POLICY CHALLENGES IN A DIVERGING

GLOBAL ECONOMY

Asia Economic Policy Conference

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POLICY CHALLENGES IN A DIVERGING GLOBAL ECONOMY

Edited by
Reuven Glick
Mark M. Spiegel

Asia Economic Policy Conference

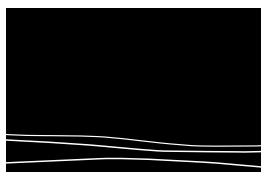*Sponsored by the*
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Contents

Foreword

The 2015 Asia Economic Policy Conference, titled "Policy Challenges in a Diverging Global Economy," continues the series that the Federal Reserve Bank of San Francisco began in 2009 and holds every other year. This series is the flagship event of our Center for Pacific Basin Studies, bringing together researchers, private market participants, and policymakers to explore Asia's evolving role in the global economy.

These conferences build on the Bank's long-standing tradition of focusing on Asian developments. They help provide the deep understanding of Asian economies that is very important to the Federal Reserve Bank of San Francisco. Knowledge of the region is important for formulating monetary policy, promoting the stability of global financial markets, and executing our responsibilities in banking supervision. The conference also affords us the ability to informally discuss global economic issues with policymakers from Asia and the rest of the world. As the Federal Reserve pursues policy normalization, communication with other monetary officials is particularly useful.

The program at this year's conference focused on the many challenges faced by policymakers in advanced and emerging countries in the global economy. Among the issues addressed are what will be the impact of U.S. policy normalization on emerging markets, what is the desirability and feasibility of international policy coordination, and what are the prospects for China's continued economic growth and currency internationalization.

I appreciate the contributions of all those who took part in the conference, including authors, discussants, panelists, and audience members. My special thanks to Reuven Glick, Zheng Liu, Fernanda Nechio, and Mark Spiegel for organizing the proceedings, to Sokha Um for handling all of the conference logistics, to Reuven Glick and Mark Spiegel for editing the proceedings, and to Anita Todd for her assistance with the production of this volume.

John C. William

John C. Williams
President and CEO, Federal Reserve Bank of San Francisco

Policy Challenges in a Diverging Global Economy: Conference Summary

Reuven Glick and Mark M. Spiegel

The Federal Reserve Bank of San Francisco's Center for Pacific Basin Studies held the fourth in its biennial Asia Economic Policy Conference (AEPC) series with a program on "Policy Challenges in a Diverging Global Economy" on November 19–20, 2015. The program focused on the challenges faced by policymakers in advanced and emerging economies as the U.S. economy continues to strengthen and the Federal Reserve pursues policy normalization by raising its policy rate. Participants considered many questions, such as what will be the impact of U.S. policy normalization on emerging markets? What is the desirability and feasibility of international policy coordination? And what are the prospects for China's continued economic growth and currency internationalization? To explore these issues and others, the conference brought together experts from around the world and commissioned papers and other presentations by distinguished speakers. This chapter briefly summarizes the papers presented.

In opening remarks on "Emerging Asia in Transition," Vice Chairman Stanley Fischer of the Federal Reserve Board of Governors observes that, after a long period of rapid economic growth, Asia's emerging economies, including China, appear to have entered a transitional phase of slower growth. He provides four reasons for this growth slowdown. First, emerging Asia has been negatively affected by slow demand growth elsewhere, particularly in advanced economies. Second, economies generally decelerate as they develop, a pattern already seen in many of Asia's growth pioneers, such as Japan and Korea. Third, the tremendous growth of trade in the region, driven by the process of global integration and expansion of production-sharing networks, may be flattening. Lastly, demographic aging and slower labor force growth across the region is dampening growth. The transition to slower growth in emerging Asian economies, as well as a shift toward domestic demand and consumption and away from external demand and investment in the region, is likely to have significant implications for the global economy.

In "Monetary Policy 'Contagion' in the Pacific Basin: A Historical Inquiry," Sebastian Edwards of the University of California at Los Angeles examines the extent to which Federal Reserve actions have affected monetary policy in emerging markets in the past. In particular, he analyzes the impact of U.S. interest rate changes on policy rates in Asian and Latin American emerging economies during the 2000s prior to the recent global financial crisis. He finds that federal funds rate changes had significant effects in these countries, particularly in Latin America. He also finds that Asian countries with more capital mobility were more affected than countries with less capital mobility. He interprets this cross-country co-movement of interest rates as evidence of policy "contagion." This suggests the possibility that the current policy of interest rate normalization by the Federal Reserve may create more macroeconomic volatility in emerging markets.

The increasing globalization of financial markets has increased the risk of financial contagion. Stephen Cecchetti of Brandeis University and Paul Tucker of Harvard University in their paper "Is There Macroprudential Policy without International Cooperation?" ask if global finance requires a common prudential standard, if macroprudential policies need to be coordinated internationally, and whether effective enforcement requires coordination of dynamic regulatory policy adjustments. They argue that a common prudential standard—what they term a level of "required resilience"—is needed to treat similar risks in a comparable manner across all countries and markets in the global financial system. They argue that macroprudential policy is not possible without international cooperation, since exposure to risk across sectors, institutions, and borders requires cooperation and transparent information exchange.

Demographic factors have played a role in China's economic development. In a keynote address entitled "Freer Choice, Lower Growth, and Higher Welfare: Recent Changes in China's Population Control Policy and the Impact on Its Economy," Shang-Jin Wei of the Asian Development Bank and Columbia University discusses how China's population control measures of one child per couple implemented in 1979 have affected its macroeconomy through different channels. First, it strongly increased the incentive to work by causing the fertility rate to fall more rapidly than the natural decline that typically occurs with rising income levels. Second, it increased the dependency ratio—as measured by the share of the working aged in the total population—and increased the incentive to save. Third and most interestingly, he argues that it increased the ratio of males to females, creating a gender ratio imbalance. This imbalance added to the incentive to work, save, and accumulate wealth in order to enable

males to find partners in the "marriage market." He concludes that the recent relaxation of China's population control policy—to allow for two children per couple in general—will likely lessen the incentives for work and saving over the next two decades. While this may lower China's growth rate, the greater freedom of choice should raise the welfare of Chinese citizens.

Jeffrey Frankel of Harvard University discusses the potential for improved global policy cooperation and coordination in his paper "International Coordination." Frankel begins with the observation that the presence of global spillovers raises the potential for improved welfare outcomes with cooperation and coordination. Moreover, he notes that attention to policy coordination has increased in the wake of apparent spillovers from monetary policies pursued by advanced economies, such as the United States, to other—often vulnerable—emerging market economies. Frankel considers the possibilities for coordination by examining outcomes in a variety of alternative strategic games, identifying beneficial coordination outcomes as those that yield superior welfare to all players relative to a noncooperative equilibrium. These may include agreements to jointly engage in fiscal expansion or, alternatively, adopt fiscal discipline measures, as well as agreements to jointly pursue expansionary or contractionary monetary policies. However, he acknowledges that countries may disagree on the potential gains from coordination, particularly because side payments in a global context are challenging to implement. These issues are likely to arise in situations where economic conditions differ across countries, creating differences in desirable fiscal or monetary policies among countries. In these instances, the scope for successful policy coordination may be limited.

The implications of an increasing role in global markets for China's currency, the renminbi, is considered in a paper by Eswar Prasad of Cornell University, "The Renminbi's Ascendance in International Finance." Prasad notes that the use of the renminbi as a currency of both denomination and settlement is on the rise. He also argues that the renminbi is already a reserve currency, in the sense that the renminbi is held by central banks as reserves and also is used in swap arrangements. Prasad acknowledges the progress China has made in liberalizing both its closed capital account and its managed exchange rate regime, which still follows the dollar closely. However, he argues that its heavily distorted financial sector continues to limit the potential for the renminbi to continue its progress toward becoming one of the true "global currencies," enjoying similar standing to the currencies of other large global economies. Moreover, he cautions that China's pattern of "sequencing" capital account liberalization before liberalizing the financial sector may result in exposing that

sector to greater instability. In particular, Prasad does not expect the renminbi to surpass the U.S. dollar as the primary global currency in the absence of continued reforms to China's financial markets and capital account policies.

While China's economy has achieved remarkable growth in the past 30 years, many distortions remain. Loren Brandt of the University of Toronto in "Policy Perspectives from the Bottom Up: What Do Firm-Level Data Tell Us China Needs to Do?" seeks to resolve the puzzle that China's economy is extremely dynamic, yet also quite distorted. Turning to firm-level analysis, he argues that this paradox is explained by the fact that the most dynamic sectors in China are those that are exposed to the greatest amount of competition and that the firms in these sectors have made great strides in reducing productivity gaps with multinational competitors. In contrast, firms in sectors that are identified by the Chinese government as important and strategic, or that are in industries with heavy shares of state-owned enterprises, are protected from competition to allow them to grow and to avoid failure. However, Brandt shows that on average firms respond to this protection by increasing size rather than productivity. He expresses concern that as China rebalances away from export-oriented activity and toward services, this problem could get larger, as firms in the service sector may be protected from outside competition and respond with a reduction in their pace of innovation.

The conference continued with a policy panel. The first speaker, Sayuri Shirai, Monetary Policy Board member of the Bank of Japan, delivered prepared remarks entitled "Monetary Policy in a Diverging Economy: Japan, the United States, and the Asia-Pacific Region." Shirai discussed the Bank of Japan's implementation of "quantitative and qualitative easing," its version of unconventional monetary policy at the zero lower interest rate bound, and its impact on Japanese inflation. Although these policies have encouraged positive inflation in Japan, Shirai observed that both Japan and the United States have much ground to cover to meet their respective inflation targets. She did note that well-anchored inflation expectations in the United States around the 2 percent level should aid in reaching the Federal Reserve's target. Turning her attention to Asia, Shirai noted the proliferation of inflation-targeting regimes, welcoming this development as indicating greater commitment in the region to the pursuit of price stability.

The second panel speaker was Joon-Ho Hahm, Monetary Policy Board member of the Bank of Korea, whose remarks were entitled "Safeguarding Financial Stability in a Diverging Global Economy." Mr. Hahm stressed that the policy normalization process undertaken now by the Federal Reserve differed from prior episodes because it was taking place at a time when economic

conditions in many emerging markets were relatively weak. Consequently, despite extensive efforts to mitigate excessive credit expansion through macroprudential policies, the impact on emerging market economies could be more severe than during previous episodes of tightening by monetary authorities in advanced countries. This impact of U.S. monetary policy will also be magnified by the effects of the simultaneous China slowdown, which is negatively affecting countries in the Asia-Pacific region. In response to these external shocks, the Bank of Korea has expanded its macroprudential efforts and also sought to ease volatility through accommodative monetary policy.

Lastly, the panel heard from Bank Indonesia Deputy Governor Perry Warjiyo, whose prepared remarks were entitled "Indonesia: Global Spillover and Policy Response." In his remarks, Deputy Governor Warjiyo noted that the combination of the slowdown in China, an important destination for Indonesian exports, and the onset of monetary policy normalization in the United States posed challenges for the Indonesian economy. China's recent liberalization of its exchange rate also exacerbated financial volatility in the region. Deputy Governor Warjiyo reviewed the policy responses pursued by Bank Indonesia, including its conduct of standard monetary policy practices, the undertaking of macroprudential actions, and efforts to deepen the country's financial system. The Deputy Governor concluded by acknowledging the need for further structural reforms, both in the short run to stabilize the economy and over the medium to long term to promote economic growth. He argued that the liberalization measures needed to achieve these goals are complementary, and that those already pursued for short-run stabilization, particularly those intended to shore up Indonesia's financial sector, should also serve the country well over the medium- to long-term horizon.

Barry Eichengreen, of the University of California at Berkeley, tended the formal portion of the conference with closing remarks. Eichengreen reviewed the themes of previous conferences where he had performed this same role, noting that prior conferences had proven quite prescient, particularly the ongoing theme that the Asia region would remain integrated with the rest of the world and hence be exposed to external global shocks. Eichengreen noted that a number of developments would facilitate the further integration of global financial markets, including China's slow, but ongoing, liberalization of its financial markets and growth in offshore borrowing. However, he acknowledged that this growing integration has created new sources of potential vulnerability for local economies. He then summarized the papers in turn.

The conference proceedings concluded with a dinner keynote address from International Monetary Fund Research Director and Counselor Maury

Obstfeld. Obstfeld noted that global economic recovery now depended importantly on the performance of emerging market economies, including China, and noted what a departure this represented from prior periods when advanced economies alone drove global economic growth. Among the factors influencing growth now, Obstfeld mentioned the debt overhangs facing many countries, remaining scarring from the recent global financial crisis, and declining productivity. Obstfeld also noted that China's rebalancing toward domestic consumption would weigh on global trade flows and commodity prices.

In terms of policy prescriptions, Obstfeld stressed the value of implementing macroprudential policies in advanced economies and the need for many emerging economies to diversify their export markets to find substitutes for China. He also observed that increases in infrastructure investment are warranted for almost all global economies and that structural reforms may be required to escape the current low-growth environment. He acknowledged that the nature of the reforms that will work to accelerate growth remain uncertain and that this was an important topic for ongoing research at the International Monetary Fund.

Emerging Asia in Transition

Stanley Fischer

I am grateful for the opportunity to participate in the Federal Reserve Bank of San Francisco's Asia Economic Policy Conference, and I thank the organizers for inviting me. After a long period of rapid economic growth, Asia's emerging economies appear to have entered a transitional phase. For decades, emerging Asian economies have been among the fastest growing and most dynamic in the world. Supported by an export-oriented development model, annual growth averaged 7½ percent in the three decades leading up to the global financial crisis. As shown in Table 1, the fast pace of growth in emerging Asia has also supported impressive gains in per capita income within the region.

As the economies of emerging Asia have developed, they have followed a similar growth trajectory, also apparent in Table 1. Along a path pioneered by Japan in the 1960s, initial integration into the global economy has been followed by a period of rapid export-led economic growth, which subsequently slows as the economy develops and incomes rise. In a process that has been likened to the pattern of flying geese, development in Japan pushed more labor-intensive production from Japan into the "Asian tigers"—that is, Hong Kong, Korea, Singapore, and Taiwan—with that set of countries experiencing rapid growth in the 1970s and 1980s. As the tigers developed, low-value-added production was pushed further on, into the group of countries known as the Association of Southeast Asian Nations (ASEAN)—primarily Indonesia, Malaysia, Thailand, and, more recently, China, where growth took off in the 1980s and accelerated through the 2000s.[1] At each step in this process, the slowing of growth in the relatively developed and globally integrated Asian economies was matched by an acceleration of growth in the less developed and less integrated economies, maintaining the overall rapid pace of growth in the region.[2]

TABLE 1
Growth and Income in Asia

Period	Japan	Korea	Indonesia	China	India
Average annual GDP growth (2005 U.S. dollars)					
1960s	10.4	8.3	3.7	3.4	3.9
1970s	4.1	10.5	7.8	7.5	2.9
1980s	4.4	8.6	6.4	9.8	5.7
1990s	1.5	6.7	4.8	10.0	5.8
2000s	.6	4.7	5.1	10.3	6.9
2010–14	1.5	3.7	5.8	8.6	7.3
Per capita GDP (2005 U.S. dollars)					
1960s	10,576	1,335	290	108	245
1970s	17,782	2,895	416	169	278
1980s	24,620	5,749	644	328	334
1990s	32,779	11,618	1,026	746	463
2000s	35,250	18,350	1,258	1,761	724
2010–14	36,916	23,373	1,712	3,381	1,115

Source: World Bank, *World Development Indicators.*
Note: GDP is gross domestic product.

Now, with China perhaps beginning to follow the same trajectory of slowing growth as has been experienced by its predecessors in the East Asian growth model and without economies of sufficient scale to fill the gap (with the notable exception of India, which I will discuss later), growth for the region as a whole is declining. As shown in Table 2, taken from the most recent International Monetary Fund (IMF) regional outlook for Asia, growth in emerging Asia is set to decline in 2015 and 2016, with China's growth decelerating.[3] Furthermore, the IMF projections through 2020 call for almost no pickup from this slower pace.

In my discussion, I will first address some of the factors behind slowing growth in emerging Asia, importantly including demographics. I will then cover one of the global implications of this deceleration, the effect on commodity markets, before looking at the prospects for India to recharge the region's growth dynamic. I will end with some thoughts on Asia's place in the global economy both now and in the years to come.

Why Is Growth in Emerging Asia Slowing?

The first thing to say and think about Asian growth is that growth at a rate of above 6 percent is not slow; it is slower than it has been, but it remains impressive. There are four factors weighing on emerging Asian growth that I would like to highlight. First, emerging Asia continues to be negatively affected by slow demand growth elsewhere, including in the advanced economies. Second, economies generally decelerate as they develop, a pattern that has already been

TABLE 2
Asia: Real GDP
(Year-on-Year Percent Change)

	Actual Data and Latest Projections					Difference from April 2015 WEO		
	2012	2013	2014	2015 (projection)	2016 (projection)	2014	2015	2016
Asia	**5.7**	**5.8**	**5.6**	**5.4**	**5.4**	**0.0**	**−0.2**	**−0.1**
Emerging Asia[a]	**6.8**	**7.0**	**6.8**	**6.5**	**6.3**	**0.0**	**−0.1**	**−0.1**
Australia	3.6	2.1	2.7	2.4	2.9	0.0	−0.4	−0.3
Japan	17	1.6	−0.1	0.6	1.0	0.0	−0.4	−0.2
New Zealand	2.9	2.5	3.3	2.2	2.4	0.1	−0.7	−0.3
East Asia	**6.8**	**6.9**	**6.7**	**6.2**	**5.8**	**0.0**	**−0.1**	**−0.1**
China	7.7	7.7	7.3	6.8	6.3	−0.1	0.0	0.0
Hong Kong SAR	17	3.1	2.5	2.5	2.7	0.2	−0.3	−0.4
Korea	2.3	2.9	3.3	2.7	3.2	0.0	−0.6	−0.3
Taiwan Province of China	2.1	2.2	3.8	2.2	2.6	0.1	−1.6	−1.5
South Asia	**5.2**	**6.8**	**7.2**	**7.2**	**7.4**	**0.1**	**−0.1**	**0.0**
Bangladesh	6.3	6.0	6.3	6.5	6.8	0.2	0.2	0.0
India	5.1	6.9	7.3	7.3	7.5	0.1	−0.2	0.0
Sri Lanka	6.3	7.3	7.4	6.5	6.5	0.0	0.0	0.0
Nepal	4.8	4.1	5.4	3.4	4.4	−0.1	−1.6	−0.6
ASEAN	**6.0**	**5.2**	**4.6**	**4.6**	**5.0**	**0.0**	**−0.5**	**−0.3**
Brunei Darussalam	0.9	−2.1	−2.3	−1.2	3.2	−1.6	−0.7	0.4
Cambodia	7.3	7.4	7.0	7.0	7.2	0.0	−0.2	0.0
Indonesia	6.0	5.6	5.0	4.7	5.1	0.0	−0.5	−0.4
Lao P.D.R.	7.9	8.0	7.4	7.5	8.0	0.0	0.2	0.2
Malaysia	5.5	4.7	6.0	4.7	4.5	0.0	−0.1	−0.4
Myanmar	7.3	8.4	8.5	8.5	8.4	0.8	0.2	−0.1
Philippines	6.7	7.1	6.1	6.0	6.3	0.0	−0.7	0.0
Singapore	3.4	4.4	2.9	2.2	2.9	0.0	−0.8	−0.1
Thailand	7.3	2.8	0.9	2.5	3.2	0.2	−1.2	−0.8
Vietnam	5.2	5.4	6.0	6.5	6.4	0.0	0.5	0.6
Pacific island countries and other small states[b]	**3.0**	**1.3**	**3.5**	**3.6**	**3.4**	**−0.1**	**−0.4**	**0.0**
Memorandum items:								
World	3.4	3.3	3.4	3.1	3.6	0.0	−0.4	−0.2
Advanced economies	1.2	1.1	1.8	2.0	2.2	0.0	−0.4	−0.2
United States	2.2	1.5	2.4	2.6	2.8	0.0	−0.5	−0.3
Euro area	−0.7	−0.2	0.9	1.5	1.7	0.0	0.0	0.0
Emerging and developing economies	5.2	5.0	4.6	4.0	4.5	0.0	−0.3	−0.2

Sources: IMF *World Economic Outlook* database; and IMF staff projections.

a Emerging Asia includes China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. India's data are reported on a fiscal year basis.

b Simple average of Pacific island countries and other small states which include Bhutan, Fiji, Kiribati, Maldives, the Marshall Islands, Micronesia, Palau, Papua New Guinea, Samoa, Solomon Islands, Timor-Leste, Tonga, Tuvalu, and Vanuatu.

Note: This table originally appeared as table 1 in International Monetary Fund, *Regional Economic Outlook Update: Middle East and Central Asia* (Washington, DC: IMF, October 2015), p. 12, http://www.imf.org/external/pubs/ft/reo/2015/apd/eng/pdf/areo1015.pdf.

evidenced in many of emerging Asia's growth pioneers. Third, the tremendous growth of trade in the region, driven by the process of global integration and the growth of production-sharing networks, may have plateaued. Lastly, demographic trends in a number of emerging Asian countries are likely to affect growth in the coming years.[4]

Regarding the first of the factors that I just listed, contrary to often-repeated and often-resurrected stories of emerging market growth "decoupling" from that of the advanced economies, the truth is that advanced-economy demand continues to play a key role in emerging Asia's economic conditions.[5] And, as we all know, advanced-economy demand for imports in recent years has been lackluster. Real goods imports in the United States, Japan, and the euro area have all increased at an average annual pace of about 3½ percent over the past three years, in all cases about half the average pace recorded in the two decades leading up to the financial crisis.

Regarding the second factor, as is well established by theory and supported by empirical experience, economic growth tends to decelerate as a country develops. In a capital-poor developing economy, initial increases in investment generally have high returns, which then decline as capital accumulates. Likewise, the initial phase of integration with the global economy is typically marked by strong gains in productivity as methods and technologies are adopted from more advanced economies. Over time, the boost to growth from this catch-up in productivity fades. Also, as incomes rise and consumption grows, there is a tendency for a relatively rapid increase in demand for services. The shift of domestic resources toward the production of services, which are typically associated with lower productivity growth, tends to further lower trend growth.

The factors that have tended to temper growth as economies develop appear to be at play in China. Following years of exceptionally high investment, the return on capital appears to be moderating, and the ratio of investment to gross domestic product (GDP), after peaking near 50 percent of GDP in 2011, has begun to edge down. As viewed in the context of the Lewis model, China could be reaching the stage at which the supply of labor from the subsistence agricultural sector becomes a constraint on growth. Further, productivity growth, though robust by global standards, has been declining.

This decrease is likely due, at least in part, to the rapid growth of services consumption. One of the most noteworthy aspects of China's recent GDP data has been the strength of services, with services now accounting for half of the value-added in GDP, up from just over 40 percent in 2008.

Next, I would like to discuss the third factor weighing on Asian growth—trade.

Global integration and trade growth have played a key role in the Asian economic success story, and the recent slowdown in global trade, over and above what might be expected given the weakness of advanced-economy demand discussed earlier, is likely to affect emerging Asian growth prospects.

During the financial crisis, global trade collapsed. After the immediate crisis faded, trade bounced back in many cases. But the bounceback was more limited than the decline, with the increase in the volume of trade since 2012 only matching the pace of global output growth, a considerable deceleration from the previous two decades, when trade increased at twice the pace of global output. While the legacy of the crisis (particularly the continued weakness of traded-good-intensive investment in many economies) has likely contributed to the weakness of global trade, a slowdown in intra-Asian regional trade also appears to be a factor. After increasing at an average rate of about 15 percent a year through the 2000s, nominal intra-Asian trade flows have flattened out considerably over the past couple of years, in part reflecting a slowdown in the growth of production sharing within the region.

The outlook for a renewed surge in intra-Asian trade does not appear to be promising. The growth of production-sharing networks in Asia has been tied to the region's export-oriented growth model. In particular, China's integration into the global economy as the hub of this production network provided a significant boost to the development and growth of these networks. As China and the region shift toward domestic demand and away from external demand, it seems unlikely that trade growth in the region will return to its earlier exceptional pace.

To the extent that the expansion of these networks was tied to export-led growth that depended partly on preferential treatment of the export sector, more-balanced growth in these economies may also result in a better allocation of production across countries. If growth of trade is lower as a result, that is not necessarily a problem. However, there is a well-established literature indicating that trade encourages greater efficiency, along with the dissemination of technological innovation, and slower growth of trade could reduce this effect.

It also bears noting that Asian trade growth has been accompanied by the creation of a variety of intraregional and broader trade agreements—including the 10-nation ASEAN and membership in the World Trade Organization, which China achieved in 2001 and Vietnam in 2007—as well as a host of bilateral agreements, both within and outside the region. I will return briefly to the Trans-Pacific Partnership (TPP) at the end of the talk.

Finally, demographics are an additional factor likely to lower growth in the region, particularly in Hong Kong, Korea, Singapore, Thailand, and

China, notwithstanding the recent relaxation of the one-child policy. As shown in Table 3, both China and Thailand have a median population age of about 37 years, about the same as the median in the United States. The median age is even higher in Hong Kong, Korea, and Singapore, all of which have medians of 40 years or more. Relatedly, as shown in the second column of the table, China, Thailand, and the relatively developed emerging Asian economies are expected to have a significant percentage of their populations older than 65 years by 2030, with the proportion similar to that in the United States, though still below those in Germany and Japan. In contrast, demographics are less of an issue elsewhere in the region, particularly in India and most of ASEAN, including Indonesia, Malaysia, the Philippines, and Vietnam, which have medians of 30 years or less. Just as slowing workforce growth is likely to be a drag on growth in many developed countries, trend growth is likely to be held back by demographic developments in relatively elderly emerging Asian economies as well.

Up to this point, I have discussed a number of factors that are likely to lower emerging Asia's growth trajectory in the coming years. However, the

TABLE 3
Emerging Asia Demographics

Country or Territory	UN Estimates for 2015	
	Median Population Age (2015)	Percent of Population Age 65 or over (2030)
Bangladesh	26	7
Bhutan	27	8
Cambodia	24	7
China	37	17
Hong Kong	43	26
India	27	8
Indonesia	28	8
Korea	41	24
Lao P.D.R.	22	5
Malaysia	29	10
Myanmar	29	9
Nepal	23	7
Philippines	24	7
Singapore	40	23
Sri Lanka	32	15
Thailand	38	19
Vietnam	30	12
Memo:		
Germany	46	28
Japan	47	30
United States	38	21

Source: United Nations (2015).

overall message is not a pessimistic one; rather, for the most part, the slowing of growth is a natural transition and an outcome of Asia's remarkable economic success.

As many have noted over the years, maintaining growth sufficiently rapid to meet the development aspirations of the region will require a transition toward an economic paradigm more rooted in domestic demand, particularly consumption. The need for this transition, or rebalancing, is most apparent and also widely acknowledged in China, the current hub of emerging Asia's export-led model. The need for these economies—primarily China, but also those economies that export through China—to switch toward domestic demand largely reflects their having become too big and too important to rely to the extent they have on the export-led models of the past.

On growth, the bottom line that should be emphasized is that even with a diminished pace of growth, the region is still expected to significantly outpace the global economy and make by far the largest contribution to global growth in the years ahead.

Spillovers from Asia's Economic Transition: Commodity Markets

I will now focus on an area where the spillovers of Asia's economic transition are likely to be substantial—global commodity markets.

Emerging Asia has played an outsized role in commodity markets for some time now. Specifically, China, with its investment-heavy growth model, has accounted for a substantial amount of incremental commodity demand over the past two decades. Since 2000, China has accounted for roughly 40 percent of the increase in global demand for oil and 80 percent of the growth in demand for steel. For copper, all of the incremental rise in global demand has come from China, with demand excluding China falling over the period.

The strength of emerging Asian demand growth pushed commodity prices up sharply over most of the past decade, at least temporarily reversing what seemed to be an inexorable decline in both commodity prices and the terms of trade of commodity producers in the preceding two decades. Higher prices were a tremendous boon to commodity producers and supported a decade of strong growth in a number of emerging market economies, as well as commodity sectors in certain advanced economies, including Australia and the United States.

Since mid-2014, commodity prices have plummeted, with oil prices falling almost 60 percent and a broad index of metals prices losing about one-third of its value, dragging down growth in many commodity producers. Although

rapid commodity output growth in recent years, which has reflected in part the response of producers to previous price increases, has certainly contributed to the fall in commodity prices, the slowing of demand growth from China and emerging Asia has also been an important factor.

While the path ahead for commodity prices is, as always, uncertain, declining investment rates in emerging Asia, particularly China, present the prospect of a prolonged decline in the growth rate of commodity demand. And prices could remain low for quite some time, which seems particularly true for metals, such as copper and steel, used heavily in construction and investment. However, for oil, the implications of a shift from investment-led growth to a consumption-led model are less certain. On a per capita basis, China's consumption of oil remains far below that of advanced economies, in line with China's lower rate of car ownership. Per capita oil consumption tends to increase with wealth, such that further income growth in China has the potential to provide strong support for the oil market in the coming years.

Indeed, more generally, the world stands to benefit from a transition to more consumption-led growth in emerging Asia. Under a successful transition toward more-balanced growth, emerging Asia can be expected to import a broader array of goods and services both from within the region and globally. Whether a country benefits from or is harmed by emerging Asia's transition is likely to be determined by the flexibility of that country's economy in adapting to shifts in Asian demand away from commodities and inputs for assembly into the region's exports and toward services and goods to meet Asian final demand.

To recap, the transition to slower growth in the emerging Asian economies, as well as a shift toward domestic demand and consumption and away from external demand and investment in the region, is likely to have profound implications for the global economy. For one, trade growth is unlikely to resume its rapid pace of recent decades, and the long climb in commodity prices, which has benefited commodity producers, appears to have come to an end.

Can India Recharge Growth in Emerging Asia?

One source of uncertainty in this outlook, as alluded to earlier, is the prospect for India to provide a new growth engine for Asian development. In principle, India has enormous potential to recharge the Asian growth engine. For one, India is relatively unintegrated into global production-sharing networks. For example, machinery and electrical products, which feature heavily in production sharing and which make up about half of exports in other emerging Asian economies, account for only 15 percent of India's exports. Foreign direct investment into India is about half the size of similar flows into China as a percentage

of GDP, and GDP per capita, at $1,600 in 2014, remains considerably below emerging Asia's average.

All told, while the export-led growth model that propelled growth in China and other economies in emerging Asia has matured, pushing down growth rates, India remains at a relatively early stage of its development trajectory. Further capital deepening and the potential for further productivity gains suggest that India could maintain rapid economic growth for a number of years. As mentioned previously, India is also a young country, with a relatively low dependency ratio and a growing workforce. By United Nations estimates, India is set to overtake China during the next decade as the world's most populous nation.

In the 1960s and 1970s, the Indian economy grew at around 3 to 4 percent. In subsequent decades the growth rate averaged close to 6 percent, and in the early years of this century it rose further, as can be seen in Table 1. In 2015, growth in India is expected to be 7¼ percent, the fastest among large economies, and the IMF expects growth to pick up from this already rapid pace through the end of the decade (see Table 4). Growth has been supported by an improved macroeconomic policy framework, including a strengthening of the framework for conducting monetary policy, as well as legal and regulatory reform. And the authorities have embarked on an ambitious program to improve the business environment.

That said, significant roadblocks need to be overcome for India to reach its full potential. The economy continues to suffer from a number of infrastructure bottlenecks that will be alleviated only through a pronounced increase in investment rates, a process that would likely be helped by a relaxation of restrictions on foreign direct investment. Likewise, efforts at difficult reform will have to be sustained. There is much hard work ahead if India is to come closer to fulfilling the potential that it so manifestly has.

Concluding Remarks

The performance of the Asian economies—notably those of East Asia, particularly China, Japan, and Korea—especially in the past six or seven decades, is an outstanding, if not unique, episode in the history of the global economy.

What lies ahead? In the relatively near future probably some major central banks will begin gradually moving away from near-zero interest rates. The question here is whether the emerging market countries of Asia—and, indeed, of the world—are sufficiently prepared for these decisions, to the extent that potential capital flows and market adjustments can take place without major macroeconomic consequences. While we continue to scrutinize incoming data, and no final decisions have been made, we have done everything we can to avoid

TABLE 4
Population and GDP for Emerging Asia, 2014

Country or Territory	UN Estimates for 2015	
	Population (millions)	**GDP (billions of current U.S. dollars)**
Bangladesh	158.22	183.82
Bhutan	.77	1.98
Brunei Darussalam	.41	17.10
Cambodia	15.31	16.55
China	1,367.82	10,356.51
Fiji	.89	4.29
Hong Kong	7.27	290.90
India	1,275.92	2,051.23
Indonesia	252.17	888.65
Kiribati	.11	.18
Korea	50.42	1,410.38
Lao P.D.R.	6.90	11.68
Malaysia	30.60	338.11
Maldives	.34	2.89
Marshall Islands	.05	.19
Micronesia	.10	.31
Mongolia	2.93	12.04
Myanmar	51.42	63.14
Nepal	28.11	19.76
Palau	.02	.25
Papua New Guinea	7.53	16.81
Philippines	99.43	284.62
Samoa	.19	.83
Singapore	5.47	307.87
Solomon Islands	.58	1.16
Sri Lanka	20.96	74.92
Taiwan	23.43	529.60
Thailand	68.66	404.82
Timor-Leste	1.23	4.97
Tonga	.10	.44
Tuvalu	.01	.04
Vanuatu	.26	.82
Vietnam	90.63	185.90

Source: IMF *World Economic Outlook*, October 2015.
Note: GDP is gross domestic product.

surprising the markets and governments when we move, to the extent that several emerging market (and other) central bankers have, for some time, been telling the Federal Reserve to "just do it."

Further ahead lies the answer to the question of whether developments in the global economy will permit the continuation of the export-centered growth strategy that underlies the Asian miracle or whether we will later conclude that this period, the period after the Great Recession and the global financial crisis,

marked the beginning of a new phase in the economic history of the modern global economy.[6] Either way, the question of the economic future of India is of major importance not only to the 18 percent of the world's population that lives in India but also to the other 82 percent of the global population.

At a more structural level are three recent developments whose potential importance is currently difficult to assess: the setting up of the Asian Infrastructure Investment Bank; the likely inclusion of the Chinese yuan in the special drawing rights basket; and the possible establishment of the TPP, a partnership in which China is not expected to be a founding member.[7]

These are interesting and potentially important developments. Underlying the answer to the questions of what they portend is the answer to the basic question of whether the economic center of gravity of the world will continue its shift of recent decades toward Asia—in particular, to China or, perhaps, to China and India. This shift would represent a return in some key respects to the global order of two centuries ago and earlier, before the economic rise of the West.

A partial answer to that question is that China is for some time likely to continue to grow faster than the rest of the world and thus to produce an increasing share of global output. Its importance in the global economy is likely to increase, and it is probable that, one way or another, its growth will result in its playing a more decisive role in the international economy and in international economic institutions.

Finally, we need to remind ourselves that geopolitical factors will play a critical role in the unfolding of that process.

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NOTES

1 With some delay, the Philippines could be added to this group. As production of labor-intensive goods has moved from one group of countries to the next, concerns have been raised about a decrease in "competitiveness" in the relatively more developed Asian economies. These concerns have been particularly pronounced in regard to China, where commentators have questioned whether China's rise has come at the expense of growth in its neighbors or provided an extra impetus to growth. Research studies (see Zheng, Wern, and You 2005 and Haltmaier et al. 2007) have generally found that China's rise has been positive for regional growth, with China's development as an export platform boosting the overall competitiveness of the region's exports.

2 In addition to integration with the global economy, a number of other factors have also contributed to the East Asian growth miracle. With regard to China, Brandt and Rawski (2008) highlight the importance of incremental reform focused on removing the most binding constraints on economic activity. Of course, reform is not independent of global integration, as the heightened international competition associated with opening an economy likely incentivizes increased reform.

3 The IMF does not include Hong Kong, Korea, Singapore, or Taiwan in its definition of emerging Asia. For the purposes of my discussion, I group these four economies along with China, India, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam as emerging Asia.

4 In a speech of this length and scope, it is not possible to relate all important developments affecting Asian growth. In particular, I will not address the need for further development of financial systems and infrastructure in Asian emerging economies, which will be important factors in determining future rates of growth.

5 This point is particularly well made in Monetary Authority of Singapore (2007).

6 See World Bank (1993) for an early attempt to define the sources of East Asian growth.

7 At this point, the reader will recall the supposed remark by Chou En-lai that it is too early to assess the importance of the French Revolution. The most plausible current version of that story is that Chou was answering a question about the importance of the 1968 student riots in Paris. The countries expected to become members of the TPP are, in alphabetical order, Australia, Brunei, Canada, Chile, Japan, Malaysia, Mexico, New Zealand, Peru, Singapore, the United States, and Vietnam.

GENERAL DISCUSSION
Emerging Asia in Transition

Mr. Kimis: My question is related to debt in Asia. We've seen huge increases in sovereign debt, corporate debt, and household debt in the region. But savings haven't increased as much, if at all. What would you say to Asian countries about watching out for debt?

Mr. Hoshi: You mentioned demographics as one of the factors for the slowdown of Asian economies. But as you pointed out, there's huge heterogeneity among Asian countries—from Japan, Korea, and Singapore, where the populations are aging and declining, to India and other Southeast Asian countries, where the populations are growing faster. So my question is, what do you think would be the effects of allowing more free flow of human capital and more immigration in Asia? Compared with Europe and the Americas, the flow of workers and the people in Asia are more restricted. So I'd like to know your view on the effects of freer immigration policies in the region.

Mr. Fischer: On the first question, about watching out for debt, I would say this: There are different behaviors in different countries. And the simple message is that an interest rate close to zero is not a long-run steady state. So countries should plan their monetary, fiscal, and financial supervision policies accordingly. Second, on demographics and labor mobility in Asia, I understand that this is a fairly complex issue, not least in Japan, or perhaps most in Japan. And one can see the many benefits of having more immigration and more mobility of labor even possibly just for limited periods. But this is one of those cases where you have to understand what the local politics is about before you can make recommendations about what should be done or what is likely to be done. I personally see a lot of room for positive results of migration and immigration in Asia. Certainly the United States has benefited from it enormously. And I think that's something that needs to be talked about, but it will be up to the Asian governments to decide what they're willing to do about it.

Mr. Eichengreen: My question is for Stan Fischer, the former World Bank and International Monetary Fund (IMF) official. You alluded to the Asia Infrastructure Investment Bank. You could have mentioned the Chiang Mai Initiative. You could have mentioned the Silk Road Initiative. Do you view these as substitutes or complements for the multilateral institutions?

Mr. Fischer: Well, they are complements. The question is, if somebody gave you an amount of money to use and your goal was to optimize development, how would you spend it? I don't know enough about the Silk Road project to know if that's a good use of funds. But I keep wondering about these large projects. Though governments love them, they frequently don't finish them or even get around to implementing them. And there's often a lot of difficulty in getting them going. But if the spending is on real infrastructure and not just a demonstration project done for short-term publicity, then I don't have big complaints about them.

Mr. Choi: Thank you very much for a very insightful address. I have a question about monetary policy in Asia. Population aging and other factors may be putting downward pressures on inflation in some countries, as you mentioned. So the question is then, how can we avoid inflation being so low that it prevents monetary authorities from engineering a low-enough real interest rate to offset deflationary world shocks? What is the right level of inflation for an emerging economy?

Mr. Fischer: Well, a large part of the argument about emerging market countries in Asia is that they do have inherent sources of growth, even without low real interest rates. And probably, if you left out international factors such as capital flows, their equilibrium interest rate is almost certainly positive—significantly positive. Let's see if we succeed in going back to having positive real interest rates around the world, even with inflation remaining low.

Mr. Wei: I would like to ask you about your view of the implications of renminbi inclusion in the special drawing rights (SDR) for the United States, the rest of the world, and China. A related question is whether the international financial system overly relies now on the U.S. dollar. Would the system be more stable if there were more reserve currencies?

Mr. Fischer: Well, I think one of the very important elements of the renminbi's inclusion in the SDR basket is that it places implicit—they're not explicit as far as I know—requirements on the nature of China's financial markets, and particularly on capital controls. The rest of the world sees the SDR inclusion as something that will help increase the efficiency of the capital markets in China. Now, we don't say if China gets rid of all of its controls and all of its regulations, then everything will be wonderful. We've seen that that is not likely to happen. But there are many areas in which China can, without much danger, liberalize some capital controls and some elements of its financial system. As for the argument about multiple currencies being more stabilizing, I'm not sure whether the

bimetalism argument of the late 19th century is relevant, because there was in that case an objective basis, namely the cost of mining, that determined what the equilibrium rate of exchange between metals should be. But it didn't seem to be a very stable system, and countries eventually gave it up. Now, does that provide an analogy about the merits of having more currencies, more international currencies around today? I don't know. But my guess is that it won't make a very big difference. It's good to have competition if the competition leads to more rational policies. But I don't buy that at first glance. And I'm not sure I will at second glance either.

Monetary Policy "Contagion" in the Pacific Basin: A Historical Inquiry

Sebastian Edwards

This paper analyzes the way in which Federal Reserve policy actions have affected monetary policy in a group of countries in the Pacific Basin—three in Asia and three in Latin America—during the period 2000–08. The results indicate that historically there has been policy "contagion" and that during the period under study these countries tended to "import" Fed policies. The paper also finds that the pass-through has been higher in the Latin American countries than in the Asian countries and that the extent of "contagion" for the Latin American nations has been independent of their degree of capital mobility. In contrast, in East Asia there is some evidence suggesting that greater capital mobility has been associated with greater policy rate pass-through.

1. Introduction

In Samuel Beckett's play *Waiting for Godot*, two friends—Vladimir and Estragon—wait, in vain, for someone called Godot. They wait and wait, but he never comes. In many ways this play is about the "anxiety of waiting." During most of the year 2015, central bankers from around the world—and especially those from the emerging markets—felt as if they were living inside that play. They waited for the Federal Reserve to make a move and raise interest rates, and as time passed without the Fed taking action, they became increasingly anxious. The first sign of apprehension came in June 2013 during the so-called taper tantrum,[1] when an increasing number of influential central bankers from emerging market economies (EMEs) called for the Fed to begin normalizing monetary policy by raising rates. They wanted the "waiting game" to be over. For example, the governor of the Reserve Bank of India, Ragu Rajan, told the *Wall Street Journal* on August 30, 2015, "from the perspective of emerging markets . . . it's preferable to have a move early on and an advertised, slow move up rather

than the Fed be forced to tighten more significantly down the line." The wait finally ended on December 17, 2015, when the Fed raised the federal funds policy target from near zero to a range of 0.25 to 0.50 percent. In the weeks that followed, many Latin American countries—Chile, Mexico, and Peru, for example—followed suit, and their respective central banks raised interest rates.[2] In contrast, during that same period most East Asian central banks remained "on hold." How emerging markets react—or will react—when the Fed begins raising interest rates raises important policy questions. What will be the spillover effects? How fast will higher global interest rates be transmitted into local financial markets and, more importantly, how will central banks react to the new reality of tighter global financial markets?[3]

According to the workhorse model of international macroeconomics—the Mundell-Fleming model—countries are able to undertake independent monetary policies under flexible exchange rates; that is, in principle central bank actions in emerging markets need not follow or even take into account the policy stance of advanced nations, such as the United States, as long as they are willing to operate with flexible exchange rates.[4] More recently, however, some authors, such as Taylor (2009, 2013, 2015) and Edwards (2015), have argued that even under flexible exchange rates there is policy interconnectedness across countries. That is, in a highly globalized economy, even when there are no obvious domestic reasons for raising interest rates, some central banks will follow the Fed. This policy "contagion" could be the result of a number of factors and considerations, including the desire to "protect" exchange rates from "excessive" depreciation, or a "fear of floating."[5] The late Ron McKinnon was a strong exponent of the existence and importance of policy "contagion." In May 2014, he stated at a conference held at the Hoover Institution that "there's only one country that's truly independent and can set its monetary policy. That's the United States."[6]

At the end, however, the extent of monetary policy independence is an empirical matter. If, for whatever reason, a particular central bank feels that it needs to mimic (or follow) advanced-country policy actions, then there will be policy "contagion" and the actual—as opposed to theoretical—degree of monetary policy autonomy will be greatly reduced.

There are many possible ways to analyze the extent of policy "contagion." One approach is to build a dynamic stochastic general equilibrium (DSGE) model of the world economy, with (some) large and (some) small countries, international trade, imperfect asset substitutability, and capital mobility. This setting could be used to address a number of important issues, including the transmission of the business cycle, "contagion," the way in which smaller countries

accommodate and deal with real and monetary shocks, the propagation of crises to the real sector, saving and investment decisions, portfolio diversification, and the role of global banks in the transmission of disturbances, among others.[7] This type of model also could be used to gain insights into how central banks in small emerging countries are likely to react to a tightening of monetary policy in a center country, such as the United States.[8] The answer depends on the structure of the smaller economy, the degree of asset substitutability and capital mobility, pass-through coefficients, and the preferences of policymakers. An alternative approach is to use historical data to investigate how central banks in EMEs have in fact reacted in the past to changes in monetary policy in the United States.

This paper uses weekly data from six Pacific Basin countries—Chile, Colombia, and Mexico in Latin America; and Korea, Malaysia, and the Philippines in East Asia—to analyze the issue of policy "contagion" from a historical perspective. The sample period extends from January 2000 through early June 2008, before the onset of the recent global financial crisis. Error correction models are estimated both for individual nations and for pooled regional panels. Thus the sample period excludes the turmoil that followed the collapse of Lehman Brothers and led the Federal Reserve to pursue policies based on zero interest rates and quantitative easing (QE).[9]

The Latin American countries in the sample have several important characteristics in common: all followed inflation targeting and allowed some degree of exchange rate flexibility during the period under study (2000–08), all had a relatively high degree of capital mobility, and all had independent central banks. In that sense, they constitute a somewhat homogenous group. The three East Asian nations constitute a slightly more varied group. Korea and the Philippines had inflation-targeting regimes and some degree of currency flexibility, while during most of the period under study Malaysia had a fixed exchange rate (relative to the U.S. dollar). All three Asian central banks were de facto (but not necessarily de jure) quite independent from political pressure.[10]

The approach taken in this paper differs from the existing literature in several ways. First, other papers typically rely on either pooled (panel) data for a group of countries—often pooling countries as diverse as Argentina and India—or have based their simulations on a "representative EME." This paper focuses on individual countries with contrasting experiences. Second, other papers use monthly or quarterly data, while this paper uses short-term (weekly) time-series data, permitting analysis of the transmission from U.S. interest rates to interest rates in EMEs at high frequency. However, the approach taken in this paper does have some limitations. In particular, dealing with individual

countries means that it is not possible to exploit cross-country variability in some variables, such as the extent of capital controls. In addition, the use of weekly data means that suitable proxies for real economic activity must be constructed. This paper uses data on commodity prices as an indicator commonly and strongly associated with real expansions and/or contractions in emerging markets.

The rest of the paper is organized as follows: Section 2 provides some background discussion and discusses the data. Section 3 deals with the theoretical underpinnings for the analysis. Section 4 reports the regression results for Latin America and East Asia using least-squares and instrumental-variables estimation, with a variety of controls. It also presents robustness and extension exercises. Section 5 provides preliminary results on the possible role of capital mobility in the pass-through process. Section 6 analyzes the extent to which Federal Reserve policies have affected market deposit rates in the three Asian and three Latin American countries. Section 7 offers concluding comments and suggests areas for future research. Section 8 lists the data sources used in the paper.

2. Background

Figure 1 plots the federal funds target rate with weekly data over the period 1994 through early June 2008, just before it was reduced to (near) zero and QE was subsequently implemented. Figure 2 shows weekly data on the policy rate for the six countries in the analysis: Chile, Colombia, Mexico, Korea, Malaysia, and the Philippines. As noted, the key question in this paper is the extent to which the central banks in these EMEs took into account the Fed's policy stance when determining their own monetary policy. In other words, with other things given, did (some of) these countries take into account Fed actions when deciding on their own policies, or did they act with complete independence?

Between January 2000 and September 2008 the federal funds policy target rate was changed 40 times. Twenty actions involved federal fund rate hikes, nineteen by 25 basis points (bps) and one by 50 bps (during the week of May 19, 2000). The other 20 policy actions involved cuts in the federal funds rate. In 7 cases it was cut by 25 bps, in 11 cases by 50 bps, and on 2 occasions by 75 bps (both in early 2008: the weeks of January 25 and March 21).

Standard tests indicate that it is not possible to reject the null hypothesis that the policy interest rate has a unit root. For this reason an error correction specification is used in the analysis that follows. This is standard in the literature on interest rate dynamics.[11] In addition, and not surprisingly, it is not possible to reject the hypothesis that the federal fund's rate "Granger causes" the

U.S. Federal Funds Target Rate, $r_{ff,t}^{us}$, 1994–2008
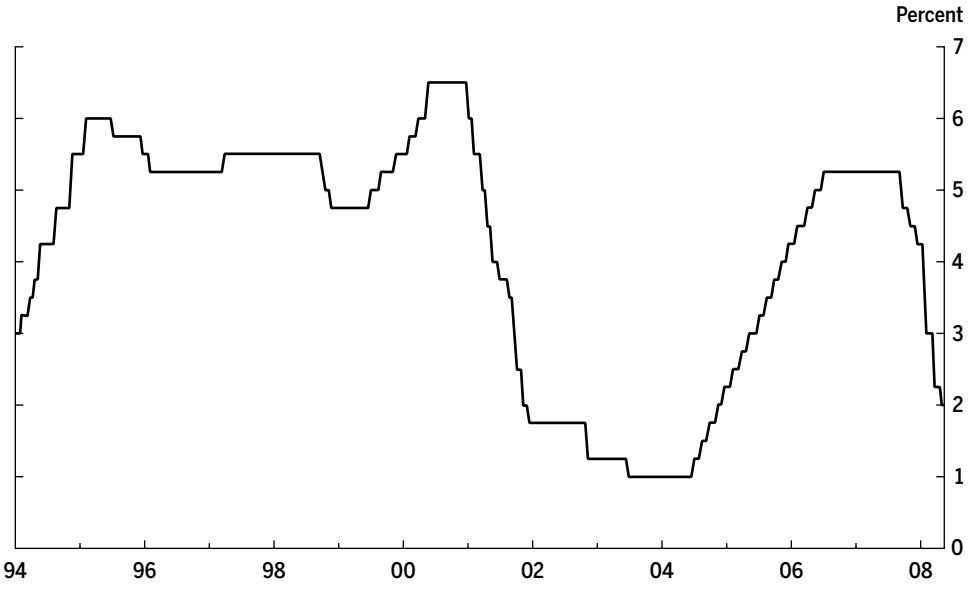
EMEs' policy rates; on the other hand, the null that these rates "cause" Fed policy actions may be rejected at conventional levels. The details of these tests are not reported due to space considerations, but are available on request.

3. Policy "Contagion"

Consider a small open economy with risk-neutral investors. Assume further in order to simplify the exposition that there are controls on capital outflows in the form of a tax rate of τ.[12] Then, the following condition will hold in equilibrium:

$$(1) \qquad \frac{r_t - r_t^*}{(1 + r_t^*)} = E_t\{\Delta e_{t+1}\} - (1 + E_t\{\Delta e_{t+1}\})\tau,$$

where r_t and r_t^* denote domestic and foreign interest rates for securities of the same maturity and equivalent credit risk, respectively, and $E_t\{\Delta e_{t+1}\}$ is the expected rate of depreciation of the domestic currency. This assumes perfect substitutability of local and foreign securities. If domestic and foreign assets are not perfect substitutes, r_t^* could be multiplied by some parameter $\theta \neq 1$. In a country with a credible fixed exchange rate, $E_t\{\Delta e_{t+1}\} = 0$, and full capital mobility, i.e., $\tau = 0$, then $r_t \approx r_t^*$. That is, the local interest rate (in domestic currency) will not deviate from the foreign interest rate. Under these circumstances, changes in the foreign interest rate will be transmitted one-to-one to the local

Monetary Policy Rates in Latin America and East Asia, 2000–08

A CHL

B COL

C KOR

D MAL

E MEX

F PHL
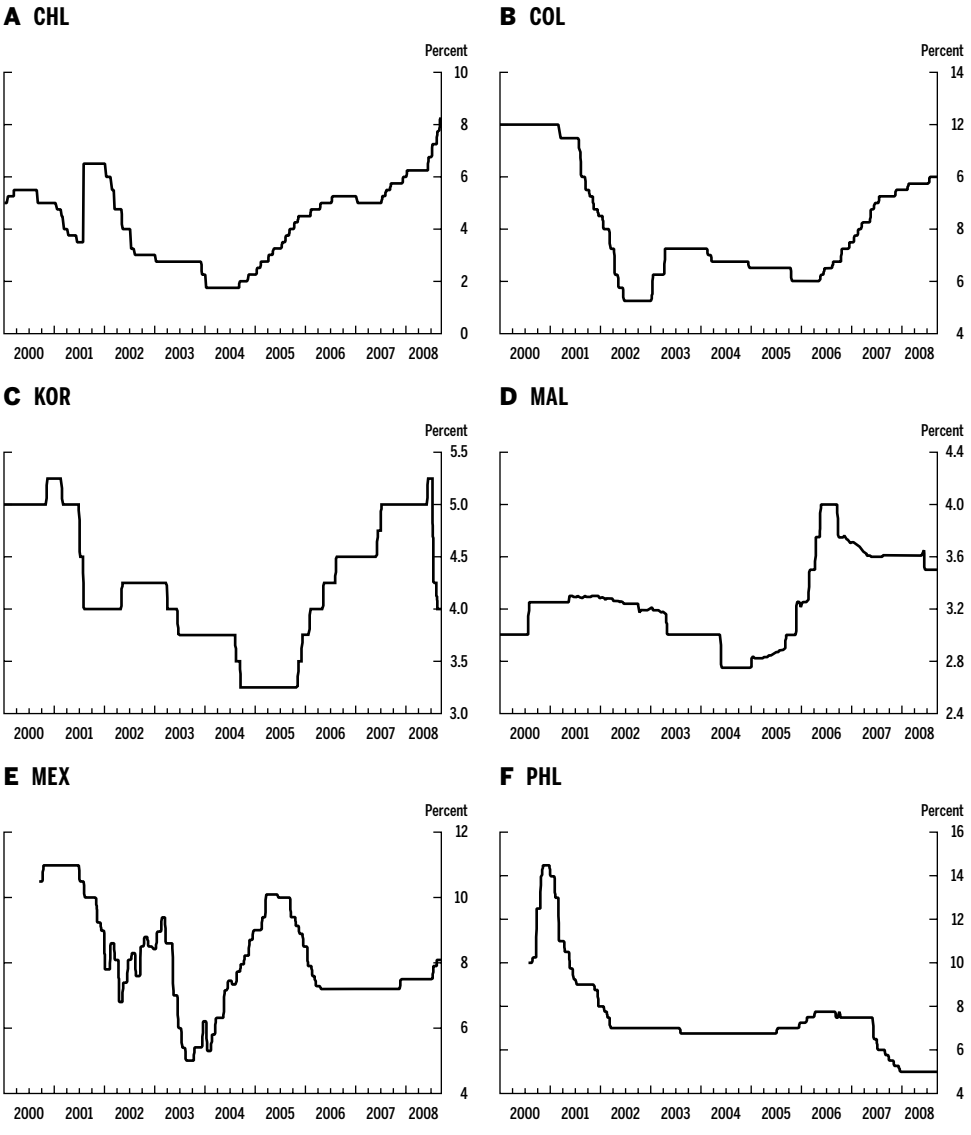
economy rate. It is in this sense that there cannot be an independent monetary policy with (credible) pegged exchange rates; i.e., the local central bank cannot set the domestic rate of interest in the long run. With limited capital mobility, i.e., $\tau \geq 0$, then there will be an equilibrium wedge between domestic and international interest rates.

Under flexible exchange rates, however, $E_t\{\Delta e_{t+1}\} \neq 0$, and local rates may deviate from the international interest rate. Assume that there is a tightening of monetary policy in the foreign country—i.e., the Fed raises the federal funds target rate—that results in a higher r_t^*. Under pegged exchange rates this would be translated into a one-to-one increase in r_t; this is so even if $\tau \geq 0$. However, if the exchange rate is flexible, it is possible that r_t will remain at its initial level and that all of the adjustment takes place through an expected appreciation of the domestic currency, $E_t\{\Delta e_{t+1}\} < 0$. As Dornbusch (1976) argued in his famous "overshooting" paper, for this to happen it is necessary for the local currency to depreciate on impact by more than in the long run. Under flexible rates then, the exchange rate will act as a "shock absorber" and will fluctuate volatilely in response to foreign shocks.[13]

In order to avoid "excessive" exchange rate volatility, the local central bank may take into account the foreign central bank's actions when determining its own policy rate. That is, its policy rule (e.g., the Taylor rule) will include a term related to the foreign central bank's policy rate.[14] In a world with two countries, this situation is captured by the following two policy reaction equations, where r_p is the policy rate in the domestic country, r_p^* is the policy rate in the foreign country, and x and x^* are vectors with other determinants of policy rates, such as the deviation from an inflation target and the deviation of the unemployment rate from its "natural" rate, and the coefficients β, β^* reflect the sensitivity of each country's policy rate to the other country's rate:

(2) $$r_p = \alpha + \beta r_p^* + \gamma x$$

(3) $$r_p^* = \alpha^* + \beta^* r_p + \gamma^* x^*.$$

Solving equations (2) and (3) gives the equilibrium monetary policy rate in each country. For the domestic country the equilibrium policy rate is (there is an equivalent expression for the foreign country)[15]

(4) $$r_p = \frac{\alpha + \beta \alpha^*}{1 - \beta \beta^*} + \left(\frac{\gamma}{1 - \beta \beta^*}\right)x + \left(\frac{\beta \gamma^*}{1 - \beta \beta^*}\right)x^*.$$

Equation (4) shows how changes in the drivers of the foreign country's policy interest rate, such as α^* or x^*, will affect the equilibrium domestic policy rate. This interdependence is illustrated in Figure 3, which includes both reaction functions (2) and (3), where PP depicts the policy function for the domestic country and P*P* for the foreign nation. The initial equilibrium is at point A. A higher level of x^* (because, say, there is a gap between the actual and target inflation rate in the foreign country) will result in a shift to the right of P*P*,

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Policy Rate Equilibrium with Policy "Contagion" and Large Countries
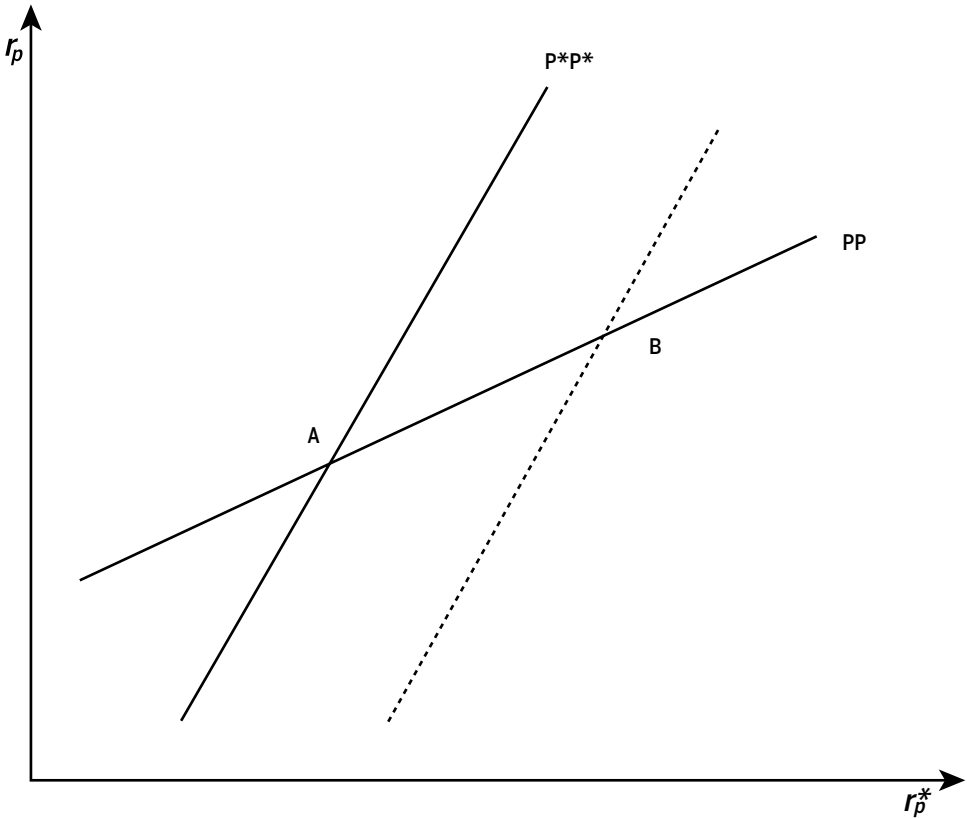
resulting in a higher equilibrium policy rate in both countries; the new equilibrium is given by point B.[16] Notice that in this case the increase in the equilibrium foreign policy rate is *amplified*; it is larger than what was originally intended by the foreign central bank, as given by the horizontal shift of the P*P* curve.

Figure 3 assumes both countries take into consideration the other nation's actions, i.e., $\beta > 0$ and $\beta^* > 0$. But this need not be the case. Indeed, if one country is large (e.g., the United States) and the other one is small (e.g., Colombia), we would expect policy "contagion" to be a one-way phenomenon. In this case, if the foreign country is the large one, β^* in equation (2) will be zero, and the P*P* curve will be vertical. A hike in the foreign country's policy rate then will impact the domestic country rate, but there will be no feedback to the large nation and thus no amplifying effect.[17] The magnitude of the "policy spillover" depends on the slope of the PP curve, as given by the β parameter. The steeper

is this curve, the larger is the extent of policy "contagion." If, on the contrary, the PP curve is very flat, policy "contagion" is minimal. In the limit, when there is complete policy independence in both countries, the PP curve is horizontal and the P*P* curve is vertical.

In traditional analyses central banks take into account the direct determinants of inflation (and unemployment, if that is part of their mandate) and there is no role for the foreign policy rate when determining the domestic policy stance, i.e., $\beta = \beta^* = 0$. The simple theoretical framework above suggests how, if $\beta > 0$ and/or $\beta^* > 0$, policy "contagion" may exist.[18] Ultimately, the extent to which specific countries are affected by policy "contagion" is an empirical matter. The rest of this paper deals with this empirical question.

4. An Empirical "Contagion" Model of Monetary Policy

This section reports results from the estimation of monetary policy rate equations for the six countries in the sample. It is assumed that each central bank has a policy function of the form of equation (2), and that it does not necessarily adjust its policy rate instantaneously to new information, including to changes in policy rates in the advanced nations. More specifically, the following error correction model allows central banks to make adjustments at a gradual pace:

(5) $$\Delta r_{p,t} = \alpha + \beta r_{ff,t}^{us} + \theta \Delta r_{p,t-1} + \delta r_{p,t-1} + \Sigma y_j x_{j,t} + \varepsilon_t,$$

where $r_{p,t}$ is the policy rate in each of the six countries in period t, $r_{ff,t}^{us}$ is the federal funds policy target rate, and $x_{j,t}$ contains other variables that affect central bank actions and would typically be included in a Taylor-type policy rule, such as domestic inflation pressure and the unemployment gap. If there is policy "contagion" from abroad, the estimated β would be significantly positive. The extent of long-term policy spillover is given by $-\left(\frac{\beta}{\delta}\right) > 0$, as long as $\delta < 0$, i.e., changes in the policy rate are mean-reverting. If $-\left(\frac{\beta}{\delta}\right) = 1$, then there is full importation of Fed policies into the domestic policy rate. In this case, monetary autonomy would be greatly reduced. The parameter θ measures the extent to which the equilibrium policy rate is cyclical, with current changes depending on past changes. In equation (5) the timing of the explanatory variables is contemporaneous with the dependent variable. However, in the estimations alternative lag structures are considered for different explanatory variables.

As noted above, the vector x in equation (5) may include the direct effect of domestic inflation and unemployment gaps on the domestic policy rate. It may also include variables that indirectly depend on the U.S. policy rate. For example, domestic inflation (or its deviations from target) may depend on import prices and the rate of depreciation of the domestic currency, a variable that, in

turn, depends on the interest rate differential between the domestic country and the United States. Another possible channel may exist when EME monetary authorities believe that the Federal Reserve has superior knowledge and/or information about world economic conditions, including global monetary pressures and/or the evolution of commodity prices. In this case the EME central bank may follow the Fed's action in a way similar to how firms follow a "barometric price leader" in the industrial organization literature. The analysis below seeks to disentangle these effects and assess whether the federal funds rate has an independent effect on EME policy rates, even when other variables (e.g., domestic inflationary pressures, U.S. expected inflation, and expected depreciation of the domestic currency) are held constant.

The following section reports results for the six countries in the sample for a basic specification where the only covariate, in addition to lagged values of the policy rate (in levels and first differences), is the federal funds target rate. These bivariate estimates provide a preliminary look at the correlation between the policy rates in these countries and the U.S. rates. This is followed by multivariate regressions with additional covariates added for the Latin American countries (Section 4.2) and Asian countries (Section 4.3).

4.1. Basic Results

Table 1 reports estimation results for a basic bivariate error correction specification of equation (5) for all six countries, using least squares. The federal funds variable is entered with a one-week lag.

The main insights from Table 1 may be summarized as follows:
- In five of the six countries the estimated coefficient β for the impact effect of a change in the federal funds rate, $r_{ff,t}^{us}$, is positive and significant, the

TABLE 1
Monetary Policy Rates in Latin America and East Asia, 2000–08

	Chile	Colombia	Mexico	Korea	Malaysia	Philippines
$\Delta r_{ff,t}^{us}$	0.016	0.016	0.004	0.007	0.002	0.018
	[2.384]**	[3.373]***	[0.590]	[3.215]***	[2.363]**	[2.146]**
C	0.044	0.055	0.090	0.062	0.022	0.088
	[1.505]	[2.055]**	[1.589]	[2.609]***	[1.494]	[1.646]
$r_{p,t-1}$	–0.024	–0.015	–0.013	–0.020	–0.008	–0.020
	[–2.610]***	[–3.588]***	[–1.854]*	[–3.072]***	[–1.695]*	[–2.377]**
$\Delta r_{p,t-1}$	0.005	–0.027	0.004	–0.010	0.159	–0.000
	[0.100]	[–0.525]	[0.073]	[–0.202]	[3.171]***	[–0.004]
Memo: $-\beta/\delta$	0.667	1.067	0.308	0.350	0.250	0.900
Observations	390	387	403	387	387	357
R-squared	0.019	0.038	0.009	0.030	0.043	0.018

Note: *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

exception being Mexico. This provides some preliminary evidence suggesting that during the period under study there may have been some policy "contagion" from the United States to these EMEs. Though generally significant, the magnitude of the impact effect during the first week of a Fed change on foreign policy rates is small. This is not surprising, as the timing of central bank meetings does not necessarily coincide across countries.

- Only Malaysia has a significant coefficient for $\Delta r_{p,t-1}$, suggesting non-monotonic adjustment of the equilibrium policy rate. This finding may be related to Malaysia's regime of maintaining a relatively rigid exchange rate during this period, in contrast to the other countries in the sample.

- The estimated long-run "contagion" effect, $-(\frac{\beta}{\delta})$, ranges from 0.25 to 1.0. The magnitude of this long-run effect is 0.67 for Chile, 1.07 for Colombia, 0.35 for Korea, 0.25 for Malaysia, insignificantly different from zero for Mexico, and 0.90 for the Philippines (throughout the paper I use rounding when discussing the results). The result that U.S. policy did not affect Mexico's central bank stance during this period is somewhat surprising, given the proximity of the two countries and the traditional dependence of Mexico's economy on U.S. economic developments. This issue is investigated in greater detail in the next subsection.

- Finally, it should be noted that the R-squared in all cases is quite low, as is usually the case for interest rate regressions in first differences.

4.2. Latin America

This subsection reports results from multivariate estimates of equation (5) for the three Latin American countries in the sample that includes, in addition to the federal funds target rate and dynamic terms, the following covariates $x_{j,t}$: (1) INFL$_t$, the year-over-year inflation rate, lagged between four and six weeks. Its coefficient is expected to be positive, as central banks tighten policy when domestic inflation increases; (2) EXP_DEPREC$_t$, expected currency depreciation, measured as the annualized difference between the three-month forward exchange rate and the spot exchange rate relative to the U.S. dollar, lagged one to three periods. To the extent that central banks are concerned about the value of the currency, its coefficient is expected to be positive; (3) US_EXP_INFL$_t$, a measure of expected global inflationary pressures, defined as the breakeven spread between the U.S. five-year Treasury securities and five-year U.S. Treasury Inflation-Protected Securities (TIPS). This is entered with a one-period lag, and its coefficient is expected to be positive.[19] In addition, some of the regressions include an indicator of regional risk EMBI_LATAM, defined as the

Emerging Market Bond Index (EMBI) spread for Latin America over U.S. Treasury securities, lagged one period. Its expected sign is not determined a priori and depends on how a central bank reacts to changes in perceived regional risk.

4.2.1. OLS Estimates

The Latin American country results using least squares are reported in Table 2 (analogous results for the Asian countries are reported in Section 4.3). As may be seen, most coefficients are significant at conventional levels and have the expected signs. The most salient findings in Table 2 may be summarized as follows:

- The coefficient on the federal funds rate (β) is significantly positive for all three Latin American countries, indicating that during the period under study there was pass-through of U.S. policy rates to central banks' policy interest rates. These coefficients are positive and significant, even when expected devaluation, country risk, and global covariates are included in the regressions. Interestingly, once these other covariates are included, the coefficient on the federal funds rate for Mexico becomes significantly positive (remember that it was insignificant in the reduced-form estimates in Table 1). This suggests that changes in Fed policy rates may

TABLE 2
Monetary Policy Rates in Latin America, 2000–08

	Chile	Colombia	Mexico	Chile	Colombia	Mexico
$r_{ff,t-1}^{us}$	0.014 [1.983]**	0.035 [3.572]***	0.017 [1.807]*	0.026 [2.679]***	0.030 [2.939]***	0.020 [1.631]*
C	−0.113 [−1.306]	−0.375 [−3.001]***	−0.282 [−1.536]	−0.342 [−2.220]**	−0.222 [−1.536]	−0.339 [−1.469]
$r_{p,t-1}$	−0.031 [−3.007]***	−0.047 [−3.941]***	−0.053 [−4.191]***	−0.035 [−3.302]***	−0.050 [−4.188]***	−0.054 [−4.198]***
US_EXP_INFL$_{t-k}$	0.059 [1.844]*	0.115 [3.156]***	0.169 [2.943]***	0.124 [2.569]**	0.070 [1.644]*	0.187 [2.592]***
EXP_DEPREC$_{t-k}$	0.008 [1.698]*	−0.002 [−0.468]	0.026 [2.984]***	0.005 [1.174]	−0.001 [−0.175]	0.026 [2.879]**
$\Delta r_{p,t-1}$	0.004 [0.078]	−0.043 [−0.843]	−0.018 [−0.351]	−0.002 [−0.047]	−0.050 [−0.994]	−0.019 [−0.357]
INFL$_{t-k}$	0.018 [1.647]*	0.059 [4.368]***	0.027 [1.735]*	0.018 [1.674]*	0.065 [4.712]***	0.026 [1.343]
EMBI_LATAM$_{t-1}$	—	—	—	0.012 [1.974]**	−0.010 [−2.079]**	0.004 [0.409]
Memo: $-\beta/\delta$	0.452	0.745	0.321	0.743	0.600	0.370
Observations	389	387	351	389	387	351
R-squared	0.035	0.086	0.068	0.043	0.096	0.069
F-statistic	2.324	5.924	4.197	2.463	5.740	3.613
Durbin-Watson	1.996	1.994	2.006	1.994	1.993	2.011

Note: *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

be transmitted to domestic policy rates through channels other than the effect of $r_{ff,t}^{us}$ on exchange rates and/or domestic inflation.[20]

- The extent of long-term policy "contagion," measured by $-\left(\frac{\beta}{\delta}\right)$, is large. The point estimates for the long-run effect range from (.017/.053=) 0.32 for Mexico, to 0.45 for Chile, to 0.74 for Colombia. However, in none of the three cases is the pass-through one-to-one. The null hypothesis that $-\left(\frac{\beta}{\delta}\right) = 1$ is rejected at conventional levels.

- The coefficients on the interest rate terms in equation (5)—β, δ, γ—can be used to calculate the medium-term effects on the domestic policy rate over time. Consider a 50 basis point increase in the federal funds rate. According to the estimates in the first three columns in Table 2, the pass-through after 24 weeks is 13 bps in Chile, 27 bps in Colombia, and 12 bps in Mexico. After 52 weeks, the policy rate is almost 25 bps in Chile, 38 bps higher in Colombia, and 16 bps higher in Mexico.[21]

The coefficients of the other variables (γ_i) generally have the anticipated signs and are significant at conventional levels. These results indicate that, as expected, with other things given, inflationary pressures—both domestic and global—result in higher policy rates. The same is true for expected depreciation in Chile and Mexico. Higher regional risk affects the policy rate significantly and positively in Chile and negatively in Colombia.

A possible limitation of the results in Table 2 is that the regressions do not include a measure of domestic activity and hence do not take into account the possibility that the central bank reacts to the evolution of the real economy. This is because there are no high-frequency (weekly) indicators for real output. In order to allow for this possibility, Table 3 reports variant regressions that include the change of each country's main commodity export price (P_COMMOD) as a proxy for real activity.[22,23] The variable is defined as the cumulative change in the commodity price over the prior six months, lagged one period.

The results in Table 3 indicate that the finding of policy "contagion" reported in Table 2 is maintained, as are the results for the other regressors. In addition, the coefficient of the change in export prices is positive as expected in all regressions, though significant only for Colombia and Mexico. This suggests that as the global market for commodity exports strengthens and prices increase and boost the local economy, the central bank will tend to reduce liquidity through a hike in its own policy rate.

4.2.2. Robustness and Extensions

This subsection reports various extensions and robustness checks.

TABLE 3
Monetary Policy Rates in Latin America, 2000–08: Role of Commodity Prices

	Chile	Colombia	Mexico	Panel
$r_{ff,t-1}^{us}$	0.026	0.029	0.025	0.014
	[2.675]***	[2.933]***	[2.048]**	[3.107]***
C	–0.342	–0.209	–0.213	–0.187
	[–2.219]**	[–1.456]	[–0.933]	[–2.011]***
$r_{p,t-1}$	–0.035	–0.050	–0.055	–0.020
	[–3.300]***	[–4.186]***	[–4.246]***	[–4.662]***
US_EXP_INFL$_{t-1}$	0.124	0.066	0.157	0.076
	[2.568]**	[1.662]*	[2.154]**	[2.580]***
EMBI_LATAM$_{t-1}$	0.012	–0.010	0.004	0.002
	[1.792]*	[–2.090]**	[0.449]	[0.494]
EXP_DEPREC$_{t-k}$	0.006	–0.001	0.031	0.006
	[1.180]	[–0.135]	[3.595]***	[2.254]***
$\Delta r_{p,t-1}$	–0.002	–0.033	–0.008	–0.003
	[–0.038]	[–0.649]	[–0.159]	[–0.086]
INFL$_{t-k}$	0.018	0.064	0.005	0.015
	[1.572]*	[4.657]***	[0.271]	[2.964]***
$\Delta\ln(P\_COMMOD)_{t-1}$	0.003	0.007	0.081*	0.030
	[0.609]	[2.773]***	[1.595]	[1.297]
Memo: $-\beta/\delta$	0.743	0.580	0.455	0.700
Observations	389	387	351	1127
R-squared	0.044	0.114	0.071	0.027
F-statistic	2.198	6.072	3.270	3.854

Notes: Commodity prices measured by copper price for Chile and WTI oil price for Colombia and Mexico. *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

Instrumental Variables. Given the structure of lags and the nature of the covariates included in the analysis, it is unlikely that the results are affected by endogeneity issues. For countries such as Chile, Colombia, and Mexico, the federal funds rate, the TIPS rate, and global commodity prices are all clearly exogenous to their monetary policy decisions. Someone could argue, however, that in a specification where some covariates enter contemporaneously, the expected currency depreciation variable may be endogenous. In order to address this concern, Table 4 reports instrumental variable versions of the equations in Table 2 and 3 for individual countries and a pooled panel with fixed effects. The results confirm the results reported previously, in that during the period under consideration all three countries were subject to considerable policy "contagion."[24]

Lag Structure. In the regressions in Tables 1, 2, and 3, the federal funds rate is entered with a one-period (week) lag. However, the results are virtually identical if the contemporaneous federal funds rate is used instead.[25] The results are also basically unaffected if the estimation period is altered somewhat, or if the *effective* federal funds rate is used instead of the *target* policy rate.[26]

Additional Global Financial Variables. An interesting question is whether other policies related to global economic conditions enter the policy rules of

TABLE 4
Monetary Policy Rates in Latin America, 2000-08: Controlling for Endogeneity

	Chile	Colombia	Mexico	Panel
$r^{us}_{ff,t}$	0.025	0.021	0.034	0.015
	[2.532]**	[1.705]*	[2.182]**	[3.093]***
C	−0.353	−0.197	−0.301	−0.202
	[−2.249]**	[−1.315]	[−1.185]	[−2.187]**
r_{jt-1}	−0.028	−0.040	−0.066	−0.022
	[−2.401]**	[−2.467]**	[−3.277]***	[−3.989]***
US_EXP_INFL$_{t-1}$	0.113	0.062	0.201	0.081
	[2.345]**	[1.432]	[2.812]***	[2.768]***
EMBI_LATAM$_t$	0.015	−0.010	0.006	0.002
	[2.006]**	[−2.066]**	[0.679]	[0.580]
EXP_DEPREC$_t$	−0.009	−0.004	0.042	0.007
	[−0.702]	[−0.505]	[1.785]*	[1.969]**
Δr_{jt-1}	−0.006	−0.051	−0.026	−0.007
	[−0.119]	[−1.012]	[−0.481]	[−0.228]
INFL$_{t-4}$(−4)	0.020	0.058	0.001	0.015
	[1.679]*	[4.095]***	[0.018]	[3.071]***
Memo: $-\beta/\delta$	0.83	0.525	0.515	0.682
Observations	378	384	351	1119
R-squared	0.040	0.091	0.063	0.020
F-statistic	2.165	5.333	2.719	3.950
Durbin-Watson	1.992	1.997	2.005	2.013

Notes: Equations estimated with instrumental variables. Pooled panel equation includes country fixed effects. *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

the Latin American countries. This issue is addressed by considering two additional covariates: the yield on the U.S. 10-year Treasury bond, $r^{us}_{tb10,t}$, and the (log of the) euro–U.S. dollar exchange rate. Adding the 10-year Treasury yield allows investigation of whether Latin American central banks react to changes in the longer-maturity portion of the global yield curve. The results (available upon request) suggest that this is not the case. However, for Colombia and Mexico the coefficient of the (one-period lagged) euro–dollar exchange rate is significantly positive. The inclusion of these variables does not affect the main findings regarding policy "contagion" earlier.

Negative and Positive Policy "Contagion." Another important question is whether the extent of policy "contagion" depends symmetrically on federal funds rate increases and decreases. Investigating this issue by separating out positive and negative funds rate changes in the regressions does not support the existence of asymmetrical responses.

Short-Term Deposit Rates. Also investigated is the extent to which Fed policies were translated into (short-run) financial market rates. The results of this exercise—also available on request—show that there is a significant and fairly rapid pass-through from Federal Reserve policies to three-month CD rates in the three Latin American countries. This is the case even after controlling for

expected depreciation, country risk, and global financial conditions such as the dollar–euro exchange rate and commodity prices. For a detailed analysis of this issue see, for example, Edwards (2012) and the literature cited there.

4.3. East Asia

This subsection reports results for the three East Asian countries in the sample—Korea, Malaysia, and the Philippines—and compares them with the results for Latin America.

4.3.1. OLS Estimates

The basic multivariate results for the East Asian countries are reported in Table 5. Several aspects are worth noticing.

- First, even after controlling for other variables, the coefficient of the federal funds rate is significantly positive, indicating that during the period under study there was "contagion" from the United States to these three Asian nations.
- Second, the long-run effects measured by $-\left(\frac{\beta}{\delta}\right)$ are somewhat smaller than in the case of the Latin American countries, and range from 0.66

TABLE 5
Monetary Policy Rates in East Asia, 2000–08

	Korea	Malaysia	Philippines	Panel
$r_{f\!f,t-1}^{us}$	0.015	0.002	0.054	0.003
	[1.662]	[2.489]*	[3.384]**	[1.303]
C	0.144	0.064	0.937	0.067
	[2.302]*	[1.981]*	[2.982]**	[1.067]
$r_{p,t-1}$	–0.032	–0.017	–0.083	–0.005
	[–2.173]*	[–2.579]*	[–4.013]**	[–1.989]*
US_EXP_INFL$_{t-1}$	–0.010	–0.001	–0.222	–0.004
	[–0.682]	[–0.275]	[–2.330]*	[–0.237]
EMBI_ASIA$_{t-1}$	–0.018	–0.005	–0.035	–0.015
	[–2.542]*	[–1.342]	[–0.627]	[–1.238]
EXP_DEPREC$_{t-1}$	0.033	–0.003	0.080	0.023
	[1.022]	[–0.452]	[2.873]**	[1.953]
$\Delta r_{p,t-1}$	–0.012	0.142	–0.157	–0.034
	[–0.215]	[2.766]**	[–1.812]	[–0.962]
INFL$_{t-3}$	–0.009	0.007	0.251	–0.022
	[–0.359]	[0.545]	[1.921]	[–0.699]
Memo: $-\beta/\delta$	0.469	0.118	0.651	0.600
Observations	378	378	357	1269
R-squared	0.036	0.061	–0.886	–0.206
F-statistic	2.701	3.442	8.817	2.024

Notes: Pooled panel equation includes country fixed effects. *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

for the Philippines to 0.13 for Malaysia, the only country in the sample with a relatively rigid exchange rate for most of the sample period. A possible explanation is that Malaysia had restricted capital mobility during this period (see the discussion in Section 5). The first difference of the lagged policy rate is only significant for Malaysia. Additional lagged terms were insignificant in all three countries. The estimates for the additional covariates are less precise than for the Latin American countries. The coefficient of U.S. expected inflation is significant for the Philippines but is surprisingly negative. The coefficient of domestic inflation is significantly positive for Malaysia and in one of the Korean regressions. Expected depreciation is significant also only in the case of the Philippines.

An important difference between the Latin American and East Asian nations is that the former are commodity exporters, while the latter export manufacturing goods. Table 6, the East Asia analogue of Table 3, includes a measure of changes in commodity prices, P_COMMOD$_t$, proxied by an international index for energy prices. As before, the impact coefficients for the federal

TABLE 6
Monetary Policy Rates in East Asia, 2000–08: Role of Commodity Prices

	Korea	Malaysia	Philippines	Panel
$r_{ff,t-1}^{us}$	0.009	0.002	0.025	0.002
	[2.521]**	[2.873]***	[3.019]***	[3.504]***
C	0.150	0.051	0.322	0.047
	[2.452]**	[2.149]**	[2.044]**	[2.213]**
$r_{p,t-1}$	–0.026	–0.015	–0.037	–0.010
	[–2.792]**	[–2.836]**	[–3.807]**	[–3.399]**
US_EXP_INFL$_{t-1}$	–0.015	–0.001	–0.106	0.000
	[–1.144]	[–0.142]	[–2.278]**	[0.109]
EMBI_ASIA$_{t-1}$	–0.016	–0.004	0.040	–0.004
	[–2.623]**	[–1.557]	[1.473]*	[–1.691]*
EXP_DEPREC$_{t-1}$	0.002	–0.000	0.011	–0.000
	[0.939]	[–0.332]	[3.549]**	[–0.483]
$\Delta r_{p,t-1}$	–0.025	0.141	–0.020	0.041
	[–0.493]	[2.853]***	[–0.406]	[1.448]
INFL_(–3)	–0.013	0.009	0.009	0.004
	[–1.780]*	[2.227]**	[0.319]	[1.249]
$\Delta\ln$(P_COMMOD)$_{t-6}$	0.139	–0.012	–0.062	0.007
	[1.732]*	[–0.388]	[–0.221]	[0.258]
Memo: $-\beta/\delta$	0.346	0.133	0.676	0.200
Observations	387	439	409	1287
R-squared	0.061	0.059	0.066	0.020
F-statistic	3.092	3.393	3.554	2.647

Notes: Pooled panel equation includes country fixed effects. *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

funds rates are significantly positive but small. The long-run point estimates for the pass-through from U.S. monetary policy to domestic monetary policy (with other things given) are 0.35 for Korea, merely 0.13 for Malaysia, and 0.68 for the Philippines.

One of the most salient results in this analysis comes from comparing the panel results for Asia with the panel estimates for Latin America (the last columns in Tables 6 and 3, respectively). As may be seen, in both cases the coefficient of the federal funds rate is significantly positive. However, it is much smaller in Asia than in Latin America (0.002 versus 0.015), indicating that the impact effect of a federal funds rate on policy has historically been significantly stronger in the Latin American countries. This is also the case for the long-run effects of policy "contagion." According to these results, in the long run the three Latin American countries "imported" more than two-thirds of the federal funds changes. Pass-through for the Asian countries is significantly lower, at 0.20. That is, with everything else constant, a federal funds increase of 350 bps would have been translated, on average, into a policy rate increase of 240 bps in Latin America. In Asia the pass-through would have amounted, on average, to a mere 70 bps.

4.3.2. Robustness and Extensions

The data for the East Asian countries were subject to the same battery of extensions and robustness tests as those for Latin America. Instrumental variable estimates are presented in Table 7. As may be seen, the main message from the previous results is maintained. In particular, even after controlling for other relevant variables, there is evidence of "partial contagion" from the Fed to these three Asian nations. In all three countries the long-run pass-through coefficient is significantly lower than one, though the magnitude varies across countries. In the Philippines the extent of pass-through was around two-thirds. In Malaysia it is barely higher than 10 percent (0.13).

The results on the extensions and robustness tests discussed above maintained the basic finding reported in Tables 5, 6, and 7, in the sense that during the period under consideration there indeed has been some—although far from full—policy "contagion" for this group of East Asian nations.

5. "Contagion" and Capital Mobility

The specification of equation (1) assumed that there was a tax of rate τ on capital outflows leaving the country. Alternatively, it is possible to think that there is a tax on capital inflows, of the type popularized by Chile during the 1990s.[27] In this case equation (1) becomes[28]

TABLE 7

Monetary Policy Rates in East Asia, 2000–08: Controlling for Endogeneity

	Korea	Malaysia	Philippines	Panel
$r_{ff,t}^{us}$	0.015	0.002	0.054	0.003
	[1.662]*	[2.489]**	[3.384]***	[1.303]
C	0.144	0.064	0.937	0.067
	[2.302]**	[1.981]**	[2.982]***	[1.067]
r_{jt-1}	–0.032	–0.017	–0.083	–0.005
	[–2.173]**	[–2.579]**	[–4.013]***	[–1.989]**
US_EXP_INFL$_{t-1}$	–0.010	–0.001	–0.222	–0.004
	[–0.682]	[–0.275]	[–2.330]**	[–0.237]
EMBI_ASIA$_t$	–0.018	–0.005	–0.035	–0.015
	[–2.542]**	[–1.342]	[–0.627]	[–1.238]
EXP_DEPREC$_t$	0.033	–0.003	0.080	0.023
	[1.022]	[–0.452]	[2.873]***	[1.973]**
Δr_{jt-1}	–0.012	0.142	–0.157	–0.034
	[–0.215]	[2.766]**	[–1.812]	[–0.962]
INFL$_{t-1}$	–0.009	0.007	0.251	–0.022
	[–0.359]	[0.545]	[1.921]*	[–0.699]
Memo: $-\beta/\delta$	0.469	0.118	0.651	0.600
Observations	378	378	357	1269
R-squared	0.036	0.061	–0.886	–0.206
F-statistic	2.701	3.442	8.817	2.024

Notes: Equations estimated by instrumental variables. Pooled equations include country fixed effects. *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

(1′)
$$r_t - r_t^*(1 - \iota) + \iota = E_t\{\Delta e_{t+1}\},$$

where ι is the tax rate on capital inflows.

As pointed out above, the six countries in this study had varying degrees of capital mobility during the period 2000–08, with Chile being the most open and the Philippines being the least open to capital movement. In addition, during the (almost) 500 weeks covered by the analysis, there were some adjustments to the extent of mobility in all six nations. This was especially the case of Chile, which, after concluding a free trade agreement with the United States in early 2001, opened its capital account further.

Figure 4 shows the evolution of a comprehensive measure of capital mobility for each of the countries in the analysis, constructed using data from the Fraser Institute. A higher number denotes a higher degree of capital mobility.

An important question is whether the degree of capital mobility affects the extent of pass-through from federal funds rates to policy interest rates in emerging countries. In order to address this issue, a number of reduced-form equations are estimated similar to those reported in Table 1, with two additional regressors: an index of capital mobility (CAP_MOBILITY) and a variable that interacts this index with the federal funds rate. The capital mobility index varies for the Asian countries in the sample from a minimum of 3 for the

FIGURE 4
Capital Mobility Index for Selected Latin American and Asian Countries, 2000–08
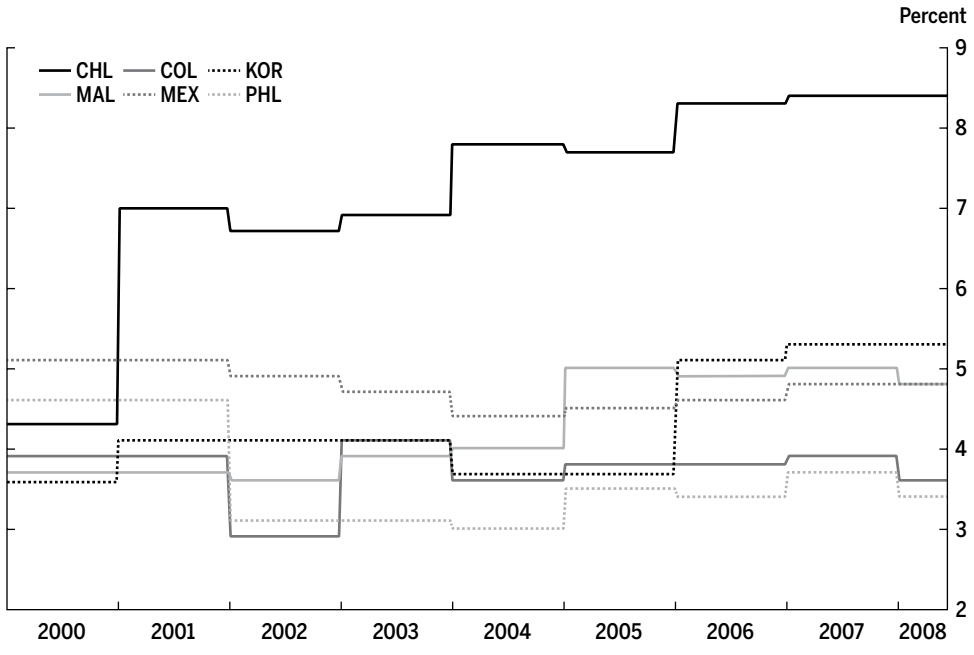
Philippines to a maximum of 5.3 for Korea, with an average of 4.0 and median of 3.9. The rather limited variation in the mobility index within each country means that it is difficult to estimate country-specific regressions. For this reason, results are reported for two pooled panels: one for the three Latin America nations and one for the three East Asian countries. The results reported in Table 8 should be considered preliminary and subject to further research for a number of reasons, including, in particular, the fact that the index of capital mobility is an aggregate summary that includes different types of capital controls. To understand better the role of mobility for interest rate pass-through, it is necessary to construct more detailed and granular indexes. Second, in order to investigate this issue fully, a broader sample that includes countries with greater restrictions is necessary.

The results in Table 8 confirm the findings reported in previous tables of pass-through from the federal funds rate to domestic policy rates. However, it is important to interpret the results with caution. As may be seen, the capital mobility measure is positive and significant when entered on its own in the Latin America sample; in this case the federal funds coefficient continues to be

TABLE 8

Monetary Policy Rates in Latin America and East Asia, 2000–08: The Role of Capital Mobility

	Latin America	Latin America	Latin America	East Asia	East Asia	East Asia
$r^{us}_{ff,t-1}$	0.014 [3.993]***	0.008 [1.064]	0.023 [2.324]**	0.002 [3.178]***	−0.003 [−1.337]	0.017 [0.886]
C	−0.028 [−0.694]	0.050 [2.645]***	−0.062 [−1.163]	0.029 [1.705]*	0.054 [3.332]***	0.015 [0.183]
$r_{p,t-1}$	−0.016 [−4.610]**	−0.015 [−4.420]**	−0.016 [−4.679]**	−0.012 [−3.489]**	−0.013 [−3.790]**	−0.019 [−3.566]**
$\Delta r_{p,t-1}$	−0.009 [−0.313]	−0.006 [−0.214]	−0.010 [−0.332]	0.044 [1.486]	0.043 [1.461]	−0.004 [−0.111]
CAP_MOBILITY$_t$	0.016 [2.199]**	—	0.023 [2.246]**	0.005 [2.409]**	—	0.019 [0.817]
CAP_MOBILITY$_{t^*}$ $r^{us}_{ff,t-1}$	—	0.001 [0.872]	−0.002 [−0.981]	—	0.001 [2.698]**	−0.003 [−0.562]
Memo: $-\beta/\delta$	0.875	0.533	1.438	0.167	−0.231	0.895
Observations	1127	1127	1127	1131	1131	744
R-squared	0.024	0.020	0.024	0.023	0.024	0.023
F-statistic	4.501	3.794	4.001	4.400	4.636	2.882

Notes: *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively. Pooled equations include country fixed effects.

significant and positive as well. The interactive variable, however, is not significant in any of the Latin American regressions.

The most interesting result in Table 8 is for the Asian countries. The coefficient of the federal funds rate on its own is not significantly different from zero, with a point estimate of –0.0028. However, the coefficient of the federal funds rate interacted with the capital mobility term is positive, with a point estimate of 0.0013. This suggests that countries with higher mobility had higher pass-through. The capital mobility index varies for the Asian countries in the sample from a minimum of 3 for the Philippines to a maximum of 5.3 for Korea. This suggests that the extent of pass-through in countries with capital mobility within this span would range from 0.30 to 0.53. Once again these estimates are significantly lower than those for the Latin American nations, suggesting that the extent of "contagion" for Asia has historically been lower than for Latin America.

6. The Fed and Short-Term Market Interest Rates in Latin America and Asia

This section expands the analysis by investigating the extent to which Federal Reserve actions affected short-term (90-day) deposit rates in Latin America and Asia. More specifically, it addresses four questions: First, what has been the effect of Fed actions on domestic market interest rates? Second, what are

the channels through which these effects work? Do they work solely through the effects on domestic policy rates that were unearthed in the previous section, or is there an additional channel?[29] Third, how (if at all) have changes in the slope of the U.S. yield curve affected domestic interest rates? Fourth, has the transmission of Fed actions to domestic market interest rates differed in magnitude and speed in Latin America and Asia? These questions are addressed by adding the yield on the 10-year U.S. Treasury note as an additional covariate in the estimations.

6.1. The Data

Tables 9 and 10 present data on the impact and lagged average changes in the short-term (three-month) deposit rate in Latin America, Asia, and the United States during the weeks following changes in the federal funds policy rate. To take into account possible asymmetric responses, Table 9 gives results for increases in the federal funds rate, while Table 10 gives results for cuts in the

TABLE 9
**Average Cumulative Changes in Short-Term Deposit Interest Rates
in Latin America, East Asia, and United States in Weeks
following Federal Funds Policy Rate Increases, 2000–08**
(in basis points; standard deviation in parentheses)

	Impact	1 week	2 weeks	3 weeks	6 weeks
Latin America	14	14	14	12	15
	(111)	(99)	(100)	(115)	(150)
East Asia	2	5	7	5	9
	(29)	(33)	(39)	(54)	(78)
United States	3	6	9	12	25
	(2)	(3)	(4)	(6)	(12)

Note: Average Federal Reserve funds rate increase during sample period is 26 bps.

TABLE 10
**Average Cumulative Changes in Short-Term Deposit Interest Rates
in Latin America, East Asia, and United States in Weeks
following Federal Funds Policy Rate Cuts, 2000–08**
(in basis points; standard deviation in parentheses)

	Impact	1 week	2 weeks	3 weeks	6 weeks
Latin America	17	5	15	9	−12
	(82)	(89)	(115)	(145)	(161)
East Asia	−1	8	4	−15	−6
	(84)	(121)	(93)	(72)	(113)
United States	−20	−21	−24	−30	−54
	(22)	(26)	(28)	(29)	(29)

Notes: Latin America is defined as Chile, Colombia, and Mexico; East Asia is defined as Korea, Malaysia, and the Philippines. Average Federal Reserve fund rate cut over sample period is 44 bps.

federal funds rate. The average increase in the Fed policy rate during the sample period was 26 bps, while the average cut was 44 bps. The key results are as follows:

- Not surprisingly, the response of deposit rates differs between the countries in Latin America and Asia. Changes in short-term rates in Latin America are greater (in absolute terms) than in Asia, on average, particularly in the case of federal funds rate hikes. However, none of these effects—either after federal funds hikes or cuts—are statistically significant.
- After six weeks there appears to be a one-to-one transmission of the Fed's action to U.S. 90-day deposit rates. This is the case for both federal funds increases and federal funds cuts: The average rate hike of 26 bps is followed by a deposit rate increase of 26 bps, while the average rate cut of 44 bps is followed by a deposit rate decrease of 54 bps.
- Following a federal funds target rate reduction, short-term interest rates in both Latin America and Asia are somewhat volatile, exhibiting both increases and decreases. After six weeks, however, there is a net decline in short-term rates in both regions. These decreases average 12 bps in Latin America and only 6 bps in Asia.

To summarize, Tables 9 and 10 indicate that after six weeks federal funds policy rates changes are transmitted fully into changes in short-term deposit rates in the United States. In contrast, the changes in short-term deposit rates abroad are very small; indeed, they are not significantly different from zero in either region. The next section analyzes whether these results are maintained in regressions that control for the role of other covariates.

