

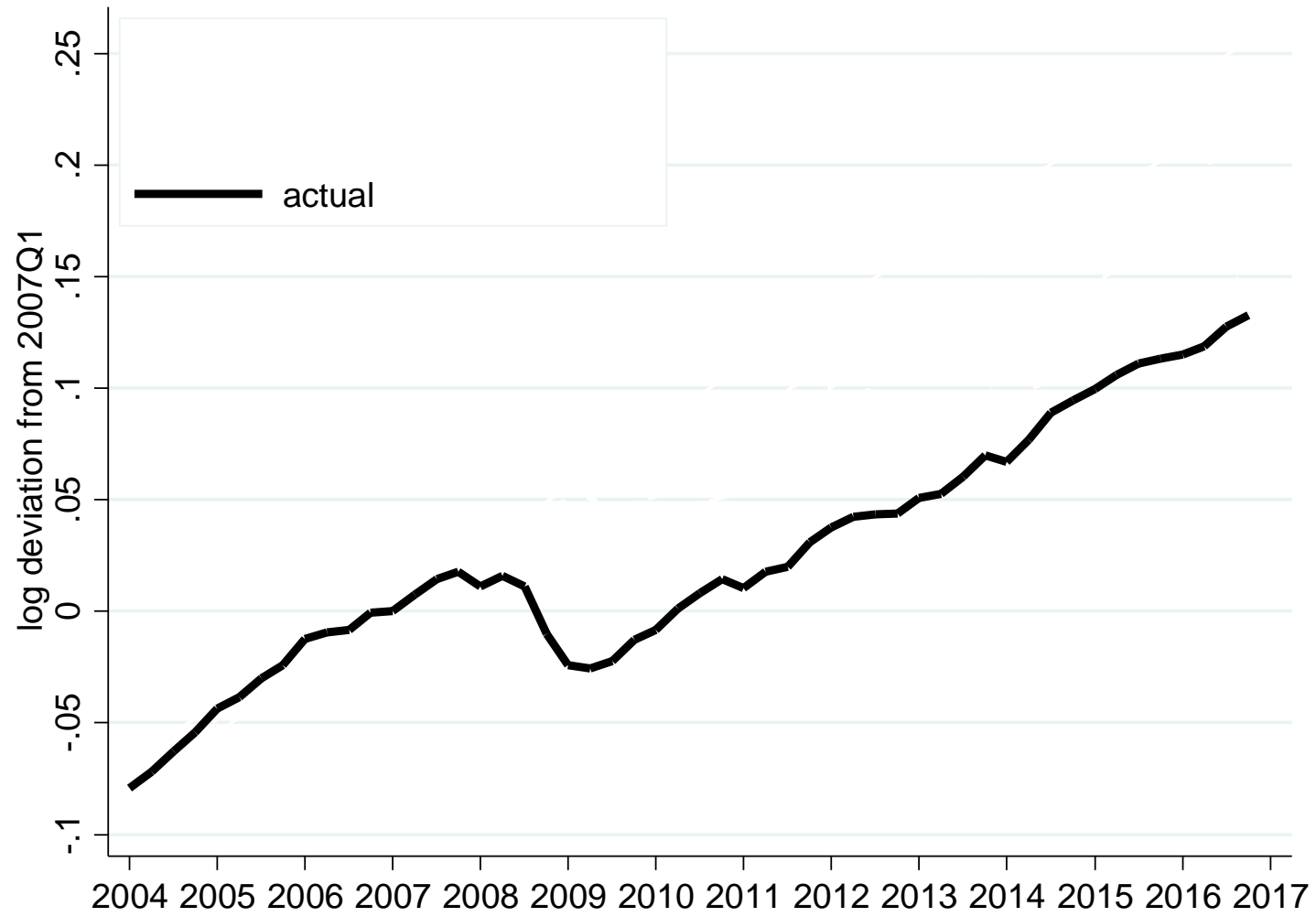
SECULAR STAGNATION: POLICY OPTIONS AND THE CYCLICAL SENSITIVITY IN ESTIMATES OF POTENTIAL OUTPUT

Olivier Coibion
UT Austin
& *NBER*

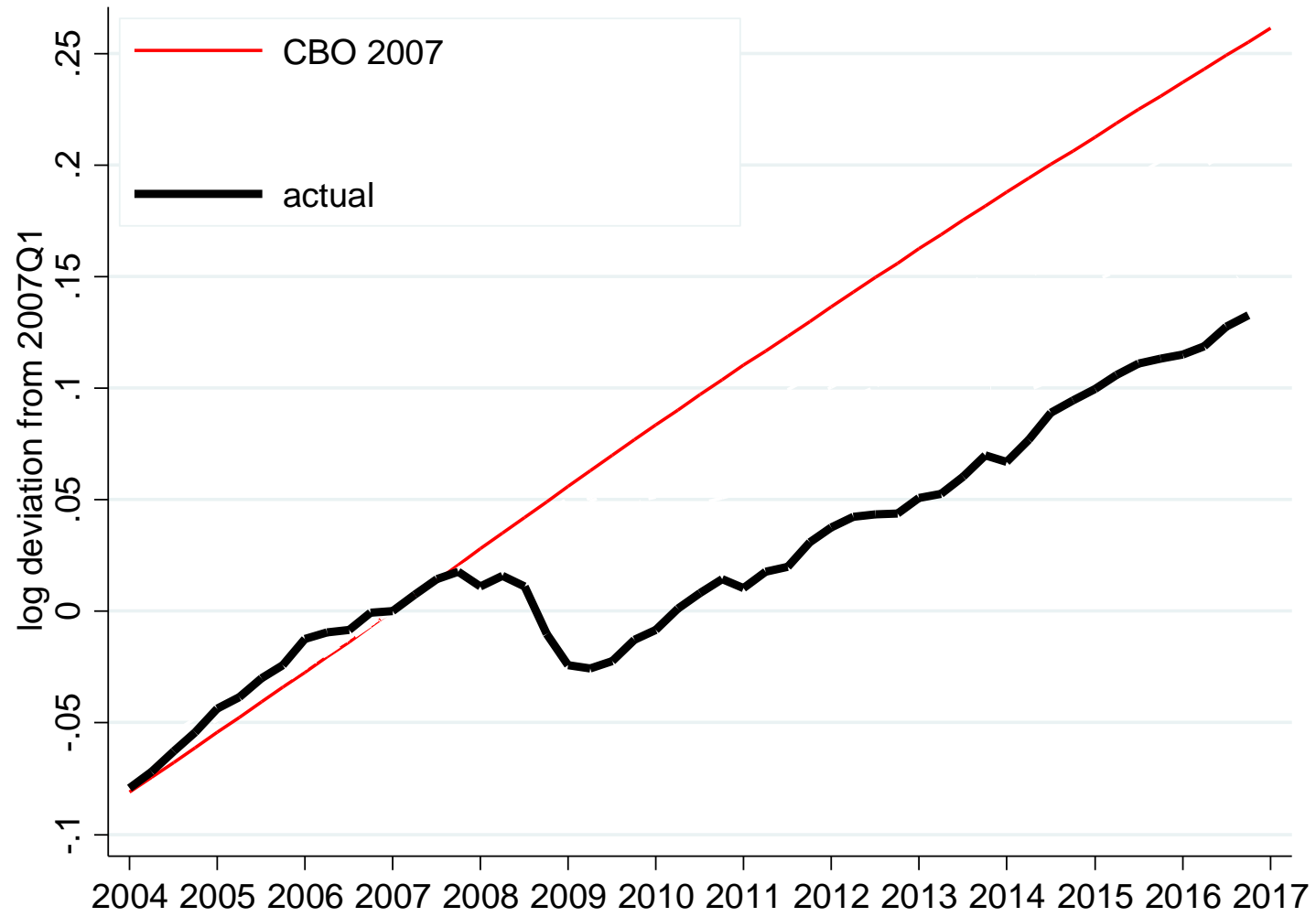
Yuriy Gorodnichenko
UC Berkeley
& *NBER*

