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Fiscal Policy in the Reagan Years: A Burden on Future Generations?

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This paper tests alternative views of the burden that fiscal policy in the Reagan years placed on future generations. In the more conventional view, fiscal deficits substantially crowded out domestic capital formation and increased net indebtedness to foreigners, thereby placing a significant burden on future generations. In an alternative view, this burden was reduced, or possibly even eliminated, by higher personal saving, an improved investment climate for business, and a "safe-haven" effect that stimulated capital inflows and increased the value of the dollar. However, no significant support could be found for any of the various aspects of this alternative view. The total economic burden that fiscal policy in the Reagan years placed on future generations is estimated as equivalent to either a lump sum payment equal to 9 percent of the nation's current GNP or an annual payment equal to 0.4 percent.

The national debt nearly tripled during the Reagan Administration. This paper offers a quantitative assessment of the economic burden that may have been placed on future generations by fiscal policy in the Reagan years.

One widely held view is that the extra spending that was financed by the issuance of federal debt during the Reagan years was generally used for consumption, rather than investment, and as a result a burden was placed on future generations.[1] This burden takes the form of a lower capital stock, and therefore lower production and incomes in the future, to the extent that the expenditures that were financed by the debt issue "crowded out" private capital formation. Alternatively, it takes the form of increased indebtedness to foreigners (without an offsetting increase in the economy's capital stock) to the extent that capital inflows were attracted from abroad. In this case, the economy's capital stock, and hence production and incomes in the future, are not reduced, but the economy's absorption of future output must decline in order to service the debt to foreigners.

Both personal and corporate tax rates were cut in the Reagan years. The cut in corporate rates encouraged business investment by lowering its after-tax cost of capital. This would have tended to offset a crowding out of business investment stemming from the pressure of budget deficits on interest rates. As a result, it is likely that the greater proportion of the burden from additional debt took the form of a greater indebtedness to foreigners, rather than a lower domestic capital stock. Indeed, U.S. external debt grew very rapidly during this period.

An alternative view of the reason for rising indebtedness to foreigners during the Reagan years is that investment opportunities in the U.S. improved, not only because of the tax cuts for business but also as a result of deregulation and a reduced risk of government intervention.[2] Improved investment opportunities in the U.S., in turn, led to greater net capital inflows. To the extent that these inflows were matched by increases in the domestic capital stock, they would not have created a burden on future generations. The stimulus to larger net capital inflows also may have been reinforced by economic difficulties in many developing

countries and the election of socialist governments abroad, which could have increased the relative safety of claims on American capital.

In the alternative view, the budget deficits of the 1980s had relatively benign effects.[3] Households are viewed as far-sighted enough to foresee the taxes needed to service the increased federal debt in the future. As a result, they would tend to increase their saving, offsetting the increased dissaving of government. With relatively little reduction in national saving, there would be no significant decline in domestic capital formation, and hence no significant burden on future generations. Finally, to the extent that lower marginal tax rates stimulated greater work effort, potential GNP would rise. This would provide a greater volume of national saving, tending to work against the adverse effects of budget deficits and minimize the burden they created for future generations.

This alternative view requires that major shifts occurred in business investment, the exchange rate, consumption, and potential output. Therefore Section I of this paper examines the stability of these variables in relation to their determinants in a mainline neo-Keynesian macroeconometric model of the U.S. economy.[4] It finds that these macroeconomic variables were not subject to statistically significant instabilities in the 1980s, and that prediction errors generally were not consistent with the patterns called for by the alternative view.

Section II goes on to make a quantitative assessment of the overall magnitude of the economic burden created for future generations by federal fiscal policy in the Reagan years. This is done by using the above macroeconometric model to simulate the effects of fiscal changes. This simulation provides a quantitative measure of the impact of Reagan fiscal policy on capital formation in the U.S. compared to what it would have been with an unchanged fiscal policy. It also gives an estimate of the contribution of fiscal policy to the increase in net inflows of foreign capital to the U.S.

The burden of fiscal policy created during the Reagan years can be expressed either in terms of (1) the lump sum amount that would be required to restore the capital stock and pay off the extra foreign debt, or (2) the annual loss of future income due to the reduced capital stock and the servicing of an increased amount of foreign debt. This is done in Section III, which also contains a summary and some policy conclusions.

I. Tests of the Alternative View

In the more conventional view, an expansive fiscal policy was the primary source of higher interest rates, a stronger dollar, greater net capital inflows, and larger trade deficits in the Reagan years. The alternative view stresses possible offsets to these fiscal effects through an increase in saving and work effort. In addition, it points to the possible importance of an improved investment climate in the U.S., stemming not only from lower taxes on business but also deregulation, a reduced risk of government intervention, and a safer haven for foreign investment in the U.S. This stronger investment climate could have been an independent source of the higher interest rates, stronger dollar, greater capital inflows, and larger trade deficits. The sections below examine the relevant equations in a structural macroeconometric model for evidence of these two types of effects.

Consumption and Saving

We begin with the behavior of consumption and saving. The consumption function in the macroeconometric model that is used to simulate the effects of Reagan fiscal policy follows in modified form the life-cycle theory of Modigliani and his colleagues.[5] In this approach, households are viewed as making a conscious attempt at achieving a preferred distribution of consumption over their lifetimes, subject to the size of the economic resources expected to accrue to them. Thus, total consumption of households is a function of expected labor and property incomes plus the current value of their wealth.

The formation of expectations of future income is crucial to the issue of fiscal effects. In the more conventional view, there is too much uncertainty about the future for household expectations to be very forward-looking. Instead, the best estimate that households can make of their future income tends to be based on actual current and past incomes. This adaptive approach to expectations formation is empirically implemented by making consumption a function of a distributed lag on actual current and past incomes. Thus, in the macroeconometric model consumption is, in part, a function of current and past disposable income and the current value of stock market and non-stock market wealth.

In a pure life-cycle model, a decline in the *real* market rate of interest increases the amount of income that is consumed if substitution effects outweigh income effects. The modification to the life-cycle model is that an important portion of households are liquidity constrained in the sense that they cannot borrow all that they might like to

against future income.[6] The aggregate size of this liquidity constraint tends to be related to the unemployment rate and the level of *nominal* interest rates. Therefore, in addition to the variables mentioned above, the consumption function in the macroeconometric model includes a weighted average of the real and nominal short-term interest rates, as well as the unemployment rate.

The econometric model's consumption function, with estimated t statistics in parentheses, is:

$$\begin{aligned} \text{CON82} = {} & -143.6 + \sum_{i=0}^{7} a_i \, \text{AGYD82}_{-i} + \underset{(6.04)}{.165}\ \text{NSW} \\ & \underset{(-6.41)}{} \\ & + \underset{(2.88)}{.0146}\ \text{SW} - \underset{(-2.22)}{.00217}\ U \cdot \text{AGYD82} \\ & + \sum_{i=0}^{3} b_i \, [(i_s - .5p_s^e)\ \text{AGYD82}]_{-i} \\ & + \underset{(17.5)}{.899} e_{-1} \end{aligned}$$

$$\sum_{i=0}^{7} a_i = \underset{(8.12)}{.491} \qquad \sum_{i=0}^{3} b_i = \underset{(-3.07)}{-.00150}$$

where:

AGYD82	=	personal disposable income in 1982 dollars, adjusted for the reduction in real value of government debt due to inflation.
NSW	=	real value of non-stock market wealth
SW	=	real value of stock market wealth
U	=	civilian unemployment rate.
i	=	short-term interest rate.
p_s^e	=	short-term expectation of inflation.

Expected inflation enters with a weight of 0.5, implying equal weights for real and nominal interest rates. The positive weight for nominal interest rates and the effect of the unemployment rate indicates the presence of liquidity constraints. In addition, current consumption is estimated to respond strongly and positively to disposable income over the past two years, and also to non-stock market and stock-market wealth.

A criticism of this type of consumption function is that households maybe more forward-looking in forming their expectations of income than assumed in the adaptive expectations approach. Formal modeling of fiscal effects under the assumption of forward-looking consumption behavior has been done in a life-cycle context with overlapping generations by Auerbach and Kotlikoff (1987) and Frenkel and Razin (1987), and on the assumption of an infinite planning horizon for households with altruistic bequest motives by Barro (1974).

Over an infinite horizon, the government eventually must pay off its debt—either explicitly with taxes or implicitly by inflating it away. As a result, a public with rational expectations and an infinite horizon could expect deficit financing now to be matched by explicit or implicit taxes of equal present value in the future. Therefore, the consumption spending of (altruistic) households maximizing utility over an infinite horizon would be the same whether current government expenditures are financed by debt or taxation. If a shift to deficit financing does not change household consumption, then household saving would increase by enough to finance the increase in the budget deficit; and there would be no potential for a crowding out of domestic investment. This idea has come to be known as the Ricardian equivalence of debt and taxes.[7]

In the less extreme case of planning only over a life-cycle, the saving response of households to fiscal deficits would not be large enough to fully prevent a reduction in capital formation, or increased indebtedness to foreigners, because some of the expected taxes would fall on future generations. However, Poterba and Summers (1986) have shown that, under a variety of plausible fiscal scenarios a substantial fraction of the deferred tax burden from deficit financing is likely to fall on present generations. So even with no altruistic bequest motive, a rational view of the government's intertemporal budget constraint could lead households to increase their saving by a substantial fraction of the increase in government's budget deficit.