6.2. Regression Results

This section reports the results from error correction models for short-term market deposit rates in Latin America and Asia. The specifications reported here are similar (but not identical) to those for policy rates in Section 4. The dependent variable is the first difference of weekly interest rates, and (most) of the covariates are the same as those used in the preceding analysis with policy interest rates. The regressions in Table 11 do not include the domestic policy rate in order to enable estimation of the total pass-through from the Fed policies to market rates, after the local central bank has reacted fully to the Fed action. With regard to the question of interest, the main findings may be summarized as follows: In every country, except Korea, there is evidence during the sample period of pass-through from Fed policy to domestic short-term deposit interest rates. In most cases the impact effect is very small, not surprising in

TABLE 11
Short-Term Deposit Rates in Latin America and East Asia, 2000–08

	Chile	Colombia	Mexico	Korea	Malaysia	Philippines
$r^{us}_{ff,t}$	0.050	0.047	0.116	0.001	0.002	0.210
	[4.119]***	[5.296]***	[5.108]***	[0.111]	[1.721]*	[5.499]***
C	0.250	0.336	0.271	0.085	0.045	−0.009
	[2.684]***	[4.773]***	[1.743]*	[1.350]	[2.106]**	[−0.023]
EXP_DEPREC	0.015	0.017	0.074	−0.015	−0.001	0.108151
	[1.629]*	[3.040]***	[5.080]***	[−4.668]**	[−0.602]	[6.929]***
$r_{90d,t-1}$	−0.058	−0.037	−0.099	−0.015	−0.014	−0.255
	[−3.949]***	[−4.252]***	[−6.363]***	[−2.387]**	[−2.314]**	[−8.8015]**
$EMBI_t$	−0.029	0.022	0.025	0.001	−0.0032	0.140
	[−1.33]	[3.756]***	[0.646]	[0.042]	[−1.110]	[2.718]***
$\Delta r_{90d,t-1}$	0.0621	0.029	0.011	0.444	0.206	0.032
	[1.096]	[0.619]	[0.244]	[7.134]***	[4.304]***	[0.643]
$r^{us}_{tb10,t}$	−0.027	−0.078	−0.062	−0.005	−0.000	0.069
	[−1.186]	[−3.751]***	[−1.400]	[−0.448]	[−0.049]	[0.864]
Memo: $-\beta/\delta$	0.859	1.283	1.178	0.041	0.153	0.824
Observations	397	452	452	187	422	345
R-squared	0.123	0.095	0.089	0.404	0.063	0.208
F-statistic	6.813	7.809	7.273	20.341	4.679	14.814

Notes: The dependent variable is the change in the 90-day deposit rate, $\Delta r_{90d,t}$, with the exception of Malaysia, where the one-year deposit rate is used. *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

view of the weekly data frequency. However, the effect builds over time, and in the long run it appears to be quite sizable in all countries, with the exception of Malaysia. The long-run point estimates exceed one, but are not significantly different from one, in Colombia and Mexico, and are slightly lower in Chile, 0.86, and the Philippines, 0.82. For Malaysia, the point estimate of the long-run pass-through is a low 0.15.

Table 12 presents results when the domestic policy rate is included as a covariate. This allows analysis of whether there was interest rate pass-through from the Fed to local market rates, even when the domestic policy rate is held constant. Alternatively, these results provide information as to the extent to which the domestic central bank can neutralize the effect of Fed policy changes on local interest rates. The coefficient for the domestic policy rate is significant and positive in four of the six countries; surprisingly, it is marginally negative in the case of Mexico and the Philippines, though it is insignificant in the latter case. A comparison of Tables 11 and 12 shows that in all countries the point estimate for the federal funds rate effect is smaller when the policy rate is included in the regression than when it is excluded (in the Philippines the coefficients are not significantly different). The simultaneous inclusion of the domestic and Fed policy rates allows decomposition of the transmission effect of federal funds rate changes into direct and indirect effects. The results suggest that

TABLE 12

Short-Term Deposit Rates and Domestic Monetary Policy Rates in Latin America and East Asia, 2000–08

	Chile	Colombia	Mexico	Korea	Malaysia	Philippines
$r_{ff,t}^{us}$	0.027808 [2.1204]***	0.006751 [0.6288]	0.100406 [4.6195]***	0.000057 [0.0106]	0.003572 [2.9946]***	0.213631 [5.0225]***
C	0.519667 [4.5813]***	0.237618 [3.4168]***	0.593594 [2.7694]***	0.124370 [1.9452]*	0.014436 [0.6966]	–0.008582 [–0.0214]
EXP_DEPREC$_t$	0.005755 [0.5484]	0.006032 [1.0850]	0.077020 [5.1340]***	–0.014230 [–4.5506]***	–0.000378 [–0.3671]	0.108628 [6.8655]***
$r_{90d,t-1}$	–0.140211 [–5.5776]***	–0.090198 [–7.5380]***	–0.070061 [–4.2336]***	–0.051005 [–3.3588]***	–0.109426 [–6.5196]***	–0.254177 [–8.6837]***
EMBI	–0.093599 [–3.5060]***	0.036215 [5.9054]***	–0.014894 [–0.4174]	–0.015447 [–0.4707]	0.001639 [0.6630]	0.145301 [2.5072]**
$\Delta r_{90d,t-1}$	0.096566 [1.7255]*	0.010856 [0.2429]	0.017768 [0.3648]	0.478838 [7.6434]***	0.213766 [4.7022]***	0.030802 [0.6175]
$r_{p,t}$	0.121452 [3.9753]***	0.073390 [6.1999]***	–0.042073 [–1.7891]*	0.041804 [2.5999]**	0.096787 [6.0635]***	–0.011630 [–0.1945]
$r_{tb10,t-1}$	–0.075028 [–2.9870]***	–0.055419 [–2.7190]***	–0.085927 [–1.8729]*	–0.014209 [–1.1368]	0.006096 [2.0367]**	0.078558 [0.8329]
Memo: $-\beta/\delta$	0.198	0.075	1.433	0.011	0.033	0.840
Observations	397	452	416	187	430	345
R-squared	0.1690	0.1673	0.0856	0.4257	0.1381	0.2083
F-statistic	8.3953	12.7476	5.4566	18.9584	9.6599	12.6673

Notes: The dependent variable is the change in the 90-day deposit rate, $\Delta r_{90d,t}$, with the exception of Malaysia, where the one-year deposit rate is used. *, **, and *** refer to significance at 10 percent, 5 percent, and 1 percent, respectively.

the transmission mechanism varies across countries. In Chile and Malaysia the effect of changes in the federal funds rate on the local deposit rate takes place both indirectly, through changes in the domestic policy rate (see the discussion in the preceding sections), and directly, as shown in Table 12. For Korea and Colombia there is no direct effect, only an indirect channel through the domestic policy rate, since once the domestic policy rate is included in the regression, the coefficient for the federal funds rate is no longer significant. For Mexico, in contrast, the effect appears to be only direct. In unreported regressions, the inclusion of the capital mobility index does not help explain these differences. A possible explanation could be related to the role of the banking sector and the extent to which global banks play a role in each country.

To illustrate the nature of these results more fully, consider the case of Chile reported in Table 12. As may be seen, the coefficients of both the federal funds and domestic policy rates are significantly positive, though the magnitudes of the point estimates are very different—0.028 and 0.121, respectively. The long-run pass-through effect of a change in the federal funds rate is (.028/.14=) 0.2, implying that an increase in the federal funds rate of 100 bps would be translated in the long run into an increase in the short-term deposit rate of 20 bps,

as long as the domestic policy rate and other covariates remain given. However, the analysis in the preceding sections suggests that in the case of Chile there is a long-run pass-through into the domestic policy rate of approximately 0.67 (see Table 1). If one adds both effects, the total pass-through from the federal funds rates into short-term market rates would be about 76 bps in the long run. This estimate is slightly smaller than the one obtained as a total effect from Table 11. Another way of thinking about the results is that the Central Bank of Chile could offset the effect of a 100 bps hike in the federal funds rate by reducing its own policy rate by 22 bps. Of course, this discussion regarding Chile does not necessarily apply to the other countries in the sample, as given the differences in results, each needs to be analyzed individually.

Similarly to the case of policy rates, the results for short-term deposit rates were subjected to a battery of robustness tests, including panel and instrumental variables estimation. These results are not reported here due to space considerations, but they confirm prior findings.

7. Concluding Remarks

In November 2015 it was expected that the Federal Reserve would raise interest rates in December. That was to be the first federal funds rate hike since 2006. An important question was—and continues to be—how the tightening process will affect the emerging markets. This paper attempts to provide an answer to this question by investigating the extent to which Fed policy actions have in the past been passed into monetary policy interest rates in three East Asian and three Latin American nations—Korea, Malaysia, the Philippines, Chile, Colombia, and Mexico.

The basic estimates suggest that Federal Reserve interest rate changes are imported, on average, into all six countries in the analysis: by 45 percent in Korea, only 12 percent in Malaysia (the only country in the sample with a rigid exchange rate during most of the period), 65 percent in the Philippines, 74 percent in Colombia, more than 45 percent in Chile, and 32 percent in Mexico. Thus, if the Federal Reserve were to hike rates by a cumulative total of 325 bps—bringing the federal funds rate to 3.5 percent—we could expect that (with other things given) Colombia would hike policy rates by 250 bps, Chile by approximately 150 bps, and Mexico by more than 100 bps; in Asia the estimates for the average policy rate adjustments (with everything else constant) would be 146 bps in Korea, merely 40 bps in Malaysia, and 200 bps in the Philippines. There is no evidence that the extent of policy "contagion" depends on the degree of capital mobility in Latin America. In contrast, there is some evidence that the more open countries in East Asia have had a higher degree of pass-through.

The finding of a non-zero pass-through from the Fed to monetary policy in the five countries in the sample with exchange rate flexibility is important for the debate on optimal exchange rate regimes. Indeed, according to traditional models one of the key advantages of flexibility is that it permits a country to conduct its own monetary policy. The results in this paper question that principle by finding that in almost all countries in the sample there is a fairly high degree of policy "contagion." A possible explanation for the results reported in this paper is a "fear of floating" that is not captured fully by the covariates included in the analysis.[30] According to models in the Mundell-Fleming tradition, if there is less than perfect capital mobility, a hike in the global interest rate—generated by, say, Federal Reserve action—will result in an incipient external deficit and a depreciation of the domestic currency. Indeed, currency adjustment is what reestablishes equilibrium. If, however, there is a "fear of floating," the local authorities will be tempted to tighten their own monetary stance by hiking the policy rate as a way of preventing the weakening of the domestic currency. Further investigation along these lines could shed additional light on the question of the "true" degree of monetary independence in small countries with flexible exchange rates. A particularly important point that follows from this analysis is that to the extent that smaller countries import policies from advanced-country central banks—such as the Federal Reserve—that are destabilizing, this may create a more volatile macroeconomic environment in EMEs.[31]

8. Data Sources

The following are the data sources used in the paper:

Interest rates: Policy rates were obtained from various issues of the national central bank of each country. Data on U.S. Treasury securities and the federal funds rate were also obtained from Datastream. All figures correspond to the Friday of a given week.

Exchange rates: Defined as domestic currency per U.S. dollar. Expected devaluation is constructed as the 90-day forward discount, also relative to the dollar. The euro–dollar rate is defined as euros per dollar. Source: Datastream.

Commodity price indexes: Source: JP Morgan.

Regional risk: Defined as the Emerging Market Bond Index (EMBI) premium for Latin America or Asia over U.S. Treasury securities, measured in percentage points. Source: Datastream.

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NOTES

1 See, for example, Aizenman, Binici, and Hutchison (2014) and Eichengreen and Gupta (2014) for discussion of the effects of the tapering on EMEs.

2 For most Latin American countries the Fed action was seen as a contributing factor to the depreciation of their currencies. In mid-January 2016, Agustín Carstens, the governor of the Bank of Mexico, suggested that Latin American central banks should form a common front to deal with further Fed action.

3 The International Monetary Fund's 2015 *World Economic Outlook* contains a long discussion of this issue.

4 On the trilemma, see Obstfeld, Shambaugh, and Taylor (2005) and Rey (2013).

5 On "fear of floating" see Calvo and Reinhart (2000).

6 I thank John Taylor for making the transcript of Ron McKinnon's remarks available to me.

7 See Glick, Moreno, and Spiegel (2001) and Prasad et al. (2003) on crises in emerging markets. On the role of the banking sector in a context of capital mobility, see Spiegel (1995) and Goldberg (2009). On capital flows in a context that emphasizes savings and investment decisions, see Tesar (1991). On the propagation of financial distress to the real economy, see Claessens, Tong, and Wei (2012).

8 Indeed, both discussants of this paper—Linda Tesar and Woon Gyu Choi—have worked on large-scale models to analyze related issues. Their approaches, however, differ from the one taken in this paper in various respects. In particular, and importantly, this paper deals with the effects of monetary policy transmission at the individual country level. Most work on the subject either pools data for many nations or considers a "representative" emerging country.

9 Aizenman, Binici, and Hutchison (2014) analyzed how the announcement of Federal Reserve tapering in 2013 affected financial conditions in emerging markets.

10 For indexes of central bank transparency and independence, see Dincer and Eichengreen (2013).

11 See, for example, Frankel, Schmukler, and Servén (2004) and Edwards (2012) for analyses of the transmission of interest rate shocks. Those studies differ from the current paper in a number of respects, including the fact that they concentrate on market rates and do not explore the issue of policy "contagion." Other differences are the periodicity of the data— this paper uses weekly data—and the fact that individual countries are analyzed. Rey (2013) deals with policy interdependence, as does Edwards for the case of a single country, Chile.

12 Parts of this section draw on Edwards (2015).

13 The shock absorber role of the exchange rate goes beyond cushioning against monetary disturbances. For example, Edwards and Levy Yeyati (2005) show that countries with more flexible rates are better able to accommodate terms-of-trade shocks.

14 Edwards (2006) argues that many countries include the exchange rate as part of their policy (or Taylor) rule. Taylor (2009, 2013) has argued that many central banks include other central banks' policy rates in their rules. The analysis that follows in the rest of this section owes much to Taylor's work.

15 The stability condition is $\beta\beta^* < 1$. This means that in Figure 3 the P*P* schedule is steeper than the PP schedule.

16 The new equilibrium will be achieved through successive approximations, as in any model with reaction functions of this type, where the stability condition is met.

17 Of course, if neither country considers the other foreign central bank's actions, PP will be horizontal and P*P* will be vertical.

18 Notice that "contagion" is in quotation marks, both here and in the paper's title. This is because many central banks strongly resist the notion that their decisions are affected by what other central banks are doing. From a theoretical point of view, it is easy to derive models where the optimal policy would include reacting to "the world" interest rate.

19 However, it is possible to argue that once the federal funds rate is included, the coefficient of the spread between Treasury securities and TIPS should be zero, since the federal funds rate already incorporates market expectations of U.S. inflation.

20 In a recent paper Claro and Opazo (2014) argue that the Central Bank of Chile has been fully independent and has not directly responded to Fed policy moves.

21 Most (but not all) central banks conduct policy by adjusting their policy rates in multiples of 25 bps. The estimates discussed here refer to *averages*. Thus, they need not be multiplied by 25 bps.

22 There are no weekly data on real activity. However, there is significant evidence that the evolution of prices of a major commodity export is a good leading indicator of economic performance in emerging market economies.

23 The weekly price of copper is used for Chile, a combination of coffee and oil prices for Colombia, and the West Texas Intermediate (WTI) oil index for Mexico. All data are from JP Morgan.

24 The instrument set includes the log of lagged commodity prices (copper, coffee, metals, energy, WTI oil), the lagged U.S. dollar–euro rate, lagged (six weeks) effective depreciation, lagged expected depreciation, and lagged rates for U.S. government assets of varying maturities.

25 The data refer to the end of the week (Friday). Since the Federal Open Market Committee never meets on a Friday, Fed actions precede in time the end-of-week recording of the local interest rate.

26 In order to check whether the last few months in the sample—the months leading to the Lehman Brothers crisis—affected the results, I reestimated the regressions for a shorter period. No significant changes were found.

27 On the Chilean tax on capital inflows, see De Gregorio, Edwards, and Valdés (2000) and Edwards and Rigobón (2009).

28 See, for example, Edwards (2012).

29 An interesting question that is beyond the scope of this paper is whether global banks play a role in the magnitude or speed of transmission of interest rate shocks. On this issue see, for example, Goldberg (2009) and Cetorelli and Goldberg (2011).

30 Calvo and Reinhart (2000) is the classic reference on this subject.

31 For a discussion along these lines see, for example, Edwards (2012), Rey (2013), and Taylor (2013).

Monetary Policy "Contagion" in the Pacific Basin: A Historical Inquiry

Woon Gyu Choi

The paper by Sebastian Edwards specifies a single-equation error correction model and estimates it with least-squares and instrumental-variable (IV) methods using weekly data. It has two main findings. First, unsurprisingly, the six emerging market economies (EMEs) in his analysis adjust their policy rates in response to changes in the U.S. Federal Reserve policy rate. Second, and more interestingly, the degree of cross-border pass-through of U.S. interest rates differs between Latin America and Asia. The paper contributes to the literature on cross-border interest rate transmission by shedding light on EME responses to global interest rate changes.

From a theoretical perspective, spillovers from the U.S. policy rate to EME policy rates could be associated with three possible channels. First, an exogenous decrease in the U.S. policy rate can lead to more capital flows to EMEs, affecting domestic liquidity through a liquidity channel. Second, it may affect trade with EMEs through an aggregate demand channel, mainly working through trade linkages. Specifically, if increases in capital inflows with a lower U.S. policy rate lead to local currency appreciation, weaker demand for EMEs' tradable goods slows down their domestic economies, calling for lower policy rates. Lastly, a global supply shock such as lower energy and commodity prices—while exerting direct impacts on EMEs' inflation—could be fed into the U.S. policy rate, which in turn affects EMEs' inflation through a price channel.

The extent of EME policy responses depends on several factors. One factor is real and financial linkages. The higher is the degree of these linkages, the higher is the contagion from global shocks to domestic policy rates. Another factor is the relative pressure of global shocks on domestic output and inflation. With subdued inflation after the global financial crisis, monetary policy in most

countries has focused more on reducing the output gap rather than inflation. A third factor is "policy space" in responding economies. An economy in which the policy rate is close to a lower bound will have a limited response to a U.S. policy rate cut. A country with limited foreign exchange reserves to intervene against abrupt capital outflows may have no choice but to raise its policy rate. Also, macroeconomic constraints associated with elevated foreign debt and household or corporate debt could restrict the use of interest rate policy.

Let me now briefly talk about recent related studies of my own. My colleagues at the Bank of Korea (BOK) and I (Choi et al. 2014) identified three channels through which global liquidity shocks may affect macro fundamentals and financial markets in EMEs. In our paper, U.S. policy tightening is equivalent to the withdrawal of policy-driven liquidity. Our more recent work (Choi et al. 2015) quantifies the effect of U.S. policy as well as EMEs' own policies on their macro fundamentals and capital flows. I will discuss this paper further in the last part of my remarks. The key result of Edwards is that a 1 percentage point hike of the U.S. federal funds rate increased policy rates in the selected EMEs by 33 to 74 basis points (bps). This result suggests a strong spillover effect. However, our work finds a modest spillover of 4 to 12 bps. Our work differs from that of Edwards in several respects. In particular, the Fed tightening in the 2000–08 period considered by Edwards is largely attributable to the desire to dampen inflation, whereas Fed policy actions after the global financial crisis have been associated more with responding to an output slowdown and slow recovery. This may matter, since the transmission of interest rates may depend on whether monetary policy is driven by the output gap or inflation.

The policy responses of EMEs may also differ depending on how well their economic fundamentals make them resilient to foreign shocks, as well as on the relative importance of output and inflation as policy goals (see Figure 1).

As regards Edwards' estimation methodology, I have two comments. First, when gauging the long-term spillover to domestic deposit rates, he includes a number of control variables, such as domestic inflation, the U.S. 10-year Treasury bond rate, and domestic policy rates. The policy rate, short-term deposit rate, and U.S. federal funds rate, however, are not negligible in the long run and could be cointegrated. This implies that the cross-border pass-through of interest rates may differ from the domestic pass-through along the yield curve. Second, endogeneity controls and tests for instrument validity should also be checked. For example, expected currency depreciation and emerging market risk premia could be affected by the dependent variable (either the policy rate or short-term deposit rate). I'd like to see more results about the adequacy of the instruments he uses in his IV estimation.

Macroeconomic Conditions in EMEs

A CPI Inflation (%)

B Real GDP Growth (%)
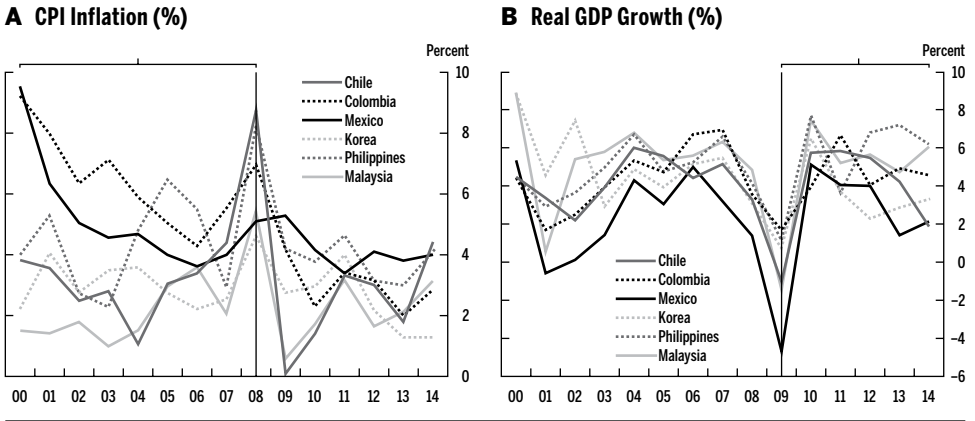
My second comment pertains to the implications of recent developments in cross-border flows. Changes in the financial landscape suggest that debt flows are becoming increasingly more important in cross-border financial flows as the United States and other advanced economies normalize interest rates. This matters because global funding network analysis indicates that debt flows are not balanced among countries whereas equity flows are largely balanced.
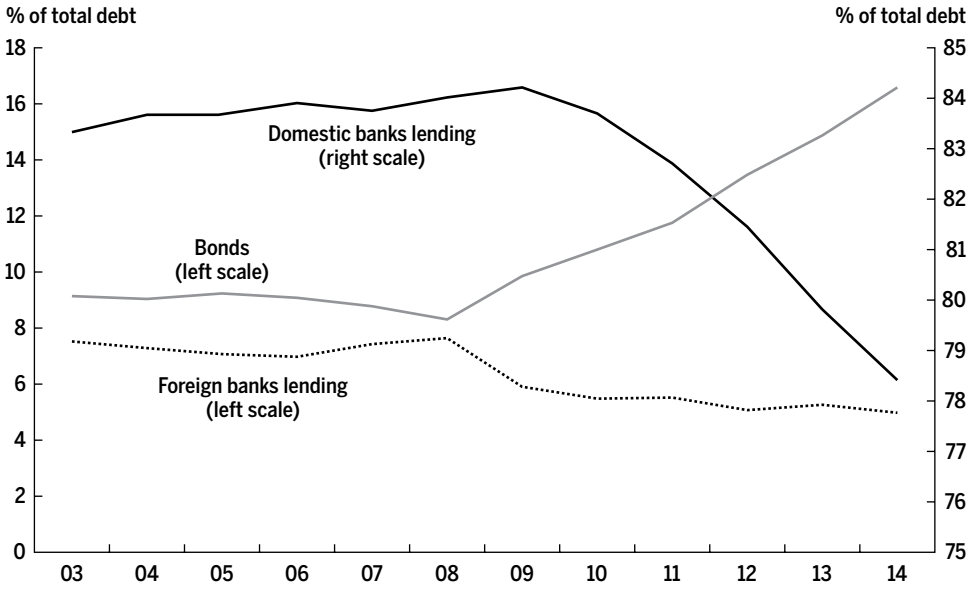
As shown in Figure 2, since the global financial crisis, the share of EME corporate debt in bonds has edged up from 9 percent to 17 percent, whereas that in domestic bank loans has declined from 84 percent to 78 percent.

Figure 3 shows trends in global fund flows to emerging market and developed economies. Equity fund flows to EMEs have been declining since the global financial crisis. In contrast, bond inflows to EMEs have risen. I conjecture that U.S. interest rate hikes could encourage greater bond flows to developed economies.

According to BOK calculations, global banking networks have evolved as well recently. From end-2011 to end-2014, euro-area banks have become relatively less active, while China banks have become more active in global lending and borrowing.

Let me conclude by further discussing my current work with colleagues at the BOK in which we explore three questions. First, how do U.S. interest rate hikes affect capital flows in EMEs? Second, are there any diverging responses across EMEs? Third, what is the link between fundamentals of EMEs and the extent of their output loss from a global liquidity shock?

FIGURE 2
Composition of EME Corporate Debt: Bonds vs. Loans

% of total debt   % of total debt

Domestic banks lending
(right scale)

Bonds
(left scale)

Foreign banks lending
(left scale)

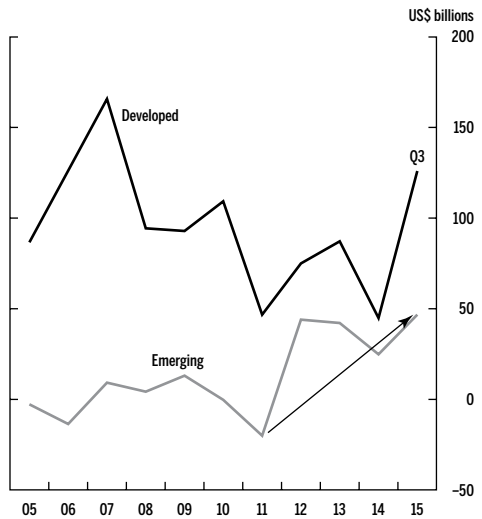**Source:** IMF Global Financial Stability Report 2015.

FIGURE 3
Global Equity and Bond Flows

A Equity Fund Flows

US$ billions

Developed

Emerging

Q3

B Bond Fund Flows

US$ billions

Developed

Q3
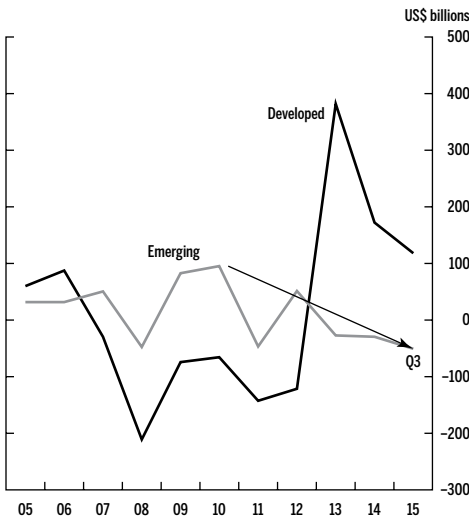
Emerging

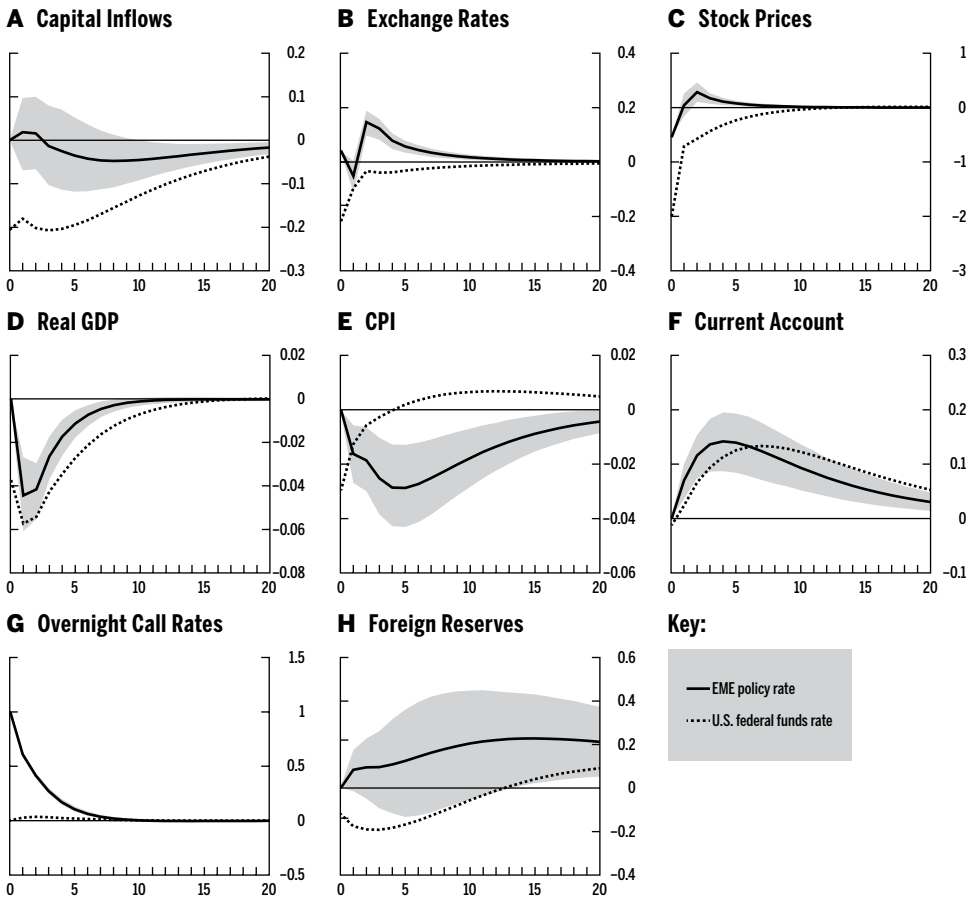**Source:** EPFR (Emerging Portfolio Fund Research).

In Choi et al. (2015), we find that a U.S. interest rate hike has a stronger effect than a domestic interest rate hike on domestic financial conditions, as a U.S. monetary tightening causes capital outflows from EMEs, creating pressure on their bond markets. We also find that EMEs with strong fundamentals are less affected by the shrinkage of global liquidity.

The empirical model used in our study is described in detail in a companion paper, Choi et al. (2014). EME variables include real gross domestic product (GDP), consumer price index, stock prices, nominal effective exchange rates, and capital inflows. Two policy variables, overnight call rates and foreign reserves, are also included. The panel comprises 19 EMEs from 1995:Q2 to 2014:Q3. Three global liquidity factors—a policy-driven liquidity factor, a market-driven liquidity factor, and a risk-aversion factor—are identified from the financial data of G-5 countries using a factor model with sign restrictions. The financial variables used to generate the factors include the policy rate, domestic credit, international claims, lending rate spread, government bond yield, monetary base (M0), real interest rate, stock price, and stock price volatility.

Figure 4 depicts the impulse responses to a 1 percentage point increase in EME policy rates (solid lines) and the U.S. policy rate (dashed lines), where the U.S. policy rate hike is interpreted as a decrease in the policy-driven global liquidity factor in the model. Observe that the U.S. policy rate hike is followed by the reversal or suspension of capital inflows and a lower, i.e., depreciated, exchange rate and lower stock prices (see Choi et al. 2014 for the error bands of EME responses to the U.S. policy rate hike). The liquidity decline in domestic financial markets also directly decreases aggregate demand, as evidenced by weaker output growth and lower inflation. The negative wealth effect from both a weaker domestic currency and lower stock prices exacerbates the situation. Weaker domestic absorption results in a current account surplus. Lastly, the policy response of domestic authorities appears to be limited. The maximal response of the policy rate is only 4 bps in response to a 100 bps hike in the U.S. policy rate. This degree of policy spillover is weaker than in other studies, including that in Edwards' paper.

Figure 4 also depicts impulse responses to a 1 percentage point increase in the EME policy rate (solid lines). The estimated effects of EMEs' domestic policy rate hike are largely consistent with the theoretical predictions of standard open-economy macroeconomics. On the real front, tighter domestic monetary policy reduces output growth and inflation in EMEs. On the financial front, EME policy tightening has weaker effects on capital flows and stock prices than does U.S. policy tightening. Capital inflows initially increase in response to higher domestic policy rates but are later reversed. In addition, the domestic

FIGURE 4
EME Responses to Tighter U.S. or EME Monetary Policy

A Capital Inflows

B Exchange Rates

C Stock Prices

D Real GDP

E CPI

F Current Account

G Overnight Call Rates

H Foreign Reserves

Key:

— EME policy rate

······ U.S. federal funds rate

Notes: The figure depicts responses of EMEs to a 1 percentage point hike in the U.S. policy rate (dotted lines) or EME policy rate (solid lines). Responses generated from the factor-augmented panel VAR based on 19 EMEs for 1995:Q1–2014:Q3 (Choi et al. 2015). All variables except stock prices and exchange rates (real effective exchange rate, REER) are seasonally adjusted by X-13 ARIMA-SEATS program of the U.S. Census Bureau. Variables are measured as annualized quarterly growth rates (real GDP, CPI, stock prices, and REER) or as percent of nominal GDP, previous five-year average (capital flows, foreign reserves, and current account). All numbers are in percent. The shaded areas mark the bands between 16 percent and 84 percent of responses to the EME policy rate hike.

currency appreciates after two quarters, reflecting tighter domestic liquidity. For stock prices, the initial decline is quickly reversed.

We also examine whether withdrawal of global liquidity following tighter U.S. monetary policy affects the composition of cross-border capital inflows to EMEs. As shown in Figure 5, all types of capital inflows declined, but the extent of the decline varies. Foreign bond investment flows declined the most. Equity

FIGURE 5
Responses of Capital Flows to the U.S Policy Rate Hike

A Bond Inflows

B Equity Inflows

C Direct Inv Inflows

D Other Inflows
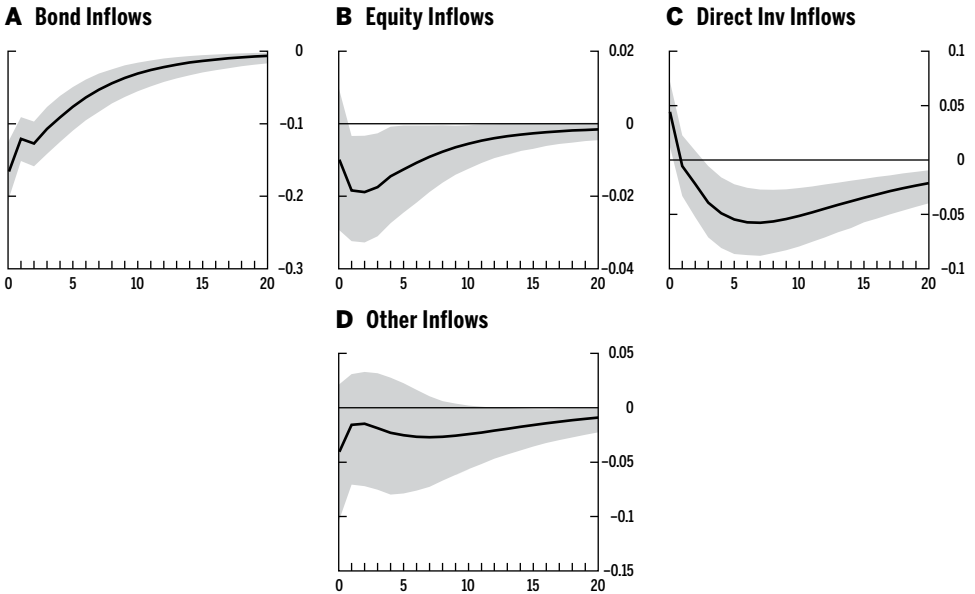
Note: See notes to Figure 4.

inflows fall only marginally. Direct investment by foreigners initially increases but quickly reverses to exhibit a persistent negative response.

The 19 EMEs can be categorized into high- and low-inflation-country groups. The high-inflation-country group includes Argentina, India, Hungary, Mexico, Indonesia, Russia, Romania, Bulgaria, and Turkey. The rest of the sample consists of low-inflation EMEs but excludes Brazil, which is at the midpoint of EMEs. The high-inflation EMEs experienced average annual inflation of 14 percent, while average inflation in the low-inflation countries was 4 percent. In response to a 1 percentage point hike in the U.S. federal funds rate, the low-inflation EMEs absorbed the shock with smaller swings in real GDP and inflation than did the high-inflation EMEs. However, policy responses through changes in overnight call rates and foreign reserves were diverging. Policymakers in the high-inflation EMEs generally raised their policy rates after U.S. policy tightening, consistent with the existence of policy spillovers. In contrast, the low-inflation EMEs lowered their policy rates after an initial increase, plausibly to moderate the adverse impacts of the U.S. funds rate hike on the real front. The loss of domestic real GDP from U.S. policy tightening is 0.3 percentage point greater for the high-inflation EMEs than for the low-inflation EMEs.

To see whether these differing responses are attributable to the EMEs' policy reaction rules or to their domestic economic characteristics, we employ a method used by Stock and Watson (2002). Specifically, we replace the estimated parameters associated with endogenous dynamics in the empirical model of the high-inflation EMEs with the corresponding parameters for the low-inflation EMEs. This counterfactual exercise suggests that the high-inflation EMEs would have experienced little improvement by mimicking the domestic economic structure of low-inflation EMEs. Hence, what matters most is the way the high-inflation EMEs respond to the global liquidity shock.

To summarize, Edwards' analysis shows that U.S. monetary policy affects EMEs' policy rates through "policy contagion" and suggests that macroeconomic stability in EMEs could be affected by the cross-border pass-through of policy rates. In the face of global interest rate normalization, policy rate pass-through may depend on policy space and the mix of available policy tools in EMEs.

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Monetary Policy "Contagion" in the Pacific Basin: A Historical Inquiry

Linda Tesar

Thank you for the opportunity to discuss this thought-provoking paper on monetary policy in emerging markets by Professor Edwards. As Professor Edwards clearly explains in the paper, his objective is to estimate the impact of changes in the U.S. federal funds rate on monetary policy in emerging markets. The sample for his analysis consists of six emerging markets—three Latin American economies (Chile, Colombia, and Mexico) and three Asian economies (Korea, Malaysia, and the Philippines). The data are weekly over the period January 2000 through June 2008. The central question is whether there has been a "contagion" of U.S. monetary policy to emerging markets through the "import" of Federal Reserve policies. The extent of contagion is measured by the reaction of the foreign central bank, as reflected in the Taylor rule, to a change in the U.S. policy rate.

Before turning to the specifics of the analysis, it might be useful to place the monetary regimes in the six emerging markets in some context. In general, the countries included in the study had independent central banks and were inflation targeters. During this period, financial markets were becoming more tightly integrated with the rest of the world. Across the six countries there was variation in the extent of exchange rate management, ranging from relative exchange rate flexibility to a dollar peg in Malaysia. Despite the official focus on inflation targeting, however, one doesn't have to look far beyond official policy statements to realize that the exchange rate was an important policy variable and that international conditions and the size of foreign-currency reserves placed significant constraints on monetary policy choices. This is important because, to the extent other things matter that aren't in the Taylor rule as specified in the paper, we might be concerned that the methodology is not picking up all of the signals and constraints that affect monetary policy choices in emerging markets.

The paper estimates an error correction model that captures the relationship between the foreign country's policy rate and a number of variables

and their lags that enter into the central bank's policy rule. Those variables include the lagged foreign policy rate (level and rate of change), the U.S. federal funds rate, the foreign country's inflation rate, the expected depreciation of the exchange rate, and a measure of expected U.S. inflation. Contagion in this context is a significant coefficient on the U.S. federal funds rate after controlling for the factors listed above. Note that because the data are weekly, typical measures of economic activity such as GDP or unemployment that are available only at a monthly or quarterly frequency cannot be included in the regression.

The general findings are that the coefficient on the federal funds rate is significantly positive in both the set of Latin American and the set of Asian economies. In Latin America, "long-term policy contagion" (the dynamic spillover effects as estimated from lagged coefficients) is large; in Asia, it is significant but magnitudes are smaller. There is also weak evidence that countries with more capital mobility have greater "contagion" than countries with less capital mobility.

The paper interprets positive spillover effects—significant coefficients on the federal funds rate—as evidence of contagion. Specifically, to quote the paper (italics mine), "if, *for whatever reason*, a particular central bank feels that it needs to mimic (or follow) advanced countries' policy actions, then there will be policy 'contagion' and the actual—as opposed to theoretical—degree of monetary policy autonomy will be greatly reduced." This is a very strong statement regarding monetary policy contagion. In effect, if an emerging market changes its interest rate along with the Fed, this is defined as a "contagious" spread of U.S. policy and calls the emerging market's monetary autonomy into question. The conclusion rests strongly on the assumption that the error correction model is picking up all of the things that could make the policy responses correlated even when the central bank is pursuing independent monetary policy objectives.

This interpretation of the results raises the following question: are there other reasons that interest rates might move in concert, even after controlling for expected inflation differentials or expected exchange rate movements? Are there situations where the central bank in the emerging market is making autonomous and optimal choices, but shocks or external circumstances result in correlated policy responses? I can think of at least four possibilities, though there are likely many more.

First, financially integrated economies could experience common real shocks, such as the slowing of global growth, a shift in Chinese demand, or a fall in global oil prices. The estimation method controls for a number of financial variables but does not have real variables at a high (i.e., weekly) frequency.

While the expected exchange rate could, in principle, pick up some of the effect of the common shock, the difficulty in forecasting real and nominal exchange rates makes this unlikely.

Second, changes in expectations about the future, such as a downward revision in expected growth rates, could cause the United States to alter its path of interest rates. If emerging markets share those revised expectations about the future, it may be optimal to change interest rates along with the United States. Again, this would hardly indicate a contagious spread of U.S. monetary policy.

Third, news about future inflation or the exchange rate will trigger movements in the policy rate. In writing about monetary policy in Chile during the time period covered by this paper, De Gregorio, Tokman, and Valdés (2005) note that "first, monetary policy could be adjusted if the *new information modifies the expected path of inflation*. And second, news may trigger an intervention policy under exceptional circumstances, such as the adverse economic effects of an overreacting exchange rate." Such news about future variables may not be picked up under the current specification of the Taylor rule and may lead to a spurious inference that U.S. variables are driving the local policy rate.

A fourth reason that policy variables may move together is due to the transmission of shocks from one country to another. Canova (2005) adopts a vector autoregressive approach to identify shocks to U.S. demand, supply, and monetary policy on Latin American economies. He finds that the interest rate channel is a crucial amplifier of U.S. monetary disturbances, while the trade channel plays a negligible role. A contractionary U.S. monetary shock induces a significant and instantaneous increase in Latin American interest rates which, in turn, are accompanied by capital inflows, price increases, depreciation of the real exchange rate, and improvements in the trade balance. Given that the majority of domestic fluctuations in the continent are of foreign origin, he concludes that Latin American policymakers must carefully monitor international conditions to disentangle the informational content of U.S. disturbances in order to properly react to external imbalances. The question is, when the foreign central bank does this, is it contagion or is it an optimal response to foreign market conditions?

The discussion up to this point is predicated on the assumption that the Taylor rule is an accurate description of the monetary policy reaction function. There is much evidence that in many countries, for much of the time, the Taylor rule is a useful way to summarize monetary policy responses. However, there is also a good bit of evidence that central bankers reserve the right to deviate from the rule. As just one example, the Banco de la Republica listed the following as objectives of monetary policy in this period: to include stable inflation, to

maintain an adequate level of international reserves, to limit excessive short-run volatility of the exchange rate at short horizons, and to moderate exchange rate movements that endanger the financial and external stability of the economy. (See Chang 2007 for a summary of monetary policy in Latin America.) To the extent these additional goals are not captured by the specification of the Taylor rule, the model is misspecified and the evidence of policy "contagion" may simply be endogenous responses of the central bank to the external environment to attain policy objectives not included in the rule.

Finally, even when the Taylor rule is the "true" rule governing monetary policy, interest rates may *still* be correlated across countries. Since 2001, policy rates across industrialized countries with independent central banks have followed a steady downward path, even though few of those countries would say that they are importing their policy from abroad. In some recent work with Christopher House and Christian Proebsting (2015), we develop a multicountry model that includes the United States and countries in Europe, some with fixed exchange rates within the euro area and some with floating exchange rates outside of the euro area. We calibrate the economies to capture their relative size, their bilateral trade relationships, and the share of government in the domestic economy. All countries pursue a Taylor rule that specifies the nominal interest rates as a function of output, inflation, and the lagged interest rate. For the European Central Bank (ECB) rate, gross domestic product (GDP) is the weighted average of euro-area members' GDP and inflation. The central bank does not care about the exchange rate and is entirely backward looking. We consider a shock to the ECB policy rate. The change in the interest rate affects output and inflation in other countries, inducing changes in foreign interest rates (smaller, but in the same direction). In other words, there is a "contagious" spread of ECB monetary policy. I'm not suggesting that this model fully explains the results in Professor Edwards's paper. My main point is that ad hoc specifications will only take us so far and that it is important to understand the underlying shocks as well as the structural model before interpreting correlations as contagion.

So to conclude, the paper does a nice job of documenting the connections between U.S. and emerging market interest rates. Labeling such connections "contagion" is provocative, but I'm not sure it's fully convincing. In order to call such effects contagion, one needs to control for all of the factors that would result in a co-movement of policy rates. The results would also be more convincing if the analysis explicitly controlled for episodes of intervention. Policy rates responded to other factors such as a desire to manage the exchange rate and to accumulate the reserves during this period. Finally, I think it is

possible to generate policy rate co-movements in models where central banks are autonomous and place no weight on the exchange rate. The transmission of shocks through trade and financial markets can result in interest rates moving together. It is important to control for those automatic transmission mechanisms before drawing strong conclusions about the lack of autonomy in central bank policy.

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Monetary Policy "Contagion" in the Pacific Basin: A Historical Inquiry

Chair: Reuven Glick

Mr. Glick: Sebastian, do you want to take a few minutes and answer your discussants?

Mr. Edwards: Okay, thanks to both discussants. Let me clarify a few things and respond to their comments. The first thing is that in a previous paper on the international transmission of monetary policy I used the term "contagion," which generated a great deal of resistance, particularly from central bankers. Stan (Fischer) said earlier today, "we don't take orders from others" when he referred to Ragu Rajan of the Reserve Bank of India, Agustín Carstens of the Bank of Mexico, and others that had said, "the Fed should get it over with." Central bankers hate the word contagion, and Linda suggested it may have been a provocation on my behalf. That's actually why I put "contagion" in quotation marks throughout most of the paper for this conference; the quotation marks are there to protect me from being accused of being a provocateur.

I agree with both of the discussants that there are many reasons why central banks in emerging markets may want to react to what the central banks in advanced countries are doing. Consider a very standard Taylor rule, where domestic inflation is affected by the exchange rate through a regular pass-through channel, and the exchange rate in turn responds to interest rate changes in the foreign country. My empirical strategy was to estimate this relation between domestic and foreign policy rates with a simple bivariate regression and then control for other factors and see whether the estimated transmission effect persists, all without making any kind of statement about whether it's optimal or not. I admit, as Linda says, that there is an implicit negativity to the term "contagion," which is why I use quotation marks.

I do, of course, recognize that there were very important shocks throughout the period of my study, 2000–08, including real shocks. I try to control for real shocks through commodity prices, like the price of copper, the price of energy, etc. I also try to control for expectations about future foreign inflation with the U.S. Treasury Inflation-Protected Securities break-even inflation

rate. I also include the U.S. dollar future rate. Some of these variables are not in the regressions reported in the paper, but believe me, I have done a lot of the things the discussants suggested and the transmission effect persists, and the difference between the two regions is always there. Linda makes a very important point that there may be circumstances under which responding is optimal. In fact, there are countries like Singapore that for a long time engaged in exchange rate targeting. This policy approach may be optimal from some point of view, and I am not passing judgment on it.

Both commentators presented results from their own research, which I found very interesting. In a previous paper, I estimated regional panel VARs, and the results were similar to what I've presented here. But let me tell you a little bit about the difference between what both Woon and Linda showed and what I'm doing. The first thing is that my sample ends with the end of the Great Moderation period, and I stop two weeks before the beginning of the global financial crisis with the Lehman Brothers collapse in September 2008. I do that deliberately because there are structural changes and nonlinearities during and after the financial crisis that are included in the sample periods used by Woon and Linda that can complicate estimation. Now you may say I am throwing away the most interesting part of the period. That may be the case, but the benefit of restricting myself to the period of the Great Moderation is that during this period there weren't significant changes in monetary policy or targets in my countries, except toward the end when Malaysia decided to have a flexible exchange rate. That makes my estimates of international transmission more reliable. Of course, there will always be concerns about omitted variables, but we cannot control for everything.

So let me finish by just mentioning two more things. One thing that I want to emphasize, and this is different from what Woon did, is that my analysis estimates results for individual countries separately, rather than pooling them together. This allows me to argue that, to the extent there weren't major changes in monetary policy regimes during my sample, I have a better claim that my results are more robust. Finally, I did not report here very interesting seemingly unrelated regression results. What you find by looking at the covariance of the error terms is that there is a very high degree of positive correlation within regions. The Latin American countries are correlated among themselves, but if you look at the matrix of variance-covariances across regions, say between Mexico and Malaysia, there is absolutely no correlation, and this again calls for the separation of the two regions. They are very different, suggesting that there's going to be a very different effect in terms of the degree of

what you want to call either "contagion" or the transmission of interest rates across countries.

Mr. Glick: Okay, we have time for questions from the floor. I see a lot of hands up. I'll do my best to recognize you in order, but I ask that once you are recognized, give your name and your affiliation. So, Andy, you're the first out of the gate.

Mr. Rose: Given that you're only using financial stuff in your weekly specification, I was struck by how low the coefficients were, and even more strongly by how poor was the fit of your regressions. And so, here's my question: Why constrain yourself to weekly frequency? Usually, you care about the span of the data, not the number of observations. So, it strikes me that moving to monthly observations would be beneficial for you in a number of ways. You could expand the number of countries. You then need not worry about the preemptive interest rate changes such as South Africa just announced. You could add way more covariates, so you could get a plausible Taylor rule and, if everything works out, you could just confirm your weekly results. So, my view is you should move to a lower frequency, if possible.

Mr. Ostry: Sebastian, I realize your data ends in 2008, but certainly over the period since 2008, emerging markets have been vocal, to varying degrees, about the transmission of U.S. monetary policy, and one of the things that's clear in your results is that what you call policy "contagion" differs quite a bit across countries. So, I wanted to invite you to speculate about whether there's any connection between the two. And I'm also very curious about the Brazil results you discussed at an International Monetary Fund (IMF) conference but which you didn't present here, and what they suggest about policy "contagion"; and whether you accept what I think is the Federal Reserve's view—I'm thinking of Ben Bernanke's Mundell-Fleming lecture last week—that, by and large, the transmission of U.S. monetary policy to emerging markets is, on the whole, small. That is, there is an aggregate demand effect and there's an expenditure switching effect, and they offset one another more or less. There's a financial stability effect as well, but it's also small. So the effects on the whole are small, but they may differ quite a bit across countries and maybe that accounts for the different degree to which countries were vocal and may be behind your results. A final, very brief question: you focused on short-term interest rates, but what we think is an important variable for the real transmission is how long-term rates are transmitted; and I think the evidence suggests that transmission is

lower for long-term rates than for short-term rates. I wondered whether you'd looked at that.

Mr. Hutchison: My first question relates to what Andy said in using weekly data over eight years. Do you really have enough interest rate cycles to pick up the effects that you're looking for? In particular, there was only one period of increasing Fed rates in your sample and two periods of rate declines. Are you picking up enough cycles with just a short period of time? My second question has to do with whether you have something to say about real as well as nominal linkages. I interpret nominal linkages as meaning the pass-through of inflation between countries. So, I'm wondering what were your thoughts on real interest rate linkages? How strong are these linkages, and is Asia still different from Latin America?

Mr. Edwards: Let me start by answering Michael's last question, which is the easiest one. Is Asia different from Latin America? The answer is, yes, it is. Also, there are two tightening cycles during this period, not one, and that's what restricts the analysis. Andy asked why I used weekly data. I started by being interested in what happens week by week. I found that after six weeks, for instance, there is full transmission of federal funds rate changes during my sample period. I've worked with monthly data and, as Andy suggested, I was able to add more covariates, but the results are very similar. You can reject that the individual countries can be pooled and that the individual country coefficients are equal, and you get a much higher response in Latin America than in Asia. On another point of Andy's, the fit of equations with interest rates in differences is usually very, very poor. I remember my discussion of a paper on Brazil at an IMF conference in which the authors were doing interest rates in first differences and they had R-squares of .8, which was impossible. In fact, the authors later discovered that they'd made a coding mistake. You don't get high R-squares with this kind of specification and data. As for expanding the sample, the problem, again related to Mike Hutchinson's question, is that if you go further back to the late 1990s, then you get into the East Asia crisis in 1997 and 1998, which is very difficult to handle, because there's no inflation targeting and there's no central bank transparency. It was a different world back then and that's one reason why I didn't include earlier data.

Regarding Jonathan's (Ostry) question about Brazil, there's almost no transmission to Brazil. Now, this was a complicated period for Brazil, with its Monetary Policy Committee (the Copom) setting the benchmark Selic interest rate at 10 percent, 15 percent. This is when Lula came into power in 2003 as the most left-wing president in Latin America since Allende in Chile, then decided

to follow Fernando Henrique's policy and bring inflation to an end, which is what allowed the credit market to be revived in Brazil and led to the Brazilian mini-miracle of the 2000s. So, for Brazil I find no transmission.

As for long-term rates, there is not a very deep market for really long-term rates. I looked at transmission for rates up to one-year deposit rates and, though the effects are smaller, they are still there, with the same pattern of differences with East Asia displaying much less transmission—in fact, the transmission for longer-term certificate of deposit rates was almost zero for East Asia.

Mr. Glick: We have time for one more round of questions. I've got four people on my list, so Joshua?

Mr. Aizenman: I enjoyed the paper and the discussion. There's an issue that you raised in answering Michael about what is the difference between Asia and Latin America. We know that one difference is that the saving rate typically is higher in Asia. We know also that dependency on external funding used to be higher in Latin America and balance sheet exposure was higher. So, I suggest adding these variables to your type of regressions in order to get some more insight about why there are different transmission effects across countries.

Mr. Claessens: In the conclusion of your paper, you give the list of countries in terms of order of pass-through as Colombia, number 1; Philippines, 2; Korea, 3; Chile, 4; Mexico, 5; and Malaysia, 6. If I have my geography right, I don't see Asia and Latin American line up in the way you tell the story, so I'd appreciate some clarification.

Ms. Shirai: I found your presentation very interesting. I'm a member of the Bank of Japan's Monetary Policy Board. As a policymaker, I have two questions about contagion between policy interest rates. First, some emerging economies use reserve requirements quite often as a policy tool, while keeping the policy rate constant. For example, my understanding is that Malaysia has often used reserve requirements as a monetary tool. How does that affect your results? That's my first question. The second question is whether you have looked at the impact of the European Central Bank's (ECB) monetary policy on policy rates in emerging markets. For example, Latin American economies depend heavily on the euro area, so ECB policies might have some effect on their monetary policies.

Mr. Warjiyo: Thank you for three excellent presentations. You ask if monetary policy in advanced countries affects policymaking in emerging markets. As an Asian policymaker, I think yes. I think that the transmission works directly

from foreign rates to domestic interest rates as well as through the effect of the exchange rate on domestic inflation. In Indonesia, we already see effects of the anticipated increase of the federal funds rate. For example, we are assuming a December increase of 25 basis points and four additional 25 basis point increases in 2016. But the real question is not about the influence of foreign shocks through the interest rate channel or the exchange rate channel on our interest rate policy. Rather, it is the effect of the risk-taking channel, which is very difficult to measure and anticipate, particularly because of the tendency of financial markets to overreact to the Fed's statements and actions. I think this is the most difficult challenge faced by policymakers in most emerging countries. Any advice on how we can anticipate possible market overreaction will be useful. Thank you.

Mr. Edwards: Thank you again to everyone. I'm delighted that we've generated this conversation. I don't know the answer to how to anticipate market reactions and risk-taking, except that we know that as the Fed starts to hike rates, we likely will see capital moving out of emerging markets, particularly the bond market, as Woon said in his very interesting discussion. We're seeing that happening already, with outflows in the last several months. The taper tantrum of a couple years ago generated massive capital outflows, something we should continue to examine and understand. Let me next respond to Stijn's (Claessen) question about the ordering of the degree of transmission across the Latin America and East Asia countries in my sample. Basically, the order is Colombia, Chile, Korea, and Mexico tied, then Philippines and Malaysia. If you look at averages by region, the effect of a federal funds rate hike of 100 basis points is about 60 basis points in Latin America and about 23 basis points in Asia, and the latter is not very different from what Woon had of up to 14 basis points.

Let me end with Joshua's question about how to explain the difference between Latin America and Asia. Joshua points out a number of differences, including saving rates and external borrowing. There are many other possible factors, including the location of the World Cup, the degree of authoritarianism of the political regime, and so on. But to concentrate on two of the variables that Joshua mentioned, the saving rate in Colombia is about 20 percent; the saving rate in Korea is higher at 27–28 percent. But they don't change over the period 2000–08. In Colombia it's 19 percent when you start, 19 percent in the middle, and 19 percent in the end. Now, the investment rate does vary a little over time but not too much. We know that current accounts did sometimes get out of whack; the average current account is 6 percent now and usually it's between 3 percent and 6 percent. So, what we could do, and this is maybe related to what

Andy said, is do a cross-country analysis, where we estimate the transmission coefficients and then we take the cross-section of these coefficients and try to relate them to country-specific variables, such as the saving rate or exposure to foreign debt, which don't change much during my sample period. I think that this is an interesting exercise. But as I said before, for the specific countries in my sample period, these factors don't change much. So one needs to have a longer sample period and maybe a broader cross-section of countries.

I want to end by going back to what Linda said: "Should we call this contagion, or not?" I'm going to stick to my view of "contagion," which is a way of hedging my view, but I go back to the notion that, and the fact that, central bankers get so upset—like Jose De Gregorio, former governor of the Central Bank of Chile, who got very upset and said, "I never took into account what the Fed was doing when I was Governor. Never, ever, ever, ever. It didn't cross my mind." And I looked him in the eyes and I said, "I don't believe you."

Mr. Choi: Two points. The first is that it seems that with rising globalization, foreign interest rates are having an increasing influence on long-term rates in emerging markets. The second point is related to the impact of global risk sentiment that Mr. Warjiyo raised. As I mentioned in my discussant comments, in my work at the Bank of Korea we found that a global interest rate hike affected domestic monetary policy. We also showed that in a worst-case scenario, an increase in foreign rates could affect domestic rates through market liquidity and risk-aversion channels. That is, domestic market liquidity might dry up and risk aversion might increase. So if you add in these other factors, the impact of an increase in the federal funds rate on domestic GDP would be doubled.

Mr. Edwards: I think I tried to answer all of the questions from the floor, but I did not answer Sayuri's (Shirai) question. I did not add the ECB policy rate, since the ECB during most of the period in my study followed its multi-pillar approach. What I did include in my analysis were both the expected dollar–euro rate and the actual dollar–euro rate as additional controls. They do tend to be significant in the analysis, but they don't affect the main conclusions of the results. Europe has become more and more important over time, but during this period, which is the period of the Great Moderation, there was no particular impact. Latin America was very linked to Spain through the presence of the Spanish banks. It goes back to Linda Goldberg's research on the role of banks in the transmission mechanism. Santander and Bilbao were very important, but they sold their Latin American operations after the Great Recession. But my impression from what I did is that there was no significant importance from Europe at that time.

Mr. Glick: Okay, thank you. Please, everyone join me in giving a round of applause to our speakers.

Is There Macroprudential Policy without International Cooperation?

Stephen G. Cecchetti and Paul M.W. Tucker

In this paper we address three questions: (1) Does global finance require a common prudential standard? (2) Does global finance require international cooperation in overseeing the system's safety and soundness? And (3), does global finance require notification, cooperation, and coordination of dynamic regulatory policy adjustments? Our answer to the first question is that global finance does require a common prudential standard, defined as a level of required resilience, applied appropriately to all parts of the financial system. Without adoption of a common resilience standard, the international financial system will fragment and balkanize. In addressing the second question, we explain why shared, collective analysis is necessary to identify and mitigate stability-threatening shortfalls against that standard for resilience. This will be possible only with increased public and private transparency. Finally, we examine the daunting, but essential, task of implementing a dynamic prudential framework that maintains the system's resilience even as its structure and risk-taking behaviors change. The policy implications of our analysis focus on the need for global agreement, implementation monitoring, information sharing, and sometimes, given damaging spillovers, even collective regulatory responses to emerging threats. Institutions will need to be adapted to make all this feasible.

1. Introduction

The world of economic and financial policymaking is abuzz with discussions on financial stability, macroprudential policy, their siblings, and their cousins. While we haven't counted, our impression is that there are at least as many research papers and conferences in this area as there are on monetary policy. This paper is designed to open up what we see as a neglected aspect of discussions around building an effective financial stability policy framework, one not yet addressed by the many theoretical papers enriching general equilibrium analysis with financial frictions or the empirical work developing early warning signals of impending systemic instability. We examine whether financial stability policy regimes can be designed and implemented by nations acting alone.

In monetary economics, questions of international cooperation and coordination have long had a prominent place. Broadly speaking, diagnoses and prescriptions have turned on the relative merits of floating versus fixed exchange rates in different circumstances. And at a practical level, central bankers have been meeting to discuss each other's monetary choices for the better part of a century. To date, however, so far as we know, there has been relatively little discussion of how domestic "macroprudential" regimes for adjusting core regulatory policies should fit together, or of how to cope if a key jurisdiction lacks such a regime. Our purpose with this paper is to promote a discussion of the international dimension of the macroprudential reform program.

Our starting point is the assumption that international finance matters. It is widely, but not universally, agreed that cross-border trade of goods and services has brought great benefits to a large number of people across the world. Trade supports middle-class living standards in the advanced economies and has pulled literally hundreds of millions of people out of abject poverty in the emerging market world. But this real side of globalization relies on financial intermediaries to fund the trading, make the payments, and insure the risks that cross borders. The recent crisis showed how problems on and off intermediaries' balance sheets can have very large costs both within and across national borders. The initial phase of reform, following the worst of the crisis, accordingly combined national and international measures to make financial intermediaries stronger. As time has passed, some countries have been deepening the macroprudential capabilities of their national authorities. However, they have done this without an international framework or, perhaps, even a consensus for the design and operation of such regimes. As a consequence, it remains unclear whether there needs to be a united, international endeavor. Hence, we ask, can there be effective macroprudential policy without international cooperation?

In tackling this question, we believe that it is necessary to step back and ask what the goals and components of a financial stability regime should be in the round. That helps both to warrant the existing cooperation on minimum standards and to set the stage for the discussion of why more cooperation is needed on surveillance of risks and of the more recent macroprudential turn. We seek, therefore, to answer the following three questions:

1 Does global finance require a common prudential standard?

2 Does global finance require international cooperation in overseeing the system's safety and soundness?

3 Does global finance require notification, cooperation, and coordination of dynamic regulatory policy adjustments?

The remainder of this paper is organized in seven parts. The next section presents some facts that motivate the analysis. Specifically, we discuss how, over the past quarter-century, finance has become global. Then, in the third section, we define the systemic resilience standard that we see as forming the basis for a financial stability policy framework. It is important to stress that our focus is on resilience, which is inherently a structural concept. Section 4 explains how, in principle, a resilience standard could be operationalized. Those two sections abstract from a world of nation states and regional groupings. Their analysis would apply to individual states under financial autarky or, alternatively, to a world without borders. The subsequent three sections address our three questions about the need for international cooperation and regimes. In Section 5, we discuss why no country or jurisdiction can maintain financial stability on its own—it is a problem of the commons that must be tackled worldwide in a joint and cooperative manner. In Section 6, we turn to a discussion of prudential supervision and oversight of the system's resilience—what it is and how it works. Section 7 is about macroprudential policy: why there is no escaping dynamic adjustment and why this will not be effective without international cooperation. We elaborate here on how the objective remains systemic resilience. And, while maintaining a given level of resilience may require changing regulatory settings over time, given our current level of understanding, we do not see a role for such tools in trying to fine-tune credit cycles or manage asset price booms. The final section concludes with our policy recommendations, centered on the need for institutional evolution and reform.

2. A Few Facts

Financial history is replete with examples of how stresses in one country's financial system quickly spread, sometimes catastrophically, to others. Two recent

examples serve to prove the point. After determining that its foreign exchange exposure exceeded three times its capital, on June 26, 1974, German supervisors withdrew the banking license of Germany's 35th largest bank: Bankhaus Herstatt. That day, a number of banks around the world had followed then-standard practice and transferred deutsche marks to Herstatt in Frankfurt with the expectation of receiving U.S. dollars in New York later in the day. Because of the six-hour time difference, Herstatt ceased operation between the time that it received payments and the time that it was scheduled to make them. The result was chaos in the international banking system.[1]

Our second example is more recent: the exposure in 2007–09 of European banks to the U.S. dollar assets, especially securities backed by subprime mortgages. Even though current account imbalances between Europe and the United States were relatively small, over the decade prior to the crisis, continental European banks managed to acquire substantial quantities of mortgage-backed and U.S. Treasury securities. McGuire and von Peter (2009) estimate that by 2007 this had created short dollar positions in excess of US$1 trillion. When interbank funding markets started to dry up, these institutions were left without sources to finance their dollar assets. And, since these banks were outside the United States, they did not have direct access to the Federal Reserve's (U.S. dollar) lending facility. This led, in December 2007, to the creation of U.S. dollar central bank liquidity swaps, where the Federal Reserve in essence lent dollars to a set of foreign central banks, who then on-lent them to their banks. At their peak in December 2008, the Fed lent US$583 billion to foreign central banks—most of this to Europe.[2]

In the case of Herstatt, the realization of the importance of cross-border spillovers in the post–Bretton Woods international monetary system led to the creation of arrangements for international cooperation that have now been in place for the better part of 40 years. This system delivered standards and institutions that have made payments systems robust—we are thinking of the introduction of real-time gross settlement systems, the creation of the CLS bank, and the convergence of international banking standards on capital and liquidity regulation in what has come to be known as "Basel III."[3] More recently, the 2007–09 financial crisis led to the recognition that financial spillovers go well beyond linkages created by regulated banks. Among other things, this has given us the Financial Stability Board, which is striving to extend cooperation and coordination in banking supervision to the global financial system as a whole.[4]

To appreciate the extent to which the financial system is global, it is worth having a brief look at some data. First, as Obstfeld and Taylor (2003) note, over the past 150 years capital market openness has waxed and waned. Following

the Bretton Woods era, which was characterized by fairly strict capital controls, finance has gradually become more open and more global. It is fair to say that today capital flows across borders more freely than any time in the modern era, including the period of the pre–World War I gold standard. And, if anything, global financial integration has accelerated in the past 20 years.

Some numbers help to demonstrate this. Figure 1 traces the recent evolution of international investment positions for 127 countries as a percentage of world gross domestic product (GDP). From 1995 to 2014, gross international asset positions climbed steadily from 75 percent to 175 percent of world GDP. In nominal terms, that's an increase from $23.4 trillion to $135.7 trillion (at market exchange rates).

The extent of global integration allows countries to be sizable net creditors or debtors to the rest of the world. The chart includes both assets (which are positive) and liabilities (which are negative), so their sum represents the net position of a country or region with respect to the rest of the world. Some of them are large. For example, at the end of 2014, the United States was the world's largest net debtor, owing to the tune of 9 percent of global GDP, or about $7.0 trillion. On the other side, China and Japan are the largest net creditors,

FIGURE 1
## Gross Cross-Border Asset and Liability Positions
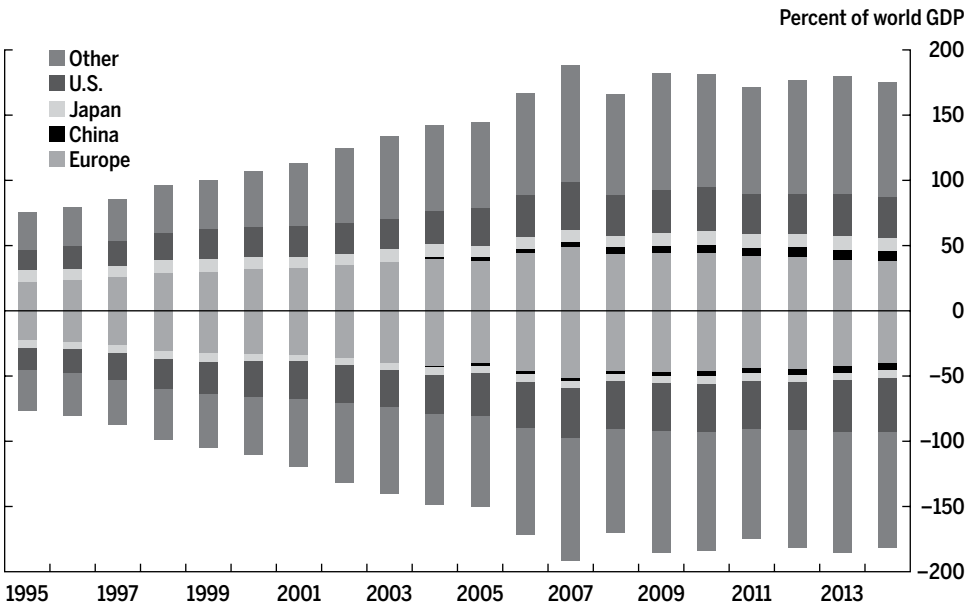
Sources: International Monetary Fund (IMF) International Financial Statistics and *World Economic Outlook*; and Bank for International Settlements (BIS).

with the world owing them a total of $5.1 trillion. While people differ in their conclusions about the desirability of this configuration of net positions, it is clear that if the structure of the financial system were to materially change, it might no longer be possible.

The explosion in cross-border asset holdings has been accompanied by a surge in cross-border bank claims. Figure 2 reports outstanding cross-border bank claims from 1980 to 2015. The level rose from 11 percent of global GDP to a peak of 55 percent on the eve of the financial crisis, and stands at just under 40 percent today.

This growth in cross-border financial activity has been supported by a set of enormous and very complex institutions and markets. Table 1 reports summary information for the 30 financial institutions that appear on the 2014 G-20 Financial Stability Board's list of global systemically important banks (G-SIBs).[5] The biggest of these, the Industrial and Commercial Bank of China and JP Morgan Chase, have assets in excess of $3 trillion. A total of 19 banks have assets in excess of $1 trillion—a level that exceeds the GDP of all but 15 countries in the world. And, while these banks have high reported regulatory capital ratios,

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FIGURE 2
Cross-Border Outstanding Banking Claims

Percent of world GDP
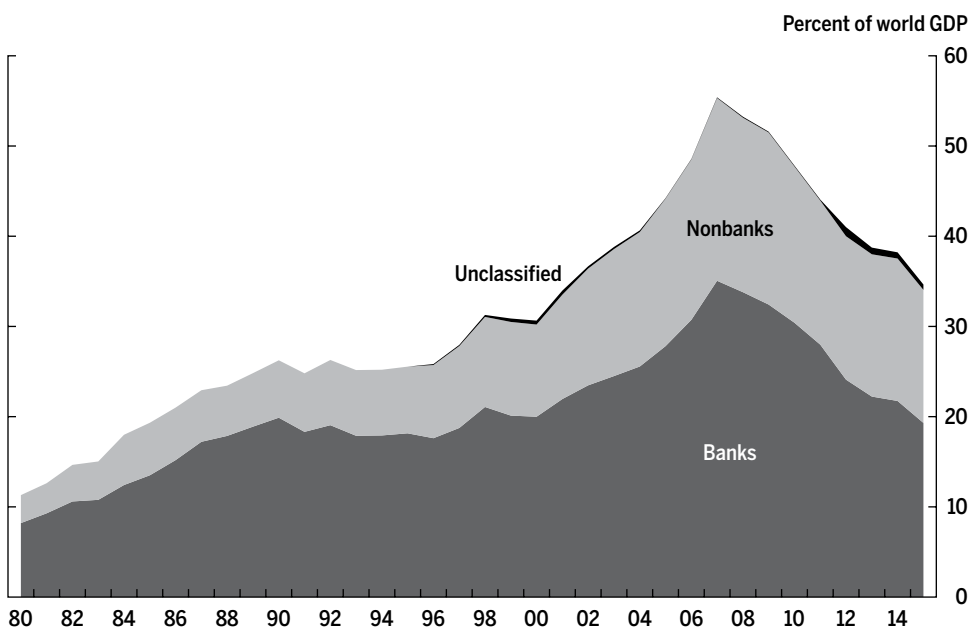
Sources: BIS Locational Banking Statistics, Table A1.1 and IMF *World Economic Outlook*.
Note: Data are annual.

TABLE 1
The Largest Global Banks

Bank Name (home jurisdiction)	Basel III Risk-Based Tier 1 Capital Ratio	Total Assets* (US$ bn)	Unweighted Leverage Ratio*	Assets as a Percentage of GDP	Estimated Number of Countries of Operation
Industrial & Commercial Bank of China (China)	12.40	3,615	6.97	34.5%	60
JP Morgan Chase (US)	12.81	3,339	5.56	18.6%	100
Bank of America (US)	12.52	2,823	5.42	15.7%	40
Agricultural Bank of China Limited (China)	10.02	2,816	5.84	26.9%	13
Bank of China Limited (China)	11.62	2,629	7.56	25.1%	27
HSBC (UK)	13.36	2,572	6.70	88.4%	80
Citigroup (US)	13.80	2,420	6.05	13.5%	140
BNP Paribas (France)	11.74	2,379	3.49	80.5%	87
Mitsubishi UFJ FG (Japan)	12.41	2,328	5.54	47.2%	40
Crédit Agricole Group (France)	14.82	1,895	4.32	64.2%	60
Deutsche Bank (Germany)	14.93	1,885	3.10	47.4%	70
Barclays (UK)	14.03	1,880	4.47	64.6%	50
Wells Fargo (US)	12.28	1,786	8.29	10.0%	35
Goldman Sachs (US)	13.54	1,633	4.86	9.1%	30
Mizuho FG (Japan)	11.45	1,567	4.54	31.8%	30
Sumitomo Mitsui FG (Japan)	13.32	1,530	5.36	31.0%	40
Royal Bank of Scotland (UK)	14.33	1,516	5.55	52.1%	30
Société Générale (France)	12.71	1,512	3.41	51.2%	76
Banco Santander (Spain)	12.38	1,490	3.37	103.4%	24
Morgan Stanley (US)	15.75	1,305	4.55	7.3%	24
BPCE Group (France)	12.78	1,301	4.44	44.0%	37
UBS (Switzerland)	19.14	1,015	3.96	143.7%	50
UniCredit (Italy)	11.40	974	3.83	43.9%	17
ING Bank (Netherlands)	14.25	962	5.14	112.2%	40
Credit Suisse (Switzerland)	16.70	939	3.45	133.0%	56
Nordea Bank (Sweden)	17.95	759	3.90	127.1%	19
BBVA (Spain)	12.31	744	4.22	51.6%	31
Standard Chartered (UK)	12.97	695	6.28	23.9%	70
Bank of New York Mellon (US)	12.45	407	4.26	2.3%	35
State Street (US)	14.17	300	4.69	1.7%	29

Sources: Federal Deposit Insurance Corporation (FDIC), IMF, bank corporate websites, and Wikipedia.

*All numbers are based on International Financial Reporting Standards (IFRS), except for the three Japanese banks, which use Japanese Generally Accepted Accounting Principles (GAAP), and Credit Suisse, which uses U.S. GAAP.

Notes: Number of countries of operation are approximate and include branches, subsidiaries, and representative offices. Total assets and the leverage ratio are for end-June 2015. IFRS estimates are from FDIC (2015). Ratio to GDP computed used is the average of the 2014 and 2015 IMF *World Economic Outlook* estimates.

ranging from 10 percent for the Agricultural Bank of China to 19 percent for UBS, their unweighted leverage ratios are as low as 3.10 (for Deutsche Bank).[6]

For our purposes, it is important to note two things. First, regardless of whether they have operating subsidiaries, branches, or simply representative offices in a particular jurisdiction, it is almost surely the case that the vast

majority of these banks do business with either financial institutions or non-financial businesses and, in some cases, households in a large number of countries.[7] The numbers range from a low of 13 countries for the Chinese giant the Agricultural Bank of China Limited to a high of 140 for Citigroup. The rest of the banks in Table 1 are somewhere in between, with the median operating in 40 countries. To put these numbers in perspective, the International Monetary Fund currently has some 188 member countries, the United Nations has 193, and FIFA (Fédération Internationale de Football Association) has 209. So Citigroup is operating in nearly three-quarters of the recognized jurisdictions in the world, and the median bank is in more than one-fifth.

Second, these banks are often very large relative to the size of their home country economies. UBS and Credit Suisse are at the top of the range, with balance sheets of well over 100 percent of Swiss GDP. The median bank has assets that are more than 40 percent of GDP. The American banks, while extremely large in absolute terms, turn out to be small relative to the size of the U.S. economy, but their foreign operations are likely very big relative to the economy of some host countries. And, taken as a group, the total assets of these 30 institutions sum to fully two-thirds of current global GDP measured at market exchange rates.

Global finance means not only cross-border asset ownership, lending, and institutions; it also means global markets. While it is difficult to get a clear fix on the extent to which financial markets are globalized, what we can say is that large trading platforms are now populated by actors from all over the world who trade in lots of currencies. The Chicago-based CME Group, the biggest trading platform in the world today, clears on the order of 3 billion trades annually with a notional value of $1,000 trillion (that's $1 quadrillion) in a combination of cash, futures, and options in interest rates, equity indexes, foreign exchange, energy, agricultural commodities, metals, weather, and real estate. And, they list products in 18 currencies and have 72 clearing members from all over the world.

LCH.Clearnet in London is also very large, with annual clearing of more than nearly 1 billion trades in 17 currencies with a notional value exceeding €70 trillion for roughly 150 members housed in nearly two dozen countries. And the Intercontinental Exchange (ICE) reports futures and options volume in excess of 1 billion contracts in 2014.

Our point is that the 21st century finance system is global. Modern financial institutions operate across borders. Modern financial markets are international. Funds in more than a dozen currencies move across borders continuously. We believe, but do not defend here, that this system brings substantial benefits that the authorities should work to support and protect. And even if these benefits

were to be modest, the internationalization of the system is a concrete fact. It would take a massive act of sustained political will to unravel this complex web of relationships, and arguably an even larger effort to manage it smoothly. This motivates our examination of the rules of the game for and oversight of global finance.

3. The Core of a Regime for Financial Stability: A Standard for Resilience

The problem of financial instability confronts and afflicts countries irrespective of whether the world is globalized. So, in this section and the next, we step back and contemplate how a regime for stability should be constructed when state boundaries and questions of international cooperation or coordination are ignored.

This endeavor often meets with comments along the lines of "we know what financial *instability* looks like but, unlike price stability, we don't know even how to define, let alone measure, financial *stability*." Were this true, it would be a major problem, leaving the authorities either relying on mopping up after the event—a strategy that was tried and abjectly failed in the run-up to the 2007 U.S. subprime crisis—or chasing after each and every potential vulnerability or bout of exuberance in markets just in case they pose a risk to stability.

We believe that the core of a regime for stability should be a standard for resilience. By this we mean that the financial system as a whole should be "sufficiently" resilient to ensure that the core services of payments, credit supply, and risk transfer and pooling can be sustained in the face of large shocks. Obviously, there is a question of how big a shock the system should be able to withstand. Among other things, that depends on the force with which first-round losses are propagated through the system.

The appropriate degree of required resilience also depends on whether there are any long-run tradeoffs between a strong financial system and other things we care about. On the one hand, a very big financial crisis can deplete the economy's productive capacity and, possibly, put it on a persistently lower growth path. On the other hand, some of the risk-taking behavior that can lead to crises might increase the availability of funds to projects that raise welfare over the long run.[8]

For these reasons, the choice of how resilient the system should be must have a democratic pedigree. Public outrage about the most recent crisis suggests that it would be a mistake to tolerate a financial collapse more frequently than every 70 years or so, which—given life expectancy today—could mean that someone could expect to be hit twice, once as a young wage earner and

again as a pensioner.[9] But do we want the system to be so safe that crises come every thousand years? Or every 5 million years?

We expand on this idea in the next section. Another question is to whom the standard of resilience should apply. Traditionally, the answer has been, above all to banks but also to insurers and major securities dealers. We think that this misses something profound about the nature of both finance and the financial stability problem.

It is typical to think of "financial stability" as a public good, like price stability and national defense; a good available to all and which no one can deplete or undermine. But following Tucker (2015), we think of financial stability as a problem of the commons. That is, it is analogous to grazing on public lands or fishing in public waters. Individuals have the incentive to do things that degrade the environment for everyone else.

To be specific, we think of financial stability as based on a common resource: the resilience of the system that is non-excludable but rivalrous. That is, if the financial system is stable, no one can be kept from basking in the glow of its stability. But individuals can act in ways that reduce the resilience of the system as a whole. Just as a farmer has the incentive to overgraze his or her cows, letting them eat until the public green becomes bare, leading to the starvation of others' herds and eventually their own, an actor in the financial system has an incentive to behave in ways that deplete its resilience and so put others at risk.

Individual institutions can deplete the resilience of the financial system outside of the public view through their hidden actions. For example, they can issue debt so that, given the inherent opacity of their portfolios, they are in fact more risky than they outwardly appear.[10] And, even if regulated, they can undertake business that makes them more risky than is permitted by at least the spirit of the rules. If they lie outside the regulatory perimeter, institutions and structures can dress up their provision of core financial services in ways that would be subject to much stricter standards were they within the perimeter. In other words, the problem of regulatory arbitrage—avoiding and evading rules designed to keep the providers of core services safe and sound—should be central to the design of a regime for stability.

For many common-resource problems, the costs are visited on the perpetrators themselves and only upon them. In a village that doesn't trade with outsiders, the overuse of common grazing land hurts only the villagers. But the financial stability commons problem has negative externalities for the end users of financial services and, thus, for the economy as a whole.[11] Further, unless the participants in financial markets are few and relatively homogenous, we cannot rely on the kind of cooperative solutions pursued in other areas.[12]

Once we realize that financial stability is a common, but rivalrous, resource that can be depleted by individual actions, it becomes clear that systemic risk is a consequence of actions that are more pervasive than those created by the explicit government safety net. That is, the lender of last resort to de jure banks has been provided by central banks since the 19th century, and the deposit insurance that governments have supplied since the 1930s surely make matters worse. But they are not the ultimate source of the problem.

Our analysis implies that a financial stability policy regime has the following three elements:

1. a standard for resilience that is applied to all parts of the system, taking account of the threats that they can pose to the delivery of core services in the face of big shocks

2. surveillance of firms, funds, and structures, as well as of the system as a whole, to identify and rectify hidden actions that undermine resilience

3. dynamic adjustment of core regulatory parameters to maintain the desired degree of resilience in the face of material changes in risk-taking behavior or of changes in the structure of the system that would make the propagation shocks more virulent

In the remainder of this paper, we examine each of these in turn. The basics of the first element, how to operationalize a standard for resilience, follows in the next section. We then proceed in Section 5 to explain why the standard must be international. But before proceeding, it is important to say something about how the abstract idea of a "standard for resilience" would be manifest in the world of public policy.

In practice, the Basel Capital Accord for banks and the accompanying capital add-on for systemically important financial institutions (SIFIs) manifests an underlying standard for resilience. It has not been explained or debated what probability of crisis it leaves open, and to do so would require explicit assumptions about the structure of the system and how shocks are propagated across it. Our point is that the same standard should be applied to other sectors, even though the relevant regulatory requirement might be quite different in kind or might be calibrated quite differently even if similar in kind.

Examples of policies to help preserve stability by building resilience or enabling market discipline of resilience include limits on asset concentrations and enhanced transparency requirements. We do not explore these here, but we want to highlight that a universal "prudential" standard of resilience almost surely would not entail universal application of bank-style regulation.[13]

The second component of the framework relates to the conception and delivery of supervision, very broadly defined. This is the topic of Section 6. The third

element, the subject of Section 7, is about what, following Tucker (2015), we call macroprudential policy.[14]

4. Modeling Systemic Resilience

Specifying a resilience standard is ultimately a quantitative exercise. It requires modeling and measurement that forms the basis for a financial stability policy framework. An early step in this process is to create a measure of resilience analogous to the consumer price index. So, in the same way that inflation-targeting central banks care about both the level of and change in prices, the financial stability policy authority would care about the level of and change in the index of systemic resilience.

To understand how we might construct such an index in practice, start with a simple representation of the distribution of possible outcomes for the output gap, y, in Figure 3. The density for y is given by $f(y)$, and it has two modes, one coming from a normal business cycle regime (the one on the right of the figure) and one from a crisis regime (shown on the left of the figure). The two regimes are separated by a threshold level of y, y^c. We have drawn the density in an intentionally stylized manner to emphasize the almost discrete nature of a crisis.[15]

Standard welfare analysis suggests that policymakers should be concerned about, among other things, the volatility of the output gap.[16] This leads naturally

FIGURE 3
Probability of Output Gap Outcomes
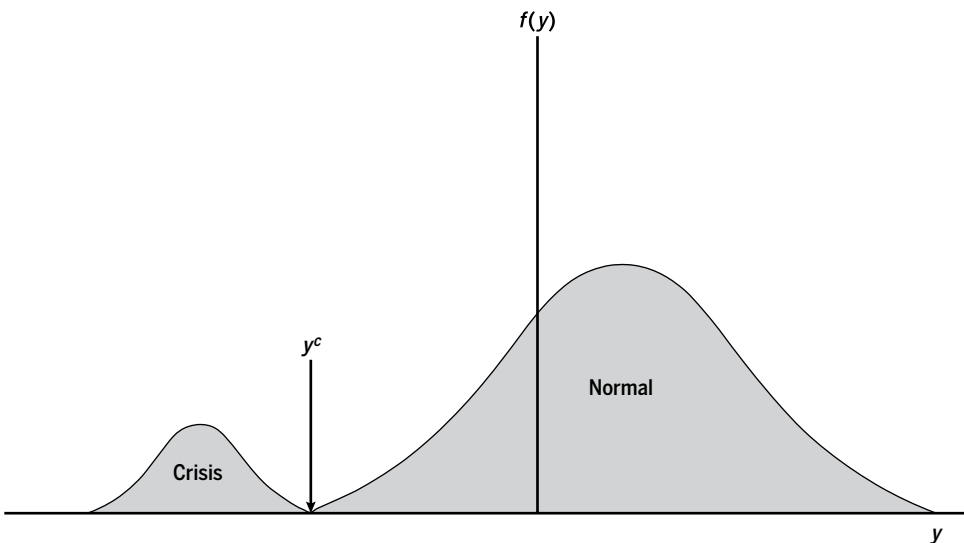
to a definition of resilience that has two parts. The first is the probability of a crisis and the second is the severity of the crisis, conditional on it occurring. We label the probability as $p = \Pr(y < y^c)$ and the severity as $s = E(y|y < y^c)$. Assuming that we can construct the density $f(y)$, these are both well defined.

Analogous to inflation targeting, where legitimacy of the target level requires a mandate from elected representatives, here we would expect the Congress or Parliament to determine (or at least endorse) the maximum level of p and s that society is willing to tolerate. This pair, call it (p^*, s^*), is the target for the financial stability policy authority. And this is what we mean by a *resilience standard*.

One way of stating the task of the policymaker is to keep $(p,s) < (p^*, s^*)$. Doing this requires modeling the evolution of (p,s) in a manner that admits some form of control. So, in the same way that we believe monetary policymakers can change interest rates in an effort to keep inflation close to target (at least in normal times), there must be some set of instruments that allow policymakers to influence (p,s)—these would naturally include what are now commonly referred to as "macroprudential" tools.[17]

To see how we might make such a policy framework implementable, turning the inherently unobservable (p,s) into something that can be monitored, recall that macroeconomists think of economic systems in terms of impulses or shocks that are amplified and propagated by the structure of the economic and financial system. We can think of $f(y)$, and hence (p,s), as arising from this combination of shocks and structure.

There are a variety of ways to formalize this construction. The simplest is to consider a vector autoregressive representation of the economy in which the lag polynomials and the variance of the shocks switch between states, normal and crisis. The transition between states, in turn, depends on conditions in the financial system. For the purposes of exposition, we label the moments of the density of the shocks hitting the economy as μ, and the vector of economic and financial quantities that both influence the state transition and the amplification potential of the propagation mechanism as Z. In very abstract terms, we can then think of (p,s) as a function of (μ, Z), $(p,s) = g(\mu Z)$.

It is worth pausing to provide a few examples of the sorts of things that we have in mind. Focusing on the economic structure, we can think of two types of things that would change the amount that a particular shock is amplified and propagated through the system. The first is the reaction of agents in the economy to a shock. While a number of things will affect this, the biggest is likely to be the structure of balance sheets. Several decades of studying the monetary policy transmission mechanism, combined with more recent work on financial

crises, leads to the conclusion that debt matters—household net worth, firm borrowing, and government indebtedness all have an influence. And, roughly speaking, a given sized negative shock will have a bigger negative impact the more debt there is in the economy.

As for the structure of the system itself, innovations in the financial instruments, markets, and institutions can create changes that affect crisis probability and severity for a given size of shock. The introduction of new, complex derivatives; the creation of securities funds with banklike characteristics (bond funds, exchange-traded funds, and the like); and changes in trading technologies and platforms are just a few examples.

While we are not being very precise in a mathematical sense, we conjecture that for a large class of models the function g can be inverted, making it possible to compute $Z^* = g^{-1}(p^*, s^*; \mu)$. That is, the target crisis probability/severity combination can be turned into a target that is a function of the moments of the density of the shocks (among other things). Since Z is observable, the authorities would then be required to announce the current level of Z^* as a part of the communication regime in the financial stability policy framework. And their policy objective would be to keep $Z < Z^*$. If our conjecture is correct, then this represents an implementable resilience standard.[18]

To see what this might mean, consider the relatively straightforward case of an economy where all intermediation is through a banking system. As a consequence of limited liability and government guarantees (both explicit and implicit), banks engage in too much credit transformation, too much liquidity transformation, and too much maturity transformation. That is, they hold assets that are too risky, too illiquid, and too long term relative to what would be socially optimal. And, because of their balance sheet structure, individual institutions are creating financial stability risks. In such a circumstance, the lower a bank's capital, and the more liquid and shorter term its liabilities for a given asset structure, the more likely a given sized shock will create stress and possibly failure. This means that (p,s) are functions of capital adequacy, liquidity, and maturity transformation—what we are calling Z.

Having converted the systemic resilience standard into one that is observable, authorities now require tools that are capable of influencing Z. They will need to understand both qualitatively and quantitatively how it is that their instruments will change the resilience of the system. Again, the specifics will surely be complex, but the more general point is that, as suggested in the previous section, any changes in either the economic and financial structure or the distribution of the shocks will change the probability and severity of crisis for a given policy setting, implying that the policy itself has to be adjusted.

Returning to the simple example of a bank-based financial system, Basel III-style standards are one such tool. That is, risk-weighted capital requirements and the liquidity coverage ratio are designed to influence the riskiness of individual banks and hence the banking system. As we note in the previous section, in a modern financial system, resilience is dependent on much more than just banking. So, this example is clearly simplistic.

In this formulation, minimizing the variance of output can be divided into two tasks. The first is neutralizing small shocks in normal times. This is the role traditionally assigned to monetary policy. The second is to maintain the resilience of the system by minimizing the probability of a transition to the crisis state. This is the role that we are now assigning to the newly constituted financial stability authorities.

Importantly, though, financial stability policy aimed at maintaining systemic resilience is not about managing what has come to be known as the "credit cycle." As we noted, credit can, and likely does, play a role in systemic resilience. But it is the broader objective of lowering the frequency and severity of crises that forms the basis for actions by macroprudential authorities. And, it is easy to imagine that if the financial system were to shift into the crisis state, interest rates would hit the zero bound. Given the inability of conventional monetary policy to further neutralize shocks at that point, the idea is that financial stability policy sets and articulates a standard for resilience, and macroprudential adjustment of regulatory parameters sustain the achievement of that standard as conditions change even at the zero bound. That framework and those tools are needed to keep us from relying entirely on macroeconomic policy to revive the economy following crises.[19]

5. From Local to Global Financial Stability

Having set up a framework for thinking about financial stability policy, we now relax our "one-country" assumption and return to our three questions about whether common standards are needed and about whether cooperation or coordination, or both, are needed in implementing any such standards. To be clear about terminology, we use the term *cooperation* to mean that jurisdictions A and B choose to exchange information and that they make their policy decisions in the light of those exchanges, seeking not to make each other worse off than they would be otherwise. And we use *coordination* to mean that A and B enter into a more or less binding agreement in which each makes policy choices conditional on the choices the other makes.

We now turn to our first question: Is the systemic resilience standard local or global? Can one country or jurisdiction have a standard that is more or less

rigorous than others, with a plurality of standards across the world? Or does the standard have to be set at a comparable level globally?

To understand why we think that a standard has to be global, recall our examples at the beginning of Section 2: the collapse of Bankhaus Herstatt in 1974 and the global dollar shortage in 2008–09. These two cases make it clear that financial stresses cross international borders with impunity. To put the matter into stark perspective, consider two almost trivial additional examples: the states of the United States, and the member states of the European Union (EU).

Given the history of banking panics in the United States, no reasonable person would suggest that the financial stability in Ohio and Pennsylvania can somehow be thought of as distinct from that in California and Oregon.[20] That is, the financial system of the 50 U.S. states rises and falls together. And this has nothing to do with either the safety net, which we mentioned earlier, or interstate banking, which has only been possible since 1994.[21]

Turning to the European Union, the principle of the single market means that a bank with authorization to operate in one country can then provide services in any of the other 27 member states. That is, a bank receiving a charter from authorities in any one national jurisdiction can branch into or provide services in others.

So, in the United States, banking and finance clearly do not stop at state borders. In the EU, they do not stop at national borders. As we pointed out earlier, the largest global banks, operating in dozens of countries, provide a wide array of financial services to households, firms, and governments, some of which can be critical to the host country's economy. The failure of any one of these could be devastating not only for the country where it is based (the home jurisdiction responsible for consolidated supervision of the group) but for other countries as well.

The immediate implication is that financial stability does not stop at the border—any border! In the terminology we established earlier, the common financial stability resource is global. In the same way that a bank inside a country can create financial instability locally, a large institution (or a host of smaller ones) can create instability globally.

This can happen in a number of simple and basic ways. First, cross-border lending can weaken the balance sheets of borrowers in other countries, reducing the resilience of their financial system. Second, a financial institution operating in a large number of countries can get into trouble, creating instability everywhere it operates. Third, a bank can have a broad array of counterparties around the globe, so that when it gets into trouble it impairs the financial systems elsewhere. Fourth, a bank could have very similar exposures and

business lines to banks in other countries, so that when it hits difficulty, customers and counterparties begin to worry about the whole set of them. In all of these cases, real or imagined problems can spread rapidly without concern for national boundaries.

So, if global finance is to be sustained, if we want to avoid fragmentation and nationalization, financial stability is a shared, global concern. With open capital markets, with large cross-border financial flows, and with multinational financial institutions, no country can be safe on its own. The immediate implication is that the financial resilience standard—the probability and severity of a financial crisis—must be shared. And, as a direct consequence, local prudential regimes must adopt a common global standard.

This bring us to the first question we asked in the introduction: Does global finance require a common prudential standard? Our unequivocal answer: Yes.

Once a common international standard is agreed upon and announced for various different parts of the financial system, each national stability authority faces a problem. Will their counterparts faithfully incorporate the agreed policies into their national (or, for example in the EU, regional) regime? Can they credibly commit to implement the globally agreed standard? Or will they deliberately set the local legal or regulatory regime in ways that fall short? It is essential that each party to the international standard has some assurance that there will be fair and faithful implementation everywhere.

But even when there is no uncertainty about whether everyone is adhering to the letter and spirit of the agreed standards, a further risk persists. This brings us to our second question: Does global finance require international cooperation in overseeing the system's safety and soundness?

6. Surveillance and Supervision of System Resilience

Each country's financial stability authority faces the possibility that parts of the financial system both in their own jurisdiction and in others will find ways around the agreed regime. And, as a consequence, the resilience of the domestic and global system will fall short of the common standard.

Our question is what to do about this. More specifically, can supervision of firms, funds, and other financial structures be conducted entirely at the national level, without international cooperation; and if cooperation is warranted, what form should it take? Concretely, does the existing system of "colleges" of home and host supervisors of individual firms, as currently conceived, deliver what is needed?[22]

Recall that maintaining resilience requires that someone ferret out hidden actions. Or, to put it another way, the problem for the authorities is finding a way

to mitigate regulatory arbitrage. That being so, the solution cannot be to pile up more and more rules, since they themselves become the targets of arbitrage, avoidance, and evasion. Rules may have a place in pushing firms into addressing internal agency problems and into improving transparency, but they are not a substitute for supervision of what is going on inside firms and surveillance of developments across the system as a whole.

Financial supervision in the modern world requires watching institutions at close range. This means that in order to detect and deter problems of hidden action, supervisors are required to obtain and guard private information. Given this, we must reinterpret our question about cooperation in oversight as follows: Can confidential information about individual financial institutions remain segmented across jurisdictional boundaries? Can we have a system in which the U.S. authorities know only about U.S. firms, the euro-area supervisors know only about euro-area firms, and so on?

There are two problems here, one concerning information and the other trust. Taking them in reverse order and assuming, for now, that each national supervisor is in principle capable of getting access to all the information on their own institutions that they need directly from their own efforts, can each authority rely upon their counterparts to exercise those capabilities and so ensure that the firms in other jurisdictions are sound? It is at least plausible that such blind reliance would be misplaced. Whether due to regulatory capture, political pressure, forbearance, incompetence, or some combination of all of these, a supervisor might not deliver what is expected by those elsewhere. And, for the reasons discussed in earlier sections, when that happens, it spells trouble for everyone.

The intrinsic problem here is that the supervisor's outputs (what it is doing and what it is learning) are not visible. This generates a need for each national supervisor to validate the integrity of the work of its peers. One possibility is to publish more of what they learn about the institutions they are examining. Supervisors have in fact taken a step in this direction with the production and publication of stress-test results. But how does the supervisor in country A know that the supervisor in country B conducted their local stress test with integrity? To be sure, they would need to be able to observe the stress tests at much closer range than current practice encourages or allows. We will return to this in the final section.

This problem is really about much more than whether one country's supervisors can provide another's with the minimum information that would be needed for the first to prove that the second can trust their supervision of "their" banks. With banks operating in multiple jurisdictions through branches

and subsidiaries, as well as interacting with institutions in other jurisdictions, supervisors cannot even properly assess their own banks without substantial cooperation and the exchange of significant amounts of information. Even if home supervisors have information on their banks' exposures in and to another country, how can they assess how risky their banks are without a deeper understanding of the vulnerabilities of that second country's financial system? Among other things, the first country's supervisors need to know the creditworthiness of the second country's banks' customers and counterparties—both real-economy borrowers and other financial institutions and structures.

In other words, supervisors in a given jurisdiction cannot assess whether their banks, or their banking system, meet the resilience standard without a comprehensive assessment of every jurisdiction and, more, the prospects for spillovers between countries if any of them gets into trouble. And we cannot stop at the first step. If one country's banks are exposed to banks in another country, which in turn are exposed to counterparties in yet a third country, the supervisors would need to know about that too.

It is impossible to see how this can be done without cooperation—and cooperation that is not currently a part of either the microsupervisory colleges, as we understand them, or the general-policy groupings created by the Financial Stability Board, as we have experienced them. Ensuring that a common resilience standard is met necessitates a form of common, joint surveillance of individual firms with a candor that, we suspect, is all too often lacking. But without that, we do not see how the common resilience standard can be maintained.

So the answer to our second question is, yes, global finance absolutely requires international cooperation in overseeing the system's safety and soundness.

7. Macroprudential Policy: Dynamic Adjustment to Maintain the Resilience Standard

Up to this point we have described and advocated the need for a common, global standard of financial resilience. We have described how that standard needs to take concrete form in base regulatory requirements for different parts of the financial system, taking into account their different circumstances. And we have explained that the purpose of microsupervision is to uncover and deter hidden actions designed to undermine the resilience standard. Each of those requires international cooperation, coordination, or, in the case of standard setting, common action. Now we reach our final, and biggest, question: Does global finance require notification, cooperation, and coordination of dynamic regulatory-policy adjustments?