Mauricio Ulate
UC Berkeley

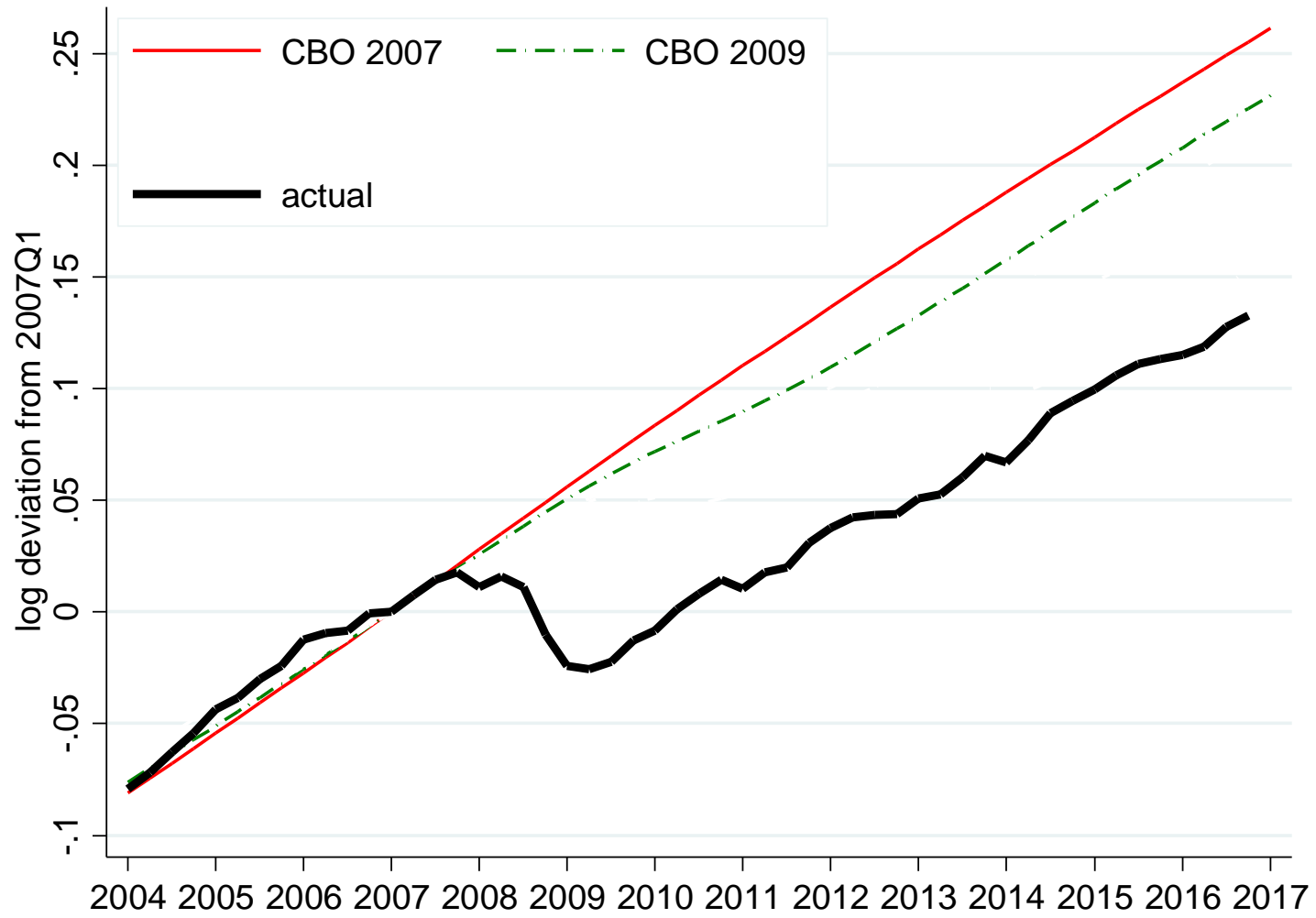
SECULAR STAGNATION?



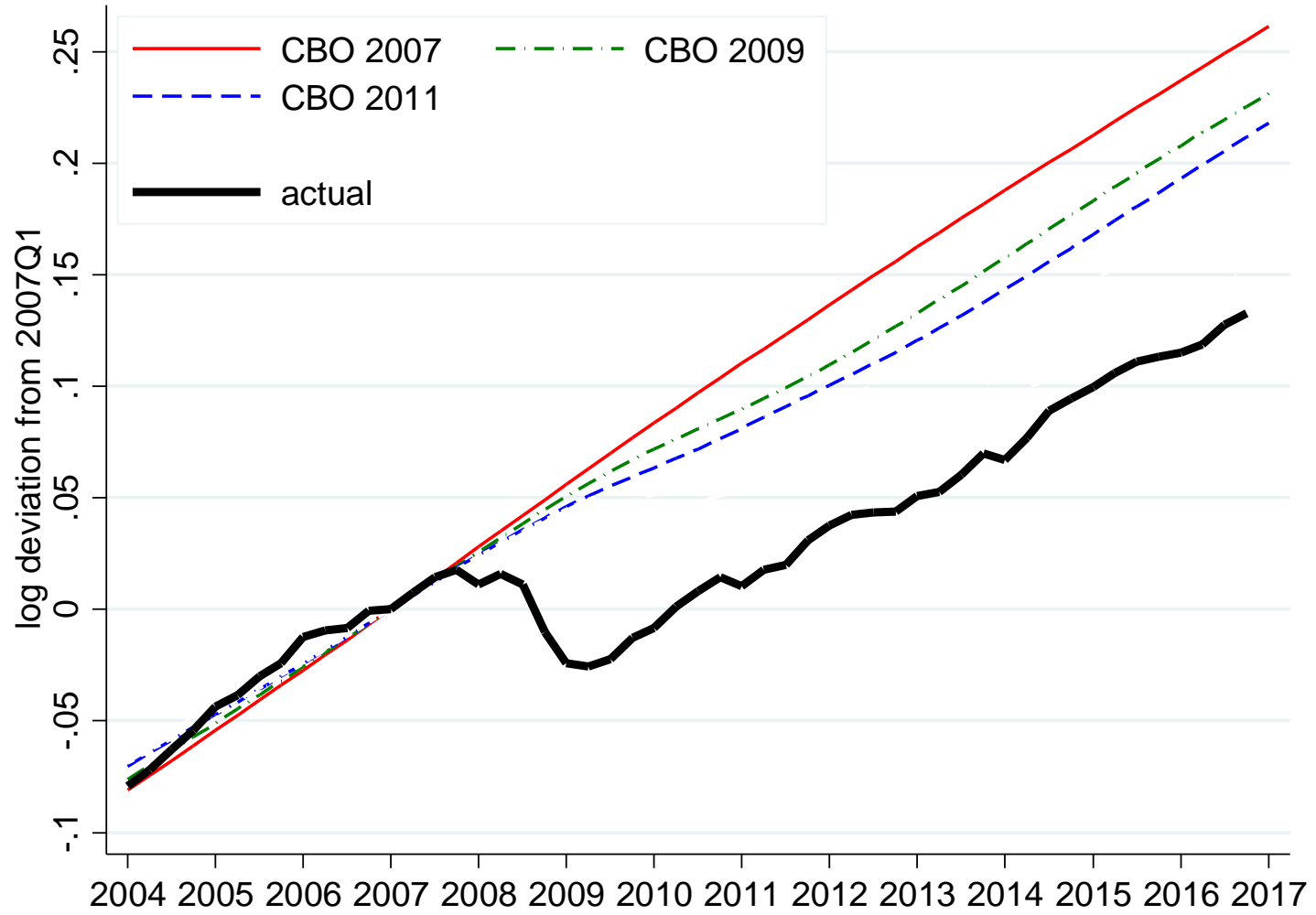
SECULAR STAGNATION?



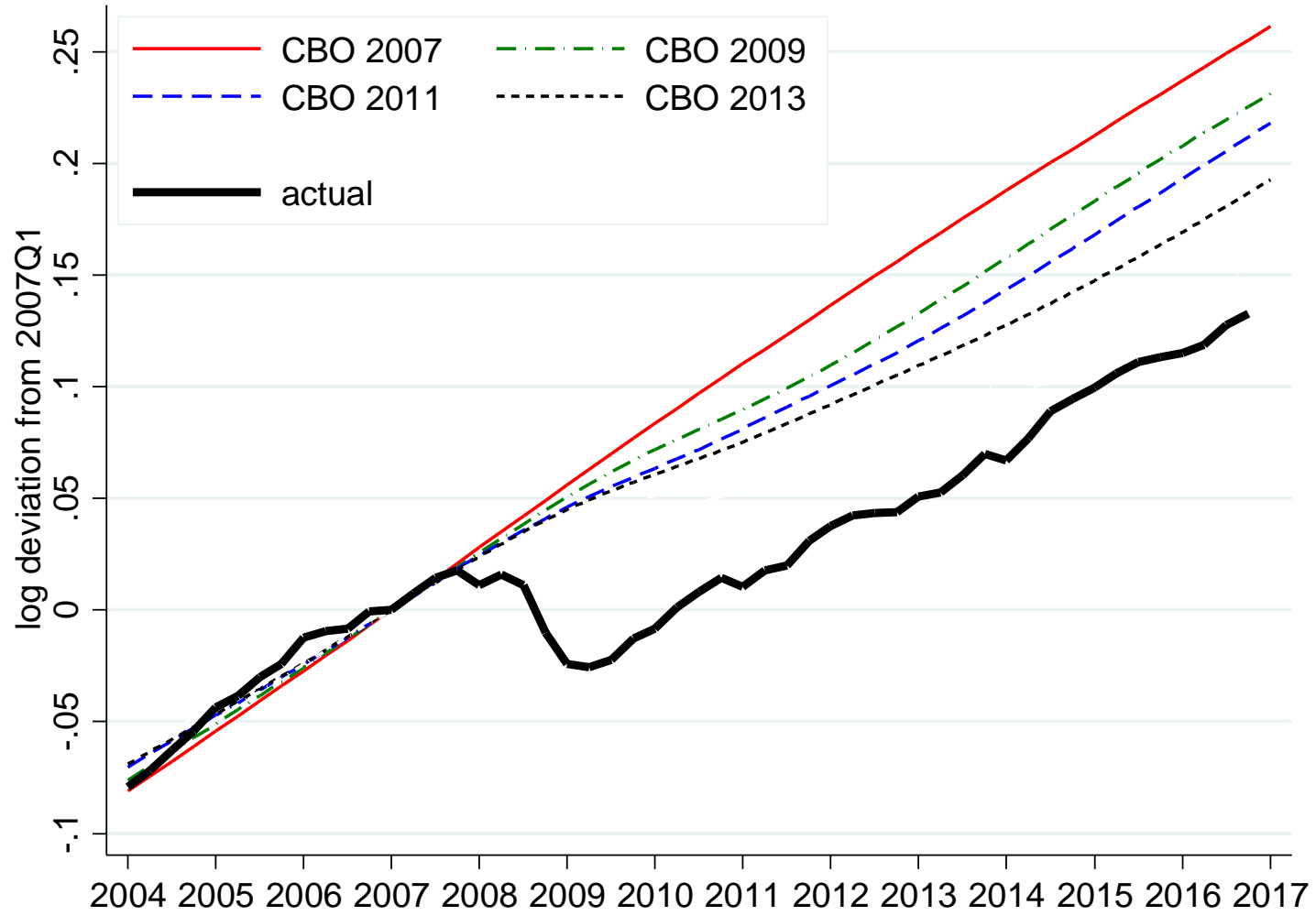
SECULAR STAGNATION?