Such a response could be considerably weakened, however, by liquidity constraints and by uncertainty about taxes facing individuals. Evidence of liquidity constraints that would make households relatively more responsive to current income was discussed above. Uncertainty about when and on whom taxes might be levied also is of particular importance. If because of uncertainty taxes are viewed by households as following a random walk, then the current level of taxes is the best estimate of any future level of taxes. So a reduction in current taxes would be interpreted by consumers as indicating a reduction in the permanent level of taxes. They would raise their consumption spending accordingly, so that current taxation would have a strong and immediate (Keynesian) effect on current consumption.[8]

Direct tests of Ricardian versus Keynesian views of household saving behavior using a wide range of historical data have not been fully conclusive.[9] A major difficulty has been that until the 1980s there was relatively little variation in government deficits independent of wars, cyclical fluctuations, and inflation, which might be expected to have a

systematic impact on national saving independent of the effect of budget deficit. However, U.S. experience of a sustained high level of deficits in the 1980s provides the opportunity for a cleaner test.

We do this by examining the stability of the econometric model's consumption function with adaptive expectations. First, the Quandt (1958, 1960) maximum likelihood method is used to assess the most likely point (or points, if about equally likely) in the estimation sample at which a shift in the consumption function's coefficients may have occurred; and an F test then is used to assess the statistical significance of the possible shift.[10] Second, the pattern and direction of out-of-sample forecasting errors for the 1981 to 1988 period are examined.[11] This is the period over which the effects of Reagan fiscal policy are later simulated.

The maximum likelihood ratio indicates most likely break points in the consumption function at 1970:4 and 1981:1. But stability of the consumption function is accepted by the F test at a 5 percent level in both cases, as shown in Table 1.[12] The out-of-sample prediction errors for the period 1981 to 1988 are shown in Chart 1A. Up until 1984, there is some tendency towards negative errors, meaning that actual consumption was less than predicted. This would be consistent with a Ricardian type of response. But the size of these errors averages only around one-sixth of the large $45 billion tax reductions, in 1982 dollars, that occurred in both 1982 and 1983. Furthermore, rather than becoming more negative over time as the budget deficit grew, and as the Ricardian response would require, the prediction errors became less negative and eventually as positive as they were negative before. This pattern of errors appears to be related more to movements in consumer confidence over the business cycle than to a Ricardian response to changes in the budget deficit.

In summary, the errors in the consumption function during the Reagan years were not atypically large, and they appear to be more closely related to the business cycle than to a Ricardian response to budget deficits. These results are consistent with those of Summers and Carroll (1987), who tested Ricardian equivalence over the same period by examining the out-of-sample predictive power of a number of different models of national saving. If Ricardian equivalence holds and national saving has not been sharply reduced by budget deficits, it should be possible to find equations that do not consistently overpredict national saving. But Summers and Carroll could not find any, and in most cases the size of the errors was close to the size of the budget deficit, suggesting the lack of even a partial Ricardian response.

Potential Output

The macroeconometric model that is later used for simulating the effects of fiscal policy during the Reagan years assumes a constant rate of growth of full-employment, or potential, output. However, in the alternative view of little or no burden from the debt, reductions in marginal tax rates would have had a large impact on labor supply and thus potential output, as would increases in the rate of investment. These forces would have tended to offset the adverse effects of budget deficits on capital formation and indebtedness to foreigners. Therefore, we examine the need for adjusting the path of potential output for these effects.

In the macroeconometric model the rate of growth potential output follows an Okun's law relationship. As an identity, output (GNP82) equals output per person hours of labor services (q) times person hours of labor services. The latter, in turn, can be expressed as the product of hours per worker (h), the employment rate (e), the labor force participation rate (l), and the civilian adult population (N). Thus,

$$\text{GNP82} = q \cdot h \cdot e \cdot l \cdot N$$

or in terms of the civilian unemployment rate (U):

$$\text{GNP82} = q \cdot h \cdot (1-U) \cdot l \cdot N.$$

In rate of change form this becomes

$$\dot{\text{GNP82}} \cong \dot{q} + \dot{h} - \Delta\dot{U} + \dot{l} + \dot{N}.$$

Okun (1962) exploited systematic relationships between these variables to estimate a reduced-form relationship between changes in real GNP and changes in the unemployment rate. The macroeconometric model follows this approach, with the modification of explicitly allowing for the exogenous effect of population growth. Also, since quarterly data are used, changes in the unemployment rate depend upon a distributed lag on the rate of growth of real GNP.

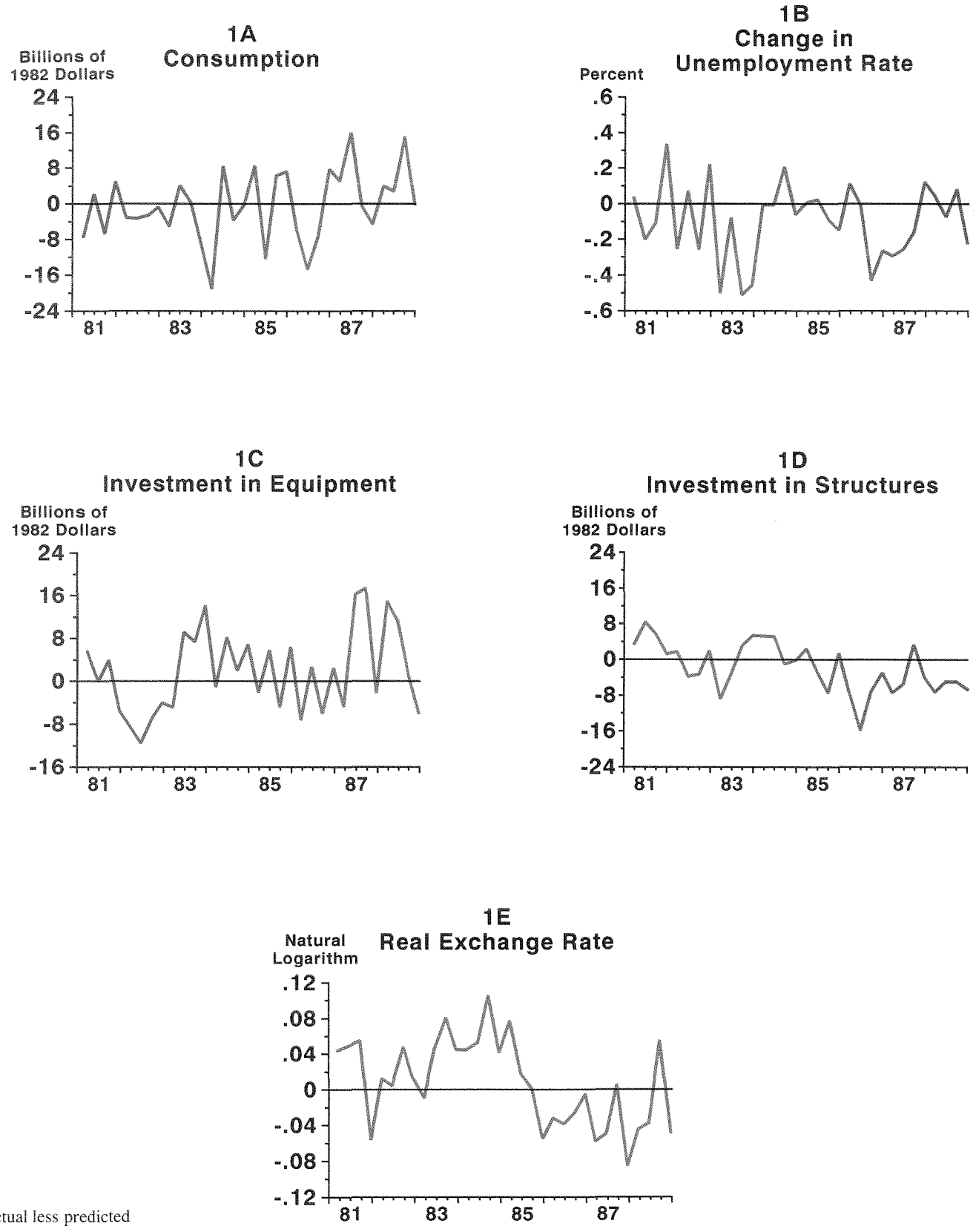
Using annualized growth rates of real GNP and population, the estimated equation for the quarterly change in the civilian unemployment rate is:

$$\Delta U = \underset{(2.59)}{.217} + \sum_{i=0}^{3} a_{-i}\,\text{GNP82}_{-i} + \underset{(1.70)}{.0761N}$$

$$\text{where } \sum_{i=0}^{3} a_{-i} = \underset{(-12.8)}{-.114}$$

The estimated growth rate of potential output is obtained by setting the change in the unemployment rate to zero and

Chart 1
Out-of-Sample Forecasting Errors*



*Actual less predicted

solving for the corresponding growth rate of real GNP. With population growth averaging slightly more than 1.0 percent, the equation requires an annual growth rate of 2.7 percent to hold the unemployment rate constant. Therefore, in the macroeconometric model the growth of potential output is constant at this rate, except for the small variations due to population growth.