A standard of resilience reflects not only society's tolerance for crisis, which is a normative matter for democratic debate, but also positive scientific inputs regarding the prospective distribution of shocks hitting the system and the structure of the financial system through which those losses are propagated and magnified. Since either or both of these can (and likely will) materially change over time, it follows that maintaining the desired level of resilience requires the adjustment of regulatory parameters. These policy changes might involve making changes to headline capital requirements, adjusting risk weights for exposures to particular sectors, or modifying minimum margin and haircut requirements. We label these adjustments as *dynamic macroprudential policy* (DMPP).

Before turning to our core question about whether such policies require international cooperation and coordination, we will make a few preliminary points about DMPP.

Perhaps most important, as we mentioned earlier, the adjustment of macroprudential tools is not primarily about managing the credit cycle or about leaning against asset price bubbles. The focus is on maintaining resilience, assuring that the financial system can absorb busts without the drying up of the supply of core financial services necessary to maintain economic activity.

This view is based primarily on our skepticism about whether economic policymakers and researchers have sufficient knowledge to deploy macroprudential tools to tune credit or asset price cycles. Here the comparisons drawn between financial stability policy and monetary policy seem to us to be stretched too far.

To understand why we say this, consider that, when a monetary policy authority announces its periodic policy decision, the incremental information for the markets is just that: the policy rate, the increment to quantitative easing, or whatever. There might also be important information about the authority's view of economic prospects and the outlook for inflation, but the macroeconomic data used to formulate that view will all have been in the public domain. While monetary authorities have private information about themselves, they rarely have private information about the world.

The position of a financial stability authority could hardly be more different. In announcing a policy decision, a macroprudential policymaker reveals not only their decision; they also disclose, explicitly or implicitly, private information about the condition of the financial system. Remember, financial stability policy is based at least in part on an assessment of the resilience of individual institutions that necessarily relies on confidential supervisory information. This means that the effects of policy announcements on things like credit spreads

depend upon the market's judgment of both the policymaker's actions and the information that is revealed. As a result, it is hard to be sure of even the sign of the effect of a change in, say, capital standards on credit volumes and credit spreads.

To see what we mean, consider what can happen when the authorities raise capital requirements with the intention of strengthening banks and improving resilience. The information signal in this case is that banks are weak and resilience insufficient. The impact depends on what market participants thought prior to the announcement. If the belief was that banks were strong, the new information is that they were in fact not strong enough. Keeping in mind that strong banks lend and weak banks don't, the result will be a fall in credit availability. But if, prior to the announcement, the common belief was that banks were very weak, the policy could lead to the conclusion that banks are going to be stronger than originally thought, in which case the cost of capital may fall, enabling lending volumes to rise.

The fact that macroprudential policy actions inevitably entail the release of previously private information is what leads us to remain focused on the objective of maintaining resilience, where the effectiveness of measures should be easier to comprehend and assess. If banks have to increase their equity by X percent, their resilience will likely increase by some positive, monotonic function of X.

Turning, then, to our third question, it follows from the discussion in the previous section that making accurate judgments on whether to take action will require rich exchanges of information among countries. But do the policy actions themselves need to involve cooperation or even coordination?

The answer to this question depends on the presence, nature, and potency of spillovers—and, in the new vernacular, on the magnitude of *spillbacks*. While lately there has been discussion of these issues as they relate to monetary policy, the debate around spillovers from macroprudential policy has barely begun.

There is, however, a profound distinction between monetary policy and macroprudential policy that is rooted again in the release or signaling of private information. Consider an example where the authorities in country A announce that they are taking action because of concern about the riskiness of their financial system's exposures to a business sector that operates globally—say, the energy sector. Say, in addition, that the financial system of country B is known to be even more exposed to the energy sector than that of country A. And, further, assume country A's financial system is heavily exposed to country B's financial system. In those circumstances, the authorities of country A might find it in their own narrow interests to communicate to the authorities

of country B about the actions they were planning to take, with a view to seeing whether country B might take action too. Alternatively, the authorities of country A might need to take action to make their financial institutions hold more capital against exposures to country B's financial institutions.

In this example, self-interest motivates country A's cooperation—its supervisors are concerned about their own financial system. But even without that, there are reasons to cooperate given that this is not a one-shot game and no authority has a monopoly on expertise in spotting stability-threatening exposures. In a repeated game, country A has an incentive to alert country B of their worries about exposures to, for example, the energy sector that could harm that country's financial system because at some future point country B might be the first to spot a shared danger in the same sector or elsewhere.

A special case arises when a risky sector is entirely located in one country. Two recent examples immediately come to mind: Should the UK authorities have alerted the U.S. authorities if, hypothetically, they had decided during the mid-2000s to make UK banks hold more capital against U.S. subprime exposures? Or should the U.S. authorities have alerted the European authorities if, again hypothetically, they had decided in the late 2000s or early 2010s to raise the capital their banks were required to set aside against some euro-area exposures?

The argument against cooperation in these types of cases is that it reduces the risk of retaliation. This is not dissimilar from what happens in trade policy, so we hope it can be avoided voluntarily. (We will come back to this analogy in the conclusion.) The more positive argument is that cooperation will ensure that the initiating authority can benefit from their foreign counterpart's knowledge and expertise, perhaps prompting them into action themselves. Indeed, one can imagine cases where acting unilaterally makes one worse off. The simplest case is where one country reveals the depth of a second country's problems, only to bring on a crisis there. That then, in turn, affects the first country before its firms have had time to build sufficient resilience.

With that last thought we move into the area of coordination. The challenge is how to create incentives that yield the best collective outcome without any jurisdiction being worse off than if they had been able to act unilaterally. We plainly want to avoid an outcome where one country fails to act, leaving itself vulnerable because its policymakers cannot bring themselves to act in the face of pleas from the other country to desist (and forebear!).

The broad answer to our third question is therefore clear but less straightforward to operationalize than our answers to Questions 1 and 2: Dynamic

macroprudential policy requires a degree of international cooperation and may in some circumstances benefit from coordination.

8. Policy and Institutional Implications: Answering the Three Questions

We have now provided high-level answers to the questions posed at the beginning of this essay: global finance requires a common prudential standard, with international cooperation in overseeing the system's safety and soundness, and notification, cooperation, and sometimes coordination of dynamic macroprudential policy settings. Without adoption of a common resilience standard, the international financial system will fragment and balkanize. Without cooperation in supervision and surveillance, the resilience standard cannot be maintained. And without cooperation and coordination, dynamic policies risk leaving individual jurisdictions worse off. Taken as a whole, this leads us to conclude that financial stability policy generally and macroprudential policy in particular require international cooperation.

Our earlier discussion does no more than hint at the institutional structures needed to support the system we have outlined. We now turn to a more detailed discussion of how this might be accomplished.

If financial stability is a *global* common good, then it faces two problems of the commons. There is the problem of financial intermediaries around the world consuming the common resource of resilience, and there is a separate problem of national authorities allowing firms operating from their jurisdiction to do so with a view to somehow securing a national advantage. Are either of these problems amenable to a cooperative solution among the relevant populations?

There are far too many private financial market participants for them to coordinate and act together to contain their incentives to erode the system's resilience. And, given that the private costs of systemic distress are lower than the social costs visited on nonfinancial firms and households, they have weak incentives to do so in any case. By contrast, the national authorities of the main jurisdictions both have the incentive and are few enough in number that coordination should be feasible.

A quarter of a century ago, Elinor Ostrom (1990) proposed a set of governance principles for addressing common-resource problems. These included the definition of clear group boundaries, the matching of rules governing use to local needs, ensuring that those affected by rules can participate in modifying them, developing a system for monitoring behavior, graduate sanctions for violators, and low-cost means of dispute resolution. Reading through this list, we

are struck by how closely the design of the World Trade Organization (WTO) conforms to Ostrom's requirements. Can we produce an equally effective set of institutional arrangements for producing what we see as the necessary cooperation in the areas of standard setting, supervision, and dynamic macroprudential policy?

Starting with the common resilience standard, we noted that it is not enough simply to come to an agreement on the details of various capital and liquidity requirements, derivative-market requirements, disclosure standards, and the like. Implementation is at least as important as agreement on the standards themselves. For this, we need *implementation monitoring*. In Basel, for example, prior to Basel III, Basel Committee on Banking Supervision member countries would participate in the negotiations with the understanding that the final agreement would become a part of their legal and regulatory system, but no one ever checked. And, since 1999 the IMF's Financial Sector Assessment Program (FSAP) has attempted to conduct comprehensive and in-depth analyses of the quality of countries' financial regulatory and supervisory systems. However, it has proven difficult for FSAPs to get beyond simply checking whether the rules themselves are in line with the international standards. Prior to the crisis, it was as if monitoring of speed limits meant checking to see if the signs were appropriate, without any regard for what drivers were actually doing.

Today, there are various types of implementation monitoring schemes in place designed to improve on past practice. The Basel Committee now examines whether national regulations conform to the Basel III agreement. The Basel Committee on Payments and Market Infrastructure, in partnership with the International Organization of Securities Commissions (IOSCO), monitors implementation of the Core Principles for Financial Market Infrastructure. And the Financial Stability Board engages in a set of thematic and country peer reviews intended to both monitor implementation and assess the effectiveness of international standards.

These initiatives reinforce and help give bite to IMF FSAPs. But will they suffice? Because of the inherently political nature of the process, the results have been mixed. Difficulties arise for a variety of reasons. Where parliaments need to pass laws to ensure material compliance with the standard, there is a need for regulators (and the international authorities) to explain why common action is warranted. Otherwise, politicians may understandably react badly to any misperception that they are being instructed by unelected technocrats in Basel, Madrid, or Washington. In cases where officials are beholden to their financial institutions, regulatory capture hampers adoption of the common

standard. And even in cases where executive action is sufficient, national pride can become an impediment to action.[23]

All of that said, there is reason to believe that national authorities understand the desirability of ensuring global compliance with the agreed-upon rules and will work toward that goal. But what about faithful application of the standards in practice? The difficulties within borders are compounded as we move beyond them. That is, domestic enforcement in the face of the relentless adaption of institutions, markets, and instruments aimed at avoiding and evading regulatory requirements, already a major challenge for national authorities, is even worse at the global level. We have argued that promulgating more complex, detailed rules is not the solution, as it simply leads to more adjustment (with more lawyers, accountants, and financial engineers).

We believe that stress tests provide at least a partial solution to this problem, both domestically and internationally.[24] Modern stress testing builds on the U.S. experience during the crisis. In late 2008, the solvency of the largest American intermediaries was in doubt. That uncertainty made their own managers cautious about taking risk and it made potential creditors, counterparties, and customers wary of doing business with them. Those doubts contributed to the extreme fragility in many financial markets, leading to a virtual collapse of interbank lending. Part of the remedy was a special disclosure procedure in which the Federal Reserve, the Office of the Comptroller of the Currency, and the Federal Deposit Insurance Corporation jointly conducted an extraordinary set of "stress tests" on 19 bank holding companies and, in May 2009, published the results.[25] The tests evaluated, on a common basis, the prospective capital needs of the 19 largest U.S. banks in light of the deep recession that was well under way. While observers questioned whether the tests were stringent enough—the "stress" scenario quickly turned into the central forecast—the results were sufficient to reassure the government, market participants, and the banks themselves that most of the institutions were in fact solvent. Partly as a consequence, conditions in financial markets rapidly improved. And, armed with the stress-test evidence of their well being, most large banks were able to attract new private capital for the first time since the Lehman failure the previous September.

Our view is that, depending on how they develop, stress tests may prove to be one of the most powerful prudential tools available for safeguarding the resilience of the financial system. They take seriously the fact that when a large common shock hits, there is no one to sell assets to or raise capital from. By ensuring that each individual institution can withstand significant stress, it

raises the likelihood that the system can. And, importantly, by adjusting the scenarios, prudential authorities can maintain a chosen level of resilience. At least in principle, stress tests can both account for changes in the distribution of the shocks that can hit the system and ensure that the amplification potential of the propagation mechanism does not increase. Moreover, they reveal otherwise hidden information on the firms and on the work of supervisors.[26]

The question is how to use stress tests not only to buttress resilience at the level of individual jurisdictions, but globally. We see the solution as having three parts: a common scenario with international components that are cooperatively designed, the sharing of detailed test results, and third-party monitoring.

Each of these requires a form of global cooperation that could grow naturally out of institutions that already exist. For example, the Financial Stability Board's (FSB) Standing Committee for the Assessment of Vulnerabilities could take on the task of developing the global component of stress-test scenarios. The results would then become a core part of the IMF-FSB twice yearly Early Warning Exercise that is reported to finance ministers and governors at the IMF's International Monetary and Financial Committee (IMFC). The sharing of detailed stress-test results, since it would involve sensitive institution-specific information, would have to be done at the level of supervisors. The agreement governing the confidential information on G-SIBS, currently collected on a weekly basis by the International Data Hub at the BIS, and the confidential reports that are produced and distributed to supervisors around the world might serve as a model. This all needs to be done at a senior level—involving those directly accountable to parliaments—and not simply amongst staff, as experience suggests they face incentives to dilute information exchanges.

As for monitoring of the stress tests to ensure their credibility, we see a role for the private sector, for national authorities, and for international institutions. On the first, we note that market analysts are already working to evaluate stress-test outcomes in their work to provide information to bank shareholders. In addition, and similar to regular monitoring of monetary policy decisions by a combination of parliamentarians, market economists, and academics, there would be a role for a group that might be referred to as the "global stress-test watchers." These people would form views on the quality of the scenarios and the plausibility of the results at a high level. They will emerge spontaneously, provided that stress tests provide market-sensitive information, giving market participants an incentive to seek third-party analysis of the results.

But given the necessary confidentiality of much of some of the information that both goes into and comes out of the tests, private-sector observers would not be in a position to do a comprehensive audit to verify their quality. This leads

us to conclude that there is a role for groups of national supervisors and for the international financial institutions (IFIs). For example, supervisors from the United States, the United Kingdom, the euro area, and Japan might check each other's tests, and some combination of the IMF, BIS, and FSB could be given an oversight role. Monitors would make public pronouncements on the quality of the testing procedures and, consequently, on the soundness of the results.

Finally, we turn to the challenges posed by the need for notification, cooperation, and coordination in the pursuit of dynamic macroprudential policy (DMPP). As we noted at the end of the previous section, this is a nearly intractable problem. In the spirit of this paper's international perspective toward policy in general, we see a solution in the creation of groupings like those used by central banks. Examples of periodic meetings in which the official sector exchanges information are the BIS bimonthly meetings, which typically attract 40 to 50 central bank governors, and the quarterly meetings of the Committee on the Global Financial System (CGFS), which is composed of representatives from the 22 largest central banks in the world. In one form or another, and at varying frequency, these meetings have existed for decades. Their purpose has always been to exchange information on current issues related to monetary policy both domestically and globally.

We propose that a similar set of meetings be organized among the financial stability authorities of the world. The hope is that such a forum could grow into one where the possibility or prospect of dynamic policy adjustments are discussed candidly and openly, enabling de facto cooperation and coordination. But such a system faces an immediate challenge: who do you invite? In some jurisdictions it is clear who is in charge of financial stability policy. For example, in the United Kingdom it is the governor of the Bank of England, and in the euro area it is the president of the European Central Bank. But who would you invite from the United States? We are reminded of Henry Kissinger's famous quip about foreign policy: "Who do I call if I want to call Europe?" If you want to call the United States to discuss global financial stability policy, who do you call? We see this as a major impediment to the construction of a policy framework that is capable of delivering financial resilience globally and therefore within the United States itself.[27]

Since it can be done quickly, our instinct is to build a relatively informal mechanism for cooperation and coordination. One criticism of this approach is that we are suggesting more meetings be added to the calendars of public officials who are already struggling to handle the load they currently face. There is an alternative, more formal approach to facilitating the required cooperation and coordination: create an organization analogous to the WTO. As mentioned

earlier in passing, financial stability bears some striking similarities to international trade. Both are common goods. In both cases, individual firms, institutions, or countries have an incentive to degrade the environment to the detriment of others (and ultimately themselves). To solve this problem in the trade realm, the WTO uses its treaty-based legitimacy to negotiate international agreements, monitors their implementation, and sanctions violators. We are not convinced that it would be possible to construct an analog to protect the financial stability commons, not least because the dynamic element of macroprudential policy unavoidably entails the exercise of constrained discretion. But we do think that cooperation and monitoring needs to be taken as seriously as it is in the trade field if the global financial stability commons is to be preserved.

Returning to where we started, in the title to this essay we asked whether there can be macroprudential policy without international cooperation. Our answer is very clearly "no." Without cooperation we risk nationalization and balkanization of the financial system. Such a world would be populated by a combination of small local firms and very large super-SIFIs that would be able to cover the very high costs of operating internationally.

Cooperation means agreement, implementation, and enforcement of a common resilience standard. This, in turn, requires mutually agreed mechanisms for monitoring, combined with candid, honest, and regular communication. Should it be thought that those arrangements already exist, our experience suggests that it is, at best, work in progress. A culture of "national champions" or national pride or vulnerability inserts sand into a system that can realistically aspire to more. As stability is restored, there is an opportunity to break new ground. The prospect of dynamic macroprudential policy raises the stakes. It is so much easier to claim satisfaction with information exchanges when not much depends on it in the short run. Once prudential policy is adjusted dynamically by key jurisdictions, it will become apparent that more exchange and cooperation is needed—not in an ideal world but in the real world—if authorities are to deliver the domestic mandates that their legislatures have given to them. It would be better for institutional structures and practices to get ahead of the game. This paper is a plea for just that.

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NOTES

1 See Bank for International Settlements (2004) for a discussion of this incident.

2 On December 12, 2007, the Federal Open Market Committee authorized reciprocal swap lines with the Bank of Canada, the Bank of England, the European Central Bank, the Federal Reserve, and the Swiss National Bank. In September and October of 2008, the following central banks were added: the Reserve Bank of Australia, the Banco Central do Brasil, the Bank of Canada, Danmarks Nationalbank, the Bank of Japan, the Bank of Korea, the Banco de Mexico, the Reserve Bank of New Zealand, Norges Bank, the Monetary Authority of Singapore, and Sveriges Riksbank. The original agreements terminated on February 1, 2010. Several months later, in May 2010, the arrangements with the Bank of Canada, the Bank of England, the European Central Bank, the Bank of Japan, and the Swiss National Bank were renewed. And, in October 2013, the swap lines were converted into standing arrangements.

3 See Basel Committee on Banking Supervision (2011) for a description of the Basel III standards.

4 See Tucker (2014) for a discussion of the importance of international cooperation in the context of the lender of last resort.

5 See Financial Stability Board (2014).

6 By comparing the risk-weighted capital ratios with the unweighted capital ratios, we can compute the relationship between total and risk-weighted assets. Assuming that the risk weights are broadly accurate, this number provides one measure of how conservatively a bank's assets are being managed. At end-June 2015, it ranged from 1.5 for Wells Fargo to 4.8 for Credit Suisse. (The asset-weighted average of this number across all 30 banks is 2.7.) The reason for emphasizing *reported* capital ratios is explained in Section 6.

7 See McCauley, McGuire, and von Peter (2010) for a discussion of the global nature of banks.

8 See Ranciere, Tornell, and Westerman (2008).

9 Schularick and Taylor (2012) catalog 79 crises in a sample of 14 countries from 1870 to 2008, implying that over the past century and a quarter, advanced economies have experienced crises on average once every 25 years.

10 The fact that an individual institution has an incentive to deplete the financial stability commons means private and social incentives diverge. That is, there is a classic externality. In the case of a bank, owners and managers succumb to moral hazard due to a combination of limited liability, the government safety net, and authorities' past tendency to bail out insolvent firms. Spillovers involving the case of a single bank failure turn into a systemwide panic, and the fire-sale and credit-crunch externalities arise from generalized balance sheet shrinkage. See Hanson, Kashyap, and Stein (2011) for a detailed discussion of the externalities that form a theoretical basis for broad-based capital and liquidity regulation.

11 Tucker thanks Diane Coyle for exchanges that highlighted the need to bring out this point.

12 We return to this issue in the final section, where we discuss how we might construct a system that meets Ostrom's (1990) principles for getting private-sector actors to manage a common in this environment.

13 We share the concern of others that insurance regulation, with the promulgation and implementation of Solvency II, is moving in this direction without sufficient consideration for its suitability to the task.

14 There is a fourth essential component of a financial stability policy regime: the ex ante arrangements for crisis management. Although this affects the incentives of firms' management, owners, and creditors, we do not pursue it here, as our focus is on pure ex ante or prophylactic measures.

15 While we do not focus on empirics here, we note that this density can be constructed from data such as that in Laevan and Valencia (2012) and Schularick and Taylor (2012).

16 Woodford (2003) shows that a second-order approximation leads to a loss function for policymakers that includes the variance of output or consumption, as deviations from the flexible-price equilibrium levels, plus one term for each friction that is introduced into the model. In the traditional New Keynesian case of price rigidity, this leads to a term in the squared deviation of prices from their equilibrium level. It should not be concluded, however, that the social welfare function necessarily contains only output or potential output. Imagine that a crisis halts the provision of core financial services today but does little

damage to the actual or potential path of aggregate output. Society might legitimately care about the hardship suffered today by some parts of the community due to their lack of access to substitute services.

17 See Committee on the Global Financial System (2010, 2012) for a detailed discussion of macroprudential tools and how they might be used.

18 The model constructed by Ajello et al. (2015) is but one recent example of what we have in mind.

19 Farhi and Werning (2015) provide a theoretical foundation for such a system.

20 See Jalil (2015) for a recent discussion of the pre-1929 banking panics.

21 The Riegle-Neal Act repealed the 1927 McFadden Act prohibitions on interstate branching.

22 See Basel Committee on Banking Supervision (2014a) for a recent discussion of supervisory colleges.

23 We note in this context that the Basel Committee peer review monitoring exercise graded the European Union's Capital Requirements Directive IV (CRD IV) as "materially non-compliant." See Basel Committee on Banking Supervision (2014b).

24 While we do not focus on it here, we note that requirements that derivative instruments be centrally cleared is another integral part of a more general solution. See Cecchetti (2013) for a discussion.

25 See Board of Governors of the Federal Reserve System (2009).

26 Stress tests are not a panacea, as they rely on the use of models—both supervisory models and institutions' own internal risk models. Calibration of these can be quite difficult. People are working on solutions, one of which involves the use of common hypothetical portfolios.

27 See Kohn (2015) for a discussion of how financial stability policy might be effectively organized in the United States.

Is There Macroprudential Policy without International Cooperation?

Linda S. Goldberg

In their paper, Steve Cecchetti and Paul Tucker claim that global financial stability requires common prudential standards, as well as cooperation and coordination of dynamic regulatory policy adjustments. Before going further with my remarks, it is appropriate to properly set expectations about the scope and coverage of the Cecchetti-Tucker (henceforth CT) paper, as its title might lead the reader to expect that a menu of macroprudential policy tools is being discussed. This is not the case: the paper does not provide a discussion of the appropriate cyclical policy tools to use by central banks. These are the instruments commonly labeled as macroprudential and which many countries are developing to deal with sectoral and asset class imbalances. The CT paper *is about structural financial stability* and the types of efforts under way in international forums to support such stability.

I broadly agree with the author's diagnosis of the context preceding this discussion. The financial landscape has changed significantly since the frameworks that came out of the Bretton Woods system. In the post–Bretton Woods era, frameworks have been developed for discussion of monetary policy. Substantial cooperation across different communities has occurred on setting these frameworks, including through many dialogues that took place around the tradeoffs between fixed versus flexible exchange rate systems.

The globalization of finance has boomed. Countries are highly interconnected through capital flows, financial institutions, and markets. As a result, the risk of financial contagion has increased. There is a clear quest for a common set of rules for global finance. In my opinion, there is a good justification of the view by Cecchetti and Tucker that a financial stability policy regime could focus on resilience. Regarding macroprudential instruments, the international policy community focus is on developing toolkits and broad frameworks

of engagement. The paper argues for specific metrics, formal monitoring and international coordination, although as I mentioned, the focus is somewhat different than this more standard discussion of macroprudential instruments. For the remainder of these comments, I put aside the important semantic issues of defining macroprudential policies and the challenges surrounding implementation of such policies.

The main focus of the CT paper is a call for a quantification of specific stability goals, along with a proposed path to support and target those quantifiable goals. The paper also sounds a call for more cooperation around stress-test frameworks currently implemented within (some) jurisdictions, and an expansion of their purpose and scope.

According to Cecchetti and Tucker, a common prudential standard, or level of "required resilience" as it is called in the paper, would in this case necessarily have to be applied to all parts of the financial system in order to avoid fragmentation of the sector and hostility between institutions. They argue in favor of specific metrics, formal monitoring and international coordination. The authors also note that, as we live in a financially interconnected world, more sharing of information between economies is required to achieve stability. The current exchange of information is inadequate. As we saw in the financial crisis, contagion in one market can quickly spread around the world. International institutions and monetary policymakers should have the flexibility to respond to new financial scenarios to the best of their abilities.

As a brief overview, three questions are posed and answered: (1) Does global finance require a common prudential standard? Answer: Yes, construct a level of "required resilience" applied to all parts of the financial system to prevent balkanization and fragmentation; (2) Does global finance require international cooperation in overseeing the system's safety and soundness? Answer: Yes, increase shared analysis to identify and mitigate stability-threatening shortfalls against that standard of resilience; (3) Does global finance require notification, cooperation, and coordination of dynamic regulatory policy adjustments? Answer: Yes, adapt institutions to make this feasible.

While the authors provide a number of broad proposals, the real issue is what these proposals mean in practice. The paper needs to do more, as the details surrounding each proposal are lacking, and some of the proposals really require clarification. On the first question—whether global finance requires a common prudential standard—the idea is interesting and worthy of careful evaluation. While the authors provide a strong endorsement and call for quantifiable metrics, the proposal raises a number of practical and basic questions that need more fleshing out. The most basic question is, what does "required

resilience" really mean? The concept of "required resilience" that is introduced is quite broad. Accordingly, multiple questions arise: How would one define risk tolerance, a crucial input into calculating the appropriate requirement, and, in turn, calculate the probability of a crisis? Would the requirement be time varying and dependent on known economic fundamentals and measured crisis risk, or would the requirement be fixed? The authors also suggest defining a level of crisis by considering its space of potential output losses. Would the potential loss from a crisis be the estimated global aggregate output loss or would it be based on some distribution of losses across countries? In this case, how do country losses (or gains) enter into the computations? Are weights based on a country's ability to absorb losses or on a country's role in systemic risk? Other issues to consider are tradeoffs of output gains from booms versus losses in busts. Does this matter? There is also the issue of predicting crises. Unfortunately, the historical record of experts foreseeing crises ex ante is quite poor, as many forecast approaches are backward-looking instead of forward-looking. This raises the additional practical question of whether the authors are proposing anything different from the bank and financial system metrics already used in monitoring financial stability risks.

Another smaller point, but still an interesting political economy one, is the authors' suggestion of having a democratic pedigree. This leaves open the question of whether a required resilience standard can be free of political influence and made with independent decisionmaking. The authors acknowledge the difficulty of creating a policy that is truly independent.

An additional question to consider is whether a level of "required resilience" should actually be applied to all parts of the financial system, as the authors argue, in order to prevent balkanization and fragmentation. Indeed, it might be useful to substantiate this, as it is not evident ex ante that a common metric would be appropriate to apply across countries and sectors. An optimal requirement might allow room for country variation based on its business cycle or financial cycle stage, by its level of economic and financial development (and, similarly, by the level of its financial linkages with the rest of world and the potential for spillovers), or by country risk tolerance. For example, the tolerance for housing price booms and busts may differ across countries. Another fundamental question to address is whether or not a common approach to resilience might lead to more correlated behaviors, thereby enhancing the probability of an adverse systemic event.

With regard to increased notification, cooperation, and coordination of dynamic regulatory policy adjustments, there are various forms of this under way by countries and institutions. Following the financial crisis, most countries

implemented higher capital and liquidity requirements and began utilizing stress tests to assess emerging vulnerabilities. The authors propose that countries share the results of internal stress tests, conduct a sort of global stress test in which there is a common global scenario, and allow third-party evaluation of the results. This idea of sharing results and conducting coordinated global stress tests is worth fleshing out. Stress tests are an underutilized innovation.

Finally, the paper makes some arguments about where the lessons of monetary policy frameworks for macroprudential policy are limited. I disagree with this, as decades of lessons can usefully be extracted, including having a clear statement of goals, proven policy tools, evaluation criteria, and activation and deactivation conditions. All of these could support effective use, communication, and expectations setting; independence of tools from political influence; and having tools that are not for use as a form of industrial policy that is viewed as sanctioned by the international policy community.

Overall, the authors have taken on an important set of issues and have proposed a bold agenda. The current version of the paper is really useful in providing a strong and thoughtful discussion of key issues regarding the structural stability of the international financial landscape. This big-picture orientation and ambition is laudable. However, there are still many unanswered conceptual and practical questions that might need to be addressed for the proposals to receive broader attention.

Is There Macroprudential Policy without International Cooperation?

Fabio Ghironi and Lawrence Schembri

Cecchetti and Tucker have written a very interesting and thought-provoking paper that asks and answers three questions in the process of giving a resounding "no" answer to their title question.

1 Does global finance require a common prudential standard? Yes, a common, minimum prudential standard is needed to treat similar risks in a comparable manner for all parts of the financial system and across countries. The intuition is clear. The highly mobile, innovative, and adaptive nature of global finance makes financial stability a common resource subject to negative externalities. A common standard is needed to avoid fragmentation and balkanization and prevent potentially destabilizing regulatory arbitrage.[1]

2 Does global finance require international cooperation in overseeing the system's safety and soundness? Yes, exposure to risk across sectors, institutions, and borders requires cooperative transparent information exchange. Immense volumes of financial transactions are conducted by global financial institutions across international borders. No one supervisor can collect all of the necessary data to aggregate exposures and accurately assess vulnerabilities.

3 Finally, does global finance require coordination of dynamic policy adjustment? Once again, the answer is yes. The adjustment of national prudential policies will need to be coordinated to preserve the common resiliency standard under evolving conditions.

Therefore, some minimum degree of international cooperation and coordination is a necessary condition for effective jurisdiction-specific macroprudential policy because such a policy can best target and mitigate national systemic risks if it is based upon the foundation of a common global resiliency standard.

Means to an End, the Institutional Framework, and the Financial Stability Board

The paper argues that a common prudential standard, cooperation in oversight, and coordination of policy adjustments are all necessary means to an end: "The financial system as a whole should be 'sufficiently' resilient to ensure that the

core services of payments, credit supply, and risk transfer and pooling can be sustained in the face of large shocks." Furthermore, the paper suggests that the existing institutional framework needs to be strengthened to accomplish this goal. But why? And are questions 1–3 really new?

The global financial crisis of 2007–09 prompted the creation of a new international institution. In 2009, the G-20 transformed the Financial Stability Forum into the Financial Stability Board (FSB) largely with the objective of achieving the development of and monitoring the consistent implementation of the common prudential standard. Given the overarching goal of global financial stability, the view was that the FSB is needed precisely because of the reality of "integration" and the consequent requirement for "coordination": The current global financial system is "integrated" across countries, and not just across the advanced ones; across sectors (banking, insurance, investment funds, and other financial entities involved in financial intermediation—like shadow banks); and across financial institutions and financial markets (as institutions and markets compete to intermediate between savers and borrowers).

Given this pervasive integration, the FSB was deliberately designed to provide "coordination" across member countries, standard-setting bodies, and other international financial institutions. In fact, the FSB was established with a broad mandate to identify and address financial system vulnerabilities; coordinate the development and implementation of regulatory, supervisory, and other policies; and promote reform through transparent peer review of implementation of global standards. The FSB crucially relies on peer pressure and transparency to foster compliance to common minimum global standards. Importantly, it has the "democratic pedigree" derived from the support of the G-20 leaders.[2]

Thus, the issues and ideas that shaped the creation and functioning of the FSB echo those in this paper. However, the paper would benefit from being more concrete or explicit on the issue of institutional design. In particular, it should address the following questions clearly: What are the shortcomings of the FSB as focal point for success on questions 1–3 in the paper? Can these shortcomings be addressed without creating a new institution? How?

Cooperation versus Coordination

The paper makes frequent use of the terms "cooperation" and "coordination" without defining them more clearly. For instance, what exactly is the difference between cooperation and coordination?

In the 1980s literature on policy interdependence—say, Horne and Masson (1988)—"cooperation" was typically used to refer to exchange of information so
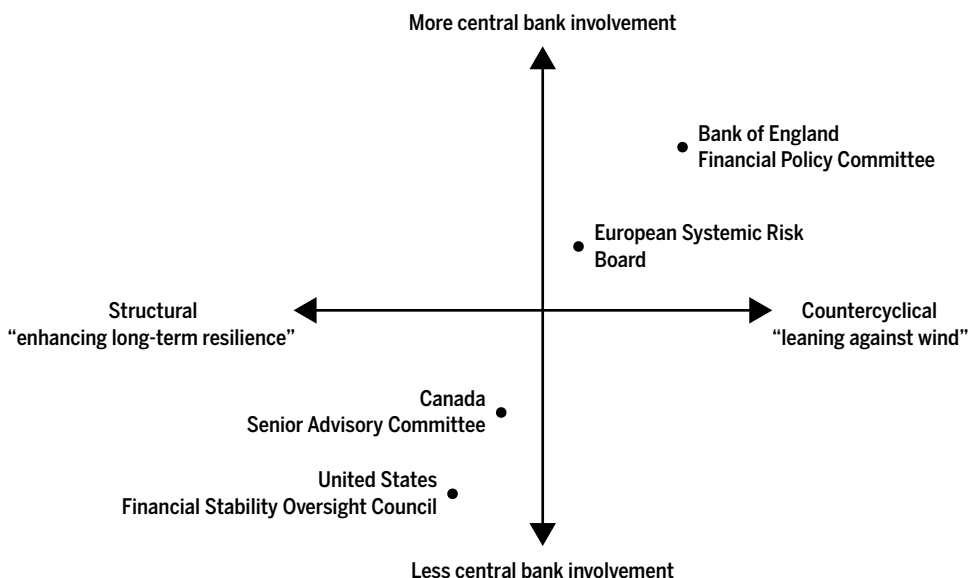
that national authorities could make better-informed policy decisions, whereas "coordination" referred to joint policymaking in which national authorities acted together to set their policy instruments to optimize an average of the respective objective functions (for instance, see Canzoneri and Henderson 1991). Canzoneri and Edison (1990) showed that, in the presence of multiple Nash equilibria, cooperation in the form of information exchange that would achieve the best Nash equilibrium could generate most of the benefits of coordination.

Cooperation, as information exchange, is an important theme in the paper. But how should we think of coordination? Should we think of it as joint optimization of objective functions—as is standard in the 1980s literature on policy interdependence (and even in the most recent literature on dynamic, microfounded models of policy interactions)—or, say, as synchronization of policy actions? The paper provides a formal framework to define the desired resiliency standard. It may be useful to define also the relevant notion of coordination in relation to that framework.

This is not just an issue of semantics: We need to define clearly what players are involved and what we envision for their behavior (cooperation vs. coordination) because the "global financial stability game" cuts across multiple dimensions. For instance, countries (or jurisdictions) differ in the extent of central bank involvement in macroprudential policy—as well as in the objectives that macroprudential policy is pursuing—as Figure 1 illustrates. Macroprudential policy goes from being more focused on "structural" issues and long-term resiliency—which seem to be the main focus of the paper's analysis—to leaning against financial cycles as we move from left to right along the horizontal axis. Central bank involvement increases as we move up along the vertical axis. The figure illustrates that across jurisdictions, central banks have different macroprudential roles. A similar illustrative diagram could be drawn for other financial regulatory and supervisory institutions to highlight that their roles in macroprudential policy differ widely across jurisdictions. Given this heterogeneity across prudential authorities, the paper should be clear on what form coordination would take.

Continuing with the role of central banks in financial stability and macroprudential policy, there is a growing consensus that central banks cannot ignore the implications of monetary policy for financial stability and, at the same time, that macroprudential regulation can affect monetary policy by affecting the environment in which the latter operates (Kryvtsov, Molico, and Tomlin 2015). Moreover, monetary policy can affect the incentives for implementation of regulatory reform by affecting the environment in which these should be implemented. Reforms may be perceived as more or less beneficial (or costly) at the

FIGURE 1
Stylized Representation of Different Macroprudential Frameworks

More central bank involvement

Bank of England
Financial Policy Committee

European Systemic Risk
Board

Structural   Countercyclical
"enhancing long-term resilience"   "leaning against wind"

Canada
Senior Advisory Committee

United States
Financial Stability Oversight Council

Less central bank involvement

time when they should be implemented depending on economic conditions that monetary policy can affect. For an example of this argument in the context of the discussion on structural reforms of product and labor markets in the euro area, see European Central Bank President Mario Draghi's speech in Sintra last May (Draghi 2015) and Cacciatore, Fiori, and Ghironi (2016).

More generally, it is useful to understand where macroprudential policy fits into the overall framework for promoting financial stability through increasing resilience and mitigating systemic vulnerabilities and risks. Like preventing a serious car accident, preventing a financial crisis rests on a combination of factors or "lines of defense" working in tandem. Own risk management of the lender or borrower is the first line of defense, followed and reinforced by market discipline, traditional microprudential regulation and supervision (which this paper may be more about than "macroprudential" policy), macroprudential policy, and monetary policy—with a question mark on the latter, as the debate on its role is not quite settled yet.[3] Importantly, these lines of defense operate within but also across countries, in the sense that each country is characterized by similar lines of defense, and integration implies that lines (and actions) are not segmented by national borders.

In turn, this implies that strategic interactions cut across lines, across prudential authorities (where different authorities within a country are in charge

of policies that affect each other's objectives and tradeoffs), and across borders. And this raises an important question: Who is supposed to cooperate in the form of information exchange and who is supposed to coordinate in the form of (possibly) joint setting of policy instruments? There is a well-known result in game theory: Coordination limited to a subset of players can be counterproductive. This result is behind Rogoff's (1985) finding that monetary policy coordination can be counterproductive, as it can exacerbate time inconsistency in monetary policy if price or wage setters are not part of the coordinated arrangement. If we think of financial stability, how do we deal with players "left out" (or who choose to remain out) of the "global resiliency coordination game" envisioned by this paper and the possible responses of these players to coordination by a subset? Is this a dimension where the FSB's hand needs to be strengthened? Are peer pressure and transparency sufficient to unite all the relevant authorities and achieve the necessary degree of coordination?

Capital Controls, Emerging Economies, and the Global Financial Cycle

The issue of cooperation, coordination, and "fragmentation" of the game is connected to the issue of capital controls. Some analysts view capital controls as an instrument of macroprudential policy, rather than as one of exchange rate management, chiefly in the context of an underdeveloped financial sector. (See, among others, Benigno et al. 2013, Jeanne 2014, and Korinek 2010, 2013.) But capital controls can also be an instrument that—by segmenting markets—alters the incentives for participation in the "all-inclusive" cooperation/coordination that the paper appears to espouse: Regardless of whether or not we view capital controls as a macroprudential instrument, they may provide a device through which players can de facto choose to "opt out" of full involvement in other macroprudential cooperation/coordination. But this raises the following question: How should we think of the consequences of capital controls in the context of the paper's three questions and answers?

Capital controls and their implications for global cooperation/coordination and resiliency must be kept in mind also because the paper makes no distinction between advanced economies and emerging market economies (EMEs). While a strong case can be made for having common financial regulatory standards across both sets of countries, EMEs generally have less developed financial sectors, thus their markets and institutions are less able to manage risks. The first-best solution to this problem would be to develop EMEs' financial sectors. In the absence of stable and efficient intermediation of capital flows, capital controls provide a different set of policy tools to help manage these potentially

vulnerable external exposures that EMEs have been using—in recent years, with the "blessing" of the International Monetary Fund. How do we ensure that use of capital controls does not imply that key players essentially opt out of the cooperation/coordination envisioned by the paper? And if players do opt out (for example, by not implementing common prudential standards on a consistent and timely basis), what will ensure that their noncooperative response to coordination by a subset will not make the outcome unfavorable for everyone?[4]

Dynamic or Responsive Macroprudential Policy?

The paper raises and endorses the concept of dynamic macroprudential policy. The use of the word "dynamic" is potentially misleading in this context because it seems to imply that macroprudential policy can be easily fine-tuned to be time-varying in an effort to be financially countercyclical. Discretionary policies that attempt to "time" the cycle are problematic. Although there are some examples of "automatic" macroprudential policies, such as dynamic provisioning, the evidence of their impact on the financial or credit cycle is not clear. Their main effect seems to be to build buffers within the financial system and thereby increase resilience, rather than meaningfully attenuate the financial cycle per se. Resilience is enhanced by mitigating two types of systemic risk: time series (procyclical behavior) and cross-sectional (interconnected and common exposures). Appropriate through-the-cycle macroprudential measures include increasing minimum buffers for capital and liquidity in financial institutions, controlling their leverage, increasing transparency, and addressing structural financial vulnerabilities (e.g., too big to fail). Given these arguments, "responsive" might be a better adjective than "dynamic" because macroprudential policy should be able to respond quickly to emerging systemic vulnerabilities.

Conclusion

The paper is organized around answering three key questions that address the necessary conditions at the global level for macroprudential policy at the national level to be effective. In the effort to answer these questions the paper raises many other questions, some of which we have highlighted, about how to achieve these necessary global conditions, but it does not fully answer them. As such, the paper is the beginning of an auspicious research program, and we look forward to reading future work that answers and raises more questions.

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NOTES

1 The prudential standard should be common in the sense of achieving comparable prudential outcomes.

2 See Schembri (2013) for further information on the FSB.

3 Monetary policy would not be needed as a prudential tool if the other lines of defense worked effectively. The policy interest rate is widely seen as a blunt macroprudential instrument, and its use for financial stability purposes would detract from the monetary policy's primary objective of low and stable inflation. For example, see Svensson (2015).

4 The issue of capital controls is also connected to the recent discussion on a global financial cycle and its implications for exchange rate regimes and monetary policy in the context of Tommaso Padoa-Schioppa's "impossible trinity" (called the "trilemma" since Obstfeld, Shambaugh, and Taylor 2005). Rey (2013) argues that flexible exchange rates in conjunction with a strong macro/financial policy framework may not be enough to shelter a small open economy from a global financial cycle. She recommends that countries, especially those without developed financial markets, rely more heavily on macroprudential tools—including capital controls.

Is There Macroprudential Policy without International Cooperation?

Chair: Reuven Glick

Mr. Glick: Steve, do you want to take a few minutes to respond to the discussants? Then we should have about 10 minutes for questions and answers afterwards.

Mr. Cecchetti: Thank you. I'll try to be brief. I think that our objective was to open a discussion and try to prod people to think about the issue of macroprudential policy. I hope we have been successful. Let me start with Fabio's last point, which also relates to the second part of what Linda said. Paul and I are not talking about time-varying prudential policy in the way people think about things like the countercyclical capital buffer. Speaking for myself and not for Paul Tucker, who is not here, I agree completely with what Fabio said at the end of his comments, which is that this is a dangerous business if you try to do high-frequency policy with prudential tools.

Let me make a couple of other short remarks. Regarding Linda's comment on the desire to have legislative mandates, I believe that in democratic societies it is essential to have legislative mandates. The question is, when is it legitimate to delegate something to an independent institution? There are a number of possible requirements for that, but one that I would say is at the top of the list—which is where I believe that we get into trouble with prudential policy—is that it shouldn't have first-order distributional impacts. Policies with first-order distributional impacts are fiscal. Through tax and expenditure policy society expresses its preferences for certain activities and certain individuals over others. Conventional monetary policy, which has been delegated historically, does not have first-order distributional impacts. But even for that, I think that we would all agree that we get in trouble without a legislative mandate.

Fabio asked about the shortcomings of the current institutional framework, and suggested that we think about possible adjustments. First of all, on the setting of standards themselves, I do not believe this is an issue. The Financial

Stability Board (FSB) is doing a reasonable job. Paul and I have both been "inside the sausage factory." We were involved in setting up and operating the institution, so we have some sense of the problems. And the apparatus of international standard setting could surely work better. I will give you a few examples. The FSB does do implementation monitoring, but all it is doing is monitoring. If we look at what has happened with Basel III, we can see the implications. As we say in a footnote in our paper, the implementation monitoring for the Basel III capital requirement by the European Union has been deemed materially non-compliant. But there is no follow-up or recourse to this finding. Nobody is doing anything to push the European Union to change. A second issue is that the FSB is not set up as an information-sharing institution. Our view is that we need such an institution, especially in the context of stress testing. As we say in the paper, and as Linda picked up on in her comments, stress-test exercises should have a coordinated global component. This could be done in the context of the twice-yearly FSB-IMF Early Warning Exercise that takes place together with the finance ministers and central bank governors of the International Monetary and Financial Committee (IMFC). To us, this seems like a perfect use of a forum that does not appear terribly useful.

The final comment I'll make is that we do not think that the capital controls are a prudential tool of any kind. This is the problem with the term macroprudential and why I don't like using it. Countries have taken the term and decided that almost any intervention that they can make in their financial systems can be called a macroprudential tool and therefore it has somehow been sanctioned. I think that's not right. I'll stop there. Thanks.

Mr. Glick: I have five people on my list. I think that's about all we're going to have time for. So, John Williams, Stan Fischer, Jonathan Ostry, Stijn Claessens, and then Sebastian Edwards, and if there's time, I'll sneak you in, Jeff (Frankel). Okay, so John.

Mr. Williams: Great. I actually thought this paper was exactly what we wanted. I think Steve and Paul did a good job of being provocative and raising high-level issues. I have two questions, and these aren't comment questions; these are true questions. When I read your paper, it kind of reminded me of what my family usually asks me to do at this time of the year, which is to create an Amazon wish list so they can decide what I want for Christmas; and then every Christmas I don't get any of the things on my wish list. And the question is, what do you do then? So you've sent out a wish list which is not that practical and, in a way, we're not close to getting a lot of these things. But there are some things that are happening that aren't on your wish list, and I want to know what you think

about them. One is the provocative, controversial ring-fencing and the intermediate holding company requirements under Dodd-Frank for foreign banks. Do you see that as a good thing or a bad thing? The second question is on stress testing. In the United States, we don't really have macroprudential tools, except for stress testing in a way—and maybe the reality is that stress testing is going to be the primary macroprudential tool in the way that you're thinking about it and not a lot of the other ideas that are out there.

Mr. Fischer: Thanks. I'm not sure that this has anything in particular to do with macroprudential policy, or anything. It's about what do we demand of any international standard. I know that there has been a lot written on this—some of it by Paul—but the notion that you're going to get full agreement on things on which there is not agreement domestically strikes me as close to what John said—it's very nice, it's possibly desirable, but it's not going to happen. So then what? Well, there are lots of bodies that do international cooperation, some of them quite effectively. I have no idea what Interpol does, but it sounds to me that it's a similar organization where you have to have some information. The notion that every country has to know what every other country is doing strikes me as absurd. And there has to be some division of labor and some reliance on a system that will work. I don't see how you can expect me to gain very much by figuring out what's going on in Luxembourg and say that I lose something if I don't quite know the details. So, perhaps you should ask what is the minimum rather than the maximum that you can get. You know, there are divergences on capital requirements at the moment, with the United States doing more than the Europeans. Does that mean the whole exercise has to be abandoned? I don't quite see that.

I do have one more thing: I think that the FSB has made a huge difference, but there is tremendous political opposition in the United States to having "foreigners" setting our regulatory requirements. And I think you're looking for something that won't exist and that it's not a good idea to spend too much time on that. It would be better to look at what is practical.

Mr. Ostry: Thanks. So my comment follows pretty obviously from the comments made by John and Stan, especially Stan's Luxembourg example. When I think of multilateral coordination and cooperation on macroprudential things, what I worry about is large jurisdictions exporting instability to smaller jurisdictions. You don't have to talk about Luxembourg; think of Sweden or Latvia as the archetypal examples. And the solution to that problem is not coordination or cooperation; it is having binding rules of the game, rules of the road to prevent large jurisdictions from exporting instability. So, I'd like to know how

you see that issue—whether what is needed is more like rules of the road monitored by a neutral umpire rather than coordination or cooperation, which as Stan mentioned involves giving up something to get something that's at least as valuable in return. And just a minor point: IMFC, FSB, and IMF presentations always contain a list of to-do's at the end. You may think they are kind of empty, and I might agree with you, but they are the best that the staffs of those institutions can come up with. And, finally, on capital controls, I disagree. They can be a macroprudential tool, as a paper that was discussed at this very conference two years ago showed. Thanks.

Mr. Claessens: Like Linda, I had some confusion about language in the paper. I think it's important to clarify because you talk about steady-state regulations, you talk about resilience, and you talk about macroprudential tools to lean against the wind, and I think that the three concepts are quite different. Clarification of terminology is important. You didn't talk about fiscal issues whatsoever, in terms of burden sharing when things actually happen in the first place. In some sense, what we have seen now in the European context with the banking union brings to the fore that if you really want globalization through cross-border flows and foreign banks, you need to go all the way; otherwise, you're not going to get the results you want. And short of that, I'm skeptical as to whether coordination ever will get off the ground. Are you not fooling yourself and maybe should you then lower the burden in terms of what information you really want to exchange? You mentioned, for example, macroprudential requires a lot of exchange of information. I'm not sure at all about that. I think microprudential probably does. But macropru? On the whole, if you look at overall trends, the problem is that many people don't act when house prices or asset prices get out of whack. Other leverage issues are there. So that's quite different, but seeing the problem is not something about information per se—it's about acting, which goes back to the fiscal. How do you motivate and incentivize people to do what is right for the global, common good?

Mr. Edwards: So, Steve, we're never going to get every country agreeing on this right away. In your table 1, the largest banks are in 11 countries. What is the minimal, critical mass and what would happen to your proposal if some of the largest countries decide to stay out, like in the climate treaties? Is that like multiplying by zero? And it will not happen? And, if that is the case, what is the second-best option at this point—in terms of a process of moving in this direction? Because, as was pointed out earlier, the U.S. Congress hates the idea that we're going to be told by someone, anywhere, what to do. So how do we move in that direction? It's like the Tokyo climate treaty.

Mr. Frankel: We've talked a lot about macroprudential policy, which is a bit of a buzz phrase with economists in recent years. I'd like to just make an observation about efforts for specifically countercyclical macroprudential policy, leaning against the wind—not just in banking, where you can look at whether the reserve requirements are countercyclical, but in housing, loan-to-value (LTV) ratios in the stock markets, the margin requirements. It strikes me that many emerging market countries have made much greater efforts and have experimented with these things much more than the advanced countries have. I'm thinking of Korea, China, Turkey, and others. And I would like to see us make more of an effort to assess that experience. Have they succeeded in calling the cycle right, leaning against the wind—which is sometimes hard to do in real time—and has it had an effect?

Mr. Cecchetti: Let me answer one of John Williams's questions. I agree with your evaluation, that stress testing is the most likely avenue toward establishing systemic resilience.

In response to Stan Fischer, do I believe that we're actually ever going to engage in any of the sort of cooperation and coordination that Paul and I describe in our paper? Probably not. But here, I would say—and I speak for myself—that the United States is a huge part of the problem. And the source of the problem is in large part the fact that the structure of the U.S. system is such that it is not clear who is in charge of what. So, you may have tools, but I don't even know who controls them. Some agencies may have the ability to act—the Federal Housing Finance Agency may have the ability to set loan-to-value limits for home mortgages, the Securities and Exchange Commission may have the ability to set margin requirements for equity markets, and the Federal Reserve Board may have the ability to set capital requirements for certain financial intermediaries. But the biggest problem is that even if I could get representatives from other jurisdictions to the table, I'm not even sure who I am supposed to invite from the United States. And, if I have to live with the United States in its current form, without clarity of representation, then some of what Paul and I envision will not work. And here I can address Sebastian's comment: without the United States, we are in very big trouble.

On the topic of information sharing, I should mention that the banks in Table 1 in the paper—the 30 Basel Committee/FSB global systemically important banks—are currently providing weekly position information to the Bank for International Settlements that is being used to generate an exposure network. This suggests that it is possible to share highly confidential information among authorities. I should say that, while I signed all the memoranda of

understanding, I could never see the data. The data belongs to supervisors and is shared among those supervisors.

Turning to the issue Jonathan raised, we are extremely concerned about spillovers and that countries will react by isolating their financial system. Will they say, look, if you guys aren't going to behave, I'm going to pull away from the system—that maybe the benefits aren't worth the costs? Now, isn't it enough then to have the 100 biggest banks in the world and their jurisdictions—which is probably less than the FSB and Basel Committee, which is 27 right now—involved? Is that enough? Maybe. It might be enough just to get those involved.

Finally, there is the question of fiscal policy and burden sharing. The honest answer is that we do not examine those issues in the context of need for international cooperation on prudential policy. The one related issue that I will comment on is resolution. This is a fiscal issue, and one where there needs to be some agreement on burden sharing. Have we made sufficient progress? I don't know. Thanks for all of your comments. This was really helpful.

Freer Choice, Lower Growth, and Higher Welfare: Recent Changes in China's Population Control Policy and the Impact on Its Economy

Shang-Jin Wei

Introduction

China used to be known mainly as the most populous but poor nation that was a small part of the world economy. Now it is more likely to be known as the largest single-country contributor to global economic growth as well as the most populous but fast-aging country.

The sheer size of the Chinese population almost guarantees that any significant changes to the country's population control policy will affect not only the future of the Chinese economy but that of the world economy as well. But there is more to it than that. The population control policy has also contributed to a side effect: a high degree of sex ratio imbalance for the premarital-age cohort, which recent research suggests can have profound effects on China's savings rates, current account balance, rate of entrepreneurship, and economic growth.

The Chinese population control policy is commonly known outside the country as the one-child policy. This is not quite right, as I will explain below, but it was approximately right at some point in time. Throughout the history of the People's Republic of China, which was founded in 1949, there have been quite a few changes to the population policy.

At the start of the People's Republic, the government had, in fact, attempted to encourage childbirth. This alarmed Professor Ma Yinchu, a Ph.D. economist graduated from Columbia University in the late 1940s and at that time president of Peking University, who thought that population growth was too fast. The total fertility rate then was 6.3 children per woman on average, meaning

that many families could have 6, 7, 8, or even 12 children. Indeed, that was the case during my grandparents' generation.

Dr. Ma Yinchu thus advocated some measure of population control, but his proposal was essentially dismissed by Mao Zedong, the paramount leader of China at the time. Mao Zedong's view on population growth was that the attention should not only be on how many mouths need to be fed but also on how many hands come with more people. By this view, women who can produce many babies are "hero mothers." However, his comrades disagreed with him, and the government quickly pulled back on such advocacy, going from encouragement to silence on the subject to gentle suggestion for families to voluntarily limit their number of children.
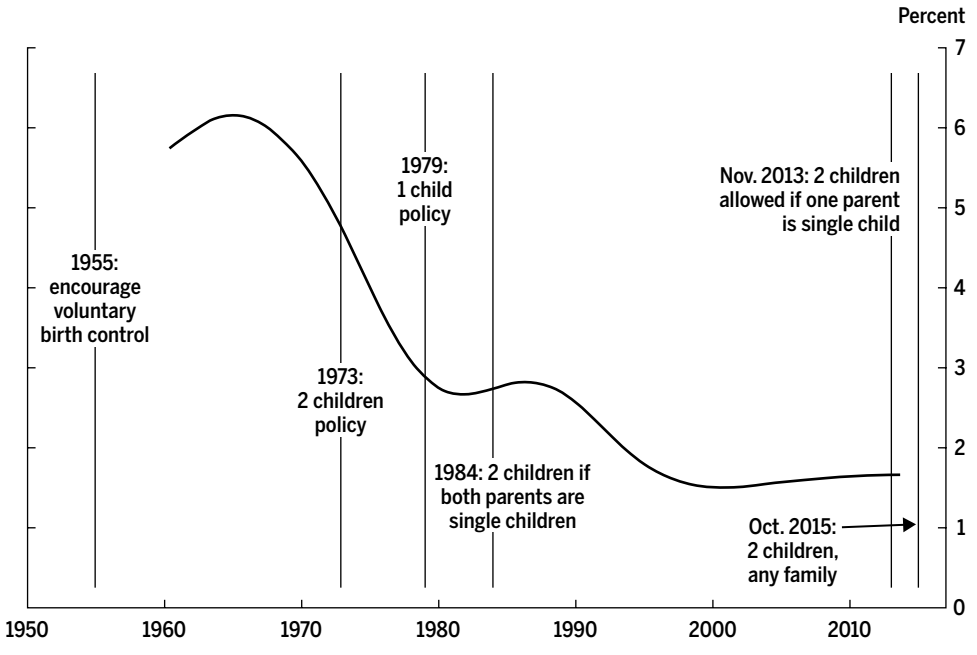
China's Population Control Policies

Beginning in 1973, the government formally encouraged its citizens to have no more than two children and to allow for longer spacing between children. There was no penalty for violating birth quotas at that time, but some people listened. My mother, my mother's sisters, and my mother's brother all had no more than two children.

In 1979, with Deng Xiaoping's ascent as the paramount leader of the country, the government came up with a much more stringent population control policy—the one that's commonly known outside China as the one-child policy. Going beyond the one-child quota would incur a penalty. Deng Xiaoping was a firm believer in family population control, and since then, China has adopted relatively stringent population control policies.

Nevertheless, some modifications were introduced along the way. In the mid-1980s, the government began to allow a second child in certain rural areas if the first child was a daughter. This is sometimes labeled by demographers as the 1.5-child policy. In more recent years, further modification has been adopted in many regions: a second child is permitted, regardless of the gender of the first child, if both parents are single children themselves. The policy was selectively implemented in different regions and spread very slowly, with the very last province adopting it in 2011. Figure 1 documents these discrete changes in policies, and the wavy line traces out the country's total fertility rate, which is the average number of children born per woman.

As Figure 1 shows, China initially had a very high fertility rate before it plummeted. The year 1979 was the turning point when the fertility rate fell very low; it continued its descent, so that starting from the late-1990s, it fell to a level of about 1.6 children per woman, which is below replacement rate.

FIGURE 1

Evolution of the Chinese Population Control Policy and Total Fertility Rate

Percent

1955:
encourage
voluntary
birth control

1973:
2 children
policy

1979:
1 child
policy

1984: 2 children if
both parents are
single children

Nov. 2013: 2 children
allowed if one parent
is single child

Oct. 2015:
2 children,
any family

People then began questioning the population control policy. But when Deng Xiaoping was alive, he was a firm believer in population control. He saw in the West that population did not equate to power. Even if the West had a smaller population, it had a much higher standard of living and was much more powerful than China. So population control was strictly enforced. In the performance assessment of lower-level government officials, staying within the population quotas has been a central element. While many aspects of performance—for example, how much foreign investment has been attracted and how much tax revenue has been collected—can be negotiated, it is said that observing population control is a non-negotiable item in the local officials' career assessment and promotion decisions.

Over time, as China's per capita income increased, households' intended fertility rate also declined (as one would expect from the experience of other countries without a strict population control policy). At the same time, the Chinese leadership came to the realization that, when it comes to a country's position on the world stage, the absolute size of the population, not just per capita income, is also useful, and that population must not be allowed to decline too fast.

In November 2013, the government relaxed anew its population control policy, allowing any family to have two children if at least one of the parents was a single child. So, the requirement went from having both parents as single children to just one of them being a single child. There were about 20 times more people who satisfied the second condition than the first condition, but that wasn't enough to revive the population growth rate.

In October 2015, the government announced the latest change to its population policy: any family can now have two children. There are roughly 10 times more families where parents are still in the childbearing age relative to the families where one of the parents is a single child.

## Consequences of the Population Control Policy

Did the population control policy make any difference? Some argue that it doesn't really matter, because globally, fertility rates naturally decline as incomes rise, especially when a woman's education goes up, and the social security system improves. There are many plausible reasons for a steady decline in fertility rate, but international experience suggests that this is a general pattern throughout the world.

Because of this general pattern, many argue that China would have gotten where it is anyway, even without population control. However, I doubt that argument. Look at Figure 2. The line with circles is the total fertility rate for China, the same as is shown in Figure 1, except now it is plotted against the log of per capita gross domestic product (GDP) measured in 2005 constant dollars. The solid line is the fitted line from a regression of the total fertility rate of Singapore; Taipei,China; and the Republic of Korea versus their log of per capita GDP in constant 2005 dollar terms.

Compared with these three economies, for the same income level, the Chinese fertility rate is substantially lower. This implies that something other than the normal pattern matters. Perhaps China's fertility rate would not have fallen that quickly without some factors that did not exist in places like Singapore; Taipei,China; and the Republic of Korea. The latter three economies are known to have a much faster drop in fertility rates than other high-income countries, and we also note that their current fertility rates are just about 1.5 children per woman.

Why is this relevant in this occasion? Standard theories suggest that output growth should be linked to at least two aspects of demography. But I think three aspects of demography should be considered simultaneously to help us understand why China grew as fast as it did in the previous three decades, why it is declining the way it is now, and how this might help us to think about

FIGURE 2
Total Fertility Rate vs. GDP: Comparison with Composite

Total fertility rate

1966

PRC

Composite for SIN, TAP, KOR

1987

1982

2001

Log of per capita GDP in 2005 US$
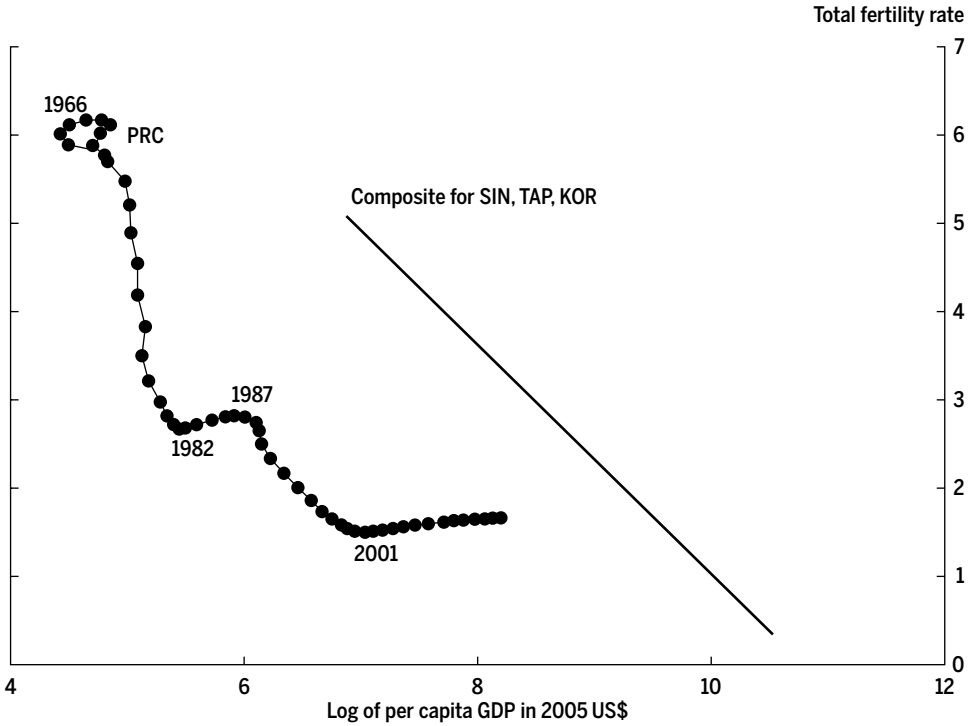
**Note:** KOR = Republic of Korea; SIN = Singapore; TAP = Taipei,China.

its likely growth trajectory in the future. The three aspects are the size of the working-age cohort, the dependency ratio, and the sex ratio for the premarital-age cohort.

China's Demographics and Growth

These three demographic aspects are not the only determinants of growth by any stretch of the imagination, but they are very important ones. The first two are easy to understand: growth of the working-age cohort and the dependency ratio. There already are well-worked-out theories that point to those connections. Figure 3 plots the growth rates of the Chinese working-age population, measured by two cohorts, 15–59 and 15–64. The top two lines are the China lines, showing growth rates from 1950 onward. As a benchmark, similar lines are plotted for the United States.

A key takeaway is that, for a while, the population control policy gave China a higher growth rate of its working-age cohort than the United States. But

FIGURE 3
Growth of Working-Age Population: China and United States

Percent

China 15–64
China 15–59
U.S. 15–64
U.S. 15–59
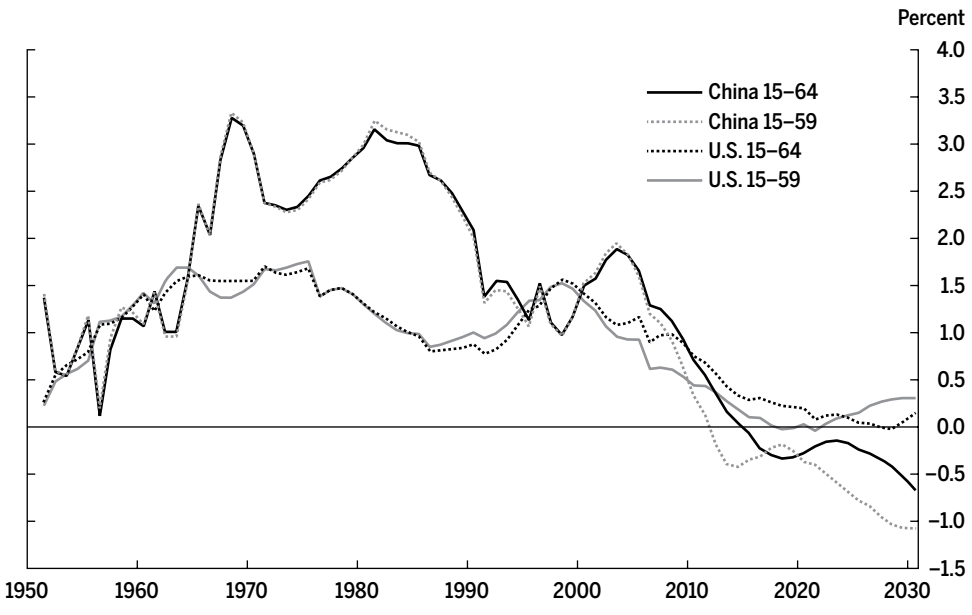
eventually the population control policies led to a dramatic decline in the growth rate, so much so that starting from 2011, the 15–59 cohort began to record a negative growth rate. The actual size of the working-age cohort is thus shrinking.

For the United States, the 15–64 cohort may be the more relevant proxy for working-age people. China has officially a much earlier retirement age, with most women having a legal retirement age of 50 and most men having a legal retirement age of 55. Some faction of people—civil servants and highly educated people—tend to have a later retirement age, by five more years, though still relatively early.

Although the exact turning point may differ depending on the age cohort being considered, there is no arguing that by now, China is facing a shrinking working-age cohort, which is likely to persist or even worsen in the medium term. Figure 4 looks at the absolute size of the working-age population—the lower line for the 15–59 cohort, the upper line for the 15–64 cohort. The 15–59 cohort peaked in 2011 and began shrinking in absolute size. In theory, this implies that, holding everything else constant, this would lead to a lower GDP growth rate.

The other theory is that the dependency ratio has implications for growth, partly going through the savings channel. Figure 5 plots the inverse of the
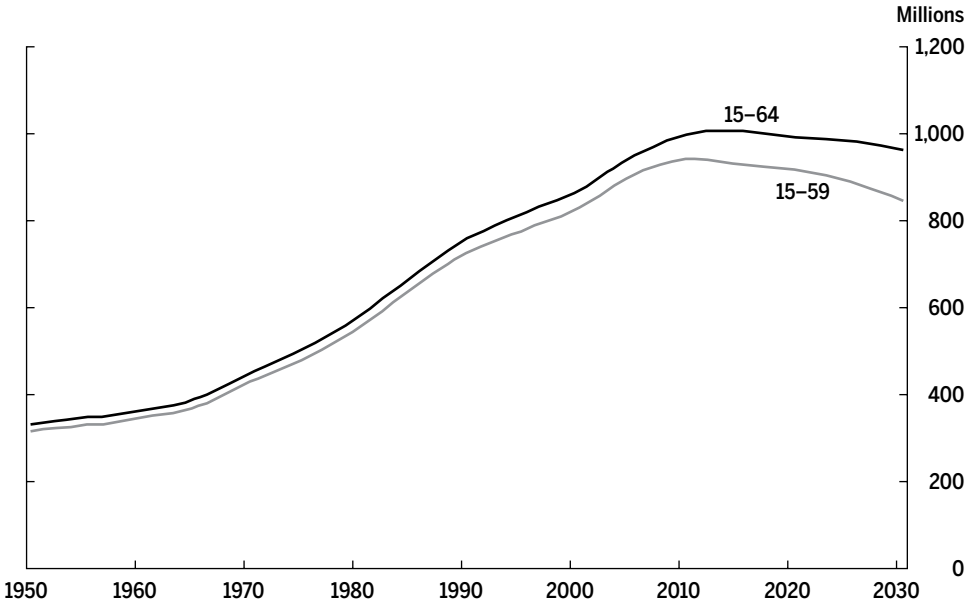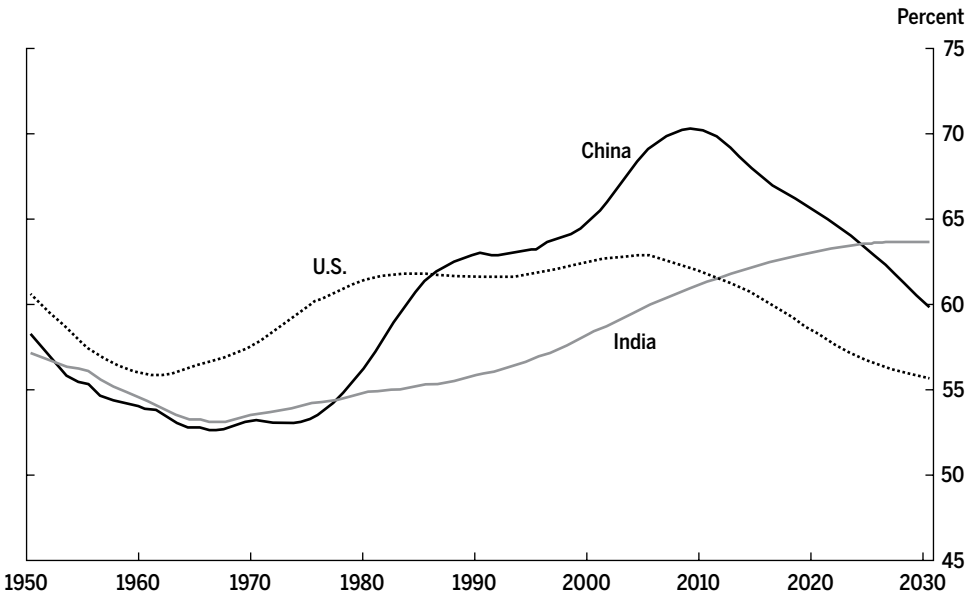
FIGURE 4
Chinese Working-Age Population Peaked in 2011

FIGURE 5
Inverse of the Dependency Ratio: Share of 15–59 Cohort in Total Population

dependency ratio, i.e., the working-age cohort divided by total population, over time.

The solid black line is for China, the dotted line is for the United States, and the solid gray line is for India, with the latter two countries added as benchmarks. The year 2014 is the latest actual figure; from 2015 onward, numbers are based on United Nations projections, based on the previous set of population control policies in force.

Here, the population control policy effect does show up, i.e., having fewer children born than what nature intended, starting from 1979 to now. China had an unusually favorable dependency ratio. Fewer children needed to be supported. However, the exact same policy is also responsible for China's switch now to unusually unfavorable demographics.

Too few children born in the past means fewer people entering the working-age cohort today, and yet their parents, grandparents, and parents' and grandparents' friends are retiring. So there are too few working people relative to people that need to be supported. The turning point is 2009 for China, and by the 2020s, its dependency ratio will become worse than India's. India's position is improving because of its relatively young population and high growth rate. China will become worse than India, and is on its way to becoming worse than the United States, not long from now if there are no significant changes to its retirement policies and norms.

The connection of these two variables—the dependency ratio and the working-age cohort—with growth is relatively direct and thus uncontroversial. But these are not the only variables affected by the population control policy. With the strict implementation of the population control policy from 1979 onward, China began to have an unusually high ratio of boys to girls, as well as of young men to young women, and this also has implications for China's current account position and growth.

Why would the population control policy lead to an unbalanced gender ratio at birth? It comes from two essential ingredients, and one additional ingredient, which, while not absolutely needed, can augment the imbalance.

The first of the required ingredients is parents' preference for a son. This is not unique to China then, nor today. This per se need not generate a gender ratio imbalance. In the past, this preference for a son just produced more children. It is not that parents want as few daughters as possible and as many sons as possible. Rather, parents want to make sure there is a son among their offspring. So in the old days, parents continued to have children until they had at least one son. This makes no significant difference by itself to the gender ratio.

The second ingredient is technology—a technology that allows one to tell the gender of the fetus relatively easily and abort a child relatively inexpensively. The most relevant technology in this context is the ultrasound beam machine. Although it was invented a while ago, for many developing countries it used to be a very expensive machine. In China, ultrasound machines in the 1970s and early 1980s were all imported. The ultrasound was intended to be a device to improve women's health. Because it was so expensive, hospitals very carefully recorded when they first got ultrasound beam machines. From their data, one can see the gradual spread of ultrasound beam machines in China. By 1985, about half of the county-level hospitals in China had at least one ultrasound beam machine.

The desire by parents to make sure one offspring is a boy, plus some reason to want to have fewer children than one's parents' cohort and grandparents' cohort, together with relatively inexpensive technology to allow gender determination very easily can collectively produce gender-selective abortions. Many countries satisfy these conditions. Viet Nam; India; Hong Kong, China; Singapore; and Taipei,China all do; and they all have gender ratio imbalances. But none had as severe an imbalance as China. Why? Because China had one more ingredient—a government-enforced, very strict birth quota, its population control policy.

Consider 20 couples, all with some preference for a son. The government says only one child is allowed. So after the first child, they stop. Assume 4 out of the 20 couples really want to make sure they have a son. Left to nature, approximately, 10 couples would have a son, the remaining 10 couples would have a daughter, and the ratio of boys to girls would be 1:1. If it is easy to determine the gender of the fetus, and the government also offers subsidized abortion, then perhaps 4 out of the 20 couples would choose to abort, i.e., they would have had girls but choose to abort girls. This will generate an unusually high boys-to-girls ratio at birth. In this example, even if the four couples who choose to abort the girls end up having two sons and two daughters later on, the boys-to-girls ratio becomes at least 12 to 8, or 1.5 to 1. In comparison, the natural boys-to-girls ratio at birth is 1.06, with no apparent cultural effect.[1]

China, before the current strict version of its population control policy and before Deng Xiaoping came to implement his policy, had a ratio of about 1.08 boys to girls because of its two-children policy. So, it was basically balanced. But from 1979 onward, there was a steady increase in the boys-to-girls ratio at birth. By 2009, the nationwide ratio was 122 boys per 100 girls. It peaked in 2009, then started to decline a bit, but was still unbalanced.

Why does this matter? When an excessive number of boys is born relative to girls, it will eventually translate into difficulty for some young men to find girlfriends or wives. Look at the sex ratios for the 0–14 cohort in Figure 6. The United States has been at the natural rate, fluctuating around 1.05. China's sex ratio took off in the early 1980s and peaked in 2011 for the 0–14 age range at 1.17. At this ratio, 17 out of 117 boys on average or roughly one out of every seven young men cannot find a wife, mathematically speaking. But for age zero, i.e., sex ratio at birth, the peak was 1.22. This implies an even worse marriage market outcome for young men in the coming decade.

Imbalances at birth eventually lead to a relative shortage of brides. When there is a shortage of brides, people get anxious. People adjust their behavior. Most men want to get married. In the Chinese context, perhaps an even more relevant fact is that most parents with sons want their sons to get married. So they ask themselves, what can we do so that our son will not be in the involuntary bachelor category?

One of the useful things to have in the dating and marriage market is wealth—relative wealth, to be more precise. Wealthy men have an easier time finding a girlfriend or wife. Indeed, there are no wealthy involuntary bachelors.

FIGURE 6
Sex Ratio (Age 0–14)
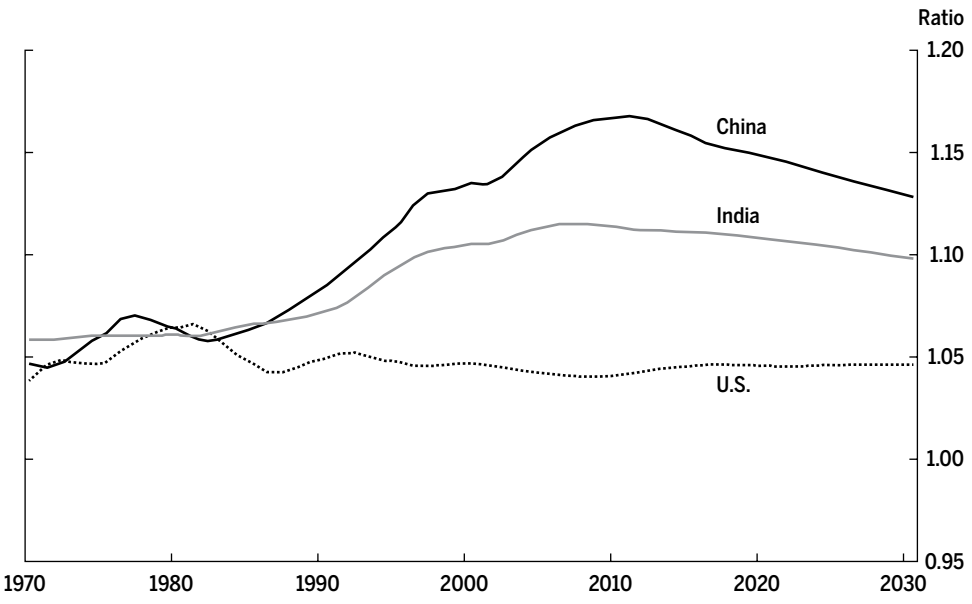
The implication is that parents—and young men themselves—need to find a way to accumulate wealth. This leads to a heightened competition for wealth.

Making money becomes a lot more important than used to be the case. Wealth is always useful, but now there is one more reason to accumulate wealth, i.e., not having money will probably doom one's son to be involuntarily single. And that is a very, very big deal. Suddenly, the importance of accumulating physical wealth becomes much higher.

Wei and Zhang (2011a) came up with the term "competitive saving motive." One implication is that people choose to raise their savings rate. The effect does not have to just go through the generation of young men; it can go through the parent cohort. Parents with sons raise their savings rate by cutting their own vacation, clothing, food, and other expenditures. As a result, the savings rate goes up.

For China as a whole, the sex ratio of the premarital-age cohort is about 1.15; this means that one out of every eight young men in that premarital-age cohort cannot find a girlfriend or wife. But there is a lot of variation across regions. Some places have a much stronger gender ratio imbalance than others. Wei and Zhang (2011a) find a very strong positive association between local household savings rates and local gender ratio imbalances. Holding constant the things that matter for savings rates, such as local income level, age composition of the local population, economic structure, race, and so on, the results still hold.

At the household level, this theory predicts a particular interactive effect, i.e., a combination of having an unmarried son at home and living in a region where one's son faces an extremely unfavorable environment in getting a girl-friend motivates parents to save even more—holding income and education constant. So this is no longer just about the fact that parents with a son save more than parents with a daughter—though this is true in the data on average. More importantly, comparing two sets of parents, both with a son and with similar income and similar other characteristics, those who live in the region with the highest sex ratio save more than the others.

The proximate reason for the imbalance is selective abortions. The deeper reasons are those explained earlier. While the family planning policy is national, i.e., set by the central government, implementation varies. In particular, the penalty a family has to pay when it violates the birth quota is set by local officials. More precisely, one of the determinants of today's sex ratio for the premarital-age cohort is the penalty set 15 or 20 years earlier by local officials. Using data collected by Harvard demographers on penalties for violating birth quotas by region and by year, Edlund et al. (2013) verified that those penalties seem to be mostly driven by the zeal of local officials.

In Wei and Zhang (2011a), we employ instrumental variables (IV) to make sure that the correlation patterns actually reflect causality. Based on IV estimation, we claim that about half of the observed rise in household savings from 1990 to 2009 could be linked to the rise in the sex ratio.

Since current account is saving minus investment, and though investment does not respond with an equal force, this also generates a natural link between the sex ratio and the current account. And that emboldened me to title one of my follow-up papers with Qingyuan Du "A Sexually Unbalanced Model of Current Account Imbalances." But when that paper was published we changed the title to "A Theory of the Competitive Saving Motive" (Du and Wei 2013). It is a theory, and the theory is helpful in clarifying additional questions by discussing a number of extensions.

Let me just discuss one. We often hear people object to our theory, because they say that when the sex ratio goes up, even if parents with a son are induced to save more, women and parents with a daughter are likely to do the opposite thing, and the latter could offset the former.

But our theory says the effect is always positive: the higher the sex ratio, the higher the savings rate. For parents with a daughter, a rise in the sex ratio surely raises the probability of the daughter finding a husband. However, parents with a daughter want their daughter to marry the best possible man. In terms of wealth, the best possible man under an environment with sex ratio imbalance is better than the corresponding man without sex ratio imbalance.

The reward for the daughter to be matched with the best man is thus higher than used to be the case. Therefore, there is also competition among women and parents with a daughter. Parents would want their daughters to have the best chance to be matched with the best men. Competition among women and parents with a daughter encourages greater savings too.

Unfortunately, a rise in the aggregate savings rate that is triggered by a rise in the sex ratio is socially inefficient. While all young men (and their parents) hope to improve their chances of marriage by increasing savings and reducing consumption, such hopes cannot be realized in the aggregate, as the total number of unmarried young men for the country as a whole is ultimately determined by the sex ratio and not by the aggregate savings rate. The economy thus has excess savings that could be consumed or invested with no corresponding change in the marriage outcome. There are other extensions to the model, but this essentially can clarify some of the potential objections.

Fang, Gong, and Wei (2015) also undertake some lab experiments to document the competitive saving motive. A lab experiment has a few advantages one

cannot get in the data. For example, one can easily manipulate the gender ratio imbalance in either direction. Intuition says that the savings ratio goes up when you have either a surplus of men or a surplus of women, although the elasticity may not be the same, because the tolerance of men and women for being single may not be the same. This can be verified in a lab experiment.

Other assumptions made in the theory can also be relaxed. For instance, in theory one makes assumptions about the mating and marriage markets, and how people are matched. In the lab experiment, those assumptions can be relaxed and can be verified.

Note that the gender ratio imbalance turned out to be an unintended consequence of the population control policy. The government never wanted to create an unnaturally high boys-to-girls ratio. In fact, the government discouraged the abortion of girls and officially forbade doctors and hospitals from performing tests to determine the gender of the fetus. But people can get around this, apparently, without too much difficulty.

One of the ways to accumulate savings is to buy a house (Wei, Zhang, and Liu 2012). For most families, housing represents the single most significant form of household wealth. The competitive saving motive thus implies that the sex ratio is a determinant of housing prices. The greater the sex ratio imbalance, the higher the housing prices, other things held constant. Figure 7 shows four lines. Working with household-level data, we classify all households into four groups: (1) households with a son in a high-sex-ratio region; (2) households with a son in a low-sex-ratio region; (3) households with a daughter in a high-sex-ratio region; and (4) households with a daughter in a low-sex-ratio region. We plot the housing value against household income.

Not surprisingly, in every group, wealthier households tend to buy bigger and more expensive homes. The interesting thing is the interaction term, i.e., an average family with a son buys a more expensive home than a family with a daughter. Looking at just families with a son and with equal income, the family with a son living in a region where there is a more skewed sex ratio chooses to own a more expensive home, because the need for saving in anticipation of marriage and the need for saving to compete on the wealth dimension is greater.

Figure 8 shows another pair of graphs that plots the ratio of the average value of a home in the region to the average household income in the region against the local sex ratio. The left panel compares one rural area with other rural areas. The right panel compares across cities.
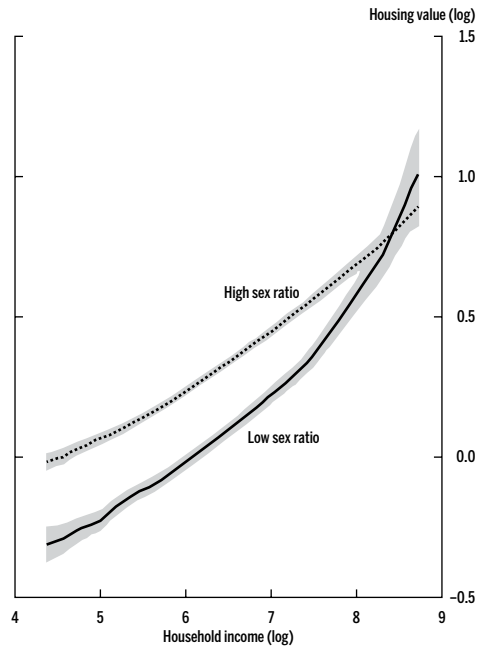
We find that, across the country, regions with a higher sex ratio have higher home values relative to household incomes. And this is not a result of comparing

FIGURE 7
Housing Value vs. Household Income

A With a Son
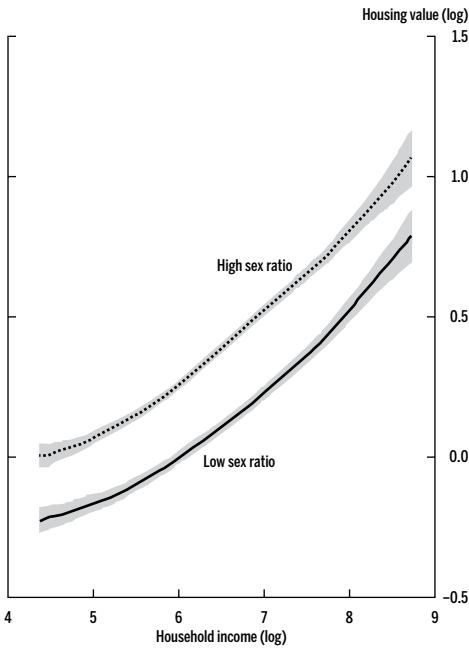
B With a Daughter

rural areas with urban areas; we are comparing rural areas with rural areas, urban areas with urban areas. One can see that the sex ratio is a predictor of housing value.

This follows very naturally from the logic of competitive savings, with one additional assumption, i.e., that the supply of houses is inelastic, unlike the supply of furniture or pencils. That assumption together with competitive savings gives this picture.

Implication for Growth

The implication for growth is also very natural. Again, a higher sex ratio leads to a stronger desire to create wealth. There are multiple ways to create wealth. For a given level of income, one can choose to consume less and save more, to leave it for the child's marriage time. The other way is to create more income. How?

We identify two channels. One is by choosing to work more. We show that, by looking at household-level data on labor supply, households with an unmarried son in regions with a greater than average gender ratio imbalance for the

FIGURE 8
Housing Value-to-Income Ratio vs. Sex Ratio

A Rural Area

B Urban Area
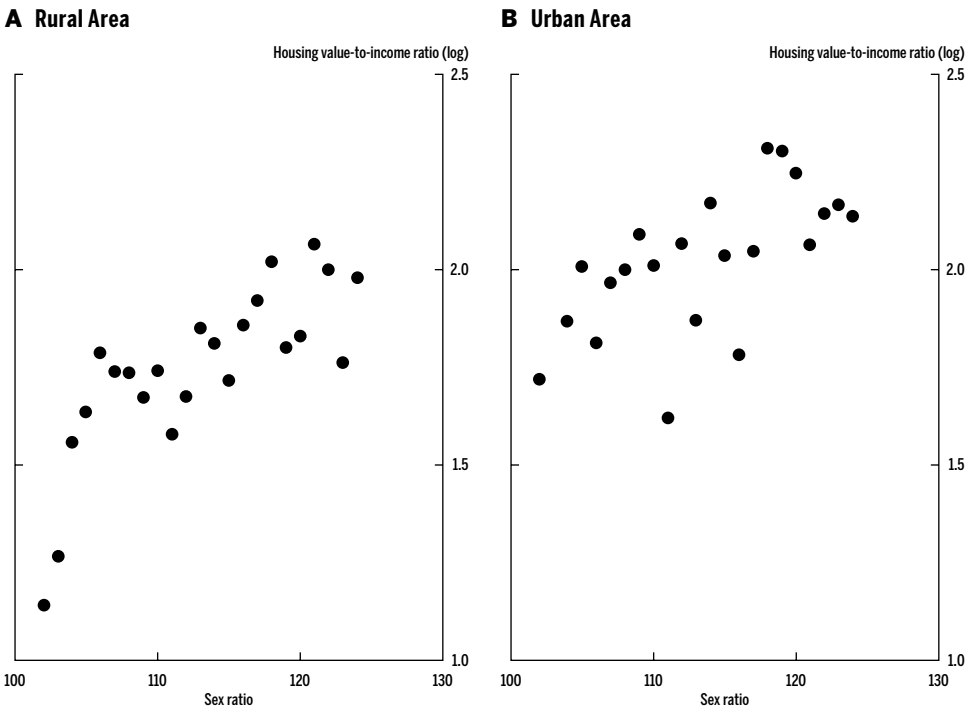
son's cohort supply more labor. The second channel is by choosing to take more risks. If, on average, risk and return are positively associated, one of the ways to take more risk and earn more income is to be an entrepreneur. We document that regions with a higher sex ratio tend to generate more entrepreneurs, measured by the growth in the count of private-sector firms between firm census years, holding constant the local income level, economic structure, importance of the firm, and so on (Wei and Zhang 2011b). These two channels, i.e., higher sex ratio imbalances inspiring more people to want to be entrepreneurs, in spite of the risk, and to supply more labor, give higher growth rates.

Household-level evidence and IV regressions confirm this. Based on our IV regression, we conclude that the sex ratio imbalance generates about 2 percentage points extra in the growth rate. This means that without the sex ratio imbalance, in the previous three decades, instead of China being a 10 percent growth economy, it could just have been an 8 percent growth rate economy. While 8 percent is already a growth miracle, it is less miraculous than 10 percent. This helps explain why China is growing so much faster, given its supposedly very lousy institutions.

It also helps to understand another interesting feature about the Chinese growth trajectory, which is that Chinese growth through the 1990s was higher than it was in the 1980s. The Chinese growth rates between 2000 and 2011 were even higher than those in the 1990s. Now, the fact that China can grow faster than the United States is well understood. Both the convergence theory and international experience tell us that should be the case. But why did China's growth accelerate in the 2000s relative to before when its income has increased?

The gender ratio imbalance provides a very natural explanation for China's growth acceleration in the previous three decades, particularly since the shortage of brides became progressively worse from the 1980s to the 1990s and 2000s. The change in the growth rate is partly explained by the change in population policy.

This theory can help us to gauge implications of the recent changes in the population control policy on the future growth of the Chinese economy. A shift to the two-children policy will simultaneously generate a change in the dependency ratio and sex ratios in the coming years.

First, there will be a deterioration in the dependency ratio for at least the next decade and a half, because more children will be born and need to be supported. But there will be no change to the working-age population. It will take some time before it will lead to an improvement in that dimension of demographics. Second, it will lead to an improvement or correction of the gender ratio imbalance—not a complete correction, but a reduction in the gender ratio imbalance. This will produce a decline in the savings rates initially, before it starts to get better. In terms of growth rates, both the deterioration of the dependency ratio, initially, and the reduction in the gender ratio imbalance, by our theory, will lead to a reduction in growth rate. And when the growth rate reverses, it will tend to do so perhaps faster than standard convergence theory would predict.

The relaxation of the population control policy raises the welfare of Chinese citizens. Not only will they have more say about an important decision in their lives, but they will also face less pressure and less welfare loss from competitive savings, competitive labor supply, and competitive risk-taking that are motivated by a desire to improve the marriage market outcome for individuals but in the end will not alter the number of young men who will be involuntarily unmarried. Therefore, even if the change in the population policy could result in a lower growth rate, the social welfare still goes up. In this sense, a complete removal of any restriction on family childbirth decisions would be even better. This is the big picture that needs to be kept in mind.

At the same time, unchecked decisions on childbirth by individual households, while optimal for individuals, could have undesirable externalities collectively from the viewpoint of managing carbon dioxide emissions and climate change. That is a separate point and will require additional research to settle.

Conclusion

In this presentation, I summarize a new way of thinking about demographics and use it to interpret the impacts of China's population control policy for its macroeconomy and to make forecasts about the future of the Chinese economy as altered by the recent shift of its population control policy. In particular, I argue that when it comes to understanding the economic consequences of demographics, we need to pay attention to three, not just one or two, dimensions: the size of the working-age cohort, the dependency ratio, and the sex ratio of the premarital-age cohort. While the first two are relatively well understood, the economic effects of the third one have been explored in recent research and could benefit from further research. Indeed, my coauthors and I find sex ratio imbalances to lead men or their parents to raise savings, supply more labor, or engage more in entrepreneurship to accumulate more wealth to better compete for girlfriends or brides.

The recent relaxation of the Chinese population control policy—to allow for two children per couple in general—will likely worsen the dependency ratio over the next two decades and lessen the competitive pressure on savings, work effort, and risk-taking. While this could produce a lower growth rate in China than the standard convergence or cross-country growth regressions may suggest, it raises the welfare of the Chinese citizens nonetheless.

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NOTE

1 Famine can generate a temporary reduction in the boys-to-girls ratio, so there are more girls than boys being born in countries in years when there are famines. Intuitively, this could mean that when there is a shortage of food, it is more important to preserve future mothers than future fathers, to get the human race going.

Freer Choice, Lower Growth, and Higher Welfare: Recent Changes in China's Population Control Policy and the Impact on Its Economy

Mr. Ostry: I really enjoyed your talk. But I didn't hear you mention education too much. When I think of young people and how they make themselves attractive to the opposite sex, I think of many things. But I would have thought having a good education was one of them. So I wondered whether you thought that the unbalanced sex ratio and the desire to make yourself attractive to the opposite sex might have had an effect on the desire to invest in education.

Mr. Wei: Education certainly matters. In my *Journal of International Economics* paper on the theory of competitive savings, we have an appendix section where the people can also compete through human capital accumulation rather than just physical capital accumulation. We show conditions under which the two can complement each other rather than be substitutes. In general, households will raise the children's education level as a way to be more competitive in the marriage market. The household chooses an interior solution and does both. It raises the savings rate, and also tries to get the children to study harder than otherwise is the case. In the data, the education channel seems to be a bit noisier than the monetary savings channel. When we go to micro data, what we found is that we get the right sign, but it's not easy to get consistently significant coefficients. That's one reason why we don't emphasize the education channel. It doesn't mean the story is wrong. It's just that so far we have not found clear-cut data to support it. But theoretically it's certainly possible.

Mr. Edwards: I have a short question. What do you think about a possible fourth channel on how the one-child policy has affected China's future growth? And that is the succession policy in family-owned firms if you have one child. Eighty percent of firms in China are family owned. The one child may not have the skills, the desire. Or the child may not actually live in China to take over the family firm. So it seems that one of the great crises facing China in the next 10 or 15 years is who's going to be running these firms.

Mr. Wei: It's an excellent point. On my recent trip to China, I visited a very successful privately owned firm that produces steel frames. The founder has one son. He sent his son to study in the United Kingdom and he got an MBA degree and came back. He's now an intern at, I think, UBS in Shanghai with the clear intent to take over his father's business someday. So there's tremendous pressure on a single child to take over the parents' business. But not all children have a preference or the ability to be a successful entrepreneur. So one of my other friends is in the business of trying to get entrepreneurs to think about professionalizing their management. That is, to think about how to separate the passing of their wealth to children versus passing the control and management of the firm to a professional manager. It's a thriving business, as many entrepreneurs are now reaching the age at which they have to think about succession. This is a very important problem in many developing countries and could have a big effect on private-sector growth in the future.

International Coordination

Jeffrey Frankel

After a 30-year absence, calls for international coordination of macroeconomic policy are back. This time the issues go by names like currency wars, taper tantrums, and fiscal compacts. In traditional game theory terms, the existence of spillovers implies that countries are potentially better off if they coordinate policies than they are under the Nash noncooperative equilibrium. But what is the nature of the spillover and the coordination? The paper interprets recent macroeconomic history in terms of four possible frameworks for proposals to coordinate fiscal policy or monetary policy: the locomotive game, the discipline game, the competitive depreciation game (currency wars), and the competitive appreciation game. The paper also considers claims that monetary coordination has been made necessary by the zero lower bound among advanced countries or financial imperfections among emerging markets. Perceptions of the sign of spillovers and proposals for the direction of coordination vary widely. The existence of different models and different domestic interests may be as important as the difference between cooperative and noncooperative equilibria. In some cases complaints about foreigners' actions and calls for cooperation may obscure the need to settle domestic disagreements.

International monetary cooperation has broken down . . . The U.S. should worry about the effects of its policies on the rest of the world.
> —Raghuram Rajan, Governor of the Reserve Bank of India,
> January 30, 2014

We have strengthened our policy cooperation. We have a shared assessment of our challenges and policy priorities. We are determined to step up our cooperation to: provide significant new momentum to the global economy; boost demand and jobs; and achieve sustained and more balanced growth, both internally and externally. Our macroeconomic and structural policies are mutually reinforcing and address both demand and supply challenges. Our integrated approach is focused on moving towards a more balanced policy framework. We will continue our efforts to foster positive spillovers and we recognise the need to avoid negative ones.
> —Brisbane Action Plan, G-20, November 2014

1. Introduction

International macroeconomic policy coordination arguably achieved a peak three decades ago, in the form of a set of initiatives undertaken by Group of Seven (G-7) leaders. These initiatives included the Bonn Summit of 1978, where G-7 leaders agreed cooperatively to reflate their economies so as to strengthen recovery from the 1974–75 global recession; the Plaza Accord of 1985, where G-5 ministers agreed to cooperate to bring down an overvalued dollar; an agreement at the Tokyo Leaders' Summit of 1986 to jointly monitor a set of economic indicators; and a 1987 G-7 ministers agreement at the Louvre to try to put a floor under the newly depreciated dollar. A lively academic literature provided theoretical support for such cooperative solutions, drawing on the tools of game theory.

Then coordination fell out of favor. Academically, critics found a variety of limitations to the case for coordination.[1] Historically, the Germans regretted what they had agreed to at the Bonn Summit, as reflation turned out to be the wrong objective in the inflation-plagued late 1970s. The Japanese came to regret the Plaza Accord when the yen reached historic heights. Many of the other summit communiqués never had much effect, for better or worse.

Another problem was that the structure of the G-7 did not allow a role for the emerging market (EM) countries, whose share of the world economy rose rapidly. Increasingly after 2003 the topic of interest to the United States was manipulation of currencies by China and other EM countries. It was not very useful to discuss such topics if the countries concerned were not represented in the room.

1.1. The G-20 and the Return of Coordination as a Live Policy Topic

Recent years have seen the partial return of international coordination. The representation problem has been addressed by expanding the membership of the meetings to include the larger EM countries in the Group of Twenty (G-20). A G-20 club of finance ministers and central bank governors, which had been founded in 1999 to deal with currency crises in East Asia and other emerging markets, was elevated to the status of leaders' summits, largely at the impetus of UK Prime Minister Gordon Brown. The first two G-20 leaders' summits took place in Washington on November 14–15, 2008, and London on April 2, 2009. Their immediate task was dealing with the global financial crisis that had hit in September 2008 and the ensuing global recession. But those meetings also represented a sea change for global governance in that the G-20 had now superseded the G-7, giving a voice to the large EM countries.

If the G-7 members thought that the newly invited members would quietly follow their lead, then they must have been disappointed. For example, EM representatives declined to join the U.S. Treasury in pressuring China to appreciate its currency. Instead, Brazilian leaders accused the Americans of depreciating their currency as much as anyone. They coined the now-popular term "currency wars."