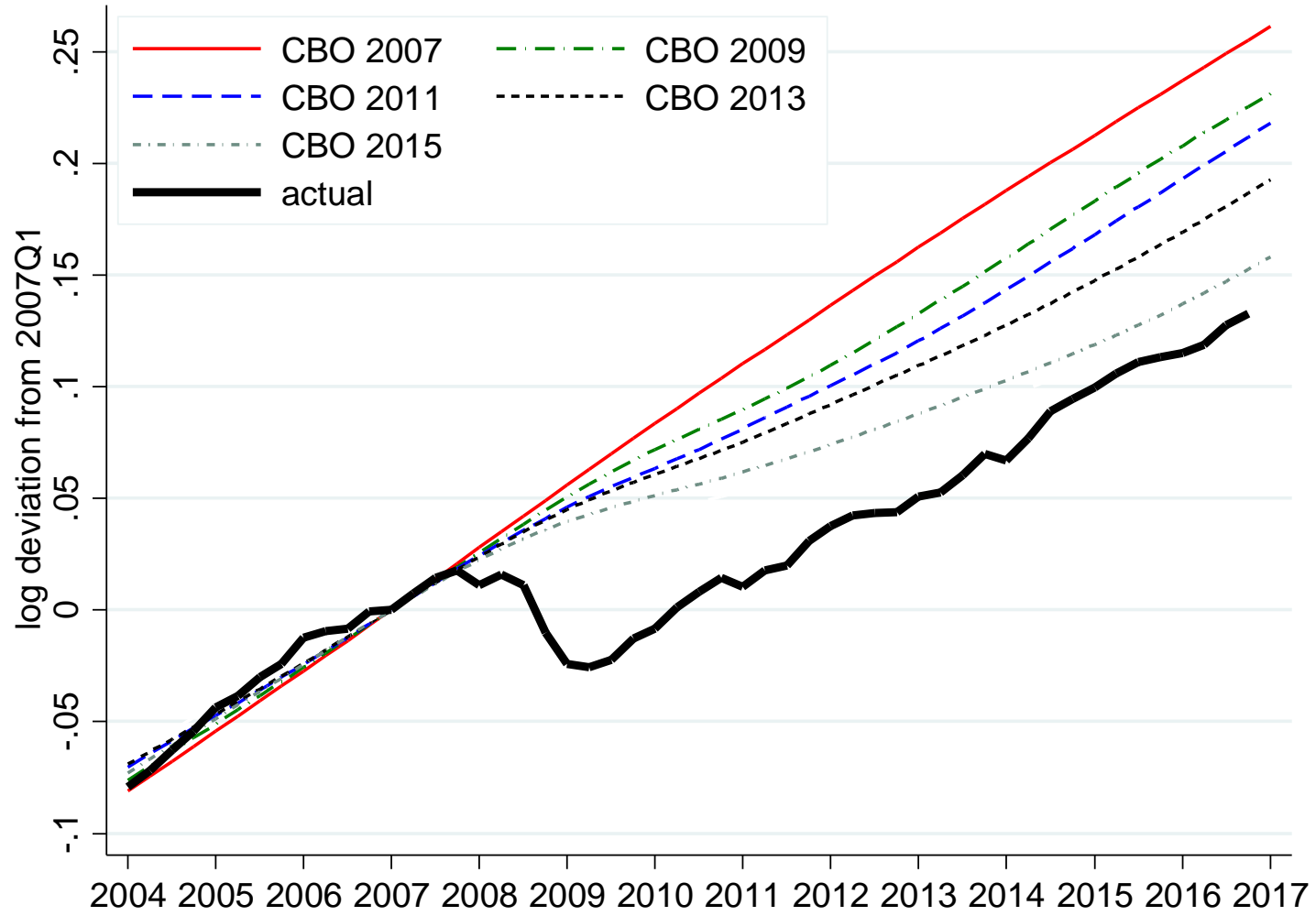
SECULAR STAGNATION?



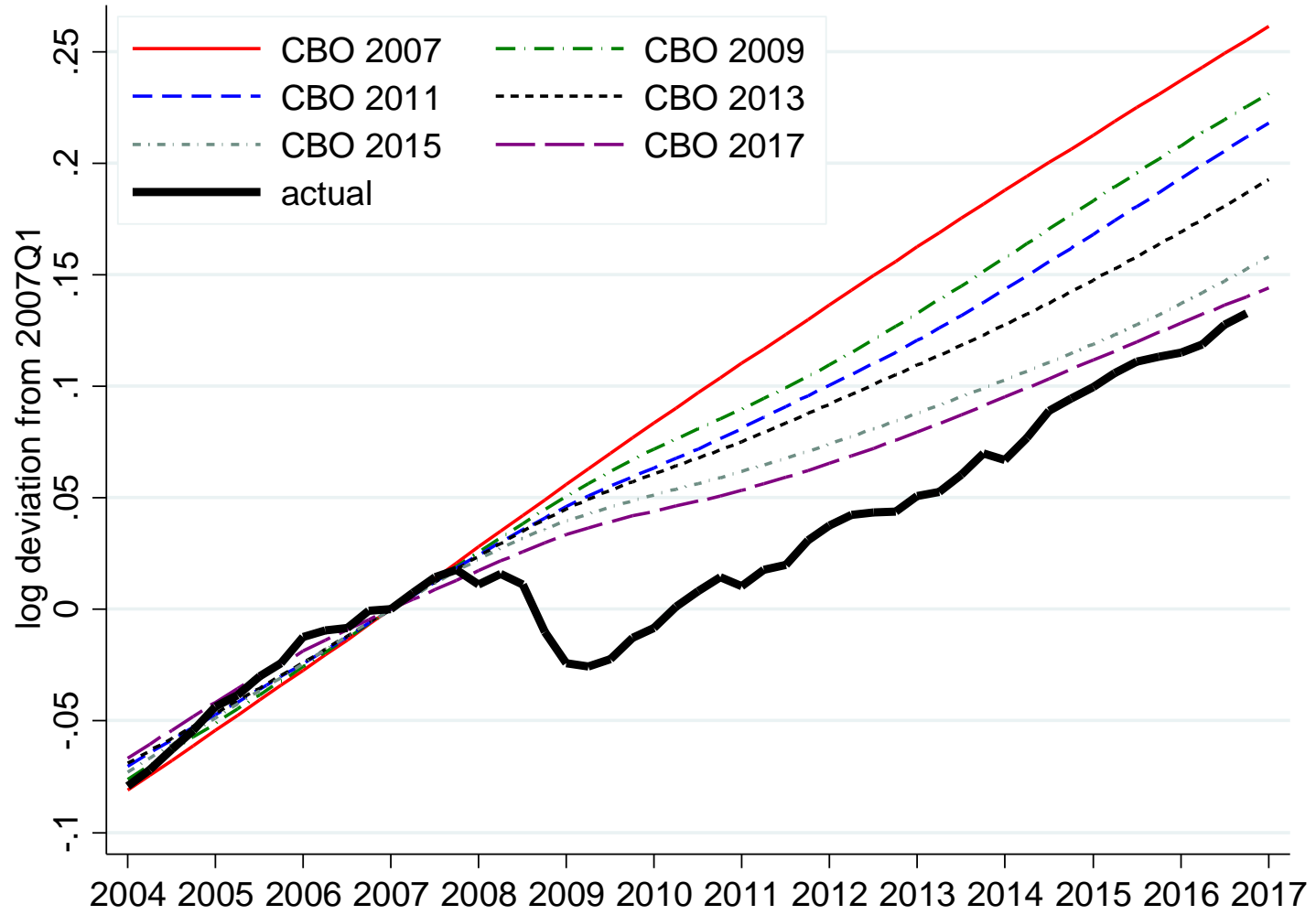
SECULAR STAGNATION?