This equation has been quite stable. As shown in Table 1, the most likely breaks in structure occur at 1974:2 and 1984:1. But *F* tests reveal no significant shifts in the equation's coefficients at these points. In addition, the pattern of out-of-sample forecast errors over the 1981-88 period is not in the direction of unexpectedly high growth in potential GNP. As shown in Chart 1B, the actual change in unemployment tends to be lower than predicted. But the estimated growth rate in potential output equals the constant term (plus the contribution from population growth) divided by the sum of the coefficients on real GNP growth. So if these errors were due to downward shift in the constant term, potential growth would be reduced. Alternatively, if they were caused by more highly negative coefficients on real GNP growth, potential growth also would be less.

Thus, there is no evidence of any significant speed-up in the growth of potential output during the Reagan years. Still, there may have been a small effect from the fiscal changes that are known to have occurred. These include possible effects of lower personal tax rates on labor supply, of greater investment spending on labor productivity, and of a more efficient allocation of capital on productivity. Estimates of these specific effects are used to modify the estimate of the burden of Reagan debt obtained from the simulation of the macroeconometric model.

Hausman and Poterba (1987) have done a detailed study of the effects of the 1981-83 and 1986 tax changes on labor supply. They estimate that the 1981 Economic Recovery and Tax Act raised the labor supply of primary earners by 0.4 percent and that of secondary workers by 1.2 percent, giving a weighted increase of 0.6 percent in total labor supply. The 1986 Tax Reform Act is estimated to have increased primary earners' labor supply by 0.9 percent and secondary earners' supply by 2.6 percent, resulting in a total weighted increase of 1.4 percent. Thus, Hausman and Poterba estimate a total increase of 2 percent in labor supply due to tax reductions in the Reagan years. An alternative estimate can be derived from the work of Fullerton (1982). Fullerton calculates an overall weighted average elasticity of labor supply with respect to the real wage of 0.15 percent. As shown in Table 2, from 1980 to 1988 the average marginal tax rate for households fell from 30 percent to 23 percent, meaning that the average after-tax wage rose from 70 percent to 77 percent of the pre-tax wage, or by 10 percent. Thus, with an elasticity of 0.15, labor supply would rise by 1.5 percent—or close to the estimate by Hausman and Poterba.[13]

Table 1

F Tests for Stability

Equations	Periods	Critical Values 5%	1%	*F* Statistic
Consumption	1958:2-1970:4 1971:1-1989:4	1.91	2.47	1.21
	1958:2-1981:1 1981:2-1989:4	1.95	2.55	1.83
Change in Unemployment Rate	1966:3-1974:2 1974:3-1989:4	2.25	3.12	2.04
	1966:3-1984:1 1984:2-1989:4	2.21	3.04	0.80
Investment in Equipment	1959:1-1964:3 1964:4-1989:4	2.17	2.96	0.54
Investment in Structures	1963:1-1976:1 1976:2-1989:4	2.09	2.79	0.95
	1963:1-1984:1 1984:2-1989:4	2.09	2.79	2.04
Real Exchange Rate	1973:1-1982:2 1982:3-1989:4	2.08	2.80	1.71

Table 2

Marginal Tax Rates During Reagan Years

	Average Marginal Tax Rate for the Individual Federal Income Tax	Effective Federal Tax Rate on Equity Financed Business Investment		
		Equipment	Structures	Rental Housing
1960	.23	.29	.60	.35
1970	.24	.31	.69	.38
1980	.30	.13	.62	.44
1981	.31	.08	.54	.41
1982	.29	.06	.44	.40
1983	.28	.03	.40	.36
1984	.27	.02	.40	.39
1985	.27	.01	.39	.39
1986	.27	.07	.32	.31
1987	.25	.14	.29	.29
1988	.23	.14	.29	.29

As a generous estimate of labor supply effects, we assume in the simulation that labor supply was 2 percent higher than it otherwise would have been over all eight years of the Reagan administration, and that this increase was fully incorporated into actual employment and output. Assuming an elasticity of substitution of 1.0, potential real GNP would increase by labor's share in total output (.7) times the 2 percent increase in labor supply, or by 1.4 percent. The average level of real potential GNP over the period was approximately $3,500 billion. So the average increase in potential real GNP would be $3,500 × .014, or $49 billion. Net private saving (including household saving in the form of consumer durables) averages 7 percent of GNP. So the average addition to either the capital stock or net investment abroad would be $3.4 billion (49 × .07) per year. Over 8 years that comes to $27.2 billion in 1982 dollars. This amount will be added in to the simulated impact of fiscal policy in the Reagan years.

Other possible effects on potential output come from capital investment. First, to the extent that capital investment was increased, the productivity of labor would be increased and potential output raised. But this effect would not be captured by the Okun's law equation that assumes a constant growth rate of potential output. The extent of the required adjustment for this effect is examined below, after the results of the model's simulation on investment are obtained. However, the overall size of this adjustment is very much less than that for the effects on labor supply. Lower taxes on business tended to raise business investment, but the higher interest rates due to larger budget deficits tended to lower it, resulting in relatively little net effect on investment from fiscal policy.

A second effect could have come through a change in the efficiency of the allocation of capital. Capital is inefficiently allocated if the after-tax cost of capital differs between different types of capital investments as the result of differing tax treatment. Hendershott (1987a) has done the most detailed study on the effects of tax changes on the efficiency of capital's allocation during the Reagan years. He finds that the 1981-83 tax changes reduced the efficiency of capital's allocation within the corporate sector, but increased the efficiency of its allocation between owner-occupied housing and the corporate sector. Given the large bias toward owner-occupied housing prior to these tax changes, overall they probably allocated capital more efficiently. But then, although the 1986 Tax Reform Act narrowed the differences in the after-tax cost of capital across corporate assets, it greatly increased the bias in favor of owner-occupied housing. On balance, Hendershott estimates that the 1986 law returned the overall efficiency of the allocation of capital to about that of the pre-1981 law. Also, since the size of the efficiency loss under the current law is estimated at only 0.25 percent of GNP, any possible changes in it would be of a very small order of magnitude.[14] Consequently, no adjustment is made to the results of the simulation for any effect of fiscal changes on the efficiency of the allocation of capital.

Business Investment

In the alternative view of the economy, in the Reagan years investment opportunities improved not only because of tax cuts for business but also as a result of deregulation and a reduced risk of government intervention. An improved investment climate could have been an independent source of greater capital investment, higher interest rates, a stronger dollar, and larger capital inflows. Except for the tax effects, an improved climate for investment would not necessarily have been a part of the response to Reagan fiscal policy. Nonetheless, this investment would have increased the capital stock of future generations, and, therefore, provided an offset to any burden created for future generations by fiscal policy in the Reagan years. Therefore, we examine the stability of business investment in relation to its economic determinants.

The macroeconometric model used for the simulation employs a standard neoclassical model of business fixed investment, as refined by Hall and Jorgenson.[15] A firm's desired capital stock is determined by the expected scale of its output and relative factor prices. Given its expected output, the desired capital stock varies inversely with the real after-tax cost of capital. Because of an imperfect secondary market for business capital goods, market prices do not equate desired and actual capital stocks in the short run. Instead, firms are assumed to eliminate some fraction of the gap between desired and actual capital stocks in the current period. This makes planned investment a function of sales, the rental cost of capital, and the lagged capital stock.

Because the investment decision gives rise to a whole stream of investment expenditures, investment spending appears as a distributed lag on these variables, where the lags are those between appropriations and expenditures. In addition, expenditures may be modified after appropriations have been made. This effect is captured by adding a "surprise" variable, equal to the difference between sales lagged one quarter and a measure of expected sales.

The model's estimated equation for nonresidential fixed investment in equipment is:

$$\begin{aligned}\text{GIPD82} = {} & -136.6 + .178 \sum_{i=2}^{9} u_{-i}\,\text{GNS82}_{-i} \\ & (-4.11) \quad (5.87) \\ & - .0211 \sum_{i=2}^{9} u_{-i}\,\text{RE}_{-i}\,\text{GNS82}_{-i} \\ & \quad (3.32) \\ & - .00529 \sum_{i=2}^{9} u_{-1}\,\text{KPD82}_{-i} \\ & \quad (-0.11) \\ & + .120\,[\text{GNS82}_{-1} - \text{E(GNS82)}] \\ & \quad (5.35) \\ & + .889 e_{-1} \\ & \quad (13.2)\end{aligned}$$

where $\sum_{i=2}^{9} u_{-i} = 1.0$ and

GIPD82	=	nonresidential fixed investment in equipment in 1982 dollars
GNS82	=	final sales in 1982 dollars
RE	=	rental cost of capital for equipment
KPD82	=	capital stock of equipment, in 1982 dollars
E(GNS82)	=	expected final sales

The equation for nonresidential investment in structures is similar, except that a relatively short distributed lag on the real price of oil (POIL), scaled by the size of the capital stock in structures (KPS82), is included to account for investment in oil drilling:

$$\begin{aligned}\text{GIS82} = {} & 77.1 + .0674 \sum_{i=2}^{9} u_{-i}\text{GNS82}_{-i} \\ & (5.17) \quad (3.70) \\ & - .00482 \sum_{i=2}^{9} u_{-i}\,\text{RS}_{-i}\,\text{GNS82}_{-i} \\ & \quad (-1.63) \\ & - .106 \sum_{i=2}^{9} u_{-i}\,\text{KPS82} \\ & \quad (-2.90) \\ & + .0395\,[\text{GNS82}_{-1} - \text{E(GNS82)}] \\ & \quad (3.14) \\ & + .016\,\text{POIL KPS82} \\ & \quad (4.25) \\ & + .016\,\text{POIL}_{-1}\,\text{KPS82}_{-1} + .879\, e_{-1}. \\ & \quad (2.92) \qquad\qquad (17.9)\end{aligned}$$

The real after-tax cost of capital has an important influence on both types of investment. A one percentage point increase in the real after-tax cost of capital is estimated to depress investment in equipment by 2.1 percent and investment in structures by 2.6 percent. The expectations of inflation in the real cost of capital are formed adaptively.