In light of currency war concerns, G-7 ministers in February 2013 agreed to refrain from unilateral foreign exchange intervention.[2] Though little heralded at the time, this agreement, which we might call a cease-fire in the currency wars, is the most important recent example of international monetary coordination. It is striking to realize that policy coordination today apparently means agreeing *not* to intervene in the foreign exchange market to lower the value of any currency, whereas it meant the opposite at the time of the Plaza Accord. Many would like to go beyond the G-7 "cease-fire" to achieve an agreement that is more permanent, covers more countries, prohibits a wider range of currency-weakening actions, and imposes serious penalties against currency manipulation.

The market "taper tantrum" of 2013—when U.S. long-term interest rates rose in response to Federal Reserve Chairman Ben Bernanke's signal that quantitative easing would soon be phased out—provoked another sort of complaint from Reserve Bank of India Governor Raghuram Rajan: "International monetary cooperation has broken down . . . The U.S. should worry about the effects of its policies on the rest of the world" (January 30, 2014). The monetary part of this paper considers both kinds of concerns, represented by currency wars and the taper tantrum.

Some scholars have begun to return to the subject of coordination.[3] Some, such as Rey (2015), have given new prominence to the point that floating exchange rates do not fully insulate one country from the actions of another, especially if the other is the United States. This seems to suggest that countries should coordinate in the way that Rajan asks.

It is too soon to say whether we will see a full-blown return of international coordination either in the outcomes of meetings of economic policymakers or in academic research. But the subject is "live" enough to merit a reexamination in the wake of such developments as the global financial crisis, unconventional monetary policies, and the currency wars framing.

1.2. Theoretical Framework for Macroeconomic Policy Coordination

International cooperation could be defined broadly—for example, to include regular communication among countries' policymakers. It is good that they meet regularly, exchange information, and don't wait for a crisis to get acquainted.

Countries like Brazil, India, and China have a valid complaint that they are not adequately represented in global economic governance, even though they have long since earned a voice through the size of their economies, to say nothing of population. It is good that the G-7 has been expanded into the G-20, giving large emerging market countries a seat at the table. Similarly, their weight in governance at the International Monetary Fund has been adjusted, although it still lags behind their economic weight.

For the purposes of this paper, coordination is defined in the conventional sense of the Nash cooperative or bargaining solution from game theory, as in the famous "prisoners' dilemma." There is scope for coordination if all parties would be better off under an agreement to put their policy instruments at particular settings, relative to the Nash noncooperative equilibrium where each chooses its policies taking the others as given.[4]

The question of international coordination arises in many areas, including trade policy, energy and environmental issues, public health, and so on. But this paper focuses on macroeconomic policy coordination.

As long as there are spillover effects (one country's actions have an effect on others) and countries don't have enough effective policy levers to counteract them (an important point to which we will return), there is the potential, in theory, for coordination to benefit everyone. This paper accepts that there are indeed spillover effects and yet, in the end, questions the usefulness of some calls for coordination.

It goes without saying that the interests of one country are not the same as the interests of another country. That is not enough to imply a role for coordination. It is appropriate to bemoan a lack of coordination only if a cooperative solution would help each country achieve what it wants. But what does it want?

We begin by observing that there is not much purpose in trying to implement coordination if participants are not clear as to the nature of the failure of the noncooperative equilibrium and the direction in which proposed coordination would move the policy levers. Would coordination consist of an agreement by countries simultaneously to undertake fiscal expansion? (We call this the locomotive game below.) Or fiscal contraction? There is quite a difference. Would coordination entail monetary discipline? (This is an example of the competitive depreciation game, now known as currency wars.) Or monetary stimulus? Advocates of coordination at various times have had in mind each of those four possibilities, and others as well.

It is natural that the character of the spillover and proposed coordination might be different at different times. Even if the basic model of how the economy works were known and unchanging, the nature of the cross-border

externality and proposed coordination would be different in the aftermath of a demand shock than a supply shock, say the 2008 global financial crisis (GFC) versus the 1979 oil shock. Furthermore, the structure of the economy may in fact evolve over time, with the extent of international integration, the rigidity of labor and goods markets, and so forth.[5] Some claim that the importance of spillovers and the case for coordination has been stronger since the GFC because many countries have lost the freedom to lower their interest rates: industrialized countries because of the zero lower bound and emerging market countries because of onerous constraints from imperfect international financial markets.

But the problem of ambiguous signs of spillovers and ambiguous directions of coordination is worse than varying shocks or parameters that shift over time. The problem with the framework may lie in the limited usefulness of the assumption of unified and rational national actors. Typically the difference between domestic interests and foreign interests is not the only cleavage, or even the most important one. Disagreement over the correct model can be just as large. Furthermore, domestic political factions typically disagree with each other, regarding objectives as well as models, as much as they disagree with other countries. Blaming problems on foreigners or on lack of international coordination may make it harder to work out disagreements domestically.

We will consider four possibilities in sequence—covering both fiscal policy and monetary policy, coordinated expansion and coordinated discipline. Ultimately we seek conclusions about the usefulness of coordination when there is disagreement over what exactly is being proposed.

2. Fiscal Policy Coordination

We begin with fiscal policy.

2.1. The "Locomotive Game": When Cooperation Means Joint Expansion

The classic coordination game is one where the noncooperative equilibrium is seen as a general deficiency of demand and cooperation consists of joint stimulus. Coordinated expansion of this sort was attempted, for example, by the G-7 at the London Summit in 1977 and agreed to more concretely at the Bonn Summit of 1978. Germany and Japan acceded to U.S. requests to join it as two more engines or locomotives to pull the global economic train out of the aftermath of the 1974–75 recession. In a pattern that has become familiar, Germany agreed to fiscal expansion only reluctantly (bringing forward a tax cut). One explanation of German reluctance was a difference in perceptions: in their "model," fiscal expansion would not lead to higher growth.[6]

Joint stimulus was again the conceptual framework at the G-20 London Summit of 2009, held in response to the global financial crisis. Less well known is a G-20 meeting in Brisbane, Australia, in November 2014, after a new slowing of global growth which had possibly been abetted by austerity moves in Europe, the United States, and Japan. The Brisbane Summit agreed to "strengthen policy cooperation," including to "boost demand and jobs."

Table 1 illustrates the locomotive game. Under the noncooperative equilibrium, both the United States and Europe pursue contractionary fiscal policies. Each is afraid to undertake fiscal expansion on its own, because it believes (correctly) that this would lead to a trade deficit. Each would much prefer that the *other* country expand, so that it could receive the boost to demand from exports, rather than from fiscal deficit spending at home. But if everyone pursues fiscal austerity, the world remains in recession, in the upper left square of the 2×2 diagram.

The cooperative solution is for all parties to agree to simultaneous fiscal stimulus, in the form of increases in spending or decreases in taxes. They move to the lower right square in the diagram, where general stimulus leads to general growth, without any country having to achieve a trade surplus at the expense of anyone else. This logic underlay the Bonn G-7 Summit of 1978 and the London G-20 Summit of 2009.

Figure 1 illustrates the standard case for coordination graphically. The horizontal axis measures the policy setting, which we here define to be fiscal stimulus, for the foreign country. For concreteness, assume the foreign country is Germany and the year is 1978 or 2009. The vertical axis measures fiscal expansion for the domestic country. For concreteness, assume the domestic country is the United States. Assume that at the starting point, *N*, each country chooses its fiscal policy independently. (*N* stands for Nash equilibrium.)

TABLE 1
The Locomotive Game

	U.S. pursues contractionary fiscal policy	U.S. pursues expansionary fiscal policy
Europe pursues contractionary fiscal policy	Noncooperative "beggar-thy-neighbor" equilibrium: global recession.	U.S. runs trade deficit; complains on behalf of its exporters and import-competing firms.
Europe pursues expansionary fiscal policy	Europe complains on behalf of its exporters and import-competing firms.	Cooperative "locomotive" outcome: nobody achieves a trade surplus, but higher spending lifts all boats.

FIGURE 1
Coordination Entails Both Countries Agreeing to Raise Their Policy Settings
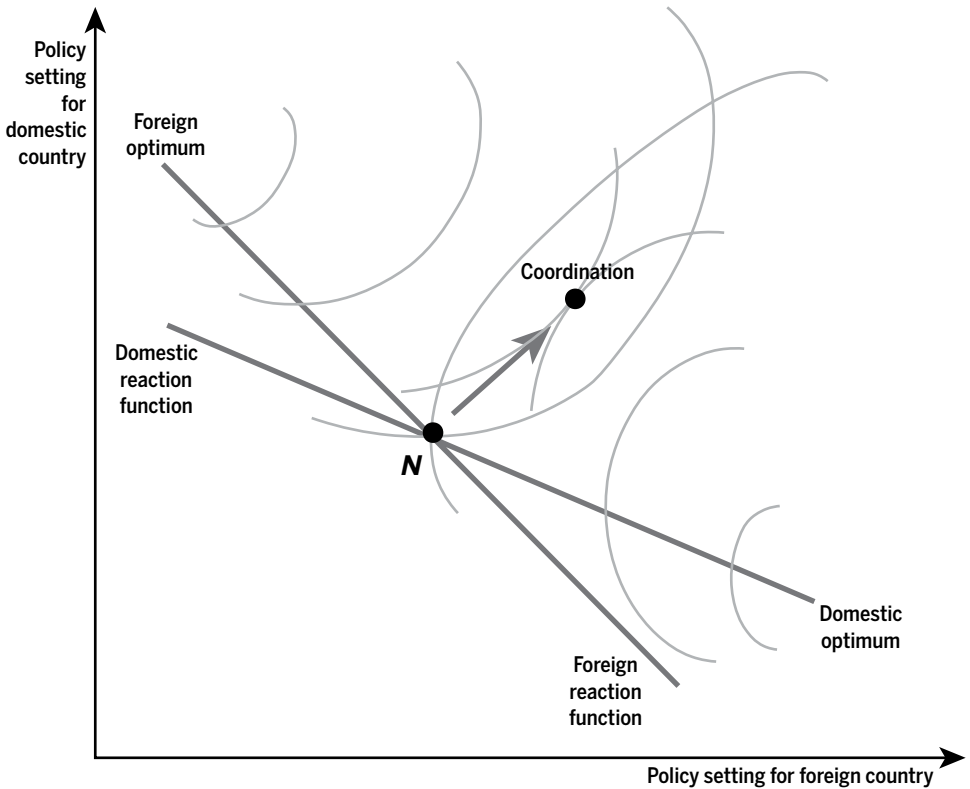

Figure 1 is meant to illustrate the world as American policymakers saw it in 1978 or 2009: a locomotive model. Hypothetically, if the United States could self-ishly choose both countries' policy settings to suit its own domestic preferences, its optimum would be in the lower right corner, where Germany and other coun-tries undertake strong expansion, so that the United States enjoys growth led by strong net export demand and is able to hold back on its own fiscal policy and thereby avoid the problems of future debt. The indifference curves that fan out from that domestic optimum represent successively lower levels of satisfaction. Germany will certainly choose some lower level of fiscal expansion than that optimum, and the United States will adjust accordingly. The line representing the domestic reaction function is traced out as the sequence of points where the indifference curves are tangent to vertical lines, because each point represents the choice of U.S. fiscal policy that achieves the highest level of satisfaction cor-responding to a particular German fiscal policy setting. It slopes downward

because the less demand is supplied by Germany, the more the U.S. authority needs to substitute its own demand. (They are "strategic substitutes.") The slope is relatively flat because a given U.S. fiscal stimulus has a bigger effect on the U.S. economy than the impact of a same-sized German fiscal stimulus on the United States.

Germany's optimum would be that it hold back its fiscal policy and instead let the United States carry the burden of the fiscal expansion. Its reaction function starts at the upper left and slopes steeply downward. The two reaction functions intersect at point *N*. This is the Nash noncooperative equilibrium, where each has set its policy optimally taking the other's as given.

From point *N*, each country would prefer that the other expand, but each holds back from expanding itself for fear of the adverse consequences on its trade balance. So the United States exercises some global leadership and proposes at a summit meeting that all parties undertake fiscal stimulus at the same time, moving northeastward in the graph as indicated by the arrow. This is the locomotive solution. Nobody needs to experience a change in their trade balance, but the coordinated expansion pulls the world out of recession. A cooperative program that is especially well designed will move the global economy to a point such as that indicated as the coordination equilibrium in Figure 1: it is one of the points where the two countries' indifference curves are tangent to each other, indicating that the joint gains are maximized. (From here, neither country can be made better off without making the other worse off.)

That is the story as the United States and some other countries see it. But it is probably not the framework through which Germany sees things. (See Figure 2.)

The apparent agreement on the desirability of stimulus at the London Summit of April 2009 was short-lived. The United States and China undertook substantially expansionary monetary and fiscal policy at that time, but other countries less so. Then when the euro crisis hit, beginning in Greece in late 2009, the European reaction was that fiscal laxity had caused the crisis, so austerity must be the treatment. In 2010, fiscal expansion went into reverse in many countries—including also the United States, after the Republicans gained control of the Congress and decided that the budget deficit was the main problem. This brings us to the discipline game.

2.2. The Discipline Game: When Cooperation Means Joint Fiscal Rectitude

Some will see the locomotive game as also applicable to the members of the euro zone in recent years. In this view, fiscal austerity in many countries has exacerbated Europe's failure to recover from a steep recession: Germany and

Coordination Entails Both Countries Agreeing to Lower Their Policy Settings
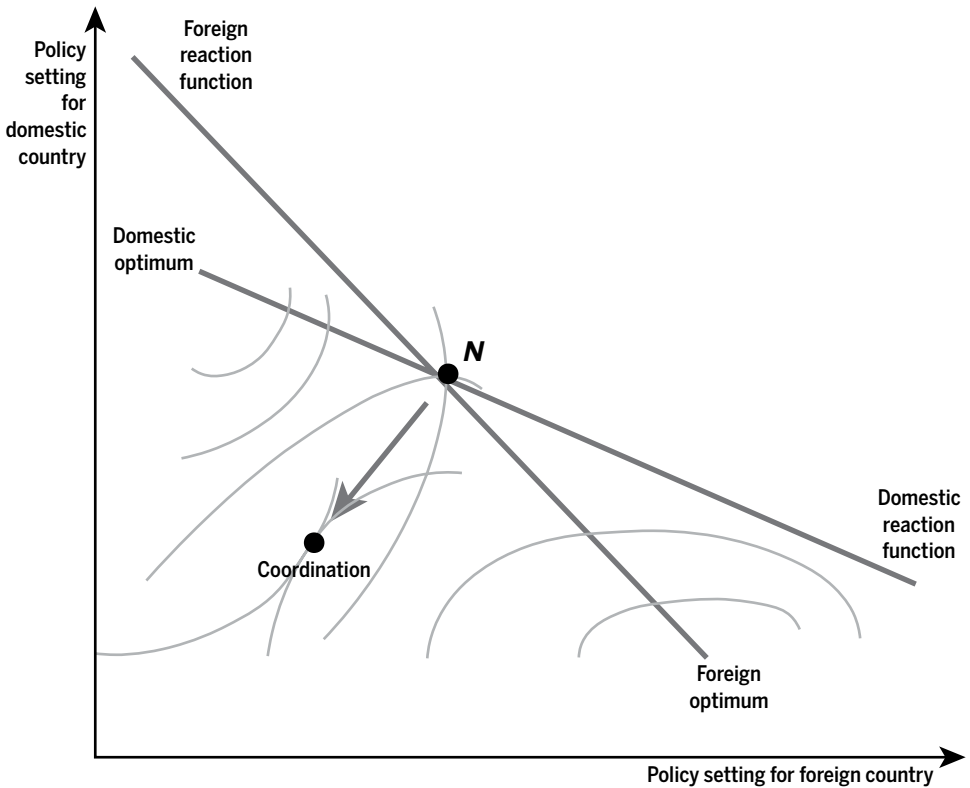
other countries should simultaneously increase spending to stimulate a general recovery. But that is not how the Germans see it (if one may continue to generalize about an entire nationality, with apologies). It is not just that they oppose moving to the lower right corner of Table 1. They reject the entire premise of the locomotive game.

The German view is that a country's budget deficit imposes a *negative* spillover on its neighbors. We could call this framework the fiscal discipline game. In one version, countries or their governments are competing for funds in the global marketplace (Chang 1990). Each country that runs a deficit puts upward pressure on global interest rates and so makes it harder for everyone else.

Another version focuses specifically on the moral hazard issues posed when the incentive for individual countries to be fiscally prudent is impaired by the likelihood of some sort of bailout by others in the event of trouble.[7] This may apply globally, if one thinks that an institution like the International Monetary Fund (IMF, or the Fund) is a source of moral hazard, which would explain why

the Fund has traditionally given so much emphasis in its procedures to enforcing budgetary discipline.

But the best example is the euro zone.[8] Most citizens of Germany and other members in Northern Europe are clearly inclined to think that fiscal profligacy among the Mediterranean members is a negative externality, not a positive one. The suspicion among Northern European taxpayers that they would be called upon to bail out their spendthrift neighbors explains why the cooperative agreements—the 1991 Maastricht treaty, the 1998 Stability and Growth Pact, and the 2013 Fiscal Compact—tried to impose limits on countries' fiscal deficits and debts.

The moral hazard game is illustrated in Table 2. In the absence of internationally agreed constraints on budget deficits, the knowledge of possible ex post bailouts attenuates the incentive to be prudent ex ante. As a result, everyone runs excessive deficits, in the lower right corner of the table. In this case, cooperation consists of agreeing to rules to limit budget deficits and debts, as under the Maastricht treaty, the Stability and Growth Pact, and its revisions.

From the G-7 summits of the 1970s to the euro crisis of the 2010s, many observers have criticized Germany for refusing to cooperate in a move to the lower right cell in Table 1 under the locomotive theory. One interpretation might be that Germany is selfishly holding back, so that it can run a trade surplus (upper right cell in Table 1). But another interpretation is that Germany thinks it is playing the moral hazard game, in Table 2. Seen from its eyes, the upper right cell is the one that results when the Germans alone abide by fiscal rectitude: they uprightly obey the rules while others cheat. The problem is not a lack of sufficient cooperative spirit in one or more governments, but rather a difference in perceptions across nationalities.[9]

Figure 2 illustrates the coordinated discipline game. We start at point *N* again, with the policy settings shown to be the same as at the corresponding

TABLE 2
The Moral Hazard Game

	Other euro member runs budget surplus	Other euro member runs budget deficit
Germany runs budget surplus	Cooperative agreement on fiscal rules, to eliminate moral hazard.	Germans fear that they will have to bail out the other member.
Germany runs budget deficit	Other member fears it will have to bail out Germany.	Uncoordinated moral hazard equilibrium: everyone runs excessive deficits because possibility of bailout undermines the disincentive.

point in the preceding graph. But the only thing on which the two sides agree is where the current policy settings are.[10] Germany, which we continue to take as the "foreign country," is puzzled when its neighbors fault it for tight fiscal policy. Germany's view is that it is doing everyone a favor by exercising as much budgetary discipline as it is and that its neighbors' budget deficits are imposing a negative externality. Germany exercises its leadership by proposing a fiscal compact, in which every member agrees to tighten budget discipline simultaneously, moving the economy to the southwest as shown by the arrow. In its view, everyone will be better off at the coordination point. Of course from the viewpoint of Figure 1, this all-around fiscal austerity moves everyone in precisely the wrong direction.

One must conclude that, regarding spillovers and coordination proposals, one person's fiscal vice is another person's fiscal virtue. Perhaps it is clearer what the nature of the spillovers and the direction of potential coordination are when it comes to monetary policy.

3. Monetary Policy Coordination

The Federal Reserve was ahead of other major central banks in easing monetary policy aggressively in response to the global financial crisis. The European Central Bank (ECB), for example, was more reluctant to ease under President Jean-Claude Trichet, from the start of the recession through the end of his term in November 2011. So was the Bank of Japan under Governor Masaaki Shirakawa. Initially the difference in reaction could be explained by the fact that the subprime mortgage crisis and recession had started in the United States in 2007. Others hoped their economies might be "decoupled" from the effects.

Complications soon emerged. The crisis was transmitted to other countries. Calls for coordination began. But, as with fiscal policy, perceptions differed as to what exactly was the nature of the spillover effects of monetary policy and the desirable direction for coordination.

3.1. Currency Wars

3.1.1. Allegations that Foreign Monetary Policy Is Too Loose (e.g., 2010)

When Brazilian Finance Minister Guido Mantega came up with a new, more colorful way of saying "competitive depreciation" in September 2010, he was reacting to currency depreciation in a number of countries against which Brazil competes on global markets. "We're in the midst of an international currency war, a general weakening of currency. This threatens us because it takes away our competitiveness" (September 27, 2010). The new "currency wars" phrase

soon came to dominate the discussion of spillover effects from uncoordinated monetary policy.

At about the same time, the Federal Reserve launched its second round of quantitative easing (in November 2010) and the dollar depreciated (through July 2011). For some G-20 countries like Brazil, the fact that U.S. monetary stimulus sent capital flowing out of the United States and into Brazil, appreciating the *real* against the dollar, was unwelcome because it left Brazilian producers less competitive on world markets.

The U.S. authorities tried to explain that a weak currency that resulted from needed monetary easing, as was the case for the U.S. dollar in 2009–11, was fundamentally different from a weak currency that resulted from foreign exchange intervention, as had been the case for the Chinese renminbi since 2004. But some did not see the distinction as so important. It was all competitive depreciation. In April 2012, Brazilian President Dilma Rousseff continued the currency war accusation, criticizing quantitative easing by the United States and other advanced countries as a "monetary tsunami" that had detrimental effects on others via the exchange rate.

Next, Japan responded to years of deflation and repeated recessions by following in the footsteps of the Fed. Abenomics was born when Japan's parliament was dissolved in November 2012 and Shinzo Abe was elected prime minister on a platform of monetary stimulus. It featured a target of higher inflation implemented via an announced steep path of monetary expansion under a program of "quantitative and qualitative monetary easing" by new Bank of Japan Governor Haruhiko Kuroda, appointed for that purpose in March 2013. The financial markets reacted immediately. The yen set off on a trend of depreciation. The stock market also reacted in the right way, with prices rising as rapidly as the price of foreign exchange.[11]

After another two years, the ECB, now under President Mario Draghi, followed suit, responding to renewed recession in the euro zone economy. The ECB began buying bonds in September 2014 and launched a full version of quantitative easing (QE) on January 22, 2015. The euro immediately depreciated, as had the dollar and the yen in their QE episodes, reaching a low in March 2015.

There is an appealing correspondence among the three successive episodes of monetary stimulus: United States 2010–11, Japan 2012–13, and ECB 2014–15. In each case the central bank decided to take dramatic steps in response to a weak domestic economy, in each case the currency depreciated, and in each case trading partners complained about competitive depreciation.

Many observers worried that such money-fueled currency depreciations—and other similar moves by emerging market and other countries—represented a potentially damaging currency war. They presumably had in mind a game as is illustrated in Table 3a. Here coordination would consist of an agreement to refrain from unilateral monetary expansion: a move from the lower right corner of the 2×2 diagram to the upper left corner.

To see a graphical version of the currency wars game, we can recycle Figure 1, rather than starting over. Simply define the policy levers on the two axes to be the domestic and foreign interest rates. At point N, everyone has set their interest rates too low, afraid to raise them for fear of appreciating their currency and losing trade competitiveness. Coordination would consist of all parties raising interest rates at the same time.

Cooperative solutions can be sought in the form of long-term rules instead of short-term policy adjustments. Another interpretation of the currency wars game is that the solution to the kind of competitive depreciation illustrated in Table 3a might be a system of fixed exchange rates. Avoiding competitive devaluation was a motivation for the Bretton Woods system agreed to in 1944 (more in Section 4.1 below). Frieden (2014) argues that it was also a prime motivation for European Monetary Union in 1999. But it is ironic if some think that the cooperative solution to competitive depreciation is a rule that exchange rates should be fixed, while others think that the solution to the same problem is a rule that exchange rates should float freely. We now turn to the latter view.

3.1.2. Cease-Fire in the G-7 (2013)

As noted in the Introduction, the G-7 partners in February 2013 agreed on a currency war cease-fire that represents the most substantive example

TABLE 3a
The Currency War Game

	U.S. pursues contractionary monetary policy	U.S. pursues expansionary monetary policy
Other country pursues contractionary monetary policy	Superior cooperative equilibrium: everyone agrees to refrain from currency warfare.	Dollar depreciates. Trading partners complain on behalf of their exporters and import-competing firms.
Other country pursues expansionary monetary policy	Dollar appreciates. U.S. complains on behalf of its exporters and import-competing firms.	"Currency war" noncooperative outcome: said to be a bad equilibrium for all, because nobody achieves depreciation and trade stimulus.

of international macroeconomic policy coordination in the last few years. They were responding, under U.S. leadership, to concerns about the Japanese monetary stimulus that was taking place and particularly about some remarks by Japanese officials that one channel of transmission would be a weaker yen.

The first sentence of the 2013 communiqué delegitimizes foreign exchange intervention: "We, the G7 Ministers and Governors, reaffirm our longstanding commitment to market determined exchange rates" (G-7 2013). The second sentence might seem to accept the broadening of the definition of manipulation to include other policies that can affect the exchange rate: "We reaffirm that our fiscal and monetary policies have been and will remain oriented towards meeting our respective domestic objectives using domestic instruments, and that we will not target exchange rates." Interpreted literally, the implication seems to be that monetary stimulus is valid so long as the authorities are not aware that it is likely to depreciate their currency, or at least so long as this is not their purpose. Of course, the authorities in practice are fully aware that depreciation is one of the ways that monetary stimulus is likely to work. But in the absence of mind-reading skills, the communiqué in practice does not effectively rule out monetary stimulus.

The G-7 currency war cease-fire has been not been inconsequential. Since February 2013, G-7 officials have indeed refrained from foreign exchange intervention.

The currency war cease-fire satisfied few of those who worry about currency manipulation, presumably because the language did not go far enough, with respect either to the lack of explicit reference to monetary policy or to the absence of sanctions to enforce the agreement. Some economists (e.g., Bergsten 2015, and Gagnon 2012, 2013) support provisions regarding currency manipulation, enforced by trade sanctions, while some of us are opposed (e.g., Bénassy-Quéré et al. 2014; and Frankel 2016.)

Some U.S. congressmen in 2015 opposed trade agreements like the Trans-Pacific Partnership (TPP) that did not include sweeping language about currency manipulation to prevent trading partners like Japan from doing what it had done under Abenomics. They wanted an international agreement that would ban currency manipulation, even in cases when no foreign currency is purchased, and that would enforce it by trade sanctions. The American auto industry has been especially vocal on this issue.[12] (Pharmaceutical and other corporations were on the other side, knowing that insistence on strong currency manipulation language would doom the TPP.) The U.S. Treasury had to explain that if such a trade agreement had been in place a few years earlier, it could

have been used against American quantitative easing at that time as easily as against subsequent QE by Japan.[13]

3.1.3. Is Monetary Stimulus a "Beggar-Thy-Neighbor" Policy?

Critics who apply the currency war allegation to general monetary stimulus go too far. It cannot be that monetary easing, when a country's authorities judge it warranted by domestic economic conditions, is, per se, presumed illegitimate under existing rules or that some new international agreement should rule it out as a general proposition.

The phrase "beggar-thy-neighbor" is applied to policies that one country uses to raise net exports at the expense of its trading partners. But a noncoordinated world in which each country chooses its monetary policy independently, subject to the choices of other countries, is very different from the beggar-thy-neighbor problems of a noncoordinated world in which each country chooses its tariffs independently. Even in the case of deliberate efforts to depress the value of one's currency through foreign exchange intervention, currency war worries may be overblown.

Ambiguous Effect on the Trade Balance. For one thing, the principle that monetary stimulus in one country shifts the trade balance in its favor and in this way may hurt other countries is much less clear than many seem to think. The exchange rate effect of monetary expansion should indeed work that way (the "expenditure-switching" effect). But there are other effects of monetary expansion: it raises spending and income. A low interest rate is the most obvious channel of transmission to spending. The income effect raises demand for imports, and for tradable goods more generally, which has the opposite effect on the trade balance from the exchange rate effect. The net effect is ambiguous both in theory and empirically.[14] Empirical models tend to agree only that the net effect on the trade balance is small.

It could well be that monetary expansion in one country is transmitted *positively* to other economies and that therefore the net effect is beneficial under conditions of excess supply, i.e., conditions of weak growth, unemployment, and low inflation. In that case the proper game theory analysis would not be a currency war framework like Table 3a. Rather it would be something more like the locomotive framework of Table 1, where cooperation consists of joint reflation rather than joint monetary restraint. (The axes in Figure 1 could be interpreted as the degree of monetary expansion.) We will consider a version appropriate to monetary policy, in Table 3b.

But perhaps coordination is not even necessary to achieve this outcome. The 2008 global recession called for easier monetary policy than had been

TABLE 3b
The Eichengreen Interpretation of Competitive Devaluation

	U.S. maintains monetary discipline (e.g., stays on the gold standard)	U.S. devalues and moves to an easier monetary policy (e.g., 1933)
Europe maintains monetary discipline (e.g., stays on the gold standard)	Tight monetary policy leaves the world in recession (e.g., the Great Depression).	
Europe devalues and moves to an easier monetary policy		All are in fact better off. Each fails to raise its trade balance, but lower interest rates stimulate global recovery (e.g., via a higher value of gold).

appropriate a few years before all around. The reaction to Fed easing, capital flows, and upward pressure on other currencies was a corresponding monetary easing in many of those other countries in order to dampen or prevent the appreciation of their respective currencies. To that extent, the objective of global monetary expansion was achieved without the benefit of coordination.

To consider decisions such as whether central banks should cooperate, modern monetary theory would prefer to think in terms of the setting of long-term rules rather than the setting of policies at a particular point in time.[15] But the ambiguity of spillover signs and the small welfare implications of coordination carry through to the case of cooperative setting of rules, according to Obstfeld and Rogoff (2002).

Asymmetries in Appropriate Monetary Stance. What if the foreign countries don't want the sort of monetary stimulus that the originating country wants, because they aren't experiencing the same conditions of excess supply? The Brazilian economy in 2010, for example, could be characterized as suffering from excess demand, in danger of overheating. The obvious answer for Brazil under such circumstances is to refrain from monetary ease, or at least to refrain from lowering interest rates as far as the United States, and to let its currency appreciate. Such international asymmetries in economic conditions are exactly what floating rates are designed to accommodate automatically.

For Milton Friedman (1953), one of the great attractions of a system of floating exchange rates was facilitation of the decentralization of policymaking to the national level. It would allow each country to take responsibility for managing its own economy. He considered this appropriate not just economically but also politically: national officials could be held democratically accountable by their own citizens.

The stronger Brazilian *real* will hurt Brazil's exporters and importing-competing firms—cutting into prices, profit margins, output, and employment

in those sectors. But if the economy is indeed up against capacity constraints and suffering from excess demand, there is no reason to let the sectors of the economy that depend on domestic demand suffer the entire burden of adjustment via higher interest rates. The burden should be shared between interest-sensitive sectors (such as construction) and currency-sensitive sectors (such as agriculture). The latter will complain. But the tension is inherent, and blaming the problems of exporters on foreigners does not help a country to think clearly about the tradeoffs or to deal with them.

To be more concrete, Brazil's structural budget deficit was too large in 2010. Taking the budget as given, somebody in the private sector was going to get crowded out. The question was who—the tradable sector via a high currency or the nontradable sector via a high interest rate? The government attempt to blame exporters' troubles on currency wars or U.S. arrogance may have distracted from the fundamental problem.

Implications of the Zero Lower Bound. One characteristic of the post-2008 revival of interest in international monetary policy coordination that is new is the constraint that short-term interest rates in advanced countries have been near zero and cannot be pushed much lower.[16] The loss of the interest rate instrument can have important implications for the nature of spillovers and coordination.[17]

If the only channels of transmission of monetary policy were the short-term interest rate (influencing domestic demand) and the exchange rate (influencing net foreign demand for domestic goods), then the loss of the former instrument would be momentous indeed. The ability of a central bank to stimulate domestic spending would be lost; it might be left only with the ability to switch spending between domestic and foreign goods. Policy would become a zero-sum game via the trade balance, where one country's gain was another country's loss.

Fortunately we don't live in that world. There are other channels of monetary transmission to domestic demand beyond the short-term interest rate. Four of the most important price signals are long-term interest rates, corporate interest rates, equity prices, and real estate prices. There may also be mechanisms that operate without price signals, particularly the credit channel.

These channels can be influenced by the instruments of unconventional monetary policy. The two broad categories of unconventional monetary policy are forward guidance and quantitative easing. Forward guidance has the potential to reduce expectations of future short-term interest rates and thereby to reduce long-term interest rates. Quantitative easing can also reduce long-term interest rates and can more directly reduce borrowing costs in nongovernment sectors, when the central bank buys corporate or asset-backed securities.

One approach is to announce an inflation target, one that is above the inflation rate that is already expected. If the announcement is believed, then it will reduce the real interest rate and thereby stimulate demand, even with the nominal interest rate stuck at the zero lower bound (ZLB). Absent any other mechanism, it is not clear why an inflation target should be believed. But given the existence of long-term interest rates and the other aforementioned channels for boosting demand, they can be reinforced by an explicit intention to let higher demand show up in higher inflation, thereby reducing the real interest rate. In this sense a generous inflation target is a complement to the other channels, rather than a substitute for them.

The menu of possible channels means that central banks are not confined to the two channels of the short-term interest rate and the exchange rate. It follows that even when the interest rate channel is constrained, monetary policy need not be a zero-sum game internationally. None of these channels is certain, however, so perhaps the ZLB helps explain the post-2008 fears of currency wars.

Competitive Depreciation/Currency Manipulation. When currency weakness is not just a side effect of monetary stimulus but is the deliberate effect, for example, of central bank sales of domestic currency in the foreign exchange market, is it a clear "beggar-thy-neighbor" policy that calls for enforced rules against currency manipulation?

Stipulate—as we have been assuming—that because a depreciation of the currency raises the country's price competitiveness on world markets, it stimulates the country's net exports—perhaps with a delay of a year or two—and thus that it achieves a switching of world spending toward the goods and services of the originating country, which comes at the expense of spending on goods and services of other countries. To be careful, notice that we are assuming that the "switching" effects that the exchange rate has via the trade balance dominate any other contrary effects that the exchange rate may have.[18]

It is then easy to see why deliberate steps to depreciate the currency are often viewed as a classic "beggar-thy-neighbor" policy, analogous to putting up tariffs against imports. Each country tries to "export unemployment" to its trading partners. And it might seem a short step from there to the view that everyone would be better off in a cooperative regime where they all agreed to refrain from deliberate intervention to depreciate their currencies, by analogy with agreeing to refrain from protectionist trade barriers. But the analogy may be misplaced.

The Precedent of Competitive Devaluations in the 1930s. The classic examples of both kinds of beggar-thy-neighbor policies—protectionism and

competitive devaluation— came in the 1930s. The Smoot-Hawley tariff enacted by the United States in 1930 was emulated by other countries, collapsing global trade. Meanwhile, Britain, the United States, France, and others pursued competitive devaluations in the early 1930s, as each in turn took its currency off the gold standard.

President Franklin Roosevelt rejected the wishes of the others to cooperate in stabilizing exchange rates at the London Economic Conference of 1933.[19] The conventional wisdom at the time and subsequently was that the tariffs and devaluations both represented similar failures of international cooperation.

The disasters of the 1930s motivated the architects of the postwar system who met at Bretton Woods in 1944 to adopt both the principle of free trade and the principle of pegged exchange rates. Exchange rates were adjustable in the event of fundamental disequilibrium, but to devalue otherwise would be unfair currency manipulation under Article IV of the IMF Articles of Agreement.

Eichengreen and Sachs (1985, 1986), however, offered a powerful revisionist interpretation of the exchange rate developments of the 1930s. They argued that, unlike the tariffs, the devaluations were not collectively damaging but may actually have been beneficial. Each of these devaluations was not just a reduction in the value of the currency in terms of other currencies but also in terms of gold. When each country had taken its turn, the net effects on exchange rates largely canceled out, but the net effects vis-à-vis gold did not. Each country was left with a currency that was worth less in terms of gold, which is to say that the price of gold was higher in terms of each currency. As a result the nominal value of gold reserves was raised. Since gold reserves were the ultimate backing for the money supply, this allowed an expanded money supply in each country and lower interest rates, which is just what the world needed at the time of the Great Depression.

Some version of this dynamic may also have applied in the aftermath of the 2008 global financial crisis, as noted above: after the Federal Reserve aggressively eased, the efforts by other countries to dampen the appreciation of their own currencies against the dollar had the effect of propagating monetary easing worldwide.[20]

Origins of the Language of Manipulation. Calls for international cooperation to prevent competitive depreciation often take the form of proposals to adopt strictly enforced rules against currency manipulation. Language on currency manipulation, for better or worse, was internationally agreed long ago.

IMF Article IV deals with obligations concerning exchange arrangements. After the members of the Fund ratified the move to floating exchange rates in the Jamaica Communiqué of January 1976, they agreed on a framework for

mutual surveillance under what is called the 1977 Decision on Surveillance over Exchange Rate Policies, and they amended Article IV in 1978. Principle A of the 1977 Decision and Section 1(iii) of Article IV both require that each member shall "avoid manipulating exchange rates or the international monetary system in order to prevent effective balance of payments adjustment or to gain an unfair competitive advantage over other members."[21]

Most of the time it is very difficult to tell whether a currency is undervalued, overvalued, or correctly valued—even for specialists, let alone politicians. Price criteria such as purchasing power parity may point one direction, for example, even while measures of external balance such as the current account or balance of payments can point the opposite direction. It is even harder to ascertain whether a currency is being deliberately manipulated for unfair competitive advantage.

Manipulation of the Renminbi. The United States has since 2003 been pressuring China to allow the value of the renminbi to be determined more freely in the foreign exchange market and to allow the currency to appreciate against the dollar.[22] These two objectives were consistent from 2003 until 2014: the country ran surpluses on the current account and the financial account, and so the People's Bank of China bought reserves in the foreign exchange market to resist market-driven appreciation of the currency. Many have claimed that China's refusal to allow appreciation in 2003–04 and its intervention to dampen appreciation thereafter constituted unfair manipulation of the currency for competitive advantage. The animus stems from concerns over the U.S. trade deficit, where China is following in the path that was earlier tread by Japan (villain to some, scapegoat to others).

Studies have also fingered other countries for having intervened excessively to counteract market-induced appreciation, including in recent years Switzerland, Korea, and Singapore. But China continues to be the overwhelming focus of concern, at least among American politicians.

The meaning of the word "manipulation" is open to dispute, since it plays no role in economic theory. The 1977 IMF Decision refers to the intent behind the actions of the authorities. Etymologically, the root of the word is the Latin for "hand," which suggests active steps rather than a passive acceptance of developments. Some claim that a country that has in the past chosen a fixed exchange rate regime cannot now be accused of manipulation just because it doesn't allow appreciation: no deliberate action has been taken.

In this view, if a country opts to peg, it cannot be accused of manipulation. This is so even when future developments leave the currency "undervalued," whether because such factors as the Balassa-Samuelson effect or low inflation

have rendered a once-appropriate exchange rate level no longer appropriate, or because the anchor currency, in this case the dollar, has in the meantime depreciated against other relevant currencies. A fixed exchange rate is a legitimate choice for any country under Article IV. It is pointed out that smaller countries with long-time fixed exchange rates are seldom accused of manipulation.

Many, on the other side, claim that China's decision to cling to a peg when the currency could as easily be allowed to appreciate was a deliberate choice with the intent to gain competitive advantage on world markets, and that it frustrates balance of payments adjustment, with adverse effects on the rest of the world. They point out that "protracted large-scale intervention in one direction in the exchange market" is one of the criteria the 1977 Decision specifies the Fund shall consider "as among those which might indicate the need for discussion" with a member over its exchange rate policy.[23]

Frankel and Wei (2007) tested econometrically two competing hypotheses regarding the Treasury's biannual reports on whether individual trading partners are manipulating currencies for unfair advantage. The first hypothesis is that the determinants are legitimate economic variables consistent with Article IV. The second hypothesis is that the determinants of the Treasury decisions are variables suggestive of domestic American political expediency. The econometric results suggest that the Treasury verdicts are driven heavily by the U.S. bilateral deficit with the country in question, though some of the other legitimate variables also turn out to be quite important. The U.S. Congress did legally mandate in 1988 that the bilateral balance should be an important consideration. But the bilateral balance does not appear as one of the criteria in the 1977 Decision or Article IV of the International Monetary Fund, the original source of the "manipulation" language.

The value of the renminbi was sufficiently low in 2000–05 that it could be judged as undervalued by a variety of criteria—a rare instance of such clarity. For example, international price comparisons (the purchasing power parity criterion) showed it to be undervalued even if one took into account the Balassa-Samuelson relationship, which observes that goods and services tend to be cheaper in lower-income countries. Estimates of the undervaluation were in the range of about 25–35 percent.[24] But the currency did appreciate between 2005 and 2011, by 25 percent in nominal terms against the dollar and more in real terms. International price comparison data for 2011 suggested that the renminbi was no longer too cheap.[25] The IMF (2015b) confirmed that the renminbi was indeed no longer undervalued.

Whether because of the end of undervaluation or for other reasons, capital began to flow out of China rather than in. Perhaps investors were beginning to

conclude that the period of export-driven super-high growth in China was coming to an end. By mid-2014, China was running a deficit on the overall balance of payments. This meant that it was no longer gaining reserves—intervening to resist market-driven appreciation as it had over the decade 2003–13. Rather, in July 2014 the People's Bank of China started to lose reserves, intervening to resist market-driven depreciation.

Despite this sea change in China's external accounts, some Americans continued to worry about Chinese currency manipulation. They continued to ask that China move toward a market-driven exchange rate and that it appreciate its currency, failing to notice that these two requests had become contradictory under the new circumstances. For a few days in August 2015, the Chinese authorities allowed the exchange rate to move more strongly in the direction that the market was pushing—precisely as the Americans had been long asking. Unsurprisingly, the result was a depreciation of the renminbi against the dollar. Even with this demonstration that their thinking had gone wrong somewhere, American politicians continued to accuse China of keeping its currency artificially low and continued to demand that President Obama negotiate enforceable prohibitions on currency manipulation in international agreements.

3.2. "Competitive Appreciation" Game

Fears at times that countries are keeping their interest rates too low or otherwise seeking to depreciate their currencies have a mirror image in fears at times that countries are keeping their interest rates too *high* or otherwise seeking to *appreciate* their currencies. We now consider this case.

3.2.1. Concerns that Monetary Policy Is Too Tight

Sometimes concerns about lack of cooperation in monetary policy take the form of fears that U.S. monetary policy is too tight and that there is unwelcome downward pressure on nondollar currencies. Consider what provoked Reserve Bank of India Governor Raghuram Rajan to make the 2014 complaint that appears in epigram form at the top of this paper. In the aftermath of the 2013 "taper tantrum," he was displeased at spillover effects on emerging markets resulting from a Fed exit out of QE and an increase in U.S. longer-term interest rates:

> *Central banks should assess spillover effects from their own actions...*
> *For example, this would mean that while exiting from unconventional policies, central banks would pay attention to conditions in*

emerging markets . . . [T]he Fed policy statement in January 2014, with no mention of concern about the emerging market situation, and with no indication Fed policy would be sensitive to conditions in those markets sent the probably unintended message that those markets were on their own. (April 10, 2014)

Fears of the coming Fed decision to raise U.S. short-term interest rates continued to afflict emerging markets in 2014 and 2015: lower EM equity prices, bond prices, currency values, and dollar commodity prices.[26]

One can see in history the reason for concern. The Volcker tightening of 1980–82 helped precipitate the international debt crisis of 1982, and the Greenspan tightening of 1994 helped precipitate the Mexican peso crisis later that year.[27] In response to such crises, cooperation might call for generalized monetary ease, in the manner of simultaneous interest rate reductions of 1987 (post stock market crash), 1998 (post Asia crisis), and 2009 (post global financial crisis).

Rajan's 2014 worry that Fed tightening would hurt emerging markets is in some sense the opposite of the Brazilian complaint in 2010 about spillover effects of *loose* U.S. monetary policy. That doesn't necessarily make either one of them wrong. Both could be right: The externalities could run in different directions at different times. Low U.S. real interest rates contributed to EM flows in the late 1970s, early 1990s, and early 2000s, before they once again did so in the aftermath of the 2008–09 global recession. Each was followed by crises in some emerging markets. Perhaps it is the complete cycle, alternating credit boom and bust, that is the problem.[28]

There are historical precedents among advanced countries as well for concerns regarding an increase in U.S. interest rates and a resulting appreciation of the dollar. The fear used to be that the U.S. tightening would come at the expense of exporting inflation to other countries. This was one interpretation of the strong dollar in the early 1980s, which provoked complaints among trading partners and eventually led to one of the most renowned coordination agreements: the Plaza Accord of September 1985, in which G-5 ministers agreed to bring the dollar down.[29]

What had been the motive in the early 1980s for keeping interest rates high? Countries might have a variety of motivations for seeking to attract foreign capital and appreciate their currencies—for example, to ward off speculative attacks when there is a general contagion in global financial markets. At the time of the early 1980s, the policy priority was to bring down inflation.

A monetary contraction that appreciates the currency is particularly helpful at putting downward pressure on the consumer price index through lower prices of commodities and other imports.[30]

Of course it is not possible for every country to raise its interest rate above everybody else's to attract a net capital inflow or to appreciate its currency. The outcome of attempts to do so might be a world with too-high interest rates. The corresponding 2×2 game is illustrated in Table 4. In this telling, cooperation consists of an agreement to simultaneously lower interest rates.

For a graphical illustration of the competitive appreciation game, return to Figure 2, with the axes defined as the domestic and foreign interest rates. At the noncooperative point N, everyone's interest rate is too high. Coordination consists of everyone agreeing to cut interest rates.

Why did the United States agree to cooperate in bringing down the dollar in 1985, whereas it had rebuffed European requests for cooperative foreign exchange intervention at the Versailles and Williamsburg G-7 summit meetings in the preceding years? One answer is that the new Secretary of the Treasury, James Baker, was more open temperamentally to the idea of international coordination than his predecessor, Don Regan (and the Under Secretary of the Treasury, Beryl Sprinkel). But another answer is that Regan and Sprinkel did not believe in a model in which the strong dollar and U.S. trade balance were affected by U.S. monetary policy, fiscal policy, or foreign exchange intervention or even that the trade deficit was a problem. Their view was that the trade deficit and its counterpart, the net flow of capital to the United States, were instead the result of a favorable national climate for market capitalism under President Ronald Reagan; that it was therefore a good thing; and that in any case sterilized foreign exchange intervention has no effect on the exchange rate.[31] A third answer is that the domestic interest groups in the tradable goods sector which were hurt by the strong dollar did not succeed in making enough political headway to force an accommodation until 1985.[32]

TABLE 4
The "Exporting Inflation" or Competitive Appreciation Game

	U.S. raises interest rates	U.S. keeps interest rates low
Other country raises interest rates	Noncooperative equilibrium: High interest rates everywhere. The world remains stuck in recession.	Dollar depreciates, raising U.S. CPI inflation.
Other country keeps interest rates low	Dollar appreciates, lowering U.S. CPI inflation at the expense of other countries.	Cooperative equilibrium: Low interest rates everywhere. Exchange rates unchanged, but growth is sustained.

As in the case of the locomotive game, fiscal discipline game, and competitive depreciation game, the success of the Plaza initiative in 1985 had as much to do with changes regarding which domestic interest groups and which perceptions held sway as it did with a Nashian triumph of cooperation over international fractiousness.

4. Do We Really Need International Policy Coordination?

It was suggested in Section 3.1.3 that floating exchange rates could allow each country to choose whatever monetary policy it deems appropriate for its own economy and, thus, render international monetary coordination unnecessary. This long-standing textbook proposition, originally proclaimed to a skeptical world by Friedman (1953), has recently been challenged anew.

4.1. Trilemma or Dilemma?

The international economists' framework of the trilemma, or impossible trinity, says that countries can have monetary independence if and only if they are willing either to give up financial integration or to give up a fixed exchange rate. The logic is that with full financial integration and full currency integration, a small country has to accept that its interest rate will be dictated by the foreign interest rate. But if the exchange rate floats, the claim is, a country can choose its own monetary conditions, and international coordination may not be necessary (e.g., Bénassy-Quéré et al. 2014). For example, floating-rate Poland was apparently insulated from the foreign shock of 2008–09, in contrast to the fixed-rate Baltic countries.

The impossible trinity has recently been challenged by Rey (2015). She points out that floating rates have not been sufficient to insulate other countries from a global financial cycle originating in financial shocks in U.S. interest rates[33] or investor attitudes toward risk.[34] When the Fed raises interest rates, interest rates in other countries go up as well.[35] International monetary policy coordination would be one way to address this problem. (Rey herself views coordination as "out of reach" in practice.[36])

In other new theoretical models as well, capital market imperfections may prevent floating rates from performing the shock absorption role claimed in traditional macroeconomic analysis.[37] Some find that in such circumstances capital controls or macroprudential regulatory policies can be welfare improving. But macroprudential policies may themselves need to be coordinated internationally.[38] The tightening of capital requirements or other regulations on domestic banks in one country may cause a "leak" abroad, in the sense that some of the projects that might previously have been funded by domestic banks may now

be financed from abroad.[39] This suggests one justification for capital controls. Engel (2015b) concludes that the leakage may call for international coordination of macroprudential policy, as under the Basel III agreement.

Others have responded to the attack on the trilemma. Klein and Shambaugh (2015) adduce evidence supporting the traditional view that "a moderate amount of exchange rate flexibility does allow for some degree of monetary autonomy, especially in emerging and developing economies." Di Giovanni and Shambaugh (2008) find that, while foreign interest rates have a negative impact on domestic gross domestic product (GDP) in pegged countries, flexible exchange rates insulate against them. Aizenman, Chinn, and Ito (2010, 2011) find that exchange rate stability is associated with less monetary independence and more output volatility. Obstfeld (2015) finds that the correlation between local and U.S. short-term interest rates falls to zero for countries with flexible exchange rates.

The proposition that a floating exchange rate fully insulates a country from foreign shocks is a straw man. It is true that the property may hold in a textbook model without financial integration. The reason is that trade surpluses and deficits are the most fundamental channel of transmission across countries; but if there are no private capital flows and no official reserve transactions, then the exchange rate adjusts to make sure that the trade balance is continuously zero. This textbook theorem is a straw man in that no country is in fact cut off from capital flows. For this reason alone, it would be hard to find an economist who claims that a floating rate guarantees that a country will feel no impact from external shocks.

The important question is not whether a floating rate is sufficient to insulate a country's economy from foreign shocks if its policymakers are passive. A more important question is rather whether floating offers enough independence that the officials, *after adjusting their policy settings in response to the shock,* can attain their objectives as well as before the shock.

Even this is a bit of a straw man. An external shock like the global financial crisis or some other "risk-off" shift in financial markets may well hit every country, regardless of its exchange rate regime. But the question for coordination is whether the big players like the United States or the euro zone or China would set macroeconomic policies differently if they were taking into account the interests of other countries than they do in the pursuit of their own economic interest. Strong economic performance in the big countries usually benefits the rest of the world as surely as it benefits themselves.

4.2. Targets and Instruments

This leads to the task of counting policy instruments and policy goals. A well-known theorem says that a country in general can attain its goals if it has as many independent policy instruments as it has goals. Assume first that the country has a single instrument, namely monetary policy, and a single goal, namely internal balance—defined as output at potential, unemployment at the natural rate, or inflation at its target. Then a floating exchange rate allows it to achieve its goal better than a fixed rate. Even when impacted by a foreign shock, the country can adjust its monetary policy setting so as to achieve a desired level of overall demand, output, and inflation.

That reasoning, however, assumes that the country does not care about the composition of output between the sector that is sensitive to domestic demand (particularly as reflected in the interest rate) and the sector that is sensitive to net foreign demand (particularly as reflected in the exchange rate). Assume now that the country has a second goal: external balance, as defined by a target for the trade balance (or it could be the balance of payments). In this case the single monetary policy instrument is not enough to achieve both goals.[40] A case for coordination of monetary policy then stands, in theory. But one must ask how important the trade balance spillover effect is in practice, if neither officials, nor citizens, nor economists and their models agree on what is the sign of the effect of monetary policy on the trade balance. We don't know if the exchange rate effect is larger or smaller than the spending effect. Thus each country doesn't really know if it should want its neighbors to adopt looser or tighter monetary policies. We saw similarly in Section 2 that countries disagree as well over whether fiscal stimulus is a virtue or a vice.

4.3. Different Models, Different Interest Groups

The wide range of models wreaks havoc with international coordination in a number of ways. First, if different countries have fundamentally different models in mind, the officials might not even be able to carry on a coherent discussion of the potential gains from coordination and how to achieve them. In graphical terms, if one negotiator sees the world in terms of Figure 1 and the other in terms of Figure 2, they don't even understand why their interlocutors are making the proposals they are making, since they seem to leave everybody worse off. (Think of the dialogue of the deaf between the government that was elected in Greece in January 2015 and its euro partners.) It is good for them to talk, in part because exchanging views makes it more likely that they will improve their

perceptions. But it is not likely that they will be able to come to an agreement unless it is phrased so vaguely that everyone can interpret it as they want.[41]

Second, the existence of such a wide variety of models forces us to confront the likelihood that any given model is very likely to be wrong. Negotiators will be able to come up with a coordinated package of policy changes that each believes will leave their own country better off, and perhaps will be able to ignore that they don't understand why the other side wants to make the deal. Under these conditions, international coordination can take place. But it could make things worse—when it moves policy settings in the wrong direction—as easily as better.[42]

The optimistic view is that officials may narrow the differences in their perceptions if they come together to negotiate. But this hope should be counterbalanced by a pessimistic possibility: Model perceptions could be endogenous with respect to interests. As Ostry and Ghosh (2013) point out, each country has an incentive to claim to believe in whatever model suits its interest in the bargaining process. (If Germany, for example, wants to maximize the amount of demand for its goods that comes from abroad rather than domestically, it suits its purposes in international discussions to subscribe to a model in which fiscal expansion has little effect.) Officials may genuinely come to believe the models that suit their positions; the psychologists would call this a desire to avoid cognitive dissonance. In this way international negotiations could actually harden differences in perceptions.

Even aside from international differences in perceptions, disagreements among domestic interest groups can also wreak havoc with the basic theory of international coordination. Within each country the interests of the tradable sector—which usually means manufacturing and agriculture—may be in opposition to the interests of other sectors. A country may suffer from excessive budget deficits due to a failure of political economy. The consequent crowding out of the private sector may take place not only via a higher interest rate and its negative effect on domestic demand but also via an appreciation of the currency and a loss in net exports. The tradable sector will complain that foreign currencies are undervalued. But talk of unfair currency manipulation by foreigners or currency wars is likely to be unproductive in this case. It may prevent a meaningful domestic discussion over the fundamental problem, the budget deficit.

Consider the complaints of the tradable sector in Brazil when the currency *(real)* was so strong in 2010. The country's leaders naturally found it easier to blame the capital inflow and strong *real* on easy monetary policy on the part of a Federal Reserve that was heedless of international spillover effects than to admit that its own fiscal policy was too loose and that the interest rate, capital

inflows, currency appreciation, and trade deficit were natural concomitants. It would have been better to have a clear understanding and debate domestically about the tradeoffs than to call for international coordination.

Or consider more recent complaints of the auto industry in the United States about unfair currency manipulation by major trading partners. Associated efforts in the U.S. Congress to put prohibitions on currency manipulation into international trade agreements may be misguided. Supporting the idea that the problem may lie in perceptions is the fact that some proponents do not seem to understand that the Bank of Japan, the European Central Bank, and (since mid-2014) even the People's Bank of China have not in fact been intervening in the foreign exchange market to depress the value of their currencies.

These and other examples undermine the calls for international coordination. When two players sit down at the board, they are unlikely to have a satisfactory game if one of them thinks they are playing checkers and the other thinks they are playing chess.

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NOTES

1 See, for example, Feldstein (1988), Fischer (1988), Frankel (1988), Ghosh and Masson (1988), Kehoe (1987), Oudiz and Sachs (1984), Rogoff (1985), and Tabellini (1990).

2 See Group of Seven (2013).

3 See, for example, Blanchard, Ostry, and Ghosh (2013), Eichengreen (2014), Engel (2014, 2015a), Ostry and Ghosh (2013), Subacchi and Van den Noord (2012), and Taylor (2013, 2016).

4 The seminal early applications of basic game theory to international macroeconomic policy coordination were by Cooper (1969) and Hamada (1976). The rise of game theory was to produce a number of Nobel Prizes in Economics, notably that awarded to John Nash in 1994.

5 Ilzetski and Jin (2013) argue that international transmission from the United States to the rest of the world has mysteriously switched sign in recent years. Kalemli-Ozcan, Papaioannou, and Perri (2013) see the sign of the transmission as different during periods of financial crisis such as 2008–09 than during normal times.

6 Branson and Rotemberg (1980) attributed the gap in understanding to a German perception that their aggregate supply curve was vertical, possibly because of institutions that made real wages rigid. Among the other reasons why some don't believe that fiscal expansion leads to higher income are Ricardian equivalence, import leakage, crowding out via higher interest rates, and loss of creditworthiness.

7 See, for example, Aizenman (1998).

8 See, for example, Glick and Hutchison (1993).

9 Guiso, Herrera, and Morelli (2016) document basic cultural differences between Germans and Greeks in perceptions regarding cheating.

10 They may not even agree on what are their current policy settings. In 2009, for example, Germany saw its fiscal stance as already more expansionary than the United States saw it, because a stronger social safety net gives Germany bigger "built-in stabilizers" than the United States, and hence more countercyclical fiscal policy, even before any deliberate shifting of spending or tax policy levers. This is another of many examples of differences in perceptions.

11 The stimulus seemed to pay off at first, with a rapid return to positive gross domestic product (GDP) growth in 2013. Growth again turned sharply negative in the second quarter of 2014, but a rise in the consumption tax seemed the obvious culprit.

12 In particular, Ford Motor Company (Bergsten 2016).

13 China is of course a more common target of allegations of unfair currency manipulation, although it is not in the TPP. The renminbi depreciated against the dollar during 2014–15. But this depreciation was the result of a slowing Chinese economy, monetary stimulus, and capital outflow, and not the result of intervention by the People's Bank of China which (since June 2014) has supported the currency rather than vice versa. Thus China during the year 2014–15 has been the fourth example in the sequence of the United States, Japan, and the ECB. China is considered in a separate subsection because it is so widely criticized for intervening to keep the value of its currency down, which is what it had done massively during the preceding ten years.

14 See, for example, Blanchard et al. (2015).

15 See, for example, Taylor (1985, 2016).

16 Monetary theorists shifted in a few short years from considering Keynes's liquidity trap to be an irrelevant artifact of the history of thought to considering the zero lower bound to be virtually the defining characteristic of monetary policy in the wake of the global financial crisis.

17 See, for example, Caballero, Farhi, and Gourinchas (2015), Chinn (2013), Devereux and Yetman (2014), Engel (2014), Landmann (2015), and Portes (2012).

18 In some countries, especially emerging markets or developing countries, a depreciation of the currency has contractionary effects, which may be big enough to offset the expansionary switching effect on the trade balance. These include especially balance sheet effects (if the depreciating country has large debts denominated in foreign currency) and the effect on the local-currency price of oil or other imported inputs. If these contractionary effects of depreciation were important, it would seem to follow that an appreciation of other currencies—because the dollar is depreciating—would have expansionary effects on their economies. Beggar-thy-neighbor would be converted to "enrich-thy-neighbor."

19 See Eichengreen (2015).

20 See Eichengreen (2013).

21 In principle, Keynes got his way at Bretton Woods in one respect: the obligation is meant to fall on countries seeking to keep the values of their currencies down so as to preserve a balance of payments surplus, as much as on those seeking to keep the values of their currencies up thereby preventing adjustment of a balance of payments deficit. International Monetary Fund (2006, p. 15): "The term 'in order to prevent balance of payments adjustment' is sufficiently broad to cover situations where a member is manipulating its exchange rate in a manner that makes it either overvalued or undervalued." In practice, however, the economic and political pressure on a surplus country to adjust its currency upward has always been far less than the pressure on a deficit country to adjust its currency downward.

22 Frankel and Wei (2007) consider U.S. pressure on China that began in 2003 regarding the exchange rate.

23 See, for example, Goldstein and Lardy (2005). China is not the only one. Ted Truman coined the phrase "competitive non-appreciation" to describe the noncooperative equilibrium in which countries intervene to prevent market-driven appreciation of their currencies, but are not actually depreciating.

24 See, for example, Frankel (2006) and Subramanian (2010).

25 See Kessler and Subramanian (2014).

26 U.S. monetary tightening is more likely to have a contractionary effect on floating-rate EM economies if they have previously incurred dollar-denominated debt, because depreciation of their currencies against the dollar has an adverse balance sheet effect. The lesson to avoid dollar-denominated debt is one that many of them learned from the crises of the 1990s. A much more general lesson is the admonition that each country should "get its own house in order."

27 This was just as Calvo, Leiderman, and Reinhart (1996) had predicted. The annual spillover report of the International Monetary Fund (2015a, pp. 6–16) considers the impact of U.S. interest rates and exchange rates on others.

28 See Rajan (2015).

29 For a consideration of the Plaza Accord on its 30th anniversary, see Frankel (2016) and other papers written for a conference on that occasion.

30 Thus Sachs (1985) interpreted high interest rates and the strong dollar in terms of the competitive appreciation game.

31 On this last point in particular, a fair number of economists would support their position. There is as little agreement today on whether sterilized foreign exchange intervention can affect the exchange rate as there ever was, although that seems surprising in light of recent concerns over currency manipulation by China and other emerging market countries.

32 Manufacturing and agriculture interests had been complaining about the strong dollar for several years. Their complaints and support in Congress for action to protect them reached a high pitch in 1984–85. It is not quite as obvious who were the interest groups on the opposite side from the strong-dollar complaints of the tradable sector. But it has been suggested that the sectors arrayed in support of the status quo included the banking and financial sector, the real estate sector, and the defense community. See Frankel (1994, pp. 321–327), and Frieden (1991, p. 448).

33 See Agrippino and Rey (2014).

34 See Forbes and Warnock (2012).

35 Among many references, see Edwards (2015) and Frankel, Schmukler, and Servén (2004). Even countries that claim to float may in fact care about the exchange rate objective and so choose to tighten when the Fed tightens.

36 She therefore favors restoring a measure of independence by capital flow management tools, that is, capital controls or macroprudential regulation or both.

37 See, for example, Farhi and Werning (2014).

38 See Jeanne (2014).

39 See Aiyar, Calomiris, and Wieladek (2012).

40 What if the country also has a second instrument, such as fiscal policy? That will work for a single country: two instruments can achieve two goals. But of course one country's trade surplus is someone else's deficit. If two countries have inconsistent goals for the same trade balance numbers, no amount of policy instruments will solve the problem. The best that can be done in a world of n countries is to observe that $n-1$ (smaller) countries can each achieve their trade balance goals if the nth country (the United States, as conceived under the Bretton Woods system) is willing and able to be the residual.

41 Cooper (2001) has pointed out, by way of precedent, that countries in the 19th century were unable to agree on any sort of international cooperation regarding public health (e.g., procedures for quarantines) until they eventually came to believe in a common model of disease (human contagion).

42 See Frankel and Rockett (1988).

COMMENTARY
International Coordination

Charles Engel

There have been increasing calls for international monetary and fiscal policy coordination. Notably, for example, Raghuram Rajan, who heads the Reserve Bank of India, has recently made the case that central banks in the large, high-income countries need to take into account the effects of their policies on emerging markets. It is a pleasure to read and discuss this paper by Jeff Frankel. The paper makes many important observations, but the chief point is that there is disagreement about models, which leads to disagreement about the nature of spillovers of policy.

Part of the discussion in this paper pertains to fiscal policy. Frankel observes that according to some models, in equilibrium, noncooperative policy is too contractionary. Positive spillovers are not as great as they could be because countries are concerned about trade deficits. But some believe that the noncooperative policy equilibrium is too expansionary. Countries run deficits that are too large because they do not take into account the externality that if their debt is too large, some other country or international organization will have to bail them out.

My comments will focus on the discussion of monetary policy coordination. Here the conflict is that, on the one hand, some models imply the noncooperative monetary policy game leads to a monetary stance that is too expansionary. If countries engage in a currency war, then there ends up being no effect on the exchange rate—the efforts of the policymakers cancel out. But while the exchange rate remains unaffected in equilibrium, monetary policy has become overly expansionary. On the other hand, some contend monetary policy ends up being excessively contractionary when there is no coordination. Policymakers become too concerned about inflation, but ignore spillovers—for example, the fact that the reduction in aggregated demand in one country reduces import demand from other countries.

We can all agree that examining the benefits of cooperation is very difficult. The lessons we learn are very much model dependent. Indeed, I am willing to advance two propositions:

Proposition 1: No analysis of the gains from cooperation in a particular model is general enough to be useful.

Proposition 2: Nothing that can be said about cooperation that is general is useful.

Nonetheless, in these comments, I will begin with a series of general observations that I believe we all agree on. By Proposition 2, they are useless. Then I will make a somewhat new observation, but the reader should be warned that it is likely to be subject to the two propositions.

Comment 1: Suppose, as an example, home and foreign policymakers target output, y and y^*. Their targets are $\bar{y}$ and $\bar{y}^*$. Suppose also that they each have an effective instrument, m and m^*. Because we are talking about strategic policies and the possible gains from cooperation, we can assume that there are spillovers so output in both countries depends on policies set in both countries:

$$y = F(m, m^*) \qquad y^* = G(m^*, m).$$

In this case, there should be a set of policies m and m^* that achieve $\bar{y}$ and $\bar{y}^*$. There is no need for cooperation. Each policymaker adjusts her instrument until she achieves her target. And so, Frankel's critique does not apply in this case. There is no need for agreement on the model.

What I have in mind here is the case of competitive devaluation, or currency wars. If each country has a target for output or aggregate demand, and that is their only target, and each has a valid policy instrument, then each should be able to adjust the instrument to achieve their desired target, irrespective of what happens to the exchange rate. For example, suppose that the Federal Reserve expands, and the dollar depreciates relative to the Brazilian *real*. Perhaps that has a contractionary effect on the Brazilian economy. (Or perhaps the monetary expansion in the United States has a positive spillover on the Brazilian economy through the income effect that generates greater demand for Brazilian imports in the United States.) The Banco Central do Brazil can alter its monetary policy to achieve its desired level of aggregated demand. That might in turn have spillover effects back onto the United States, but by successive adjustments, both countries can achieve their desired target using their monetary instrument.

Comment 2: The problem arises when there are more targets than instruments. For example, a country may have both an inflation and an output target, and it cannot simultaneously hit both if they have only a single instrument (perhaps a monetary-policy-controlled interest rate). Alternatively, they might have a target for capital flows, the current account, financial stability, or maybe all of these things.

In this case, spillovers from policies in another country may affect the trade-off. The problem, and the potential need for cooperation, arises when the spillovers negatively affect the tradeoff. Even so, first, the gains from cooperation may be small, as Obstfeld and Rogoff (2002) have argued. Second, policymakers might disagree on the model. Especially if the posterior beliefs of policymakers are not much influenced by the data, there may be little point in setting up a mechanism for formal cooperation. That is one of Frankel's main points.

Comment 3: Nothing that I have said so far presumes that the exchange rate is a target of the strategic policymaker. There may be spillovers from exchange rate movements even if policymakers are targeting a domestic aggregate. If the United States needs to expand aggregate demand, expansionary policy may cause the dollar to depreciate even though the United States is not explicitly targeting the value of the dollar. The exchange rate may actually be the target of policymakers at the Fed or the European Central Bank, but they generally deny that. Instead, the exchange rate is said to be an endogenous variable that changes when the policymaker alters its instrument in order to hit its target.

As Frankel notes, even if monetary policy in one country has effects on the exchange rate, that is not the only channel of spillovers. Some channels may work in the opposite direction of the currency effect. Expansionary U.S. monetary policy may lead to dollar depreciation which generates negative aggregate demand spillovers, but the positive effects of higher U.S. income on import demand work in the opposite direction. There may also be influences through capital flows—lower U.S. interest rates may lead capital to flow abroad, which may have or may not have salutary effects on the recipient country.

So, in order for cooperation to be the right prescription, three criteria have to be met. First, spillovers have to lead to worse outcomes in other countries. Second, domestic policies must not be able to correct fully for these negative spillovers. And, third, there must be gains from cooperation that are quantitatively reasonably large in order to justify the costs (which may be primarily political) of setting up a mechanism for cooperation.

Comment 4: Here, I would like to characterize comments that have been made by some Fed policymakers. I will refrain from identifying them, and I will not quote directly. The following paraphrase, in fact, is more of a caricaturization than a characterization, but it captures the point I want to make. The hypothetical typical comment is: "Our legal mandate is to achieve low inflation and high employment. We use our policy instruments to achieve those goals. We don't pay attention to the rest of the world—that is not our mandate. So we are not engaged in non-cooperative policy."

This is the sentiment that some policymakers in the United States seem to want to convey, but this is precisely a description of noncooperative or strategic policy. The policymaker takes into account only his own goals and ignores the spillovers on the rest of the world. Noncooperation does not mean that one policymaker is obstinate, or evil, or deliberately working to harm other countries. It simply means that the policymaker is ignoring the spillovers.

Why should the Fed cooperate if its mandate is to achieve inflation and unemployment targets for the United States? It does not have a mandate to care about conditions in the rest of the world. But precisely the point of cooperation is that it can help a country achieve its own goals more effectively.

Comment 5: Does the zero lower bound (ZLB) imply there is no scope for cooperation? When we are at the zero lower bound, does that leave currency depreciation as the only channel through which monetary policy can reflate?

As Frankel points out, the ZLB does change the mechanism, but there are still channels through which monetary policy can affect the economy. For example, quantitative easing appears to have lowered long-term interest rates in the United States and perhaps boosted the stock market. And, of course, fiscal policy remains as a potential instrument even at the ZLB.

Caballero, Farhi, and Gourinchas (2015) develop a full-fledged dynamic stochastic general equilibrium model that examines spillovers and monetary policy at the zero lower bound. Let me make some observations based on a much simpler model that I presented in Engel (2016), which is essentially an open-economy version of Nagel (2015) embedded in a New Keynesian framework. In this simple setup, there are near-money assets, such as Treasury bills, that have a liquidity return. These assets are liquid because they might be useful as collateral, or can be used to meet balance sheet requirements for financial institutions.

The mechanism of the model is quite simple. These near-money assets pay a liquidity return in addition to any actual pecuniary return they offer. Even if the pecuniary return is zero because the country is at the ZLB, there remains the nonpecuniary return. The public holds a portfolio of assets—money, near money, and assets that don't pay a liquidity return. Quantitative easing cannot lower the interest rate on near money when we are at the ZLB, but it does reduce the liquidity return. Near money is less useful than actual money, so the liquidity value of near money decreases under quantitative easing as the public holds more actual money. In turn, the demand for other assets rises when the liquidity return on near-money assets falls, which pushes down their return and has an expansionary effect on the economy.

Main Observation: The main point that I want to make here is that the objectives of the global policymaker may not simply be the sum of the objectives of the individual policymakers (depending on how those objectives are expressed). For example, the Fed may have a target for inflation and output, and may wish to minimize some weighted sum of those targets. Perhaps it has other objectives as well. Other countries may have similar policy goals. But from a global standpoint, the objective of maximizing the welfare of households throughout the world might not be expressed simply as the sum of the objectives of each national policymaker.

Here is an example that should be familiar to anyone who has taken a good undergraduate international trade class. We know that in a simple neoclassical model of trade in which each country has economic power in the global market for its export, there is an optimal tariff that allows the country to achieve its terms of trade objective. For example, think of a stylized two-country world. Let the variable t stand for the home country's terms of trade—the price of its export relative to its import. It may use tariff policy to try to raise its terms of trade on global markets. Perhaps we could characterize its policy objective as trying to minimize the square of the gap between the actual terms of trade, t, and the optimal target for the terms of trade, t_h. In other words, the home country's objective is to minimize $(t - t_h)^2$.

In a "tariff war," the foreign country also has a target for the terms of trade, t_f. It will be the case that $t_f < t_h$, because the foreign country prefers a higher price for its export. We can characterize the foreign country's objective as one of trying to minimize $(t - t_f)^2$.

From a global perspective, there is an optimal terms of trade, t_w, that lies in between the targets of the home and foreign policymakers: $t_f \leq t_w \leq t_h$. The global or cooperative policymaker wants to minimize $(t - t_w)^2$, and of course in a simple model, free trade is the policy that achieves the minimum. My point is that the global policymaker's objective function cannot, in general, simply be expressed as the sum (or weighted sum) of the objectives of the policymakers in each country: $(t - t_w)^2 \neq (t - t_h)^2 + (t - t_f)^2$.

The point carries over to monetary policy. In particular, the global policymaker might be concerned about global misallocation of resources, but that is not necessarily a particular concern of each national policymaker.

It may be helpful to do a quick review of the New Keynesian approach to monetary policy to shed some light on this point. One of the key differences between old-style Keynesian economics and the new style is the approach to monetary policy. In New Keynesian economics, monetary policy is thought of

the way the field of public finance has attacked optimal tax policy. Policy should be aimed at reducing distortions, and the policy objective can be characterized by the weight that each distortion should take on in the policymaker's loss function. In the monetary policy literature, distortions may arise from price stickiness, monopoly power, wage stickiness, credit constraints, etc.

Here is an example from a simple closed-economy model. The policymaker wants to maximize expected utility of a representative household, which depends on consumption and leisure:

$$E_t \sum\nolimits_{j=0}^{\infty} U(C_{t+j}, L_{t+j}).$$

One of the great achievements of this literature has been to show how, at least in some simple cases, we can rewrite the objective function of the policymaker as a loss function, expressed in terms of macro aggregates:

$$E_t \sum\nolimits_{j=0}^{\infty} V(y_{t+j} - \bar{y}_{t+j}, \pi_{t+j} - \bar{\pi}_{t+j}).$$

Here $\bar{y}_{t+j}$ and $\bar{\pi}_{t+j}$ are output and inflation levels in an efficient economy, and are the targets of monetary policy. This way of representing the objective function is appealing both intuitively and as a pedagogical device.

Now consider a global economy made up of two countries. It is reasonable to state the objective of the global policymaker as a weighted sum of home and foreign expected utility:

$$\omega E_t \sum\nolimits_{j=0}^{\infty} U(C_{t+j}, L_{t+j}) + (1-\omega) E_t \sum\nolimits_{j=0}^{\infty} U^*(C_{t+j}^*, L_{t+j}^*).$$

However, it does not generally follow that the objective of the global policymaker can be rewritten as a weighted sum of the same loss functions that hold for each individual policymaker:

$$\omega E_t \sum\nolimits_{j=0}^{\infty} V(y_{t+j} - \bar{y}_{t+j}, \pi_{t+j} - \bar{\pi}_{t+j}) + (1-\omega) E_t \sum\nolimits_{j=0}^{\infty} V^*(y_{t+j}^* - \bar{y}_{t+j}^*, \pi_{t+j}^* - \bar{\pi}_{t+j}^*).$$

The analogy to the case of the optimum tariff and the tariff war applies here—that there may be global considerations that are different than those expressed in the sum of the loss functions for each policymaker under strategic policy setting. Intuitively, each country's loss function does not include the spillover, or loss imposed on the other country.

An important example of what might matter from the global perspective is currency misalignment, which I have written about in Engel (2011). Suppose both countries were producing at full employment and had zero inflation. Why would we care about currency misalignment? With local-currency consumer price stickiness, consumers in different countries could be paying very different prices for identical or near-substitute goods. It is inefficient to have pricing to

market—consumption can be reallocated to improve global welfare when prices paid by consumers in different countries are out of line. For example, the purchasing power of U.S. consumers has dropped 20 percent relative to European and Japanese consumers in the past year. The reason for this has little to do with the cost of delivering the goods to these consumers. It is the combination of the effects of nominal exchange rate movements that respond quickly to news about monetary policy or other macro events, and sticky prices in the consumers' currencies. With nominal wage and price stickiness, production patterns may also be misaligned. For example, with a weak euro, German exporters may be advantaged relative to U.S. firms. The U.S. economy may then tilt too much toward nontraded goods and services.

To reiterate, in the end, policymakers care about the welfare of individuals. From the New Keynesian perspective, loss functions are a convenient, intuitive way to summarize utility. While global welfare is a weighted sum of each country's welfare, global losses are not necessarily a weighted average of each country's losses. There are global distortions, in other words. These are things that matter for global welfare, but no country finds it in their individual interest to target. This is a key point that is missing from Frankel's discussion (as well as many other recent discussions, such as Bernanke's (2015) Mundell-Fleming lecture).

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COMMENTARY
International Coordination

J. Aizenman

Overview

The paper provides an insightful synopsis of the history of international economic cooperation from the Great Depression, analyzing episodes where countries behaved cooperatively or noncooperatively in two international fiscal games and two international monetary games.

The fiscal games are as follows:

1 **The "locomotive game":** The superior cooperation outcome means coordinated fiscal stimulus expansion of countries in recessionary times, inducing positive spillover effects, and increasing the GDP of countries without increasing their trade surpluses. The noncooperative outcome is the "beggar-thy-neighbor" equilibrium inducing deeper global recession, as would be the case when each country pursues a contractionary fiscal policy due to concerns associated with larger trade and fiscal deficits.

2 **The moral hazard game:** The superior cooperative outcome is an agreement on fiscal rules to eliminate moral hazard. The noncooperative outcome is when everyone runs excessive deficits because of possible anticipated bailouts, as may be the case in loose currency or fiscal unions.

The monetary games are as follows:

1 **The currency war game:** The cooperative equilibrium occurs when everyone agrees to refrain from currency warfare induced by loose monetary policy aimed at depreciating a country's currency in order to gain competitiveness and trade stimulus. The noncooperative outcome occurs when all countries follow an expansionary monetary policy, and thereby nobody achieves real depreciation or trade stimulus.

2 **The competitive appreciation game associated with interest rate setting:** The cooperative equilibrium implies low interest rates everywhere. Exchange rates stay unchanged, but growth is sustained. The noncooperative equilibrium occurs when monetary policy is too tight due to high interest rates everywhere, and the world remains stuck in recession.

The main lessons of the paper are as follows:
- Perceptions of the signs of spillovers and directions of coordination vary widely, inhibiting cooperation.
- The existence of different models and different domestic interests is as important as the difference between cooperative and noncooperative equilibria.
- Complaints about foreigners' actions and calls for cooperation may obscure the need to settle disagreements domestically.

Comments

A central policy lesson of this paper is that international cooperation is rare and occurs mostly in exceptional circumstances. Hence, countries should invest more in precautionary strategies and putting their house in order, in anticipation of trouble. My comments highlight first the rare conditions leading to international cooperation, next the obstacles preventing cooperation, and then conclude with policy implications.

Circumstances Leading to Greater International Cooperation

The rarity of international cooperation does not imply that such cooperation should be ignored. The first year of the global financial crisis (GFC) illustrates that exceptional circumstances may lead to needed and highly beneficial cooperation. This is in line with the view that in "normal times," associated with no bad tail events, the gains from cooperation have the size of Harberger's triangles, about 0.5–1 percent GDP points. These gains may not be worth the possible income redistribution effects, which may be of even larger magnitude than the efficiency gains from cooperation. In contrast, clear bad tail events that may cause the imminent collapse of financial markets would induce massive losses. Collapsing financial markets may terminate the entire Marshallian supluses associated with their normal operations, triggering global financial contagion in domestic and global networks, inducing costs of double-digit GDP points.

Thereby, in normal times, the cooperative solution is associated with welfare gains akin to Harberger's second-order magnitude triangles, hence the odds of cooperation are low. In circumstances of bad tail events inducing imminent and correlated threats of destabilization in most countries, the perceived losses have a first-order magnitude of terminating the total Marshallian surpluses. The looming threat may induce fiscal and monetary cooperation, as has been the case during the first quarters of the GFC. As a result, short of positively correlated impending threats, do not expect deeper cooperation. Yet, a key benefit of ex ante international cooperation may be reducing the probability

of tail events. This mission should be a top priority for international financial institutions (IFIs) and central banks (CBs). The benefits of such ex ante cooperation include setting swap lines and contingent credit lines, establishing leverage rules reducing the amplitude of credit cycles, and the like.

Achieving this cooperation cannot be taken for granted—ex ante cooperation should deal with complex moral hazard and agency problems. Furthermore, the benefits of such cooperation are easily overlooked, as the counterfactual—identifying all the tail events that were prevented—is hard to measure.

Obstacles Preventing Cooperation

The obstacles preventing cooperation may be hard to overcome. Status quo may reduce macroeconomic cooperation, both domestically and internationally. This is the case if policymakers and agencies take the view that "if it ain't clearly broken from my perspective, don't fix it." Frequently, new policies inducing welfare improvements raise income distribution concerns, triggering a possible war of attrition among key stakeholders, aiming at shifting the costs to others, and delaying cooperation. One expects that greater income inequality and polarization may intensify the incidence of wars of attrition delaying adjustment.

To illustrate, Eichengreen and Sachs's (1985) interpretation of the gains from competitive devaluation during the Great Depression is an example of a noncooperative outcome, leading over time toward an outcome akin to global coordinated monetary expansion. The delay in achieving this cooperative outcome may reflect the resistance of domestic powerful groups (e.g., "rentiers") to policies lowering interest rates, engaging in a war of attrition against interest rate cuts and monetary expansions.

Similarly, large fiscal and current account adjustments, frequently needed to stabilize developing countries, may be easier to achieve in countries with lesser polarization. South Korea improving its current account by about 13 percent GDP points in the two years following the Asian crisis is the exception. This was feasible in Korea but not in euro-area periphery countries in recent years, nor in most developing countries. Status quo bias may also explain the CBs' unwillingness to increase inflation targeting at times of global peril from 2 percent to 4 percent, as was advocated by Blanchard, Dell'Ariccia, and Mauro (2010).

Principal-agent, moral hazard, and political constraints matter, as they constrain the feasibility of ex ante cooperative arrangements and ex post stabilization efforts. The provision of swap lines by the U.S. Federal Reserve during the GFC is a prime example of international cooperation inducing first-order effects. Yet, the Fed extended these swap lines only to four emerging markets (EMs). The selectivity of these swap lines reflected the imminent cost to U.S.

interests following defaults of Mexican and Korean counterparties (Aizenman and Pasricha 2010). It also reflected the Fed's concerns that overextending such swap lines would be used by some to constrain the Fed's future independence. China does not face such constraints and is willing to supply swap lines to large groups of developing countries, including Argentina and other countries with a history of defaults.

Precautionary Policies

Developing countries and EMs are more vulnerable to adverse tail events. Their limited financial depth, limited ability to borrow in their own currency, possible history of defaults, and less developed institutions imply greater vulnerability. The scarcity of global cooperation at time of peril implies that emerging markets would benefit from building precautionary buffers, such as international reserves and sovereign wealth funds (SWFs) during tranquil times. The potency of these buffers is enhanced by policies aiming at reducing a country's balance sheet exposures. EMs should also strive toward deeper cooperation between their CB, SWF, and Treasury. The pioneering papers of Frankel (2011) and Frankel, Vegh, and Vuletin (2013) show that this can be done, Chile being a prime example.

Greater exchange rate flexibility is another margin of safety, mitigating the moral hazard game between the private sector (ignoring exchange rate risk) and the CB (that is expected to bail out systemic balance sheet exposure). These precautionary policies were tested by the GFC, with mixed outcomes, leading Rey (2013) to doubt the usefulness of exchange rate flexibility, reducing Mundell's trilemma into a dilemma between financial integration and monetary autonomy. Chances are, however, that the claims on the trilemma's death and the futility of flexible exchange rate regimes are exaggerated. An alternative take is that Mundell's trilemma morphed into a quadrilemma, where financial stability is a fourth dimension of desirable macro outcome. An economy that pursues greater exchange rate stability and financial openness faces a stronger link with the center economies (Aizenman, Chinn, and Ito 2015). Macroeconomic and financial vulnerabilities are significantly greater under less flexible exchange rate regimes—including hard pegs—as compared with floats. Although not especially susceptible to banking or currency crises, hard pegs are significantly more prone to growth collapses, suggesting that the security of the hard end of the prescription is largely illusory (Ghosh, Ostry, and Qureshi 2015). In this context, the quality of institutions matters: countries that constrain their balance sheet exposure keep benefiting from exchange rate flexibility. Macroprudential

policies and capital controls seem to significantly reduce the exchange market pressure, although the economic size of this impact is highly dependent on the institutional quality (Aizenman and Binici, forthcoming).

Latin American countries (LATAMs) may provide useful lessons. The GFC increased their exposure to larger and more volatile financial flows, which were followed in 2014 by LATAMs' collapsing terms of trade due to the drop in commodity prices. Yet, most LATAMs retained so far their resilience, helped by managed exchange rate flexibility and greater coordination between domestic institutions. Chances are that the flexibility of the exchange rate of Mexico and other Latin American commodity countries has so far prevented a balance of payment cum banking crisis, akin to those observed during the 1990s (the 1994–95 Tequila crisis in Mexico, the East Asian crisis of 1997–98, and the Russian and Brazilian crises of 1998–99). Exchange rate flexibility has other side benefits—reducing the exposure of countries to the Spanish syndrome of the 2010s, when the fixed exchange rate associated with being a euro-area member restrained Spain's ability to improve its competitiveness by means of nominal exchange rate adjustment, exposing Spain to destabilizing raises in its sovereign spreads, as was highlighted by the contrast between Spain and the United Kingdom (De Grauwe and Ji 2013). Indeed, LATAMs, Russia, and other commodity countries buffered the adverse commodity shocks of 2014–15 via their exchange rate depreciation, facilitating an easier adjustment in countries with limited balance sheet exposure, yet challenging countries with greater exchange rate exposure, Brazil being a prime example.

However, flexible exchange rate is not a panacea: among n flexible exchange rate currencies, at most only $n-1$ are independent. Size matters even under flexible exchange rate regimes. The weakening gains from exchange rate flexibility highlighted by Rey (2013) may be the outcome of the evolution leading to the GFC, when financial instability in the United States was transmitted globally due to global balance sheet exposure, as the U.S. global share in finance vastly exceeded its global GDP share. Yet, these factors do not negate the usefulness of exchange rate flexibility in dealing with terms-of-trade shocks, domestic disturbance, and other shocks. Indeed, the lesson of the 1990s has been that emerging markets covered the middle ground of Mundell's trilemma—controlled exchange rate flexibility and limited financial integration, retaining monetary independence. This configuration, properly buffered by precautionary policies (hoarding international reserves and controlling external borrowing) may be the second-best optimal response of countries to the limited efficacy of international coordination (Aizenman and Pinto 2013).

Conclusion

Frankel's contribution brings to the fore the scarcity of global cooperation and the need for countries to put their house in order. This does not negate the key importance of global cooperation in the aftermath of bad tail events that may induce a global depression. A key role of IFIs and CBs remains facilitating deeper ex ante international cooperation aimed at reducing the probability of such tail events. Time will keep testing the viability of such cooperation.

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International Coordination

Chair: Fernanda Nechio

Ms. Nechio: Questions?

Mr. Ostry: I enjoyed all of the presentations. I have questions for each of the speakers. Jeff, on the dialogue of the deaf, if people are not playing the same game, is there a role for some third party to explain the rules of the game to all of the players? And Charles, on your point about terms-of-trade manipulation, I didn't quite see what that has to do with the issue of policy cooperation. If people are manipulating the terms of trade, it seems to me that all you can do is try to prohibit that antisocial behavior. It wasn't clear to me that this involved any opportunity for policy cooperation. Lastly, Joshua, on the choice of fixed versus floating exchange rates, what about the middle ground with some currency intervention as a possible optimum for dealing with all the various shocks a country may face?

Mr. Fischer: I just wondered how what Charles talked about relates to Kindleberger's view that the global economic system doesn't work without a hegemon, since, Charles, what you said is that nobody's taking care of the system from the viewpoint of the system as a whole. In fact, I think Kindleberger's view was more about realpolitik, that is, the more powerful will decide what policies to follow. But there is another interpretation of why it's good to have a hegemon and that's to set up missing institutions to help maximize global welfare. And that's how it may well have been many decades ago.

Ms. Shirai: I have two questions for Professor Frankel. My first question is about the current difference in the monetary policy stances of Japan and the European Central Bank (ECB) on the one hand, and the United States on the other hand. This difference in monetary policy stances may actually contribute to the stabilization of the global economy and financial markets. In particular, the Federal Reserve is preparing to normalize its policy rate, and that will put upward pressure on global interest rates, while the Bank of Japan and ECB will continue to do quantitative easing, putting downward pressure on global interest rates. So in some sense the effects of these opposing monetary stances are offsetting and hence may contribute to global stability. Should this

be considered as an example of monetary policy cooperation or not? My second question is that, right now, the Bank of Japan and other central banks have currency swap arrangements with the Federal Reserve. This is not a form of direct monetary coordination, but it helped in the sense that, for example, during the 2010–12 European crisis when there was a shortage of U.S. dollars needed by European banks, the U.S. dollars provided by the Federal Reserve through the swap arrangements helped to stabilize the global financial market, because they prevented the European banks from massive selling of U.S. dollar assets and mitigated the stress on the European banking system.

Mr. Williams: First, I'd like to comment on what Joshua said—that policy coordination isn't a panacea. I'm really tired of everyone saying something isn't a panacea. I would like a panacea. So, could we come up with some panaceas? That would be really helpful.

The other comment I have is about Charles's discussion about the difference between the old Keynesian model versus the new Keynesian model. The latter thinks of optimal monetary policy as similar to a public finance problem where policy is used to minimize the effects of distortions. I think this is a great way to characterize monetary policy. In an *NBER Macroeconomics Annual* paper I wrote with several co-authors about 10 years ago, we were doing optimal monetary policy and basically characterized it as a public finance problem using monetary policy tools. But the thing that we learned from our analysis— and this is why I'm intrigued by what you say, though I'm not convinced how important it is—is that there may be many different distortions due to durable goods, sticky wages, etc., which break down the simple relationship between consumer welfare and a standard quadratic loss function of inflation and output gaps. These are Harberger triangles, and as long as you minimize the biggest welfare losses, you're down to very tiny welfare differences between different policies. So as long as you're tackling the big problems, how big of a benefit can there be from cooperation?

And my last comment is that I really liked the way Jeff highlights the point that labeling any policy differences as leading to currency wars is not the right way to think about differences in monetary policy or other policies. Bob Hall has on his website a request that all economists donate a dollar to a charity every time they talk about differences between freshwater versus saltwater economics. He says this is not a useful distinction. I would suggest we do the same, so that every time an economist refers to currency wars, they donate a dollar to charity.

Mr. Frankel: Great comments and questions. I did mean coordination is not a panacea. Floating is not a panacea. I actually have a theorem: I claim you cannot find that anybody, anywhere has used the word panacea unless it's preceded by the word "no" or "not." I'd be happy to see counterexamples. Also the word "silver bullet."

I agree we currently have global policy divergence. The United States has ended quantitative easing and everybody's expecting U.S. interest rates to go up, while interest rates and currency values are headed in the opposite direction in other countries because their economies are weaker. I think the world is operating as it should. Theory is being validated, because the U.S. economy is stronger and that's where interest rates are headed up and the dollar is appreciating. How often have developments matched up with textbook theory so well? Floating works: Each country can choose the policy that suits its domestic conditions. Even though the outcome may not always be perfect, it's working pretty well.

I would say about the swap arrangements that there are times when coordination is necessary, and crisis management is one of them. Without going into detail, I think that that's true both when preparing for crises ahead of time and when managing actual crises.

To Stan (Fischer): Whatever is the best regime or the best institutional approach to crisis management, I think that Charlie Kindleberger was right. You do need a hegemon, if only just to call meetings. If you're going to decide to fix exchange rates, if you're going to decide to float, if you're going to decide to have a trade agreement, someone has to call the meeting and propose what is the best coordination strategy. I think the United States' great contribution after World War II was its role in leading the effort to create new international institutions, such as the General Agreement on Tariffs and Trade, in order to set up a free trade system.

As for the International Monetary Fund (IMF), I'm getting to Jonathan Ostry's comment about the dialogue of the deaf and the possible role for some third party to mediate policy differences across countries. Perhaps he had in mind his own employer. And I think the answer to that is that the IMF does have a useful role. There is a real dialogue of the deaf in the example I gave of the new Greek government, which as of January 2015 was not speaking the same language and couldn't think the same thoughts as the Germans. I think they miscalculated badly. Everybody talked about how the finance minister was an expert at game theory, but he was playing a different game and his country has suffered for it! Tsipras, the prime minister, way overestimated how much

power he had and played the game wrong, I would say. That is a case where the IMF could play a useful role and is playing a more useful role as we go forward.

Ms. Nechio: So, we have time for a few more questions.

Mr. Engel: Let me first respond to Jonathan about my using terms-of-trade manipulation as an analogy for optimal policy coordination. I was trying to use it as an example of how the global policy objective may differ from the sum of individual country loss functions. To John (Williams), let me just say that I think everything is a Harberger triangle. And that was Lucas's point, that the costs of business cycle fluctuations are Harberger loss triangles. I also think Joshua is right that ultimately it's the tail risk you're most concerned about, and if you're trying to get big welfare effects, people have introduced utility functions where you really care about tail risk. To Stan, I don't think a global hegemon would go over very well in Congress, but Ben Bernanke was talking about all these central banker meetings held every month in Basel. I felt bad for him, but all I'm saying is that when Ben, Stan, or any other Federal Reserve official goes to those meetings, what ought to be on the table there is a global perspective on issues, such as currency misalignment, that may not be fully reflected from each individual country's standpoint.

Mr. Aizenman: I would like first to reply to Jonathan. I fully agree with you that the middle ground is the way to go, but I'm willing to push it further to address John's comment. My research on the trilemma with Chinn and Ito, and the history of emerging markets over the past 20 years suggests that, if there is any second-best panacea, it's for emerging markets to converge to the center of the trilemma configuration, by giving up some degree of exchange rate flexibility or capital account openness, depending on the relative magnitudes of domestic and foreign shocks.

   I cannot think of any large emerging market—i.e., with more than 10 million people—that has performed well in the last 20 years without being somehow in the trilemma middle ground. Allowing controlled exchange rate flexibility may also require being sensitive to the balance sheet exposure associated with foreign-currency-denominated debts.

Mr. Spiegel: I was thinking about Joshua's point—that size has to matter in these analyses—in the context of both Jeff's and Charles's models. In the Nash model, the model is pretty symmetric and both countries have a significant impact on each other. In the New Keynesian model, if you're going to maximize overall welfare, you're probably going to be doing what the large country wants to do. And so, to some extent, when you motivate the question about the

merits of policy coordination as Jeff did, all the cool, good policymaker quotes come from the small countries that are buffeted by the policies of large economies. And I'm wondering, what is the paradigm that's going to let us think about the possibility of policy coordination between large economies and small economies that really are subject to large-economy shocks? Or do these models all just teach us that there is no scope for policy coordination?

Mr. Fischer: I have one more comment. The first is that in these coordination games, there may be different policymakers within the same country. At the Bank of Israel, I would occasionally talk to the finance minister and tell him he had to do something about the exchange rate. He said, look, I just spent a year getting a budget through. It was very difficult to change anything, so do me a favor, intervene. And I thought he had a point, because he was going to have a big political fight to change anything, and the central bank didn't have to face a big political fight to get the same thing done, though possibly less well. So, we need to take domestic political situations into account.

The Renminbi's Ascendance in International Finance

Eswar S. Prasad

The renminbi is gaining prominence as an international currency that is being used more widely to denominate and settle cross-border trade and financial transactions. Although China's capital account is not fully open and the exchange rate is not entirely market determined, the renminbi has in practice already become a reserve currency. Many central banks hold modest amounts of renminbi assets in their foreign exchange reserve portfolios, and a number of them have also set up local currency swap arrangements with the People's Bank of China. However, China's shallow and volatile financial markets are a major constraint on the renminbi's prominence in international finance. The renminbi will become a significant reserve currency within the next decade if China continues adopting financial-sector and other market-oriented reforms. Still, the renminbi will not become a safe-haven currency that has the potential to displace the U.S. dollar's dominance unless economic reforms are accompanied by broader institutional reforms in China.

1. Introduction

This paper considers three related but distinct aspects of the role of the renminbi in the global monetary system and describes the Chinese government's actions in each of these areas. First, I discuss changes in the openness of China's capital account and the degree of progress towards capital account convertibility. Second, I consider the currency's internationalization, which involves its use in denominating and settling cross-border trades and financial transactions—that is, its use as an international medium of exchange. Third, I trace the renminbi's evolution as a reserve currency.

It might seem premature to discuss the renminbi's ascendancy as a reserve currency or even as an international currency insofar as China has neither a flexible exchange rate nor an open capital account, once considered essential

prerequisites for a country's currency to play a major role in global financial markets. Still, the Chinese government has recently taken a number of steps to increase the international use of the renminbi. Given China's sheer size and its rising shares of global GDP and trade, these steps are gaining traction and indicate the growing role of the renminbi in global trade and finance.[1]

This paper outlines some of the policy actions taken by the Chinese government to open up its capital account, which in turn will facilitate the currency's international use. China's approach to such policies is also closely linked to domestic macroeconomic objectives and financial market development. The paper reviews the potential implications of these changes for capital flows into and out of China and evaluates the renminbi's prospects for becoming a reserve currency based on a variety of conventional metrics. As it strives to meet these criteria, China faces two major challenges. First, it must properly sequence its capital account opening with other policies, such as exchange rate flexibility and financial market development, to improve the benefit/risk tradeoff. Second, it must commit to adequate financial market development, which involves strengthening the banking system along with developing deep and liquid government and corporate bond markets as well as foreign exchange spot and derivative markets.

What impact will the renminbi have on the global monetary system? Will it make a positive contribution to global financial stability? That depends on how, and how quickly, China opens up its capital account and develops its financial markets, as well as on other policy changes it enacts to support this process. It also depends on the implications of these policy initiatives for China's own growth and stability.

The main conclusions of the paper are as follows:

- China's capital account is likely to become largely open within the next three to five years, with few restrictions on capital inflows and outflows other than some "soft" controls related to registration and reporting requirements.
- The renminbi will play an increasingly important role in global trade and finance, with the currency being used more widely to denominate and settle cross-border transactions.
- Although the International Monetary Fund (IMF) has decided to include the renminbi in the basket of currencies that make up the IMF's special drawing rights basket in October 2016, this decision will not by itself transform the renminbi into a major reserve currency in terms of the currency composition of global foreign exchange reserves.

- The renminbi has in practice already become a reserve currency, as some central banks are holding modest amounts of renminbi assets in their foreign exchange reserve portfolios. A number of central banks have also set up local currency swap arrangements with the People's Bank of China (PBC).
- Although China's rapid growth will help promote the international use of its currency, its low level of financial market development is a major constraint on the renminbi's prominence in international finance.
- The renminbi will become a significant reserve currency within the next decade if China continues adopting financial-sector and other market-oriented reforms. However, the renminbi will erode but will not displace the dollar's dominance unless economic reforms are accompanied by broader institutional reforms in China. This does not appear likely.

2. Capital Account Opening

In this section, I document and assess China's capital account openness in both de jure and de facto terms.[2] An initial question is why capital account liberalization appears to be a priority for China, given the many domestic challenges the economy faces. China's approach is consistent with the objective of improving the benefit–cost tradeoff of capital account liberalization by undertaking liberalization in a controlled manner that provides a number of collateral (indirect) benefits while reducing the risks associated with having a fully open capital account (see Kose et al. 2009 for an analytical discussion).