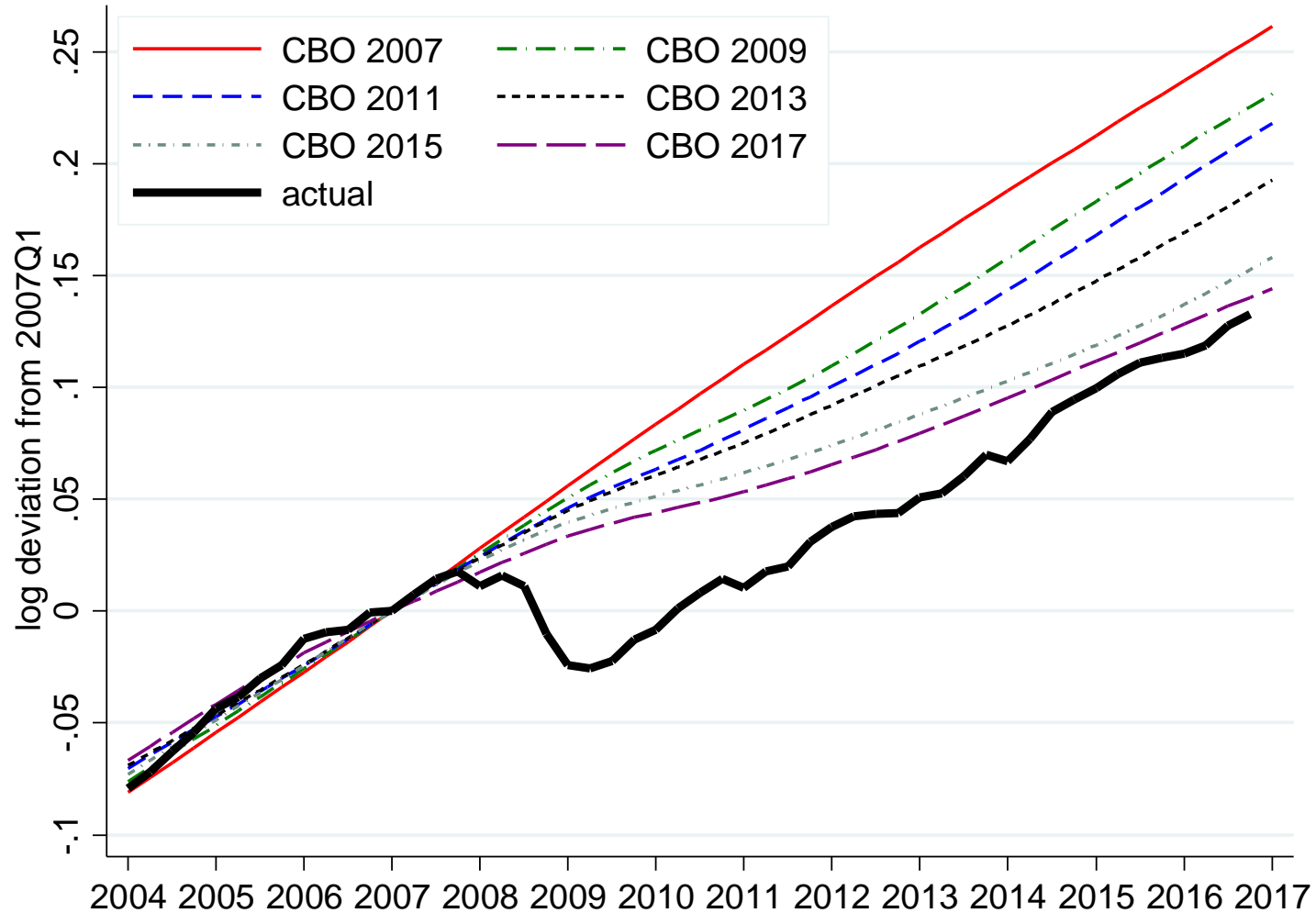
SECULAR STAGNATION?



SECULAR STAGNATION?



SECULAR STAGNATION?



Larry Summers: I'm more convinced of secular stagnation than ever before.

WHY DOES IT MATTER FOR CENTRAL BANKS?

- After the Great Recession/Global Financial Crisis, many economies struggle to return to pre-crisis trends.
- Key questions:
 - How much “slack” do we have?
 - How permanent are the deviations from pre-crisis trends?

WHY DOES IT MATTER FOR CENTRAL BANKS?

- After the Great Recession/Global Financial Crisis, many economies struggle to return to pre-crisis trends.
- Key questions:
 - How much “slack” do we have?
 - How permanent are the deviations from pre-crisis trends?
- Policy (Taylor) rule: $i_t = i^* + \phi_\pi(\pi_t - \pi^*) + \phi_x(y_t - y_t^*)$
- Revisions in potential output y_t^* reduce output gap and hence the argument for more monetary stimulus is weaker.

WHY DOES IT MATTER FOR CENTRAL BANKS?

- After the Great Recession/Global Financial Crisis, many economies struggle to return to pre-crisis trends.
- Key questions:
 - How much “slack” do we have?
 - How permanent are the deviations from pre-crisis trends?
- Policy (Taylor) rule: $i_t = i^* + \phi_\pi(\pi_t - \pi^*) + \phi_x(y_t - y_t^*)$
- Revisions in potential output y_t^* reduce output gap and hence the argument for more monetary stimulus is weaker.

What do we know about y_t^* ? Why do we have revisions in y_t^* ?

PREVIEW

What do we know about y_t^* ? Why do we have revisions in y_t^* ?

- Collect measures of potential output for the U.S. and other countries.

PREVIEW

What do we know about y_t^* ? Why do we have revisions in y_t^* ?

- Collect measures of potential output for the U.S. and other countries.
- Study how identified shocks influence actual output and real-time estimates of potential output.

PREVIEW

What do we know about y_t^* ? Why do we have revisions in y_t^* ?

- Collect measures of potential output for the U.S. and other countries.
- Study how identified shocks influence actual output and real-time estimates of potential output.
- **Main results:**
 - Estimates of potential output respond to “demand” and “supply” shocks.
 - Potential output eventually catches up with actual output.
 - Properties of estimates of potential output can be well-approximated with one-sided, univariate Hodrick-Prescott filter.

PREVIEW

What do we know about y_t^* ? Why do we have revisions in y_t^* ?

- Collect measures of potential output for the U.S. and other countries.
- Study how identified shocks influence actual output and real-time estimates of potential output.
- Main results:
 - Estimates of potential output respond to “demand” and “supply” shocks.
 - Potential output eventually catches up with actual output.
 - Properties of estimates of potential output can be well-approximated with one-sided, univariate Hodrick-Prescott filter.
- Main conclusion: the decline in potential output is not necessarily as permanent as many policymakers and academics think.

WHAT IS POTENTIAL OUTPUT?

Three main approaches:

- Production function: $Y^* = F(K^*, L^*, Productivity)$

WHAT IS POTENTIAL OUTPUT?

Three main approaches:

- Production function: $Y^* = F(K^*, L^*, Productivity)$
- Statistical measures (potential = trend):
 - Hodrick-Prescott filter
 - Unobserved component: $y_t = y_t^* + u_t$ and $y_t^* = y_{t-1}^* + e_t$
 - Multivariate versions of the unobserved component model

WHAT IS POTENTIAL OUTPUT?

Three main approaches:

- Production function: $Y^* = F(K^*, L^*, Productivity)$
- Statistical measures (potential = trend):
 - Hodrick-Prescott filter
 - Unobserved component: $y_t = y_t^* + u_t$ and $y_t^* = y_{t-1}^* + e_t$
 - Multivariate versions of the unobserved component model
- **Structural:**
 - Sophisticated dynamic stochastic general equilibrium model (DSGE)
 - Estimate shocks and structural parameters
 - Potential output is the level of output one would observe if some shocks and frictions in the model are “turned off”

MEASURES OF POTENTIAL OUTPUT

Congress Budget Office (CBO):

Method: production function

Sample: 1991-present

Federal Reserve (“Greenbook”):

Method: a mix of methods + judgmental

Sample: 1987-2011 (high-quality), 1969-2011 (lower quality)

International Monetary Fund (IMF):

Method: a mix of methods + judgmental

Sample: 27 countries, years 2003-2016

Organization for Economic Cooperation and Development (OECD):

Method: production function

Sample: 31 countries, years 1989-2016 (varies across countries)

Private sector forecasts (Consensus Economics):

Method: output growth rate forecast at long horizons (up to 10 years)

Sample: 12 countries, 1989-2016

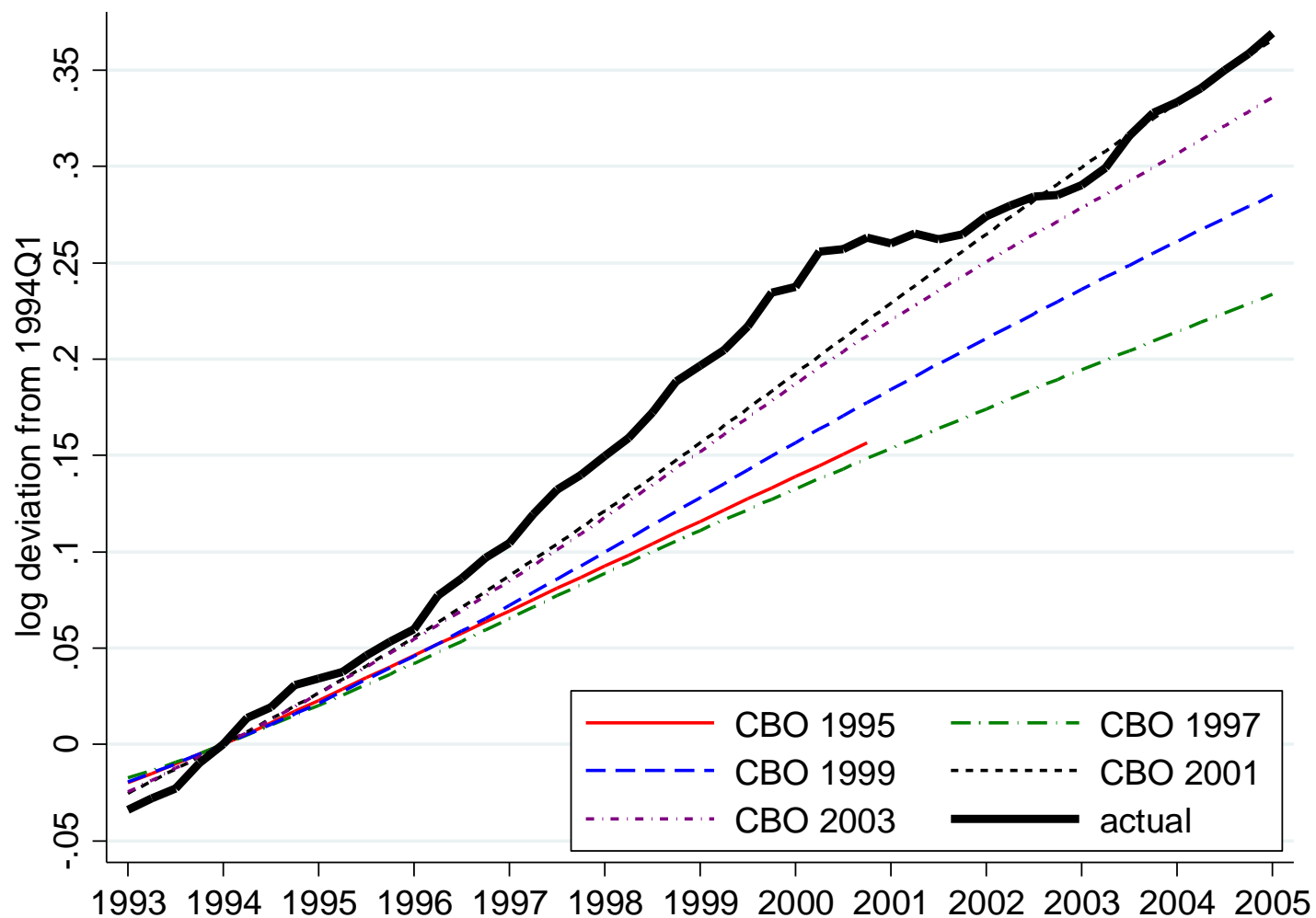
MEASURES OF POTENTIAL OUTPUT: IMF

	Structural	Statistical	Judgment	Other
Full sample	34.1	44.4	78.6	9.5
APD	47.1	47.1	76.5	11.8
AFR	14.8	33.3	74.1	7.4
EUR	56.3	50.0	78.1	9.4
MCD	22.7	36.4	90.9	9.1
WHD	28.6	53.6	75.0	10.7
ADV	75.0	45.0	70.0	10.0
EME	32.8	46.9	75.0	7.8
LIC	16.7	40.5	88.1	11.9
OIL	22.2	50.0	77.8	5.6
Training				
Yes	35.4	50.0	79.2	8.3
No	33.3	41.0	78.2	10.3
Experience				
High	33.3	44.4	83.3	11.1
Low	34.3	44.4	77.8	9.3