These investment equations exhibit a high degree of stability. The most likely break-points occur in 1964:3 for equipment and in 1976:1 and 1984:1 for structures. But stability is accepted with an F test at the 5 percent level in all cases (Table 1). Moreover, out-of-sample prediction errors for the period 1981-88 do not show any patterns that suggest a distinctly improved investment climate in the Reagan years (Charts 1C and 1D). Investment in equipment tends to be less than predicted in 1982 recession, but greater than predicted in 1983, and again in 1987 and 1988, when capacity utilization was relatively high. Thus, the errors appear more closely related to business cycle effects than to a permanent improvement in the investment climate. Also, while prediction errors for equipment are generally positive, those for structures tend to be negative. Thus, the view that the investment climate improved independently of tax factors that are already included in the model of business investment is not supported by the data.

Another recent study that examines the stability of a standard neoclassical model of business fixed investment in the 1980s is Corker, Evans, and Kenward (1989). It too finds that such a conventional model can explain investment behavior quite well over this period and that evidence of parameter instability is very limited.

The Exchange Rate

In the alternative view of the economy in the Reagan years, the emergence of a relatively safe haven for foreign investment was an important factor in increasing the net inflow of capital to the U.S. and driving up the value of the dollar, tending to offset any crowding out of domestic capital formation that would have been generated by budget deficits. Again, although a safe haven effect would not necessarily have been a response to Reagan fiscal policy, it could have provided an offset to the burden of fiscal policy created in the Reagan years by increasing the capital stock for future generations.

A safe haven effect would have produced instability in the macroeconometric model's equation for the exchange rate. This equation follows the asset theory of exchange rates in which an open interest parity condition approximately holds.[16] Except for a risk premium, the current real value of the exchange rate is assumed to be at the point where the expected capital gains or losses from its expected future return to long-run equilibrium just offset the dif-

ference between interest returns in the U.S. and abroad. This implies that the current real value of the dollar equals its expected future equilibrium value plus the difference in real interest returns between U.S. and foreign assets, plus the amount of any risk premium. A safe haven effect for the dollar would make this risk premium more positive.

Real long-term interest rates in the model are assumed to conform to the expectations theory of the term structure of interest rates, where expectations of future short-term rates and future inflation are formed adaptively.[17] Expectations may be formed differently for interest rates than for inflation. So the real value of the dollar becomes a function of separate distributed lags on the differences between U.S. and foreign interest rates, and between U.S. and foreign inflation. Also, the market's expectation of the equilibrium real value of the dollar depends upon expected high-employment budget balances at home and abroad. Although the sign of these latter effects is theoretically indeterminate, depending importantly on the market's effective time horizon, it is found that expectations of a larger budget surplus depress the expected real value of a country's currency because of the expected reduction in the government's demand for credit. Expectations of future budget positions are assumed to be formed adaptively, being based on the high-employment budgetary balance over the previous year.[18]

The econometric model's exchange rate equation is:

$$\ln EXCH = \underset{(62.5)}{3.38} + \sum_{i=0}^{17} a_{-i}(i_s - i_s^*)_{-i} + \sum_{i=0}^{17} b_{-i}(\dot{p} - \dot{p}^*)_{-i}$$

$$\underset{(-2.46)}{-.0374B} + \underset{(1.68)}{.0477B^*} + \underset{(7.79)}{.708e_{-1}}$$

$$\sum_{i=0}^{17} a_{-i} = \underset{(6.90)}{.0908} \qquad \sum_{i=0}^{17} b_{-i} = \underset{(-6.80)}{-.0908}$$

where EXCH = real trade-weighted value of U.S. dollar

i_s, i_s^* = short-term interest rate in the U.S. and abroad, respectively.

$\dot{p}$, $\dot{p}^*$ = inflation rate in the U.S. and abroad, respectively.

B, B^* = high employment budget balance as percent of high employment GNP in previous four quarters for U.S. and foreign countries, respectively.

A sustained one percentage point increase in the differential between U.S. real short-term interest rates and the trade-weighted foreign real rate is estimated to raise the real trade-weighted value of the dollar by 9 percent. Also, a one percentage point increase in the U.S. budget surplus, as a percent of high employment GNP, lowers the real value of the dollar by approximately 4 percent through its effect on the expected equilibrium value of the dollar, while a like change in the trade-weighted foreign budget balance appreciates the dollar by about 5 percent.

Turning to the stability of the exchange rate equation, the most likely break point in its structure is found to be 1982:2. But an F test reveals no significant shift in its coefficients at this point, as shown in Table 1. Also, the out-of-sample prediction errors for the period 1981 to 1988, shown in Chart 1E, indicate only a temporary safe-haven effect at best. Up until 1985 the dollar's value is somewhat stronger than predicted. But the size of this error averages no more than 4 percent, and nearly equally large errors in the opposite direction subsequently develop. Thus, even if there was a small safe-haven effect acting to strengthen the dollar by increasing the risk premium up until 1985, a nearly equally large negative effect on the risk premium occurred after 1985. Therefore there is no evidence of a sustained safe-haven effect during the 1980s, which would have raised U.S. domestic investment significantly by attracting net capital inflows independently of the effect of U.S. fiscal policy[19]

II. Simulated Effects of Fiscal Policy

The previous section found no significant shifts in key macroeconomic relationships that might either bias the simulated effects of fiscal policy in the 1980s or create an independent offset to the estimated burden of fiscal policy on future generations. This section goes on to simulate the effects of fiscal policy on U.S. capital formation and indebtedness to foreigners, using the mainline neo-Keynesian macroeconometric model.

Most of the key relationships in this model have been described in the previous section. It is assumed that short-term interest rates are determined either as matter of Federal Reserve policy or, if money is being targeted, through an equilibrium between the supply and demand for money. Long-term interest rates basically follow the expectations theory of the term-structure of interest rates. Foreign central banks are assumed to partially respond to changes in U.S. interest rates so as to stabilize their economies.

Investment spending on consumer durables and housing is importantly determined by nominal after-tax interest rates because of the importance of liquidity constraints, while investment spending on business plant and equipment responds to real after-tax interest rates. Net exports are dependent upon the real exchange rate, which in turn is a function of differences between real interest rates at home and abroad, as well as expected budget deficits.

These elements of spending then combine with consumption spending and inventory investment to determine the aggregate demand for output and the rate of unemployment. The inflation rate is determined by an expectations-augmented Phillips curve, in which the inflation is a function of the current unemployment rate and expected inflation, with additional effects from the price of oil and the exchange rate. Expectations in the Phillips curve are formed adaptively, and there is no trade-off between inflation and unemployment in the long run.[20]

Simulation Methodology

The effects of fiscal policy during the Reagan years were estimated in two steps. First, the historical errors in each equation of the macroeconometric model were added back in to allow a simulation of the model to replicate history exactly, or in other words to produce the historical baseline. Second, with historical errors still in the equations, the effect on the economy of holding the relevant fiscal policy variables at their 1980 levels, instead of at their actual historical values, was simulated. Then the difference between the economy's performance in the historical baseline and in the counterfactual simulation with an unchanged fiscal policy after 1980 can be attributed to the changes in fiscal policy that occurred during the Reagan years.

Two aspects of this approach require further elaboration. The first is the measurement of an unchanged fiscal policy, and the second is the assumption made with respect to monetary policy. From a macroeconomic point of view, there are two dimensions to the measurement of an unchanged fiscal policy. First, there should be no change in federal marginal tax rates that would alter economic incentives. For example, in the macroeconometric model the average marginal tax rate for households affects their after-tax mortgage rate and, therefore, influences expenditures on housing. Similarly, business taxes influence the cost of capital for nonresidential investment and rental housing. An unchanged fiscal policy is defined, in part, as one that does not alter marginal tax rates that affect these expenditures.

As shown in Table 2, the Economic Recovery and Tax Act of 1981 and the Tax Reform Act of 1986 reduced the average marginal federal tax rate on individual income from 30 percent in 1980 to 23 percent in 1988. In the counterfactual simulation that keeps fiscal policy unchanged, the average federal marginal tax rate for households is therefore held constant at 30 percent from 1980 through 1988, instead of being allowed to fall. As a result, after-tax interest rates for households are reduced, and their expenditures on durable items are raised, relative to actual expenditures in this period.