The liberalization of inflows is important for attaining certain such collateral benefits. The liberalization undertaken thus far has allowed foreign investors to play a larger role in developing and deepening China's financial markets, and, as it continues, such investors will provide further impetus to this process. For instance, there is a significant body of evidence indicating that liberalizing portfolio inflows helps improve liquidity in the domestic equity markets of emerging economies. This, along with the entry of foreign banks, would increase competition in the banking sector, which in turn would benefit private savers and borrowers. Other segments of China's financial sector, including the insurance sector, have depended on capital controls and other entry restrictions to stay competitive. These segments will face greater competition with more open inflows. With effective regulation, this could lead to significant efficiency gains.

Liberalizing outflows also generates a number of collateral benefits for the domestic economy. It provides Chinese households with opportunities to diversify their savings portfolios internationally and stimulates domestic financial

reforms by creating competition for domestic banks with captive domestic sources of funds. An additional benefit from the central bank's perspective is that, when the currency experiences sharp appreciation pressures, private capital outflows could serve as an alternative to official reserve accumulation (Prasad and Rajan 2008).[3]

Capital account liberalization could also have broader benefits for China. An open capital account would catalyze progress toward the objective of making Shanghai an international financial center. Capital account opening, especially if accompanied by greater exchange rate flexibility, could also strengthen China's domestic economic structure. It would facilitate financial-sector reforms, allowing for a rebalancing of growth away from reliance on exports and investment-driven growth to a more balanced model of growth, with larger contributions from growth in private consumption.[4]

2.1. De Jure and De Facto Capital Account Openness

De jure measures of capital account openness typically rely on binary indicators from the IMF's *Annual Reports on Exchange Arrangements and Exchange Restrictions* (*AREAER*). These binary measures reflect the existence of restrictions on any of a large number of categories of inflows and outflows. These measures change only when there is a relatively major policy shift related to specific capital account items. *AREAER* indicates that, as of 2013, China imposed restrictions of some sort in 14 out of 16 broad categories of capital inflows and in 15 out of 16 categories of capital outflows.

Conventional measures of de jure financial openness drawing on *AREAER* data show little, if any, change in China over the past decade. For example, the popular Chinn-Ito index has registered little change in China's de jure openness since 1993 (see Chinn and Ito 2006 and subsequent updates). The index, which is based on a statistical procedure that aggregates information from several categories covered by *AREAER*, ranges from 2.39 (most financially open) to –1.89 (least financially open). A higher value corresponds to a greater degree of de jure capital account openness.

The reserve currency economies have the same index value of 2.39, which is the maximum and indicates a fully open capital account. The value of this index for China in 2013 is –1.19, compared with an average that is close to the maximum for advanced economies, 0.3 for emerging market economies, and 0.1 for less developed economies. China's index jumped from –1.89 to –1.19 in 1993 but has not changed since then. This value indicates a relatively closed capital account characterized by capital controls that are, on paper, extensive and stringent.

Standard de jure indices often fail to capture subtle or limited changes because they tend to be aggregated across finer categories of inflows or outflows. The number and magnitude of relaxations of capital account restrictions have gathered pace in the past few years, consistent with the active promotion of the renminbi as an international currency. In most cases, constraints on inflows and outflows have been made less stringent rather than being eliminated entirely.[5]
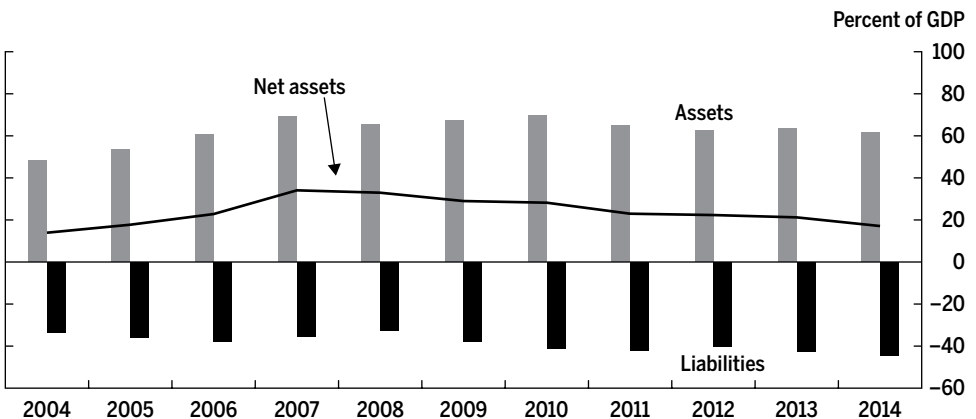
An alternative and complementary approach to evaluating an economy's financial openness is to analyze de facto measures of integration into global financial markets. Figure 1 shows China's gross external assets and liabilities,

FIGURE 1
China's External Assets and Liabilities

A Levels
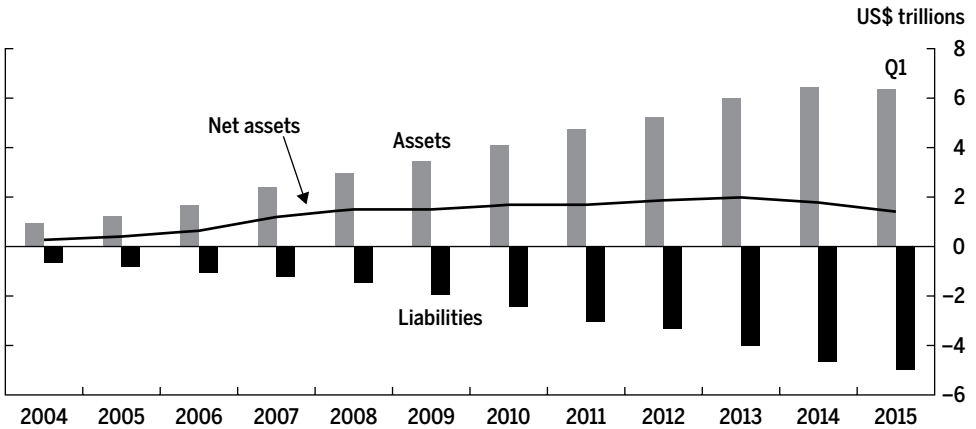
B Ratios to Nominal GDP

Sources: State Administration of Foreign Exchange (SAFE) and CEIC.

along with its net asset position, both as levels (upper panel) and as ratios to nominal gross domestic product (GDP) (lower panel) from 2004 to the first half of 2015.[6] Both assets and liabilities have risen sharply over the last decade. As of the second half of 2015, China has $6.4 trillion in foreign assets and $5 trillion in foreign liabilities.

The academic literature often measures financial openness by reference to an economy's gross assets plus liabilities position (i.e., its gross external position) either in levels or as a ratio to GDP (see Kose et al. 2009). For China, the ratio of gross assets and liabilities to GDP is now just over 100 percent. In terms of levels, China's gross external position exceeds those of all the other key emerging markets and also that of Switzerland (Prasad and Ye 2012). As a share of GDP, its openness lags behind that of the reserve currency economies. Among emerging markets, however, China's de facto measure of openness is relatively high, exceeding those of countries such as Brazil and India.

2.2. Controlled Capital Account Liberalization: Channels for One-Way Flows

China's government has created a number of schemes that allow for controlled and calibrated opening up of the capital account to both inflows and outflows. These schemes have been designed to generate many of the collateral benefits of financial openness while creating freer movement of capital.

2.2.1. Qualified Foreign Institutional Investor (QFII) Scheme[7]

The QFII scheme, introduced in December 2002, allows QFIIs to convert foreign currency into renminbi and invest in a range of renminbi-denominated financial instruments that include A shares, B shares, treasury securities, convertible bonds and enterprise bonds listed on China's stock exchanges, securities investment funds, and warrants and other financial instruments approved by the China Securities Regulatory Commission (CSRC). The scheme seeks to attract high-quality and stable (medium-to-long-term) foreign portfolio investments while deterring short-term speculative inflows of foreign capital. One of the scheme's main objectives is to promote the development of China's securities market. QFIIs are typically foreign fund management institutions, insurance companies, securities companies, and other asset management institutions.

The CSRC (which licenses QFIIs) and SAFE (Safe Administration of Foreign Exchange, which approves investment quotas for each QFII) have established eligibility criteria with the explicit goal of blocking short-term, speculative capital inflows of foreign capital and inviting investors such as pension, insurance, mutual, and charitable funds that have long-term investment horizons. Foreign institutional investors applying for QFII status are required

to meet minimum eligibility criteria related to the number of years of operation, the dollar value of total assets under management (AUM), and sound financial status and corporate governance. They are further required to be domiciled in countries with sound legal and regulatory systems and whose securities market regulators have entered into memoranda of understanding for maintaining regulatory cooperation with the CSRC.

QFII eligibility criteria related to the minimum number of years of operation and the minimum total AUM in the most recent fiscal year have been progressively liberalized to allow an increasing number of foreign institutional investors—smaller and lesser known ones—to undertake portfolio investment in China.

SAFE has demonstrated a clear policy thrust towards liberalizing the flows of foreign portfolio investment via the QFII channel by increasing the aggregate amount available for allocation as QFII quotas, and also by relaxing the maximum quotas for individual QFIIs. As of July 2015, the total investment quota awarded under the scheme was about $76.6 billion, covering nearly 300 institutions. The CSRC also announced that it intends to raise the total QFII quota from $80 billion to $150 billion. Until recently, only a handful of sovereign wealth funds, central banks, and monetary authorities were allowed to invest more than $1 billion. In March 2015, the $1 billion investment quota limit for overseas fund management companies was lifted as part of the effort to further open up the country's capital market and pursue structural reforms.

Over the period 2004–11 QFIIs held, on average, 67 percent of their total assets in A shares. However, QFII investments in the A-share market have remained small compared with the overall size of that market; A shares held by QFIIs accounted for less than 2 percent of the tradable capitalization of the A-share market. Thus, any effects of the QFII scheme on securities market development have been largely catalytic rather than directly substantive in nature.

2.2.2. Renminbi Qualified Foreign Institutional Investor (RQFII) Scheme

The RQFII pilot program was launched in late 2011. The key difference relative to the QFII program is that RQFIIs can use offshore renminbi directly to invest in mainland markets. QFIIs must first convert their foreign currency funds into renminbi before purchasing equities and securities in onshore markets. Thus, the RQFII scheme may be seen as a response of China's authorities to the expansion of the pool of offshore renminbi funds.

This scheme, like the QFII scheme, requires financial institutions to apply for licenses from the CSRC and for investment quotas from SAFE. Approved

institutions need to open special renminbi accounts separately to invest on foreign exchange markets, interbank bond markets, and stock index futures in domestic custodian banks. Movements of funds under the RQFII scheme are subject to various restrictions. Funds that can be remitted inward include investment principal remitted inward from overseas, amounts required for payment of the relevant taxes and fees, and other renminbi funds permitted by the PBC and SAFE to be remitted inward. Funds that can be remitted outward include income from the sale of domestic securities, cash dividends and interest, and other renminbi funds permitted by the PBC and SAFE to be remitted outward. These funds may be remitted outward in renminbi or in foreign exchange purchased with renminbi.

Initially, only Hong Kong subsidiaries of Chinese financial institutions were eligible for RQFII licenses. Since 2014, the scheme has been expanded to additional Hong Kong banks and asset managers and subsequently also to financial institutions in the United Kingdom, Singapore, South Korea, France, Germany, Australia, and Switzerland. As of July 2015, 135 financial institutions, including foreign branches of Chinese financial institutions and foreign institutions, had been granted a total quota of $64.3 billion under this scheme. Financial institutions from Hong Kong, many of which are Hong Kong branches of mainland financial institutions, are still the major players. Hong Kong now accounts for $43 billion of the allocated RQFII quota and South Korea accounts for $8 billion.

2.2.3. Qualified Domestic Institutional Investor (QDII) Scheme

The QDII (qualified domestic institutional investor) scheme, launched in 2006, allows Chinese domestic financial institutions (commercial banks, securities companies, fund management companies, and insurance companies) to invest in offshore financial products such as securities and bonds. Financial institutions must first apply for a QDII license from the relevant regulatory agencies (the Securities, Banking, or Insurance Regulatory Commission) and then seek a quota allocation from SAFE.[8] The scope of the investment under the QDII program is subject to certain restrictions, with investment in bank deposits, debt securities, stocks, bonds, and derivatives being allowed, while investments in real estate and precious metals are forbidden. The approved investment destinations for QDIIs include Hong Kong, the United Kingdom, the United States, Singapore, Japan, Korea, Luxembourg, Germany, Canada, Australia, and Malaysia.

As of May 2015, 132 institutions have been granted QDII licenses and a total quota of $90 billion which, broken down by institution type, is as follows:

securities companies ($38 billion), insurance companies ($31 billion), banks ($14 billion), and trust companies ($8 billion).

2.2.4. Qualified Domestic Individual Investor (QDII2) Scheme

The proposed Qualified Domestic Individual Investor scheme, commonly known as QDII2, will expand the QDII scheme from institutional to individual retail investors. It is to be launched initially in six Chinese cities: Shanghai, Tianjin, Chongqing, Wuhan, Shenzhen, and Wenzhou. News reports indicate that the new pilot scheme will allow individuals with at least 1 million renminbi (roughly $160,000) in assets to invest directly overseas in securities, stocks, and real estate. At present, the maximum amount in local currency that individuals can exchange for foreign currency is subject to an annual cap of $50,000; this restriction would not apply to investors under QDII2.

2.3. Controlled Capital Account Liberalization: Two-Way Flows

2.3.1 Free Trade Zones

China has extended its experimental, learning-by-doing approach to reforms to the context of the capital account liberalization program. We see one manifestation of this in the form of free trade zones (FTZs) that are islands of capital account convertibility within China. The Shanghai Pilot Free Trade Zone was officially launched in September 2013. In April 2015, China's State Council released official documents to launch three new FTZs—in Guangdong, Tianjin, and Fujian.

Key features of the FTZs include the following: (1) without seeking approval from the PBC, banking institutions in the zone are free to process cross-border renminbi settlements under current accounts and under direct investment for entities; (2) companies in the zone are allowed to borrow renminbi offshore, although these funds cannot be used outside the FTZ and cannot be invested in securities or used for extending loans; (3) voluntary foreign exchange settlement by foreign-invested enterprises (FIEs) within the zone is permitted, allowing FIEs to convert foreign currency in their capital account into renminbi at any time; (4) qualified foreign-invested banks are allowed to set up subsidiaries, branches, or special institutions, and to upgrade existing sub-branches to branches; (5) qualified private investors can enter the banking sector in the FTZ and set up banks, finance leasing companies, consumer finance companies, and other finance institutions; and (6) the government has indicated its intention to support banking institutions in the FTZ to develop cross-border financing services.

The Shanghai FTZ uses a "negative list" structure to regulate foreign investment. This implies that investment in other sectors is mostly unrestricted, although some administrative procedures must still be followed. The 2015 negative list contains 122 prohibited or restricted areas, down from 139 on the 2014 negative list.

The FTZs provide a significant channel for two-way capital flows through the banking system as well as through corporates, although there is in principle a firewall between each FTZ and the rest of the mainland. Over time, these walls are likely to erode since there are multiple financial institutions and corporations operating on both sides. Nevertheless, the FTZ approach does provide the government with another controlled approach to capital account opening.

2.3.2. The Shanghai–Hong Kong Stock Connect

Another approach to selective and calibrated capital account liberalization involves implementing a stock connect program that creates another channel for cross-border equity investments by a broad range of investors, including retail investors. The "stock connect" link between the Shanghai and Hong Kong stock exchanges was officially launched in November 2014. The program allows mainland Chinese investors to purchase shares of select Hong Kong and Chinese companies listed in Hong Kong (southbound investment), and lets foreigners buy Chinese A shares listed in Shanghai (northbound investment) in a less restrictive manner than had previously been the case.

Trading under this program in each direction is subject to a maximum cross-border investment quota (i.e., an aggregate quota), together with a daily quota. The northbound aggregate quota is set at 300 billion renminbi, with the daily quota being 13 billion renminbi. The corresponding southbound quotas are 250 billion renminbi (aggregate) and 10.5 billion renminbi (daily). The Stock Exchange of Hong Kong (SEHK) and Shanghai Stock Exchange monitor compliance with these quotas. Enforcement of the daily and annual quotas is managed through the structure of the settlement mechanisms.[9]

This investment channel has been used quite extensively. The northbound daily quota was used up on the launch day and has been consistently high (until this summer, when the Chinese stock market began to fall sharply), while the southbound daily cap was hit for the first time in April 2015.

2.3.3. Mutual Fund Connect

This program, launched in July 2015, allows eligible mainland and Hong Kong funds to be distributed in each other's markets through a streamlined vetting process. Along with the Stock Connect programs, this substantially increases

the range of equity investment products available to investors on both sides and provides yet another channel for bidirectional flows of capital. The major difference between the two schemes is that the stock connect program allows retail investors to invest directly in equities, while the mutual funds program allows funds to sell their products to investors on both sides.

Eligibility for Mutual Fund Connect is limited to general equity funds, bond funds, mixed funds, unlisted index funds, and index-tracking exchange-traded funds (ETFs). Gold ETFs, listed open-ended funds, funds of funds, structured funds, and guaranteed funds are not eligible. Another criterion is that the fund must be a publicly offered securities investment fund registered with the CSRC under the Securities Investment Fund Law of the People's Republic of China or the Securities and Futures Commission under the Securities and Futures Ordinance of Hong Kong. There are additional requirements related to the minimum fund size, the minimum period for which the fund has been in existence, and so on. The initial investment quota for the scheme is 300 billion renminbi for fund flows in each direction.

2.4. Summary

In short, while China still has an extensive capital control regime in place, it is selectively and cautiously dismantling these controls. Many of the restrictions on cross-border capital flows have been loosened over time, consistent with the active promotion of the renminbi as an international currency. In most cases, constraints on outflows and inflows have been made less stringent rather than being eliminated entirely. Consequently, the country's capital account is becoming increasingly open in de facto terms, but the government is far from allowing the extent of free flow of capital that is typical of reserve currencies.

China's selective and calibrated approach to capital account liberalization has been effective at promoting the renminbi's international presence without risking the potentially deleterious effects of complete capital account liberalization. However, the full potential of the Chinese currency's international use cannot be realized without more active onshore development. It will be difficult, for instance, to fully develop China's foreign exchange and derivatives markets in the absence of a more fully open capital account.

An interesting issue is whether there is a policy goal short of complete capital account convertibility that provides a better risk/benefit tradeoff. Joseph Yam (2011), the former head of the Hong Kong Monetary Authority, has argued that China's long-term objective ought to be full capital account convertibility, which he defines as relaxation of capital controls but maintenance of "soft" controls in the form of registration and reporting requirements for regulatory

purposes. He draws a careful distinction between this and an entirely unfettered capital flow regime, referred to as free capital account convertibility. This is a subtle but important distinction that aptly characterizes the Chinese approach to capital account liberalization, given that full convertibility by this definition provides a path to an open capital account without entirely ceding control to market forces.

3. The Exchange Rate Regime

The value of the renminbi was tightly managed against the U.S. dollar, but it was allowed to appreciate gradually against the dollar starting in July 2005. In principle, starting at that time the PBC implemented a managed floating exchange rate mechanism, with the currency's value determined by market demand and supply, and with reference to a basket of currencies. The PBC would announce the reference rate (relative to the U.S. dollar) at which the renminbi would begin trading each day, with intraday volatility of plus or minus 0.3 percent

FIGURE 2
China: Bilateral Exchange Rates
(renminbi per unit of foreign currency)
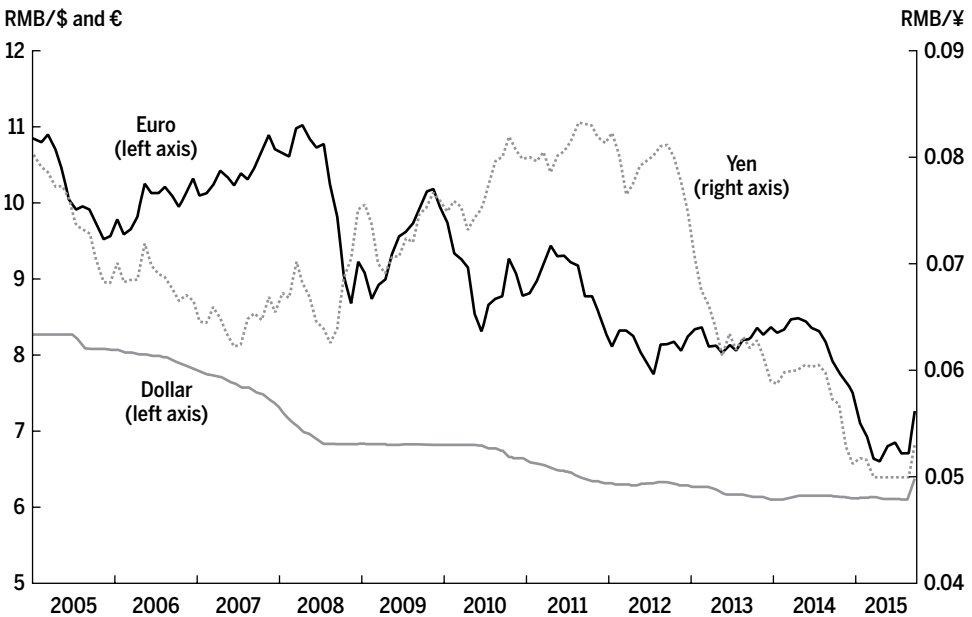
Source: SAFE.

Notes: The left scale shows the renminbi's exchange rates relative to the U.S. dollar and the euro. The right scale shows the renminbi's exchange rate relative to the Japanese yen. A decrease denotes appreciation of the renminbi. An increase denotes depreciation.

permitted. In reality, the practice of managing the value of the renminbi relative to the U.S. dollar was not abandoned and the amount of daily volatility was quite limited, although over time the renminbi was allowed to appreciate gradually relative to the dollar. Since June 2005, the renminbi has appreciated by nearly 30 percent relative to the U.S. dollar (as of November 5, 2015) and by over 40 percent relative to the euro and the Japanese yen (Figure 2). It has also appreciated substantially on a trade-weighted basis. From June 2005 to September 2015, the nominal effective exchange rate appreciated by 48 percent, while the CPI-adjusted real effective exchange rate appreciated by 58 percent (Figure 3).

In May 2007, the daily trading band was widened to 0.5 percent in each direction relative to the reference rate. With the onset of the global financial crisis, the hard peg to the dollar was reinstituted in July 2008 before being relaxed again in June 2010. In April 2012, the daily fluctuation band of the renminbi–dollar exchange rate was widened to 1 percent on either side of the reference rate set by the PBC. In March 2014, the daily fluctuation band was widened further to 2 percent on each side.

FIGURE 3
China: Effective Exchange Rates
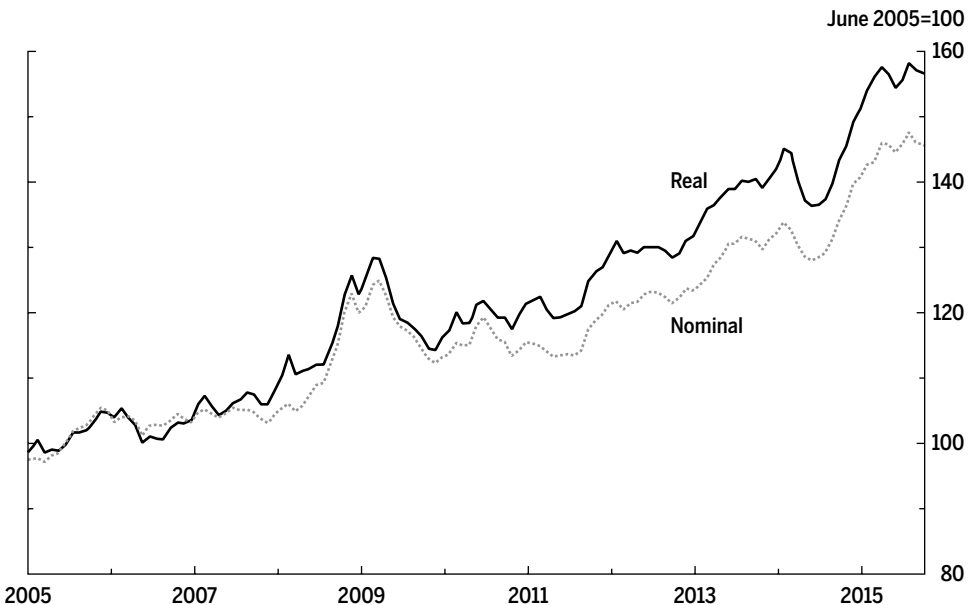
Source: Bank for International Settlements.
Notes: An increase denotes appreciation of the renminbi. A decrease denotes depreciation.

Despite these moves, which were designed ostensibly to increase currency flexibility, over the last decade the volatility of China's nominal exchange rate against the dollar, as measured by the standard deviation of changes in monthly exchange rates, has been the lowest among the major emerging market economies (Prasad and Ye 2012 and updates). China's trade-weighted effective exchange rate measures (nominal and real), which tend to track each other closely, are more volatile than the yuan–dollar exchange rate. The gap in exchange rate volatility relative to that in other emerging markets is smaller using these measures, but China still has the lowest level of volatility in this group. In other words, China now displays greater flexibility in its effective exchange rates but this flexibility remains quite low.

By limiting the flow of money, the capital account restrictions help control the value of the renminbi, which now trades on both onshore (CNY) and offshore (CNH) markets. Onshore trade takes place through the China Foreign Exchange Trade System, which is in effect managed by the PBC. Offshore trades take place mostly on the Hong Kong Interbank Market. Mainland government regulations mandate these separate markets for trading renminbi. The onshore market is subject to the mainland's capital account restrictions, and the renminbi's value on that market is therefore higher under the PBC's control. In contrast to the CNY market, the CNH market is not subject to direct official control or intervention.

The two exchange rates became more closely linked after a series of developments in the last quarter of 2010 boosted renminbi-denominated financial transactions (Figure 4). This includes the approval granted to financial institutions and banks in Hong Kong to open renminbi accounts and for Hong Kong banks to access the onshore interbank market, activation of a swap line between the PBC and the Hong Kong Monetary Authority, and a flurry of renminbi-denominated bond issuance activities. These measures have lowered transaction costs for eligible financial market participants seeking to access both markets. The two rates have moved in lockstep for much of the period since the end of 2010, reflecting the rising integration of China's onshore and offshore financial markets. Before this period, the renminbi was typically more valuable offshore.

On a conceptual basis, three operational elements characterize China's onshore exchange rate system. The first is the reference-pricing mechanism, whereby in the morning of each trading day the PBC sets the opening price on the Shanghai China Foreign Exchange Trading System. The second, a 2 percent trading band around the central parity, determines the maximum amount of intraday volatility in the renminbi–dollar exchange rate. The third involves

FIGURE 4
Onshore (CNY) and Offshore (CNH) Spot Renminbi–Dollar Exchange Rates
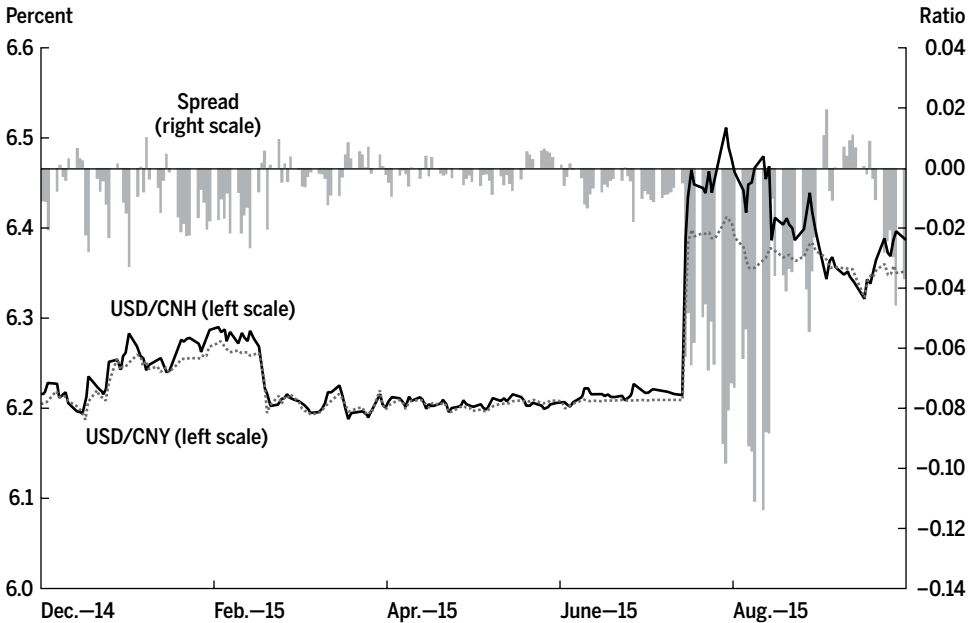
Source: Bloomberg.

Notes: This chart shows daily data (end of the day) on the onshore and offshore spot exchange rate markets. The spread is defined as the USD/CNY minus USD/CNH.

a dirty float to moderate exchange rate fluctuations when the PBC determines that the exchange rate is overshooting on one side or the other.

On August 11, 2015 the PBC changed the first element of the exchange rate management mechanism, combined with a 1.9 percent devaluation of the renminbi relative to the dollar. In principle, the PBC now sets the morning fixing at the same level as the closing price on the previous trading day. This change is fully consistent with onshore foreign exchange market intervention by the PBC during the trading day in Shanghai to manage the level of the exchange rate. The other two elements were left unchanged.

The shift in the exchange rate regime that was combined with a currency devaluation event on August 11, 2015 set off a sharp divergence between the CNY and CNH rates. The renminbi was for much of the remainder of the month worth less on the offshore markets than on the onshore markets, reflecting downward pressures on the renminbi as markets appear to have interpreted the government's move as possibly being the first in a series of devaluations intended to support the weak economy by boosting exports. By intervening in the CNY market, the government was able to limit the downward pressures on

the renminbi–dollar exchange rate but at the cost of opening up a spread between the onshore and offshore rates. By mid-September 2015, the gap between the CNY and CNH exchange rates had closed. Press and analyst reports suggest that the PBC and Chinese state-owned commercial banks intervened directly in the CNH market to facilitate this outcome. By early October, however, a gap between the two exchange rates had opened up again. It remains to be seen if the PBC will in fact allow the onshore rate to float more freely and thereby lead to a natural, market-led convergence of the two rates.

4. China's External Position: Stocks and Flows

4.1. The External Balance Sheet

Starting in 2015, China began reporting its international investment position (IIP) based on the IMF's latest *Balance of Payments and International Investment Position Manual* (*BPM6*). A major change, according to SAFE, is that the key IIP items are now reported using the market capitalization method rather than the historical flow accumulation method. Data through 2014 are still reported based on *BPM5*. Hence, comparisons of the 2015 IIP with those of prior years are not feasible. It should be noted that SAFE started reporting balance of payments data based on *BPM6* standards earlier, so those data are in fact comparable over time. This inconsistency between the IIP and balance of payments data points to difficulties in matching flow and stock measures in earlier years.

An examination of China's international investment position in 2015 (at the end of the second half of the year) reveals a number of interesting features (Table 1). Foreign exchange reserves account for 58 percent of China's external assets. Foreign direct investment accounts for 57 percent of China's external liabilities, while portfolio equity liabilities account for another 14 percent. Portfolio debt and other investments (which typically capture bank loans) account for 29 percent of external liabilities. The relatively low share of external debt in China's external liabilities, as well as the fact that foreign exchange reserves are more than sufficient to cover them, suggests that China is not exposed to the vulnerability caused by high levels of external debt that has precipitated past crises in many emerging market economies.

China's foreign exchange reserves, which peaked at \$3.99 trillion in June 2014, have fallen to \$3.51 trillion in September 2015 (Figure 5). Reserves had been rising for a number of years until the second half of 2014. Starting in the third quarter of 2014, China's reserves have fallen for five consecutive quarters. This decline was partly accounted for by currency valuation effects, as

Currency Distribution of Global Foreign Exchange Market Turnover
(selected currencies, in percent)

	2001	2004	2007	2010	2013
U.S. dollar	89.9	88.0	85.6	84.9	87.0
Euro	37.9	37.4	37.0	39.1	33.4
Japanese yen	23.5	20.8	17.2	19.0	23.0
Pound sterling	13.0	16.5	14.9	12.9	11.8
Australian dollar	4.3	6.0	6.6	7.6	8.6
Swiss franc	6.0	6.0	6.8	6.3	5.2
Indian rupee	0.2	0.3	0.7	1.0	1.0
Russian ruble	0.3	0.6	0.7	0.9	1.6
Chinese renminbi	0.0	0.1	0.5	0.9	2.2
South African rand	0.9	0.7	0.9	0.7	1.1
Brazilian real	0.5	0.3	0.4	0.7	1.1
All currencies	200.0	200.0	200.0	200.0	200.0

Source: BIS Triennial Central Bank Survey.

Notes: The percentage shares of individual currencies sum to 200 percent, because two currencies are involved in each transaction. Data are adjusted for local and cross-border interdealer double counting (i.e., "net-net" basis).

FIGURE 5
China: Foreign Exchange Reserves
(monthly accumulation in billions of dollars; total level in trillions of dollars)
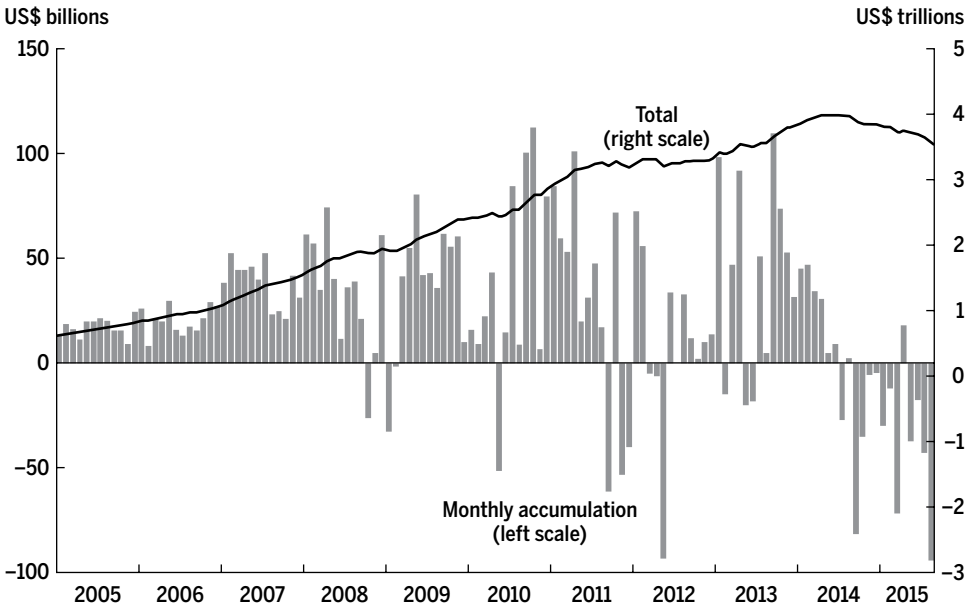
Source: People's Bank of China.

the dollar value of China's holdings of euro- and yen-denominated assets has declined due to the depreciation of those currencies relative to the U.S. dollar. The remainder signals intervention by the PBC to keep the renminbi's value relative to the dollar stable in the face of large shifts in its balance of payments. The fall in China's reserves appears to have picked up pace during 2015, with a particularly steep fall of about $94 billion in August 2015.

The composition of China's external assets and liabilities has resulted in the paradoxical outcome that, despite China's being a substantial net external creditor, net foreign income flows have in fact been negative in recent years, for two reasons. First, China's foreign investments are largely concentrated in low-yielding advanced-economy bonds. This is dictated by the need to keep foreign exchange reserves, which constitute the dominant portion of external assets as noted earlier, in safe and liquid financial instruments, even at low yields. By contrast, foreign investors have gotten better returns on their foreign direct investment (FDI) and portfolio equity investments in China. Second, the renminbi has appreciated significantly relative to the G-3 currencies over this period.

I computed the approximate gross returns on China's external assets by comparing gross inward investment income flows in a given year with the total stock of external assets at the end of the previous year. I used a similar procedure to compute the approximate gross returns on China's foreign liabilities, i.e., the gross investment income earned by foreign investors on their investments in China. While these estimated returns are crude approximations, the patterns they reveal are still striking and unlikely to be overturned by more sophisticated calculations. Table 2 shows that, in every year over the last decade, China has received a substantially lower return on its foreign assets than it has paid out on its foreign liabilities. The average annual difference between the gross return on liabilities versus the gross return on assets is 3.76 percent. There are only two years when the net income flow was slightly positive despite this return differential; this was because the stock of foreign assets has been substantially larger than the stock of foreign liabilities.

4.2. External Accounts—Flows

China's external flow imbalances have to a large extent dissipated since the global financial crisis. China's current account and trade surpluses have shrunk markedly relative to their peaks in 2007, when they hit 10.1 percent and 7.6 percent of GDP, respectively. On a rolling four-quarter basis, the two ratios stood at 2.8 percent and 3.4 percent, respectively, in the first quarter of 2015 (Figure 6). We can attribute these shifts to two factors—the lower level of China's trade surplus in recent years and the recent deficit on the capital account, implying

TABLE 2
Geographical Distribution of Global Foreign Exchange Market Turnover
(selected economies, in percent)

	2001	2004	2007	2010	2013
United Kingdom	31.8	32.0	34.6	36.8	40.9
United States	16.0	19.1	17.4	17.9	18.9
Singapore	6.1	5.1	5.6	5.3	5.7
Japan	9.0	8.0	5.8	6.2	5.6
Hong Kong	4.0	4.1	4.2	4.7	4.1
Switzerland	4.5	3.3	5.9	4.9	3.2
Germany	5.4	4.6	2.4	2.2	1.7
Russia	0.6	1.1	1.2	0.8	0.9
China	—	0.0	0.2	0.4	0.7
India	0.2	0.3	0.9	0.5	0.5
Brazil	0.3	0.1	0.1	0.3	0.3
South Africa	0.6	0.4	0.3	0.3	0.3
Total	78.5	78.1	78.6	80.3	82.8

Source: BIS Triennial Central Bank Survey (Foreign Exchange Turnover, Table 6 in April 2013).

Notes: Other countries with at least a 1 percent share include Australia, France, Canada, Denmark, and the Netherlands. A dash (—) indicates that data were not available for that year. Data are adjusted for local interdealer double counting (i.e., "net-gross" basis). Estimated coverage of the foreign exchange market ranged between 90 percent and 100 percent in most countries.

FIGURE 6
China: Current Account and Trade Balances
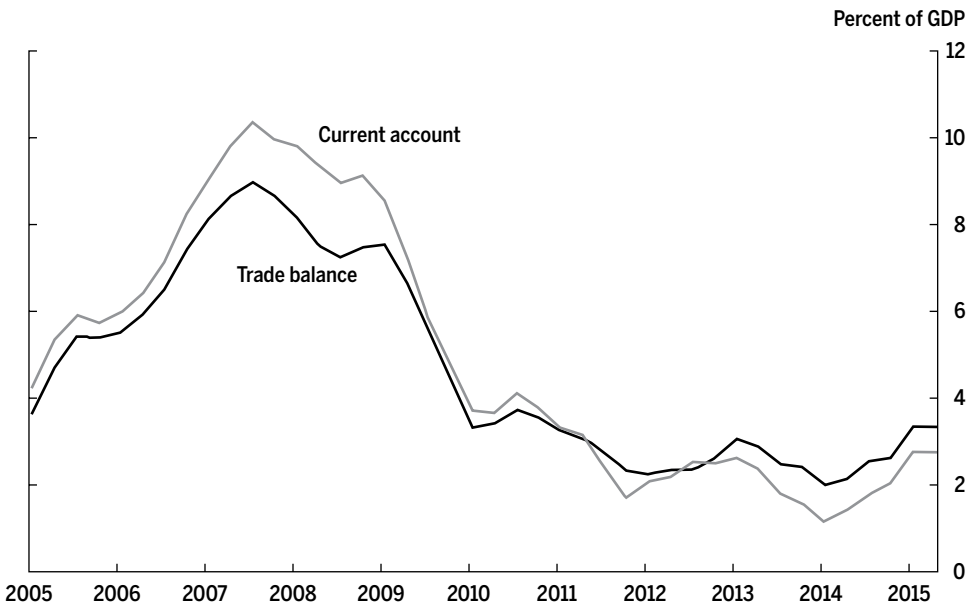
Sources: SAFE and National Bureau of Statistics.

Notes: Current account balance (gray line) and the goods and services trade balance (black line) are both expressed as ratios to nominal GDP. The figure shows four-quarter trailing moving averages for both variables.

that more capital (other than through accumulation of international reserves) flowed out of the country relative to the amount that came in. This represents an important change in the nature of China's overall capital exports (which is equivalent to the current account surplus). Balance of payments data show that, in 2014, China's current account surplus was $220 billion, while the increase in international reserves was $118 billion. This implies that other net capital outflows, including private outflows and non-reserve official outflows, amounted to $102 billion in 2014.[10] In fact, most of these net outflows went through unofficial channels. The net errors and omissions in 2014 amounted to –$140 billion, and the financial account registered a small surplus of $38 billion.

In the first half of the year, the trade surplus to GDP ratio rose to 5.1 percent, while the current account to GDP ratio was 2.9 percent. This resurgence in the trade surplus appears largely to reflect domestic demand conditions, as import growth has fallen more sharply than export growth, driving up the trade balance. The difference between the current account and trade surpluses again reflected capital outflows, this time through a capital account deficit as well as negative net errors and omissions. These outflows were tempered by a decline in the stock of reserves (which, in a balance of payments accounting sense, are similar to capital inflows).

4.3. Capital Outflows

The financial account balance fell to $38 billion in 2014 and registered a deficit of $126 billion in the first half of 2015. The capital account deficit has sparked concerns about capital flight, with the connotation being that domestic residents and corporations concerned about China's domestic macroeconomic and financial situation are sending capital out of the country. A more benign interpretation is that rising capital outflows are a natural consequence of steps that China is taking to open up its capital account and remove restrictions on outflows. As the economy matures and financial markets develop, domestic retail and institutional investors will look to foreign investments as a way of diversifying their portfolios. Moreover, Chinese corporations and financial institutions are seeking investments abroad to diversify their operations and as a conduit for acquiring technical and managerial expertise.

Based on simple balance of payments accounting, the current account balance represents an economy's overall capital exports. There are three components that add up to the current account balance:

$$\text{Current Account Balance} = \text{Net Reserve Accumulation} \\ - \text{Financial Account Balance} \\ - \text{Net Errors and Omissions.}$$

The first component is net reserve accumulation, which represents official exports of capital through accumulation of foreign assets on the central bank's balance sheet. Second, the negative of the financial account balance represents net non-reserve official and private capital flows. A positive financial account balance indicates a capital account surplus (i.e., net capital inflows), so taking the negative of that reduces net capital outflows. Third, net errors and omissions represent unofficial flows. A negative number indicates capital outflows, so taking the negative of that represents unofficial capital outflows.

Figure 7 shows the three-year trailing moving averages of the current account balance and its components measured in this manner, all in billions of U.S. dollars. The current account balance rose through 2007 and has declined significantly since then before rising modestly near the end of the sample. Net reserve accumulation has fallen sharply since 2007, while unofficial outflows, as represented by (the negative of) net errors and omissions, have trended steadily upward. The financial account surplus (shown as a negative number) has fallen markedly in the period since the financial crisis. While gross inflows

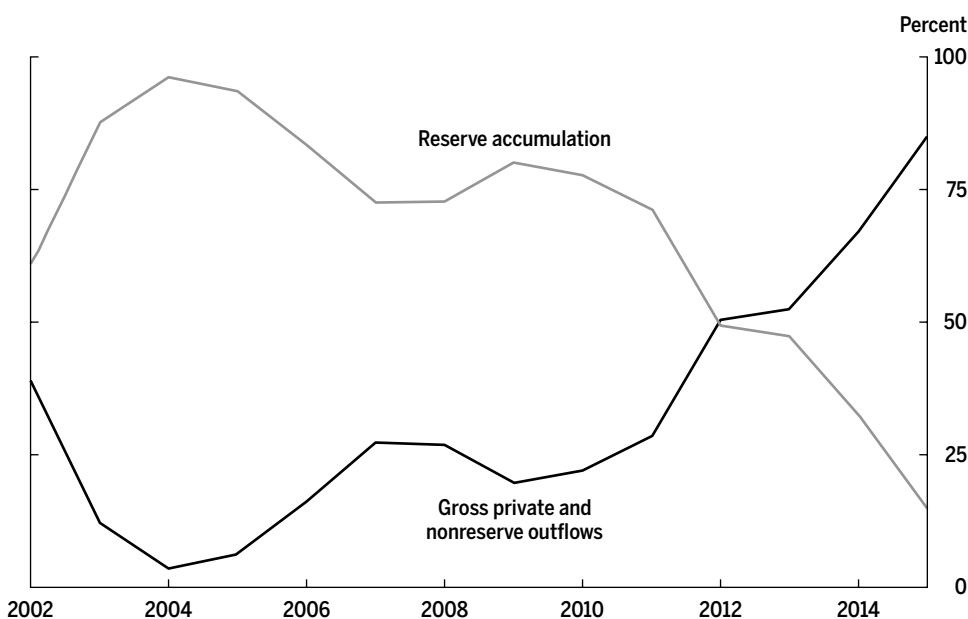FIGURE 7
A Decomposition of China's Current Account Balance
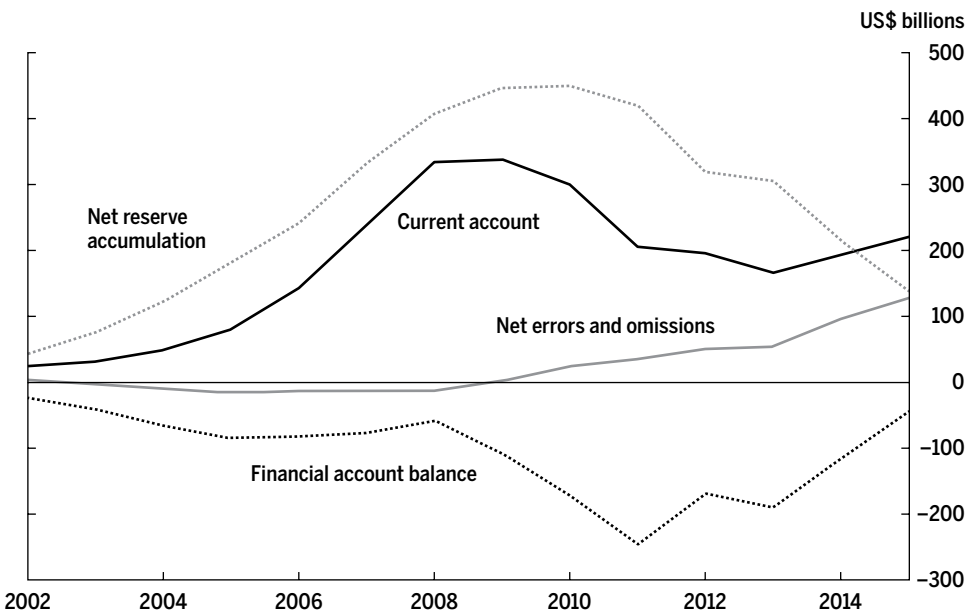
Sources: SAFE and CEIC.

Notes: This figure shows three-year trailing averages of the current account balance and its accounting breakdown into three parts. The figure shows the negative of the financial account balance and the negative of net errors and omissions. The current account balance is the sum of the other three lines shown in the figure. Data for 2015 represent a simple doubling of available data for the first half of 2015.

fell modestly in 2014, a sharp rise in gross outflows resulted in a fall in the financial account surplus from $343 billion in 2013 to just $38 billion in 2014.

To explore changes in the composition of gross capital outflows, I split them into (1) reserve accumulation and (2) gross private and non-reserve official outflows plus (the negative of) net errors and omissions. The latter category includes foreign investments by the China Investment Corporation (the sovereign wealth fund) and other state-owned financial and corporate entities. Figure 8 shows the trailing three-year moving averages of shares of gross capital outflows accounted for by these two components. There is clearly a trend change in the composition of gross outflows, which has shifted markedly from reserve accumulation to official and unofficial flows from both the private and state sectors. This shift is consistent with SAFE's stated objective of shifting foreign exchange risk from the central bank's balance sheet to those of households, corporations, and state-controlled entities such as the sovereign wealth fund. This objective of "foreign exchange holdings by the people" (rather than the central bank) will have a significant impact on the composition of future capital outflows from China.

FIGURE 8
The Structure of China's Gross Capital Outflows


Sources: SAFE and CEIC.

Notes: This figure shows three-year trailing averages of the shares of China's gross capital outflows accounted for by net reserve accumulation and all other outflows, which includes private outflows as well as foreign investments by Chinese official agencies, including its sovereign wealth fund. Data for 2015 are for the first half of the year.

5. International Use of the Renminbi

In this section, I provide a quantitative evaluation of the renminbi's rising prominence as an international currency. Given China's rapidly expanding trade volumes, promoting greater use of the renminbi in trade settlement was a logical first step in the currency's internationalization process. In a relatively short period, cross-border trade settlement in the Chinese currency expanded rapidly. Figure 9 shows that trade settlement in renminbi was $1.72 trillion in the first quarter of 2015, amounting to roughly 23 percent of China's trade. Virtually all of the trade settled using renminbi involves China. The rise in the share of China's trade settled using renminbi has leveled off since 2014, which could be related to reduced interest among foreign exporters in acquiring renminbi as appreciation pressures on the currency abated.

To support renminbi settlement, the Hong Kong Interbank Market initiated a renminbi settlement system in March 2006 in order to provide a variety of services such as check clearing, remittance processing, and bankcard payment services. There were virtually no renminbi clearing transactions until

FIGURE 9
Settlement of China's Foreign Trade in Renminbi
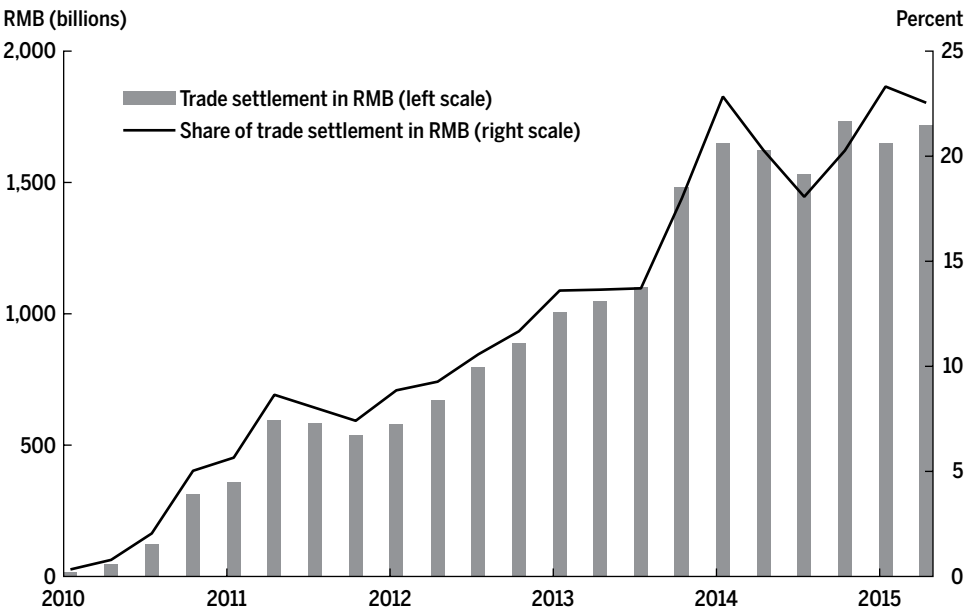
Sources: People's Bank of China and SAFE.

Notes: The bars show the amount of trade settlement in renminbi (billions of yuan, left scale). The solid line shows the share of China's trade settled in renminbi (in percent, right scale).

mid-2010, when financial institutions in Hong Kong were allowed to open renminbi-denominated accounts. At the end of 2014, renminbi customer deposits and certificates of deposit issued by banks in Hong Kong together amounted to over 1.1 trillion renminbi. Renminbi financing is also available in Hong Kong in the form of bank loans. The outstanding amount of renminbi loans in Hong Kong was 188 billion renminbi at the end of 2014.[11]

Another development is the rising issuance of renminbi-denominated bonds, better known as "dim sum bonds," in Hong Kong. The outstanding stock of these bonds was 381 billion renminbi at the end of 2014 (starting at a minuscule level in 2010), making Hong Kong by far the largest renminbi bond market outside the mainland. The stock of outstanding bonds grew more slowly in 2014 than in previous years, indicating that the issuance of new bonds has slowed. Mainland government agencies, banks, and enterprises accounted for about 42 percent of the outstanding stock of renminbi bonds at the end of 2014.

As a result of the initiation and rapid expansion of various elements of the offshore renminbi market, the currency has been gaining a significant foothold in Asian trade and financial transactions (see Shu, He, and Cheng 2014).

5.1. The Renminbi's Role as a Payment Currency

One indicator of the renminbi's rising international role that has received considerable attention is its evolution as a payments currency, i.e., a currency used for clearance and settlement of cross-border financial transactions. Data on the renminbi's role as a payments currency are based on information compiled and provided by the Society for Worldwide Interbank Financial Telecommunication (SWIFT). SWIFT provides a network that enables financial institutions worldwide to send and receive information about financial transactions in a standardized environment. While SWIFT transports financial messages, it does not perform clearing or settlement of transactions. The majority of international interbank messages use the SWIFT network.

SWIFT data on the usage of renminbi primarily measure the number of financial institutions using the currency for payments, both inbound and outbound, throughout the world. The data can also be used to show the share of renminbi in terms of the value of all payments transacted over the SWIFT network. This share has risen significantly in recent years, from 0.3 percent at the end of 2011 to 2.3 percent by mid-2015. While this share still seems relatively modest, it has vaulted the renminbi from the 20th rank at the beginning of 2012 to the rank of 5th most important payments currency by 2015. That leaves just four currencies—the U.S. dollar (43.6 percent), the euro (28.5 percent), the

pound sterling (8.7 percent), and the Japanese yen (2.9 percent)—ahead of the renminbi by this metric.

Hong Kong continues to dominate payment transactions conducted in renminbi. In 2012, it accounted for about 80 percent of renminbi transactions over the SWIFT network. By 2015, however, that share had declined to 70 percent. Singapore and the United Kingdom account for 6.9 percent and 5.1 percent, respectively, while China itself accounts for less than 5 percent. Most of the countries on this list are also designated as renminbi clearing centers. The United States is an important exception—it does not have a clearing center for renminbi transactions but still accounted for nearly 3 percent of renminbi payments over the SWIFT network.

While the SWIFT data on the renminbi's rising international role have attracted great interest, there are a few important caveats regarding these data. First, SWIFT estimates its market share to be around 80 percent of all cross-border payments flows in volume (correspondent banking); remaining transactions go through other channels. Second, SWIFT does not capture all intra-institutional flows, since financial institutions may use their own proprietary networks or systems. Third, SWIFT does not capture a large share of domestic flows. For instance, transactions that are intermediated through the Fedwire Funds Service are not on SWIFT. Fourth, the financial flows (sender–receiver) track bank-to-bank activity rather than the underlying commercial flows. For instance, a commercial transaction between China and South Africa that is intermediated through a U.S. bank could involve two messages—one between South Africa and the United States, and the other between the United States and China. This could result in double counting of some financial transactions (relative to the value of the underlying commercial transactions).

Notwithstanding these caveats, the SWIFT data reveal the rising prominence of the renminbi as an international payments currency, although it is still a long way from being a major payments currency that can rival the U.S. dollar.

5.2. Limited Use in International Financial Transactions

The pace of the internationalization of China's currency depends on its use in international financial transactions as well. The choice of currency for denomination and settlement of trade flows is contingent on the extent to which that currency can also be used in international financial transactions.[12]

Foreign exchange market turnover is a good indicator of a currency's potential for developing into a vehicle currency. As shown in Table 1, the renminbi accounts for just over 2 percent (out of 200 percent, as each transaction

involves two currencies) of all turnover in foreign exchange markets. While this may seem like a small share, it represents a considerable increase over a relatively short period, especially for a currency that is not freely convertible. The U.S. dollar is dominant in this dimension, accounting for 87 percent of turnover in 2013. The four major reserve currencies (the dollar, the euro, the yen, and the pound sterling), along with the Australian dollar and Swiss franc, account for 169 percent of total turnover in foreign exchange markets.

In terms of the geographic distribution of foreign exchange turnover, China has the advantage of having Hong Kong as an important financial center for settling foreign exchange transactions (Table 2). Hong Kong accounts for 4 percent of global foreign exchange market turnover (compared with 41 percent for the United Kingdom and 19 percent for the United States). This leaves the renminbi on a competitive footing relative at least to other emerging market currencies in terms of attaining the role of an international currency.

Table 3 shows the shares of various instruments in each major currency's foreign exchange market turnover (each row sums to 100). Overall, the spot and derivatives markets for trading in the renminbi have progressed to a significant extent but remain underdeveloped. China's currency once took a relatively low share of spot transactions turnover among all major economies, but that has shifted in just the last three years (since the previous Bank for International Settlements (BIS) Triennial Central Bank Survey based on 2010 data). The renminbi's foreign exchange derivatives trading volume as a share of total

TABLE 3
Global Foreign Exchange Market Turnover: Currency and Instrument Distribution
(percentage shares of average daily turnover: April 2013)

	Spot	Outright Forwards	Foreign Exchange Swaps	Currency Swaps	Options, Other Instruments
U.S. dollar	36.3	12.6	43.6	1.1	6.3
Euro	42.2	10.0	42.9	1.0	3.9
Japanese yen	49.7	10.0	27.0	0.9	12.4
Pound sterling	36.0	10.9	47.7	0.8	4.6
Australian dollar	42.4	10.8	39.6	1.3	5.8
Swiss franc	30.5	9.8	54.2	0.4	5.1
South African rand	31.7	11.7	51.7	—	3.3
Russian ruble	43.5	10.6	43.5	—	3.5
Indian rupee	28.3	45.3	18.9	—	5.7
Brazilian real	18.6	57.6	1.7	5.1	18.6
Chinese renminbi	28.3	23.3	33.3	0.8	14.2

Source: BIS Triennial Central Bank Survey (Foreign Exchange Turnover in April 2013).

Notes: This table shows, for each currency, the relative shares of its turnover in each of the five categories of global foreign exchange market shown in the column. Each row sums to 100. A dash (—) indicates that data were not available. Data are adjusted for local and cross-border interdealer double counting (i.e., "net-net" basis).

renminbi foreign exchange market turnover, which used to be far smaller than those of the major reserve currencies, has also risen. China also has a major presence in markets for commodity futures (not shown here). Based on the number of futures/options traded, three of China's commodity futures exchanges are among the top 20 derivatives exchanges in the world. These data confirm that China has made headway in promoting the international use of its currency.

The renminbi now leads other emerging market currencies in terms of its share of the turnover in global foreign exchange markets (Table 4). The U.S. dollar, the euro, and the Japanese yen together account for a substantial fraction of the total turnover in spot and derivatives markets. The renminbi has made significant progress—especially in terms of the share of its turnover in spot, outright forwards, and foreign exchange swaps markets. Its share of global foreign exchange market turnover still remains modest but is larger than those of other major emerging markets.

The renminbi's presence in the interest rate derivatives market remains modest. For trades cleared through centralized counterparties, the renminbi's shares are 0.9 percent of trades and 0.2 percent of the notional value of trades, respectively (Table 5, panel A). For trades cleared through all channels (including those not cleared through centralized counterparties), the renminbi's shares are lower and account for 0.5 percent of all trades and just 0.1 percent of the notional value of all trades (Table 5, panel B).

Another indicator of the currency's potential use in international financial transactions is the relative amount of international debt securities (i.e., debt issued outside the home country) in the several currencies of issuance. Table 6

TABLE 4
Turnover in Global Foreign Exchange (FX) Markets, April 2013
(daily averages in billions of U.S. dollars during April 2010)

	Spot	Outright Forwards	FX Swaps	Currency Swaps	Options Sold	Options Bought	Total Options	Total FX Contracts
U.S. dollar	1,691	588	2,030	50	189	188	293	4,652
Euro	754	178	766	18	48	46	70	1,786
Japanese yen	612	123	332	11	94	99	153	1,231
Pound sterling	227	69	301	5	19	20	29	631
Australian dollar	196	50	183	6	19	19	27	462
Swiss franc	84	27	149	1	8	8	14	275
Chinese renminbi	34	28	40	1	11	11	17	120
South African rand	19	7	31	0	1	1	2	60
Russian ruble	37	9	37	0	2	2	3	85
Indian rupee	15	24	10	0	2	2	3	53
Brazilian real	11	34	1	3	8	7	11	59

Source: BIS Triennial Central Bank Survey (global foreign exchange market turnover in 2013).

TABLE 5
Interest Rate Derivatives by Currency

	Gross Notional Value		Total Trade Count	
	USD Billions	Percent of Total	Trade Count	Percent of Total
A. Trades cleared through centralized counterparty				
Euro	80,018	33.9	628,417	25.3
U.S. dollar	75,502	32.0	702,401	28.3
Japanese yen	29,271	12.4	267,440	10.8
Pound sterling	20,526	8.7	234,049	9.4
Swiss franc	2,652	1.1	32,221	1.3
South African rand	1,792	0.8	30,080	1.2
Brazilian real	776	0.3	15,658	0.6
Indian rupee	742	0.3	43,097	1.7
Chinese renminbi	435	0.2	22,417	0.9
Russian ruble	1,466	0.6	6,648	0.3
Share of total	213,180	90.3	1,982,428	79.8
Total	236,185		2,483,499	
B. All trades				
Euro	172,596	34.8	1,103,212	25.6
U.S. dollar	172,099	34.7	1,320,501	30.7
Japanese yen	64,845	13.1	64,845	1.5
Pound sterling	42,325	8.5	425,289	9.9
Swiss franc	5,921	1.2	77,470	1.8
South African rand	2,387	0.5	49,975	1.2
Brazilian real	775	0.2	15,658	0.4
Indian rupee	742	0.1	43,097	1.0
Chinese renminbi	435	0.1	22,417	0.5
Russian ruble	132	0.0	6,648	0.2
Share of total	462,257	93.2	3,129,112	72.7
Total	495,889		4,302,569	

Source: Tri-Optima Interest Rate Trade Repository Report 2012.

Notes: "Trades cleared through centralized counterparty" refers to any interest rate trade cleared through a central counterparty. This was calculated by adding the trade summary by currency for G14 and non-G14 dealers. Tri-Optima's Interest Rate Trade Repository Report no longer publishes this data. The Depository Trust and Clearing Corporation now handles the data but does not make it available to the public.

shows that the existing reserve currencies dominate, with the U.S. dollar and the euro together accounting for 82 percent of outstanding international bonds and notes. The top five reserve currencies combined account for 95 percent of these instruments. Only a modest 0.5 percent of international debt is denominated in renminbi.

All of these indicators point to the significant progress that has been made by the renminbi in gaining acceptance in international financial markets, although a gulf between it and the advanced economy currencies, particularly the U.S. dollar, remains.

TABLE 6
International Bonds and Notes Outstanding
(selected currencies)

	June 2015 (USD billions)	Share (percent of total)
U.S. dollar	8,816	42.7
Euro	8,092	39.2
Pound sterling	1,988	9.6
Yen	402	1.9
Swiss franc	295	1.4
Chinese renminbi	98	0.5
Brazilian real	37	0.2
South African rand	29	0.1
Russian ruble	21	0.1
Indian rupee	7	0.0

Source: *BIS Quarterly Review*, Detailed Statistical Annex, Table 13B, September 2015.
Note: This table shows the breakdown of outstanding international debt securities by their currency denomination.

5.3. Payments and Clearing

The scale of international use of the renminbi will be determined to an important extent by the availability of renminbi liquidity offshore and how many financial centers are authorized to serve as clearing centers for renminbi transactions. The Chinese government has taken a number of measures in recent years to promote the renminbi's international use by increasing the number of international financial centers authorized to do renminbi business and by making it easier to settle transactions abroad in renminbi.

Table 7 shows that a total of 15 financial centers (other than Hong Kong and Macao) now serve as Chinese government-approved offshore centers for clearing yuan transactions. The list spans a wide geographic distribution of countries, with only five of them in Asia (Singapore, Taiwan, Thailand, South Korea, and Malaysia). Three major European financial centers—Frankfurt, London, and Paris—joined the list in 2014. Two Latin American countries—Chile and Argentina—are the latest additions to the list, while Japan and the United States are not on it.

In October 2015, China launched a new cross-border renminbi payments system—the China International Payment System (CIPS)—that is organized more in line with internationally accepted standards. This will help facilitate settlement and clearing of cross-border renminbi transactions, including trade and investment flows, and bolster the international role of the renminbi. Nineteen banks, including eight Chinese subsidiaries of foreign banks, have been authorized to use CIPS. CIPS will initially use SWIFT for interbank messaging, but the system has the capability eventually to serve as an independent channel for secure transmission of payment messages.

TABLE 7
Recent Offshore Yuan Clearing Arrangements
(excluding Hong Kong and Macao)

Country	Date Signed (Date of bank appt.)	Bank Appointed	Transaction Amount	Share of Payment Value
Singapore	July 6, 2012 (Feb. 8, 2013)	ICBC	¥10 trillion+ (Apr. 8, 2014)	6.9%
Taiwan	Aug. 31, 2012 (Dec. 11, 2012)	Bank of China	¥3.1 trillion (May 2014)	2.6%
Germany	Mar. 28, 2014 (June 19, 2014)	Bank of China	TBA	0.6%
Thailand	Dec. 22, 2014 (Jan. 8, 2015)	ICBC (Thai) Public Co. Ltd.	TBA	< 0.4%
United Kingdom	Mar. 31, 2014 (June 18, 2014)	China Construction Bank	TBA	5.1%
Luxembourg	June 28, 2014 (Sept. 23, 2014)	ICBC Luxembourg	TBA	0.6%
France	June 28, 2014 (Sept. 23, 2014)	Bank of China Paris	TBA	1.1%
South Korea	July 3, 2014 (July 4, 2014)	Bank of Communications of China	TBA	2.3%
Qatar	Nov. 3, 2014 (Nov. 14, 2014)	ICBC (Qatar)	TBA	< 0.4%
Malaysia	Nov. 10, 2014 (Jan. 8, 2015)	Bank of China (Malaysia) Berhad	TBA	0.4%
Australia	Nov. 17, 2014 (Nov. 17, 2014)	Bank of China (Sydney)	TBA	1.5%
Canada	Nov. 17, 2014 (Nov. 17, 2014)	ICBC (Canada)	TBA	< 0.4%
Switzerland	Jan. 21, 2015	TBA	N/A	< 0.4%
Chile	May 26, 2015	China Construction Bank (Chile)	TBA	< 0.4%
Argentina	Sept. 17, 2015	TBA	TBA	< 0.4%

Notes: Each offshore clearing center has only one clearing bank. The third column of the table shows official renminbi clearing banks. The shares of payment values are based on data from the SWIFT renminbi tracker as of July 2015. In addition to the designated offshore clearing centers listed in the table, two special renminbi centers that were set up over a decade ago—Hong Kong (December 2003) and Macao (September 2004)—account for 69.8 percent and 0.4 percent of payment values, respectively. The United States, Japan, and the Netherlands are not offshore clearing centers but are ranked among the top 15 countries, with their shares of payment values amounting to 2.68 percent, 0.4 percent, and 0.3 percent, respectively.

6. The Renminbi's Role as a Reserve Currency

The renminbi's prospects as a reserve currency will be influenced by progress on these criteria: (1) capital account openness, (2) exchange rate flexibility, (3) economic size, (4) macroeconomic policies, and (5) financial market development. China's progress on the former two criteria has been covered in previous sections. In this section I evaluate how the renminbi measures up on the remaining three criteria and then provide a summary evaluation of its progress towards reserve currency status.[13]

6.1. Economic Size

Some economists have argued that China's sheer size and dynamism will lead to its currency becoming a global reserve currency. China is now the second-largest economy in the world, accounting for 13.4 percent of global GDP in 2014 at market exchange rates. At purchasing power parity (PPP) exchange rates, the Chinese economy is already slightly larger than the U.S. economy, accounting for 16.3 percent of global GDP.

Another important criterion for achieving international or reserve currency status is the share of an economy in world trade and its trade interconnectedness with other economies. Although having large trade flows is neither a necessary nor sufficient condition for a country to have an international currency, it does boost the potential for the economy's currency to serve as an invoice currency.[14]

China now accounts for 8.5 percent of world trade in goods and nonfactor services, behind only the shares of the euro area (which includes within-euro-area trade) and the United States. When trade is measured on the basis of goods trade alone, the same ranking of the top three holds up, with China accounting for 10.5 percent of the world total. In addition to trade volumes, another important criterion is the degree to which an economy is interconnected with other economies through trade linkages. This has implications for the incentives of traders in other countries to settle their transactions in the home country's currency. On the basis of a variety of criteria, Errico and Massara (2011) find that, in 2010, China was the second-most interconnected country in terms of its trade flows, up from fifth in 2000.

6.2. Macroeconomic Policies

Macroeconomic policies that anchor long-run inflationary expectations and foster macroeconomic stability are typically important conditions for a reserve currency. China has a low level of explicit public debt relative to the major reserve currency economies. The level of central government debt is estimated to be about 17 percent of GDP in 2015. This is a positive situation from the perspective of macroeconomic stability, even if it means limited availability of "safe" renminbi-denominated assets. The IMF also calculates a measure of augmented debt, which includes various types of local government borrowing, including off-budget borrowing by local government financing vehicles (LGFVs) via bank loans, bonds, trust loans, and other funding sources. By this measure, China's public debt is estimated to be about 57 percent of GDP in 2015, which would still be below the median public debt-to-GDP ratio among advanced economies.[15]

China has had a relatively stable inflation rate in the recent past. During the years 2000–10, the period of the Great Moderation followed by the global financial and economic crisis, inflation was well contained in most major economies. The standard deviations of annual consumer price index inflation in the reserve currency economies were all around 1 percent. During this period, the standard deviations of inflation in emerging markets were in the range of 3 to 4 percent, with China registering the lowest inflation volatility in that group, with a standard deviation of 2 percent (Prasad and Ye 2012). In 2014 and 2015, CPI inflation generally came in under 2 percent. China's track record in terms of the level and volatility of inflation indicates that concerns about inflation should not be an impediment to the renminbi becoming a global currency.

The reserve currency economies have diverse net international positions. The United States has a particularly large negative net foreign asset position, amounting to $6.7 trillion in the second quarter of 2015. Germany, Japan, and Switzerland have positive net asset positions. The United Kingdom and also the euro area as a whole have negative net asset positions. This diversity suggests that the signs of the net positions are themselves not crucial for reserve currency status. In other words, it is not essential for a country to run current account deficits for its currency to attain reserve currency status (as some have argued based on a misinterpretation of the Triffin dilemma). In fact, the average current account balance as a ratio to GDP during the period 2000–07 was positive (or, in the case of the euro zone as a whole, essentially zero) for all reserve currency economies except the United Kingdom and the United States.[16]

6.3. Financial Market Development

Financial market development in the home country is one of the key determinants of a currency's international status.[17] There are three relevant aspects of financial market development: (1) breadth, or the availability of a broad range of financial instruments, including markets for hedging risk; (2) depth, or a large volume of financial instruments in specific markets; and (3) liquidity, or a high level of turnover (trading volume).

Without a sufficiently large and liquid debt market, the renminbi cannot be used widely in international transactions. To make the currency attractive to foreign central banks and large institutional investors, they will need access to renminbi-denominated government and corporate debt as "safe" assets for their portfolios. At the same time, both importers and exporters may be concerned about greater exchange rate volatility resulting from an open capital account if they do not have access to derivatives markets to hedge foreign exchange risk.

Thus, depth, breadth, and liquidity are all relevant considerations in assessing the readiness of a country's financial sector to cope with an open capital account and elevate its currency to reserve currency status.

China's financial system remains bank-dominated, with the state directly controlling most of the banking system. Domestic credit allocation has been disproportionately directed toward large state-owned enterprises rather than households and small and medium-sized private enterprises. Credit allocation through the banking sector is supported by massive deposits in the banking system, amounting to 179 percent of GDP in 2014. The size and structure of the banking sector in China seem unsuitable for promoting the international use of the renminbi. Policies that favor the banking sector relative to the rest of the financial system—including the interest rate structure that inhibited competition by setting a floor for lending rates and a ceiling for deposit rates—have been detrimental to broader financial market development. Recognizing this, the Chinese government has instituted a number of recent reforms including full liberalization of bank lending and deposit rates (although the PBC still sets reference rates) and the introduction of an explicit deposit insurance system.

China also has a large shadow banking system that has expanded rapidly as a way around the regulations imposed on the formal banking system. Based on a broad definition and using figures from Moody's, shadow banking assets are estimated to amount to 65 percent of GDP in China, compared with 150 percent in the United States and a world average, weighted by country size, of about 120 percent (Jiang 2015). The risks related to shadow banking are that it is nontransparent, falls largely outside the formal regulatory apparatus, and has no formal safety backstops, such as through a deposit insurance mechanism. Concerns about the risks to financial stability posed by the growth of shadow banking in China have prompted the government to impose stricter regulation of shadow banking activities undertaken by both banks and nonbank financial entities. As a result, the flow of total social financing (a measure that includes bank credit as well as credit provided by the shadow banking system) has fallen sharply in the last two years, led by a decline in shadow banking.

While the financial system in China is dominated by regular or shadow banks, the more relevant issue for the renminbi's role as a reserve currency—beyond financial stability considerations—relates to the availability of high-quality financial assets for foreign investors.

Capitalization and turnover in Chinese equity markets now exceed those of other economies—with the notable exception of the United States, which remains dominant in terms of its share of global equity market capitalization and turnover (Prasad and Ye 2012). Equity markets do in principle provide

renminbi-denominated instruments that can be held by both domestic and foreign investors and, as noted earlier, there are an increasing number of channels through which foreign investors can participate even in China's A-share market. The level of foreign investor participation remains limited, however, relative to overall stock market participation. Moreover, Chinese stock markets are volatile and prone to concerns about weak corporate governance, limited transparency, weak auditing standards, and shoddy accounting practices. The recent volatility in the stock market has heightened many of these concerns, which is likely to lead international investors to shy away from investing heavily. Hence, the country's deep equity markets may be of limited help in making the renminbi an international currency in the near future.

China's fixed-income markets, especially for corporate debt, have developed rapidly in recent years (Table 8). The stock of government bonds stands at about $3.51 trillion, a tenfold increase since 2002. Nonfinancial corporate debt was practically nonexistent in 2002, but the outstanding stock has risen to $1.57 trillion. Turnover in both markets remains quite low, however. China's overall domestic debt market value of $5 trillion in 2014 was significantly lower than those of the top three reserve currency areas—the United States, Japan,

TABLE 8
Government and Corporate Bonds in China: Stocks and Turnover

Year	Government Bonds			Corporate Bonds		
	Level (USD billions)	Turnover (USD billions)	Turnover Ratio	Level (USD billions)	Turnover (USD billions)	Turnover Ratio
2002	328	—	—	7	—	—
2003	424	—	—	12	—	—
2004	570	—	—	22	—	—
2005	788	—	—	54	—	—
2006	1,038	—	—	98	—	—
2007	1,426	—	—	140	—	—
2008	1,898	—	—	230	—	—
2009	2,062	—	—	427	—	—
2010	2,349	—	—	618	—	—
2011	2,459	—	—	797	—	—
2012	2,725	—	—	1,176	—	—
2013	2,952	496	0.17	1,416	263	0.18
2014	3,341	1,053	0.31	1,543	306	0.20
2015	3,515	1,885	0.54	1,570	425	0.27

Sources: AsianBondsOnline, Asian Development Bank.

Notes: Turnover is defined as the value of bonds traded on the secondary market. Turnover ratio is defined as total turnover divided by average amount of bonds outstanding between the end of the third and fourth quarters of each year. Repurchase transactions are excluded. Corporate bonds include those issued by nonfinancial and financial corporations. The BIS revised the compilation methodology for debt securities statistics in 2012. While the revised stock data on outstanding bonds are consistent over time, the turnover data had a discontinuity in 2013, so data for prior periods are not shown. A dash (—) indicates missing data (based on the revised statistics). Data for 2015 are for June of that year.

and the euro area (Table 9). Interestingly, the quantity of China's outstanding domestic securities is greater than that of the United Kingdom and Switzerland, two reserve currency economies (not shown here). This suggests that the size of the domestic debt market per se does not necessarily prevent the Chinese currency from going global.

China had placed a number of restrictions on foreign investors' participation in its bond markets, which could affect its currency's scope with respect to becoming a reserve currency. In recent years, however, China has started creating channels, including through the QFII scheme, through which foreign institutional investors can purchase both government and corporate debt securities. However, the level of participation remains modest.

6.4. A Summary Evaluation

This section builds on the prior analysis to discuss the relative importance of each criterion for reserve currency status mentioned earlier and summarizes how China measures up against each of these.

- **Economic size:** A country's size and its shares of global trade and finance are important, but not crucial, determinants of the status of its reserve currency. China now accounts for 13 percent of world gross domestic product (16 percent if measured by PPP rather than market exchange rates) and 9 percent of world trade. In 2014, it is estimated to have accounted for about one-third of world GDP growth.
- **Open capital account:** Reserves must be acceptable as payments to a country's trade and financial partners, which requires that the currency

TABLE 9
Stocks and Turnover of Government and Corporate Bonds: A Cross-Country Perspective

	Government			Corporate		
	Amount Outstanding	Turnover	Turnover Ratio	Amount Outstanding	Turnover	Turnover Ratio
U.S.	13,063	127,739	9.8	7,718	5,368	0.7
Japan	8,216	11,103	1.4	670	37	0.1
Euro area	8,126	—	—	3,655	—	—
China	3,341	1,053	0.3	1,543	306	0.2
Germany	1,356	5,919	4.4	267	—	—

Sources: Statistical Abstract of the United States, Securities Industry and Financial Markets Association (SIFMA), European Central Bank, Bundesbank, the Federal Financial Supervisory Authority, AsianBondsOnline, CEIC, and Securities and Exchange Board of India.

Notes: Data shown in this table are for 2014. The data shown here do not include debt securities of monetary financial institutions such as central banks. Government bonds include both central and general government debt. The amount of government and corporate bonds outstanding and their turnover are expressed in billions of U.S. dollars. Corporate bonds for China, the euro area, Germany, and Japan include those issued by nonfinancial and financial corporations. A dash (—) indicates that data were not available.

be easily tradable in global financial markets. China is gradually and selectively easing restrictions on both inflows and outflows. The capital account has become increasingly open in de facto terms, but extensive capital controls remain in place.

- **Flexible exchange rate:** Reserve currencies are typically traded freely and their external value is market determined, although this does not preclude occasional bouts of intervention by the country's central bank in foreign exchange markets. China has in principle increased the flexibility of the exchange rate, which will become increasingly hard to manage as the capital account becomes more open.

- **Macroeconomic policies:** Investors in a country's sovereign assets must have faith in its commitment to low inflation and sustainable levels of public debt so the value of the currency is not in danger of being eroded. China has a lower ratio of explicit public debt to GDP than most major reserve currency economies and has maintained moderate inflation in recent years.

- **Financial market development:** A country must have broad, deep, and liquid financial markets so that international investors can access a wide array of financial assets denominated in its currency. China's financial markets remain limited and underdeveloped, with a number of constraints such as a rigid interest rate structure.

While China measures up favorably in the first four areas, its aspirations to make the renminbi a global reserve currency rest in large part on the pace of development of its fixed-income markets. Reserve currency economies are expected to issue high-quality and creditworthy government debt or government-backed debt instruments in markets that are both deep and liquid. The recent growth of China's debt markets suggests that the pace of the country's financial market development is consistent with its intention to gradually increase acceptance of its currency as an international currency. Moreover, to satisfy their demand for relatively safe renminbi-denominated assets, foreign investors—both official and private—will eventually need to be given greater access to China's debt markets if the renminbi is to become a significant reserve currency.

6.5. De Facto Reserve Currency Status

Since 2009, the PBC has moved aggressively to establish bilateral local currency swap arrangements with other central banks in order to facilitate and expand the use of the renminbi in international trade and financial transactions. So far, 34 central banks have signed such local currency swap arrangements

with the PBC (Table 10). The total amount that could be drawn by the 34 participating swap arrangements amounts to roughly half a trillion dollars.[18] China's bilateral swap lines with foreign central banks directly support the renminbi's greater international use.

Moreover, despite its lack of convertibility, the renminbi is already beginning to play a modest role in a few central banks' reserve portfolios.[19] Chile, Malaysia, and Nigeria are widely believed to have pioneered this trend, starting in the second half of 2011. Official statements and other accounts, including press reports, suggest that other central banks are also considering adding renminbi assets to their reserve portfolios. The IMF estimates that in 2014 about 1.1 percent of official foreign currency assets were held in renminbi, up from a share of 0.7 percent in 2013 (see IMF 2015, Table 4). This puts the renminbi in the seventh spot in terms of the identified composition of official foreign currency assets (behind the U.S. dollar, the euro, the British pound sterling, the Japanese yen, the Australian dollar, and the Canadian dollar, and ahead of the Swiss franc, the New Zealand dollar, and the Swedish krona).

On November 30, 2015, the IMF executive board announced its decision to incorporate the renminbi into the basket of currencies that comprise the IMF's special drawing rights (SDR), taking effect October 1, 2016. The IMF's SDR basket consists of the major currencies that are (1) issued by IMF members (or monetary unions that include IMF members) that are the largest exporters, and (2) have been determined by the IMF to be "freely usable." The latter condition was added as a formal criterion only in 2000 and requires that the currency be (1) widely used to make payments for international transactions, and (2) widely traded in the principal exchange markets. Full capital account convertibility is not necessary for a currency's inclusion in the SDR basket.

The IMF staff's recommendation to the executive board was summarized as follows:[20]

> *There is a sufficient basis for the Board to determine that the RMB is a freely usable currency. The analysis suggests that the use of the RMB in international payments has risen substantially, reaching in staff's view a critical mass such that it can now be considered "in fact, widely used to make payments for international transactions" under the freely usable currency definition. RMB activity in FX markets covering two of the three major trading time zones has also increased significantly and can accommodate transactions of the magnitude involved in Fund operations. The level of trading across multiple time zones provides, in the judgment of staff, a basis for the RMB can now [sic] be*

TABLE 10
Central Bank Swap Arrangements with People's Bank of China, December 2008–September 2015

Bank	Date	Amount (billion yuan)	USD equivalent (billion)
Bank of Korea	Dec. 12, 2008	180	28.2
	Oct. 26, 2014	360	56.4
Hong Kong Monetary Authority	Jan. 20, 2009	200	31.3
	Nov. 27, 2014	400	62.7
Bank Negara Malaysia	Feb. 8, 2009	80	12.5
	Feb. 8, 2012	180	28.2
	Apr. 18, 2015	180	28.2
National Bank of the Republic of Belarus	Mar. 11, 2009	20	3.1
	May 11, 2015	7	1.1
Bank Indonesia	Mar. 23, 2009	100	15.7
	Oct. 1, 2013	100	15.7
Central Bank of Argentina	Apr. 2, 2009	70	11.0
	July 18, 2014	70	11.0
Central Bank of Iceland	June 9, 2010	3.5	0.5
	Oct. 14, 2013	3.5	0.5
Monetary Authority of Singapore	July 23, 2010	150	23.5
	Mar. 7, 2013	300	47.0
Reserve Bank of New Zealand	Apr. 18, 2011	25	3.9
	May 22, 2014	25	3.9
Central Bank of the Republic of Uzbekistan	Apr. 19, 2011	0.7	0.1
Bank of Mongolia	Apr. 19, 2011	5	0.8
	Mar. 20, 2012	10	1.6
	Aug. 21, 2014	15	2.4
National Bank of Kazakhstan	June 13, 2011	7	1.1
	Dec. 14, 2014	7	1.1
Bank of Thailand	Dec. 22, 2011	70	11.0
	Dec. 22, 2014	70	11.0
State Bank of Pakistan	Dec. 23, 2011	10	1.6
Central Bank of the United Arab Emirates	Jan. 17, 2012	35	5.5
Central Bank of the Republic of Turkey	Feb. 21, 2012	10	1.6
Reserve Bank of Australia	Mar. 22, 2012	200	31.3
	Apr. 8, 2015	200	31.3
National Bank of Ukraine	June 26, 2012	15	2.4
Banco Central do Brazil	Mar. 26, 2013	190	29.8
Bank of England	June 22, 2013	200	31.3
Central Bank of Hungary	Sept. 9, 2013	10	1.6
Bank of Albania	Sept. 12, 2013	2	0.3
European Central Bank	Oct. 10, 2013	350	54.9
Swiss National Bank	July 21, 2014	150	23.5
Central Bank of Sri Lanka	Sept. 16, 2014	10	1.6
Central Bank of Russian Federation	Oct. 13, 2014	150	23.5
Qatar Central Bank	Nov. 3, 2014	35	5.5
Bank of Canada	Nov. 18, 2014	200	31.3
Nepal Rastra Bank	Dec. 25, 2014	—	—
Central Bank of Suriname	Mar. 18, 2015	1	0.2
Central Bank of Armenia	Mar. 30, 2015	1	0.2
South African Reserve Bank	Apr. 10, 2015	30	4.7
Central Bank of Chile	May 25, 2015	22	3.4
National Bank of Tajikistan	Sept. 7, 2015	3	0.5
Total Amount		3,162	495.8

Sources: People's Bank of China and other participating central banks.

Notes: The U.S. dollar equivalent amounts are based on the September 9, 2015, exchange rate of 6.38 yuan per dollar. The table shows only the dates of the initial arrangement and the latest arrangement (if the initial arrangement has been renewed). Intermediate renewals (for instance, the Bank of Korea's and Hong Kong Monetary Authority's renewals in 2011) are not shown. A dash (—) indicates unknown.

considered "widely traded in the principal exchange markets." While recognizing some remaining operational challenges, staff views these as manageable. In light of these considerations, staff proposes that the Board add the RMB to the list of freely usable currencies and include it in the SDR basket.

One of the operational challenges referred to in the report was the deviation between the offshore (CNH) and onshore (CNY) renminbi exchange rates. Deviations between the two rates imply that the CNH cannot be a perfect hedge for CNY-based exposures. This had become a significant concern in the aftermath of the August 11, 2015, exchange rate move, which led to a sizable gap between the two rates. The report concluded that this was not enough of a hurdle to keep the renminbi, which met the other technical criteria, out of the SDR basket:

Recent developments highlight some remaining operational challenges although their impact on members is mitigated by a number of factors . . . the existence of some capital account restrictions does not preclude a currency from being freely usable as long as the currency is "in fact widely used to make payments for international transactions" and "widely traded in the principal exchange markets." Therefore, the existence of a spread between RMB onshore and offshore exchange rates is not an impediment per se for the assessment. However, sudden spikes in the spread, as recently experienced, create uncertainty for RMB users and, if persistent, could increase the complexity and costs associated with RMB transactions. Unencumbered access to both onshore and offshore markets should reduce financial risks to members by allowing them to transact in the market with the most favorable conditions, although the need to operate simultaneously in two separate markets for the RMB could imply some additional administrative burden and hedging could be more challenging and costly. China's obligation to collaborate with the Fund and other members to enable the exchange of RMB for other freely usable currencies if the RMB is declared freely usable should also help to ensure that Fund-related transactions can be executed even in circumstances of market stress.

The IMF also changed the formula used to calculate the shares of currencies in the SDR basket (the shares have to sum to 100). The new formula is meant to better reflect the rising importance of cross-border financial flows in addition to trade flows. The formula assigns equal weight to exports and a financial

indicator, reflecting a country's importance in global trade and the currency's importance in global financial markets, respectively. The financial indicator is a composite variable that assigns a 50 percent weight to the share of reserves denominated in that currency, a 25 percent weight to foreign exchange turnover accounted for by that currency, and a 25 percent weight to the sum of international banking liabilities and international debt securities denominated in that currency.[21]

Under the new formula, the weights of the SDR currencies are as follows: 41.7 percent for the U.S. dollar, 30.9 percent for the euro, 10.9 percent for the renminbi, 8.3 percent for the Japanese yen, and 8.1 percent for the pound sterling. The new basket of currencies with these weights will take effect on October 1, 2016. Interestingly, the U.S. dollar's share, which was 41.9 percent in the previous SDR basket, was essentially unchanged, while the shares of the other three currencies fell significantly compared with their shares in the previous basket.

The IMF's decision is an important validation of China's efforts over the past year to liberalize financial markets, open up its capital account, and allow the renminbi's value to be determined to a greater extent by market forces. Progress in all of these areas has been slow and uneven, as described in earlier sections, but in a relative sense these reforms have outstripped those in other areas such as state-owned enterprise reform, liberalization of the services sector, and other reforms of the "real" side of the economy where progress has been limited at best.

The decision by itself is unlikely to generate a surge of capital inflows into China. SDRs currently account for less than 3 percent of reserve asset holdings worldwide, so the direct effect of including the renminbi in the SDR basket will not be large. Private financial institutions do not have any portfolios that are benchmarked against SDRs, so no portfolio rebalancing effect will follow. But the symbolic effect could be significant, as the renminbi's recognition as an official reserve currency is likely to encourage central banks around the world to begin adding renminbi assets to their reserve portfolios. The IMF's imprimatur will help, but ultimately it is the availability of sufficient high-quality renminbi-denominated financial assets and the ease of moving financial capital into and out of China that will determine the renminbi's trajectory as a reserve currency.

There could be significant effects on the patterns of global capital flows if this decision does lead to further financial sector reforms, capital account liberalization, and exchange rate flexibility in China. These changes would open the door to more capital inflows into China and also further tilt the composition of

China's outflows away from foreign exchange reserve accumulation by the central bank, as it will spur more foreign investments by China's households, corporations, and institutional investors.

The IMF argued that its decision would be good for both China and the international monetary system, stating:

> *Put into a broader context, the inclusion of the [RMB] in the SDR basket could be seen as an important milestone in the process of China's global financial integration. It also recognizes and reinforces China's continuing reform progress. As this integration continues and further deepens, and is paralleled in other emerging market economies, it could bring about a more robust international monetary and financial system, which in turn would support the growth and stability of the global economy. The RMB's inclusion will also enhance the attractiveness of the SDR as an international reserve asset, as it diversifies the basket and makes its composition more representative of the world's major currencies.*[22]

7. Sequencing and Transitional Risks

One important issue is how China sequences capital account liberalization steps relative to other policy changes and how that affects the benefit/risk tradeoff from capital account opening. This has implications for China's growth and financial stability, and therefore for the renminbi's international role.

Is China putting the cart before the horse by pushing forward with capital account opening before fixing its financial markets and fully freeing up its exchange rate?[23] An examination of China's international investment position, in terms of evolution over time and from a cross-country perspective, would seem to suggest that the economy faces only modest risks from having a more open capital account in terms of vulnerability to external shocks. China's gross capital inflows since 2000 have been mostly in the form of foreign direct investment. As noted earlier, FDI liabilities now account for 57 percent of China's total (gross) external liabilities. FDI and portfolio equity together account for 71 percent of external liabilities. This structure of liabilities—dominated by FDI and portfolio equity—is consistent with the objective of sharing risk across countries, with foreign investors bearing capital as well as currency risks on such investment.

Another potential source of risk is that an open capital account often encourages accumulation of external debt. Short-term foreign-currency-denominated external debt has been the scourge of emerging markets and was a major source

of vulnerability for Latin American and Asian economies during the 1980s and 1990s. China has traditionally maintained a low level of external debt, which amounted to about $900 billion or 9 percent of GDP in 2014 (IMF 2015), a lower ratio than those in other major emerging markets. China's overall external balance sheet suggests that its economy is relatively well insulated from external shocks, as net foreign assets amounted to about $1.5 trillion at the end of the first half of 2015. China has enough foreign assets not only to meet all its external debt obligations but also to more than cover all of its foreign liabilities. In short, China does not seem to be subject to the traditional risks associated with opening up the capital account in advance of increasing exchange rate flexibility.

One of the bigger risks may be related to domestic policies. The combination of a managed nominal exchange rate and an increasingly open capital account weakens the ability of the central bank to use monetary policy instruments such as interest rates to maintain domestic price stability. Although its capital account is not fully open, this constraint applies to China as well because the capital account is in fact rather porous and becomes even more so when interest differentials with the rest of the world increase and the incentives to evade controls increase as well (Goodfriend and Prasad 2007). Indeed, the expectations of renminbi appreciation that resulted from the tight management of the renminbi's value may have fueled more speculative inflows in previous years. The reverse is true as well. As discussed in greater detail below, capital outflows at a time of domestic economic weakness can also complicate domestic policymaking.

China's stock of foreign exchange reserves, which stood at $3.2 trillion (roughly 30 percent of GDP) in April 2016, would seem to provide enough insurance against most conceivable financial shocks. However, for an economy with a weak financial system and a de facto relatively open capital account, the relevant measure of foreign exchange reserve adequacy may be determined not in relation to exports or short-term debt but relative to the size of the monetary base (Obstfeld, Shambaugh, and Taylor 2010). By this criterion, China's massive stockpile of foreign exchange reserves looks less imposing. Bank deposits in China amounted to 179 percent of GDP in 2014 (Figure 10). Corporate deposits amounted to 89 percent of GDP and household deposits were about 80 percent of GDP. The ratio of M2 to GDP was 193 percent in 2014.

The recent elimination of the ceiling on deposit interest rates has reduced the risk of withdrawals from China's banking system in search of better returns abroad. However, another important reform, the replacement of the implicit full government insurance of all deposits with an explicit risk-based deposit

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FIGURE 10

China: Bank Deposits and Money Supply

Percent of GDP
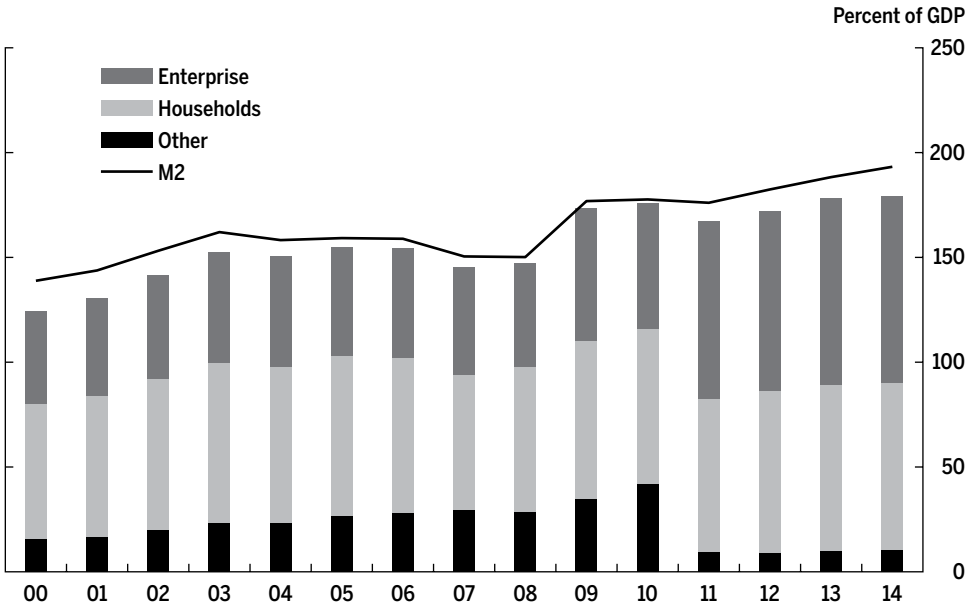
Sources: People's Bank of China, National Bureau of Statistics, and CEIC.

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insurance system, raises the risk that an accident in the banking system could trigger a surge of outflows due to loss of confidence. Substantial deposit withdrawals for other reasons, including more basic concerns about the stability of the banking system, can damage banks and strain the entire domestic financial system.

How worried should China be about these risks? The government has firm enough control of its financial markets and enough resources to back up its banks that these risks are probably not likely to escalate into a full-blown banking or broader financial crisis. Nevertheless, it could take a large amount of government resources to keep the system stable in difficult times. Even if one were to discount the possibility of a systemic crisis in the Chinese financial system, there are many fragilities in the banking system and in the unregulated parts of the financial system that warrant serious concern. A capital account that is becoming increasingly open could heighten these tensions.

The controlled and calibrated approach to capital account opening adopted by China mitigates but does not eliminate these risks. The scale of recent

outflows indicates how sentiments about economic and financial market conditions can shift quickly. These capital flow surges in one direction or another can be exacerbated if the exchange rate is not allowed to adjust freely, and speculative pressures on the currency start building up.

Consider, for example, the downward pressure on the renminbi–dollar exchange rate after the PBC announced a shift to a more market-determined exchange rate on August 11, 2015. In the immediate aftermath of this shift, which was accompanied by a nearly 2 percent devaluation of the renminbi relative to the dollar (as noted earlier), financial market participants appeared to interpret the move as signaling Chinese policymakers' concerns about the state of the economy. This move, in tandem with the sharp drop in mainland stock markets since July 2015, appears to have increased outflows. Foreign exchange market intervention to keep the renminbi's value from falling sharply in the second half of August led to a reduction in foreign exchange reserves. SAFE data indicate that the reserve losses may have been about $94 billion in that month, although it is not clear if any of this represents currency valuation effects on the value of China's massive foreign exchange reserve portfolio or actual foreign exchange market intervention.

Reflecting the fragility of even a large stock of reserves, China's foreign exchange reserves fell from their peak of $3.99 trillion in June 2014 to $3.51 trillion in September 2015, a 12 percent decline. In the first three quarters of 2015 alone, China lost a total of $329 billion of reserves, a decline of 8.5 percent relative to the level at the end of 2014.

An additional aspect of capital outflows is that net errors and omissions, which reflect unrecorded capital account or current account transactions, have been persistently negative since 2009. Negative amounts in this category reflect money leaving the country through unofficial channels. During 2014, such outflows amounted to –$140 billion and in the first half of 2015 alone they amounted to –$180 billion. From 2009 through the first half of 2015, cumulative net errors and omissions amounted to –$578 billion. One possibility, which is difficult to verify for obvious reasons, is that the government's crackdown on corruption is leading to some capital leaving the country for fear of expropriation as part of the crackdown. But these flows could also represent outward investments reflecting the same concerns about macroeconomic and financial stability laid out earlier.

In summary, China has taken major steps down the path of capital account liberalization that will be difficult to reverse. In the absence of other domestic reforms that are necessary to support a more open capital account—including

financial-sector development, better regulatory frameworks, and a more flexible exchange rate—there are transitional risks that could result in substantial capital flow volatility and impose significant stresses on the financial system. Nevertheless, the possibility of a systemic financial crisis or balance of payments crisis remains low.

8. Concluding Remarks

On its present trajectory, China will have a nearly fully open capital account in the next few years, allowing the renminbi to play an increasingly prominent role in global trade and finance. The renminbi already plays a significant role in the denomination and settlement of international trade transactions that involve China. The renminbi is also making inroads into the global financial system and is starting to appear in the reserve portfolios of certain emerging market central banks. It is set to become a constituent of the basket of currencies that comprise the IMF's special drawing rights. These shifts, some of which are more symbolic than substantive at present, will develop critical mass over time and have the potential to start transforming the global monetary system.