Source: Resende (2014). The table shows the share of a method used to construct potential output by IMF economists across countries.

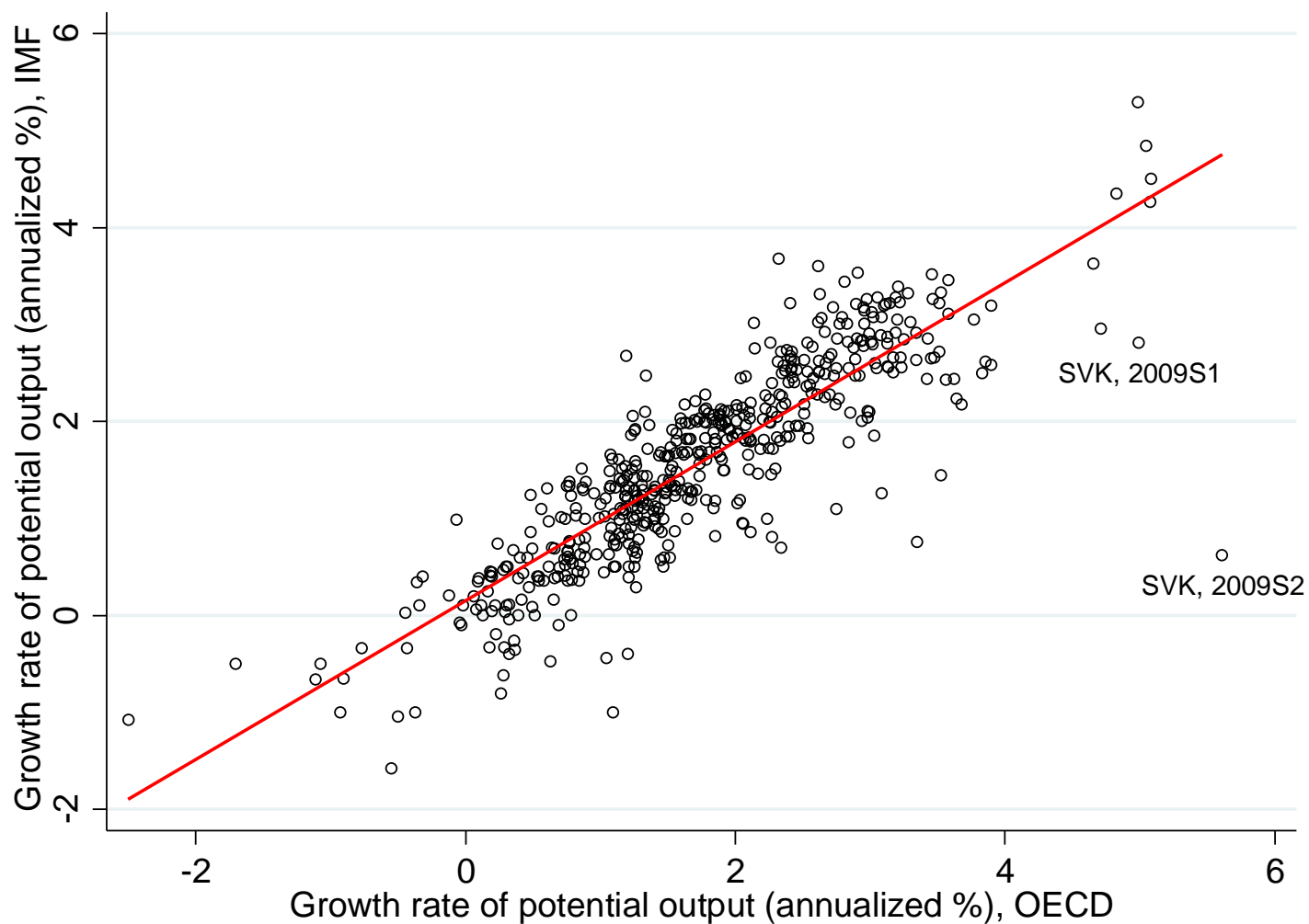
MEASURES OF POTENTIAL OUTPUT

Fact #1: Revisions are not one-sided



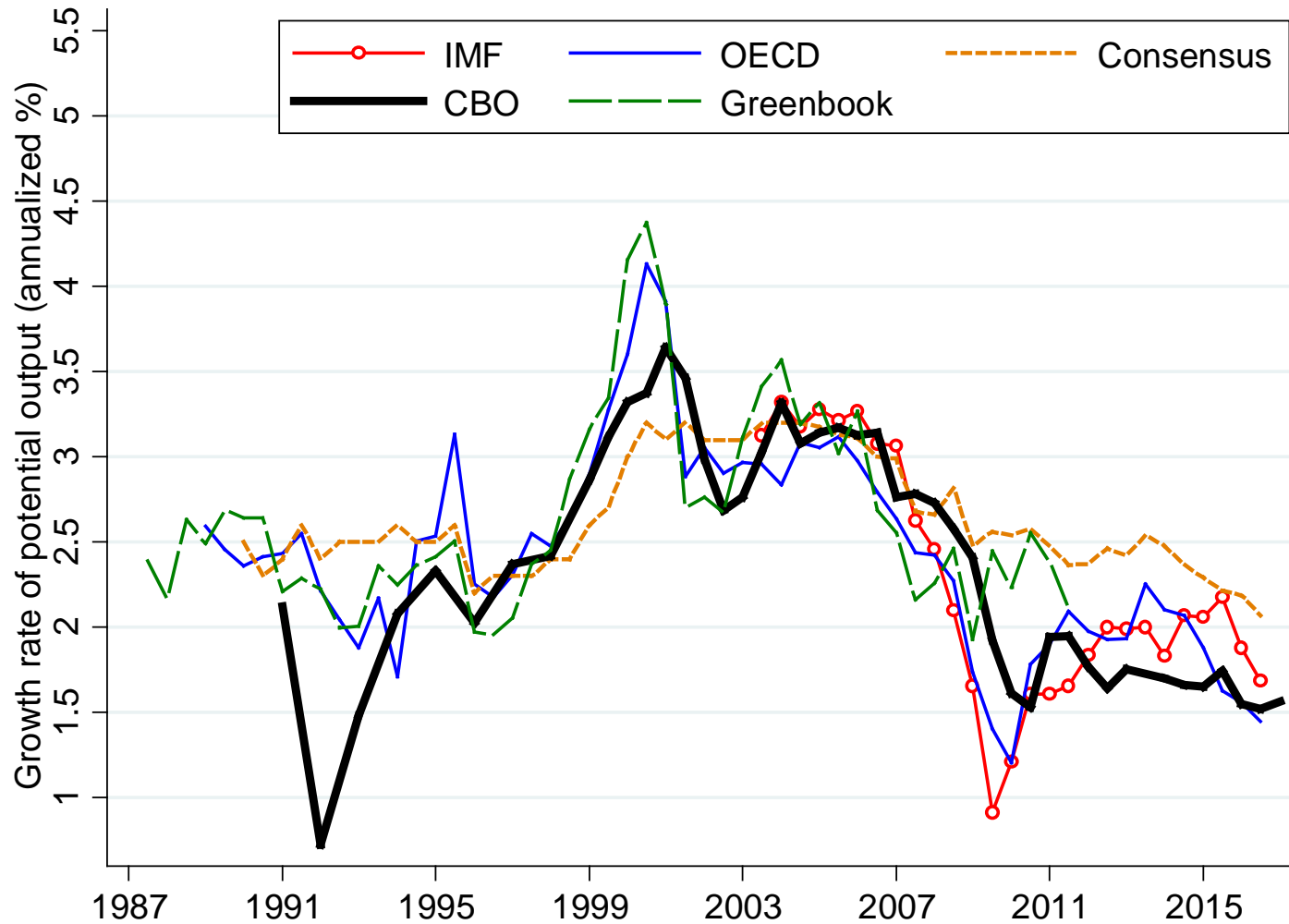
MEASURES OF POTENTIAL OUTPUT

Fact #2: Consistency of measures across countries

