Some Comments on Gali and Gambetti's

"On the Sources of the Great Moderation"

A Summary of Some Key Results:

1. Variance and Correlations

Diagonal = σ, Off-Diagonal = Correlation

	1948:I – 1983:IV			1984:I – 2005:IV		
	$\Delta^4 Y$	$\Delta^4 n$	$\Delta 4(Y-n)$	$\Delta^4 Y$	$\Delta^4 n$	$\Delta^{4(}Y-n)$
$\Delta^4 Y$	4.04			1.96		
$\Delta^4 n$	0.87	3.08		0.84	2.26	
$\Delta^4(Y-n)$	0.67	0.20	2.07	0.05	−0.50	1.24

2. Sources of changes in variance and correlations

Table 4. Changes in Conditional Volatility

	Non-Technology Shocks				*Technology Shocks*			
	Pre-84	Post-84	$\frac{\text{Post-84}}{\text{Pre-84}}$	p-value	Pre-84	Post-84	$\frac{\text{Post-84}}{\text{Pre-84}}$	p-value
First-Difference								
Output	1.14	0.62	0.54	0.00	0.52	0.54	1.05	0.70
Hours	0.79	0.65	0.82	0.26	0.34	0.21	0.61	0.00
Productivity	0.46	0.20	0.37	0.00	0.72	0.67	0.88	0.52
BP-Filter								
Output	1.93	1.19	0.62	0.07	0.65	0.65	1.01	0.95
Hours	1.59	1.35	0.85	0.51	0.47	0.30	0.65	0.05
Productivity	0.49	0.33	0.67	0.06	0.89	0.81	0.91	0.59

Table 5. Changes in Conditional Correlations

	Non-Technology Shocks			Technology Shocks		
	pre-84	post-84	change	pre-84	post-84	change
First-Difference						
Output, Hours	0.94	0.94	−0.00 (NA)	-0.39	-0.48	−0.09 (0.10)
Hours, Productivity	0.63	-0.30	−0.93** (0.08)	-0.75	-0.70	0.04 (0.07)
Output, Productivity	0.84	-0.01	−0.85** (0.16)	0.90	0.96	0.05 (0.08)
BP-Filter						
Output, Hours	0.97	0.97	−0.01 (NA)	-0.26	-0.34	−0.06 (0.19)
Hours, Productivity	0.60	-0.59	−1.19** (0.12)	-0.71	-0.65	0.06 (0.11)
Output, Productivity	0.75	-0.39	−1.14** (0.15)	0.86	0.93	0.07** (0.03)

Robustness of Results:

1. Changes in Variances and Covariances

    − filters, changes in timing

    − sectors: Stiroh (2007):
       80% show decline in variability, although covariance across
       sector is responsible for most of decline in aggregate
       volatility

       … within sector correlation of Δn and $\Delta(y-n)$ shows decline
       (annual data, weighted averages post 1968)

2. Decomposition − $\varepsilon^{Technology}$, ε^{Other}:

Harder and, in other contexts, more fragile

Fragility in other contexts:

− treatment of low-frequency variability in n (differences, levels, detrending, etc.) … Shapiro-Watson, Gali, Francis-Ramey, Christiano-Eichenbaum-Vigfusson, Pesavanto-Rossi

− treatment of low-frequency correlation of hours and changes in productivity (Fernald)

− lag-lengths in VAR (Christiano-Eichenbaum-Vigfusson, Chari-Kehoe-McGratten)

Basic Identifying Restrictions:

(1) ε^{Tech} explains all of long-run variability $y-n$.
(2) ε^{Tech} and ε^{Other} are uncorrelated.

"Relatively" Easy to Identify: long-run variance of $y-n$.

Interpretation: Standard deviation of ε^{Tech} (defined as a shock that leads to 1% long-run change in $y-n$.)

Standard deviation of $\varepsilon^{Technology}$

Estimator	1948-1983	1984-2005
AR(2)	1.1	0.66
AR(4)	1.02	0.59
AR(6)	0.91	0.61
Bartlett(4)	1.01	0.61
Bartlett(10)	0.93	0.66
Bartlett(4) – Fernald-DT	0.94	0.50
Bartlett(10) − Fernald-DT	0.77	0.42

Evident decline in variance of identified technology shocks

Model	1948-1983		1984-2005		% Decline Variance From Prod
	$SD(Y)$	$VD\ \varepsilon^{Tech}$	$SD(Y)$	$VD\ \varepsilon^{Tech}$	
BP Transformed Series					
GG − TVP	2.03	0.10	1.36	0.23	0%

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BP Transformed Series					
GG − TVP	2.03	0.10	1.36	0.23	0%
Annual Differences − Split Sample					
VAR(4) Δn	4.07	0.21	1.64	0.07	24%
VAR(6) Δn	4.03	0.18	1.63	0.22	17%
VAR(4) n	4.08	0.35	1.59	0.59	31%
VAR(6) n	4.03	0.47	1.59	0.63	44%
VAR(4) n, Fernald-DT $\Delta y - \Delta n$	4.01	0.11	1.68	0.06	12%
VAR(6) n Fernald-DT $\Delta y - \Delta n$	3.99	0.17	1.69	0.16	18%

Identification/weak instruments

Key Equation

(Levels of n): $\Delta(y-n) = \Delta n_t + \text{lags} + \varepsilon^{Technology}$

(Differences of n): $\Delta(y-n) = \Delta\Delta n_t + \text{lags} + \varepsilon^{Technology}$

(Fernald-DT): $\Delta(y-n)^{Fernald} = \Delta n_t + \text{lags} + \varepsilon^{Technology}$

First Stage *F*-statistic for IV estimates

Specification	Lags	1948-1983	1984-2005
Level *n*	4	6.5	4.4
Level *n*	6	5.5	5.1
Dif *n*	4	40.7	3.2
Dif *n*	6	26.0	2.3
Fernald-DT	4	3.7	1.9
Fernald-DT	6	2.0	2.0

Summary:

1. Changes in variances and correlations seem quite robust … "strict" good luck are inconsistent with these results.

2. Decomposition of changes into $\varepsilon^{Teschnology}$ and ε^{Other} appears to be less robust … at least based on crude split-sample analysis.