The renminbi's prospects as a global currency will ultimately be shaped by broader domestic policies, especially those related to financial market development, exchange rate flexibility, and capital account liberalization. As Chinese financial markets become more fully developed and private investors increase the international diversification of their portfolios, shifts in China's outward investment patterns are also likely to become more pronounced. Thus, the various policy reforms that are needed to support the international role of the renminbi could also create significant changes in China's economy and the patterns of its capital inflows and outflows.

So long as China continues to make progress on financial-sector and other market-oriented reforms, it is likely that the renminbi will become a significant reserve currency within the next decade. However, the government's unambiguous repudiation of significant political, legal, and institutional reforms means that the renminbi is unlikely to be seen as a safe-haven currency (see Prasad 2014). In the absence of these broader reforms, the rise of the renminbi is likely to erode but not seriously challenge the dollar's dominance in international finance.

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NOTES

1 Chen, Peng, and Shu (2009) and Subramanian (2011) argue that the renminbi is well on its way to becoming a major, if not dominant, reserve currency. Dobson and Masson (2009), Eichengreen (2011a, 2011b), and Kroeber (2011) offer more nuanced and skeptical views.

2 A burgeoning body of literature examining specific aspects of China's exchange rate management and capital account liberalization includes Frankel (2005, 2011), Lardy and Douglass (2011), Yam (2011), and Yu (2015).

3 Initiatives designed to encourage corporate outflows have focused on large state-owned firms and a concentrated set of sectors such as natural resources that are relevant to the Chinese economy (Rosen and Hanemann 2009; Scissors 2011).

4 See Prasad (2009) for a more detailed discussion of these issues.

5 Appendix B in Prasad (2016) provides a detailed documentation of significant changes to capital account restrictions during the past decade, based on annual IMF *AREAER* reports.

6 As discussed in greater detail later in the paper, the 2015 figures are not directly comparable with those for prior years.

7 This subsection draws on Sharma (2015).

8 The general qualification requirements for QDII include (1) stable financial status and good credit; (2) qualified personnel who meet the relevant stipulations; (3) a sound governance structure and internal control systems; and (4) no record of major penalties levied by the relevant regulatory authority. There are also specific requirements that vary by type of institution. For example, an eligible fund management company needs to have net assets of at least 200 million renminbi, at least two years of active participation in the fund management business, and more than 20 billion renminbi or assets of equal value under management at the end of the latest quarter.

9 The quota balances are calculated at the end of each trading day on a net-buy basis: Aggregate Quota Balance = Aggregate Quota – Aggregate Buy Trades + Aggregate Sell Trades. The daily quota caps the daily net value of cross-border trades and is updated on a real-time basis. When the balance falls short of the daily quota, all buy orders on the next trading day are suspended, while sell orders are still accepted. The Hong Kong Securities Clearing Corporation and the China Depository and Clearing on the mainland are each other's clearing participants and undertake the settlement obligations of their respective clearing participants' trades on a net basis.

10 In principle, China has been reporting balance of payments (BOP) data based on *BPM6* standards for a number of years, while, as noted earlier, it has begun reporting IIP data based on *BPM6* in 2015. Changes in foreign exchange reserves differ between the historical BOP and IIP data. For instance, in 2014, the BOP data indicate net accumulation of foreign exchange reserves of $118 billion, while the corresponding number in the official reserves data, which is consistent with the IIP, is $22 billion. The difference could be due to two types of valuation effects—currency valuation effects and marking-to-market of assets in the reserve portfolio. In the first half of 2015, BOP data indicate a loss of reserves of about $67 billion, while the corresponding number in official reserves data is a loss of $149 billion.

11 See "Hong Kong: The Premier Offshore Renminbi Business Centre," Hong Kong Monetary Authority, April 2015.

12 Data on foreign exchange market turnover, derivatives markets, and currency denomination of international debt securities are taken from the Bank for International Settlements. See Prasad and Ye (2012) for further discussion of the concepts and data. Also see Ito and Chinn (2014) and Eichengreen and Kawai (2015).

13 Angeloni et al. (2011) note that, in addition to strong financial markets, a reserve currency should be backed up by (1) the reliability of rules and institutions, (2) the quality and predictability of fiscal and monetary policies, (3) the ability of policymakers to respond to unexpected shocks, and (4) political cohesion. Some authors also argue that network externalities are important, as they generate economies of scale and scope. See, for instance, Chinn and Frankel (2007). There is related empirical evidence on strong persistence effects in international investment patterns. See European Central Bank (2013, appendix C).

14 This is an underlying implication of Krugman's (1995) triangle model of currency invoicing—whereby economies are more likely to use the currency of the larger nation, as measured by trade, due to economies of scale.

15 The IMF refers to this figure for augmented debt as an upper bound of the government's obligations. However, this figure does not seem to include estimates of contingent liabilities in the state-owned banking system, which could swell the government's fiscal obligations. Reliable estimates of these contingent banking system liabilities are hard to come by.

16 See Prasad and Ye (2012) and Prasad (2014) for more details

17 On the importance of home country financial market development for attaining reserve currency status, see Tavlas (1991), Chinn and Frankel (2007), Forbes (2009), and Obstfeld (2011).

18 The PBC's 2014 report on renminbi internationalization indicates that 38 billion yuan (about \$6 billion) was actually drawn by other central banks during 2014, with the cumulative amount used by the end of 2014 adding up to 80.7 billion yuan (about \$12.6 billion).

19 Foreign central banks that want to buy Chinese bonds for their reserve portfolios need permission from the Chinese government through the QFII scheme. Sovereign wealth funds need the same. In December 2012, SAFE removed the ceiling on inward investments by sovereign wealth funds, central banks, and monetary authorities.

20 IMF Policy Paper, "Review of the Method of Valuation of the SDR," December 1, 2015.

21 The previous formula essentially involved summing up the country's exports and the stock of global foreign exchange reserves held in assets denominated in its currency.

22 The IMF has posted a Q&A about its decision at http://www.imf.org/external/np/exr/faq/sdrfaq.htm.

23 For a discussion of the issue of the sequencing of capital account liberalization in the context of China, see Prasad, Rumbaugh, and Wang (2005) and Prasad and Rajan (2005, 2006, 2008). Goodfriend and Prasad (2007) discuss the implications of China's exchange rate regime for monetary policy formulation and implementation. For a description of the challenges facing China's financial system, see Lardy (2012).

The Renminbi's Ascendance in International Finance

Menzie Chinn

In this wide-ranging review of recent developments involving the progress in renminbi internationalization, Eswar Prasad concludes, "Given China's sheer size and its rising shares of global GDP and trade, these steps are gaining traction and indicate the growing role of the renminbi in global trade and finance." This is a difficult proposition to argue with. I would say the renminbi is already an important regional currency. The question is the extent of the prominence and when, if ever, the renminbi will become a *key* international currency.

China's Economic Weight Is Not the Same as the Renminbi's Financial Weight

To begin with, there is no doubt that China's economic weight in the world economy has surged over the past two decades, overtaking the euro economy weight, in dollar terms. Figure 1 depicts this process of overtaking. However, we also know that for a currency to become a reserve currency, it needs much more than sheer economic mass. Figure 2, taken from Chinn and Frankel (2007), shows the currency composition of foreign exchange holdings of central banks, before the advent of the euro, plotted against the share of eight-country gross domestic product (GDP). The highly nonlinear relationship between GDP and share in reserve currency holdings is clear and is verified in the post–Bretton Woods sample examined by Chinn and Frankel. This nonlinear relationship between reserve currency status and economic output is also likely to hold for other dimensions of an international currency.

In this extremely informative and comprehensive review, Prasad recounts recent developments in liberalizing domestic, cross-border transactions; examines the pace of internationalization of the renminbi; and discusses the challenges in terms of sequencing opening and financial liberalization. A signal of this rising importance is the inclusion of the renminbi in the special drawing rights (SDR) basket. To that point, I would add that the renminbi has become an anchor for other currencies in the East Asia region.[1]

I have one caveat before proceeding. One of the motivations given for the devaluation in August 2015 was the objective of making the renminbi exchange

FIGURE 1
GDP in Trillions of USD, at Market Exchange Rates
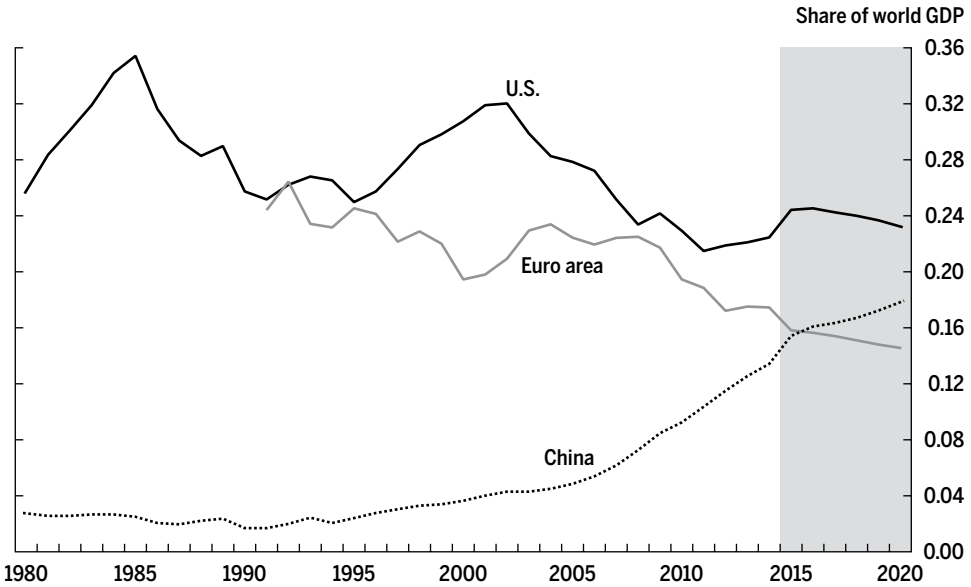
Source: International Monetary Fund's *World Economic Outlook* (October 2015).
Note: Shaded area denotes estimates.

rate regime more flexible. I wonder how much of this goal has really been achieved, i.e., how much has really changed. Figure 3 depicts the day-to-day change in the CNY. It is not clear that there has been much of a change.

Progress on the Prerequisites for Internationalization

There has been some clear progress along one important dimension: capital controls. While this openness doesn't show up in some standard measures (including the Chinn-Ito 2006 index), it does when looking at measures based on a finer level of disaggregation of categories afforded by the 1997 revision to the *Annual Report on Exchange Arrangements and Exchange Restrictions* (*AREAER*). Simple averages and weighted averages of these restrictions are shown in Figure 4, drawn from Chen and Qian (2016).

This process is important, because as shown by Chinn and Ito (2006), financial openness is critical to the process of financial development, and financial development is the critical factor determining a reserve currency. No reserve currency exists without a highly developed financial system.

Sheer economic mass and presence in trade partly accounts for the rapid development of the renminbi as an invoicing currency. Figure 5 documents the

FIGURE 2
Share of Reserve Currencies vs. GDP Share

Share of reserve currencies

Fitted values (gray)

Share of GDP
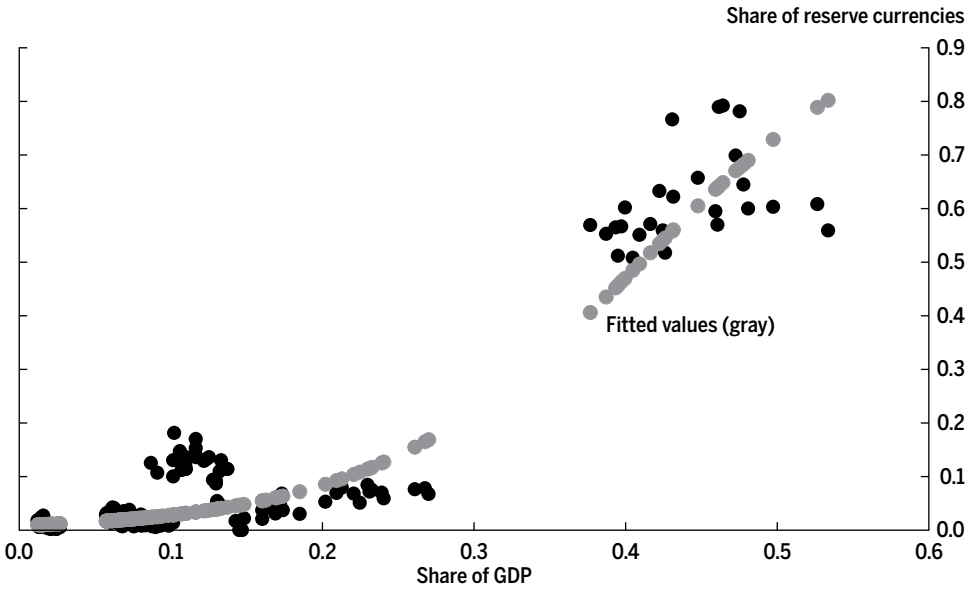
Source: Chinn and Frankel (2007).

FIGURE 3
Log First Difference of USD/CNY Exchange Rate, Daily

First diff log USD/CNY
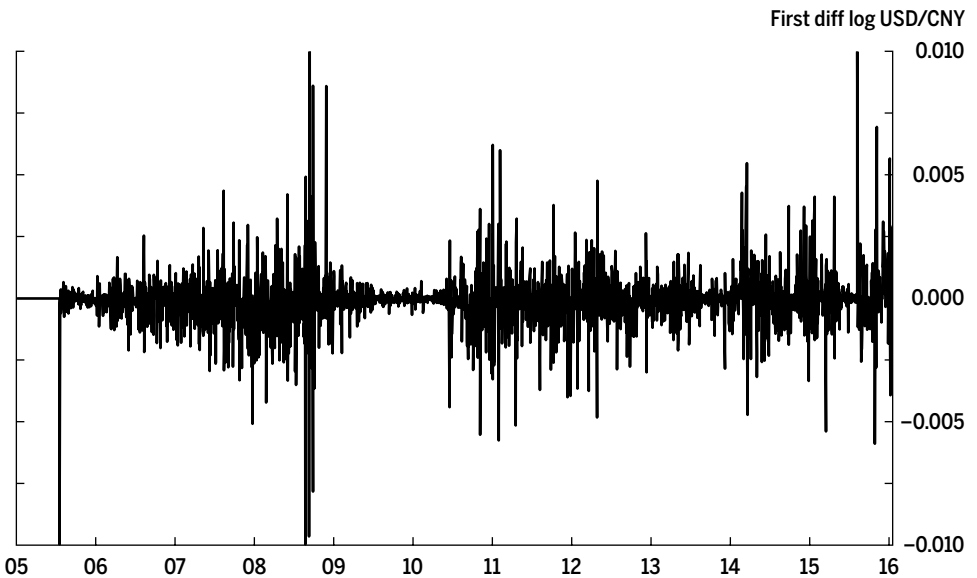
Source: Federal Reserve Board.

FIGURE 4
Capital Account Openness Indices

A Gross Flows

Percent

B Inflows

Percent

C Outflows

Percent
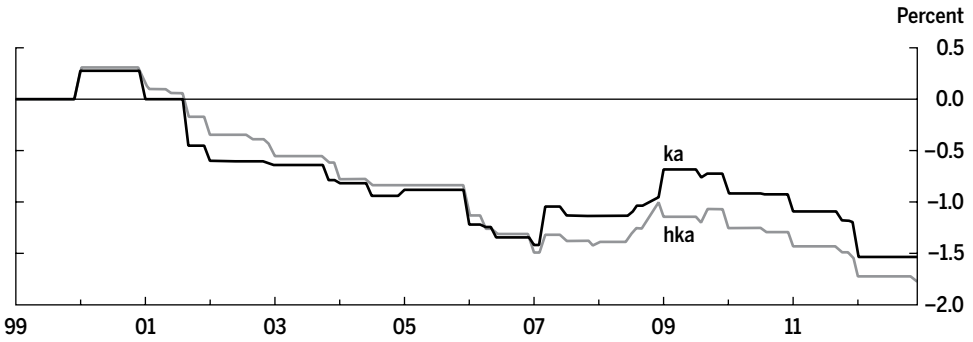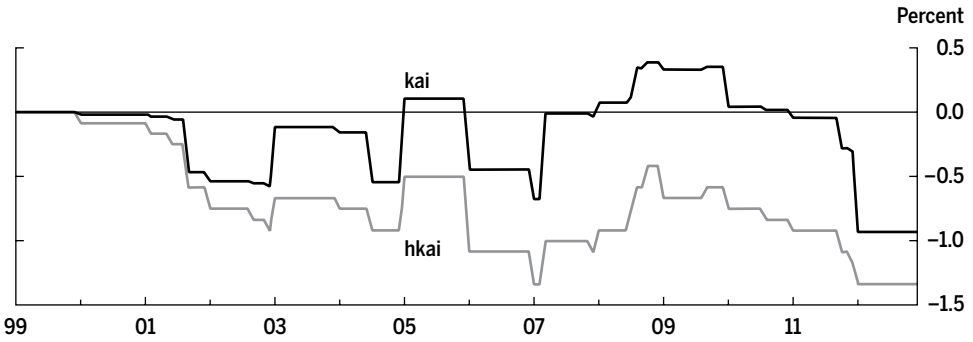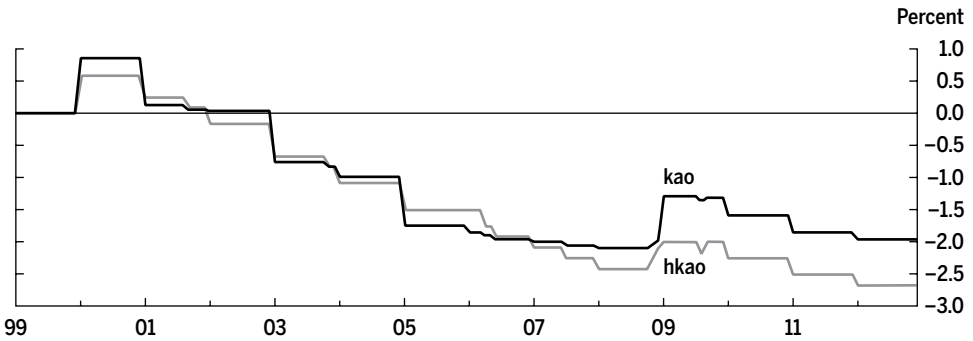
Source: Chen and Qian (2016).

FIGURE 5
Share of Invoicing of Trade in Own Currencies, for Japan and China

% of home currency invoicing

Exports

Japan

Imports

China

Imports

Exports

1969   1979   1989   1999   2009
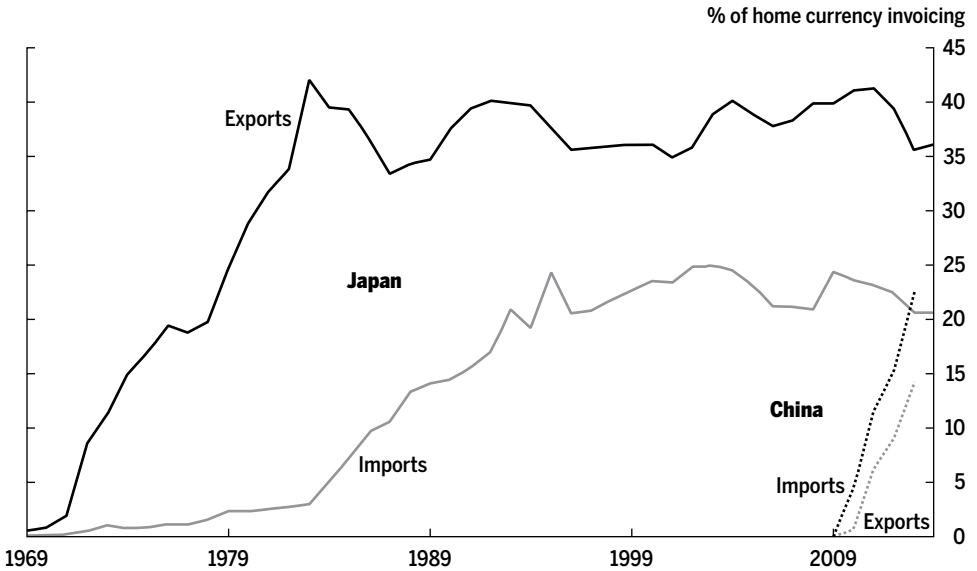
Source: Ito and Chinn (2015).

fact that the renminbi has recently taken off as an invoicing currency; however, as of 2013 it remained below predicted levels, according to Ito and Chinn (2015).

How Close?

In the end, reserve currency status and extensive use as in invoicing and denominating financial transactions (as opposed to trade) will depend on deep and liquid financial markets, including active stock and bond markets, efficient financial intermediation, and so on.[2] In Chinn and Frankel (2007), this measure is proxied by foreign exchange turnover. Where does the renminbi stand? China accounts for 0.7 percent, Hong Kong 4.1 percent. When Hong Kong and China are one, then it is in the ballpark of Japan's 5.6 percent share of total forex turnover. And the yen constitutes about 2.2 percent of total central bank foreign exchange holdings. So is the renminbi on the way to becoming a major reserve currency and a currency used in financial transactions?

Perhaps. But in the end, I think it is wrong to focus on the technical constraints to internationalization. Rather, it is probably more fruitful to consider the pace of internationalization as being determined by political choices regarding fuller cross-border/domestic liberalization and the accompanying loss of policy autonomy.

The key question is then, what price in terms of policy autonomy are Chinese policymakers willing to pay in order to achieve renminbi internationalization? This question has been thrown in sharp relief by the faster than anticipated deceleration in growth. Will they be willing to give up the lever of exchange rate management in order to retain monetary policy independence? Will they relinquish control over the financial system (and ability to stem financial outflows) that would occur with capital account convertibility? The heavy-handed nature of intervention in the stock market over the summer of 2015 gives one pause for thought. We may see further backsliding on exchange rate flexibility (and capital account liberalization) if foreign exchange reserves continue to decline, as shown in Figure 6.

These are assessments of political will, and I have no particular expertise in judging the likely outcomes of these policy debates. Personally, I doubt whether full capital convertibility will be achieved in the next five years (and that's not even tackling domestic financial deregulation). Hence, the renminbi will be—and in fact is already—an important regional currency. But graduation to a major international currency is a long way off.

FIGURE 6

Log Real CNY (Left Axis) and International Reserves, Excluding Gold, in Trillions of USD (Right Axis)
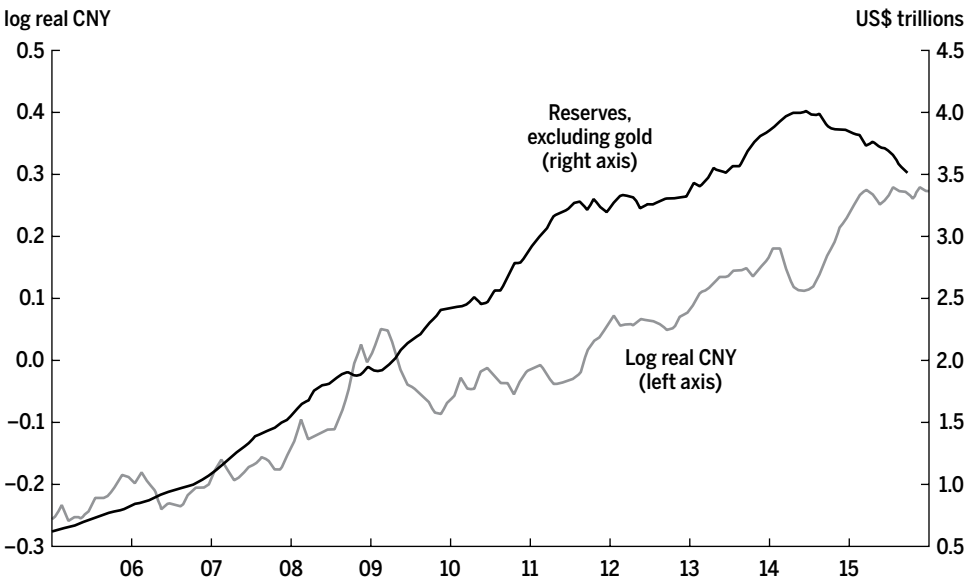
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NOTES

1 Chinn (2014) finds that in recent years, East Asian currencies have become more highly correlated with the CNY.

2 See Chinn (2015) for further discussion of measures of financial development, in relation to emerging reserve currencies.

The Renminbi's Ascendance in International Finance

Stijn Claessens

This is a very interesting and timely paper, especially since the board of the International Monetary Fund (IMF) endorsed the renminbi for inclusion in the special drawing rights (SDR) basket 10 days after the conference. Let me start by quickly summarizing the paper; then I will provide some comments on the paper and raise some questions that I have that were triggered by the paper.

The paper poses the following very straightforward questions: What is the renminbi's current role in the global monetary system, what is the government's role in driving this international role, and what could the international role of the renminbi be in the future? On the latter it specifically asks, what is the likelihood that the renminbi will become an international and reserve currency? Let me give some corresponding definitions, at least as I see them. Internationalization is what I would call greater use of the renminbi globally in trade and financing. I would define a reserve currency as a currency that provides on a large scale a store of value, as well as a unit and medium of accounts, transactions, and invoicing.

The answers the paper provides to these questions are straightforward: The renminbi is on track to become an important currency. Policies have been put in place over the past decade to support a greater international role for the renminbi. The paper has much evidence of increased use of the renminbi internationally, for both trade invoicing and financing. This increased role is now further enhanced through the likely ramifications of being included in the SDR basket.

At the same time, the paper points out that there are constraints to internationalization and risks along the way. Notably, China still has a financial sector that is not yet fully liberalized. And, while large in size, China's financial sector is limited in other aspects, particularly in the quality of resource allocation and governance, and in the development of its capital markets. And, as many countries have experienced, phasing in capital account and financial liberalization

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policies without triggering a financial crisis is not easy. It is not just about making one's currency freely convertible; one also has to consider the almost inevitable political economy changes that will accompany these steps. Furthermore, regardless of how successful one is in internationalizing a currency, the path toward a reserve currency status is not the same and has to consider the still dominant role of the dollar.

Before giving my comments, let me start by noting the relevance of the paper. This is surely a worthwhile research topic. Internationalization of a currency is of course not just a China-specific issue. Since we actually know little about what drives a currency to be a successful international or global currency, the renminbi internationalization is an interesting but also surely unique case study. The topic is even more important from policy and financial markets perspectives. Many people are focused on the renminbi's internationalization, including international financial markets and policymakers. And renminbi internationalization will have many global repercussions.

I learned a lot from the paper and tend to agree with many of its main findings. The paper provides a very careful historical review of the steps taken by Chinese authorities so far in encouraging the internationalization of the renminbi. Through careful planning and deliberate steps, this program has largely been successful. The paper documents the increased use of the renminbi in trade and finance. And its views expressed on the best strategies for internationalizing the renminbi (or other currencies) are consistent with most other studies.

Overall, the paper makes the case that internationalization of the renminbi is something that is both going to happen and going to be useful for the world as well as for China. Given China's general success with economic reforms and its growth path, it is very hard to question this assessment. This is even truer for this paper, as it is very hard to disagree with the world's expert on this topic. Quotes of Prasad have appeared in many news outlets, including the *Economist*, the *Wall Street Journal*, the *Financial Times*, National Public Radio, and many others.

Let me, in my task as commenter, try to do two things: comment on the stock-taking of the paper, and review why one might want to internationalize a currency and how that can best be done. The paper is mostly an exercise in stock-taking, not a review of goals or paths that China should follow going forward. It informs on where China is with renminbi internationalization in a number of important dimensions, but it does not question the government's stated goals. It concludes that renminbi internationalization appears on path in most respects. I have some quibbles on the stock-taking, on which I will expand next.

But I would also have liked to have seen a review of the goals. This is in part because the analysis relies implicitly heavily on the "collateral benefits" view, espoused earlier by Prasad and colleagues at the IMF (Kose et al. 2009). This view says that pursuing a deliberately gradual path of internationalizing, "stepping the stones across the water," provides many side benefits, among others, as it helps financial markets develop and encourages improvements in the institutional environment. My question though is, are these benefits really as large as we thought they were before the global financial crisis? The experiences of advanced countries over the past decade should make us rethink this paradigm to some degree at least. And, related, are all steps actually being taken in China consistent with maximizing learning? Some would arguably appear to be more for narrow or private interests than for broader collateral benefits.

In terms of the stock-taking, my comments are of the nature "half full versus half empty" in that one can debate progress in some of the dimensions listed. While official reserves are large, for example, they do not necessarily represent a good measure of "internationalization," as they are not the outcomes of market choices but are instead outcomes of public-sector and exchange rate management choices. It is also correct that China's international financial openness is increasing rapidly, but it appears to be happening at asymmetric speeds between inward and outward flows. And which type of investors or financial institution can go in or out China can appear to be selective, up to the point of being intransparent. There is also a difference between openness and control that is not emphasized enough in my opinion. Take debt flows, which do not come with control, and equity flows, which give a majority stake. The latter has been much less relaxed than the former. Also, being open to international capital flows does not equal granting full market access, notably in financial services that are heavily regulated. For example, the limited presence of foreign banks suggests that there are still some serious barriers to the establishment and operation of foreign financial institutions. In addition, the difference between cash flow and control rights—as in the differences between the A, B, and H shares—suggests some hesitations to granting full openness. And while exchange rate management is indeed freer, the regime is still not fully market determined and transparent in its operations (e.g., the difference between the onshore and offshore exchange rate does vary over time for unclear reasons).

In terms of domestic financial development, one can have some quibbles as well. Is financial development high or low? Using the stock figures, financial development is very large, but the quality of financial services is surely less so. Similarly, the fiscal position is strong today, but as we have seen in other situations (countries like Ireland and Spain come to mind), a very large financial

system combined with high credit growth can mean that the contingent liabilities could be very large as well. This also applies to the stock of foreign exchange reserves, where both the Greenspan–Guidotti rule, on how much reserves to hold relative to short-term liabilities falling due, and ratios calling for maintaining a high enough ratio of M2 to reserves, would call for some caution. And while the inclusion in the SDR did indeed happen, there can be some questions as to whether it did accelerate reforms in good ways. In this context, some recent policies can make one wonder whether the path was fully worked out. Notably, events over the last half-year, including the stock market gyrations and the somewhat botched exchange rate devaluation, are hard to interpret. Then there are the steps being undertaken in terms of interest rate liberalization, which do not fully fit with overall deliberate strategy of reforms. As such, there can be legitimate differences of opinions on the sequencing and consistency of reforms.

In terms of stepping back (and I am not the first one to do this), let me attempt an analytical framing. Three questions can then be and have been pondered: (1) Can the renminbi internationalize and additionally become an international reserve currency? (2) Should the renminbi internationalize? What are the costs versus the benefits for China? (3) How could the renminbi internationalize? What is the (best) path? This sequence of questions makes it clear that only if one answers yes to questions (1) and (2) does question (3) then become relevant on how to best achieve the goals. For example, what reforms, relative or absolute, matter more? What reforms are needed now? Which can wait? How can one balance any tradeoffs among objectives? What else is important to do? How does one maximize the overall gains?

The paper does some review of the literature to date on whether the renminbi can internationalize and become a reserve currency. Others' lists of what criteria are important in this respect differ somewhat from Prasad's, as others are more cautious and have more preconditions (Table 1). Most agree, however, that both internationalization and reserve currency will take some time and effort, and may not be urgent in the overall sequence of reforms. For example, Frankel (2011) uses phrases such as "a long way to go," "policy defies the logic of political economy," and "sequence appears unorthodox." In a more recent review, Eichengreen (2015) writes, "not in one day" and "not without risk," and stresses the difference between a regional role of the renminbi versus an international or global role. Eichengreen and Kawai (2015) also say that it will take many steps. And Goldberg (2013), in her review of what it takes to become a reserve currency, makes clear that many steps are typically involved as well as overcoming path dependencies, related in part to the persistence of dollar of the

Can the Renminbi Internationalize and Become a Reserve Currency? Others' Views vs. Prasad's

	ECB (2015), Eichengreen (2015), Eichengreen and Kawai (2015)	Prasad
Size, economic strength, share of world economy, trade, etc.	√√√	√√
Strong financial markets	√√√	√
Reliability of rules	√	
Quality and predictability of fiscal and monetary policies	√√	√
Ability to respond to unexpected shocks	√	√
Political cohesion	√√	
Network externalities persistence, hysteresis	√	
Mountains, island, army, etc.	√	

Note: Checkmarks very roughly correspond to number of times criteria are mentioned in the papers cited.

major reserve currency. Prasad (2014) himself also makes the point that there can be a dollar trap, where its dominance is self-reinforcing.

The views are consistent in that all mention that the key to successful internationalization is policy coherence between domestic financial deregulation; institutional development, including supervisory capacity; and capital account liberalization. And a key requirement consistently mentioned for a reserve currency is stability of domestic markets, especially government bonds. In this context, an important question is whether China's bond market is large and stable enough.

In terms of whether the renminbi should internationalize, the literature points out that there are gains and risks, and that these are not necessarily equally distributed among parties, with more gains for some parties than for others (Table 2). And while some observers believe that the renminbi should become a reserve currency, given costs, others have disagreed. Clearly, the status of a reserve currency comes with some costs. It comes with some volatility

Gains and Risks of Renminbi Internationalization

Gains	Risks
• Benefits for local financial markets development and monetary policy	• Challenges managing internal and external balances
• More general learning	• Spillovers, importing of global financial cycles
• Better scope for diversification, insulation from shocks, fewer valuation effects	• Financial instability ("We are not in Kansas")
• Lower cost of funding (debt)	• Hard to reverse policies (easier to lose than to gain)
• Seignorage	
• Global influence	

in demand due to "safe haven," as the dollar experienced in the global financial crisis and which still affects some other currencies today. There is also the demand, and perhaps need, to adapt its monetary policy, as a reserve currency's monetary policy can have international repercussions. There are also narrower responsibilities. It may be necessary, for example, to maintain swap lines with central banks, ship cash, have more extensive foreign exchange settlement systems, and help countries with their "renminbi-ization." So it is not obvious whether the step from an international to a reserve currency is worth it. As examples, Japan and Germany were reluctant to "reservize," as, in the words of Frankel (2011), "the costs outweigh benefits." Furthermore, as he notes, the optimal timing can be "elusive." For internationalization to be the right choice, the optimal combination of inflation, exchange rate dynamics, and financial stability can make timing difficult.

Lastly, in terms of how to best internationalize the renminbi, evidence suggests caution in quite convincing ways, with the caveat that China is unique. Other capital account liberalization experiences suggest that it can be very complex, perhaps more so than was presented in the paper. One can frame these questions as how to prevent a situation similar to Chile in 1979–82, when financial liberalization was accompanied by large-scale foreign exchange borrowing and buildups of domestic vulnerabilities that ended in a major financial crisis, or, similarly, how to avoid a situation like the 1997 East Asia financial crisis. These cases are not likely to repeat themselves exactly the same way—every crisis is in some sense different—but they do offer some lessons. The literature clearly suggests that one needs to follow an overall consistent approach, starting with domestic financial market development, not just in terms of size but also in terms of institutional development, and that an open capital account can also require economic liberalization *and* political liberalization.

Furthermore, there has been revision of the desirability of an ultimate fully open capital account, notably in the form of the so-called institutional view of the IMF (2012) with its greater emphasis on the use of capital flow management and macroprudential policies. This view stresses the need for an integrated approach, i.e., adopting the right sequencing, and maintaining consistency in various financial reforms. But it also stresses that it is important to have, or at least keep the option open for, the use of macroprudential and capital flow management policies.

Recent experiences and thinking thus suggest some cautionary lessons. It makes one focus on the risks encountered along the path toward full capital account liberalization and how those risks depend on the policies chosen. And it makes one recognize the irreversibilities of some reforms, i.e., those

that one cannot easily—or at all—reverse, and therefore suggests the desirability of moving slowly on some reforms. Another related lesson is that international financial integration is not just about cross-border flows. It also needs committed capital, which can mean the local presence of foreign banks and other financial institutions that have set up brick-and-mortar shops and fund themselves locally. By being present, as the experiences of the euro area, Eastern Europe, and other countries show, they can add to financial stability in the face of domestic and foreign shocks. Another lesson is to build in more explicit learning. How can one assure, for example, that the opening up of capital outflows leads Chinese investors to increase their rates of return on their overseas assets, so that they exceed the rates of return on their liabilities?

My last set of comments relate to the theme of the conference, which is "Policy Challenges in a Diverging Global Economy." The paper does not spend much time on the global stability implications of renminbi internationalization, but it is of course an important aspect. Would a rise of the renminbi make the global system more or less stable? On one hand, internationalization could make it more stable, since having more assets and liabilities to choose from means easier and better global risk sharing. On the other hand, in the presence of other, existing reserve currencies, it could also imply, due to market failures and externalities, a greater risk of tipping, meaning large swings in the value of any one currency, with related adverse booms and busts.

There could also be policy implications of a greater renminbi internationalization for the rest of the world. It may be wise, for example, to have greater swaps between central banks to avoid some of the liquidity problems observed during the global financial crisis. And making financial markets work most effectively may require some better infrastructure, such as better settlement systems on currency and derivatives trading. A greater role for the renminbi is also likely to mean more change in Asia and globally. Here there could be lessons from the euro zone on how to best handle regional financial integration. For example, a full banking union may be necessary to avoid the financial trilemma. In the interim, there will be a need for smart macroprudential and capital flow management policies, which is preferable to a policy of ring-fencing.

In summary, my comments on the paper are threefold. First, in terms of the state of play on renminbi internationalization, one can have a half-full or half-empty view. The paper is more of a half-full view, but there are many possible quibbles. Crucial ones in my opinion are on the presence of collateral benefits, the process of learning, and the consistency of reforms. Is the paper too optimistic here? Are reforms following the best processes? Second, the interim and perhaps as well the final goals deserve some more debate. Regarding the interim

goals, an important set of questions is whether the balance is right between liberalization of the capital account and that of financial services. Could it be that less capital account openness, but first greater domestic financial development, including market access with more control of foreign investors, is a preferred step? It allows for learning, yet maintains the overall direction of openness. And is the final goal, full openness, worth revisiting in light of recent experiences? Third, in terms of international aspects and repercussions, there are many implications, deserving more thought in the coming years as renminbi internationalization progresses.

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GENERAL DISCUSSION
The Renminbi's Ascendance in International Finance

Chair: Zheng Liu

Mr. Liu: Let's open to questions.

Mr. Ostry: It seems to me that one of the key goals for the domestic financial system in China will be to provide financing for small and medium enterprises, which are key for job creation to serve the huge domestic market. I'm not sure why opening up to foreign finance is an important part of this process.

Mr. Choi: I have several questions for Professor Prasad. We recognize that the role of China in the global economy has been increasing and that China's current account surplus, particularly with the United States, has been persistently large. According to Triffin's dilemma, it's important for a reserve currency country to provide sufficient global liquidity to the rest of the world. So if China is to become a provider of global liquidity, reducing its current account surplus might be necessary in the future. So my first question is whether China is better positioned now than the United States to be a provider of global liquidity. A related question is that if global interest rate normalization is beginning now, will there be a shortage of dollar liquidity for some emerging markets and could the renminbi then be a suitable replacement in global financial markets?

Mr. Gourinchas: I want to come back to the question of the renminbi as a reserve currency and maybe approach it from a slightly different angle. Stijn mentioned that a task for a reserve currency country is to issue a safe asset, where a safe asset is an asset that is defined as having a negative beta with other global returns, so it provides portfolio protection to the rest of the world. And so if we look at China from that perspective and we ask ourselves "What happened during the financial crisis?" there are some signs that maybe the renminbi did suffer some valuation losses around that time that would support Eswar finding that China is already playing a role as a safe asset provider. But if China is indeed becoming a reserve asset provider, then the flip side of this is it has to be taking long risky asset positions while providing short safe liabilities in global financial markets. In other words, it has to be holding more risky stuff on the asset side of its balance sheet, and I'm not sure we're seeing that yet, given

the amount of foreign reserves it's holding. And you showed some interesting graphs about China's gross capital flows. Maybe we're moving in that direction in the sense that China is exhibiting less accumulation of reserves and more accumulation of private assets. I'm not quite sure whether these private assets are long and risky, as would be consistent with the picture of China emerging as a reserve currency provider. But I think that looking more into whether the structure of China's balance sheet is changing could give a direct indication that it is actually taking on this new role.

Mr. Liu: All right. Let's take a couple more questions.

Mr. Williams: This paper was so clear and comprehensive that I have no questions about it. So I want to be provocative and pick up on Pierre Olivier's and Stijn's comments and put out a hypothesis that many people like Jeremy Stein and others have made that there is an insatiable demand for safe, money-like assets in the global economy. And one story from the financial crisis was that because of this huge demand for money-like assets, the private sector created these assets through securitization, structured finance, etc. And those assets are all gone now because people have learned that they can be dangerous and bad. But there's still the insatiable demand for money-like assets. So I guess my question is, as the renminbi becomes a more international currency, will investors and others see China as the new place to go for money-like, safe assets when, in fact, as Stijn mentions, there are a lot of reasons why China really isn't yet there?

Ms. Shirai: I have first a question and then a comment. I found very interesting the comment by Mr. Claessens about the negative impact of currency internationalization, especially in terms of the demand for safe-haven currencies. I think in the case of Japan, for example, the yen was depreciating before the financial crisis, but after the crisis began, all of a sudden the yen appreciated by 20 to 30 percent. The yen's appreciation further depressed prices and economic growth in Japan during the crisis. And I have a question for Professor Chinn. In your chart, page 8, you compared the use of the yen and renminbi as invoice currencies. You showed that the use of the yen as an invoicing currency is much greater for Japan's exports than for its imports. But in China's case it's the opposite. China's renminbi is used more frequently to invoice imports than exports. I think this is a very interesting finding. The reason that the yen is not used much for import invoicing is because Japan imports a lot of oil which is priced in dollars. The reason that the yen is more frequently used in exports is because a lot these transactions are internal transactions between

Japanese companies and a subsidiary abroad. Now in the case with China, I wonder why so much of its imports are invoiced in renminbi. Maybe this has something to do with the $4 trillion stimulus package since 2010 that created lots of demand for domestic investment. Maybe that affected the pattern of currency invoicing.

Mr. Eichengreen: I have a question for Eswar and the central bankers in the room. One reads that inclusion of the renminbi in the special drawing rights (SDR) is supposed to lead to a significant increase in the demand for renminbi-denominated reserves. I just read online that currency strategists anticipate a $500 billion increase in renminbi-denominated reserves as a result of the currency's inclusion in the SDR basket. Does that make any sense?

Mr. Hutchison: Getting back to the general theme about the rapid internationalization of the renminbi over the last few years, I just want to say that in this same room in the 1980s everyone was saying exactly the same thing about the yen and pretty much making the same arguments. What happened is that use of the yen grew rapidly and then just leveled off, as Menzie Chinn's chart shows. There may be some specific reasons for that based on invoicing of oil and so forth, but at that time there was a massive expansion of Japanese banks around the world and people were thinking that the yen might supplant the dollar as a reserve currency. And that, of course, hasn't happened. Of course, if you go back to Kublai Kai Khan, 800 years ago, as you mentioned, the expansion of currency use is a pretty slow process. Lastly, I want to just mention two papers that Reuven Glick and I wrote on the topic in which we showed that China has had much more of a regional influence through equity markets than through fixed-income markets, and I'm just wondering if this internationalization of finance or at least for equity markets is due to the regional production linkages in which China plays such a huge role as opposed to financial linkages.

Ms. Goldberg: Terrific paper, terrific discussion. I want to come back to the safe asset theme and first mention a Vox column of mine where my co-authors and I talked about how the United States basically cemented its role as a safe-haven currency during the financial crisis even though its economy was under stress, by the way that it was able to respond to crisis through the different facilities that were put in place. I'm going to keep that as a backdrop for my other comment. Eswar mentioned some of the risks China faces by providing a safe-haven currency. One of them arises from the terrible returns that China has earned on its external portfolio. Of course, part of that is because a large part of this portfolio is invested in foreign assets with low yields because China

is paying a liquidity premium in the event that these assets need to be liquidated quickly. The other risk that you mentioned is about reserve adequacy and the view that the M2-to-reserves ratio is unfavorable for China, particularly in light of the extent of China's domestic contingent liabilities and the possibility of insufficient policy space for the government during a crisis. So given all of this, is it your view that in a risk-off event or some kind of crisis China can actually play the role that Pierre Olivier was talking about in satisfying the safe-haven need of the rest of the world?

Mr. Aizenman: I enjoyed the discussion very much. But I wonder if your de jure measures of a financial openness of China may understate its de facto openness, particularly in light of China's openness to trade and the powerful incentives for trade mis-invoicing to circumvent limits on capital flows. So, one interpretation of the trend in China toward greater financial integration is the desire to internationalize the renminbi. An alternative interpretation is they don't have too many choices because of the pressure of trade mis-invoicing. So, I wonder, what is your view about the capacity of China to fight trade mis-invoicing? Because if the capacity is limited, then China may still move toward greater financial integration, independent of the role of the renminbi in the international financial market.

Mr. Obstfeld: A couple of weeks ago the *Wall Street Journal*, somewhat to my surprise, strongly endorsed the yuan's inclusion in the SDR basket. Their rationale was that it's very close to the collateral benefits view that this would create a tsunami of liberalization and market orientation in China. This is related to what Stijn said. So I wonder what China's capacity is in the medium term to really move to a system where markets pick winners and losers subject to fairly transparent rules and whether it's really plausible that China could become a truly major reserve currency unless that criterion is met.

Mr. Dollar: My impression is that during the opening up of its capital account China opened up outflows more than inflows, and there are still a lot of restrictions on capital inflows. There's a certain logic to this development, as Chinese policymakers were concerned with the extreme reserve accumulation they experienced several years ago and so letting residents invest more abroad had a certain logic, so they opened the doors to capital outflows. But now it seems like perhaps they miscalculated, because they have awfully large net capital outflows. So my short question is, do you agree there has been asymmetric opening of the capital account in China and is that creating particular risks for China? And by the way, just in the last 48 hours, the government arrested officials

involved in a financial institution that specializes in taking money out. So perhaps they're trying to undo some of the outflow opening.

Mr. Liu: Eswar, why don't you take five minutes to respond to the questions.

Mr. Prasad: After Kublai Khan, the Mongol Dynasty did not hold together. The Ming Dynasty that followed actually did issue paper money, but there was such hyperinflation that paper money was banned until 1850. So even after paper money was introduced, there were certain bumps in the road in this long process toward where we are today.

The comments that we've heard can be bunched into three groups. First, why is China doing this? Why is it promoting the renminbi's international role? Second, is it doing it the right way? And third, where is this all going to lead? On the first—why is China doing this?—I have a view that's very different from the notion that this is a policy in and of itself. I think there is a much bigger objective here. I've written about this and referred to this in a *Wall Street Journal* piece as a Trojan horse strategy. Once you get the leadership of China to sign on to the notion that it's important to make the renminbi an international reserve currency, it forces the country to do what's necessary for that to happen. You need better financial markets. You need a better regulatory structure. You need a better monetary policy. All of these are very good for China independent of what happens to the renminbi, but it makes it much better to have a framework that helps get around the existing financial structure, especially big reforms like these. The system as it now is structured works wonderfully well for the large state-owned enterprises, the large state-owned banks, and certain provincial governments, and I think this framework has been very important. Including SDR inclusion of the renminbi, the amount of progress that has been made over the last year in terms of financial market reforms in China is remarkable. It's hard to conceive of so much progress having been made in terms of opening up the capital account, liberalizing interest rates, and setting up an explicit deposit insurance system. The SDR inclusion was a microcosm of this bigger picture; it provided a focus but, more importantly, also a timeline.

And I think the collateral benefits view is one where there has been traction. When Shang-Jin Wei, Ken Rogoff, and Ayhan Kose wrote about this, they didn't have a good example. But I think China has proved to be the perfect example of this view. If you think about what it did in 2007 to allow foreign strategic investors into the local banks, that was because it wanted to improve corporate governance and risk management. Perhaps bringing Western banks to improve corporate governance and risk management was not the most spectacular idea, but the concept was exactly right. And then if you think about what

has been accomplished through the Qualified Foreign Institutional Investor (QFII) scheme, the amounts are small. The amount of Asian market capitalization held by the QFIIs amounts to only about 2 percent of Asian market capitalization, but having those players in that market creates new products; it creates a sort of discipline, and I think it has an important catalytic effect. And this catalytic effect is one that the Chinese really take seriously.

But Menzie, Stijn, and others have alluded to the fact that even if the Chinese know where they're going, they're not getting it all right. For example, if you think about the sequencing of reforms that they've undertaken, the classical answer will be get your financial system right first, then get your exchange rate to be flexible, and lastly open up your capital account. China is doing it in exactly the opposite way. If you think about how they've actually gone about capital account opening with all the risks to the financial system, as David (Dollar) pointed out, opening up the capital outflows seems like exactly the wrong thing to do. But here again there is a logic to it. And I think the logic comes from the fact that by setting in place a fait accompli in one part of the financial sector, you force the government to undertake a range of other reforms. I think that is exactly the point: so, if you do open up the capital account very significantly, in order to reduce the risks, it forces the government to start thinking about other reforms that are crucial. I spoke about all of the reforms that have been undertaken in the last year or two; however, virtually everything involves the financial markets, and I think if one were to be concerned about China— and there are many reasons to be concerned about China—one reason is not that there have been no reforms, but that these reforms have largely been focused on the financial markets. If you don't have broader real side reforms, if you don't have the institutional reforms to support more liberal markets, you're going to create even more risks than benefits. The stock market is a perfect example. The notion of the stock market working as a market makes sense, but if you don't have good corporate governance, if you don't have good auditing and accounting standards, and if you don't have corporate transparency, then it's no longer a stock market. It's something of a casino. And so I think it's these other reforms that are going to be important and if other reforms don't catch up, that will be a problem.

And finally, where is this all going to lead? I wrote a book last year in which I make a very important distinction between an international currency, a reserve currency, and the safe-haven currency. I don't think there is the slightest prospect that without very broad legal, political, and institutional reforms that the renminbi will ever become a safe-haven currency. People don't go to China for safety. The Chinese don't go to China for safety. They take money out when they

need a safe place to put their money. What you need for a safe-haven currency is a lot more than market size and financial market development. You need institutions that are essential to maintain the trust of foreign investors. Of the amount of debt issued since 2007, if you take away the amount of public debt in the U.S. federal government—debt that is held by the Social Security trust fund and on the Federal Reserve's books—that leaves about $10.3 trillion, and about 60 percent of that is held by foreign investors. They come here for safety. Why? Because they know that they're going to be treated like other investors. If you think about safety from the point of view of maintaining principal, the dollar is not the best asset. It does have the right sort of beta, but if you look at holding an instrument denominated in renminbi, you would have made much, much better returns over the last 11 years since 2005 given how much the renminbi has appreciated. But people go to China for yield. They go to China for diversification. I don't think they will go to China for safety unless there are much deeper institutional, political, and legal reforms, and I think the current government has made it very clear that that is not going to happen.

Policy Perspectives from the Bottom Up: What Do Firm-Level Data Tell Us China Needs to Do?

Loren Brandt

Chinese industry combines enormous dynamism with huge inefficiencies. Drawing on extensive firm-level analysis and several hundred firm interviews, this paper offers an explanation for China's mixed record. Over the last two decades, the most dynamic sectors and those in which Chinese firms have been most successful in narrowing the gap with multinationals are those that have been most open to competition, in which entry and exit have been least encumbered, and in which firms have been free from the all too "visible" hand of the state. The role of new firms in these sectors is especially prominent. The laggards are often those sectors identified as pillar and strategic. Moving forward, the concern is that China's continued inward turn in both industry and services runs the risk of making the economy less, and not more, dynamic and innovative. Lower productivity and economic growth is a likely consequence.

1. Background

Much of the current focus on China is on the consequences for growth of deleveraging and the need for rebalancing of the economy. In the near term, China needs to work down a huge run-up in its debt-GDP ratio incurred trying to cushion the economy from the effects of the international financial crisis. Often forgotten in these discussions are equally important issues relating to productivity. Although much is often made of China's "investment-led" growth, productivity growth has been the most important source of China's rapid growth over the last three and a half decades (Zhu 2012).[1] This will be true moving forward.

The Chinese economy combines enormous amounts of dynamism with huge distortions and inefficiency. The two exist side by side and in fact are the product of the same system and set of institutions. Investment spending—often supported through access to inexpensive finance—has been used as much as a vehicle to redistribute resources from dynamic sectors enjoying rapid TFP (total factor productivity) growth to laggard firms and sectors that are politically connected and serve political and strategic objectives, as to foster

growth. Redistribution of this form is also probably a major source of widening inequality.[2]

At the aggregate level, there are likely important links between macroeconomic imbalances and productivity growth through the effect of distortions in the price of capital, energy, and the exchange rate that run through both. For policymaking, however, a more microeconomic perspective on productivity seems useful. Here, I would like to provide an assessment that comes from the bottom up, based on a combination of extensive firm-level analysis and several hundred firm interviews over the years. It is an assessment that is less than perfect, and carries with it some margin of error. We face huge data issues for industry that are even more severe for the service sector. One obvious policy recommendation is for better access to firm-level data.

Much of my focus will be on industry, but as I note at the end, the tertiary sector (i.e., services) cannot be ignored. This point is increasingly well recognized, but usually in the context of rebalancing of the economy (Lardy 2014; Pettis 2013). The direct contribution of services to the economy now exceeds that of industry and will only increase over time. Services such as ICT (information and communications technology), power, finance, and transportation and logistics are also critical inputs into manufacturing; thus, productivity in these sectors exerts a significant influence on the competitiveness of the rest of the economy.[3]

In a number of respects, the current Chinese leadership recognizes the important role of productivity growth and innovation in helping China to narrow the gap with the West. China's industrial sector currently rivals that of the United States in terms of its size. It is also a major exporter of manufactured goods that span most sectors of industry (Schott 2008) and compete in increasingly more demanding market segments (Mandel 2013). However, gaps in technological capabilities remain between domestic Chinese firms and firms from advanced countries, and those gaps are also reflected in productivity differences.

The Chinese leadership firmly believes that the country's economic *and* strategic future rests on the ability of the country to be at the cutting edge of newly emerging technologies and "indigenous innovation" in both industry and services. Indigenous innovation here means innovation by Chinese-owned firms as opposed to firms operating in China. These perspectives are embodied in the 2006 Science and Technology Medium Term Plan as well as in the Five-Year Plan on Strategic and Emerging Industry announced at the end of 2010. These initiatives committed US$1.6 trillion to seven emerging technologies: energy

saving and environmental protection, next-generation information technology, biotechnology, advanced equipment manufacturing, new energy, new materials, and new-energy vehicles.

Underlying current policy directions, most notably, the focus on indigenous innovation and a more limited role for MNCs (multinational companies) in key sectors is a view that China's earlier model failed to deliver, especially in terms of producing "national champions." I agree that dynamic Chinese firms have not emerged in all sectors, but the interpretation I offer for this "failure" is different from the narrative currently heard in some policy circles in China.

A key lesson from the experience of the past 15 or 20 years is that sectors that have been consistently most open to competition, in which entry and exit of firms have been far less encumbered and, more generally, in which firms have been free from the all too "visible" and often distorting hand of the Chinese state at both the local and central level, are in fact those that have been most dynamic. They are also the sectors in which Chinese firms are successfully competing today in more demanding markets, domestic as well as overseas.

By contrast, those sectors (1) that remain the preserve of the SOEs (state-owned enterprises) either exclusively, or occasionally through ventures with other types of firms; (2) in which NDRC (National Development Reform Commission) or MIIT (Ministry of Industry and Information Technology) continues to influence sector dynamics through licensing and entry decisions, technology choices and investment, and regulatory behavior; and (3) in which outcomes are often badly distorted by a combination of central government objectives and local governments incentives, have usually failed to deliver dynamic local firms.

These contrasting experiences have important implications for policy. They also suggest that China's continued inward turn runs the risk of making the economy less, not more, dynamic and innovative.

2. Productivity Dynamics in Industry

Overall, China's current industrial sector combines enormous amounts of entrepreneurialism and dynamism with huge inefficiencies and distortions. The former is most clearly reflected in rapid productivity growth—measured here in terms of output per units of inputs—that is on par with that achieved by the manufacturing sector in other successful Asian economies, e.g., Japan, Korea, and Taiwan, at similar periods in their development (Brandt, Van Biesebroeck, and Zhang 2012; Yu 2015).[4] The dynamism is also revealed in the success of manufacturing firms in China—foreign and increasingly domestic—in moving up the value chain and capturing growing market share in more demanding

export markets from firms in advanced countries (Mandel 2013). In the process, the share of domestic value-added in China's export sector has increased significantly (Kee and Tang, forthcoming).

The inefficiency is reflected in recurring problems of excess capacity and low returns on investment in some firms and sectors, and in the constraints on more dynamic firms in capturing a growing share of a burgeoning domestic market. These constraints come in multiple forms, including access to finance and human resources, state procurement policy that discriminates against non-state actors on the demand side, and so on. More generally, the lack of a level playing field works to the disadvantage of these better firms. Estimates suggest that there are huge gains to eliminating the inefficiencies *within as well as between* sectors (Gao 2014; Hsieh and Klenow 2009). The problem is that these constraints are deeply embedded in China's political economy and so far have been difficult to remove. Furthermore, top-down policies designed to help promote upgrading and innovation are often having the opposite effect.

3. Where Have the Productivity Gains Been Coming From?

Productivity decompositions allow us to examine the role of a number of alternative margins in raising productivity. Four are important. First, there are gains coming through TFP improvement amongst existing firms. These can be the product of efforts that lower firm costs or that improve product quality and thus allow firms to command higher prices for the products they sell. Second, a reallocation of resources to the most productive of firms will have the same effect. M&A (mergers and acquisitions) is a potentially important mechanism through which resources are reallocated amongst firms. Third, entry of new firms at levels of TFP higher than incumbents will also lift average TFP. Finally, the exit of poorly performing firms with TFP below average will also contribute to these gains. Generally speaking, the contribution of entry and exit will depend on the volume of these flows as well as the size and relative productivity of these firms.

A unique feature of China's productivity growth in industry compared with other countries is the important role of entry. Entry rates for new firms[5] can be calculated based on firm-level records from the Industrial Census for 1995, 2004, and 2008.[6] The 1995 Chinese Industrial Census puts the number of new firms entering industry in that year at slightly more than 40,000, or an entry rate of 8 percent. By the time of the 2004 census, the number of new entrants more than tripled in absolute terms, as the entry rate rose to 12 percent. The rate of entry fell off in 2008—likely reflecting the effect of the global financial crisis—however, an additional 150,000 firms were added.[7]

Estimates of entry as well as exit can also be extracted from the business registry of the State Administration of Industry and Commerce for the period between 1998 and 2013. Figure 1 provides entry, exit, and net entry rates (entry minus exit) for industry. Entry rates are generally higher but move in line with the estimates of new firm entry from the Census data and the NBS (National Bureau of Statistics) annual firm survey data. The behavior is also cyclical, with entry rising with the recovery from the Asian financial crisis in the late 1990s, falling in 2007 and 2008 with the onset of the global financial crisis, and then rising again.[8] Exit rates are declining over this period but net entry remains highly cyclical.[9] By 2013, there were 3.85 million industrial establishments, compared with 1.47 in 1998, implying an annual increase in the number of new firms of more than 6 percent.

Estimates made by Brandt, Van Biesebroeck, and Zhang (2012) using the annual firm-level survey data of the NBS between 1998 and 2007 show that 57 percent of the growth in industrial output is a result of productivity growth. Moreover, up to two-thirds of the productivity growth within sectors is coming from new firm entry, especially private firms. The remaining one-third is from rising TFP amongst incumbents. Figure 2 provides a breakdown of the contributions to output and productivity growth.

FIGURE 1
New Firm Dynamics, Industry, 1998–2013
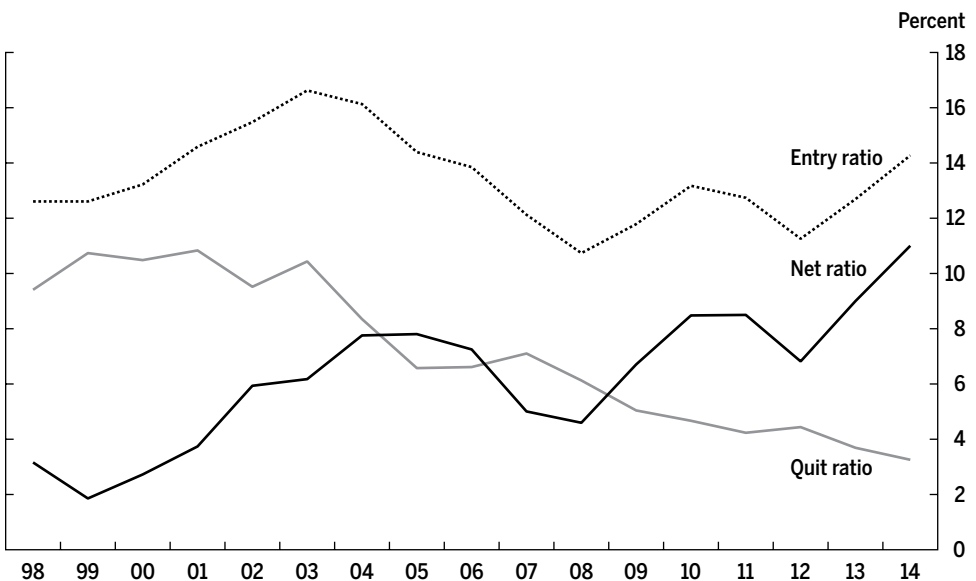
Source: Business registry of State Administration of Industry and Commerce.

FIGURE 2
## Output and Productivity Decompositions
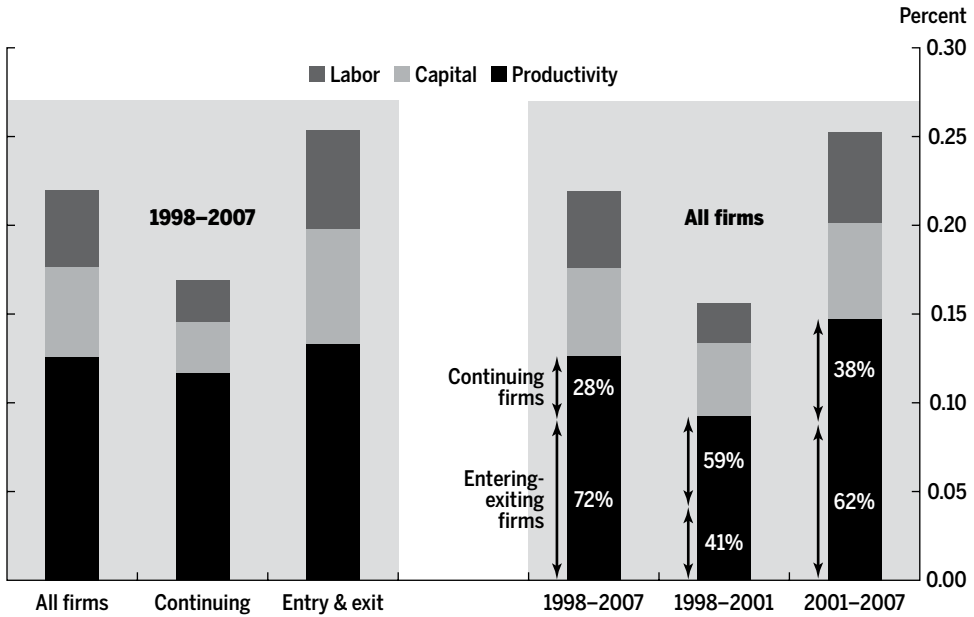
Source: Brandt, Van Biesebroeck, and Zhang (2012), Figure 7, p. 348. ©2012, reprinted with permission from *Journal of Development Economics*.

Significantly, the role of either the reallocation of resources to more productive firms or firm exit is negligible. The latter is more likely to be the case when exit rates are either low or when larger, poorly performing firms do not exit. As for the limited contribution of efficiency-enhancing input reallocations, capital market restrictions are often cited in this context (Hsieh and Klenow 2009; Song and Wu 2013), but also likely important are product market barriers, input subsidies for inefficient firms, and finally, preferential treatment of politically connected firms.

4. Differences across Sectors

The high rates of productivity growth in industry conceal important differences across sectors. Figure 3 graphs the distribution for TFP growth at the four-digit level between 1998 and 2007, and reveals wide differences between sectors over this period.[10] Sectors experiencing especially high rates of TFP growth include electronics, office machinery, and furniture; laggards include electrical equipment machinery, ferrous and nonferrous metals, and chemicals.
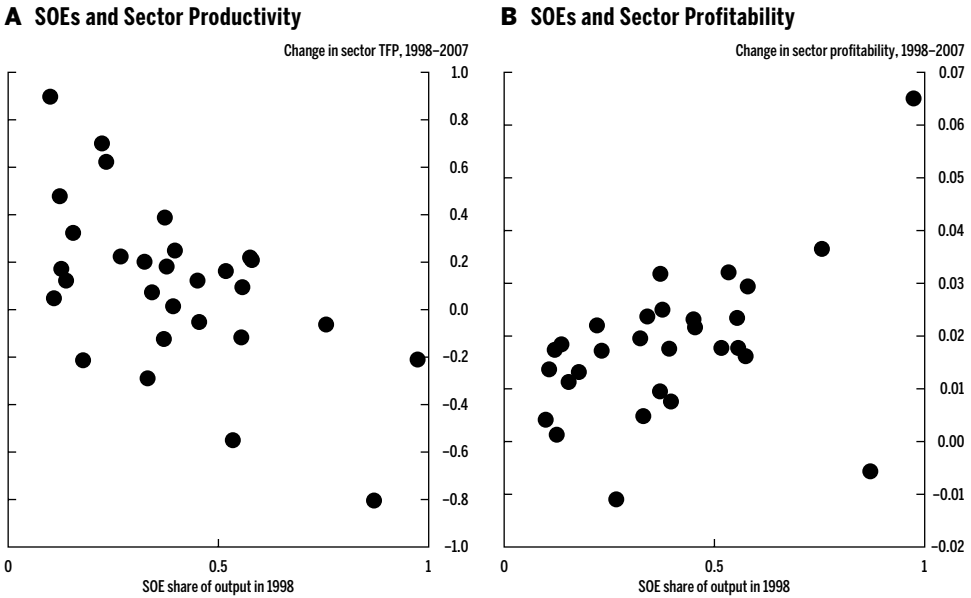
TFP Growth by Four-Digit Industry (1998–2007)

Number of sectors

TFP growth
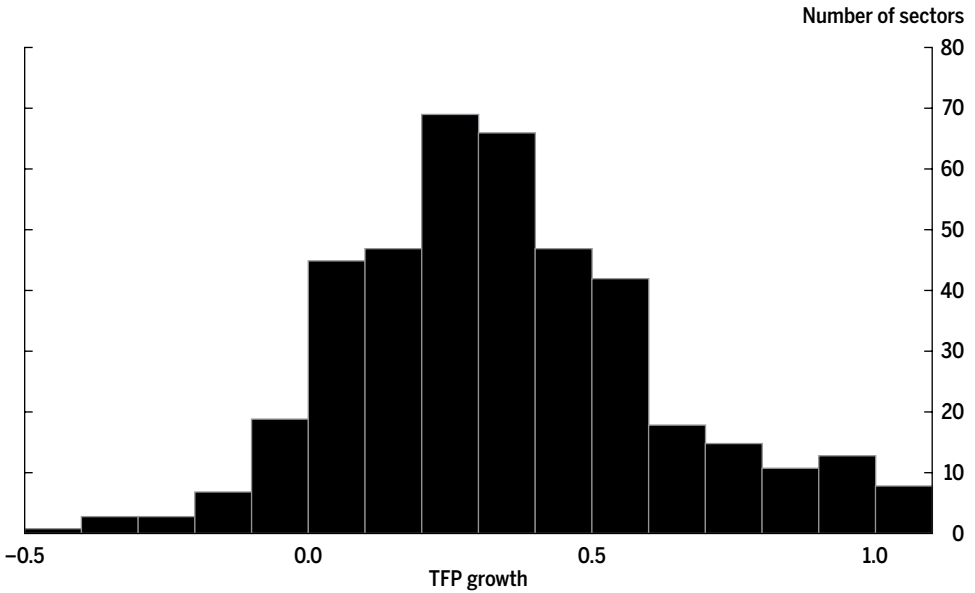
A critical determinant of the differences between sectors is the role of state-owned firms in the sector. As has been well described (Pearson 2015), the state has retreated from major segments of the economy. Today, SOEs dominate more capital-intensive upstream sectors such as power, telecommunications, transportation, and finance, and in manufacturing are most important in "pillar" and "strategic" sectors such as aeronautics, chemicals, iron and steel, and electrical machinery. Drawing on the Industrial Census, the share of the state sector in GVIO (gross value of industrial output) fell from 53 percent in 1995 to slightly more than 36 percent in 2008. Over the same period, the percentage of firms classified as state owned fell even more sharply, reflecting the huge selloff and bankruptcy of the smaller SOEs in the late 1990s.[11] In the context of a general decline in the role of SOEs in industry, state shares at the sector level are highly correlated over time.

The left panel of Figure 4 shows the relationship between the share of state-owned firms in the sector in 1998 and TFP growth between 1998 and 2007. The relationship is clearly negative, with those sectors in which the state was most important in 1998 experiencing the lowest growth in productivity over the same period. Paradoxically, the right panel of Figure 4 reveals that these same sectors experienced the most rapid growth in profitability over this period, a likely

FIGURE 4
SOEs, Productivity and Profitability, 1998–2007

A SOEs and Sector Productivity

Change in sector TFP, 1998–2007

B SOEs and Sector Profitability

Change in sector profitability, 1998–2007

SOE share of output in 1998

SOE share of output in 1998

byproduct of technological differences and preferential access enjoyed by these firms to key inputs such as capital, energy, and land.[12] Naughton (2008) has argued that "rents" of this sort remain important to maintaining patronage in the system.

Decompositions of productivity of the kind described above that break down the sources of productivity change into its components are equally telling. Table 1 reports results based on a division of the two-digit sectors for industry into two groups: those in which the state had more (less) than 50 percent of GVIO in 1998.[13] Note the huge gap in TFP growth between the two types of sectors, negative in state-dominated sectors and positive in those in which the role of the state is less important. Equally telling, in the state-dominated sectors, the contribution of both incumbents and new entrants to productivity growth is negative. The former occurs when productivity growth of established firms is negative; the latter occurs when new firms enter the productivity distribution at a level that is lower than the industry average. Disaggregating even further by ownership reveals that in state-dominated sectors, non-state actors—incumbents as well as entrants—also perform poorly, and contribute to the declining productivity we observe. Conversely, state-owned firms in non-state-dominated sectors perform better, albeit not to the levels of the non-state actors.

TABLE 1
SOE Shares and Sector TFP Growth, 1998–2007

Sectors	Total Change in TFP	Sources of Change in TFP			
		Within	Between	Entry	Exit
SOE share > 0.50	−0.117	−0.048	0.007	−0.080	0.004
SOE share < 0.50	0.208	0.050	−0.024	0.175	0.007
All sectors	0.107	0.019	−0.014	0.096	0.006

Note: Based on TFP estimates from Brandt et al. (2012, revised 2015).

This behavior suggests that not only is ownership important, but so is the entire regulatory environment that governs and shapes how firms compete in a sector. The negative contribution to TFP of "new" non-state actors in state-dominated sectors—sectors in which profitability was actually rising—suggests an entry process that is highly politicized and distorted, and in which political connections rather than how good a firm is likely matter most. Table 2, which reveals huge differences in outcomes among three (two-digit) industrial sectors in which state firms have been important, helps make the point further that ownership alone is not the problem. Clearly, there are sectors in which SOEs appear to be doing reasonably well.

Unfortunately, data limitations do not allow comparable estimates of productivity for the post-2007 period. Estimates for 2013 at the two-digit level on capacity utilization rates recently reported by the State Council reveal, however, a significant overlap in sectors currently experiencing low capacity utilization rates with those we identified above having low (or negative) TFP growth between 1998 and 2007. These include chemicals, ferrous and nonferrous metals, cement, electrical machinery and equipment, shipbuilding, and autos. Coincidentally, all of these sectors were included in the government's Top 10 Industries Revitalization Plan rolled out in 2009. For these sectors, capacity

TABLE 2
Difference among SOE-Dominated Sectors

Sector	SOE	Share	Change in TFP	Contribution to TFP			
	1998	2007		Within	Between	Entry	Exit
"Better performing" SOE-dominated sectors							
Special-purpose machinery	0.58	0.43	0.21	0.07	−0.01	0.15	0.00
Transport equipment	0.52	0.39	0.16	0.07	−0.02	0.11	0.00
"Average" SOE-dominated sectors							
Smelting of ferrous metals	0.76	0.60	−0.06	−0.01	0.00	−0.04	−0.01
Chemical products	0.55	0.41	−0.12	−0.06	0.00	−0.06	0.00
"Poorly performing" SOE-dominated sectors							
Smelting of nonferrous metals	0.53	0.52	−0.55	−0.21	0.06	−0.39	−0.01
Processing of petroleum	0.87	0.75	−0.80	−0.31	0.08	−0.57	0.00

Note: Based on TFP estimates from Brandt et al. (2012, revised 2015).

utilization in 2013 was only 70 percent, compared with 85 percent or so for the rest of industry. In general, there appears to be a high correlation between problems of excess capacity and how "strategic" the sector is in the economy.

With relatively robust growth in domestic demand in all of these sectors until only the last few years, the problem would seem to rest heavily on the supply side. Central government policy—compounded by the incentives facing local government officials to promote local growth—has badly distorted firms' investment decisions and choices. The consequence is not simply too much investment in these sectors, but rather investment in new capacity by some of the most inefficient firms (in probably some of the most inefficient regions), firms that all else equal should have been going out of business or, at a minimum, downsizing.[14]

Policy measures now proposed to address these issues include the familiar: firm-level consolidation through top-down M&A; elimination of existing "backward" capacity and tighter control on new expansion; and stimulus of domestic demand. Added to the list is a new measure: relocation of some of the excess capacity overseas.[15] In the past, top-down administrative M&A tended to favor firms that were either the largest or best connected. Provincial and subprovincial governments, whose own power is often tied to these firms, know the game. Not wanting "their" firms to be among those that are acquired by others, they have clear incentives to expand—through either new investment or local M&A—measures which only add to existing inefficiency and likely discriminate against better firms.

5. Leveraging the Domestic Market: The Important Role of Continuing Market Liberalization

The role of expanded access to global markets in the learning and upgrading process of firms and countries is well documented. But on the demand side, far more important for a majority of firms in China is the domestic economy, which has consistently absorbed more than 85 percent of what is produced by manufacturing firms in China. For a long list of products including autos, heavy construction equipment, wind turbines, cell phones and network equipment, glass, and iron and steel, China is the largest market in the world. Important here are several factors: China's huge population, 1.37 billion; sustained growth of the economy over more than three decades; and a rapidly growing middle class. Recent estimates put the size of China's middle class—defined to be households earning between $US9,000 and $US34,000—at several hundred million (Barton, Chen, and Jin 2013).

The huge size of this market has been providing a unique set of upgrading opportunities for firms operating in China that their counterparts in smaller

countries do not enjoy. This suggests that government policy toward the domestic market is as important, if not more important, than it is with respect to nurturing overseas markets. In fact, the two are highly complementary. Liberalization of the domestic market and its timing has been far from uniform, however, and is reflected in wide differences in the competitive strengths of Chinese firms across sectors.

In selling locally, Chinese-owned firms do not face the same set of marketing and technical gaps that they usually face in selling overseas. In fact, in some domestic market segments—notably, the low to middle end—domestic firms may actually have advantages vis-à-vis foreign firms, whose products are often better suited for consumers in richer countries (Brandt and Thun 2010, 2016). Success in selling in the domestic market can also become an important platform for selling in other emerging markets where levels of incomes (and consumer preferences) are often more similar than they are in advanced countries.

Central to the dynamism and productivity growth we often observe at the sector and the firm level have been policies that have lowered barriers, increased competition, and helped to better leverage capabilities inherited from the planning period that often continue to reside in the state sector. These measures include falling tariff and nontariff barriers for imports that were part of China's accession to the WTO (World Trade Organization), lower entry barriers for new firms, a more open environment to foreign direct investment, the bankruptcy and reorganization of the assets and workers of the SOEs, as well as less-discriminatory procurement policy by state actors.

In the context of a growing domestic market, these market-liberalizing reforms put considerable pressure on firms operating in China to lower costs and improve product quality; more generally, they promoted investments in upgrading at both the OEM (original equipment manufacturer) and supplier level. Falling tariffs and nontariff barriers also helped to provide less expensive access to capital and intermediate goods, which facilitated product upgrading and productivity improvements.[16] A key channel through which tariff liberalization affected growth was through its effect on the productivity of firms that entered these sectors (Brandt et al. 2012, revised 2015).

At the outset, there were deep concerns in China that market liberalization of the sort mandated by WTO accession would be at the expense of domestic firms. Similar concerns are often expressed today in the context of the prospect of opening up the service sector. There have been casualties, and thousands of firms folded under intensified competitive pressures, but more generally, and after an initial reduction in their market share, Chinese firms have done well in the domestic market. This is perhaps most noticeable in more mature

industries in which incremental innovation in both product and process technology are especially important to newcomers. Like firms in Korea, Japan, and Taiwan before them, Chinese firms are remarkably adept at this kind of innovation (Breznitz and Murphree 2011), strengths that policymakers should be leveraging.

Especially important in this context has been an evolving relationship between MNCs and domestic firms. In order to help lower costs in the context of falling domestic prices and profit margins, and to meet demand in the rapidly expanding "middle" segments of the market, foreign firms have invested heavily in building up the domestic supply chain, increasing their local content in the process. A leading multinational OEM in the auto sector, for example, had a five-year plan in the mid-2000s to lower their costs by 45 percent through more local sourcing for intermediate inputs and capital machinery and equipment, and a shift in some of their more "applied" R&D (research and development) to China. They succeeded.[17]

These kinds of investments have resulted in the transfer of manufacturing know-how and capabilities from the multinationals to local firms, and required complementary investment by local firms in capital equipment, human resources, and R&D. Foreign firms have also become an important source of managerial and engineering expertise for new Chinese firms. Chinese firms have leveraged these opportunities, and it is not uncommon to find them participating in both domestic and global value chains. Development of the domestic supply chain has also become key to the upgrading by Chinese firms at the OEM level who have been able to tap into rapidly improving networks of Chinese suppliers.

6. Case Studies: Autos, Heavy Construction Equipment, and Wind Turbines

Liberalization of the domestic market and its timing has been far from uniform. A few examples help link policies to the current competitiveness of domestic (Chinese) firms.

China's heavy construction equipment sector is a good example of where liberalizing forces over an extended period have contributed to robust growth of the sector *and* the rise of national champions. Two decades ago the domestic market was highly segmented, with a long list of Chinese firms dominating the "low-end" wheel loader market, and imports and local production of MNCs in China serving the "high-end" excavator market.[18] Since the early 1990s, the sector has been relatively open: tariffs on heavy equipment machinery and intermediate goods were low; entry by non-state actors, domestic as well

as foreign, was relatively unencumbered; and there were few restrictions on the form of technology transfer allowed, e.g., licensing, joint ventures (JVs), and wholly owned subsidiaries. With one or two prominent exceptions, M&A was also generally permitted. On the demand side, small and medium-sized enterprises (SMEs) in the construction sector have been a major source of market demand.

Today, multinationals such as Caterpillar, Komatsu, and Volvo continue to be important players in a highly competitive domestic market, but Chinese firms have done remarkably well in the sector. In the wheel loader market, the top four firms—three of which are Chinese—now enjoy upwards of 70 percent of the market, while in the domestic excavator market, Chinese firms currently capture upwards of half. Only five years ago, it was less than half of this. A recent in-depth analysis of the sector attributed this success to the ability of Chinese firms, SOEs as well as private, to compete on the basis of both price and quality in medium-market segments (CLSA 2013). In a test of 13 leading excavator brands in China in the mid-size excavator market (20–25 tons), performed over 185 working hours during a two-week period in 2013, CLSA (p. 23) found that "*technology gaps are non-existent* between top-tier Chinese and international companies."

Rapid growth in a domestic car market now rivaling that of the United States in terms of size has not meant similar success of Chinese (domestic) automotive OEMs. The root of these difficulties lies in earlier policies—most notably, very high rates of protectionism prior to the WTO, restrictions on forms of entry and technology transfer, and until only more recently, a marked policy bias in favor of the state-owned, JV partners of leading international auto MNCs. Licensing of technology, which was common in heavy construction, was limited to a single locally state-owned company, Tianjin Xiali.

The expectation of policymakers was that a combination of a high tariff umbrella and local content requirements would help to foster national champions through the development of the independent production capabilities of the same SOEs, i.e., FAW (First Auto Works), Dongfeng, and SAIC (Shanghai Automotive and Industrial Company). Despite huge investments in their operations, these spillovers have not materialized, and car production of the SOEs outside the JVs remains very modest. Nor have newer firms such as BYD or Chery, with deep local government support, developed the foundations needed to compete successfully.

A recent external assessment of the domestic OEMs is revealing, especially when read in juxtaposition to the one above for their counterparts in heavy construction: "The leading Chinese products now have bodies, safety

and suspension hardware that are largely competitive. But they are behind on engine technology and are also let down by assembly standards, material choices, systems integration, refinement, and a lack of final development and testing. *They are still a long way from being genuinely 'world class.'*" (Warburton et al. 2013). With their domestic market share declining, some of these same firms—with the encouragement and financial support of the "go out" policy of the central government—now look overseas, especially to low-income countries, for markets.

Wind turbines provide a similar and more recent example of policy-induced difficulties. In the early 2000s, a small nascent domestic industry was dominated by multinationals, largely through local JVs.[19] Within less than a decade—and almost exclusively in the context of a rapid, government-led expansion in the domestic market—Chinese firms came to dominate, and today they have all but 1 or 2 percent of the domestic market. JVs have largely disappeared and MNCs supply the local market through a small number of wholly owned subsidiaries. In 2014, foreign firms sold almost the same number of units they had a decade earlier. Over the same period, the domestic wind turbine market expanded from 250 to 13,121 units, while the average size of wind turbines (in terms of kilowatt hours) doubled.

On the surface, this looks like a huge success, and there is an extensive literature documenting the rise of Chinese domestic wind turbine companies and the role of public policy in fostering the development of the domestic sector (Lewis 2013). Upgrading of capabilities in domestic firms has certainly occurred, but there may be less than meets the eye. The sharp drop in the market share of the MNCs may have as much to do with procurement rules and localization requirements that made it harder for them to compete with local firms. The industry is increasingly dominated by a handful of firms, largely SOEs. Moreover, a majority of the rapid expansion in wind farms in China, the local customers for wind turbines, has been through subsidiaries of the five big state-owned power-generating companies, two of which have also acquired domestic wind turbine manufacturers. Vertical integration and the dominance of state firms throughout the value chain in key components—e.g., generators, gearboxes, and blades—and as end users of turbines has dampened the demand for more efficient wind turbines relative to a sector in which independent power producers facing hard budget constraints were allowed a larger role. Recently, it has been reported that less efficient wind farms with higher costs were receiving higher feed-in tariffs. High levels of wind curtailment, which reflect problems in both the wind turbines and the power system, have been a recurring problem in the sector.[20]

The end result is that Chinese wind turbine companies—urged on by policy initiative to leapfrog the foreign competition and gain first-mover advantage—have been able to increase the size of the wind turbines that they manufacture, but they are not able to compete globally, even in wind turbines between 1.5 and 2 megawatts that are the "bread and butter" of the sector. In 2014, the number of units exported was less than 2 percent of total production. Like their domestic counterparts in the auto sector, they remain weak in design capabilities and systems integration; they are also highly dependent on foreign firms for control systems, the "core" of the wind turbine.[21] The recent collapse of Sinovel, one of China's largest wind turbine manufacturers, following charges of intellectual property (IP) theft from AMSC, a leading U.S. supplier of the software that controls wind turbines, is a case in point. With problems of excess capacity in the sector and intense competition from other power sources for a share of a slowly growing market, a future shakeup among wind turbine manufactures seems likely.

7. The Service Sector

Our focus has been primarily on industry, but there are equally important issues relating to the service sector. Today, the service sector represents upwards of 50 percent of GDP, a percentage that will only rise over time with the growth in household incomes. These services also represent important inputs into industry, and thus affect the global competitiveness of Chinese industry through their upstream role.

Analysis of the service sector is seriously handicapped by the lack of the same kind of rich firm-level data we have for industry, but several observations can be made. In the service sector, we observe rates of entry of new firms that are even higher than those for industry. In Figure 5, we draw on the State Administration of Industry and Commerce business registry data and provide estimates of the flows in and out of the sector for the period between 1998 and 2013. In general, they follow those in industry but suggest even higher rates of gross and net entry. Between 1998 and 2013, net entry (entry minus exit) averaged nearly 8.5 percent per annum, compared with 6.6 percent for industry. These high rates of entry help explain several more recent positive assessments of developments in the sector.

Analysis at the more aggregate level suggests a possibly less sanguine picture. Although the gap between services and industry in productivity growth has narrowed since the late 1990s, huge differences remain in *productivity in levels* with industry (Brandt and Zhu 2010, revised 2016). Services are also highly segmented, with the more capital- and skill-intensive sectors such as

FIGURE 5
New Firm Dynamics, Services, 1998–2013

Percent
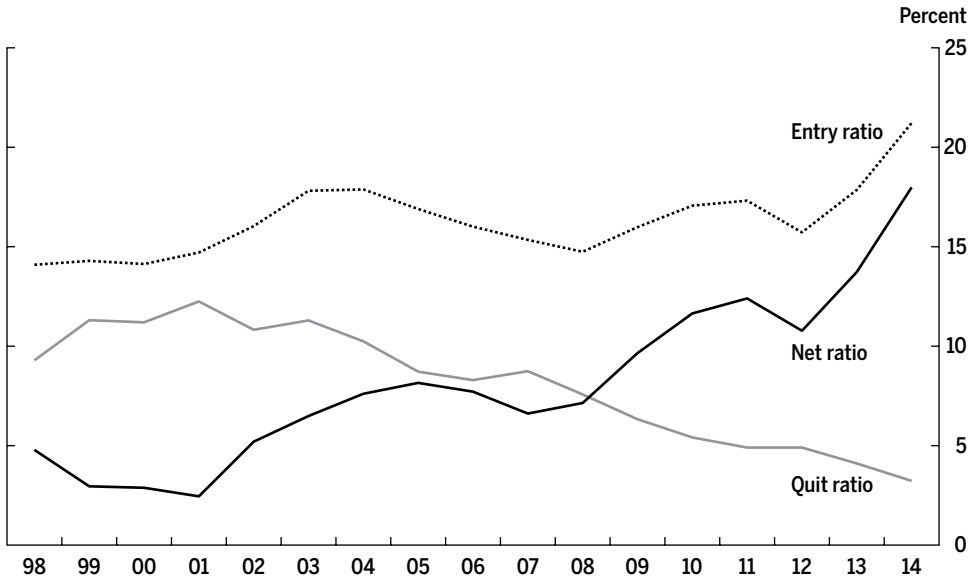
finance, telecommunications, and transportation dominated by state or state-connected firms, while the more labor-intensive sectors such as retail and wholesale trade and hospitality are often largely private. Some of these barriers are beginning to recede slightly, but a case can be made that labor-intensive, low-productivity services have been left to absorb those individuals not able to find jobs in either the more highly competitive manufacturing sector or the capital- and skill-intensive segments of services and manufacturing which tend to be state dominated. One consequence of these barriers (and distortions in capital markets) is huge differences in the after-tax returns to capital in state and non-state firms in industry and services. (See Figure 6.) In both industry and services, returns to capital in the state sector are low if not negative. They are higher in the non-state sector, but note the gap between industry and services, and the rapidly falling returns in the non-state sector after 2008.

ICT (information and communications technology) is reflective of these difficulties. In the case of broadband Internet, the three state-owned telecom operators, China Mobile, China Telecom, and China Unicom, are the backbone of the system. Retail Internet service providers are largely private but depend on the state-run operators for connectivity. A recent study by the International Technology Union (2014) showed that Chinese broadband prices were high in a cross-country comparison. A principal reason these rates remain high is that

FIGURE 6
Return to Capital in China
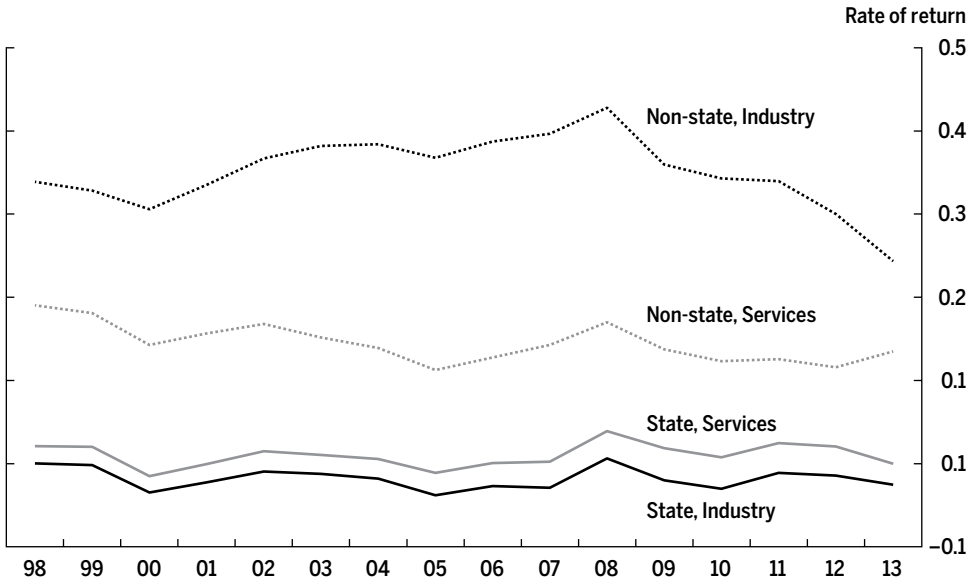
Source: Brandt and Zhu (2010, revised 2016).

interconnection rates (to the network and to international gateways) are high due to the lack of competition and the market power enjoyed by the three tele-coms (Wu 2015). In part, the monopoly power enjoyed by the three carriers is tied to continuing state efforts to regulate Internet content.

Mobile services in China fare slightly better in international comparisons, but capacity utilization rates for China's 3G networks, which we expect to be tied to productivity and returns to capital, are low for all three carriers.[22] These low utilization rates are likely one of the reasons regulators recently required the three operators to open their networks to mobile virtual network opera-tors (MVNOs) in hopes of expanding mobile services to customers. The first of the MVNOs was established in the spring of 2014, but reports for 2015 sug-gest that the MVNOs are having a hard time offering competitive retail rates, largely because of high interconnection terms. There is now discussion of possi-ble mergers among the three state-owned telecom operators that would reduce the number of firms to two.

In the last few years China has laid out a new ICT policy, the core compo-nent of which is the development of indigenous technologies and industries. A recent review (Atkinson 2014) of the major initiatives of this policy recognized the steps taken to open up the market to the private sector, but raised concerns

that have an uncanny similarity to those identified above. On their list were huge subsidies to Chinese-owned firms, requirements that foreign firms localize R&D and IP, the development of Chinese-only technical standards, and the establishment of discriminatory government procurement measures. If history has any lessons, perhaps the most important is that these policies will have high costs not only for foreign firms but for China as well.

8. What's Next?

Improvements in productivity have been the most important source of growth in the Chinese economy, and will be in the future as well. The problem has been that sources of dynamism in the economy have been accompanied by huge inefficiencies at the sector and firm level that often have high ancillary costs, e.g., nonperforming loans.

The reasons for the distortions that underlie these inefficiencies have not been our central focus. Nonetheless, a case can be made that they are deeply embedded in China's political economy and often serve multiple purposes: they are an important source of patronage and rents, they help align central and local interests, and they enable the party and the state to fulfill strategic objectives tied to domestic and international security considerations. There are also vested interests.

I do not have a crystal ball, but the lessons from the past 10–15 years—that the most dynamic sectors are those that have been most open to competition from all sources and free from the often visible and distorting hand of the state—will likely be true moving forward. This is not to say that the state should not have a role: it should, both as a regulator and as an important provider of key inputs that might otherwise be undersupplied, including coordination. Limiting itself to such a role, however, has run counter to the instincts of China's earlier leadership, and probably the current one as well.

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NOTES

1 Recent work by Zhang and Zhu (2013) also suggests that investment (consumption) has been overestimated (underestimated) in the Chinese national income accounts.

2 A case could be made that the imbalances in the Chinese economy have widened with efforts to redistribute.

3 Power and utilities are actually part of industry, but have similarities with telecom in that both are network industries and key upstream sectors for manufacturing.

4 At the firm level, Brandt, Van Biesebroeck, and Zhang (2012) estimate productivity improvements of 8.0 and 2.8 percent per annum on a gross output and value-added basis, respectively. At the industry level, productivity growth is even higher, reflecting the role of entry/exit and reallocation of resources among firms in the sector. On average, productivity growth has been the source of half or more of the growth in industry since the mid-1990s.

5 Entry rates are calculated by dividing the number of new firms established in a year by the total number of firms operating that were established earlier.

6 The activity of these firms covers between 75 and 80 percent of industrial activity. Those excluded are small in terms of size.

7 These estimates are based on data from the 1995, 2004, and 2008 Industrial Census.

8 The Census data for 2004 and 2008 suggest a decline in the gross entry rate of 4 percent over this period, compared with 3 percent in the business registry data.

9 The reasons for the decline in exit rates are a mystery at this point and remain to be investigated. Declining exit rates may have important implications for productivity, however.

10 These estimates are drawn from Brandt et al. (2012, revised 2015).

11 State ownership (and control) can be identified in a number of alternative ways, none of which are perfect. The estimates reported above are based on a relatively conservative definition.

12 The most important technological difference is an elasticity of substitution between capital and labor greater than one. See Berkowitz, Ma, and Nishioka (2014).

13 A third of all sectors had a state share of 50 percent or more in 1998. Using a slightly lower cutoff point or dividing sectors into two groups after ranking them does not alter the picture.

14 Since the mid-2000s, similar kinds of behavior have emerged in sectors such as solar, a sector in which SOEs have been much less prominent and the market is largely overseas, but the role of the government, local and central, has been offsetting and highly distortionary.

15 Relocation of capacity overseas in these sectors is viewed as highly complementary to the setting up of the Asian Infrastructure Investment Bank.

16 For intermediate goods, we observe significant pass-through of falling tariffs into lower prices of domestically manufactured intermediate goods.

17 Interview with a leading global auto OEM, July 2006.

18 These two products differ enormously in terms of their design and manufacturing requirements, much of which is related to the hydraulic system in an excavator, and the integration of hydraulics and transmission. In key respects, however, they are substitutes.

19 There were a relatively small number of domestic firms, of which Goldwind was the largest, that entered the sector through technology licensing agreements with some of the smaller European manufacturers and design firms.

20 Curtailment occurs when wind is available but the grid operator does not allow the wind farm to supply power on the grid. This is a common problem for renewables in all power systems, but in China it is especially serious.

21 Goldwind is an exception and is investing heavily in design as opposed to manufacturing capabilities. In this regard, the head of R&D said they aspire to be like Apple (Interview with Goldwind, October 23, 2012).

22 In interviews in the fall of 2013, one of the carriers reported a utilization rate of 35 percent for their 3G network. They also claimed that it was higher than that of their two other competitors.

Policy Perspectives from the Bottom Up: What Do Firm-Level Data Tell Us China Needs to Do?

David Dollar

It is a real pleasure to discuss Loren Brandt's paper. I do not have any major disagreement with his empirical work, which is carefully done. The richness here is in providing us with microfoundations for understanding what is happening in China's very complicated economy. First, I would like to briefly highlight what I think are four key empirical results in this paper. Second, I want to talk about how those four results can give us a good understanding of why China has done so well over the past three decades. Third, I want to talk about the current slowdown. Some of that may be cyclical, but there is also a structural slowdown going on. These results actually can help us understand that slowdown. Fourth, I will talk about policy issues. What are some of the things China can do to mitigate the slowdown and to prevent the buildup of risks?

First, let me pay tribute to the paper by highlighting what I see as four key results. The presentation was very clear. First, though we think of China as an investment-heavy growth model, and certainly in the aggregate it has had a high investment rate, Brandt shows that there has really been very fast total factor productivity growth in Chinese industry. This is similar to the earlier so-called East Asian miracle experiences. That has been established by other work as well, but it is nice to see it confirmed here. The thing that is most new here for me is this key role of entry, which is definitely different than what we have seen in other economies. According to Brandt's estimates, upwards of two-thirds of the productivity growth in sectors can be attributed to the entry of firms coming in at a higher level of productivity. Some of that entry of course would be foreign firms. Most of the entries are going to be domestic firms. Then the third thing—and I think this is not that surprising—is that there is tremendous variation across sectors. But it is interesting to relate that to the presence of state enterprises and the degree of openness of these different sectors. You have a very dualistic economy with some sectors open and competitive. Other sectors are relatively closed and dominated by state enterprises. The paper shows that

the more open sectors, with more private-sector participation, have faster productivity growth—an intuitive result, but nice to actually see in the data. The fourth result I want to mention: everything I have highlighted is about manufacturing. But then the paper brings in services in the last part. This is going to be a very important issue in China's future. The paper has nice estimates of the real productivity of capital in different sectors. There is a clear hierarchy of (1) private industry, (2) private services, and (3) state enterprises in both services and manufacturing at a very low level of productivity. Also, if you look carefully, between 2008 and 2013, there is a distinct drop in the productivity of capital in private industry, though it remains the most productive kind of investment. These results can help us understand a number of things about China's economy.

First, look at China's tremendous growth record over three decades: when China joined the World Trade Organization (WTO) in 2001, it agreed to open up its economy. But if you look at the WTO agreement, it is very partial. China agreed to open up most of manufacturing to foreign investment, including wholly owned subsidiaries of foreign companies. But some key manufacturing sectors were not included. Automobiles, for example, remain relatively protected, with restrictions on foreign investment. Foreign investors have to operate in these awkward 50-50 joint ventures. But mostly manufacturing has opened up.

But there's almost nothing in the WTO agreement about opening up the modern service sectors; I will come back to that. Joining the WTO started a dynamic process in which manufacturing expanded its share of the economy, while at the same time the private sector expanded its share of manufacturing. That contributed to the overall growth.

Some of that entry is coming from multinational firms. They play an important catalytic role initially. But most of the entry is coming from the domestic private sector. For a long time the majority of China's exports (that is, in terms of gross value) have come from foreign-invested firms. Tang, Wang, and Wang (2014) show that in terms of value-added, most of China's exports come from the domestic private sector. So the entry of private firms in manufacturing is a key part of their success. Brandt's paper emphasizes that exports have always been a minority of output, but still they play an important catalytic role. But there are a lot of other things going on as well. When it joined the WTO, China opened up a lot of these sectors that become very competitive domestically. Most of the manufacturing output is not being sold as exports. Most of it is actually contributing to investment in China. So it is important to bring in the macroeconomic story, that this is an economy with high savings rate and high investment. Aside from joining the WTO, Zhu Rongji opened up the housing market

in China, so there was a big private housing boom. A lot of investment started going into housing starting around 1995 and accelerating into the 2000s. The demand coming from exports peaked around the time of the global financial crisis. And then China's exports dropped very sharply. China chose to replace that with a stimulus program that was almost completely investment. So they took their investment rate, which was already pretty high, up to about 50 percent of GDP. To relate this back to the micro story, all the way up through that stimulus, there was a period in which manufacturing was increasing its share of the economy and the private sector was increasing its share of manufacturing. These productivity results help us understand why China's overall growth has been so good.