The Tax Act of 1981 also reduced effective tax rates on business investment by shortening depreciable "tax lives" and increasing the investment tax credit for purchases of equipment. The Tax and Fiscal Responsibility Act of 1982 took back part, but by no means all, of these tax cuts for business as a part of a package to reduce the size of the federal budget deficit. Then, in 1986, the Tax Reform Act reduced the corporate income tax rate from 46 percent to 34 percent, but at the same time eliminated the investment tax credit for equipment and lengthened the tax lives for residential and nonresidential structures. The net effects of these changes are also shown in Table 2.[21] The effective tax rate on investment in equipment dropped from 13 percent in 1980 to only 1 percent in 1985, but then rose to 14 percent by 1988. The tax rates on investment in structures and rental housing were cut by one third to one half in this period. In the counterfactual simulation of an unchanged

Table 3

Federal Spending and Revenues During Reagan Years

(Percent of High Employment GNP)

	Cyclically Adjusted Federal Budget Balance[1]	Federal Purchases of Goods and Services	Cyclically Adjusted Federal Taxes[1]	Cyclically Adjusted Federal Transfer Payments	Grants-in-Aid to State and Local Governments
1960	1.7	10.5	17.6	5.9	1.2
1970	0.4	9.7	18.9	8.2	2.4
1980	−0.3	7.6	20.9	11.2	3.2
1981	0.0	7.9	21.8	11.7	2.9
1982	−1.4	8.6	20.6	12.0	2.5
1983	−2.2	8.3	20.0	12.4	2.4
1984	−2.8	8.2	19.5	12.3	2.5
1985	−3.8	8.8	19.7	12.8	2.5
1986	−4.0	8.6	19.5	13.0	2.6
1987	−2.8	8.4	20.2	13.1	2.4
1988	−2.4	7.8	20.3	13.3	2.4

[1]Counts erosion in real value of federal debt due to inflation as a federal receipt. (See Box 1.)

fiscal policy, these effective tax rates are held at their 1980 values, tending to reduce business investment spending relative to actual business investment in the 1980s.

The second dimension of an unchanged fiscal policy is that there should be no change in federal outlays and receipts measured on a high employment basis. Unchanged receipts would prevent disposable income, and hence consumption, from changing on account of fiscal policy. With unchanged government receipts and outlays, as well as unchanged marginal tax rates, there would be no change in aggregate demand due to a change in fiscal policy.

As shown in Table 3, the federal high employment budget deficit rose from 0.3 percent of high employment GNP in 1980 to 4.0 percent in 1986, and then dropped back to 2.4 percent of GNP by 1988. (In this calculation of the fixed deficit, the erosion in the real value of the federal debt due to inflation is counted as a receipt, as explained in Box 1). The most permanent contributor to the deficit's increase was an increasing ratio of federal transfer payments to GNP, which rose over 2 percentage points. In contrast, purchases of goods and services as a proportion of high employment GNP rose only a little more than one percentage point through 1985, but returned almost to their 1980

(Box 1)

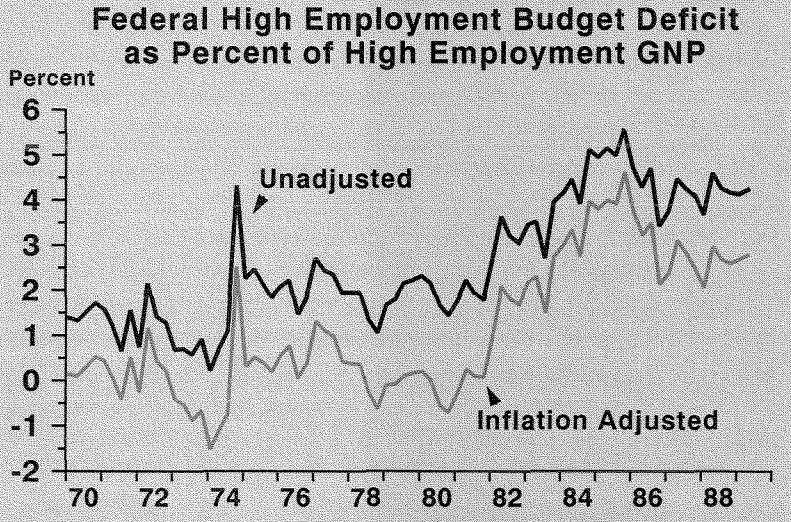
Inflation Premiums and Budget Deficits

The federal government budget counts as an outlay the inflation premiums in interest rates that compensate bondholders for the loss in real purchasing power of the principal value of their holdings of government debt, but it does not count the corresponding loss in the real value of debt as a tax, which of course it is. As a result, the size of the federal deficit is overstated by the amount of the inflation premiums.

Correcting this overstatement gives a truer measure of the effect of a fiscal deficit on household income, and hence spending. Households should save the income that they receive in the form of inflation premiums in order to keep the real value of their wealth intact. As a result, any budget deficit that is created by such premiums will tend to be matched by an increase in household saving, producing no net increase in aggregate demand and no tendency for private investment to be crowded out. By counting the erosion in the real value of federal debt due to inflation as a tax, this overstatement of the degree of stimulus of the fiscal deficit to aggregate demand is corrected.[26]

The inflation tax on the federal government's debt has ranged approximately between 1 and 2 percent of GNP. It dropped from 1.9 percent of GNP in 1980 to 0.9 percent by 1986 as inflation and interest rates fell, but then rose back to 1.6 percent by 1988 as federal debt continued to rise faster than GNP.[27]

As shown in the accompanying chart, correcting for the inflation tax has a noticeable effect on the level of the federal government's fiscal deficit, but much less so on the extent of changes in the deficit over time. The figures on the deficit shown in Table 3 already make this correction. Thus, even after correcting for changes in the inflation tax, fiscal policy in the Reagan years created a substantial increase in the federal budget deficit.



level by 1988. Although the ratio of income tax receipts to GNP dropped two percentage points, a rise in Social Security taxes approximately offset this decline.

In the counterfactual simulation of an unchanged fiscal policy, the ratio of federal purchases of goods and services to high-employment GNP is held at its 1980 value. In the macroeconometric model, the impact of policy induced changes in total federal receipts and transfer payments on household disposable income, and hence consumption, is captured by the ratio of cyclically adjusted federal taxes less transfer payments to high employment GNP. So in the counterfactual simulation of an unchanged fiscal policy, this ratio is also held at its 1980 value, except for an adjustment for state and local taxes.

As shown in Table 3, the Reagan fiscal package included a reduction in grants-in-aid to state and local governments. These governments were able to absorb the grant reductions and maintain approximately the same level of

(Box 2)

Capital Investment by the Federal Government

The national income accounts regard as investment the purchases of durable goods by businesses and households to create future output and, in turn, income. Government purchases of fixed facilities similar to business plant and equipment are not counted as investment, in part because they are not managed the way a private enterprise might manage them. Rather, they are classified as consumption. As a result, a rise in government spending or a decline in taxes reduces either domestic investment or net foreign investment in the national income accounts, given the level of private saving.[28]

But if the standard of durable goods that produce future output and income were applied to governments, some of their activities could well be considered as investment. Included for the federal government would be public investment in highways, office and other buildings, water resource development projects, military base facilities, and the physical assets of research and development agencies.

Recent trends in such federal investment are shown in the accompanying table. Federal net investment in nondefense physical capital was quite small in the 1980s, and also not much larger than in the previous two decades.[29]

From 1980 to 1988 federal net investment in nondefense military capital increased by only $3.4 billion in 1982 dollars, or by less than one-tenth of 1 percent of the net national product. Adding in the available data on investment in military structures, total federal net investment in physical capital rose only from $4.1 billion in 1980 to $4.7 billion in constant dollars by 1986, leaving it an unchanged proportion of net national product.

A broader definition of federal government investment might include any expenditure that yields long-term benefits. Included in this broader concept would be military weapons systems, federally funded research and development, state and local investment through federal capital subsidies, and investment in human capital. The broader concept would require parallel changes in national estimates of investment in the private sector. The Congressional Budget Office (1987) has attempted to estimate what the inclusion of these broader types of net public investment would do to trends in national saving and investment during the 1980s. Using the more generous measure of net public investment in each category, broadening the concept of public investment adds about two percentage points to net domestically owned investment as a percent of net national product in the late 1970s, and also about two percentage points in the mid-1980s. Thus, it can be fairly concluded that there was no significant increase in the rate of federal capital formation during the Reagan years, however measured.

Federal Net Investment in Physical Capital

(Billions of 1982 Dollars)

	Nondefense[1]	Total[2]
1960	1.8	NA
1970	1.2	4.7
1980	2.6	4.1
1981	2.6	3.9
1982	1.6	1.1
1983	1.0	3.3
1984	2.6	1.6
1985	3.9	2.2
1986	3.2	4.7
1987	4.2	NA
1988	6.0	NA

[1]Source: *Special Analysis: Budget of the United States Government, Fiscal Year 1990*, p. D-11.

[2]Source: Congressional Budget Office, *Trends in Public Investment*, December 1987.

services by raising taxes toward the end of the 1981-82 recession (see Weicher (1987)). Since the change in the ratio of cyclically adjusted *federal* taxes less transfer payments to high-employment GNP overstates the *total* reduction in net taxes and transfers, in the counterfactual simulation this change was adjusted for the increase in state and local taxes.

Finally, the burden of fiscal policy during the Reagan years would have been reduced to the extent that the increase in federal debt financed greater capital formation by the federal government. But as discussed in Box 2, the federal government's capital formation as a percent of high employment GNP was neither significantly higher nor lower during the Reagan years than it was earlier. Therefore, in the counterfactual simulation of an unchanged fiscal policy no change is made in the amount of public investment.