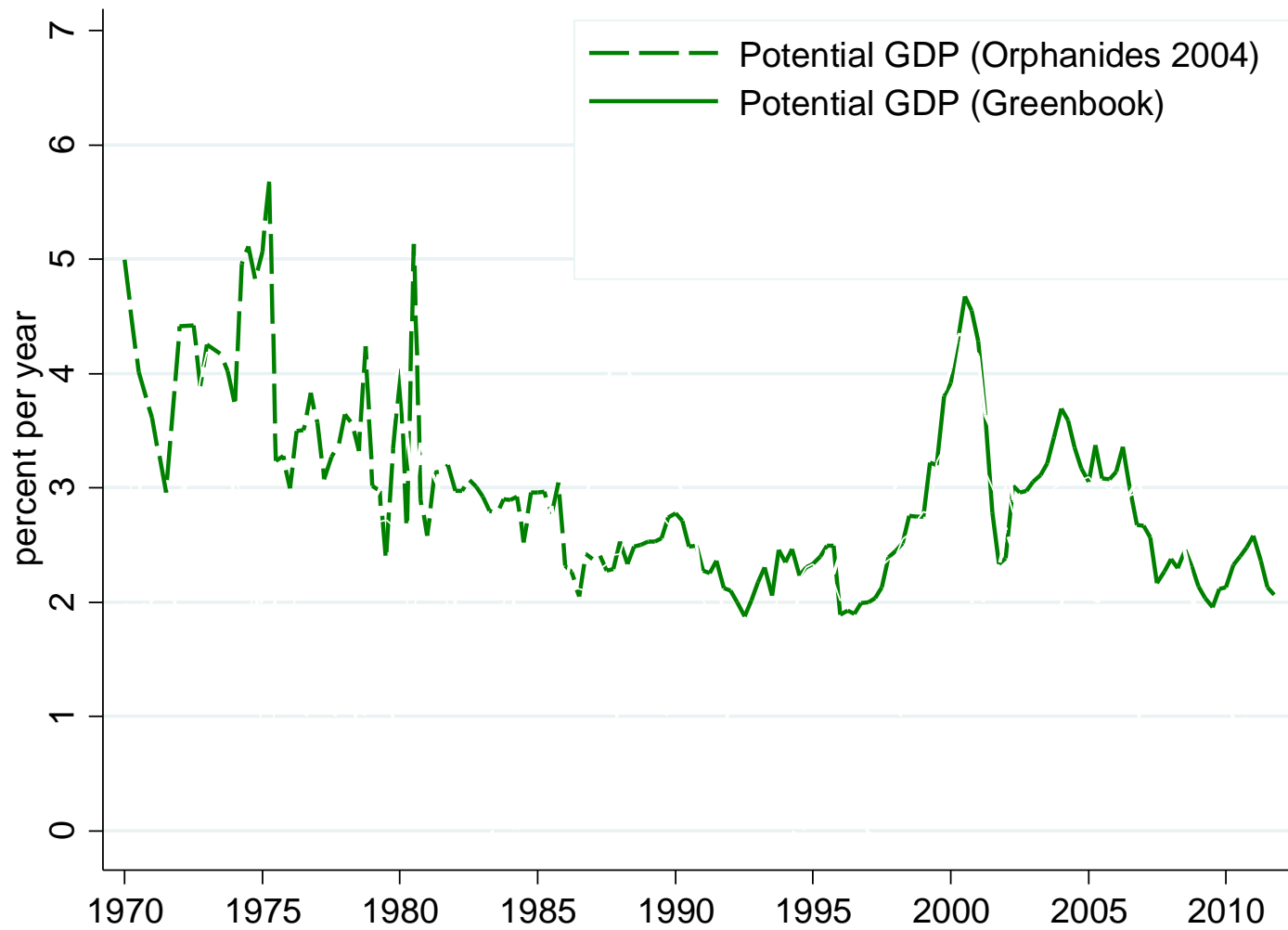


MEASURES OF POTENTIAL OUTPUT

Fact #3: Consistency of measures across time within countries

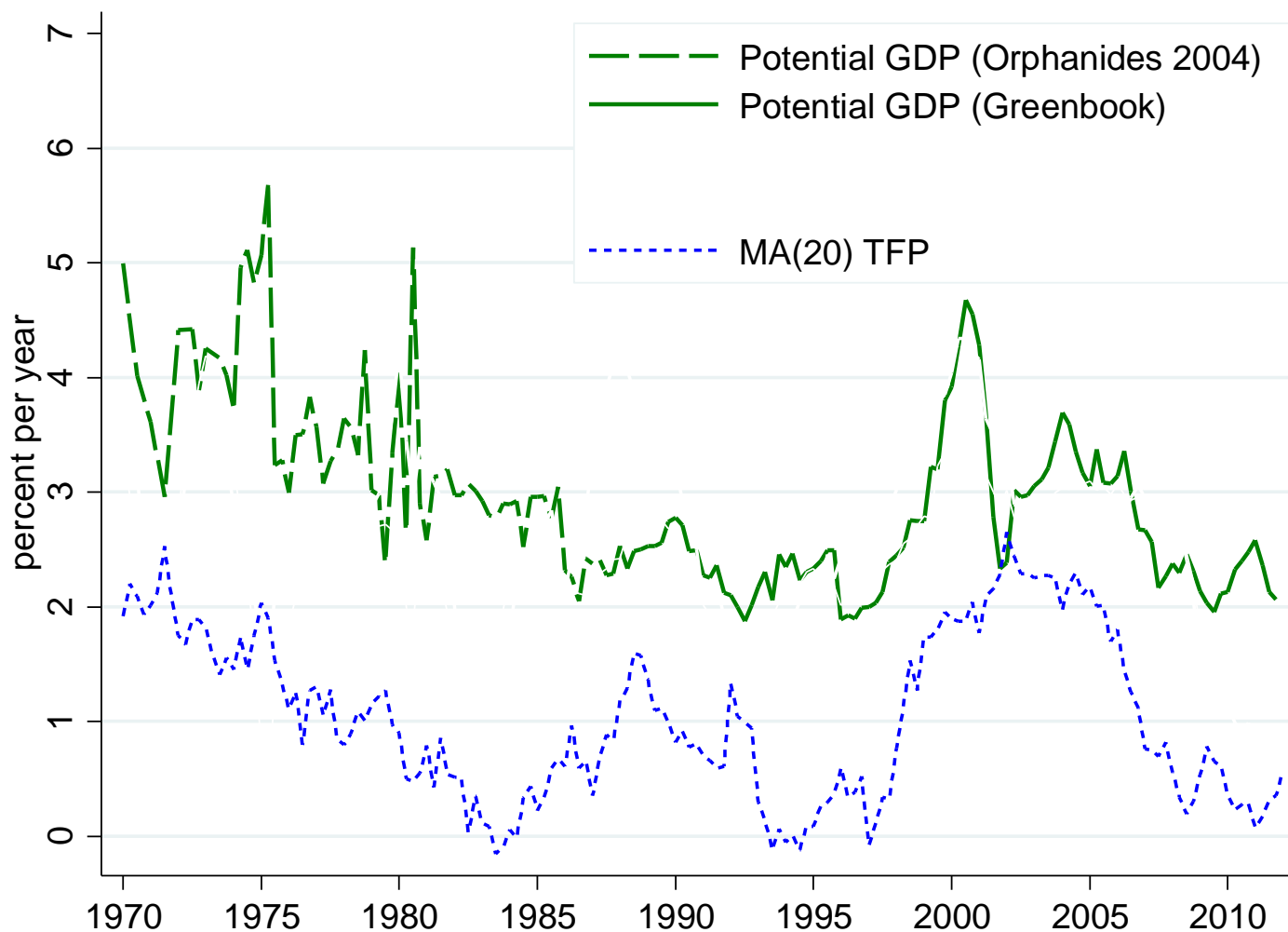


MEASURES OF POTENTIAL OUTPUT



MEASURES OF POTENTIAL OUTPUT

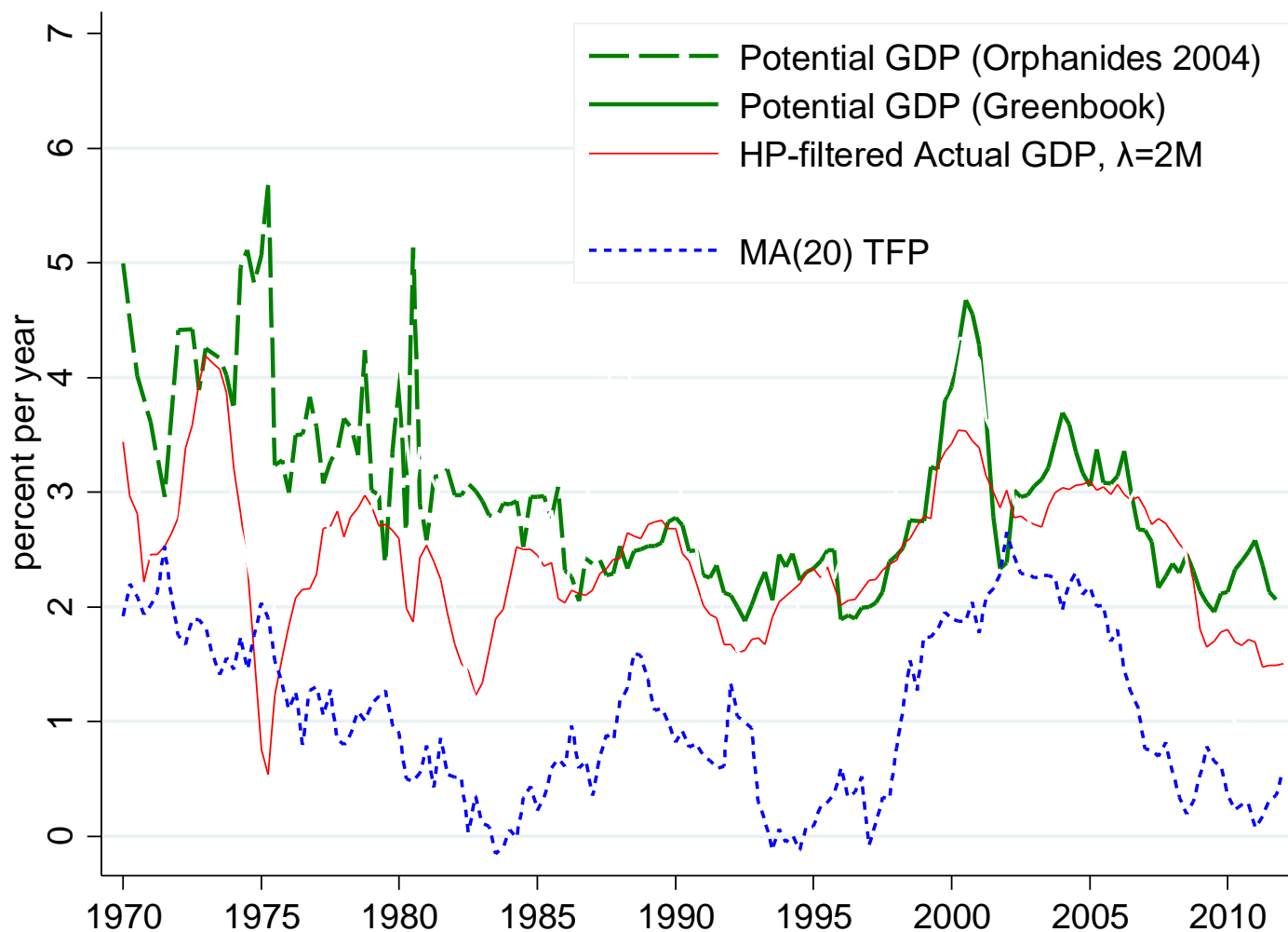
Fact #4: Estimates of pot. output co-move with productivity