My third point is that the model that I have just described inevitably runs out of steam. China started out as a small player and became a very successful exporter. It was so successful that it became the biggest exporter in the world. So now it is difficult for China's exports to grow at the kind of rates we have seen in the past. This year, China feels that its exports are not growing well. But actually China's exports are growing in line with world trade: about 2 percent real. And it is just not realistic for exports to grow much faster than that. Add in that the investment-heavy model at the macro level has generated excess capacity throughout the economy. So now real estate is overbuilt. A lot of apartments are empty. A lot of manufacturing is now operating at low capacity.

In his remarks yesterday, Stan Fischer mentioned that it is natural at this stage for China's service sectors to start becoming a more important source of growth. And we actually see that in the data. While investment and industry have slowed down, there is a nice dynamic in which the labor market so far has remained tight; wages and household income are going up, consumption is rising, and consumption is mostly services. So China is growing pretty well. But then bring in Brandt's results. A lot of the service sectors that are expanding are the relatively closed, unproductive sectors in China. The OECD calculates an index of foreign direct investment restrictiveness by sector (Kalinova, Palerm, and Thomsen 2010). China is almost completely closed to foreign investment in financial services, telecom, logistics, media, and health care. Essentially the core of modern services is restricted in terms of foreign investment. And in many cases, there are restrictions on domestic investment as well. So naturally there will be some slowdown in China's growth rate as the manufacturing sector peaks and starts to decline as a share of GDP. But I think in China, this natural slowdown will be exacerbated, because now resources are shifting into sectors that are uncompetitive and where there is not a very important private-sector role.

The fourth and last issue is policy. China could help itself by opening up more. The obvious thing to do would be to open up these service sectors, both domestically and internationally. We have a relatively new leader in China, Xi Jinping. The Third Plenum two years ago rolled out a comprehensive reform program. That program includes a lot of these plans. The problem is that so far implementation has been slow. To be fair, they have made some progress. They have made it easier to register firms, for example. So the kind of start-ups that spur entry actually should be facilitated in a lot of sectors that are already open. But they have not really opened up new sectors. They certainly have not opened up new sectors to foreign investment. China is negotiating a bilateral investment treaty with the United States. The fact that they are trying to do that on the basis of a negative list indicates willingness to consider opening up. But the negotiation is going slowly. China has also not chosen to be part of the initial Trans-Pacific Partnership negotiations. This is the kind of agreement that could help China a lot if it opened up service sectors. It is not going to get the same kind of productivity growth as in manufacturing, but it certainly would get a better performance than we are seeing now.

The last reform issue I will just mention briefly. Eswar Prasad covered the issues of financial liberalization very nicely. There is a lot of progress in financial liberalization. You would hope the financial sector could play a role, bringing about exit of less productive firms and shifting resources to more productive firms. As Brandt said, we have not seen much of that so far. They certainly have done some things like liberalizing interest rates. But there are still a lot of problems in the financial sector. Private firms cannot easily go to the capital markets. It is a bureaucratic process that requires approval. Firms cannot just meet standards and issue stocks or issue bonds. A lot of the private investment is self-financed because the financial system is not financing it. But as Eswar Prasad emphasized, they are making progress with liberalizing the capital account. I want to end on a worrying note: By moving ahead with financial liberalization, and especially opening the capital account, but not moving on the real-sector reforms, China is creating certain types of risks. As investment slows down, as manufacturing slows down, if there are not a lot of good opportunities in the service sectors, then of course more capital is going to go overseas. Some of that can be healthy, but a very large, continual outflow from China could be quite disruptive.

In conclusion, it is useful to take a detailed look at firm dynamics and industry dynamics, as in Brandt's paper. China is very complicated. And this paper gives us a good sense of some of the things that are going on at the grassroots level, which in turn help us understand the macro level.

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COMMENTARY

Policy Perspectives from the Bottom Up: What Do Firm-Level Data Tell Us China Needs to Do?

Tao Zha

Loren Brandt provides an informative, careful, and thoughtful microeconomic perspective on China's productivity. His approach is "an assessment that comes from the bottom up, based on a combination of extensive firm-level analysis and several hundred firm interviews over the years." I applaud the author's work and effort. The findings on the differences in capital returns between state-owned enterprises (SOEs) and privately owned enterprises (POEs) are fascinating and will be consistent with the arguments I later develop.

The paper argues that there exist "huge distortions and inefficiency" in China's firm dynamics, and it focuses on improvements in productivity. As pointed out by the author, the reasons for such distortions that may underlie these inefficiencies are not the paper's central focus.

In this discussion, I provide a different perspective by broadening the picture, focusing instead on the *main reasons* for the distortions mentioned in the paper, as these reasons are inextricably linked to China's institutional details and its financial system and thus China's growth prospects.

Questions about how fast China's economy will grow in the future have tantalized policymakers and researchers alike. To provide an answer, one must understand not only positive but also negative consequences of China's past performance. Indeed, a deep analysis of China's macroeconomy poses more questions than answers. There are four visible questions about China's growth prospects that must be reckoned with:

1 What is the tradeoff between short-term and long-term growth prospects?
2 Is China's spectacular growth in the past two decades an unalloyed progress?

3 What macroeconomic policy is mainly responsible for the past growth?

4 Why are financial reforms crucial to achieving sustainable growth in the future?

The first question is a practical policy-related question, which I will quantify.

What Is the Tradeoff between Short-Term and Long-Term Growth Prospects?

At what level China's economic growth is sustainable in the long run is almost impossible to reckon. To a large degree, it will probably depend on the success of financial reforms, as will be elaborated in sections below. One thing remains clear: there will be a painful tradeoff between short-term and long-term growth prospects. Based on the time-series model estimation of Higgins, Zha, and Zhong (2016), it is reasonable to expect China's gross domestic product (GDP) growth to slow down to 5.5–6 percent if the government is willing to reduce growth of fixed-asset investment (FAI) to 8 percent. This forecasting model has been tested for its out-of-sample performance of GDP growth. The root mean square error over the four-year horizon is only 0.9 percent, compared with the 2 percent error produced by the random-walk model.

According to our estimation, a 5 percentage point reduction from the current FAI growth rate leads to a .05 percentage point fall in GDP growth in the short run (over one to five years) but increases the consumption-output ratio by 20 percent over the five-year horizon from the current level. (This estimation is nonlinear and depends on the initial state of the economy.) The tradeoff between consumption and investment is a lesser-known fact. At the same time, our simulations indicate that rapid adjustments in reducing investment growth run a risk of significantly slowing down the economy in the short or medium run.

## Why Does China's Spectacular Growth in the Past Two Decades Fail to Continue?

This is an important question in the face of these tradeoffs. One answer to this question lies in the *imbalance of China's past growth*—an imbalance of first order. Figure 1 provides two striking facts about China's economy that are seldom discussed but essential to comprehend China's growth prospects. Household consumption as percent of GDP steadily declined during the period of rapid GDP growth (Figure 1A), while investment as percent of GDP steadily increased in the same period (Figure 1B). Brandt indicates that China's investment may be overestimated or consumption may be underestimated. We have

FIGURE 1
Consumption and Investment Rates in China

A Consumption as Percent of GDP
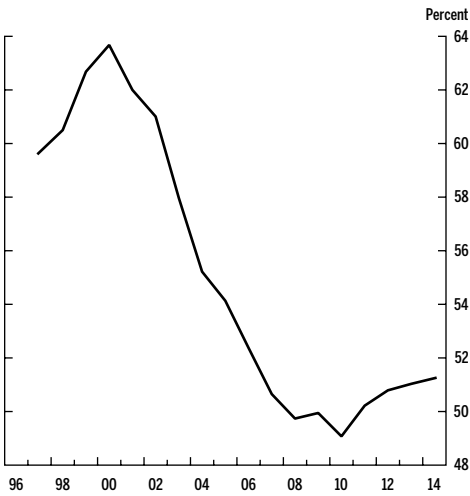
B Investment as Percent of GDP
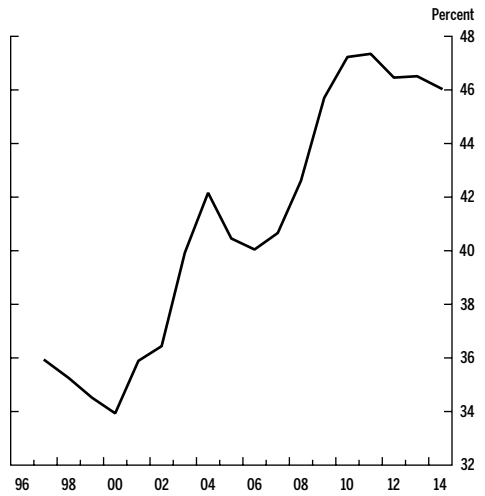
Sources: CEIC Data and the National Bureau of Statistics.

done such adjustments ourselves, including questionable housing services, given the underdeveloped rental market in China. Nonetheless, no matter how one adjusts the time series of China's GDP components, these level adjustments do not change the basic growth pattern displayed in Figure 1.

How important is the rise of the investment-output ratio to GDP growth? A growth-accounting exercise confirms that capital deepening (investment) accounts for a majority of GDP growth, about 74 percent between 1998 and 2011. It is not a mystery that China's growth has been driven by a boom in investment. What is less known is that much of the unprecedented investment boom has gone into overcapacity and real estate sectors. As argued by Chang et al. (2016), such imbalance is a negative consequence of resources misallocated from the productive light (labor-intensive) sector to the less productive heavy (capital-intensive) sector. The heavy industry is largely composed of large capital-intensive firms (both SOEs and POEs), many of them associated with overcapacity and real estate sectors. Unless this misallocation is reduced and eventually eliminated, China's growth prospects will continue to face serious problems.

But What Macroeconomic Policy is Mainly Responsible for such Capital Misallocation?

One serious problem is overinvestment in the heavy industry on the one hand and the difficulty of obtaining bank loans by vibrant and productive small firms on the other. This paradox has been recognized by the media and researchers, but how was this problem created in the first place?

Overinvestment in China's heavy industry would not have taken place without active government policy. Since the late 1990s, the government has been actively promoting the heavy industry as part of its strategic plan. Encouraged by the central government's policy, local governments made implicit guarantees of long-term bank loans to the heavy industry. The easy access to long-term loans distorted business finance and crowded out short-term loans needed by vibrant and productive small firms (Chang et al. 2016), as shown in Figure 2. Indeed, long-term and short-term loans are negatively correlated (–0.4), in sharp contrast to the U.S. economy in which the correlation, over 0.6, is significantly positive. Such preferential policy was largely responsible for credit distortion of large versus small businesses and of productive versus unproductive firms.

FIGURE 2
Newly Originated Bank Loans
(as percent of GDP)
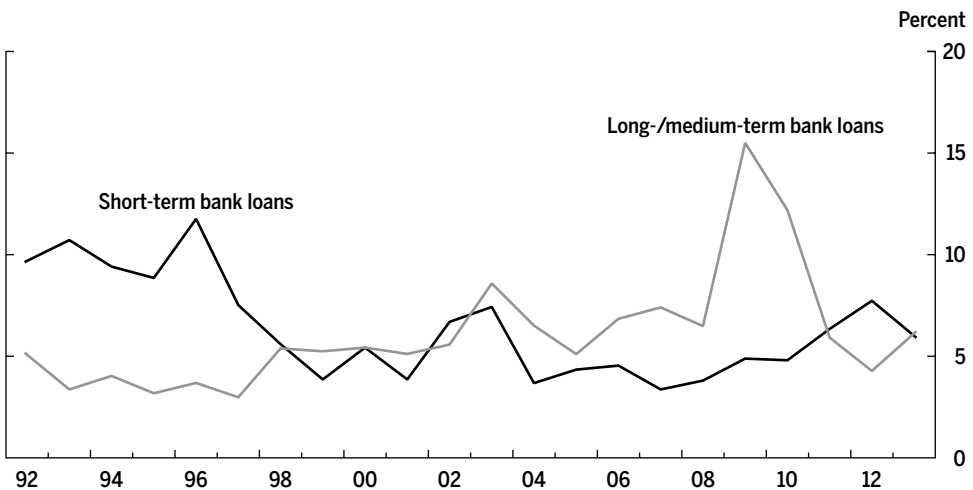
Sources: CEIC Data and the National Bureau of Statistics.

# Why Are Financial Reforms Crucial to Achieving Sustainable Growth in the Future?

The seeds of this distorted credit policy were sown in the latter part of the 1990s when the 8th National People's Congress passed a historic long-term plan in March 1996 to adjust the industrial structure over the next 15 years in favor of strengthening the heavy industry. This strategic plan, coupled with the preferential credit policy in favor of large firms, brought forth the success of China's past growth. Ironically, the same financial arrangement turned out to be the thin edge of a wedge driven into the heart of the problem faced by China in the future: the sustainability of past growth. This problem has alarmed Chinese policymakers. The 18th National People's Congress in 2012 explicitly expressed concerns about low consumption and income growth in China.

Moreover, the preferential credit policy has begotten the debt problem faced by China's large corporations and local governments alike. Concurrently, the rapid rise of shadow banking, especially entrusted loans, may have created a serious problem for China down the road (Figure 3). (Total shadow bank lending is the sum of entrusted loans, trusted loans, and bank acceptances.) Financial reforms dealing simultaneously with distorted loan policies, shadow
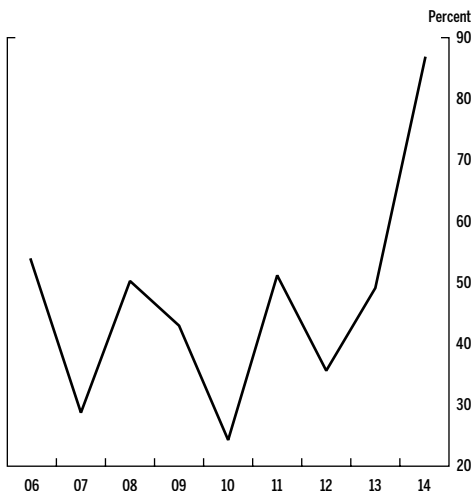

FIGURE 3
China's Shadow Banking Sector with All Series Being Newly Originated Credits

A Entrusted Loans as Percent of Total Social Financing Net of Stocks and Bonds
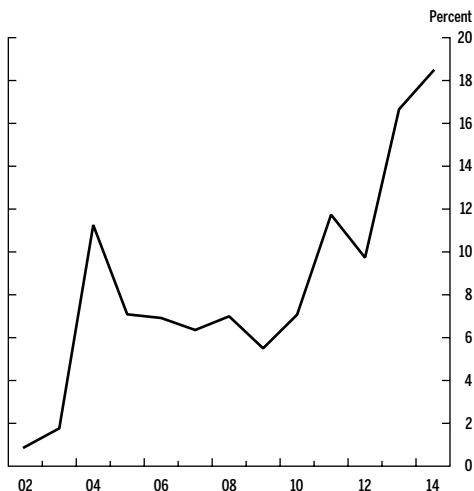
B Entrusted Loans as Percent of Total Shadow Bank Lending

Sources: CEIC and Wind Information Co., Ltd.

banking practices, and local government debts seem more important than ever to ensure the sustainability of China's growth. The State Council, on June 11, 2015, issued policy guidelines on firm dynamism, so-called massive entrepreneurships and innovations in modern China. In these guidelines, the Council made clear that financial reforms were crucial to reduction of capital misallocation and other resource misallocations to garner productivity gains.

Conclusion

In a nutshell, China's imbalances brought forth by past dazzling growth may have had more to do with deliberate macroeconomic and credit policies than improvements in productivity. With proper financial reforms to correct the imbalance and effectively cool overinvestment in the heavy industry, the pains of reducing GDP growth in the short run are perhaps necessary to achieve a sustainable and balanced growth path in the long run.

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GENERAL DISCUSSION
Policy Perspectives from the Bottom Up: What Do Firm-Level Data Tell Us China Needs to Do?

Chair: Mark Spiegel

Mr. Spiegel: Let's take questions from the floor.

Mr. Hahm: I think it's a good sign that new firms with relatively high productivity are growing in China. But it seems unlikely that world aggregate demand will recover enough to resolve China's problem of overcapacity in many sectors, especially in manufacturing, where China invested heavily after the global financial crisis. Given the limited financial resources available to support the transition toward a more consumption- and service-oriented economy, I think that corporate restructuring of China's large manufacturing sector is very critical. So, do you see any progress in corporate restructuring, and is there any improvement in credit allocation towards more productive firms?

Mr. Wei: I have two questions for Loren. The first is about the measurement of total factor productivity (TFP) growth. Is it a revenue-based measure or a quantity-based measure? I suspect it's a revenue-based measure. One of the issues is that if firms' monopoly position strengthens, it might show up as TFP growth rather than as a change in markups. My second question is about the finding that TFP growth tends to be faster in sectors with fewer state-owned enterprises (SOEs). Sounds right, and I'd like to believe it is right, but I was wondering, with input/output linkages, how much does the success in a particular sector depend on other sectors? So the question is whether you can exclude the possibility that the success of the non-SOE sectors depends, in part, on the fact that the SOE-dominated sectors provide the necessary inputs. That is, they help the non-SOE sectors to be successful, to have high TFP growth.

Mr. Spiegel: Do you want to take those questions now?

Mr. Brandt: On the TFP estimates, the most recent TFP estimates are very similar to the De Loecker–Warzynski type estimates that are in their *American Economic Review* (*AER*) 2012 paper. These are revenue based and use

sector-level deflators, and under some identification restrictions we can sort out what's going on with the markup as well as TFP. A recent paper with co-authors has analyzed the impact of China's tariff liberalization on both TFP and markups.

SOEs are more likely to be involved in infrastructure and upstream-type sectors. These linkages can be extremely important, and the key question is: Can other firms provide these services and inputs more productively? My gut take on this is that they can. SOE domination appears to have increased in upstream sectors. The private firms entering these sectors also tend to serve the lower end of the market. Why aren't these firms moving into the middle, more demanding segments of the market? Well, one reason is it takes enormous amounts of investment in R&D, capital, and human resources. When these firms look at opportunities to expand, they're worried that these huge investments may not pay off, because they see a market highly skewed in favor of SOEs. This is an issue in segments of the power sector. In the case of wind power, for example, power-generating companies often own the wind turbine companies and also own the wind farms. It is an increasingly highly vertically integrated industry.

Currently, I'm actually rather pessimistic, because what I see in industry after industry, especially with respect to the SOEs, is a very top-down industrial management strategy. There are two recent cases, one of which was announced yesterday, where they've decided to merge the two largest ship-building companies. It's the same thing that they did with the two largest manufacturers of railroad equipment. Any time that there is a top-down strategy to encourage this kind of consolidation in the industry, predictable behavior by firms at the bottom follows. If I happen to be a local or provincial SOE or I'm a provincial party secretary, I'm going to try to consolidate firms that are under my control and expand in order to avoid being acquired. We don't have good enough data to formally estimate the impact of corporate restructuring and consolidation on productivity, but I'm hoping that in some new work that we're doing we'll be able to look at how SOEs and their structures are changing over time—for example, through mergers and acquisitions activity—and see if it's having any impact on how these firms are performing. My view of the restructuring now occurring at the sector level—the increasing vertical integration by many of these SOEs— is that it's not a recipe for dynamism but rather a recipe for continued low productivity growth.

Mr. Spiegel: Okay, I have two questions here.

Mr. Liew: The Chinese government has talked about a new normal growth rate of 6 to 7 percent. My question is, with labor force growing at about zero, with productivity growth low, and with trade growth slowing down, how can this growth target be achieved? And if it cannot be achieved, what kind of reforms can generate higher productivity growth? I'm wondering whether China might be in for a period of much slower GDP growth than is expected.

Mr. Warjiyo: Chinese firms are doing more foreign direct investment in Southeast Asia. My question is, are they are able to compete with Japan and South Korea competitors and what is the implication for the regional pattern of production?

Mr. Brandt: Let me work backwards. I think that there are many sectors where Chinese firms are competitive, although they're still not able to compete at the highest end of the market. They are not going to be competing with the Japanese, they may not even be competing with the Koreans, but if you take a look at firms in power generation, heavy construction, and machine tools, what you find is that there are very good Chinese firms that are competitive in what I would call middle market segments. I think that in these markets Chinese firms have positioned themselves extremely well, and so when you talk to multinationals, their concern is about the ability that these Chinese firms have developed to be able to compete in emerging markets. In some sense the success that Chinese firms have had in their own market when competing with multinationals has put them in a relatively good position to be able to be competitive in emerging markets.

But the other thing you also see that worries me is how China is trying to deal with problems of excess capacity. Excess capacity is a problem that has been recurring for 30 years, which tells us something about both the nature of the incentives and the access to finance in these sectors. You often have a combination of state-connected firms expanding but also very dynamic private firms that are entering those sectors because of increasing market demand. So, it's a problem of excess capacity, but at the same time some of the most dynamic firms in those sectors aren't growing as rapidly as they could. They see market opportunities and want to expand rapidly. But they are not the problem. The problem is those larger state-connected firms that have access to finance and that are expanding relatively rapidly.

In response to the question that was raised about China's projected growth rate, it's difficult to gauge what growth rate China will be able to achieve. If you compare productivity levels in China with the United States and Europe,

productivity is only about 40 percent. What that means is that there is still an enormous amount of room to improve productivity through a variety of means. It's also clear that one thing contributing to the lower productivity in China is the enormous dispersion in productivity levels across firms. So, I think there is still much room for productivity growth across firms and across sectors.

If you're familiar with the work of Chang-Tai Hsieh and Peter Klenow, you know that there's an enormous inefficiency in allocation of resources within sectors. Chang-Tai and Pete's work suggests that if you eliminate the inefficiencies within sectors in China to the levels in the United States, you can improve productivity by 40 percent. So, within sectors, as well as across sectors, I think there's still an enormous amount of room for productivity growth. In addition, if you look at the capital-output ratio in China, it's still only 30 to 40 percent of that in the United States. Although the returns to investment are going to depend a lot on productivity growth, there is still much room for growth through capital deepening. There's a side to me that says 6 percent growth in China is certainly reasonable if growing domestic demand is accompanied by the kinds of reforms that we've been talking about at both the macro and micro level to provide the right kinds of incentives for investment on the supply side. As David talked about, demand and supply need to be in balance for China to maintain a high rate of growth.

Mr. Hoshi: This is a very interesting paper, and I have one question and one suggestion. The question is whether you find that sectors dominated by SOEs tend to have low productivity growth and negative entry effects, and I'm wondering which way the causality goes. One possibility is that some sectors are dominated by SOEs for some reason, like entry barriers or maybe distorted credit policy that Tao mentioned, and that those sectors do not have a high productivity growth, so a negative productivity growth. But the other possibility is that some sectors have low productivity growth for some technological reason, and private sectors do not find it attractive to enter those sectors that the SOEs continue to dominate. I'd like to have your view on that. My suggestion is to decompose the extent of entry into each sector further into entries by SOEs and non-SOEs separately. I think that this type of exercise would be informative.

Mr. Brandt: We have, in fact, done that. I don't present the results in the paper at this conference, but we did decompose on every margin between SOEs and firms, and what you see in these SOE-dominated sectors is that not only are the SOEs bad, but so are the private firms. And that tells us something about the nature of the entry process into those sectors, because these are often sectors, if you look at their profitability figures, where there are rents or profits to be

made. Firms want to enter these sectors, but the regulatory process through which firms are allowed permission to enter these sectors is highly politicized. David talked about autos. I think the auto sector is a good case of how regulations affect activity. Since you need a license if you want to expand capacity, you either have to buy capacity from some firm that's long since bankrupt or you need to get the National Development and Reform Commission to give you permission to expand your capacity. So, what I would say is that in many of these sectors everything is highly politicized, and though private firms may be entering, they're not necessarily good private firms.

One sector that I've spent a lot of time looking at is heavy construction equipment. This, in part, reflects my Peoria, Illinois roots. Peoria is home to Caterpillar. This is an industry where Chinese firms have done remarkably well. It's a sector where, back in 1990–92, tariffs on heavy construction equipment were 17 percent. By comparison, tariffs on autos were somewhere on the order of 80 percent. It's a sector where all kinds of technology transfers were allowed through licensing, joint ventures, and fully owned subsidiaries. It's a sector where very early on private firms were allowed to enter. It's a sector where much of the demand came from private Chinese construction companies. Twenty or thirty years ago the market was highly segmented, with Chinese firms operating mainly at the low end, making wheel loaders. Today, Chinese firms have moved more up market, making about half of the excavators. They're competing with Komatsu, with Caterpillar, with Volvo, with Hyundai, and they're doing extremely well. Contrast that with what we see in the auto sector. Chinese domestic automobile companies have had enormous difficulty over the last twelve years, particularly in the last three or four years when their market share has declined enormously. A lot of them can't compete in the domestic market and are now trying to export. I think you raise a good question about the direction of the causality, but I think it's also a matter of time. If you take a look at the success of firms in Japan and Korea, we're talking 15–20 years of investment by firms in those sectors to be able to compete in various market segments. There's no reason for us to expect anything less in the case of China.

Mr. Choi: I have a question about the relationship between exchange rate appreciation and how this affects China's service sector. As we have heard from Professor Prasad's presentation, the yuan has appreciated more than 35 percent against the dollar since 2005. This is quite substantive. With the service sector in terms of GDP over 50 percent, it is very important to consider the effects of changes in the terms of trade and the relative price between tradables

and non-tradables, such as services. While appreciation hurts the competitiveness of the manufacturing sector, my question is, what is the implication for employment and wages?

Mr. Brandt: That question is way out of my element. I have two guys who are sitting on my left who might be in a much better position to answer.

Mr. Spiegel: Yes, I was going to ask if the discussants had any closing remarks.

Mr. Dollar: In addition to the big real exchange rate appreciation of the yuan that Eswar (Prasad) showed, right now service-sector prices in China are rising at a healthy rate, maybe 3 percent per year, while industry prices are deflating at 6 percent per year. So, you're getting a very, very serious internal terms-of-trade change. In terms of employment, they report that employment generation is very good, with roughly 7 million urban jobs generated in the first half of the year. While the level of the labor force may have peaked, there's still quite a bit of potential for rural migration, which would be the main source of urban employment growth. Since the service sector is much more labor intensive, it looks like China has a virtual circle where the labor market tightens, wages go up, consumption rises, and people mostly spend their money on services, and those service sectors are more labor intensive. So the question is, can they keep this dynamic going while the bleeding of the industrial sector continues?

Mr. Spiegel: I think we have a break now, and we're going to start again with our policy panel at 3:45 sharp, so please join me in thanking Loren and the discussants of his paper.

POLICYMAKER PANEL

Monetary Policies in a Diverging Global Economy: Japan, the United States, and the Asia-Pacific Region*

Sayuri Shirai

Introduction

Thank you very much for inviting me as a panelist to the discussion on monetary policy at the 2015 Asia Economic Policy Conference organized by the Federal Reserve Bank of San Francisco. My presentation today will highlight two topics. First, as one of the policymakers at the Bank of Japan (BOJ), I would like to talk about Japan's price developments and monetary policy by making a comparison with the case of the United States. I will then focus on the Asia-Pacific region by summarizing the recent features of price developments and its challenges related to monetary policy, covering nine countries (Australia, China, Indonesia, Malaysia, New Zealand, the Philippines, Singapore, South Korea, and Thailand). Let me stress that the views expressed here are entirely my own and do not necessarily represent those of the BOJ.

Japan's Price Developments and Monetary Policy: Comparison with the United States

As you may know, the BOJ adopted a 2 percent price stability target in January 2013, followed by the implementation of *quantitative and qualitative monetary easing* (QQE) the following April. Partly reflecting the impact of QQE, the year-on-year rate of change in the headline consumer price index (CPI) turned positive in June 2013. It then achieved 1.6 percent in December 2013 and March 2014—the highest rate of inflation since the introduction of QQE after excluding the direct impact of the consumption tax hike. From the end of 2014, however, the rate of change in the CPI began to decelerate and since July 2015 has been sitting at around 0 percent, mainly due to drops in crude oil prices and

other commodity prices. The sluggish performance of headline price indices is also commonly observed in many other countries. Here, I would like to highlight the features of Japan's price developments in comparison with those of the United States.

Headline and Core Price Index Deviations from 2 Percent Inflation

As the first feature, the year-on-year rate of change in the price index excluding energy has been higher than that in the headline price index both in Japan and the United States. In the case of Japan, not only has the rate of change in the headline CPI been recently hovering around 0 percent, but also that of the core CPI (defined as all items less fresh food). However, the CPI (excluding fresh food and energy) has risen to 1.2 percent (Chart 1). Similarly, in the United States, the rate of change in the headline personal consumption expenditures (PCE) deflator has recently been more or less flat, at around 0 percent year-on-year, but that in the core PCE deflator (defined as all items less food and energy) has been around 1.3 percent. The rates of change in the CPI and PCE deflator have been substantially below the 2 percent target (or the longer-run goal) in the two countries. However, looking ahead, the rates of change in the price indices will likely accelerate as the effect of the crude oil price drop wanes in the near future—provided that crude oil prices will at least remain unchanged or begin to rise moderately.
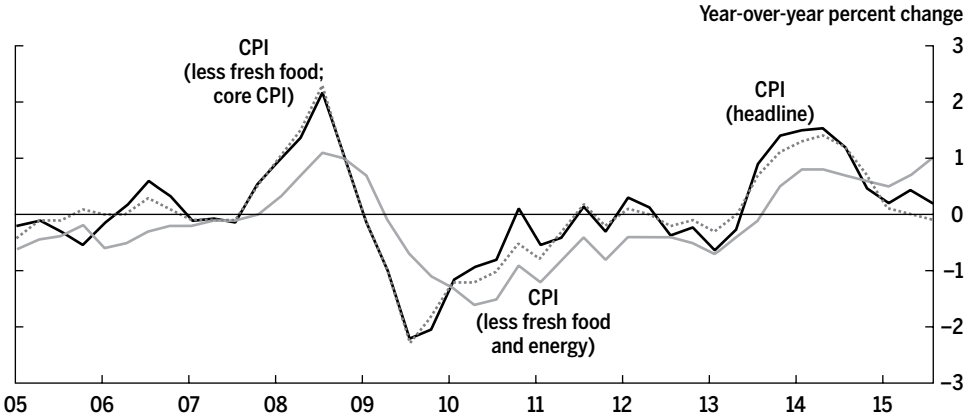
Against this backdrop, it is taking longer than initially projected for the BOJ and the Federal Reserve to achieve 2 percent inflation. In particular, for the Federal Reserve, such a prolonged underperformance of prices has not been experienced in recent years, given that inflation in the decade prior to the sharp drop in oil prices in October 2014 averaged around 2 percent, even including the period of the global financial crisis. One encouraging development in the United States is that economists' and market-based long-term inflation expectations currently remain stable, at near 2 percent, which indicates that the recent sluggish price performance is projected to be temporary and will eventually converge to about 2 percent. Meanwhile, Japan's corresponding long-term inflation expectations rose rapidly in 2013, but have since generally remained more or less flat at a little over 1 percent and distant from the 2 percent target (Chart 2). *This suggests a need to generate a further increase in inflation expectations in Japan with a view to achieving a steady inflation rate of around 2 percent.*

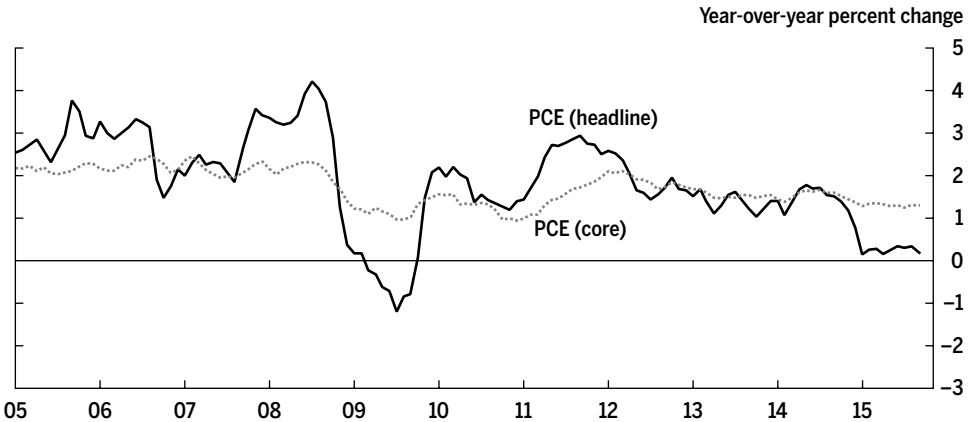## Labor Market Approaching Full Employment with Sluggish Wage Growth

Regarding the second feature, both Japan and the United States continue to enjoy a sustained recovery in employment. As a result, the rate of unemployment has

CHART 1
Japan and the United States: Price Developments

A Japan

Year-over-year percent change

CPI
(less fresh food;
core CPI)

CPI
(headline)

CPI
(less fresh food
and energy)

05 06 07 08 09 10 11 12 13 14 15

B United States

Year-over-year percent change

PCE (headline)

PCE (core)

05 06 07 08 09 10 11 12 13 14 15

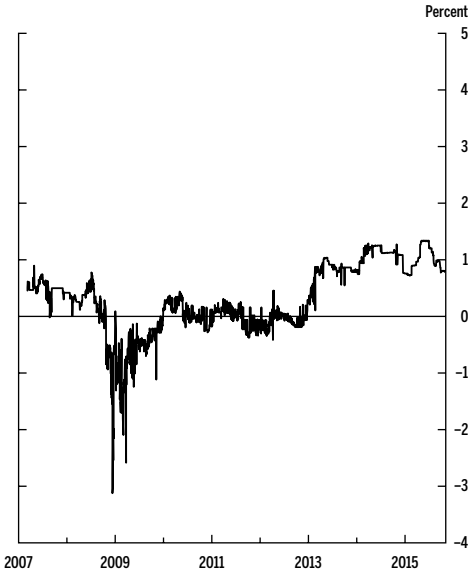**Sources:** Ministry of Internal Affairs and Communications; Bank of Japan; U.S. Bureau of Economic Analysis.
Note: Figures for Japan exclude the direct effects of the consumption tax hike after April 2014.

reached around 3.0–3.5 percent in Japan and 5 percent in the United States—approaching the structural rate of unemployment (longer-run normal rate of unemployment for the United States). Considering the favorable pace of job creation, however, the rate of wage growth appears to be limited in both countries.

Let me elaborate on this point. In Japan, the number of job applicants exhibits a declining trend due to a decline in the working age population. A growing number of firms report a persistent labor shortage, and thus economic opportunities appear to be constrained at some firms in labor-intensive industries. Firms enjoy historically high profits, but so far those profits have not

CHART 2
Japan and the United States: Long-Term Inflation Expectations
(implied five-year forward rate, five years ahead)

A Japan: Inflation Swap Rate   **B United States: Inflation Swap Rate**
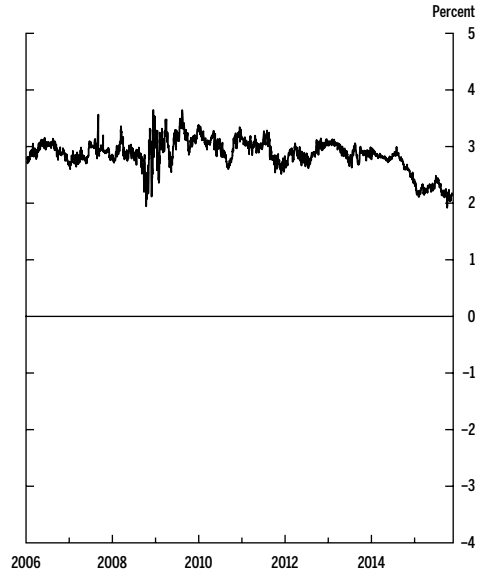
Sources: Ministry of Internal Affairs and Communications; Bloomberg.

generated sufficiently high wage growth. The mediocre wage growth reflects a *shift effect*—or a rising share of part-time (mostly voluntary part-time) workers in total employment—caused mainly by the increased labor market participation of older adults and housewives, as well as by firms' high demand for flexible low-cost part-time workers. The rate of change in per worker wages turned positive from fiscal 2014 onward, but presently remains roughly at around 0.5 percent (or slightly below 1 percent on an hourly basis). To achieve the 2 percent price stability target, it is clear that wages must further increase. To do so, firms must review their business strategies fostered during the persistently stagnant wage environment, and improve labor productivity. Meanwhile, in the United States, there are still some discouraged workers and involuntary part-time workers. Partially because of this slack and moderate labor productivity growth, the hourly rate of wage growth remains at 2–2.5 percent, which is about half of the level prior to the global financial crisis.

Moreover, the output gap, a broader concept of the economic slack, reports a demand shortage of about negative 1.5 percent in 2015 in both countries, according to International Monetary Fund (IMF) estimates. The slack is

larger than the one based on the unemployment rate, suggesting extra room for further improvement in the labor force participation rate and the capital stock utilization rate. That said, it is becoming increasingly difficult across countries to estimate the output gap partly due to the declining trend in potential GDP after the global financial crisis—leading to widely dispersed output gap estimates. For example, the BOJ's estimate on the output gap for the recent April–June period is negative 0.7 percent and is smaller than that of the Cabinet Office of negative 1.6 percent. This implies that the output gap estimates must be interpreted with wide margins. In any case, the trends indicate that both Japan and the United States have been achieving steady improvement in the employment and output gap, and thus their downward pressures on prices have weakened. Large swings in commodity prices and foreign exchange rates, however, have blurred the positive price effects driven by the domestic demand-supply balance.
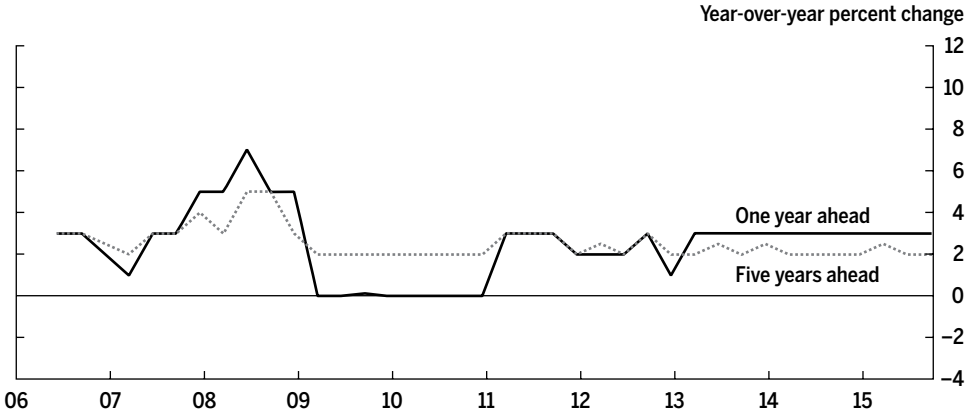
Households' Upward Bias in Inflation Expectations and Its Relation to Income

As the third feature, short- and long-term inflation expectations (median) have been fluctuating at around 2–3 percent in Japan and the United States (Chart 3). From the BOJ's Opinion Survey on the General Public's Views and Behavior and Michigan University's Surveys of Consumers, short-term inflation expectations—one year ahead in Japan and over the next year in the United States—have remained stable, at a similar level of around 3 percent over the past two years. Long-term inflation expectations—five years ahead in Japan and over the next five to ten years in the United States—have been stable for a longer period, at about 2 percent in Japan and around 3 percent in the United States. Furthermore, it is not widely known that households in Japan kept positive inflation expectations even when mild deflation prevailed from 2009 to mid-2013. *Similarly, Japanese households' present perceived inflation (defined as present perceived price changes relative to one year ago) has never turned into the negative territory over the same mild deflationary period (Chart 4).*
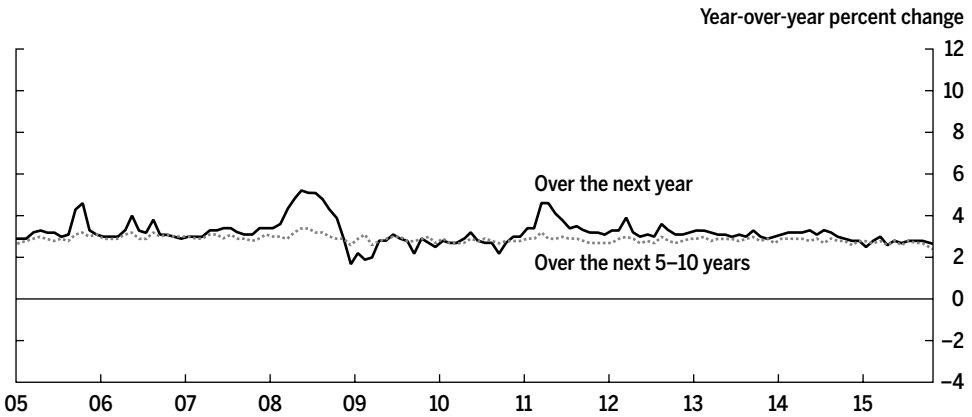
Another commonly observed trend that should be highlighted is that households' inflation expectations tend to be higher than the actual price developments captured in official price statistics in both countries—suggesting the presence of an upward bias in inflation expectations. This may reflect that households' responses in the survey are often affected by the recent price movements of everyday goods and services, such as food, daily necessities, and gasoline. However, there is a difference in the scale of upward bias; it appears to be generally greater in Japan than in the United States. Let me assume that a gap between the average rate of long-term inflation expectations and the average

CHART 3
Japan and the United States:
Households' Short- and Long-Term Inflation Expectations
(median)

A Japan

Year-over-year percent change

One year ahead

Five years ahead

B United States

Year-over-year percent change

Over the next year

Over the next 5–10 years

Sources: Bank of Japan; University of Michigan, "Surveys of Consumers."

rate of change in the headline price index roughly reflects an upward bias. The scale of the bias over about the decade before the sharp drop in oil prices in October 2014, averaged at around 2 percent in Japan and around 1 percent in the United States. This implies that the seemingly stable long-term inflation expectations of around 2 percent held by Japan's households may simply be a result of the upward bias, rather than representing their true inflation expectations. *Under the presence of such a bias, households in Japan may perceive that a rate of actual inflation is much higher than 2 percent in the process of*

CHART 4
Japan: Households' Present Perceived Inflation
(median)

Year-over-year percent change

Present perceived inflation
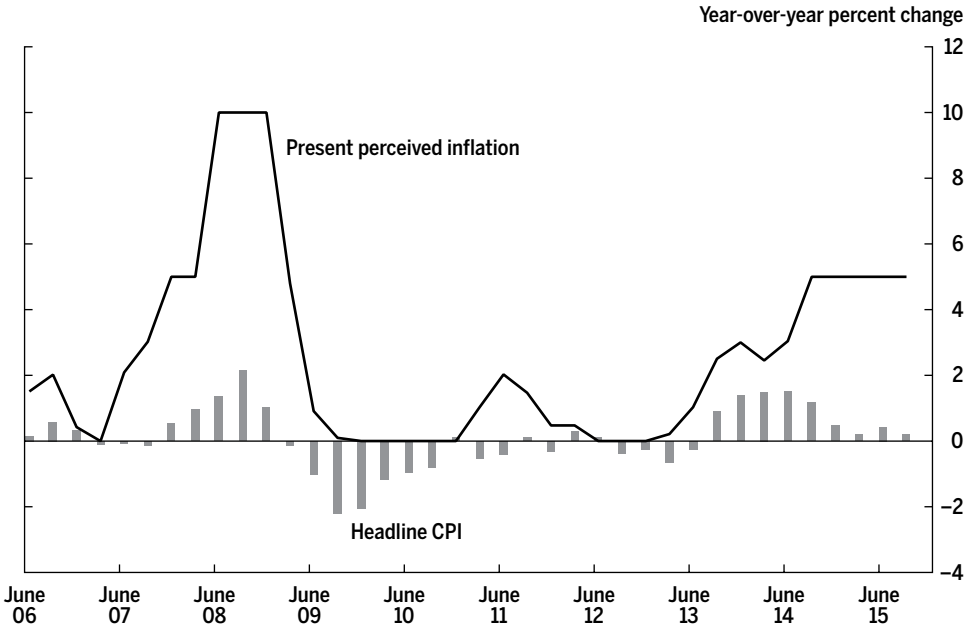
Headline CPI

Sources: Ministry of Internal Affairs and Communications; Bank of Japan.
Notes: Present perceived inflation is defined as present perceived price changes relative to one year ago. Figures for the headline CPI exclude the direct effects of the consumption tax hike after April 2014.

approaching the 2 percent price stability target, and regard such a price rise as unacceptable.

One factor contributing to Japan's larger upward bias may be a difference in future income prospects. To see this, a comparison can be made between the two countries by focusing on the diffusion index (DI) for expected income (one year ahead in Japan and over the next year in the United States)—calculated by subtracting the percentage share of households responding that prices will "decrease" from that of "increase." Japan's expected income DI always remains negative and currently records about negative 30 percent. This suggests that Japan's households always expect a decline in future income, leading to antici-pated tighter budgets as a sign of a strong defensive action, and resulting in a larger upward bias in their inflation expectations. *If so, it will be important for the BOJ to promote public understanding that its objective is to achieve a moderate price rise associated with a wage hike and a sustainable increase in household spending, to improve households' tolerance to price rises.*

In sharp contrast, the corresponding expected income DI in the United States always remains positive and has recently risen to around 40 percent (Chart 5). Moreover, in the United States, the year-on-year rate of change in (household) expected income over the next year (median) has started to improve since around 2013 and since early 2015 has risen to around 1.5 percent—after having dropped from around 2.5 percent before the global financial crisis to a low of around 0.5 percent in 2009–2012 (Chart 6). Let me also illustrate that the upward bias appears to be different across income groups in the United States, by comparing expected income growth over the next year

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CHART 5
Japan and the United States: Households' DIs on Income and Prices
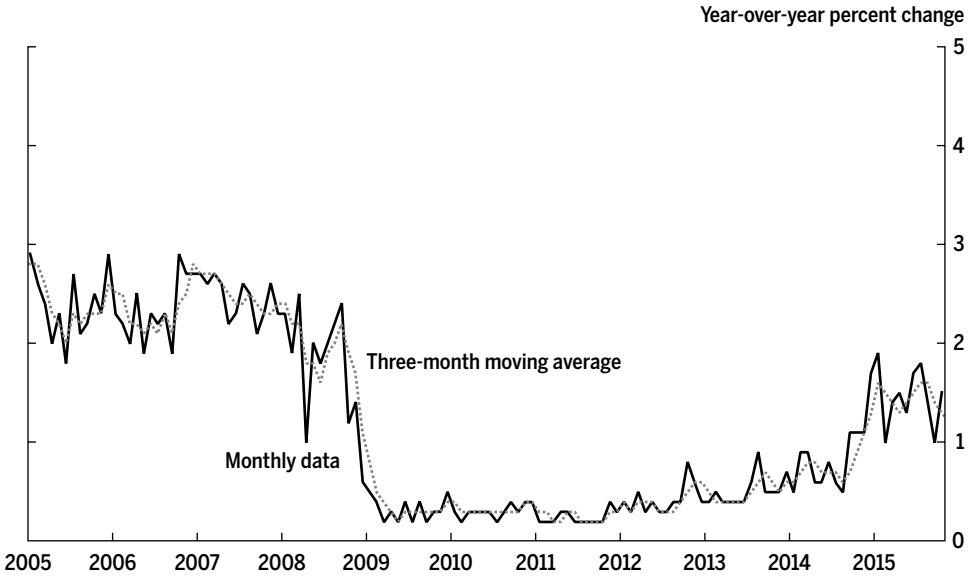
A Japan (One Year Ahead)
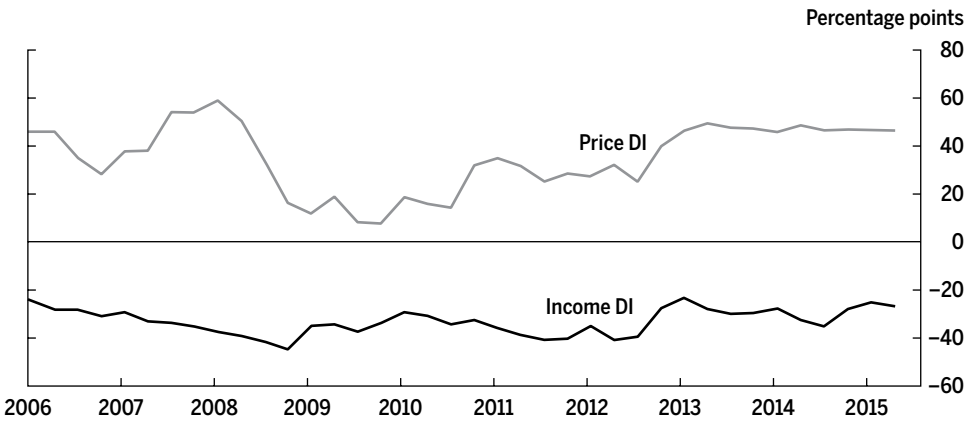
B United States (Over the Next Year)
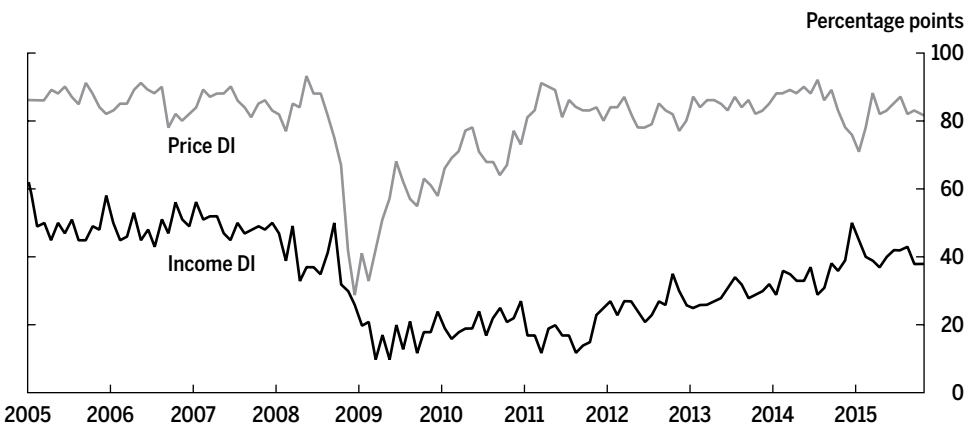
Sources: Bank of Japan; University of Michigan, "Surveys of Consumers."
Notes: Income DI = "expect increase" – "expect down." Price DI = "will go up" – "down."

CHART 6
United States: Households' Expected Changes in Income over the Next Year
(median)

Year-over-year percent change

[Chart showing United States households' expected changes in income over the next year from 2005 to 2015, with a y-axis ranging from 0 to 5. The chart includes two series: "Three-month moving average" and "Monthly data." Values start near 3 in 2005, decline sharply around 2009 to near 0.5, remain low through 2012, and rise to nearly 2 by 2015.]

Source: University of Michigan, "Surveys of Consumers."

and corresponding expected inflation by high- and low-income groups. Specifi-
cally, expected income growth for low-income (bottom third of the income dis-
tribution) households tends to be lower than that of high-income (top third of
the income distribution) ones, while inflation expectations of low-income house-
holds tend to exceed those of high-income ones. *This suggests that in the United
States there is a similar positive correlation between lower income prospects
and higher expected prices as in Japan.*

Next, we look at income prospects in real terms. We can do so by paying
attention to *expected price DI* (one year ahead in Japan and over the next year
in the United States) and corresponding *expected income DI*. Expected price
DI has always been positive in both countries with each currently recording
around 50 percent in Japan and over 80 percent in the United States. Moreover,
the expected price DI continues to exceed expected income DI in both coun-
tries (Chart 5). The comparison between Japan and the United States suggests
that a large number of households in Japan project a decline in real income,
as many households expect lower incomes and more expect higher prices. In
the United States, households are less likely to perceive tighter budgets than
in Japan because households expect a rise in nominal income, although many

households probably project lower real income. In fact, *the probability expectations on real income gains over the next five years*—available from the U.S. survey—have risen from 2013 onward and have now fully recovered to the level before the global financial crisis of around 40 percent, having dropped temporarily to a low of around 30 percent after the crisis. *These data support the view that U.S. households' recent income conditions are relatively favorable both in nominal and real terms.*

Japan's Mild Deflationary Experience and Monetary Policy

Based on the aforementioned observations, I will now summarize my views on Japan's mild deflationary experience and the effectiveness of QQE. Japan's deflationary experience could be characterized with the following two features.

First, the expression the "prevalence of deflation-oriented mindsets" seems to have been very applicable to the state of the corporate sector. It refers to firms' deflationary expectations and associated cautious price-setting behavior. As for the household sector, on the contrary, they tended to form high inflation expectations reflecting long-standing stagnant income growth and anticipated tighter budgets. As a result, whenever the households' *present perceived inflation* rose, their *tolerance to price rises dropped*, fostering a negative correlation between them (Chart 7). Based on this perception, firms appear to have found it difficult to raise sales prices, contributing to a wide spread of discount-based marketing strategies.

Since the introduction of QQE, firms' price-setting behavior has been gradually changing—some firms have raised their sales prices by providing innovative goods and services that stimulate potential demand, and maintaining sales volumes. Nevertheless, many households continue to perceive that current prices are much higher than the official price statistics and expect a rise in prices. This could be one reason why many firms still generally maintain cautious price-setting behavior. Indeed, this seems to be reflected in the recent developments in firms' *sales price expectation DI* for three months ahead in the BOJ Tankan (Short-Term Economic Survey of Enterprises in Japan), which has shown significant improvement from the low level in 2013 but currently hovers around 0 percent. In addition, *the average inflation outlook on sales prices* for one year ahead (relative to the current level) dropped moderately to somewhat below 1 percent year-on-year. In detail, looking at the percentage share of the number of respondents, 60 percent of firms answered "around 0 percent," reaching about 80 percent if those that answered "will decline" and "don't know" are included. *Looking ahead, favorable corporate profits and an*

Japan: DIs on Households' Tolerance to Price Rises and Present Perceived Inflation

Percentage points   Percentage points
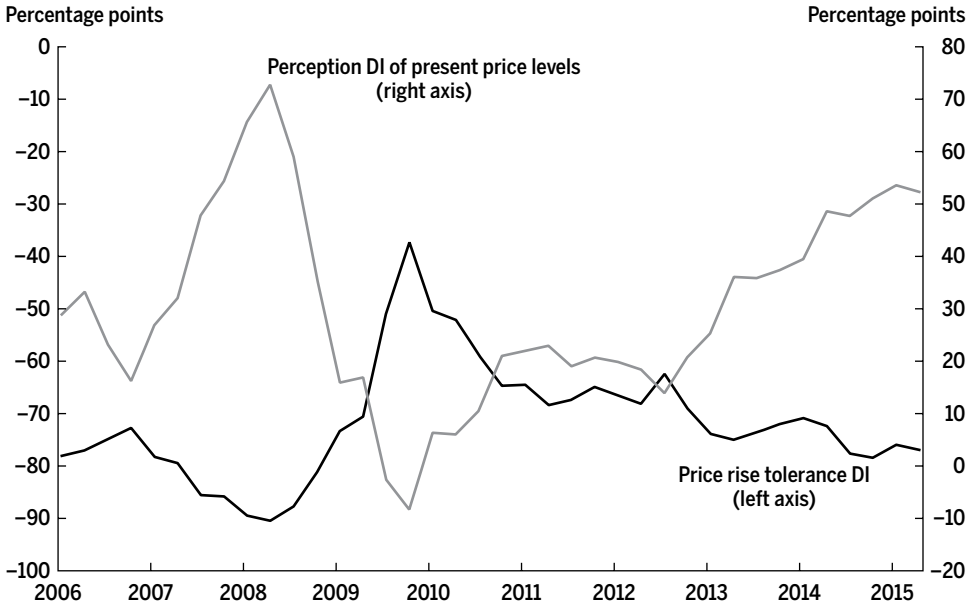
Sources: Ministry of Internal Affairs and Communications; Bank of Japan.

Notes: Price rise tolerance DI = ("price rise is rather favorable" and "price decline is rather unfavorable" respondent ratio – "price rise is rather unfavorable" and "price decline is rather favorable" respondent ratio)/(valid respondent ratio – "have remained almost unchanged" respondent ratio). Perception DI of present price levels = ("have gone up significantly" × 1 + "have gone up slightly" × 0.5) – ("have gone down slightly" × 0.5 + "have gone down significantly" × 1).

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increase in wage growth, if sustained, may improve households' tolerance to price rises, thereby helping to correct households' upward bias. Once that happens, firms may be gradually more willing to change their cautious price-setting behavior.

Against this backdrop, I feel that a policy to raise average inflation is relatively more challenging than to lower inflation. On this front, a lesson can be learned from the U.S. experiences of an anti-inflationary policy through bold monetary tightening adopted by then Federal Reserve Chairman Paul Volcker in the late 1970s to the early 1980s. At that time, until around 1983 economic recession caused a continuous decline in households' expected income DI over the next year. At the same time, however, both actual inflation and inflation expectations dropped sharply, and thus real income and its outlook improved instead and partially contributed to an improvement in consumption. For example, during that period, the aforementioned U.S. survey responses showed that

there was an increase in the share of households that considered low prices as a good reason to purchase durable goods and automobiles. In other words, while a tight monetary policy to reduce inflation in a sustainable manner could be accompanied by a serious challenge of potentially increasing unemployment, it may obtain more support from the public compared with the opposite inflationary policy—as it could bring about improvement in real income as long as a decline in inflation moves ahead of a decline in income growth. *Turning to Japan, wage growth per worker in real terms turned positive in July this year, but still remains at around 0.5 percent. To achieve around 2 percent inflation, a further improvement in real wage growth is necessary.*

Regarding the second feature of Japan's deflationary experience, a lack of healthy risk-taking practices should be mentioned. Households have accumulated their assets largely in the form of deposits. Assessing in real terms, they have benefitted from relatively high interest rates and an increase in value of outstanding deposits, owing to the zero lower bound on nominal interest rates and mild deflation. Setting aside whether households actually perceived this to be true, their risk-averse behavior has turned out to be rational. In the corporate sector, on the other hand, the expected returns on investment were so low that actions to improve profitability and to efficiently utilize their assets were limited. Meanwhile, financial institutions concentrated their assets on government bonds and their supply of risk money necessary to support startup firms and business was limited. Since the introduction of QQE, this situation has been gradually changing together with the government's economic policies. Households and financial institutions increasingly express interest in riskier assets and diversification of risks. Banks are more eager to extend credits with innovative financial services. The number of initial public offerings has increased and firms are more active in business investment, mergers and acquisitions, and organizational rationalization both domestically and globally. *It is important that the BOJ continue to support these positive developments by maintaining an accommodative monetary environment.*

Price Developments and Monetary Policy in the Asia-Pacific Region

Next, I would like to focus on the Asia-Pacific region, covering nine countries. Among these nine, six (Australia, Indonesia, New Zealand, the Philippines, South Korea, and Thailand) have officially adopted an *inflation-targeting framework* (Chart 8). Regarding the monetary policy frameworks of the region, I had an opportunity to speak in Singapore in July 2014.[1] Since then, economic and financial conditions have changed dramatically globally as well as in the region. Thus, today I will briefly review recent developments.

CHART 8
Inflation Targets and Definitions

	Inflation Target	Introduction Year	Reference Indicator	Numerical Value	Duration to Achieve the Target	Target Variability
United States	Longer-run goal	2012	Headline PCE	2%	Long term	Fixed
Euro Area	Definition of price stability	1998	Headline HICP	Below but close to 2%	Medium term	Fixed
Japan	Price stability target	2013	Headline CPI	2%	Medium to long term	Fixed
United Kingdom	Inflation target	1992	Headline CPI	2%	Reasonable time	Fixed
Australia	Inflation target	1993	Headline CPI	2–3%	Medium term	Fixed
New Zealand	Inflation target	1988	Headline CPI	1–3% (with a focus on 2% target midpoint)	Medium term	Fixed
South Korea	Inflation target	1998	Headline CPI	2.5–3.5% for 2013–15	Pre-fixed term	Adjusted every few years
Indonesia	Inflation target	2000	Headline CPI	4.5% ± 1% for 2012–14 and 4% ± 1% for 2015	Pre-fixed term	Adjusted every few years
Thailand	Inflation target	2000	Headline CPI	2.5% ± 1.5%	Annual	Adjusted annually
Philippines	Inflation target	2002	Headline CPI	3% ± 1% for 2015–16 and 3% ± 1% for 2017–18	Pre-fixed term	Adjusted every few years
China	Annual target	NA	Headline CPI	Around 3% for 2015	Annual	Adjusted annually

Source: Each central bank.

Growing Divergence in Monetary Policy in the Asia-Pacific Region

Since the East Asian economic crisis in the 1990s, central banks in the region have placed a greater emphasis on price stability than on exchange rate stability. Specifically, six central banks took the lead on this by adopting an inflation-targeting framework with a clear numerical inflation target. Under the framework, the realized inflation and inflation expectations of these six countries gradually showed a downward trend in line with their targets. The inflation-targeting framework in the region is more *flexible* than that in other inflation-targeting countries with the following features: (1) an adoption of an *inflation target range* rather than an *inflation target point*; (2) the acceptance of relatively large deviations from the inflation target; and (3) the use

of relatively *frequently reviewed* inflation targets—rather than *fixed* inflation targets—in South Korea, Indonesia, Thailand, and the Philippines. Inflation developments showed a tendency to converge, albeit with temporary deviations, to the long-term inflation expectation level, which has remained stable within target ranges. One difference observed between inflation-targeting countries and other countries until the first half of 2014 was that the policy interest rates were more frequently adjusted to actual price developments in the former.

I would like to highlight two new developments that have occurred since the second half of 2014. First, inflation in all six inflation-targeting countries has now deviated from the inflation target range. Among them, only in Indonesia has inflation been above the upper bound of the target range again since late 2014. This is due to a cut in the fuel subsidy in 2014 and a sharp depreciation of the rupiah. In contrast, inflation in the remaining five countries has been below the lower bound of the target range, mainly due to declining crude oil prices. Looking ahead, depending on future global economic and financial conditions, it may take some time for these six countries to achieve their respective inflation targets. *That said, as their long-term inflation expectations have remained more or less within the target range, inflation is projected to reach the target levels in the future.*

Second, since the adoption of their inflation-targeting frameworks, these countries have regarded short-term policy interest rates as their major operational tool for monetary policy and these policy rates tended to be frequently adjusted to price developments. Meanwhile, in China and Malaysia, the two non-inflation-targeting countries, such rates remained largely flat because they also used other tools including reserve requirements. *Since the second half of 2014, however, this differentiation no longer seems valid.* Namely, China has been lowering policy interest rates more flexibly in response to a declining trend in the inflation rate since November 2014—to contain an increase in real interest rates. Together with a cut in the reserve requirement, moreover, China has dealt with a shortage in market liquidity caused by a drop in foreign reserves by expanding the volume and frequency of funds-supplying operations (including term facilities). As a result, the annual growth rate of M2 has exceeded the annual target of 12 percent. Meanwhile, inflation in both Indonesia, an inflation-targeting country, and Malaysia, a non-inflation-targeting country, has risen significantly, mainly owing to a large depreciation of their currencies.[2] However, because their policy rates were barely adjusted perhaps in an attempt to avoid capital outflows, their inflation rates have been approaching their policy rates, leading to a recent decline in their real interest rates to nearly 0 percent.

The region has been subject to various domestic and external shocks rang-ing from commodity price drops, a reversal of capital inflows centered on secu-rities investment, a depreciation of currencies, a decline in trade with China, and unstable global financial markets. Depending on the type and extent of those shocks received, price developments in each country are diverse and are not necessarily consistent with the business cycle. This makes the direction of their monetary policy stances diverse. *While it is likely that these shocks will eventually fade away, until then the region's monetary policy conduct will remain divergent—regardless of whether a country has an inflation-targeting framework.*

Future Possible Direction of Monetary Policy Conduct and Challenges

To conclude, let me summarize the implications for monetary policy conduct in the Asia-Pacific region based on recent developments.

- In the region, a growing number of countries are conducting more flexi-ble exchange rate arrangements. This is confirmed by the fact exchange rates have become more volatile than before. One example is China, which has gradually enhanced the flexibility of exchange rate move-ments. As a result, the IMF concluded in the recent Article IV consulta-tion report that the renminbi is no longer undervalued. The report also recommended that China adopt a flexible exchange rate regime over the next two to three years.

- Nonetheless, a sharp depreciation of the exchange rate, while contrib-uting to improving international price competitiveness, may generate a further depreciation expectation and thereby accelerate capital outflows. This may amplify the risk of overshooting the exchange rate far beyond the equilibrium (depreciated) level, thus leading to the risk of a surge in domestic interest rates and economic recession. For this reason, the region could utilize the accumulated foreign reserves to mitigate abrupt exchange rate volatility. Depending on the type of shocks, the scale of changes in foreign exchange rates, and the size of foreign reserves, pol-icy responses vary widely across the region.

- In the case of drawing down foreign reserves, a country may need to deal with possible slower growth in the monetary base. To offset the resultant shortage in liquidity supply to the market, a central bank may find it necessary to expand funds-supplying operations to a greater extent than before. To enable smooth operations, monetary policy con-duct must be more centered toward a policy interest rate adjustment—

together with measures to foster collateral asset markets, to develop yield curves with long maturities and sufficient liquidity, and to promote the monetary policy transmission mechanism based on the policy interest rate.

• In this sense, this may be an opportunity for a country that once relied on liquidity supply through foreign reserve accumulation as a monetary easing tool to shift toward a more market-based monetary policy tool. Such a practice may promote convergence of monetary policies to ones that are more consistent with the flexible inflation-targeting framework within the region, regardless of whether a country has an inflation-targeting framework.

This concludes my presentation. Thank you very much for your attention.

REFERENCE

Shirai, Sayuri. 2014. "Recent Monetary Policy Trends in Advanced Economies and the Asia-Pacific Region." Keynote Address delivered at the National Asset-Liability Management Conference held in Singapore, July.

NOTES

1 See Shirai (2014).

2 In Malaysia, the inflation rate has also been affected by the introduction of the 6 percent Goods and Services Tax in April 2015.

Safeguarding Financial Stability in a Diverging Global Economy

Joon-Ho Hahm

I feel truly delighted and privileged to speak in the policy panel discussion at this renowned conference. In my remarks today I will start with a contextual preamble, by characterizing the current state of the global economy in comparison with previous episodes of U.S. interest rate hikes. I will then discuss the macroprudential policies introduced in Korea since the global financial crisis, and the potential risks and policy challenges that Korea now faces. Finally, I will conclude by considering the financial stability policy framework and the role of the central bank.

Upcoming Federal Reserve Rate Hike and EMEs: How Is This Time Different?

Compared with the three most recent episodes of U.S. interest rate hikes, in 1994, 1999, and 2004, the current state of emerging market economies (EMEs) appears quite different. First of all, in the past both advanced economies and EMEs were in the midst of business cycle upturns prior to the U.S. rate hikes, and the upward growth in EMEs actually accelerated after the hikes. However, the currently approaching U.S. rate hike is expected to occur during business cycle downturns in EMEs, and may thus lead to further divergences in growth between EMEs and advanced economies (see Figure 1A).

Second, not only is the amount of global liquidity that has flowed into EMEs much higher now, due to the unprecedented volume of quantitative easing, but the composition of capital inflows to EMEs has also changed noticeably. While banks were the main channel of cross-border capital flows in the past, it is now equity and bond portfolio investment that account for 65 percent of total capital inflows (see Figure 1B). And the sheer volume of portfolio investment flows has led to a stronger coupling of financial asset prices across EMEs and advanced economies, irrespective of their recent decoupling in terms of their business cycles. As one example, due to large cross-border bond investment flows, the correlation between long-term interest rates in the United States and EMEs has changed from –0.3 before the global crisis to +0.8 since the crisis.

Third, the expansion in global liquidity has led to a dramatic compression in credit risk and liquidity premiums on emerging market assets. Term premiums on long-term emerging market bonds have fallen to levels similar to those in the United States (see Figure 1C). This compression of risk premiums and cheap credit have brought about a significant rise in debt leverage in EMEs, in contrast to the case with advanced economies that have seen deleveraging since the crisis (see Figure 1D).

While the accommodative monetary policies in the euro zone and Japan may continue, and offset the capital outflows from EMEs to some extent, these features of the current situation suggest that the upcoming U.S. interest rate normalization could have larger than expected impacts on EMEs, if it is combined with other destabilizing factors such as the slowdown in the Chinese economy and a further decline in commodity prices. They also suggest that the financial markets and shadow banking could become important channels of crisis propagation this time. If the U.S. rate hike leads to a collapse in global risk appetite, credit and term premiums on emerging market assets could soar. And the resulting fire sales of global risky assets could precipitate crises in some EMEs, irrespective of their banking sector and external balance sheet soundness.

## Macroprudential Policies in Korea since the Global Financial Crisis

As emphasized in our paper presented at this conference four years ago (Hahm et al. 2012), for addressing financial imbalances preemptively in open EMEs macroprudential policy is more desirable than monetary policy. This is because financial cycles in open EMEs are often driven by global liquidity conditions, irrespective of the local economic situation. And monetary policy leaning against the credit cycle is often unavailable for EMEs, as tighter monetary policy would only attract additional capital inflows, further amplifying the credit cycle.

In the aftermath of the global financial crisis, Korea has introduced a variety of macroprudential policy tools to make its financial system more resilient and less procyclical. On the external front, Korea introduced a leverage cap on foreign exchange derivatives positions in 2010 and a macroprudential bank levy on noncore foreign currency bank liabilities in 2011, while reinstating taxation of foreigners' bond investment in 2011 as well, in efforts to ensure that capital inflows through banks and the bond markets do not lead to excessive procyclicality in our financial system. The macroprudential bank levy deserves special attention. As evidenced in Hahm, Shin, and Shin (2013) and in Bruno and Shin (2015), rapid accumulations of noncore bank liabilities signal vulnerabilities to systemic risk spillovers in EMEs, and fluctuations in banks' noncore liabilities are directly linked to cross-border capital flows. Therefore, as noncore foreign
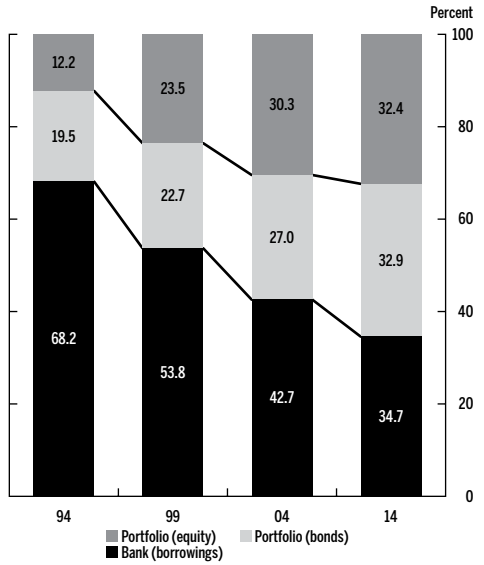
FIGURE 1

Growing Disconnect between Real Economy and Financial Cycle
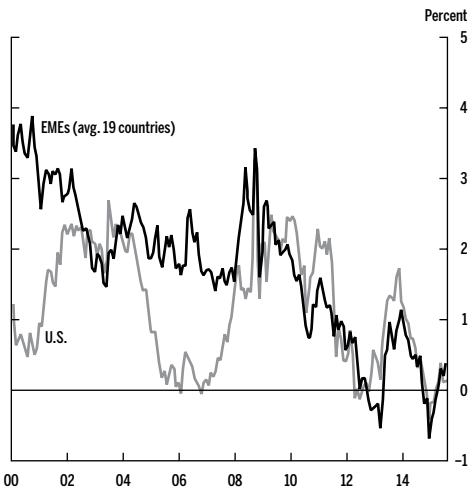
A GDP Growth Rates
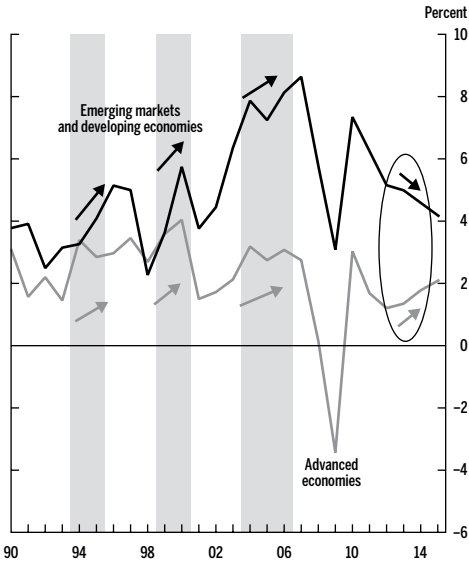
Source: International Monetary Fund (IMF).

Note: Shading indicates periods of interest rate hikes in the United States.

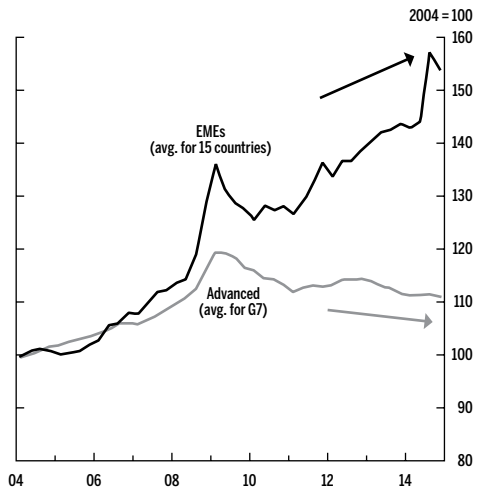**B Composition of Foreign Investment**

Source: IMF International Investment Position (IIP).

Note: Based on accessible country data from 19 emerging market countries, including Korea.

C Bond Term Premiums

Source: Bank of Korea.

Note: Based on 10-year government bonds.

D Private Credit/GDP

Sources: Bank for International Settlements (BIS), Bloomberg.

currency bank liabilities may lead to complicated interconnectedness among domestic and foreign banks, and their unwinding may cause significant negative externalities, their correction using appropriate macroprudential tools is totally legitimate.

On the internal front, in order to avoid credit and housing bubbles, Korea strengthened its loan-to-value (LTV) and debt service-to-income (DTI) regulations for home mortgage loans in 2009, while reinstating the loan-to-deposit ratio regulation in 2010.

Until now these diverse macroprudential policies seem to have helped to contain the buildup of financial imbalances. At this stage, it is estimated that the gap between Korea's credit cycle and its long-run trend is not large, and the banking sector's noncore liability and external debt structures are relatively sound (see Figure 2). It is also worth noting that our countercyclical macroprudential policies have provided the central bank with wider policy space to focus more on output and price stability.

## Potential Financial Vulnerabilities and Policy Challenges

Notwithstanding these preemptive efforts, in the run-up to U.S. interest rate normalization, the containment of potential financial instabilities has emerged as a crucial policy challenge in Korea. First of all, a rise in the U.S. policy rate could trigger outflows of short-term capital, giving rise thereby to significant negative externalities for our real economy. Secondly, the trend of increasing household debt has accelerated since last year, due to the temporary easing of the LTV and DTI regulations together with our reduced policy interest rate. Let me touch briefly now on these two potential risks to financial stability.

With regard to the capital outflow risk, foreign capital flows in Korea have remained stable despite the recent global financial turmoil, in line with the Korean economy's having been differentiated from other EMEs due to its relatively sound economic fundamentals and robust external balance. However, with the global shift in the composition of capital flows, the shares of stock and bond portfolio investment have increased rapidly in Korea as well, while bank borrowings have remained stable due partly to the macroprudential policies that I mentioned earlier (see Figure 3A).

If we look at the time-series properties of foreign capital flows in Korea, the volatility of foreign portfolio investment has been relatively high compared with those in advanced economies and other EMEs. The foreign capital flow volume has been affected not only by factors such as our interest rate differential and growth gap against advanced economies but also by purely exogenous global factors such as global credit growth and the VIX (volatility index) in the

FIGURE 2
Credit Cycles and Bank Liability Structure in Korea
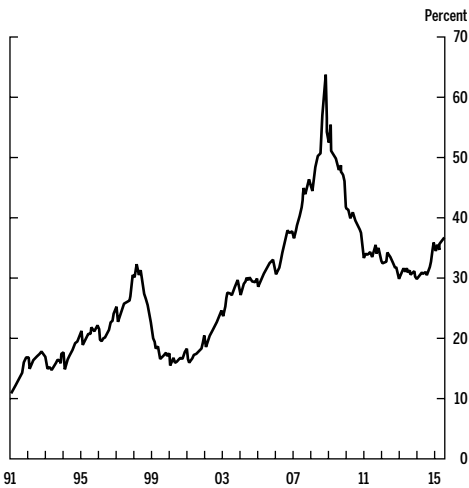
A Corporate Credit/GDP
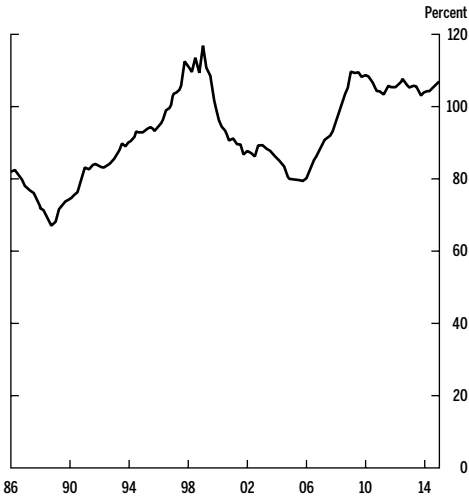
B Household Credit/GDP
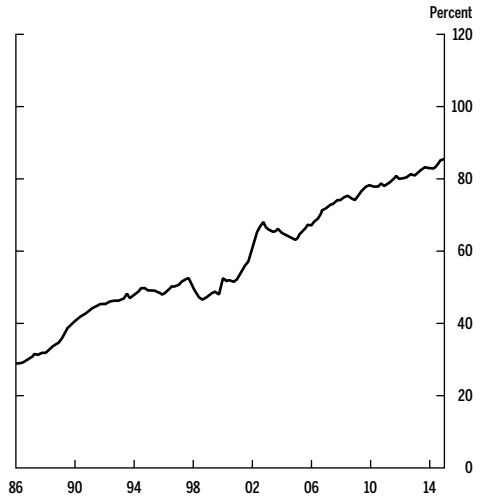
Sources: Bank of Korea, BIS.

C Bank Noncore Liabilities/GDP

D Bank Short-Term External Debt Ratio
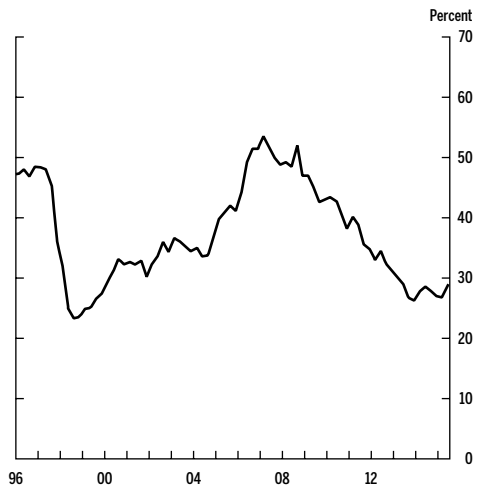
Source: Bank of Korea.

global financial markets. Further, the impact of foreign capital flows on domestic financial market volatilities—for example, of our stock prices and foreign exchange rates—has grown greatly in the post-global-crisis period.

Korea's financial and foreign exchange markets have become much more resilient recently, as demonstrated by the impulse responses of the won–dollar

exchange rate to a one-unit VIX shock, and this shows that effects are dissipating much faster in the post-crisis period (see Figure 3B). But given that Korea's financial mark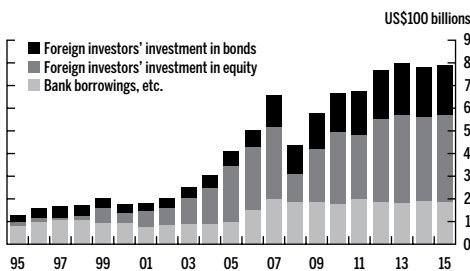et is quite open, that global institutional investors such as banks and mutual funds are responsible for a large share of portfolio investment flows there, and that these investors tend to reallocate their country portfolios from a global perspective, some possibility of capital outflows does exist despite our robust domestic economic fundamentals.

Next let me move on to the household debt issue. Korea's household debt-to-GDP ratio, including the debt of small household enterprises, reached 85 percent at the end of 2014, possibly approaching a threshold level beyond which it may constrain consumption spending. Cecchetti, Mohanty, and Zampolli (2011), for example, suggest this threshold level to be around 85 percent. Given this large volume of household debt, any future rise in interest rates could hamper private consumption through increases in households' debt service burdens, and debt defaults by vulnerable households could then undermine the lending banks' capital soundness. At this point the possibility of such systemic risk materializing is judged to be low. According to our stress-test results (Bank of Korea 2015), for instance, under a combined shock of a 200 basis point rise in interest rates and a 10 percent housing price decline, the proportion of households at risk would increase to 14.2 percent, from 10.3 percent at present, and the proportion of debt at risk to 32.3 percent, from 19.3 percent, which could be absorbed through the current buffers in bank capital.

FIGURE 3
Capital Inflows and Impact of Global Shocks

A Outstanding Balance of Foreign Financial Investment in Korea

US$100 billions

- Foreign investors' investment in bonds
- Foreign investors' investment in equity
- Bank borrowings, etc.

Source: Bank of Korea.
Note: Based on IIP, but 2015 based on figures at the end of the second quarter.

B Impulse Response of Won–U.S. Dollar Exchange Rate to VIX Shock

Won/dollar

2001 to 2007

2010 to 2014
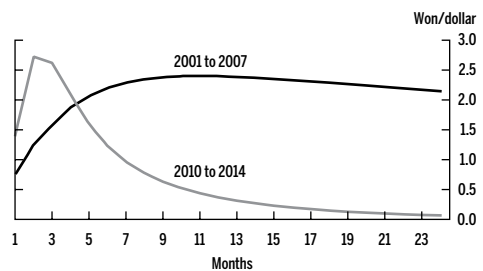
Months

Source: Bank of Korea.
Notes: Using the VAR model of the VIX, industrial production (rates of change), and the won–dollar exchange rate. Time lag is two months, and Cholesky decomposition is applied. The shock is a 1 point increase in the VIX.

Housing prices also do not seem so greatly overvalued in Korea. The increases in our price-to-income ratio and price-to-rent ratio have been modest compared with those in other OECD countries (see Figure 4), suggesting that the risk of rapid housing price adjustment may not be high in Korea. However, if the current trend of growth in household debt persists, then the upturns of our credit and housing cycles may bring about excessive disparities with the underlying fundamentals such as household income and debt service capacity. It is therefore imperative that we come up with preemptive countercyclical macroprudential measures now. And in this context, the supervisory authority recently announced policy measures to (1) improve the mortgage debt structure by accelerating the switch to fixed-rate and amortized loans, and (2) strengthen bank lending assessments of borrowers' repayment capacities.

Financial Stability Policy Framework and the Central Bank

As I have noted, the latent risk and potential effects associated with the upcoming U.S. interest rate hike could be large in EMEs, and Korea would not be exempt. In this context, the Bank of Korea has devoted persistent efforts to expanding its financial stability role. First, as a key participant in the macroprudential policy governance scheme, we conduct in-depth analyses and assessments of systemic risk, prepare the *Financial Stability Report*, and work hard to communicate with the public. We also conduct co-examinations of banks and participate in macroprudential councils with other government bodies.

In addition to our macroprudential policy-related roles, as the monetary policy authority we devote steady efforts to improving our monetary policy strategy framework so as to incorporate financial stability concerns when formulating optimal policies. While I believe that macroprudential policies must

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FIGURE 4
Housing Prices in Korea

A Price-to-Income Ratio

B Price-to-Rent Ratio
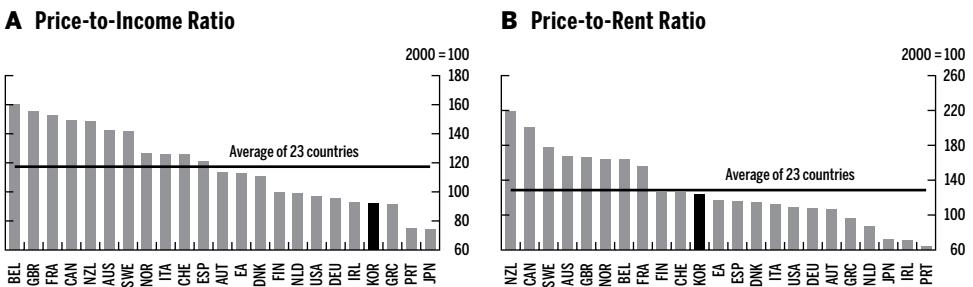
Source: OECD.
Note: As of end-2014.

be the first line of defense in open EMEs, there are reasons why these policies are not always sufficiently effective. Macroprudential supervision could, for example, be subject to more political pressures than monetary policy, since it has direct bearings on the business of financial institutions, and policy inaction bias could result. Further, accommodative monetary policies that do not consider financial stability concerns may lead to excessive risk taking. Low interest rates may, among other results, lead to excessive search for yield, expanded leverage through valuation effects, and lower risk premiums.

Various approaches can be used to consider financial stability risks in formulating monetary policy strategy. For instance, we need to consider the financial stability implications in setting our medium-term inflation target, which is currently revised every three years in Korea. And we can consider financial stability risks in setting the target path for output. One example here would be the finance-neutral potential GDP growth rate and output gap as suggested by Borio, Disyatat, and Juselius (2013). We could also use estimates of a real neutral interest rate that takes the financial cycle into consideration. However, when monetary policy is conducted with financial stability in mind, we will also need to be very cautious about any unintended consequences—for instance, the risk of its reducing inflation expectations through weakening public confidence in the central bank's commitment to inflation targeting.

Ultimately, it is essential to conduct our macroprudential and monetary policies in a harmonized and complementary manner. To achieve this we need an effective, operating macroprudential policy governance scheme, which guarantees timely information sharing and cooperation among the related institutions. In addition, in order to maintain our monetary policy independence and secure political neutrality in macroprudential policy, relevant institutional devices are needed within the policy framework. For instance, we need devices to enhance the transparency and accountability of the macroprudential policymaking scheme, and we also need to clearly define the central bank's role related to macroprudential policy. For open EMEs, in the end, the effective coordination of monetary and macroprudential policies will be the key to simultaneous achievement of the objectives of price stability, output stability, and financial stability.

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Indonesia: Global Spillover and Policy Response

Perry Warjiyo

Introduction

Since the global financial crisis, emerging economies have been subjected to a number of external shocks from global economic and financial market volatility. Global economic recovery has been slow and uneven, causing emerging economies to resort to domestic demand to compensate for declining exports in order to support growth. With declining global commodity prices, these external shocks to growth are even more challenging for commodity-exporting countries. Recently, economic slowdown in emerging economies, notably China, has become apparent and has spilled over to other countries, both emerging and advanced countries, thus putting further pressures on global economic recovery. The global spillovers to emerging countries have become even more challenging with increasing volatility in the global financial market emanating from global economic imbalances and divergences in monetary policy across countries. While other major advanced economies, including Europe and Japan, continue to adopt quantitative monetary easing, the U.S. Federal Reserve announced in mid-2013 its plan for a monetary normalization process, thus putting even higher risks of capital reversals and exchange rate pressures on emerging countries. The recent Chinese policy to further liberalize its foreign exchange system and the internationalization of the renminbi as a special drawing rights (SDR) reserve currency added another factor for increasing volatility in the global financial market.

These spillovers from global economic and financial market volatility have placed many emerging countries in a dilemma between maintaining macroeconomic and financial system stability and managing the negative impacts to economic growth. Designing policy response to mitigate these complex global spillovers is challenging both in terms of policy instruments and in terms of optimal configuration. From a central bank's perspective, the challenge is to maintain its independence in setting an interest rate policy for domestic price stability and supporting economic growth, while taking into account the

pressures from exchange rate and capital flow volatility. While exchange rate flexibility is an external shock absorber, market irrationality may require foreign exchange intervention and some forms of capital flow management to avert excessive exchange rate volatility. Macroprudential measures have also been implemented in many emerging countries to safeguard the financial system stability from these external shocks and to strengthen the effectiveness of monetary policy. Moreover, fiscal policy and structural reforms are necessary to improve the investment climate, productivity, and competitiveness of the real sectors, while creating fiscal space for stimulating economic growth.

This paper describes Indonesia's experiences in designing and implementing a mix of policy responses to mitigate global spillovers, with a focus on the period following the 2013 taper tantrum. Three particular issues are discussed: (1) the setting of interest rates for managing macroeconomic and financial system stability, supported by exchange rate flexibility and capital flow management, in response to the policy trilemma arising from global spillovers; (2) the efficacy of macroprudential measures in safeguarding financial system stability and reinforcing the lending channel of monetary policy transmission on the back of volatile capital flows and an underdeveloped financial market; and (3) the importance of financial market deepening in smoothing out the transmission of global shocks to domestic monetary and financial system stability.

The paper concludes with a discussion about monetary and fiscal policy coordination, and argues for structural reforms to further strengthen macroeconomic stability in the short term, and for a reform agenda to promote sustainable and balanced growth in the medium term. To set the stage for these policy responses in Indonesia, following a discussion on the nature and channels of global spillover to emerging markets, the paper reviews the Indonesian macroeconomic performance since the global crisis.

Global Spillover to Emerging Markets

The following three aspects of global economic and financial market development warrant special attention, as they have significant impacts on the economy and policy responses of emerging countries. First, global economic recovery has been relatively slow and uneven. In the advanced countries, though U.S. economic recovery is progressing, economic growth in the euro area and Japan remains sluggish. Among emerging economies, the slowdown in growth becomes more apparent in China and then spills over to other emerging countries, notably Asia. With global economic recovery supported only by one engine, i.e., recovery in the United States, a slower than expected increase in world trade volume limits external sources of growth. Under such an unfavorable external

environment, emerging countries must resort to domestic demand to support their economic growth to compensate for the weakening exports.

Second, global commodity prices continue to fall with weak demand, new low-cost mineral productions, and geopolitical tensions. The end of the commodity supercycle added significant negative trade channel impacts to the export and growth performances of many emerging economies. The impact is more severe in commodity-exporting countries, giving rise to macroeconomic stability risks with weakening current account balances. The indirect impact is also being felt by manufacturing-exporting countries, which face slower than expected global economic recovery. Thus, the trade channel of global spillovers is putting constraints on the ability of emerging countries to push their domestic demand up to support economic growth, without facing further worsening of current account balances and macroeconomic stability risks.

Third, global financial markets have been unprecedentedly volatile with the divergence of monetary policies across countries. In the period of ultra-quantitative monetary policy easing by advanced economies—notably in the United States, the euro area, and Japan—the financial channel of global excess liquidity has flushed huge capital inflows to emerging economies, pushing significant exchange rate appreciation in these countries, notably during the period from 2009 to mid-2013. Nonetheless, the 2013 taper tantrum has reversed the conditions and increased risk sentiment in global financial markets. A combination of capital flow reversals, strengthening of the U.S. dollar, and risk-off/risk-on market behavior put serious pressures on the exchange rates and external vulnerability of many emerging countries. The pressures on the exchange rate and market volatility have been accentuated by continuous monetary easing in the euro area and Japan, as well as divergence in monetary responses among other advanced economies, giving rise to the debate of "currency war" among policymakers.

The extent to which these global spillovers impact emerging countries depends on their respective economic fundamentals and policy responses. In general, the impact will be relatively contained in countries with strong economic fundamentals in the form of low inflation, a manageable current account balance, a sustainable fiscal position, and a more diversified economic structure. Sound macroeconomic policy through preemptive monetary and prudent fiscal policies will also strengthen the resilience in withstanding the global spillovers. While monetary policy in many emerging countries needs to focus on maintaining macroeconomic and financial stability, fiscal policy can play a role in creating space to stimulate growth where fiscal sustainability is not an issue. Moreover, emerging countries need to accelerate structural reforms in

key areas of real sectors, fiscal policy, and financial market deepening to better mitigate external shocks, and to better manage macroeconomic stability and economic growth.

Nonetheless, the complexity of the spillover effects—such as exchange rate pressures, capital reversals, asset price volatility, increasing risk premiums, and liquidity and credit risks—requires policymakers to optimize their policy mix. In most cases, relying solely on the interest rate response will not be sufficient. This is particularly true in emerging countries, where the shallowness of the domestic financial market often causes excessive volatility in the market reaction and inhibits an effective monetary transmission mechanism. Thus, to ensure macroeconomic and financial stability, the interest rate response needs to be complemented by greater exchange rate flexibility, capital flow management, and macroprudential measures. Crisis prevention and resolution management is important to build capability in early warning exercise and coordinated policy responses across authorities. Building lines of defense in the form of adequate foreign reserves, as well as international and regional financial safety arrangements, is also needed to raise the bar for a country's resilience against global spillovers.

Indonesia: The Macroeconomic Context

Indonesia is a small open economy that has a domestic-oriented economic structure, has a free foreign exchange system, and is a commodity exporter. About 65 percent of the economy comes from consumption, 32 percent from investment, and 21 percent from exports. In one aspect, this economic structure makes Indonesia more resilient against external shocks. Nonetheless, as a commodity-exporting country, Indonesia's exports rely significantly on primary commodities such as oil and gas, palm oil, rubber, coal, tin, and other minerals, and are exposed to global commodity price cycles. The implication is that managing a sustainable current account is very important not only for ensuring macroeconomic stability but also for smoothing Indonesia's growth cycle against the impacts of the global commodity cycle. Moreover, with a free foreign exchange system, global financial markets and capital flows have direct impacts on Indonesia's monetary and financial system. While capital inflows are important for financing external position, managing their volatility is key for supporting exchange rate stability and strengthening monetary independence in achieving domestic economic objectives (Warjiyo 2013a).

Notwithstanding the strains of external shocks, the Indonesian economy has been resilient and continues to record robust growth with macroeconomic and financial stability well maintained. The experience from the 1997/98 Asia

crisis has taught Indonesia the hard lesson that strengthening domestic economic fundamentals with sound macroeconomic and financial system policies is vital. A law was introduced that limits the budget deficit of both central and local government to a maximum of 3 percent of gross domestic product (GDP). A new central bank law was issued that gives independence and a clear mandate of price stability to Bank Indonesia. Moreover, financial restructuring has resulted in highly capitalized banks with sound risk management and governance. Overall, these reforms put Indonesia in a much better position to withstand the 2008 global crisis than it was in during 1997/98. In fact, in the period from 2009 to 2011, Indonesia benefited from high global commodity prices and huge capital inflows that had resulted in high growth, low inflation, current account surplus, and exchange rate appreciation. Nonetheless, the end of the high global commodity prices cycle in 2011 and the subsequent normalization process of U.S. monetary policy have put strains on Indonesia's external sector, giving rise to the current account deficit, volatile capital flows, and exchange rate pressures, which required policy adjustments to manage macroeconomic stability and to support economic growth.

Indonesia has recorded stable and relatively high economic growth. In 2009, for example, Indonesia was among the few countries that recorded economic growth of 4.5 percent while other countries were under recession. GDP growth averaged relatively high, at 6.3 percent, during the period from 2010–12, but the slowdown in China and the decline in commodity prices pushed down Indonesia's growth to a moderate level, at an average of 5.2 percent in 2013–15 (Table 1). These favorable growth performances were mostly driven by domestic consumption and investment. Exports also showed strong performance in 2010 and 2011, with growth of 15.3 percent and 13.6 percent, respectively, but the slowdown in China and the decline in commodity prices have been putting pressures on Indonesian export performance since 2012. Overall, the strong domestic consumption and investment have been able to compensate for the declining export performance, supporting Indonesia's economic growth. Indonesia's growth recorded at 4.8 percent in 2015 and is forecasted to accelerate to 5.2–5.6 percent in 2016, supported by fiscal stimulus and structural reforms as well as continued global economic recovery.

The strong Indonesian economic performance has also been achieved with sound macroeconomic and financial system stability. On price stability, except in the event of increases in domestically subsidized fuel price and other administrative prices, consumer price index (CPI) inflation has been under control within the target ranges. It was on the downward trend from 6.9 percent at the end of 2010 to 3.8 percent in 2011 and 4.3 percent in 2012, within its target range

TABLE 1
Indonesia: Selected Macroeconomic Indicators, 2009–15

	2009	2010	2011	2012	2013	2014	2015
GDP growth (%)	4.63	6.22	6.49	6.26	5.78	5.02	4.79
Consumption (%)	6.20	4.14	4.51	4.77	5.23	4.82	4.92
Investment (%)	3.29	8.48	8.77	9.25	4.71	4.12	5.07
Export (%)	–9.69	15.27	13.65	2.00	5.30	1.02	–1.97
Import (%)	–14.98	17.34	13.34	6.66	1.21	2.19	–5.84
CPI inflation (%)	2.78	6.96	3.79	4.30	8.38	8.36	3.35
Core inflation (%)	4.28	4.28	4.34	4.40	4.98	4.93	3.95
Volatile food prices (%)	3.95	17.74	3.37	5.68	11.02	10.88	4.84
Administered prices (%)	–3.26	5.40	2.78	2.66	2.91	17.57	0.39
Balance of payment ($m)	12,506	30,343	11,857	215	–7,325	15,249	–1,098
Current account ($m)	10,628	5,144	1,685	–24,418	–29,115	–26,705	–17,661
% of GDP	2.00	0.72	0.20	–2.80	–3.20	–3.00	–2.05
Financial account ($m)	4,852	26,526	13,636	24,909	22,010	44,926	16,774
Foreign direct investment	2,628	11,106	11,528	13,716	12,295	14,656	9.503
Portfolio investment	10,336	13,202	3,806	9,206	10,875	26,066	16,749
Other investment	–8,208	2,262	–1,801	1,922	–871	4,332	–9,514
Exchange rate (Rp/$)	9,447	9,036	9,113	9,715	12,250	12,135	13,395
% change	14.16	4.35	–0.85	–6.61	–26.09	0.94	–10.338
Foreign exchange reserves ($m)	66,165	96,207	110,123	112,781	99,387	111,862	105,931
Month of import (cif)	8.59	8.93	9.34	9.62	9.01	6.60	7.40
Interest rates							
BI (policy) rate (%)	6.50	6.50	6.00	5.75	7.25	7.75	7.50
Deposit rate (%)	6.87	6.69	6.35	5.85	7.92	8.58	7.48
Lending rate (%)	13.69	12.75	12.18	11.50	12.12	12.79	12.58
Banking							
CAR (%)	17.42	17.18	16.05	17.43	18.13	19.57	20.43
Deposit growth (%)	13.76	20.45	18.72	15.61	13.11	12.17	7.26
Lending growth (%)	10.12	23.28	24.67	23.13	21.39	11.56	10.45
NPLs (%, gross)	3.40	3.07	2.23	2.01	1.82	2.23	2.49

of 4.5±1 percent. Core inflation was kept under control below 4.5 percent during that period, while the impact of global commodity prices was muted by Bank Indonesia letting the rupiah appreciate, benefiting from huge capital inflows at the time. However, the increases of domestic fuel prices in 2013 drove CPI inflation to 8.4 percent in 2013, exceeding the target range of 4.5±1 percent. The same happened in 2014 as a result of a reform to the subsidy policy, which led to a domestic fuel price increase and caused CPI inflation to increase to 8.4 percent. Since then, CPI inflation has been kept under control. It declined to 3.4 percent at the end of 2015, within its target range of 4.0±1 percent. Considering the well-anchored inflation expectation, sluggish domestic demand, and muted imported inflation, CPI inflation is forecasted to also be kept under control at around 4 percent in 2016, within its target range of 4.0±1 percent.