The counterfactual simulation of an unchanged fiscal policy requires an assumption to be made with respect to the reaction of the Federal Reserve's monetary policy. The goal of the Reagan Administration and the Federal Reserve was to reduce the rate of inflation from near double digit to more moderate levels. Monetary policy was successful in achieving this objective. Inflation in the GNP price index dropped from 9.3 percent in 1980 to 4.0 percent in 1984 and stayed in the 4 percent range through the end of the decade. The demand for money became unstable in this period, however, and the Federal Reserve shifted emphasis in its short-run operating procedures from targeting money to looking through to its ultimate economic objective of controlling inflation. But because of the long lags between monetary policy and its impact on inflation, an intermediate target was still needed.

One widely used approach for forecasting the dynamics of inflation is the expectations-augmented Phillips curve with adaptive expectations, as used in the macroeconometric model in this paper. In this framework, the unemployment rate is a logical intermediate target for monetary policy. Unemployment has both a direct effect on the inflation rate through current labor market pressures and an indirect one operating through inflation expectations. So any desired path for inflation requires a corresponding path for the unemployment rate. In the basic counterfactual simulation of an unchanged fiscal policy, it is therefore assumed that the Federal Reserve used the unemployment rate as an intermediate target and achieved the same unemployment rate as occurred historically.[22]

As is common, the expectations-augmented Phillips curve in this macroeconometric model also contains an effect on inflation from current and lagged changes in the real value of the dollar. This effect operates through competitive pressures in the tradeable goods sector of the economy. These effects are assumed to be regarded as one-time changes by market participants and therefore do not feed through to inflation expectations. But an unchanged fiscal policy would have produced a lower value for the dollar than actually occurred, and consequently a higher price level. Therefore, to achieve any price level, the Federal Reserve would have had to conduct a tighter monetary policy than otherwise. For an alternative reaction of monetary policy, we therefore assume in the counterfactual simulation that the Federal Reserve achieved the same level of prices by the end of the Reagan years as actually occurred. This would imply higher interest rates and higher unemployment than in the case of the counterfactual simulation that uses the unemployment rate as a target.

The simulated effects of fiscal policy during the Reagan years are most easily seen in chart form. These charts show the results of the simulation on the assumption that the Federal Reserve would have targeted the unemployment rate. The results of the simulation under the alternative target for monetary policy are discussed below. Although nominal yields on long-term bonds generally declined in the 1980s, real (or inflation adjusted) bond rates actually rose quite substantially. Furthermore, as shown in Chart 2A, the rise in real bond rates was primarily due to the effect of fiscal policy. It is estimated that with an unchanged fiscal policy the real bond rate still would have shown considerable cyclical fluctuation, but would have been 1 to 2 percentage points lower on average.

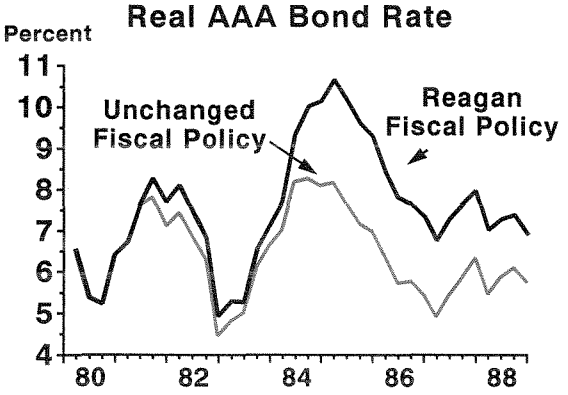
Next consider the investment sectors of the economy that would have been significantly affected by the higher interest rates, starting with residential investment. As mentioned earlier, in the case of owner occupied housing, the lower marginal income tax rates of the Reagan fiscal program worked to discourage housing investment by raising the after-tax cost of capital. But in rental housing the effective tax rate on new investment went down. Of course, both sectors were discouraged by higher interest rates. Chart 2B shows that the net effect of fiscal policy was to reduce total residential investment. Residential investment was clearly crowded out by the fiscal expansion in this period, consistent with the conventional view.

Chart 2C shows a similar story for household spending on consumer durables. Both the tax effects and the interest rate effects of fiscal policy in the Reagan years worked to discourage consumer spending on durables, and the simulation confirms that with an unchanged fiscal policy consumer spending on durables generally would have been higher.

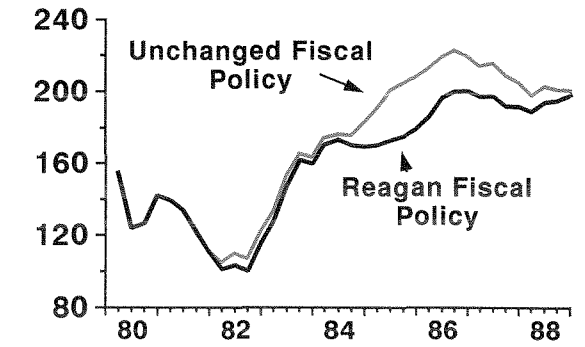
There was a significant increase in tax incentives for

Chart 2
Simulated Effects of Fiscal Policy During Reagan Years

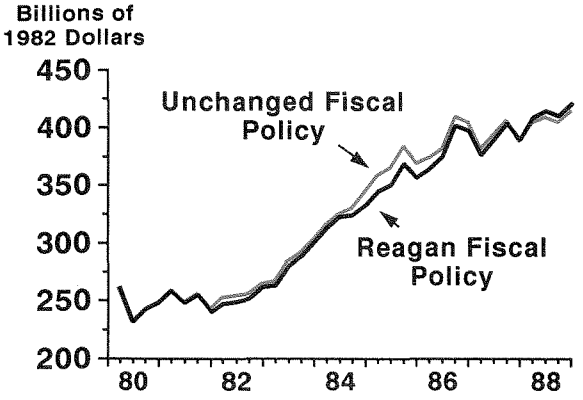
2A
Real AAA Bond Rate



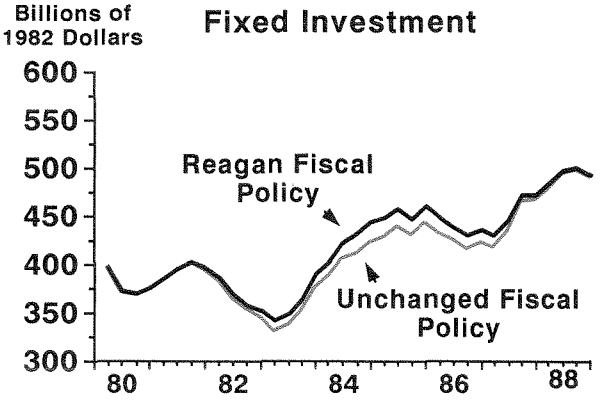
2B
Residential Investment



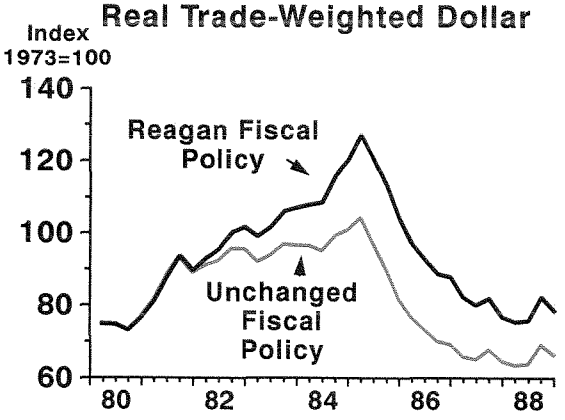
2C
Personal Consumption Expenditures: Durables



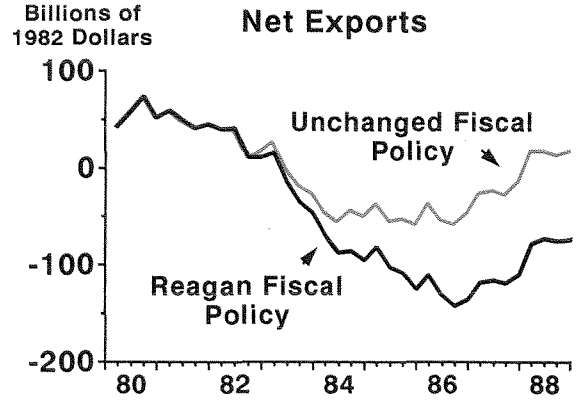
2D
Nonresidential Fixed Investment



2E
Real Trade-Weighted Dollar



2F
Net Exports



business investment, however. Indeed, Chart 2D shows that they were strong enough to outweigh the effects of higher real interest rates to some extent. Thus, the fiscal expansion in the Reagan years on balance acted to raise business investment by a modest amount, or to crowd it in rather than to crowd it out. But taking these three investment sectors together over the entire 1981 to 1988 period, the reduction in the stock of housing and consumer durables exceeded the stimulus to nonresidential fixed capital by $40.3 billion, as shown in Table 4. In addition, the simulation shows a $13.6 billion reduction in the stock of inventories, bringing the total simulated reduction in the capital stock to $53.9 billion.