MEASURES OF POTENTIAL OUTPUT

Fact #4: Estimates of pot. output co-move with productivity

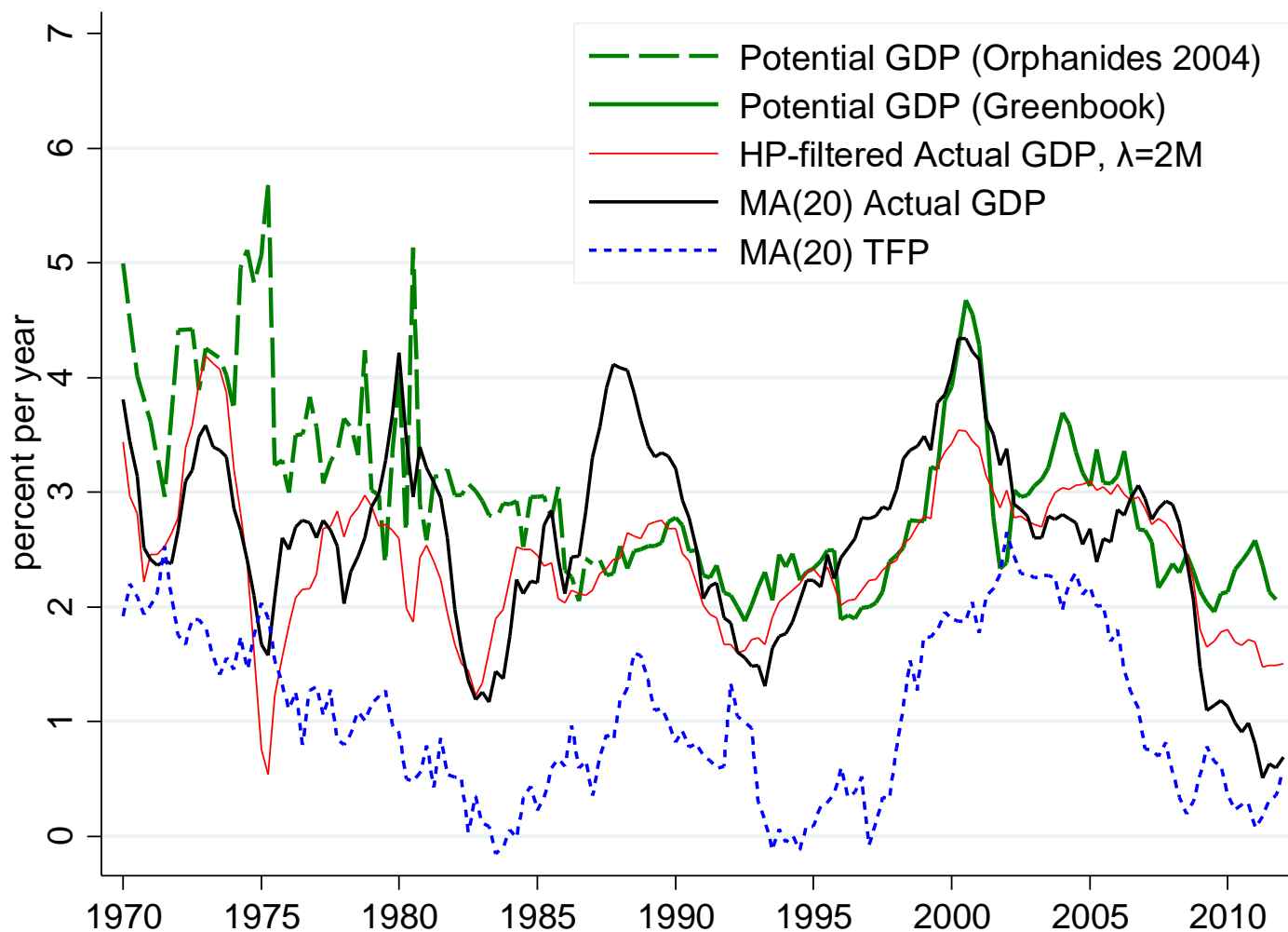
Fact #5: Estimates of pot. output can be proxied with moving averages of actual output



MEASURES OF POTENTIAL OUTPUT

Fact #4: Estimates of pot. output co-move with productivity

Fact #5: Estimates of pot. output can be proxied with moving averages of actual output



CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

- Econometric framework:

- Actual output: $\Delta \log Y_t = \alpha + \sum_{k=0}^K \phi_k \epsilon_{t-k} + error$
- Potential output: $\Delta \log Y_{t|t}^* = \beta + \sum_{k=0}^K \psi_k \epsilon_{t-k} + error$

CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

- Econometric framework:

- Actual output: $\Delta \log Y_t = \alpha + \sum_{k=0}^K \phi_k \epsilon_{t-k} + error$
- Potential output: $\Delta \log Y_{t|t}^* = \beta + \sum_{k=0}^K \psi_k \epsilon_{t-k} + error$

- Shocks ϵ :

- “Supply” (permanent):
 - Total factor productivity (Fernald)
 - Tax shock (Romer and Romer, 2010)
 - Oil price shocks (Kilian, 2009)

CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

■ Econometric framework:

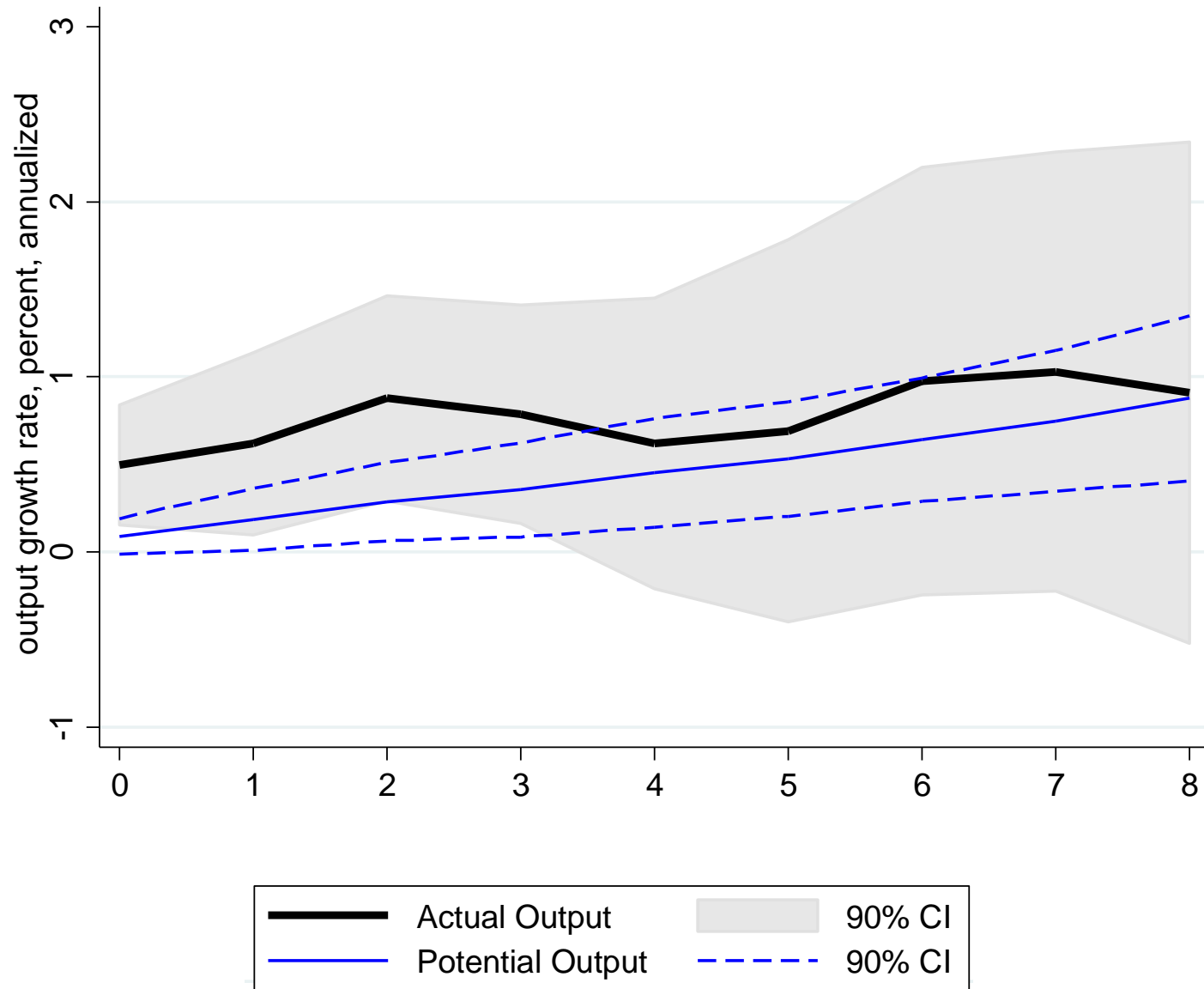
- Actual output: $\Delta \log Y_t = \alpha + \sum_{k=0}^K \phi_k \epsilon_{t-k} + error$
- Potential output: $\Delta \log Y_{t|t}^* = \beta + \sum_{k=0}^K \psi_k \epsilon_{t-k} + error$