Volatile global commodity prices and capital flows have also affected the performance of Indonesia's external sector. During the period from 2009 to mid-2011, Indonesia enjoyed current account surpluses, which peaked at US$10.6 billion (2 percent of GDP) in 2009, benefiting from both strong external demand and high commodity prices. At the same time, Indonesia also enjoyed huge capital inflows, especially in the forms of foreign direct investment and portfolio investments, buoyed by global excess liquidity from quantitative monetary easing in the advanced countries (Warjiyo 2013a). The surplus in the capital account peaked at US$26.5 billion in 2010 before it decelerated to US$13.6 billion in 2011 due to the Greek crisis. As a result, Indonesia enjoyed sizable surpluses in the balance of payments during this period. Foreign exchange reserves increased from a mere US$66.2 billion in 2009 to US$110.1 billion in 2011.

The external-sector condition was then reversed and became challenging with weakening external demand and falling global commodity prices. The current account turned into a large deficit of US$24.4 billion (2.8 percent of GDP) in 2012, which widened further to US$29.1 billion (3.2 percent of GDP) in 2013. Strong macroeconomic policy adjustments through both monetary policy tightening by the central bank and prudent fiscal policy by the government have been able to narrow the current account deficit to a more sustainable level of around 2.5–3.0 percent of GDP. In fact, the deficit came down faster than expected to US$26.7 billion (3.0 percent of GDP) in 2014 and US$17.7 billion (2.0 percent of GDP) in 2015. The strong macroeconomic policy adjustments are also vital for securing market confidence. Capital inflows remained high at US$24.9 billion in 2012, leading foreign reserves to further increase to US$112.8 billion.

However, huge capital reversals of portfolio investments following the taper tantrum in 2013 have caused a decline in capital inflows to US$22.0 billion and forced Bank Indonesia to intervene to stabilize the exchange rate, causing foreign reserves to decline to US$99.4 billion. The market confidence was quickly restored as Bank Indonesia aggressively responded with "stability over growth policy" through interest rate and other measures (will be discussed in the next session), increasing the capital account surplus to a record high of US$43.6 billion and foreign reserves to US$111.9 billion in 2014. Nonetheless, the planned increase of the federal funds rate and market reaction to the Fed's communication has once again intensified the external pressures. Even though both inflation and the current account deficit have been kept under control, global financial market uncertainty has caused increasing volatility of capital inflows to Indonesia and put pressures on the exchange rate and monetary stability.

The dynamics of balance of payments as explained above, including the volatile capital flows, have affected exchange rate movements, thus creating risks to

both monetary and financial system stability. As such, the exchange rate appreciated strongly up to August 2011 with the surpluses in both current and capital accounts, but it has been under pressure since then, with capital reversals being impacted by the worsening of the European crisis. Subsequently, the exchange rate was heavily under pressure following the taper tantrum. It depreciated by 26.1 percent in 2013 before it appreciated as market confidence resumed in 2014. In this regard, Bank Indonesia continues to adopt a flexible exchange rate policy as a tool to absorb external shocks. In most cases, the exchange rate is determined through market mechanism, although in some cases Bank Indonesia may intervene to stabilize the exchange rate along its fundamental level. Nonetheless, maintaining exchange rate flexibility is a daunting challenge in such a volatile global environment, especially in assessing its consistency with macroeconomic outlook and maintaining its stability.

Indonesia's resilience in withstanding global spillovers is not only attributed to sound macroeconomic policies but also supported by a strong financial system. Overall, financial system stability has remained solid, underpinned by a resilient banking system and relatively stable financial markets. The banking industry is well capitalized, with credit, liquidity, and market risks being well mitigated. In September 2015, the capital adequacy ratio (CAR) remained well above the 8 percent minimum threshold at 20.4 percent, while nonperforming loans (NPL) were low and stable at 2.5 percent (gross) or 1.3 percent (net). On the intermediation function, credit growth accelerated to 10.5 percent (yoy) while deposit growth was recorded at 7.3 percent (yoy). Looking ahead, credit growth is predicted to continue accelerating to 12–14 percent in 2016, in line with the increase in economic activity and looser macroprudential policy stance adopted by Bank Indonesia.

Monetary and Macroprudential Policy Mix

For small open economies, global spillovers give rise to the policy trilemma of setting the optimal interest rate to satisfy the domestic policy objective while keeping the stability of exchange rate and free flows of capital. Theoretically, the interest rate policy needs to be geared toward maintaining price stability, while taking into account the impacts on economic growth. To mitigate global spillovers of volatile capital flows, exchange rate flexibility can act as a shock absorber. However, excessive exchange rate movements can undermine the effectiveness of the interest rate in achieving price stability, both because of exchange rate pass-through to inflation and because of real exchange rate effect on growth. Furthermore, market overreaction and structural rigidities can cause unnecessary exchange rate overshooting and volatility that may hamper

overall monetary and financial system stability. Foreign exchange intervention to avert excessive volatility of the exchange rate can be an option.

Volatility in capital flows under a free foreign exchange system also complicates the interest rate response for achieving domestic economic objectives. This is evidenced in Indonesia where capital flows are driven more by "push factors" than "pull factors" (Indawan et al. 2013). The functioning of the monetary policy transmission mechanism is directly affected by volatile capital flows, particularly through their impact on domestic excess liquidity in the financial system (Warjiyo 2014b, 2015). Under such conditions, interest rate policy alone would not be sufficient for an effective monetary policy transmission. An increase in interest rate to manage excess liquidity, for instance, will further induce more capital inflows and liquidity expansion. Bank lending will also be less sensitive to interest rate under excess liquidity environment. Furthermore, volatility in capital flows may cause bank lending to be more procyclical to global financial markets than to domestic economic activity. Some forms of capital flow management can strengthen the effectiveness of interest rate policy.

In the case of Indonesia, this policy trilemma is addressed through a mix of monetary and macroprudential policies, consisting of interest rate response complemented by exchange rate flexibility, capital flow management, and macroprudential measures (Warjiyo 2013c, 2014c). The interest rate policy, consistent with the inflation-targeting framework that Indonesia implemented since 2005, is the main instrument for anchoring inflation expectations and forecasts within the targeted range (Warjiyo 2014a). The exchange rate policy is geared toward maintaining stability along its fundamental path. Capital flow management is also implemented with the objective of dampening excessive short-term volatility in these flows and stabilizing the exchange rate. At the same time, the macroprudential measures aim to manage procyclicality and excessive lending in specific sectors. Overall, the policy mix is intended to reinforce the effectiveness of all monetary transmission channels. Clear communication; policy coordination with the government on inflation, fiscal, and structural reforms; and central bank cooperation on strengthening regional financial arrangements also play a crucial role.

The implementation of this policy mix was somewhat straightforward during the period from 2009 to 2012, even though Indonesia was subjected to huge capital inflows. During that period, there was no underpinning reason for an interest rate response, as domestic inflation was under control even though economic growth was approaching the potential output level. In addition, as mentioned above, an increase in interest rate would further induce capital inflows and overshoot exchange rate appreciation. For this reason, capital flow

management was introduced through a holding period for investing in central bank bills. At the same time, macroprudential measures were also implemented through increasing reserve requirement and introducing a loan-to-value (LTV) ratio to automotive and property lending. Taken together, these measures are found to be effective in smoothing short-term capital inflows and managing liquidity and bank lending.

The situation has become challenging since the taper tantrum in mid-2013. Capital reversals were large in the aftermath of the taper tantrum, and subsequently capital flows have been increasingly volatile. The complexity of policy responses was also attributed to domestic problems of high inflation following the government policy to increase the subsidized fuel price. The current account deficit has also widened to an unsustainable level due to combining factors of global commodity price plunge and strong domestic demand. Confronted with these challenges, Bank Indonesia strengthened its monetary and macroprudential policy mix. The following sections discuss in detail each of the instruments in the policy mix from the taper tantrum to date.

Interest Rate Policy

Bank Indonesia was one of the first central banks to raise its policy rate in the aftermath of the taper tantrum in May 2013. Bank Indonesia started raising its policy rate by 25 basis points (bps) in June 2013. The policy rate was then aggressively increased by 50 bps in July, another 50 bps in August, and another 25 bps in September 2013. After pausing in October 2013, Bank Indonesia again raised the policy rate by 25 bps in November 2013. In total, the policy rate was raised by 175 bps to 7.50 percent within six months. Bank Indonesia has kept the policy rate on hold since then.

The primary objective of this aggressive interest rate response was to preemptively anchor inflation expectations which initially rose due to food price shocks. Another aim was to contain the second-round impacts of fuel price hikes that caused CPI inflation to peak at 8.6 percent in July 2013. Moreover, the sharp increase in the policy rate was to dampen domestic demand in order to rein in the current account deficit, which rose to a peak of 4.4 percent of GDP in 2013:Q2. The timing of the aggressive policy rate increases was also important, as they have succeeded in reverting the capital reversals and pressures on the exchange rate following the taper tantrum. The bold interest rate response has been key in sending a strong, clear signal to the markets regarding Indonesia's monetary policy deliberations to safeguard macroeconomic and financial stability.

The bold interest rate response has succeeded in containing the inflation pressures and has helped reduce the current account deficit faster than initially forecasted. CPI inflation has returned to its normal path on a month-to-month basis since September 2013 and decelerated further in 2014. Had the government not raised again the domestic fuel price in October 2014, inflation would have been down to 4.9 percent at the end of 2014, or would have fallen within the target range of 4.5±1 percent. The downward trend of inflation continued and reached 3.4 percent at the end of 2015, contained at the target range of 4.0±1 percent. On the external side, trade balance turned into a surplus and the current account deficit fell much faster than expected to 3.0 percent of GDP in 2014 and around 2.0 percent of GDP in 2015. The current account deficit of about 2.5–3.0 percent of GDP is deemed sustainable in the longer term for Indonesia. Moreover, this price and external stability can be achieved with manageable moderation in economic growth at 5.0 percent in 2014 and 4.8 percent in 2015.

The interest rate policy has also been able to move bank activities to a more balanced and sustainable footing. Following the 175 bps increase in the policy rate, bank deposit rates rose by 240 bps as liquidity tightened and competition for funding among banks increased. The lending interest rate also increased, albeit at a slower pace, by less than 50 bps, due to a combination of factors (e.g., time lag in setting interest rates, wide interest rate margin, and shallowness of the domestic financial market). Overall, a combination of macroprudential measures, capital outflows, and economic slowdown has reinforced the impact of the interest rate increase on the pace of deceleration in domestic liquidity and bank lending. Monetary aggregates already declined substantially, e.g., M2 growth decreased from around 22 percent in 2013 to about 10.4 percent in December 2015. Similarly, bank lending growth decelerated more rapidly from 23.5 percent in 2013 to 10.5 percent during the same period.

With macroeconomic and financial stability successfully maintained, recent conditions make room for monetary easing. As discussed above, CPI inflation is forecasted to be contained within the targeted range of 4.0±1 percent, at 3.4 percent at end-2015 and around 4 percent in 2016. Likewise, the current account deficit is well managed at a sustainable level of 2.5–3.0 percent of GDP, i.e., at around 2 percent of GDP in 2015 and 2.6 percent of GDP in 2016. With these forecasted inflation and other macroeconomic variables for the next two years, including incorporating the possibility of federal funds rate (FFR) increases over the course to the end of 2016, the implied Taylor rule estimation shows room for policy rate cuts from the current Bank Indonesia (BI) rate of 7.50 percent. This is also supported by an estimation of natural real rate

for Indonesia that is now well above its long-term level. In essence, the level of BI rate provided ample premium for external risks, especially in anticipation of FFR increases, well above that necessitated by the domestic price stability objective.

Nonetheless, with the lingering uncertainty in the global financial market—stemming mainly from the expected FFR increases as well as the divergence of monetary policies, particularly from the euro area, Japan, and China—Bank Indonesia remains cautious in easing its monetary policy. For this reason, Bank Indonesia's Board of Governors on November 17, 2015, decided to hold the BI rate at 7.50 percent, and instead opted to lower the primary reserve requirement from 8.0 percent to 7.50 percent of banks' deposits, effective December 1, 2015. In this respect, monetary easing through reduction in reserve requirement is expected to boost banks' financing capacity to stimulate economic growth, reinforcing the relaxation of macroprudential measures that has been issued. In the Board of Governors meeting on December 17, 2015, Bank Indonesia also decided to hold the BI rate at 7.50 percent, as it was considered too early to judge market reaction following the recent Fed decision of a 25 bps FFR increase.

Bank Indonesia started to ease its policy rate in January 2016 with a 25 bps cut, and it was followed by a 25 bps cut in February and another 25 bps cut March 2016. To ease bank liquidity for lending to the economy, the reserve requirement was also reduced by 100 bps to 6.50 percent. To facilitate stronger economic growth as well as preserve macroeconomic and financial system stability, Bank Indonesia will continuously strengthen policy coordination with the government in supporting fiscal stimulus for increasing domestic demand and accelerating structural reforms to upgrade the structure of the economy.

Exchange Rate Policy

Although policy rate increases have succeeded in anchoring inflation expectations and have helped dampen domestic demand, they alone could not be expected to bring about all the necessary economic adjustments, such as further reducing the current account deficit and mitigating global spillovers. To do so, it would have required excessive increases in the policy rate. Exchange rate flexibility helps facilitate reduction of the current account deficit and, furthermore, acts as a shock absorber of global spillover impacts to the domestic economy. Nonetheless, implementing exchange rate flexibility in emerging economies with relatively shallow domestic financial markets is quite challenging, especially at a time when the global financial market poses high volatility, as witnessed since the global crisis. Market-based exchange rate movements

are more erratic, and market irrationality often causes excessive misalignment (overshooting) beyond fundamentals. Greater flexibility must be weighed against excessive volatility.

In Indonesia, the exchange rate policy is geared toward maintaining the stability of exchange rate movements that is consistent with its fundamental path. When determining the policy interest rate, this path is calibrated by using some methodology for determining the fundamental exchange rate and then inputted to be consistent with macroeconomic forecasting and simulation. Incorporating exchange rate as an integral part for achieving the inflation target could strengthen monetary policy credibility under the inflation-targeting framework (Ostry, Ghosh, and Chamon 2012; Warjiyo 2014a). Many emerging economies incorporate exchange rate in determining the policy rate in the Taylor rule (Mohanty and Klau 2004; Aizenman, Hutchison, and Noy 2011). The methodology to check for the consistency of exchange rate movements with the fundamental path ranges from a simple real effective exchange rate (REER) to more complex macroeconomic models such as the external balance approach and computable equilibrium exchange rate developed by the International Monetary Fund (IMF). The exchange rate path serves as a general guide to monitor exchange rate movements. In most cases, the exchange rate is determined by the market. Nonetheless, if there is market overreaction that causes overshooting to the fundamental, symmetric intervention is conducted to smooth out the short-term exchange rate volatility. The objective is not to achieve a certain level or range of exchange rates, but merely to avoid excessive volatility that could give rise to panic and disruption in the foreign exchange market.

Foreign exchange intervention is complemented by central bank purchases of government bonds in the secondary market, especially during periods of large capital reversals, a tactic that is called "dual intervention" (Warjiyo 2013b). There are at least three rationales behind the operation. First, it helps strengthen the effectiveness of foreign exchange intervention in stabilizing the exchange rate. For Indonesia, heavy pressures on the exchange rate are mostly driven by large capital reversals from government bonds, as foreign investors account for about 38 percent of total bonds outstanding. With the close link between volatility of exchange rate and bond yields, interventions in both markets are required for achieving exchange rate stability. Second, purchases of government bonds from the secondary market are also intended to sterilize some of the impact of foreign exchange intervention on domestic liquidity. Through this dual intervention, some of the rupiah liquidity that has been absorbed due to foreign exchange intervention can be recirculated into the market, thus avoiding excessive liquidity squeeze and interest rate overshooting in

the money market. Third, dual intervention is a way of achieving the objective of monetary stability in a manner that is consistent with maintaining financial system stability. In particular, the operation at times of heavy market pressures provides a clear signal that the central bank stands ready to buy government bonds that foreign investors wish to unwind, in case the domestic market could not absorb them. By taking on the role of "market maker of last resort," the central bank can better manage risks to market illiquidity and excessive asset price corrections, thus helping stabilize the overall financial market condition.

Capital Flow Management

Volatile capital flows, especially those of short-term and speculative nature, increase risks to both monetary and financial system stability. Carry-trade flows often give rise to excess volatility in exchange rate movements beyond that implied by fundamentals. Risks to market liquidity are also imminent. In one period, large capital inflows often lead to domestic excessive lending and asset bubbles, while in another, large capital reversals pose serious risks to market illiquidity and excessive asset price corrections. Dual intervention is one of the strategies to smooth out the impacts of volatile capital flows on asset prices and market liquidity. But in many cases, direct measures of capital flow management are needed.

In Indonesia, the policy on capital flow management is guided by three principles. First, the objective is to help mitigate the negative impacts of short-term volatility in capital flows on the stability of both the exchange rate and the overall monetary and financial system. Second, the measures specifically target short-term and speculative capital flows; medium- to longer-term flows are welcomed, as they benefit the economy. Third, the measures are consistent with the broad principle of maintaining the free foreign exchange system. They are temporary, i.e., the measures are strengthened in the event of excessive capital inflows and are relaxed in the event of excessive capital outflows, and do not differentiate between domestic and international investors.

The following provides a clear example. During heavy capital inflows from quantitative monetary easing, Bank Indonesia introduced in 2010 a six-month holding period for transactions in central bank bills and imposed a maximum of 30 percent capital to the short-term offshore borrowings of the banks. However, following the 2013 taper tantrum, the holding period for central bank bills was relaxed to one month and the transactions exempted from the calculation of banks' offshore borrowings were expanded. Recently, the holding period was further relaxed to one week to provide wider options of asset classes for portfolio investment, as global financial market volatility is lingering. Bank Indonesia

believes that these measures help dampen short-term and volatile capital flows, thus making them consistent with the objective of managing exchange rate and financial system stability.

Another example is Bank Indonesia regulation that was issued in 2014 requiring private corporates to strengthen risk mitigation for their external debts, as public and banks' external debts were already under strict regulations. The rationale for this new regulation was to respond to the rapid increase of private external debts driven by both global excess liquidity and needs for financing strong domestic demand. The problem was that proper risk mitigation could not be assured in those corporates, an indication that could resemble the condition leading to the 1997/98 crisis. Thus, under the new rule, corporates must provide a minimum hedging ratio of 20 percent net external debts due within three to six months to cover the risks of currency mismatch. On top of this hedging ratio, an additional liquidity ratio of minimum 30 percent net external debts due within three to six months is required to cover liquidity risks. In addition, to mitigate credit default risk, corporates that resort to external debts will be required to have a minimum credit rating of one notch below investment grade. As it deals with managing the flows and strengthening risks of external debts, the new regulation could be viewed as both capital flow management and macroprudential measures.

Macroprudential Measures

As previously underlined, the interest rate transmission mechanism of monetary policy is not always smooth or fully effective in a country with an underdeveloped financial market, such as Indonesia. Another channel of monetary transmissions that needs to be addressed is the lending channel. This is where macroprudential measures can play a role to reinforce the interest rate policy in influencing bank lending for managing aggregate demand and achieving price stability objectives. Macroprudential measures can also be used to smooth out the procyclical nature of bank lending behavior. Thus, the considerations of maintaining both monetary and financial system stability are taken into account when designing macroprudential measures.

In Indonesia, the formulation of macroprudential measures for managing bank lending is done as follows. Methodology is developed to assess optimality of actual bank lending growth relative to the level implied by full potential output condition (Utari, Arimurti, and Kurniati 2012). This model is then estimated to determine optimality of aggregate lending growth, of each bank, as well as to certain types of lending (consumption, working capital, and investment), and by economic sectors. By comparing these optimal growth figures

with actual lending growth, assessment could be made where lending is excessive and what macroprudential measures could be applied to correct the excessive misalignment. For addressing the credit gap in certain economic sectors or types of lending and household, for instance, macroprudential instruments such as loan-to-value (LTV) ratio, debt-to-income ratio, or different risk weights in the capital adequacy ratio (CAR) measurement could be implemented. For dealing with excessive lending by banks, supervisory actions are more effective as standalone measures or to complement other macroprudential instruments.

This is the approach that was applied by Bank Indonesia when introducing an LTV ratio of about 70–80 percent to lending to the automotive and property sectors in 2012, as they recorded excessive lending growth driven by both strong domestic demand and ample bank liquidity from huge capital inflows. Subsequently, confronted with increasing risks of housing bubbles, Bank Indonesia strengthened the macroprudential measures in 2013 by applying a progressive LTV ratio of a 5 percent deduction to every mortgage for the second and subsequent purchases of certain types of houses and apartments. The measures were also complemented by supervisory actions against banks that are viewed as excessive in their lending behavior. Note that the formulation and implementation of macroprudential measures required a very detailed and complex analysis and calibration, as well as the need for clear communication with the banks and business community on the rationale and objective of the measures.

The experience in Indonesia shows that macroprudential measures and supervisory actions helped reinforce the effectiveness of monetary policy transmission and helped support financial system stability (Purnawan and Nasir 2015; Wimanda et al. 2012, 2014). Although lending growth increased prior to the implementation of these measures, banks and their customers were probably taking advantage of the interim period, as lending declined substantially in the relatively short period of the subsequent episode. For instance, the growth in mortgages on housing of less than 21 square meters declined from more than 100 percent to negative growth during the period from June to September 2012. Likewise, the growth in mortgages on apartments of less than 21 square meters dropped from more than 300 percent to less than 10 percent during the period from January to November 2013. It should be noted that the automotive and property sectors have very large import content, so managing the growth in lending to these two sectors helped reduce the current account deficit, as well as reinforcing the policy responses through interest rate increases and exchange rate flexibility.

As discussed above, even though macroeconomic and financial stability have been successfully maintained, global risks are forcing Bank Indonesia to remain cautious in utilizing the window of monetary easing through interest rate cuts. Instead, Bank Indonesia opts to relax macroprudential measures to stimulate bank lending, domestic demand, and economic growth. Thus, prior to the recent 50 basis point reduction of reserve requirement to 7.50 percent, the LTV had already been relaxed by an average of 10 percent to about 80–90 percent in early 2015. The positive impact from this macroprudential easing can be seen in the recovering growth in bank lending to the real estate and construction sector that recorded at about 22 percent and 28 percent, respectively, in September 2015. Nonetheless, mortgage loans still show sluggish growth of about 8 percent, even lower than aggregate lending growth of 11 percent. The reason for the difference is that fiscal capital expenditures in a number of infrastructure projects started to stimulate investment demand and thus induced demand for lending in the real estate and construction sector, while demand for housing mortgages is still constrained by moderation of household income with the domestic economy slowdown.

Financial Market Deepening

The stage of development and depth of the domestic financial market influence the transmission mechanism and policy response to global spillovers. The interest rate transmission is constrained by wide margins between bank deposits and the lending rate, combined with the absence of a smooth and continuous term structure (particularly from six months to three years) in the domestic financial markets. The shallowness of the domestic foreign exchange market often causes excessive volatility and overshooting of exchange rate movements in response to global monetary and financial shocks. This is the rationale for Bank Indonesia's focus and priority on financial market deepening as an integral part of the policy responses to global spillovers. In addition to strengthening economic fundamentals and promoting sound macroeconomic and financial system stability, a key for better withstanding the global spillovers is to make the financial market more conducive and resilient to swings in international investor preferences.

Since 2013 Bank Indonesia has launched a series of aggressive policy initiatives to deepen the financial market, especially the domestic money and foreign exchange markets. In the foreign exchange market, the Jakarta Interbank Spot Dollar Rate (JISDOR) was successfully introduced in May 2013, reflecting the actual transactions of exchange rates, as a reliable reference for the market.

Subsequently, the Association Banks of Singapore (ABS) recommended that their members use JISDOR as a reference rate in fixing their nondeliverable forward (NDF) transactions. Hedging instruments were also introduced through Bank Indonesia's foreign exchange swaps transactions with the banks, both bilaterally and in weekly auctions. Further relaxation on regulations regarding underlying transactions for forwards and swaps as hedging instruments has been issued. Banks and corporates were also encouraged to use more hedging instruments in managing their increasing exchange rate risks. Significant progress has also been achieved in deepening the domestic money market, especially for collateralized transactions. Reverse repo has been conducted with government bonds in the monetary operations. Bank Indonesia has also succeeded in developing an interbank repo using government bonds as the underlying transactions.

Further initiatives to develop the financial market are key for creating an environment that is conducive for foreign capital inflows and economic financing. The significant progress made so far in deepening the foreign exchange and money markets will be followed by additional measures to strengthen interest determination, product development, and market infrastructure and conduct. The objective is to expedite the development of interbank swaps to provide hedging facilities for banks and corporates to better mitigate increasing exchange rate risks. Close links between the already developed interbank repo and the much needed interbank swap market would facilitate the smooth functioning of the domestic money market in responding to global monetary transmission. More products will be introduced in both money and foreign exchange markets, including development of negotiable certificates of deposit, commercial papers, promissory notes, and medium-term notes. In the capital market, measures for financial market deepening include the relaxation of corporate bonds issuance, the development of infrastructure bonds, and a domestic investor base.

Final Remarks

The sound economic performance of Indonesia is a positive outcome of close coordination between Bank Indonesia, the government, and related agencies in the key areas of monetary, fiscal, and structural reforms (Warjiyo 2013c). The macroeconomic and financial system stability needs to be continuously safeguarded in order to better withstand global spillovers. With both inflation and the current account deficit under control, any monetary policy easing through interest rate cuts needs to be cautiously calibrated against the impacts of lingering global market volatility on the need to maintain exchange rate and external

stability. Relaxation of macroprudential measures in the forms of an LTV ratio in early 2015 and recent monetary easing through reduction in reserve requirement have already provided more space for banks to provide lending for supporting economic growth, while demand is recovering through fiscal stimulus.

Policy coordination between the Ministry of Finance, Bank Indonesia, the Financial Service Authority (FSA), and the Indonesia Deposit Insurance Agency (IDIA) for maintaining financial stability is closely conducted through the Financial System Stability Coordination Forum (FSSCF). The deputies meet regularly every month, while the ministries meet quarterly or in the event of additional need. In these meetings, officials assess overall financial system stability (individual financial institutions, systemic risks, macro and fiscal risks, and global and external risks) and discuss coordinated policy measures to safeguard financial system stability. In addition, the forum provides clear institutional arrangements and protocol for a crisis prevention and resolution mechanism, reinforcing the already strong overall financial system condition.

From the government, a series of fiscal reforms has been accelerated under the new administration. The bold subsidy reforms have been implemented since the end of 2014 with the clear objective of moving from product subsidy to targeted subsidy. Such reform was first implemented by removal of a fuel subsidy on gasoline and introduction of a fixed 1,000 rupiah per liter subsidy on diesel. Other subsidy reforms include the removal of an electricity subsidy for industry and upper-middle-income households, and then the gradual move toward a targeted subsidy for lower-income households. The bold subsidy reforms have already generated significant savings for more productive fiscal expenditures to stimulate economic growth and support various social programs. The acceleration of these productive fiscal expenditures absorptions in both the central and local governments is now being addressed through a special task force specifically formed for the purpose. Fiscal reforms aimed at higher tax revenues and tax policy for supporting the economic development are also under way.

In addition to fiscal reforms, the new administration is also embarking on aggressive real-sector structural reforms in the areas of infrastructure, better investment climate, and social programs. The objective is to boost investment and productivity that will provide a better foundation for supporting strong, balanced, and sustainable growth over the medium term. Over the past months, the government has already issued seven deregulation packages, and more will follow. The deregulation encompasses measures, among others, that will cut red tape and simplify permit requirements and procedures, accelerate strategic infrastructure projects, simplify land permit procedures, and develop low-cost housing, integrated logistics facilities, and special economic zones.

Tax incentives are also given for supporting export-oriented and import-substitution industries. For supporting financing of the infrastructure and property sector, a real estate investment trust will also be established. The fiscal stimulus and progress of these reforms have been able to accelerate the infrastructure development and significantly improve the ease of doing business in Indonesia.

In closing, Indonesia has weathered global spillovers relatively well. The policy mix of monetary and macroprudential measures proves to be more effective in anchoring inflation, lowering the current account deficit, and maintaining financial system stability, with a modest decline in economic growth. The policy mix of monetary and fiscal policies also plays a supportive role not only in the stabilization process over the short term but also in providing stimulus for economic growth. At the same time, acceleration of structural reforms will be monumental in moving the Indonesian economy toward higher, sustainable, and balanced economic growth over the medium to long term.

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GENERAL DISCUSSION
Policymaker Panel

Chair: Mark Spiegel

Mr. Spiegel: Let's turn to questions.

Mr. Santiprabhob: I have two questions for the speakers. The first question is for all of the speakers. Given that there are quite a number of structural reform initiatives going on in each of your countries, how do you take into account the future impact of structural reforms, given uncertainties about the pace and extent of structural reform measures? And the second question is related to macroprudential measures that have been introduced in your country. How do you incorporate decisions on macroprudential policies into the monetary policy framework?

Mr. Hutchison: My question is directed to Dr. Shirai. Japan's debt-to-GDP ratio is about 240 percent at present. I'm wondering what you think is the normal real interest rate in Japan and how the interest rate level affects the sustainability of the public debt?

Mr. Hoshi: Mr. Hahm, you said macroprudential policies in Korea, such as loan-to-value (LTV) ratio and debt-to-income (DTI) regulations, successfully contained household debt and mortgage lending. But I think they also partially led to increased corporate liabilities, as you showed in one of the figures in your presentation. When I look at the data, what I see is that the banks which relied more on mortgage lending before the introduction of LTV and DTI regulation ended up increasing their lending to already indebted SMEs, small and medium enterprises, with dubious prospects. So I think it's important to recognize the potential side effects of macroprudential policy like LTV or DTI regulation. And I think this relates to what Perry (Warjiyo) pointed out too. LTV regulation in Indonesia reduced mortgage loans, but at the same time it seems that it led to more real estate and construction lending. Although you mentioned that these developments may not be related, I think we should not rule out possible interactions.

Mr. Spiegel: Let me take one more question for this round.

Mr. Ratcliffe: My question is motivated by Joon-Ho Hahm's comments about the decoupling of the real economy and the credit/financial cycles. It's something that we've been discussing at my firm, Blackrock. I want to get your opinion on where you consider us to be in the credit cycle. Are we in the late stage in the credit cycle as indicated by the increase in credit spreads in the past months? Or are we midway through, and is this cycle different following the quantity of easing that we've seen? So is there more to go? And the last part of my question is, do you identify Korea as being closer to where the United States is in the cycle? Or more broadly with emerging markets?

Mr. Spiegel: Thanks. So let's just go in order and start with Dr. Shirai. You may respond to the questions from the floor or your co-panelists, as you choose.

Ms. Shirai: About the first question—whether we take account of structural reforms when we make a policy decision—usually when we make a policy decision it's based on a baseline scenario for the economic outlook. And the baseline scenario takes the present structure of the economy as given. But if, for example, there is a possibility that structural reform might have a positive impact, it is treated as an upward risk to the baseline scenario. About how macroprudential policy is incorporated into our monetary policy decisionmaking, as you know, we are doing very massive amounts of monetary accommodation. We have said we will continue our Quantitative and Qualitative Monetary Easing (QQE) program as long as we find it necessary in order to achieve the 2 percent inflation target. But at the same time, we have said we look at both upside and downside risks related to Japan's economic growth, prices, and financial stability. So if there is some concern related to these considerations, we may make adjustments to our QQE framework. At this moment, we are closely watching financial stability but don't see any serious risks. The debt-to-GDP ratio, 220 percent, is huge. Right now, based on our internal calculations, the equilibrium, natural interest rate is zero percent. With the implementation of QQE, monetary policy in Japan is now very, very accommodative, as the actual real interest rate is less than the equilibrium interest rate.

On the debt monetization issue, we are not supposed to talk about it. But I will say that since QQE was implemented, tax revenue has been growing and the government fiscal balance has been improving. Corporate-sector profits are now the highest in history, and firms are paying a lot of taxes. And so in that sense, monetary policy has helped improve the fiscal situation. In addition, we also introduced a consumption tax hike last year that is also increasing tax revenue. But of course, in the future we will exit QQE and interest rates will rise. So it's quite important for us to make progress on fiscal consolidation now.

Mr. Hahm: Let me first answer the question about how the Bank of Korea actually incorporates macroprudential concerns in making monetary policy. It's a very difficult question. We don't have a unified framework or any strategy that we reveal to the market in regard to how financial stability is incorporated into monetary policy strategy. Rather it depends on the individual policymakers' judgment. But we do monitor quite vigilantly financial stability risk in the financial system. And we do have periodic meetings at the board level to assess the financial stability risk, and we try to share these assessments with the public and also with the government. But the perceived risk really depends on the individual policymakers on the board.

On the question about whether macroprudential policy introduced in the household sector may lead to a kind of substitution effect in other sectors, such as lending to small and medium-sized enterprises, actually, as I showed in one of my graphs, the corporate-sector loan-to-GDP ratio in Korea has not recovered yet up to the pre-crisis level. It's close, but it's still lower, only 105 percent of GDP. So probably it's true that the lower policy interest rate during the last year is causing loans to small and medium-sized companies to pick up slowly. But I'm not sure whether the recovery of small and medium-sized loans is entirely due to our adoption of macroprudential policy measures in the household sector, because it was the Bank of Korea's purpose when it introduced non-interest rate policies like the credit support lending facility to foster more loans to the small and medium-sized sector. Of course, our examiners are closely watching the growing credit in the small and medium-sized sector.

And finally, the question about the decoupling of the financial cycle and real business cycles. The graph that I showed in my presentation is basically for emerging markets. Korea is a little bit different. It's somewhere in between due to the macroprudential policies that I mentioned. Korea's financial cycle hasn't deviated much from our business cycle. But we are now probably at a critical point, as our financial cycle has become more tied to the financial cycle of more advanced economies. For instance, our long-term interest rates have been close to U.S. long-term interest rates even though there are big differentials on the short-term side of the yield curve. This means that the risk and liquidity premia in Korean financial markets have become quite compressed. There is a risk that could change, something we are paying a lot of attention to. But at this point in time, our financial cycle has not decoupled much from the business cycle.

Mr. Warjiyo: On the macroprudential experience in Indonesia, first we have to be clear about whether the immediate objective of macroprudential policy is to achieve financial stability or monetary stability, even though the two goals are

linked to each other. If you're concerned with financial stability, then macro-prudential policy involves bank stress testing and things like that. If you're concerned about monetary stability, then usually we're talking about the pro-cyclical nature of bank lending and so on. In Indonesia's case there is not much concern about financial systems stability now because our banking system is quite strong. And so there is more on the procyclical nature of bank lending—the boom-bust cycle usually, with excessive lending at the boom stage and contractive lending at the bust. This is why we introduced loan-to-value ratio regulations in the first place. Second, how do we put macroprudential policy into our inflation-targeting framework? In 2013, after we increased the policy interest rate by about 175 basis points, we saw that aggregate lending started to decelerate, but some sectors were not so responsive to the interest rate rise. It's in those sectors, such as housing property and automobile finance, where we employed limits on the loan-to-value ratio. We did not apply macropruden-tial regulations in other sectors where there were interest rate responses. As I mentioned, the real estate sector is not so responsive to our macroprudential measures because the big developers can resort to overseas borrowing to off-set the loan-to-value ratio limits. As I said, from the monetary policy perspec-tive, macroprudential policy works as a complement to our interest rate policy.

Mr. Spiegel: Thank you. Are there any other questions from the audience?

Mr. Williams: I want to go back to Jeff Frankel's paper from yesterday on pol-icy cooperation and coordination. I think all three of you mentioned the Federal Reserve about 572 times. So I was curious about your views on what central bankers could do better on policy coordination beyond having more meetings in Basel. I think it was mentioned yesterday. What are the opportunities in your views, if any, for better monetary policy cooperation and coordination?

Mr. Spiegel: Any other last questions? Let me give you each an opportunity to answer John's question. And then if you add any remarks, we'll close with that.

Ms. Shirai: First, I want to add to my comments on the earlier question about Japanese debt. I want to emphasize that this is a domestic problem, not an external problem, at the moment. Our current account is in surplus, around 3 percent of GDP. And probably we can maintain it near 3 percent in the near future. That means that even though Japan's fiscal debt level is very large, it's covered by the saving investment balance of the private sector. So in flow terms at this moment, we don't have a serious issue. In stock terms, when we look at Japan's net international investment position, it's positive, one of the largest in the world. So we have lots of foreign assets. So that's why Japanese government

bonds are still trusted even though the debt-to-GDP ratio is about 220 percent. But that's in gross terms. Because the Japanese government holds asset claims on other parts of the public sector, the debt level is lower in net terms, around 150 percent of GDP. That's why at the moment nobody's really panicked in Japan. So we still have some time, but that doesn't mean the government should not do anything. It has to make progress on fiscal consolidation.

Responding to the question about policy coordination, Japanese currency is one of the key currencies in the global financial system. I think it's very difficult for an individual central bank to coordinate its monetary policy with the policies of other central banks. However, there has been effective coordination through the currency swap arrangements of major central banks, including the U.S. dollar, Japanese yen, euro, Swiss franc, Canadian dollar, and the pound. As I mentioned earlier, during the 2010–12 European debt crisis, the Federal Reserve provided dollar funding and helped mitigate contagion effects and the deepening of banking-sector problems. I think the swap arrangements are becoming more permanent based and have helped global financial stability. Another example of regional cooperation is the Chiang Mai Initiative that now supports multilateral currency swaps among 11 Asian central banks, including the Bank of Japan. This initiative also introduced an Asian bond fund in early 2000 to help develop local-currency-denominated bond markets in Asia after the East Asian crisis. This has helped to make asset markets in the region more liquid and efficient.

Mr. Hahm: I think that's a very challenging question. I think, John, you already have contributed a lot to international coordination of monetary policy by having this kind of conference that enables policymakers to understand each other's problems. Perhaps what policymakers can do is to share more information among central banks and maybe to conduct joint research on, say, the spillover effects of monetary policy to other countries. Such joint research by central banks may help us understand the issues better and how to achieve international coordination among monetary policymakers.

Mr. Warjiyo: In a world of globalized, but independent, monetary policy focused on domestic objectives, I'm not sure if formal international policy coordination can be achieved. I agree with what Jeff said in his session. Cooperation is important in the sense of sharing information and openly discussing issues, such as the spillover effects of monetary policy on other countries. When I look at, for example, U.S. monetary policy communication, compared to 2013, we are now in a better position to understand the direction and likelihood of U.S. monetary policy. In 2013, I don't think we had dot plots about the Federal Open Market

Committee's interest rate path. And now, at least by looking at the dot plots and Bloomberg forecasts and so on, we can take into account the likelihood of a future federal funds rate increase in our policymaking. That's why in Indonesia we put a premium on the possibility of a federal funds rate increase. That's one thing. The other issue, as I said yesterday, the most difficult thing policymakers in emerging markets face is not anticipating when and how much the Fed will raise rates. Rather it is anticipating the market's reaction to the possibility of a federal funds rate increase. It is so much more difficult to predict and to anticipate market behavior and whether the markets will overreact.

Mr. Spiegel: Thank you very much. Please join me in thanking all the panelists for what was quite an interesting session.

Closing Remarks

Barry Eichengreen

It is one of the great pleasures of my association with the Federal Reserve Bank of San Francisco to give these closing remarks. Having done this twice before, in 2011 and 2013, this affords me the opportunity not just to highlight some insights from this year's papers but also to look back at the conclusions of those earlier conferences and see how they stack up in light of recent events.

In 2011 the focus was on Asia's role in what the organizers optimistically referred to as the "post-crisis global economy." The main conclusions—that Asian countries would remain deeply integrated into the international economy and that their influence over global economic prospects would, if anything, increase over time—have clearly been borne out by events. Integration has deepened further as countries like China have taken additional steps to relax regulations limiting the integration of their financial markets with those of the rest of the world. Further evidence of financial integration lies in growing offshore borrowing, mainly in Europe and the United States, of corporations in a variety of Asian countries, a phenomenon that is now widely seen as something of a mixed blessing. Earlier this year, starting on August 11, we saw how even a minor change in Chinese exchange rate policy could have major repercussions for global financial markets. Changing views of the prospects for Chinese economic growth now affect assessments of the economic outlook for countries in every part of the world. Global commodity prices have been shaped by events in Asia. Expectations about interest rate normalization by the Federal Reserve have been shaped by events in Asia. The tendency until recently for the growth of global trade to outstrip the growth of global gross domestic product (GDP) and now for the growth of trade to lag has been heavily shaped by events in Asia, first as regional supply chains developed and then as they approached their limits. Contributors to the 2011 Asia Economic Policy Conference (AEPC) were right to highlight these implications.

The other emphasis in 2011 was the linkage between monetary and financial policies. Strikingly, there was extensive discussion of what we would now call macroprudential policy, not least because the macroprudential policy toolkit was being pioneered by Asian countries like South Korea. There was extensive

debate about whether it would be possible to develop a macroprudential tool-kit sufficiently powerful to allow interest rate policy to be assigned exclusively to the central bank's inflation target, or whether it might be necessary to use interest rates to "get into all the cracks" of supervision and regulation, as Jeremy Stein subsequently put it. The debate then was inconclusive. It is fair to say that this remains the case today.

In 2013 the topic of the AEPC was Asia's growth prospects. The focus, not surprisingly, was on China and Japan, given the challenges of Chinese rebalancing and the advent of Abenomics. For China, the questions were whether the rate of economic growth was poised to slow and whether leaders were serious about rebalancing the economy from investment to consumption and from manufacturing to services. On the first question, the nearly unanimous answer was yes, on the grounds that no economy can grow by 10 percent per annum indefinitely (a point also emphasized by Stanley Fischer in his remarks at this year's conference), that the pool of underemployed labor had essentially been drained, and that raising service-sector productivity—China's challenge going forward—is harder than raising productivity in manufacturing. This conclusion, we can say, has been more than fully borne out by events.

On the second question, whether Chinese leadership was fully committed to reforming and rebalancing the economy, considerable uncertainty was expressed. I think subsequent party plenums and policies have tended to support a positive answer—that the authorities are indeed committed to rebalancing. That said, there have also been some indications that they are prepared to rebalance only as fast as is compatible with growth in the 6 to 7 percent range. Hence there has been some reluctance to restructure debts. Efforts to limit liquidity provision were reversed in mid-2015 when the economy started to sputter. We will have to continue to monitor how rapidly or slowly rebalancing now proceeds.

The other big unknown in 2013 was the success of Abenomics. I am happy to report, therefore, that the big unknown in 2015 is the success of Abenomics. The Bank of Japan (BOJ) has waged total war against deflation. Learning from the economic setback that followed the first increase in the value-added tax, the BOJ put a second increase on hold. Following this adjustment in fiscal strategy, the campaign against deflation and stagnation appeared to be gaining ground. More recently, however, Japan's economic performance has weakened again. (According to data for the third quarter of the year, the economy is back in "technical recession.")

The question is, why? It could be that the economy's productive capacity has been permanently reduced by the long period of stagnation. In seeking to

explain why a weaker yen hasn't done more to revive exports, some observers suggest that Japanese industry has been "hollowed out" by its lost decades. Olivier Blanchard, Eugenio Cerutti, and Lawrence Summers (2015) point to evidence suggesting that recessions can permanently reduce potential GDP, and we may be seeing this mechanism at work in Japan. Others suggest that the problem is a weak external environment and the failure of Japanese policy to do more, given the resistance of vested interests to structural reform and now the complications for the weak-yen policy of the need for U.S. congressional ratification of the Trans-Pacific Partnership.

The 2013 conference also came in the aftermath of the Fed's "taper talk," creating concern about the economic prospects of Asian countries, such as India and Indonesia, with large current account deficits. Two years later, all eyes are on interest rate normalization rather than tapering, but concern for emerging markets with large external obligations remains. At this point there seems to be less concern over India, where the current account deficit has shrunk very considerably as a result of low oil prices and where what remains is largely financed by inward foreign direct investment. Indonesia, on the other hand, suffers from being a commodity and energy exporter. Its current account deficit has shrunk as well, but in its case due to a weak economy and weak import demand. The worry now is not so much about the current account deficit as it is about servicing the existing stock of dollar-denominated debt of the corporate sector. If the rupiah weakens further, this will be worth watching closely.

Let me now say a few words about the papers, starting with that by Sebastian Edwards. Edwards takes a historical approach to the question of whether there could be contagion to Asian or Latin American emerging markets from Fed normalization. Naturally, I applaud his adoption of a historical approach. History offers a number of interesting episodes of anticipated and unanticipated increases in interest rates.

But we know that history doesn't repeat itself; it rhymes. There also may be significant differences in economic structures and circumstances leading Asian and Latin American central banks to respond differently this time. We heard about some of these in the discussion. Dollar-denominated corporate debt is more of a problem today. Short-term bank-intermediated debt, on the other hand, may be less of a problem, as bond issuance has risen relative to cross-border bank lending. In some cases, dollar invoicing and therefore pass-through may be less than in the past. In other cases, financial openness may be greater. What all this means for policy contagion is not exactly clear. But it does point to the question of whether the patterns that Edwards detects still hold today, out of sample. Edwards acknowledged the point in his conclusion. It bears repeating.

Loren Brandt's analysis of productivity growth in China at the firm level paints a convincing picture of relatively fast growth in industrial sectors most exposed to domestic and international competition and most subject to entry and exit. This result is intuitive, but documenting it has powerful policy implications. My question is whether the conclusions carry over to the service sector, something that Brandt flags in his introduction but does not pursue in his empirical analysis. The service sector will be the fastest growing part of the Chinese economy going forward, and a number of economies in whose footsteps China is following—in Asia, the Japanese and South Korean cases spring to mind—have experienced considerable difficulty in raising service-sector productivity.

This is part of a broader problem experienced across a broad swath of middle- and high-income economies, also something emphasized by Stan Fischer in his opening address. The question is, why? One traditional explanation, that advanced technology is less applicable to services than manufacturing, no longer appears to hold water, whether your preferred example is Uber, Airbnb, or Mechanical Turk. Another, that service-sector firms are small and that small firms have relatively low productivity, is similarly dubious in a world inhabited by the likes of Amazon and Alibaba.

More likely is that the service sector in many countries, including in Asia, has served as a catch basin for older workers displaced from industry as manufacturing becomes less labor intensive. Brandt mentioned this in his presentation. This highlights the need for public programs to provide retraining and productive employment for these workers, rather than shunting them off to the corner store.

Steve Cecchetti and Paul Tucker, our two leading authorities on macroprudential policy, ask if such policies need to be coordinated internationally, whether because global finance requires a common prudential standard, because effective enforcement requires coordination, or because dynamic regulatory policy adjustments in order to be effective have to be coordinated before and after the fact. The authors argue the case for the affirmative on all three grounds. In my view, the first argument is impeccable; lack of a common standard can allow a dangerous race to the bottom. The second argument is similarly strong, since otherwise there almost certainly will be cross-border externalities and spillovers that macroprudential regulators fail to internalize. And the third argument, that dynamic adjustments need to be coordinated, is just a special case of arguments one and two.

The question is whether such extensive cooperation is feasible under current institutional and political arrangements, or whether one can imagine new institutions that are up to the task. There have been ambitious institutional

developments to facilitate standard setting and information sharing through the Bank for International Settlements, the Financial Stability Board, and a variety of other entities, as documented by the authors in their paper. But the capacity of these entities to facilitate formal policy coordination—dynamic or even static—is another matter. The situation is analogous to that in the literature on international macroeconomic policy coordination, where standard setting (think inflation targeting) and information sharing (think the G-20 and World Bank/International Monetary Fund annual meetings) are relatively successful, but formal policy coordination (actual policy tradeoffs) has proven much harder to arrange.

Jeffrey Frankel addresses this question of macroeconomic policy coordination directly. His work with Katherine Rockett in the 1980s demonstrated that coordination could be counterproductive when policymakers disagree on the model. In his conference paper Frankel argues that such disagreements are, in practice, pervasive. It's hard to quibble with this conclusion, given recent disputes over the stance of policy in Europe and complaints by emerging markets about competitive currency depreciation by the United States and other advanced economies.

A new element in the paper is the question of whether there is a case for policy coordination when interest rates are at the zero lower bound. If monetary policy truly loses all effectiveness at the zero lower bound except insofar as it operates via the exchange rate, then monetary policy truly becomes a zero-sum game, creating a prima facie case for coordination. But if monetary policy, unconventional as well as conventional, can still work via the portfolio balance channel even at the zero lower bound, then the case is weaker. I have my own strongly held views of this question, but reasonable people can disagree—which is precisely the point of Frankel's paper.

Another element not addressed in the paper but relevant to this conference is whether there is a case for policy coordination—monetary policy coordination in particular—in Asia. One can argue that the depth of trade linkages and supply chains makes monetary and maybe also fiscal policy coordination especially desirable in the region. Explicit exchange rate and monetary policy agreements in Asia are therefore striking for their absence. One wonders whether this reflects historical political tensions or, alternatively, whether monetary policy coordination is really not so important after all.

If there is going to be meaningful monetary policy coordination in Asia, it will have to be coordination around, or at least involving, the renminbi. This brings us to Eswar Prasad's paper, which provides a definitive account of the progress and prospects of renminbi internationalization. Progress, the paper

documents, has been slow but steady—and in some cases, like last August 11, not so steady. Prasad emphasizes the structure and development of China's financial markets as a limiting factor governing the pace of internationalization.

I would point to China's political system as a second limiting factor. Every first-class reserve and international currency in history (every "safe-haven currency," as Prasad put it in his discussion) has been the currency of a democracy or a political republic. The sample is not large, to be sure. But there are sound reasons for believing in this association. Central banks and private investors will park a significant share of their reserve and investment portfolios in Shanghai only if there are checks on the arbitrary action of the executive—checks of a sort that we associate with political systems with multiple veto points. The question is, what kind of political change exactly is needed to foster renminbi internationalization? An independent central bank? An independent regulator? Something more?

Our organizers, authors, and discussants have given us a lot to consider. I hope to have the opportunity to revisit these issues with you in two years.

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The World Economy after the Global Financial Crisis

Maurice Obstfeld

It's a pleasure to return to this conference. As John Williams said in his introduction, my links to it go way back to the beginning, even to before the beginning. I gave a paper, with Ken Rogoff as coauthor, at the first of these conferences. And I'm now going to embarrass Mark Spiegel with an anecdote that shows how far back my involvement really goes. Sometime in the spring of 2008, when Mark and Reuven Glick were planning the first conference, Mark and I were having dinner in Oakland. It was around the time of Bear Stearns, and Mark and Reuven were kicking around possible topics for the commissioned papers. Mark asked my opinion. "The conference will be in the fall of 2009," he helpfully pointed out. "All of this turbulence will be over by then, so we'll be able to focus on other things." Needless to say, the focus of the first conference soon became all too evident.

My topic tonight is related to that long introduction. The theme of the present conference is "policy challenges in a diverging global economy." In line with that, I propose to focus on asking where we are in the extended aftermath of the global financial crisis that erupted decisively about six months after my dinner with Mark. I will take up the multiple forces that have given rise to this protracted, slow, uneven recovery. Some of these are legacies of the crisis itself. Some of these are trends that began before the crisis. And then, there are some more recent phenomena. The one I'll stress is also one that we discussed quite a bit today, macroeconomic slowdown and rebalancing in China. I will make an obvious point: It's not easy to see how we restore, if we even could restore, the kind of growth we saw before the global financial crisis. And at the very end, I'll talk about some of the International Monetary Fund's (IMF's) recommendations, which will probably come as no surprise to you.

The crisis of course caused a synchronized global contraction, and the recovery has been uneven, not only across advanced economies but also across emerging economies. The United Kingdom and especially the United States

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have recently been growing at fairly reasonable rates, but growth in the euro area and Japan remains too low. In emerging and lower-income economies, we also see a pattern of uneven growth. China is growing more slowly than its torrid rates of before the crisis and immediately afterward. But it is still growing at somewhere between 6 and 7 percent, in our estimation. India is growing as well—it is the fastest growing big country in the world. But countries like Russia and Brazil—those that are challenged by geopolitical factors or domestic political turmoil, as well as by external factors—are having an especially hard time. Commodity price declines, related to changing Chinese growth patterns as well as developments in oil markets, are battering exporters.

Moreover, looking forward and thinking about where we were before the financial crisis, growth expectations have been scaled back dramatically, not only in advanced economies but in emerging markets as well. Looking at the most recent data, prospects are looking pretty unfavorable compared with how they looked about a decade ago.

To even imagine getting the world economy back where it was, we must rely on emerging markets, including China. How far we have traveled from the world of the 1960s and 1970s, in which many of us went to school and started learning economics! Look at Figure 1. Not only has the pace of global growth declined since then, but the main regional contributors to global growth have changed dramatically over the decades, from a global economy where most growth was explained by advanced economies (the United States in particular) to one in which it's now explained by emerging and developing economies, especially China. This is both because the growth rates of those economies tend to be higher than in the advanced economies and because they represent an ever-increasing share of global output. While spillbacks from the emerging markets to the advanced economies were limited in the '60s and '70s, now they're a huge deal and must inform the way we think about global macroeconomic policies.

What are some of the forces that are determining where we are now, in terms of recovery and in terms of growth prospects? There are many factors: legacies of the crisis, developments that began before the crisis, and rather new developments. One legacy is very broad-based debt overhang. Globally, there is some deleveraging progress compared with the post-2006 peaks, but not a lot. And progress is uneven across countries. On the whole, private debt levels still remain high. Public debt levels remain very high. There has been quite a bit of fiscal adjustment in terms of government deficits, but even with that, government debt levels, relative to GDP, are not all that different from the post-2006 peaks. So, there is a lot of debt out there, including, in many economies, nonperforming loans that haven't been adequately addressed—think about Italy.

FIGURE 1
## Contribution to Global Real GDP Growth, Time-Varying GDP Weights
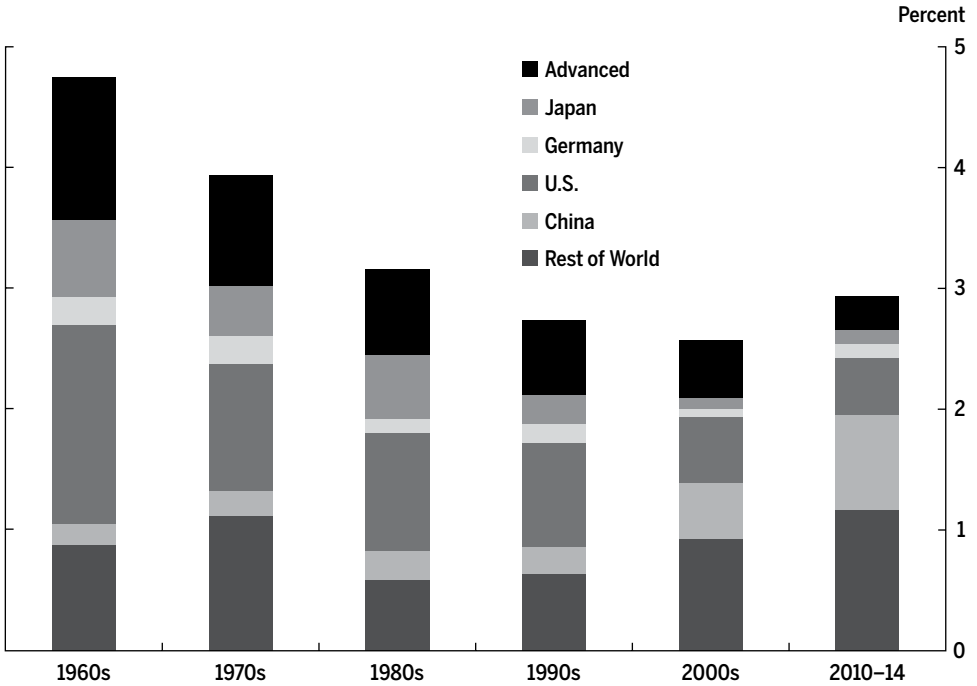
Source: IMF *World Economic Outlook.*

Another crisis legacy—and Barry Eichengreen referred to this in his summing-up of the conference—is the possibility of hysteresis, not only in potential output but also in potential output growth. Barry cited the work of Olivier Blanchard, Eugenio Cerutti, and Larry Summers (2015). Figure 2 illustrates the output gap effect; it comes from their paper. The distribution on the right-hand side shows where output gaps are three to seven years after a recession, relative to before the recession, using a sample of 122 recession episodes in advanced economies. You can see that the distribution is very much skewed to the right, to bigger output gaps. So, there is a lot of persistence of business cycles, and it is not surprising that we see that particularly in the latest experience. These effects also seem to affect growth rates and potential output. Is this something real? Is it just a figment of the observation that growth is trending down cyclically since the early postwar period? It is not entirely clear: there are multiple explanations. But these data are a fact that we need to contend with.

Declining productivity is another big factor driving current experience and our forecasts. The decomposition in Figure 3 illustrates the trend. It breaks

FIGURE 2
Output Gap Three to Seven Years after a Recession
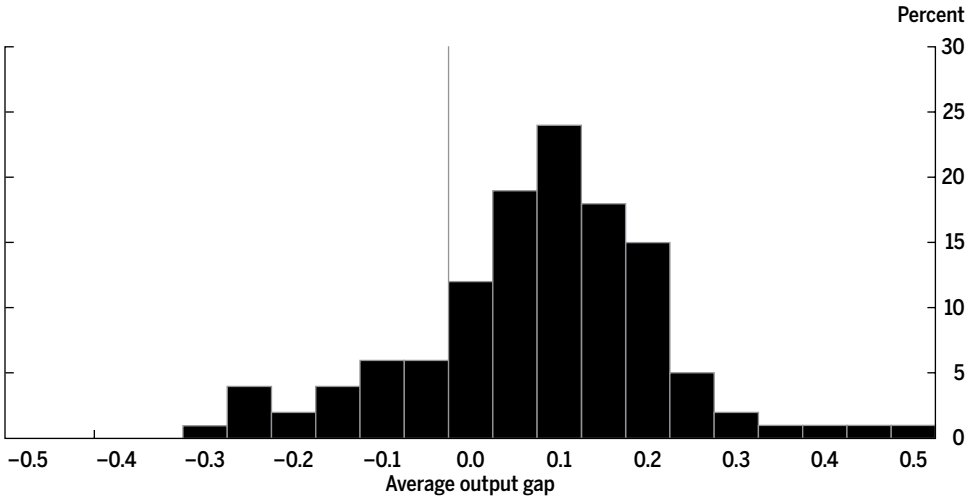
Source: Blanchard, Cerutti, and Summers (2015).
Note: Sample is 122 recession episodes in advanced economies.

FIGURE 3
## Declining Productivity in Advanced Economies*
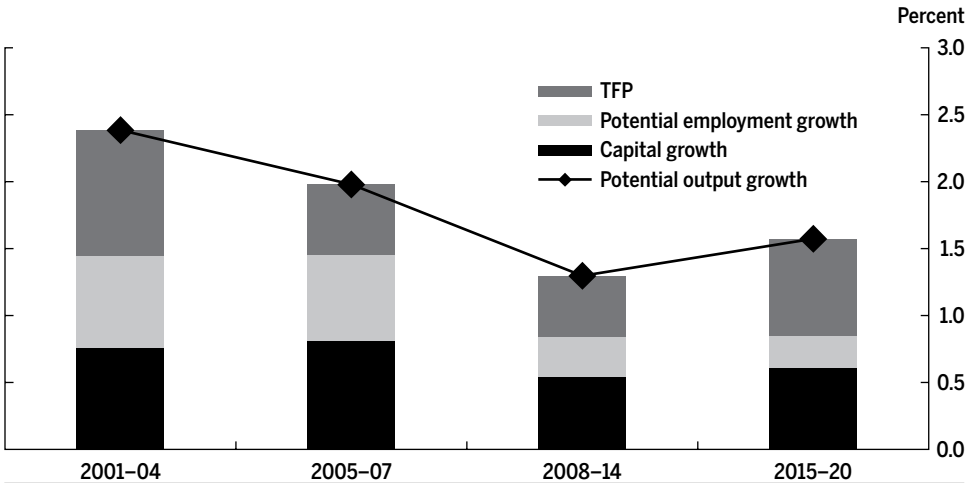
*Consists of Australia, Canada, France, Germany, Italy, Japan, Korea, Spain, United Kingdom, and United States.
Source: IMF (2015).

down output growth into labor, including the efficiency of labor, capital deepening, and total factor productivity (TFP). Since the early 2000s, the trend is strongly downward. Also driving what has been going on, in terms of potential growth, is a declining demographic trend—lower population growth, aging populations—even in emerging markets, including strongly in China.

What other trends are in play? One that has been very important, and has been the subject of public debate between Ben Bernanke and Larry Summers in their blogs (Bernanke 2015 and Summers 2015) as well as also covered by other research (e.g., IMF 2014, Council of Economic Advisors 2015, and Rachel and Smith 2015), is the decline in global real interest rates. For the United States, this process has been going on at least since the Volcker disinflation (see Figure 4); arguably, it has been going on much longer than that, perhaps since the 19th century, depending on whom you read. But what we can see in these data, which include both long-term and short-term nominal rates corrected for survey forecasts of inflation, is very low, even negative, real interest rates. Strikingly, short-term real rates have remained negative since 2008–09. In previous cycles, they recovered more quickly. In the current experience, they've remained very low. Again, there's much debate over the causes.

FIGURE 4
U.S. Real Interest Rates
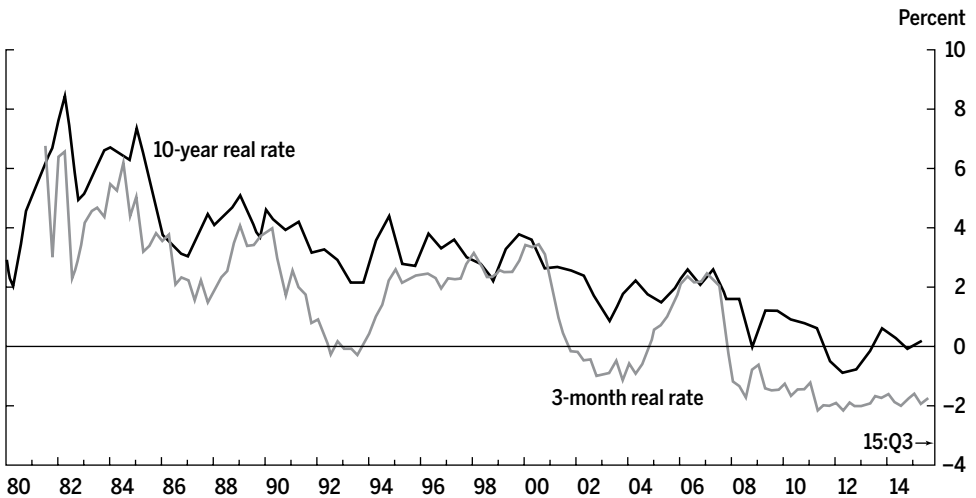
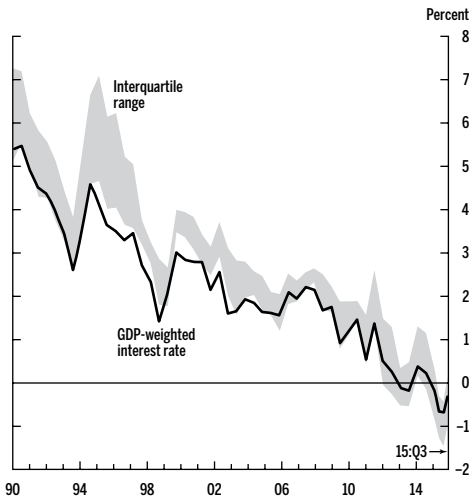**Sources:** Bloomberg L.P. and Federal Reserve Bank of Philadelphia.
Note: Real rates are calculated based on nominal government bond yields minus Survey of Professional Forecasters CPI inflation expectations.

Is this a harbinger of future growth? Does it reflect other factors? We don't know, but one thing we do know is that it has been a global phenomenon. Figure 5 tracks the coherence of international long-term and short-term real rates across advanced economies. As you can see, the dispersion is fairly limited, and if we were to add some of the more open emerging markets to the sample, we would see broadly similar trends for many of those.

Alongside trends that pre-date the global financial crisis, some more recent phenomena weigh on global growth. The central one has been the rebalancing and slowing of China, which has had multiple spillover effects throughout the world. One trend change has been the ongoing shift of China's economy toward the service sector and "new economy" sectors. This dynamic has clearly impacted the rate of growth overall, but it has also had a big effect on China's trade—a surprisingly big effect. China's trading partners have suffered as Chinese imports have slowed dramatically, and why imports have slowed this dramatically, with output still growing somewhere between 6 and 7 percent a year, is a puzzle. The apparently sharp shift in the economy toward services is clearly involved. Will services keep growing enough to take up the slack released by relative shrinkage in the traditional "old economy"? It is hard to say. Worth noting is that much recent growth in services in China was financial services, some

FIGURE 5
Global Real Interest Rates

A Global Long-Term Real Interest Rates (Quarterly)   **B** Global Short-Term Real Interest Rates
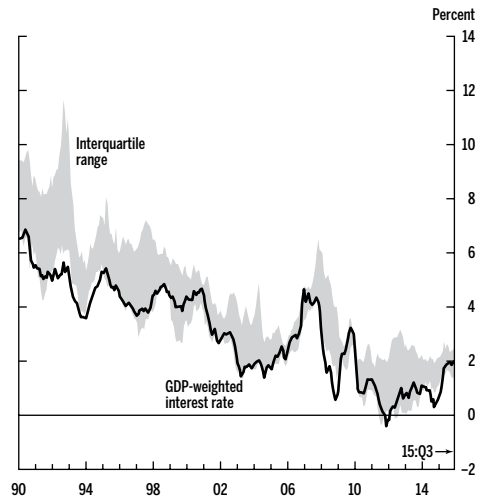
Sources: Global Data Source and Consensus Forecasts.

Note: Sample includes Australia, Canada, France, Germany, Italy, Japan, Netherlands, New Zealand, Norway, Spain, Sweden, Switzerland, United Kingdom, and United States.

of it connected with the stock market boom and collapse, especially in 2015, and that component of growth seems poised to slow.

Closely related to what is happening in China is the slowdown in global trade. We all know that global trade has been growing more slowly than GDP recently, whereas in the recent past it grew more quickly. It is less appreciated that this slowdown is really concentrated in emerging markets, circumstantial evidence that what is going on in China is a very big factor. Figure 6 shows recent patterns in world trade-volume growth.

A key mechanism through which China's rebalancing—its move away from investment, toward consumption and services—has spilled over to the world economy is through world commodity markets. Commodities have been declining for a while. The decline in oil began in earnest in mid-to-late 2014, but other commodities began falling much earlier, around 2011, when China stepped back from its model of heavy construction-based growth. The declines in prices of base metals have been particularly striking, because China is the world's leading consumer of those goods. China consumes 50 percent or more of the world's copper, iron, and nickel, and those commodities have taken a huge hit. (We've also seen falls in prices of agricultural commodities.) Chinese demand led a lot of emerging markets to invest heavily in mining capacity, so that now they have excess capacity—in many cases in a main export, the price of which is very low. Adjusting to this new normal will be painful and slow. And commodity prices are not likely to bounce back anytime soon.

One reflection of this can be seen in capital flows. In some cases, emerging markets have intervened to prevent excessive or disorderly currency depreciation, and some countries' reserves have gone down as a result, the most notable case being China's loss of reserves between summer of 2014 and recently. For countries that do not intervene in the foreign exchange market, measured net capital outflows (aside from errors and omissions) cannot exceed the current account surplus, yet we can still see incipient capital account pressures in exchange rates (which have depreciated) and sovereign spreads (which have risen, notably in Latin America and Africa).

What am I most worried about? There are many things one could worry about, but one of several concerns is deflation. The U.S. situation seems fairly healthy, but if we look around the world, the number of countries experiencing low inflation—either below 2 percent, below 1 percent, or below 0 percent—has crept up, whether you look at headline inflation or, to a lesser extent, core inflation or inflation expectations (Figure 7). At the zero lower bound, our ability to address inflation by standard monetary policies is compromised. If you have a roaring inflation, you can always raise interest rates. If you're at the zero lower

FIGURE 6
Trade Volumes and Output Growth*
(percent, year-over-year)

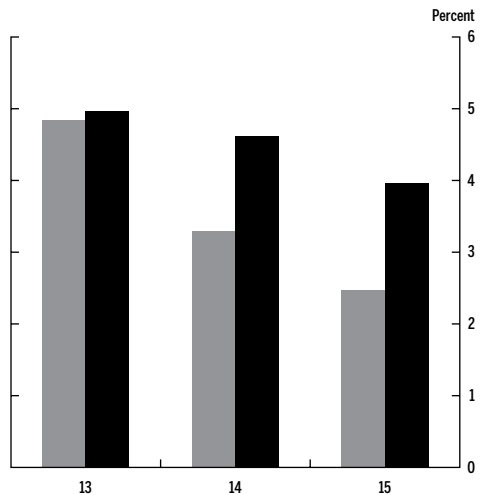**A World**

Percent, YoY
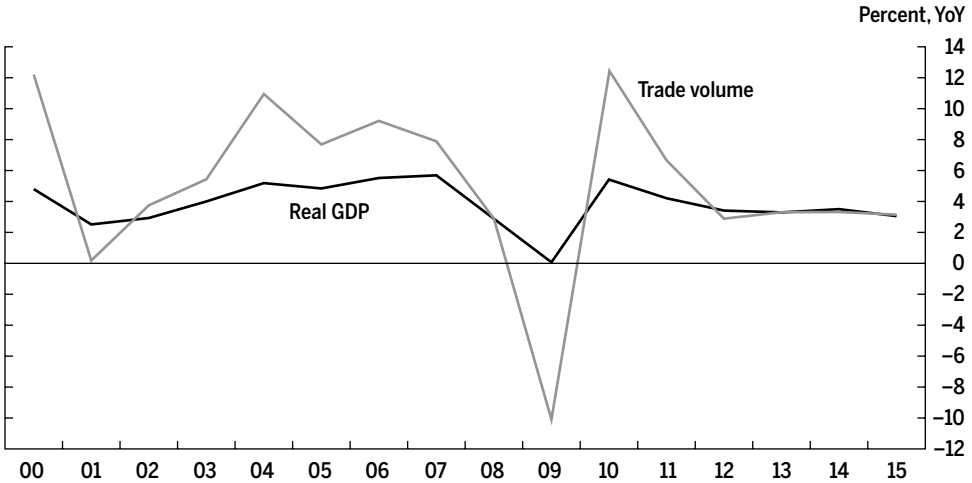
B Advanced Economies

Percent
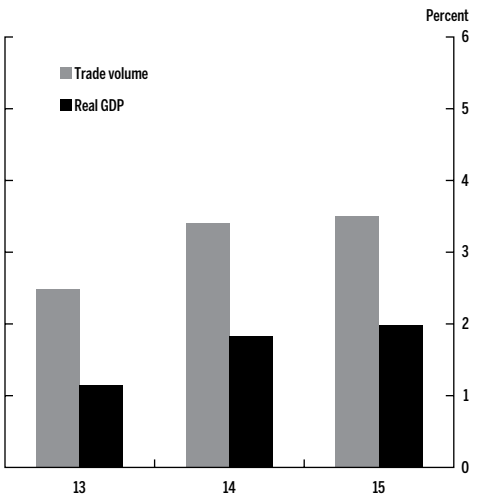
C Emerging Market and Developing Economies

Percent

*Trade is measured by the volume of total imports and exports of goods and services (in real U.S. dollars).
Sources: IMF *World Economic Outlook* and IMF staff calculations.

bound, you can do quantitative easing. You can think about negative interest rates, which can only go so far. But the tools are much less powerful. And so, there really is a risk that expectations become unmoored and anchorless. Is this going to happen broadly in the world economy? I think some economies could be at risk. The overall trend is worrisome.

FIGURE 7
Number of Countries with Low Inflation Rates
(out of 55 countries)

A Headline CPI Inflation

Inflation rate below 2%
Inflation rate below 1%
Inflation rate below 0%

B Core CPI Inflation

C Inflation Expectations, One Year Ahead
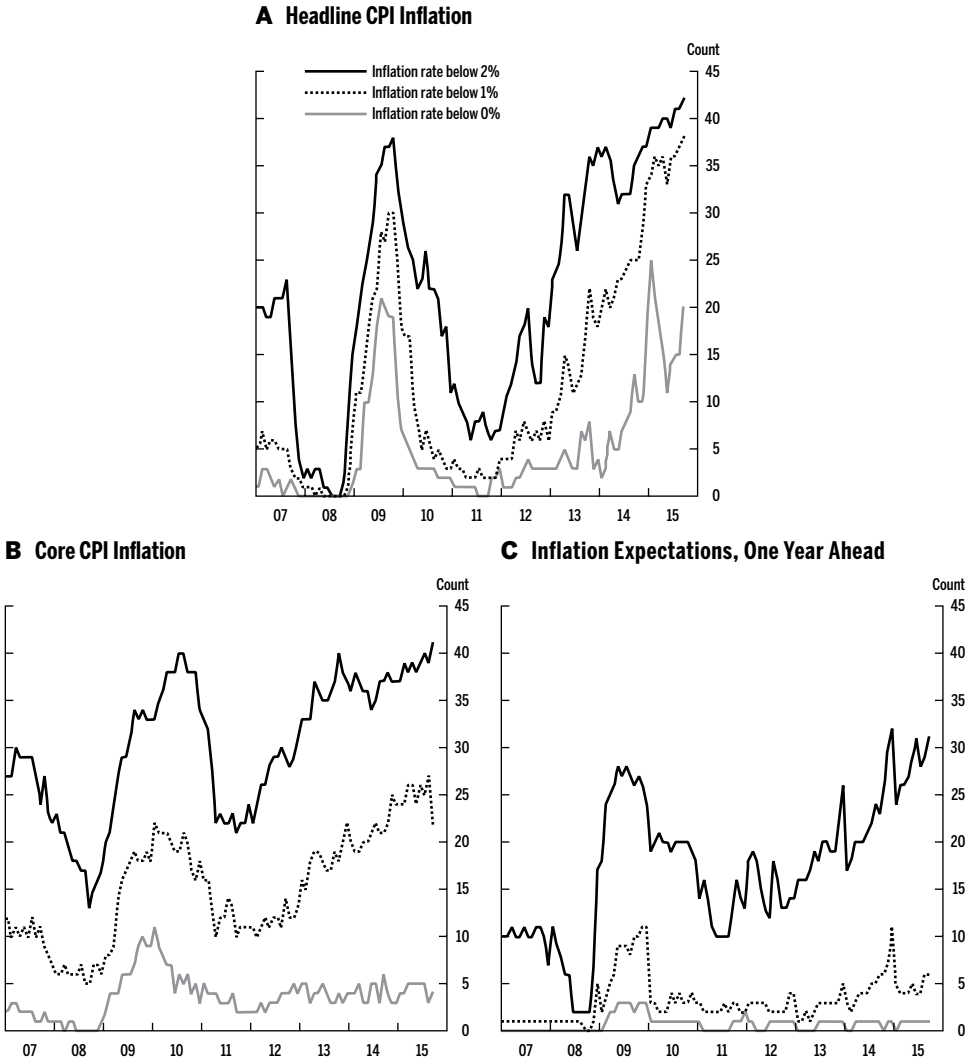
Sources: Global Data Source and IMF staff calculations.

Despite earlier speakers' desire to ban these clichés, I am still compelled to warn that there are no panaceas, no silver bullets. But the IMF's job is to give advice, so we do have some prescriptions. All of these things are easier said than done, but they do need to be done if we hope to return closer to previous growth rates. Deal with the legacies, including nonperforming loans. Where

inflation is below target, where deflation is a threat, where expectations need to be restored to appropriately anchored levels, monetary accommodation should continue, and in the euro area and Japan in particular. And in the United States, a smooth normalization of monetary policy, with clear communications, will be a good thing. Macroprudential policy is also important. A number of concerns arise from the period of low interest rates: Have there been excessive risk-taking, asset bubbles, too much borrowing in dollars by emerging market corporates? And in some countries, there remains scope to utilize fiscal space: I can think of some candidates in Europe with very large current account surpluses, whose residents are not earning much on their foreign investments but could possibly earn more on needed domestic infrastructure.

What about emerging markets and developing economies? Many of them could improve their business climates, stimulating investment. Many of them will now have to work very hard at diversifying their export bases, because China is not going to be there for them in the same way that it was over the past 15 years. One likely success story is the reliance on exchange rate flexibility (Obstfeld 2015). We've seen fairly large depreciations without huge knock-on effects in financial markets so far, and that is very different from the Asian crisis of the late 1990s. Of course, there is still the potential for unpleasant surprises. But for now, the shock-absorbing properties of flexible exchange rates seem to be confirmed. Again, as in advanced markets, macroprudential supervision frameworks need to continue to be elaborated; we heard in the panel earlier today that, indeed, that work is continuing.

For all countries, there are some common tasks. There is a huge pay-off, short run as well as long run, to increasing potential output and potential growth. The big question is, how? Infrastructure investment certainly is part of the picture. At the IMF, we're also working hard on understanding structural policies, and we're learning that what works differs from country to country. We already knew that the political obstacles can be very big, so the dynamics of the impacts are important. But what structural reforms could we and should we go for, and in what settings? Figuring that out is a work in progress, but it is necessary in order to escape the environment of subdued and uneven growth that persists years after the global financial crisis.

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GENERAL DISCUSSION
The World Economy after the Global Financial Crisis

Mr. Williams: On your last slide you listed a set of policy concerns. Your list included deflation risk from the lower bound and the need for structural reforms to increase potential output. These are all very reasonable. But Gauti Eggertson has written a number of papers that say that when you're at the zero lower bound, increasing supply through structural reforms actually creates bigger output gaps and more deflationary pressure. So at the zero lower bound, a lot of our conventional wisdom is reversed. What is your view on that?

Mr. Obstfeld: Well, I think Gauti's models are special, but I think it's a mistake to think about doing different policies one at a time. So if you're considering doing growth-enhancing reforms that have a short-run deflationary effect, you also should be thinking about what other policies you should do at the same time to offset the latter effect. Can you use fiscal policy? Can you use monetary policy? Coming up with the right policy package is the way we should be thinking about this, particularly a package that works to increase potential output.

Mr. Hutchison: Maury, I'm wondering about your point that some advanced economies should utilize their available fiscal space. I can imagine the countries you're thinking of there, which have very solid fiscal positions. But given Jeff Frankel's talk earlier today about the difficulties with policy coordination, it seems to me you're suggesting the policymakers in these countries should utilize fiscal space in order to help others, even if the political dynamics and the economics of their own country suggests otherwise. So, are you suggesting that countries should go against what they view is in their national policy interest? That is, to help the world economy, they should start pursuing much more expansionary policies?

Mr. Obstfeld: Consider a random economy with high national saving, call it Germany. Now, from the point of view of maximizing national income, if you can borrow at a very low interest rate and invest in productive domestic infrastructure rather than in lower-yield foreign assets, there's a net gain for the country. It's a winner. It raises national output. So, I would contest the point that it's not in their interest. They may not view it as in their interest, but I think it's our job as economists to make the case that it is. But I wouldn't say that we're

arguing on the basis that this will help the world economy. Now, of course it will help the world economy. And there's a legitimate case to be made that excessive external surpluses are a bad thing. But I think on purely domestic grounds, you can make the case that greater fiscal spending would be good. Now, people will argue that it increases the debt. But I view that more as a figment of the way we do fiscal accounting. If you have a capital account and recognize that you're using debt to fund a productive investment that yields more than the debt costs you, economic theory would say it's a net gain. So, that's the argument that I would make to the Germans. Now, would they listen? No. We know that. But it's our job to keep saying it.

Mr. Prasad: Before September, your boss, Christine Lagarde, and your now colleagues at the International Monetary Fund (IMF, or the Fund) suggested that a Federal Reserve rate hike in September (2015) is too soon. What is the official Fund view now about whether December is the right time? And even if the Fed's normalization process starts smoothly in December in the United States, do you think the effects will be tough for the rest of the world to deal with?

Mr. Obstfeld: Well, I'm not the repository of the Fund's official position on your question, as hard as that may be to believe. I think the original statements that were made by IMF officials over the past summer were based on an assessment about where the U.S. economy and world economy would be in the latter half of 2015. And in their view the state of world economy would not be conducive to normalization. It will be interesting to see what the Fund says in December if the Fed actually does increase rates. So, I'm basically going to dodge that question. It has been interesting that a number of emerging market central bankers have said to the Fed, just do it already—begin raising rates. I think that reflects their view that this will eliminate uncertainty in financial markets. But I feel that it will not eliminate the uncertainty, because after the Fed first raises its target interest rates by, say, 25 basis points, we likely still won't know what is the future path of U.S. monetary policy. I feel that these emerging market central bankers want to establish that they can withstand the first jolt. And then once they've done that, any subsequent developments will be easier to withstand. This has been built up into such a big thing that they want to get it over with. But I would add that there has been some signaling from the Fed, that the ultimate interest rate level will be reached more slowly and that it may not be as high as some expect. And I think that has had a stabilizing influence. So, my sense is that at this point financial markets have pretty well factored in the prospect of a Fed hike. Expectations have been managed. It's hard to imagine that a December liftoff would be a surprise. But that's just one person's view.

Mr. Claessens: I want to follow up a little bit with a combination of both Eswar's (Prasad) and Michael's (Hutchison) comments. You haven't said anything about the role of the IMF. You've said advanced countries should do this and emerging markets should do that. But what can the IMF do to help this process, particularly on the coordination side? More specifically, what are your views on what we need to do better to coordinate on monetary policies going forward?

Mr. Obstfeld: Well, I think the best thing we can do is try to promote policies that would lead to more balanced growth in the world economy. We've seen incredibly uneven growth since the global financial crisis. First the U.S. was recovering slowly, while emerging markets and China were growing more quickly. Then we went into the euro crisis. Now we're in a situation where the emerging markets, feeling the spillover from China and experiencing some domestic problems, are growing very slowly. And whenever that happens, we have very big exchange rate adjustments and discussions of currency wars or competitive depreciations, and spillover effects. So, I think the best thing that we can do is to promote a more balanced growth path. If we can't do that, I think we should promote resilience-building measures that allow the world to tolerate big exchange rate changes, because currency changes ultimately are the shock absorbers that help reconcile different countries' policies. It's not within the Fund's mandate to actually ask countries to take into account international spillovers when setting their policies. So we try to make their effects evident and we try to talk to about them. But ultimately, we recognize that countries will follow their domestic mandates. So, the question is, how do you make the world safer for central banks and governments to do that?

Mr. Hoshi: On the issue of the IMF's role, I want to comment on the useful function that the IMF can play in facilitating structural reforms. As an example, I want to point out what the IMF did in its Article 4 consultation with Japan this year. The IMF not only listed the individual potential structural reform measures that Japan could undertake but also estimated how much each reform would increase potential output. So I think that this helped the policy discussion in Japan very much.

Mr. Obstfeld: Yes, the structural changes that might help raise potential output differ from country to country. Japan has a number of issues, which you went through very nicely in your paper with Anil (Kashyap) and which I heard in July. Among these are labor force participation. That's also a big factor in the United States. If you look at emerging markets, as I mentioned in my remarks, the business and investment climate are a big issue. Investment is low every-

where, and anything we can do to jump-start it would be welcome. In many countries there are supply bottlenecks. There are labor market rigidities. There are product market distortions. So, there's a long laundry list. But there is no one-size-fits-all prescription.

Mr. Choi: I have a question about the relationship between demand and supply. In normal times, demand moves in tandem with the supply side. But in recent years, I'm wondering whether the fall in demand could be having an influence on supply. Potential GDP could be affected by many factors, such as population aging and heightened uncertainty, which discourage investment. But in addition many countries, including advanced economies, are very concerned about a widening gap between their wages and productivity, as real wage growth undershoots productivity growth.

If such a gap continues, it could be a constraint on consumption and aggregate demand. If this downward pressure on demand persists, there could be consequences on the supply side as well. So, what is your view about this?

Mr. Obstfeld: You raised a number of very important questions. I think it's absolutely true that demand influences growth and possibly potential growth. You see this in the histogram that I showed in the Blanchard et al. work. It was also a major theme of the IMF's *World Economic Outlook* last spring, which was basically about the investment accelerator and the role of low demand in creating low investment. But I believe there's also a feedback in the other direction as lower potential growth acts as a drag on demand and leads to even lower potential growth. So, you can get into a trap. The wage issue is a very interesting one, particularly as the trend shift of income away from labor toward capital actually dampens aggregate demand. And this is a trend that we've seen throughout the world, including in emerging markets, that is, the labor share has gone down as the capital share has risen. So, I think that's a relationship we have to understand better so we know what type of policies can be used that would help rather than hurt. But there's no question that that's a big puzzle. Is it due to globalization? Is it due to technology? Is it something more related to rents in the economy and the way they're shared, which might be more amenable to policy measures? We don't really know, and it definitely warrants more research.

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Joshua Aizenman joined the faculty at University of Southern California (USC) in 2013, where he serves as the Dockson Chair in Economics and International Relations. He also serves as a Research Associate for the National Bureau of Economic Research and co-editor of the *Journal of International Money and Finance.*

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Mr. Eichengreen's most recent books are *Hall of Mirrors: The Great Depression, The Great Recession, and the Uses—and Misuses—of History* (Oxford University Press, 2015) and *From Miracle to Maturity: The Growth of the Korean Economy* with Dwight Perkins and Kwanho Shin (Harvard University Asia Center, 2012).

Mr. Eichengreen was awarded the Economic History Association's Jonathan R.T. Hughes Prize for Excellence in Teaching in 2002 and the University of California at Berkeley Social Science Division's Distinguished Teaching Award in 2004. He is the recipient of a doctor honoris causa from the American University in Paris, and the 2010 recipient of the Schumpeter Prize from the International Schumpeter Society. He was named one of *Foreign Policy Magazine*'s 100 Leading Global Thinkers in 2011.

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Stanley Fischer took office as a member of the Board of Governors of the Federal Reserve System on May 28, 2014, to fill an unexpired term ending January 31, 2020. He was sworn in as Vice Chairman of the Board of Governors on June 16, 2014.

Before joining the Board, Mr. Fischer was Governor of the Bank of Israel from 2005 to 2013. From 2002 to 2005, he was Vice Chairman of Citigroup. He served as the first Deputy Managing Director of the International Monetary Fund from 1994 to 2001 and Chief Economist of the World Bank from 1988 to 1990. Mr. Fischer was a Professor of Economics at the Massachusetts Institute of Technology (MIT) from 1977 to 1999; the Elizabeth and James Killian Class of 1926 Professor from 1992 to 1995; and an Associate Professor of Economics

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Fabio Ghironi, Professor
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Fabio Ghironi is the Paul F. Glaser Endowed Professor in Economics at the University of Washington. He is a Research Fellow in the International Macroeconomics Programme of the Centre for Economic Policy Research, a Research Associate in the International Finance and Macroeconomics Program of the National Bureau of Economic Research, and a Fellow in the Euro Area Business Cycle Network.

Mr. Ghironi is an officer of the Central Bank Research Association and the Director of its Research Program in International Trade and Macroeconomics. He is the U.S. associate editor of *International Finance*, a co-editor of *economics*, an associate editor of the *Journal of International Economics*, and an editorial board member of the *Review of International Economics*.

Mr. Ghironi obtained a Laurea in Economic and Social Sciences from Bocconi University in 1993, a master's degree in Economics from the same institution in 1994, and a Ph.D. in Economics from the University of California, Berkeley, in 1999. Prior to joining the faculty at the University of Washington, he was a faculty member at Boston College and an economist at the Federal Reserve Bank of New York.

Mr. Ghironi's main areas of research are international macroeconomics, macroeconomics, and monetary economics. His work has been published in the *Journal of Political Economy*, the *Quarterly Journal of Economics*, and several other leading journals.

Linda S. Goldberg, Vice President of Financial Intermediation
Federal Reserve Bank of New York

Linda S. Goldberg is a Vice President of Financial Intermediation at the Federal Reserve Bank of New York and a Research Associate of the National Bureau of Economic Research.

Ms. Goldberg's main areas of expertise are in global banking, international capital flows, and the international roles of currencies. She is the Director of the Center for Global Banking Studies at the Federal Reserve Bank of New York, Chair of the Council on Global Economic Imbalances of the World Economic Forum, and a Research Fellow with the Bank for International Settlements. She is the Co-Chair of the International Banking Research Network, which collaborates across central bank and international organizations to study domestic and global liquidity risk transmission through bank balance sheets and international spillovers of prudential policy instruments.

Ms. Goldberg is on the board of the Committee on the Status of Women in the Economics Profession for the American Economic Association. She serves on the editorial board of the *Journal of Financial Intermediation* and the *Journal of Financial Services Research* and previously served as book review editor of the *Journal of International Economics*.

Ms. Goldberg was a Professor of Economics at New York University and has been a visiting professor at Princeton University and the University of Pennsylvania. She has worked with numerous international agencies, including the

International Monetary Fund, the World Bank, and the Organisation for Economic Co-operation and Development.

Ms. Goldberg earned a Ph.D. in Economics from Princeton University and a bachelor's degree in Mathematics and Economics from Queens College, City University of New York.

Joon-Ho Hahm, Member, Monetary Policy Board
Bank of Korea

Joon-Ho Hahm is a member of the Monetary Policy Board of the Bank of Korea. He is currently on leave from Yonsei University, where he serves as a Professor of International Economics and Finance.

Mr. Hahm began his academic career as an Assistant Professor of Economics at the University of California, Santa Barbara, and was later a Research Fellow at the Korea Development Institute before joining the Yonsei faculty.

Mr. Hahm has been a Specialist Commission Member of the Republic of Korea's Presidential Commission for Financial Reform, a Listing Committee Member for the Korea Exchange, and a Non-Executive Director of the Korea Deposit Insurance Corporation, Woori Bank, Prudential Asset Management, and NH Life Insurance. He has served in a variety of advisory and consultative roles for the Korean government and for international organizations, including the World Bank and the Asian Development Bank.

Mr. Hahm received his MBA and Ph.D. from Columbia University's Graduate School of Business. He has written extensively in the fields of economics and finance, with his academic articles having appeared in numerous internationally renowned journals including the *Journal of Economic Dynamics and Control, Review of Economics and Statistics*, and *Journal of Money, Credit and Banking*.

Maurice Obstfeld, Economic Counselor and Director of Research
International Monetary Fund

Maurice Obstfeld is the Economic Counselor and Director of Research at the International Monetary Fund (IMF), on leave from the University of California, Berkeley, where he is the Class of 1958 Professor of Economics and former Chair of the Department of Economics (1998–2001). He began as a professor at Berkeley in 1991, following permanent appointments at Columbia University (1979–86) and the University of Pennsylvania (1986–89) and a visiting appointment at Harvard University (1989–90).

From 2014 to 2015, Mr. Obstfeld served as a member of President Obama's Council of Economic Advisers. He served as an Honorary Advisor to the Bank

of Japan's Institute for Monetary and Economic Studies from 2002 to 2014. He is a Fellow of the Econometric Society and the American Academy of Arts and Sciences.

Mr. Obstfeld has received Tilburg University's Tjalling Koopmans Asset Award, the John von Neumann Award from Rajk Laszlo College of Advanced Studies (Budapest), and Kiel Institute's Bernhard Harms Prize. He has delivered the American Economic Association's Richard T. Ely Lecture, the L.K. Jha Memorial Lecture of the Reserve Bank of India, and the Frank Graham Memorial Lecture at Princeton. Mr. Obstfeld served on the Executive Committee and as Vice President of the American Economic Association. He has consulted and taught at the IMF and numerous central banks. He has co-authored two leading textbooks on international economics and more than 100 articles.

Mr. Obstfeld received his Ph.D. in Economics from the Massachusetts Institute of Technology in 1979, his master's degree from King's College, Cambridge University, and his bachelor's from the University of Pennsylvania.

Eswar S. Prasad, Professor
Cornell University

Eswar S. Prasad is the Tolani Senior Professor of Trade Policy at Cornell University. He is also a Senior Fellow at the Brookings Institution, where he holds the New Century Chair in International Economics, and a Research Associate at the National Bureau of Economic Research. He was previously Chief of the Financial Studies Division in the International Monetary Fund's Research Department and, before that, was the head of the Fund's China Division.

Mr. Prasad published the books *The Dollar Trap: How the U.S. Dollar Tightened Its Grip on Global Finance* in 2014 (Princeton University Press) and *Emerging Markets: Resilience and Growth Amid Global Turmoil* in 2010 (with M. Ayhan Kose; Brookings Institution Press). He has co-authored and edited numerous other books and monographs on financial regulation and on China and India.

Mr. Prasad has testified before the Senate Finance Committee, the House of Representatives Committee on Financial Services, and the U.S.-China Economic and Security Review Commission. He was a member of the analytical team that drafted the 2008 report of the High-Level Committee on Financial Sector Reforms set up by the Government of India. He serves on an Advisory Committee to India's Finance Minister and is Lead Academic for the DFID-LSE International Growth Center's India Growth Research Program. He is the creator of the Brookings-Financial Times world index (TIGER: Tracking Indices for the Global Economic Recovery; http://www.ft.com/tiger). His

op-ed articles have been published in the *Financial Times*, *Harvard Business Review*, *New York Times*, *Wall Street Journal*, and *Washington Post*.

Sayuri Shirai, Member, Monetary Policy Board
Bank of Japan

Sayuri Shirai has been a member of the Monetary Policy Board of the Bank of Japan since April 2011.

Ms. Shirai started her teaching career as Assistant Professor of International Finance and Japanese Economy at Keio University in 1998. She was promoted to Professor in 2006 and continued teaching at the University until she was appointed to her current position. She also served as a visiting scholar at the Asian Development Bank Institute from 2000 to 2003. Prior to that, she served as an economist at the International Monetary Fund from 1993 to 1998.

Ms. Shirai graduated from Keio University and holds a Ph.D. in Economics from Columbia University. She is the author of numerous articles in professional journals. She has also published several books in Japanese on China's exchange crises, Japan's macroeconomic policy, development assistance policy, and the European sovereign debt crisis.

Linda Tesar, Professor
University of Michigan

Linda Tesar is currently a Professor of Economics in the Department of Economics at the University of Michigan. She received her Ph.D. from the University of Rochester in 1990 and joined the faculty at the University of Michigan in 1997. She is a Research Associate at the National Bureau of Economic Research and has been a visitor in the research departments of the International Monetary Fund, the Board of Governors of the Federal Reserve System, and the Federal Reserve Bank in Minneapolis. She has also served on the Academic Advisory Council to the Federal Reserve Bank of Chicago and as a Senior Macroeconomist on the Council of Economic Advisers.

Ms. Tesar's research focuses on issues in international finance, with particular interests in the international transmission of business cycles and fiscal policy, the benefits of global risk sharing, capital flows to emerging markets, international tax competition, and the impact of exchange rate exposure. Results of her research have been published in the *American Economic Review*, *Journal of International Economics*, *Review of Economic Dynamics*, and *Journal of Monetary Economics*.

Perry Warjiyo, Deputy Governor
Bank Indonesia

Perry Warjiyo is currently Deputy Governor of Bank Indonesia. Previously he was Assistant Governor for monetary, macroprudential, and international policy, and Executive Director of the Economic Research and Monetary Policy Department at Bank Indonesia since 2009.

Before rejoining Bank Indonesia in 2009, Mr. Warjiyo served for two years as an Executive Director in the International Monetary Fund, where he represented the thirteen member countries in the Southeast Asia Voting Group. He has a long-standing career in Bank Indonesia in the areas of economic research and monetary policy, central banking studies and training, monetary policy strategy and organization transformation, foreign exchange management, and international issues.

Mr. Warjiyo is also a lecturer in post-graduate studies at the University of Indonesia and a visiting lecturer at a number of reputable universities in Indonesia.

Mr. Warjiyo earned a master's degree in 1989 and a Ph.D. in 1991 in Monetary and International Finance from Iowa State University. He has written and published a number of books, journals, and papers on economic, monetary, and international issues.

Shang-Jin Wei, Chief Economist
Asian Development Bank

Shang-Jin Wei is the Chief Economist of the Asian Development Bank (ADB). He is the chief spokesperson for the ADB on economic and development trends, and leads the Economic Research and Regional Cooperation Department.

Mr. Wei has a long and distinguished career in academia and international finance and trade. Before joining the ADB he was the N.T. Wang Chair and Director of the Chazen Institute of International Business at Columbia University, Director of the National Bureau of Economic Research's working group on the Chinese economy, and a Research Fellow at the Centre for Economic Policy Research.

Before joining Columbia University, Mr. Wei served as Assistant Director and Chief of the Trade and Investment Division at the International Monetary Fund (IMF), where he led the Fund's policy research and advised on issues in international trade, investment, globalization, and related topics. He was IMF Chief of Mission to Myanmar in 2004.

Mr. Wei served as an advisor on anti-corruption policy and research at the World Bank from 1999 to 2000. He was an Assistant and Associate Professor at Harvard University from 1992 to 1999.

Mr. Wei earned a Ph.D. in Economics and a master's degree in Finance from the University of California, Berkeley; a master's degree in Economics from Pennsylvania State University; and a bachelor's degree in World Economy from Fudan University in the People's Republic of China.

John C. Williams, President and Chief Executive Officer
Federal Reserve Bank of San Francisco

John C. Williams took office as President and Chief Executive Officer of the Federal Reserve Bank of San Francisco on March 1, 2011. In this role, he serves on the Federal Open Market Committee, bringing the perspective of the Federal Reserve's 12th District to monetary policy discussions in Washington. Mr. Williams previously served as Executive Vice President and Director of Research for the Federal Reserve Bank of San Francisco. He began his career in 1994 as an economist at the Board of Governors of the Federal Reserve System.

Mr. Williams's research focuses on topics including monetary policy under uncertainty, innovation, productivity, and business cycles. He has published numerous articles in leading research journals. Mr. Williams currently serves as the managing editor of the *International Journal of Central Banking*. Previously, he served as associate editor of the *American Economic Review*. Additionally, he has served as Senior Economist at the White House Council of Economic Advisers and as a lecturer at Stanford University's Graduate School of Business.

Mr. Williams earned a Ph.D. in Economics at Stanford University, a Master of Science with distinction in Economics from the London School of Economics, and a bachelor's degree from the University of California at Berkeley.

Tao Zha, Executive Director, Economic Research/Professor of Economics
Federal Reserve Bank of Atlanta/Emory University

Tao Zha is Executive Director of the Center for Quantitative Economic Research at the Federal Reserve Bank of Atlanta and Samuel Candler Dobbs Professor of Economics at Emory University. He is also a Research Associate at the National Bureau of Economic Research (NBER).

Mr. Zha's major fields of study are macroeconomics, financial economics, the Chinese economy, and econometrics. He has published in academic journals such as *Econometrica, American Economic Review, NBER Macroeconomics Annual, Brookings Papers on Economic Activity, Journal of Political*

Economy, and *Review of Economic Studies.* He has also served on editorial boards of academic journals, including *Econometrica, Journal of Econometrics*, and *American Economic Journal: Macroeconomics.*

Mr. Zha received his doctorate in Economics from the University of Minnesota in 1992 and earned his master's degree in Economics from Washington State University in 1988. He received a master's degree in Statistics from the Southwestern University of Economics and Finance and earned a bachelor's degree in Mathematics from the Chengdu University of Technology in 1982.

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