Other studies have been unable to find any significant change in the rate of accumulation of fixed nonresidential capital in the 1980s. For example, Oliner (1989) concludes that the pace of accumulation of business capital in the 1980s continued to support a rate of capital deepening (relative to the labor force) not much different from the postwar average, suggesting that characterizations of capital formation in the 1980s as unusually weak or unusually strong are unwarranted. Another study by Englander and Steindel (1989) also reaches the same conclusion.

Table 4

Estimated Cumulative Impacts of Fiscal Policy During the Reagan Years

(In Billions of 1982 Dollars)

	Sector	Assumed Target for Monetary Policy: Unemployment Rate	Assumed Target for Monetary Policy: Price Level
1.	Stock of Inventories	−15.5	−10.7
2.	Stock of Consumer Durables	−15.4	−8.5
3.	Stock of Residential Capital	−83.1	−72.7
4.	Stock of Nonresidential Fixed Capital	47.2	65.6
5.	Total Stock of Capital (1+2+3+4)	−66.8	−26.3
6.	Net Indebtedness to Foreigners	370.7	362.5
7.	Estimated Labor Supply Effects (Either Increasing the Capital Stock or Reducing Net Indebtedness to Foreigners	27.2	27.2
8.	Total Burden on Future Generations (6-5-7)	410.3	361.6

Our simulated increase in fixed nonresidential capital due to fiscal changes in the 1981 to 1988 period comes to $47.2 billion in 1982 dollars, or 1.3 percent of the average level of that stock in the 1980s; and under the alternative assumption for monetary policy it is $65.6 billion, or 1.8 percent. This is equivalent to an increase in the annual growth rate of the stock of fixed nonresidential capital of around 0.2 percent during this period. Given the small size of this number relative to the long-term growth trend of about 3 percent, it is not surprising that other studies have not been able to find a significant break in the rate of accumulation of business capital in the 1980s.

Neither are the estimated effects on the capital stock large enough to significantly alter potential GNP. Assume that all of the estimated $27.2 billion effect of a larger labor supply on private saving was channeled into domestic capital formation. Still, the total change in domestic capital stock (exclusive of consumer durables) comes to a decline of $24.2 billion in the simulation where the Federal Reserve targets the unemployment rate, and to an increase of $9.4 in the alternative simulation. As a result, the average level of the capital stock as a percent of GNP would have been 0.3 percent lower to 0.1 percent higher than otherwise. Assuming a 20 percent gross rate of return on investment, potential GNP therefore would have been .06 (.3 × .2) percent lower to .02 (.1 × .2) percent higher because of the effects of fiscal policy on capital formation. Since these estimates are small (equaling less than one-twentieth of the estimated effect of labor supply on potential output) and on average close to zero, no adjustment is made for the effect of investment on potential output.

The remaining burden of fiscal policy during the Reagan years stems from its effect on indebtedness to foreigners. As we have seen, fiscal policy put upward pressure on real interest rates in the United States. These, in turn, attracted capital from abroad which was used either directly or indirectly to finance the higher level of government borrowing. As foreign investors purchased dollars, they put upward pressure on the real foreign exchange value of the dollar.

Chart 2E shows the effect of fiscal policy on the real trade-weighted value of the dollar. The large volume of foreign capital that the Reagan fiscal expansion attracted put significant upward pressure on the dollar. It boosted the real value of the dollar by a maximum of nearly 25 percent in 1985; and even by 1988, when the federal budget deficit had been reduced somewhat, the real value of the

dollar was still 15 percent higher than it otherwise would have been.

A by product of the stronger dollar was a large deterioration in our trade balance. For supply to equal demand in the foreign exchange market, a dollar of extra capital inflow must produce a dollar's worth of reduction in net exports. So the reduction in net exports is also a measure of the net increase in foreign capital inflows.[23] As shown in Chart 2F, U.S. net exports would have declined—and net capital inflows increased—even with an unchanged fiscal policy because of the strong growth of the U.S. economy as it pulled out of the 1982 recession. But by 1988 the change in fiscal policy had reduced the value of net exports in 1982 dollars by over $90 billion. Thus, the effect of fiscal policy in the Reagan years was to add about $90 billion dollars of indebtedness to foreigners in peak years, and lesser amounts in other years, without increasing the domestic capital stock to provide any more income to service this debt. As shown in Table 4, by 1988 foreign indebtedness is estimated to have been $370.7 billion greater, in 1982 dollars, than it otherwise would have been with an unchanged fiscal policy.

The assumption that the Federal Reserve would have targeted the price level, rather than the unemployment rate, makes relatively little difference to the simulated effects of fiscal policy, as shown in Table 4. On the assumption that monetary policy targeted the unemployment rate, fiscal policy in the Reagan years reduced the price level by 2 percent because of a stronger dollar. So targeting the price level would have allowed a somewhat easier monetary policy. However, this reduces the simulated increase in short-term interest rates that is attributed to the effects of fiscal changes in the Reagan years by only 15 basis points. The estimated impact of fiscal policy on the total stock of capital is reduced by $40.5 billion, and on indebtedness to foreigners by $8.2 billion. The total estimated burden of fiscal policy is reduced by only 12 percent.

Another intermediate target that the Federal Reserve might have followed in this period is nominal GNP. But targeting the unemployment rate is almost the same as targeting real GNP, given the small supply-side effects of fiscal policy on potential output. So a simulation assuming nominal GNP targeting (or some combination of real GNP and price level targeting) on the part of the Federal Reserve would lie between the other two alternatives.

III. Summary and Conclusions

This paper has tested alternative views of the burden that fiscal policy placed on future generations in the Reagan years. The more conventional view is that fiscal deficits led to a substantial crowding out of capital formation and net exports, and as a result reduced the capital stock and increased the indebtedness of future generations to foreigners. In the alternative view, there were important offsetting responses to fiscal policy that reduced these effects. One is a Ricardian response of private saving to the budget deficits, and another is a positive response of private saving, investment, and work effort to lower marginal tax rates. But no evidence of a Ricardian response in consumption is found, and the estimated response of saving to changes in the real interest rate is very small. Similarly, the estimated effects of lower marginal tax rates on labor supply, and hence potential output, provide only a small offset to the burden. Also, while lower tax rates stimulated domestic investment, higher real interest rates discouraged it. As a result, no significant influence of domestic investment on potential output is estimated.

Neither is it possible to find any evidence of an improvement in the investment climate of the U.S., which could have independently boosted the stock of capital for future generations. Although business investment responded positively to reductions in the effective rate of taxation, it did not exhibit any unusual strength relative to its usual economic determinants. Similarly, although there is some evidence of a small "safe-haven" effect acting to strengthen the dollar and net capital inflows up until 1985, an equal and opposite effect on the dollar developed afterward. Thus, there is no evidence of any sustained safe-haven effect during the 1980s, which would have lowered the cost of capital and raised U.S. domestic investment by attracting net capital inflows from abroad independently from the pull of U.S. fiscal policy.

The cumulative change in the U.S. high employment budget deficit from 1981 to 1988 comes to $619.4 billion, in 1982 dollars (Table 3). The longer-run tendency should be for budget deficits to fully crowd out interest sensitive private investment spending and net exports. But because of lags in the responses of investment to interest rates, and net exports to the exchange rate, the actual effect over any

finite period should be smaller. A simulation using a mainline neo-Keynesian macroeconometric model estimates the reduction in the total domestic capital stock due to fiscal changes in the Reagan years at $66.8 billion, in 1982 dollars, when the unemployment rate is assumed to be the intermediate target of monetary policy. Alternatively, the reduction comes to $26.8 billion if it is assumed that the Federal Reserve targeted the price level. However, the largest estimated impact by far is on net exports, and therefore on an increased indebtedness to foreigners. It is estimated that fiscal policy in the Reagan years increased net indebtedness to foreigners by $410.3 billion, in 1982 dollars, if the unemployment rate is assumed as an intermediate target for monetary policy, and $361.6 billion if the price level is assumed as the target.

It is interesting to compare these estimates with those from other macroeconometric models. Helliwell (1990) has surveyed the consequences of an increase in debt-financed U.S. government spending for ten multicountry econometric models having alternative kinds of expectations. In almost all of them, there is complete or nearly complete crowding out of real private spending and net exports in the medium term; and the crowding out tends to be divided about evenly between investment expenditures and net exports.

There are two fundamental reasons why the simulation in this paper produces a larger proportionate effect on net exports, and smaller impact on investment, than in the models surveyed by Helliwell. In the first place, the simulations surveyed by Helliwell assume only a simple change in debt-financed government spending, and so do not capture the full details of the kinds of fiscal changes that occurred in the Reagan years. In particular, the large tax cuts for business tended to shift crowding out from domestic investment to net exports. Second, a unique feature of the present macroeconometric model is an expectational effect of budget deficits on the exchange rate. Thus, the expectation of continued U.S. budget deficits raised the value of the dollar independently from the budget's effect on interest rates. As a result, the dollar rose by more and interest rates rose by less than would otherwise have been the case. This shifted the crowding out even further on to net exports and away from domestic investment.[24]

The burden that fiscal policy placed on future generations in the Reagan years can be expressed either in terms of (1) the lump sum amount that would be required to restore the capital stock and pay off the extra foreign debt, or (2) the annual loss of future income due to the reduced capital stock and the servicing of an increased amount of foreign debt. Over the full eight years of the Reagan Administration, the total burden of fiscal policy on future generations comes to a lump sum amount of between $361.6 and $410.3 billion, in 1982 dollars, depending on the assumption made for monetary policy. This includes a $27.2 billion offset from favorable labor supply effects created by lower marginal tax rates. To put this total burden in perspective, it is equal to about 9 percent of the nation's current output, or $2,706 in current dollars for every member of the adult population. This is what it would cost to restore the lost capital stock and pay off the extra foreign debt incurred.

Alternatively, the burden would otherwise take the form of an annual loss in income due to a lower capital stock and the need to service the increased amount of foreign debt. At a current 4 percent real bond rate, this comes to an annual payment equal to 0.4 percent of current GNP, or $110 per year in today's dollars for every member of the adult population, forever.

Of course, current generations benefitted in the Reagan years by consuming more domestic and foreign goods than they would have otherwise. But since objective interpersonal welfare comparisons between different generations cannot be made, a scientific assessment of the overall effect of fiscal policy on the nation's economic welfare is not possible. Still, the estimated size of the burden on future generations is a good measure of the size of the intergenerational transfer that has occurred. If the burden were paid off now, future generations would be relieved of it, and the current generation would bear the full cost of its current consumption. This would be an appropriate policy if we truly do not want to better our own welfare at the expense of future generations.

To correct this intergenerational inequity, the Bush Administration has proposed running budget surpluses by the mid-1990s.[25] The broad outlines of this plan were incorporated into the budget summit agreement of last year, and a down payment of about $40 billion in deficit reduction has been made for fiscal 1991. Such reductions in the budget deficit, along with resulting reductions in interest rates and the value of the dollar, would stimulate private domestic investment and reduce net foreign capital inflows. As a consequence, the burden on future generations from fiscal changes in the Reagan years would tend to be eliminated.

NOTES

1. See, for example, B. Friedman (1988), Gramlich (1989), and Modigliani (1988) for statements of this view. For an earlier but still quite relevant collection of economists' writings on the burden of the public debt, see Ferguson (1964).

2. See Darby (1988), M. Friedman (1989), and Judd (1989).

3. See Barro (1974, 1989).

4. This model is fully described in Throop (1989).

5. For elaboration of this theory, see Modigliani and Brumburg (1954), Ando and Modigliani (1963), Modigliani (1970), and Steindel (1981).

6. A detailed study showing the importance of liquidity constraints is Wilcox (1989).

7. Although David Ricardo was one of the first to discuss the issue, he did not believe in the equivalence between debt and taxes, but like Adam Smith before him, argued that taxes on households mainly reduce current consumption while internal borrowing tends to result in reduced capital formation. Thus, the "Ricardian Equivalence Theorem" should be relabeled the "Non-Ricardian Equivalence Theorem" and Ricardo's doctrine relabeled the "Ricardian Non-Equivalence Theorem." See Buiter and Tobin (1979) and O'Driscoll (1977). However, for ease of exposition we have followed conventional usage.

8. As Blinder (1986) puts it: "When an individual has very diffuse priorities over what long-run government policy will be, it strikes me as plausible that his point estimates of future policy variables may have weak effects on his current decisions—which is just the opposite of what Barro and Sargent and Wallace assume. If this is so, then expectational issues, although deep and weighty, may not be of great empirical importance."

9. For a thorough recent survey of the theory and evidence on Ricardian equivalence, see Bernheim (1987). Earlier surveys include Brunner (1986) and Tobin (1980, Ch. 3).

10. See Chow (1960). For this test all the variables were transformed according to the estimated serial correlation coefficient for the full sample. The *F* test was then performed on the residuals from the estimated equations using these transformed variables. This procedure avoids a rejection of stability simply because of instability in the error pattern, as opposed to a shift in the structural equation itself.

11. Similar to the procedure for the *F* tests, the forecasting equation was estimated for the period up until 1981 using the serial correlation coefficient from the full sample period through 1989.

12. Because the Quandt test was used to identify most likely break points, effective critical values would actually be somewhat higher than those reported for the *F* distribution alone in Table 1.

13. Other estimates in the same neighborhood have been made by Hausman (1983) and Kendrick (1983).

14. See Hendershott (1987a).

15. The basic theory and its application are described in Jorgenson (1963), Hall (1971) and Hall and Jorgenson (1967).

16. The asset view of exchange markets was pioneered by Dornbusch (1976) and Frankel (1979).

17. See Modigliani and Shiller (1973).

18. Earlier studies of this particular exchange rate equation are Hutchison and Throop (1985) and Throop (1989d, 1989e).

19. See also Throop (1989b, 1989c), in which it is argued that movements in U.S. and foreign monetary and fiscal policies, rather than other factors such as safe-haven effects, explain most of the fluctuation in the dollar's value during the floating rate period.

20. Throop (1988) tests adaptive measures of expected inflation against more "rational," or forward looking, measures, but finds that the adaptive expectations have provided a better representation of actual expectations of inflation, even when monetary policy was changing sharply as in the post-October 1979 period of disinflation. See also Kaufman and Woglom (1984).

Two relationships in the model which were not examined in the previous section but which are potentially subject to instabilities because of expectational effects are the term structure of interest rates and the inflation equation. Although the term structure equation does show some evidence of instability during a temporary shift in the "monetary regime" between 1979 and 1982, there is no evidence of significant instability due to changes in fiscal policy. In particular, expected budget deficits are not found to enter significantly into the term-structure equation. See Throop (1988, 1989a) and Blanchard (1984). The stability of the expectations-augmented Phillips curve that is used to explain inflation in the model has been confirmed in a number of studies. See, for example, Gordon (1985), Perry (1983), and Blanchard (1984).

21. The effective tax rate on equity financed business investment shown in Table 3 is calculated as:

$$\frac{1-uz-k}{1-u}$$

where u = corporate tax rate
z = present value of one dollar's worth of depreciation allowance
k = investment tax credit

The Reagan program initially reduced the tax rate on business investment by increasing the present value of depreciation (z) and increasing the investment tax credit (k). For the derivation of this formula, see Hall and Jorgenson (1967) or Throop (1989a).

22. Because of a problem known as instrument instability, this can only be done approximately. See Holbrook (1972) for a general discussion. Only a fraction of the total effect of a change in interest rates on the unemployment rate occurs contemporaneously. Thus, if the targeted unemployment rate is hit exactly in a current period, in subsequent periods the lagged effects of the initial change in interest rates have to be offset. This can result in ever-larger oscillations in interest rates. Therefore, a degree of smoothing of interest rates is required. Still, the unemployment rate in the counterfactual simulation of an unchanged fiscal policy does not differ from the historical unemployment rate by more than 0.1 percentage point in any quarter.

23. The reduction in net exports is only an approximate measure of the increase in net capital inflows. There are two types of errors that tend to work in opposite directions. Interest payments on foreign debt are not modeled explicitly in the macroeconometric model. Therefore, to the extent that interest payments on debt to foreigners are financed by further capital inflows, equating the change in net indebtedness to the simulated change in net exports understates the increase in indebtedness. On the other hand, this procedure overstates the increase in indebtedness if the assumption in the simulation of a constant risk premium in the foreign exchange market does not hold exactly. In this case, the accumulation of debt has the effect of reducing the risk premium, and therefore the value of the dollar. This would generate higher net exports and smaller net capital inflows than in the simulation.

24. See Throop (1989d, 1989e) for a fuller discussion.

25. See *Budget of the United States Government: Fiscal Year 1991.*

26. See Eisner (1986, 1989), Blades and Sturm (1982) and Throop (1980) for further discussion of this inflation tax. The structural macroeconometric model that is used to simulate the effects of Reagan fiscal policy subtracts the inflation tax on all government debt from the NIPA measure of disposable income. This inflation-adjusted measure of income is consistent with households behaving rationally and generally saving (and reinvesting) inflation premiums in the interest on government debt.

Because of this behavior, the private saving rate as conventionally measured should tend to rise and fall with the inflation rate. This response of the private saving rate to inflation is particularly evident in some European countries that have experienced sharp changes in inflation, but it is somewhat obscured in U.S. data by movements in the ratio of wealth to income, which influences the saving rate in a life-cycle model of consumption. See Throop (1989a).

27. Because of adjustment costs, households tend to respond to their perception of the *permanent* reduction in real wealth due to the inflation tax. The inflation tax on federal debt is therefore calculated as an eight-quarter moving average of the inflation rate in consumer prices times the stock of federal debt held by U.S. residents.

28. Algebraically, by definition $GNP = C + I + G + X - M$, where C is private consumption, I is domestic investment, G is government spending, and $X - M$ is exports less imports. But since $GNP - C = S$ (private saving) $+ T$ (taxes), then $S + T - G = I + X - M$. Thus, given private saving (S), a reduction in the government surplus ($T - G$) always decreases domestic investment (I) or net foreign investment (equal to $X - M$).

29. These figures do not include matching grants to state and local governments for state and local capital spending. In an accounting sense this capital does not belong to the federal government, and in a behavioral sense the prevailing empirical evidence is that grants do not build up the stock of state and local capital because of a fiscal substitution effect (see Gramlich (1978)). In any case, federal grants to finance state and local capital projects dropped by $7.5 billion in constant dollars between 1980 and 1988.

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