■ Shocks ϵ :

- “Supply” (permanent):
 - Total factor productivity (Fernald)
 - Tax shock (Romer and Romer, 2010)
 - Oil price shocks (Kilian, 2009)
- “Demand” (transitory):
 - Monetary policy shocks (Romer and Romer, 2004)
 - Military spending (Ramey, 2011)
 - Government spending shocks (Auerbach and Gorodnichenko, 2012)

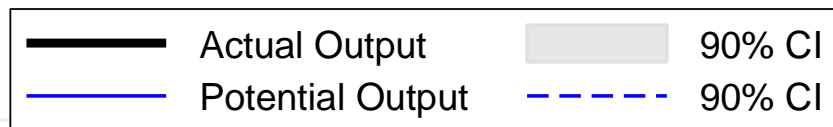
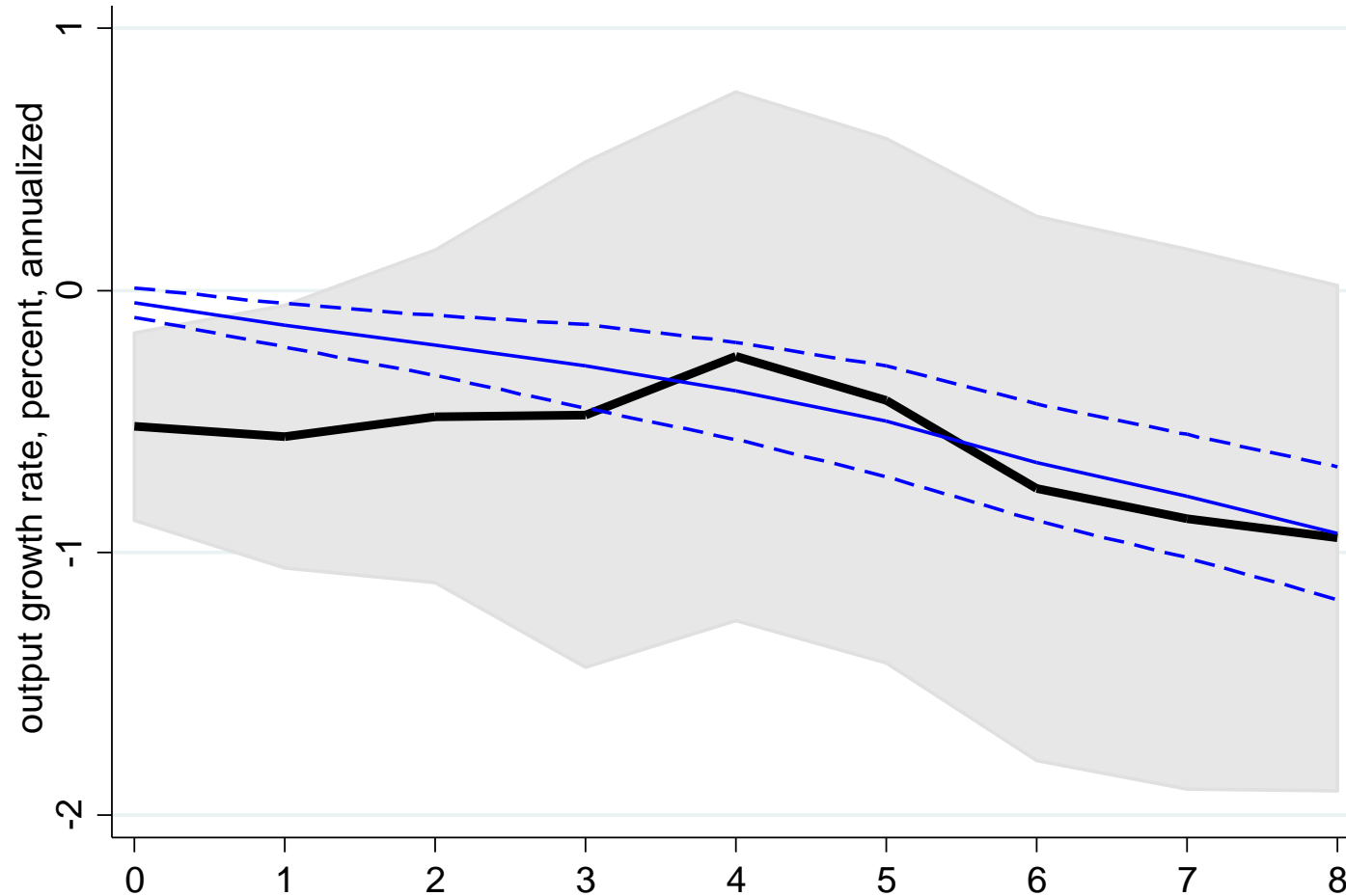
CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

TFP shock (Fernald)

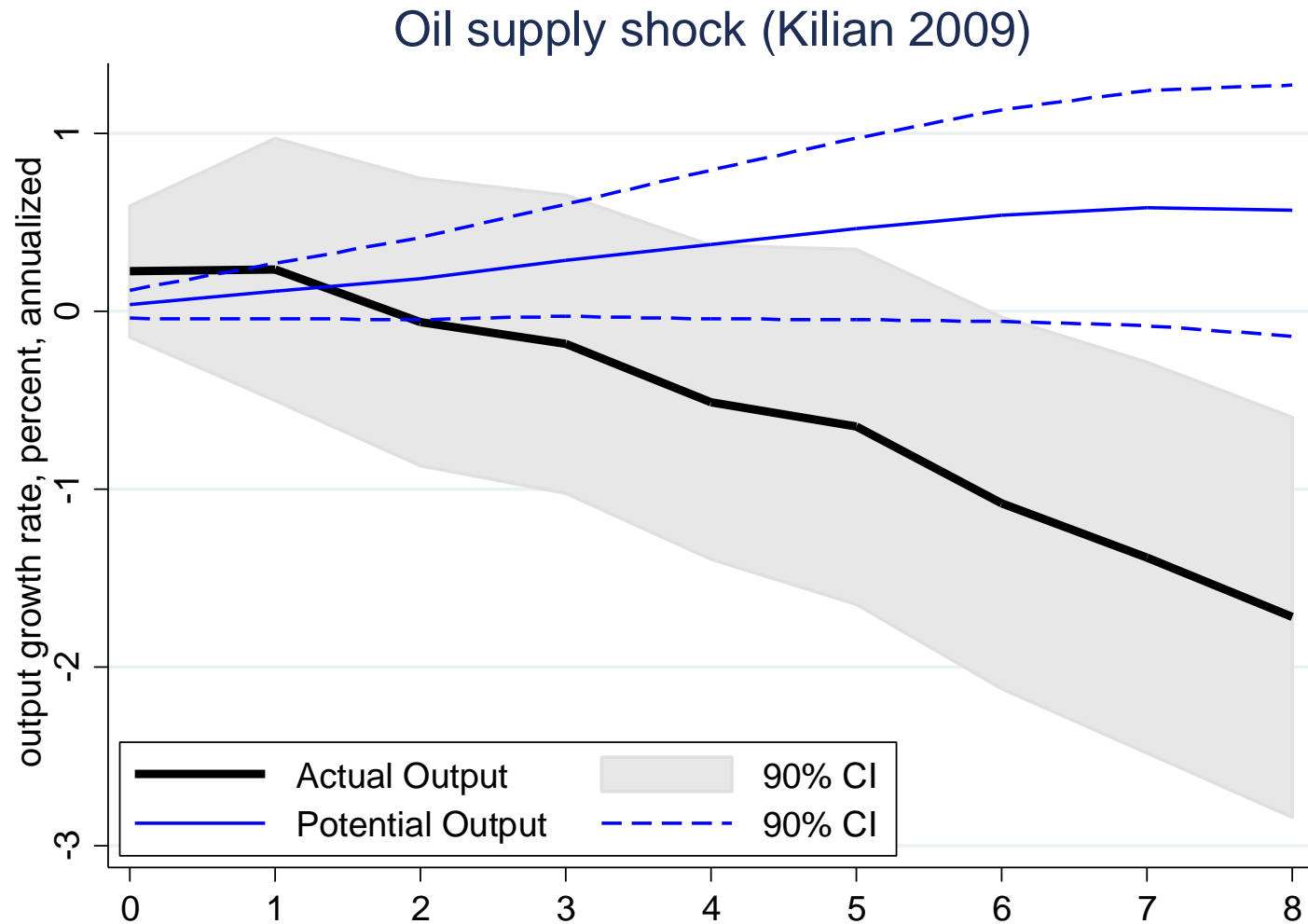


CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

Tax shock (Romer and Romer 2010)

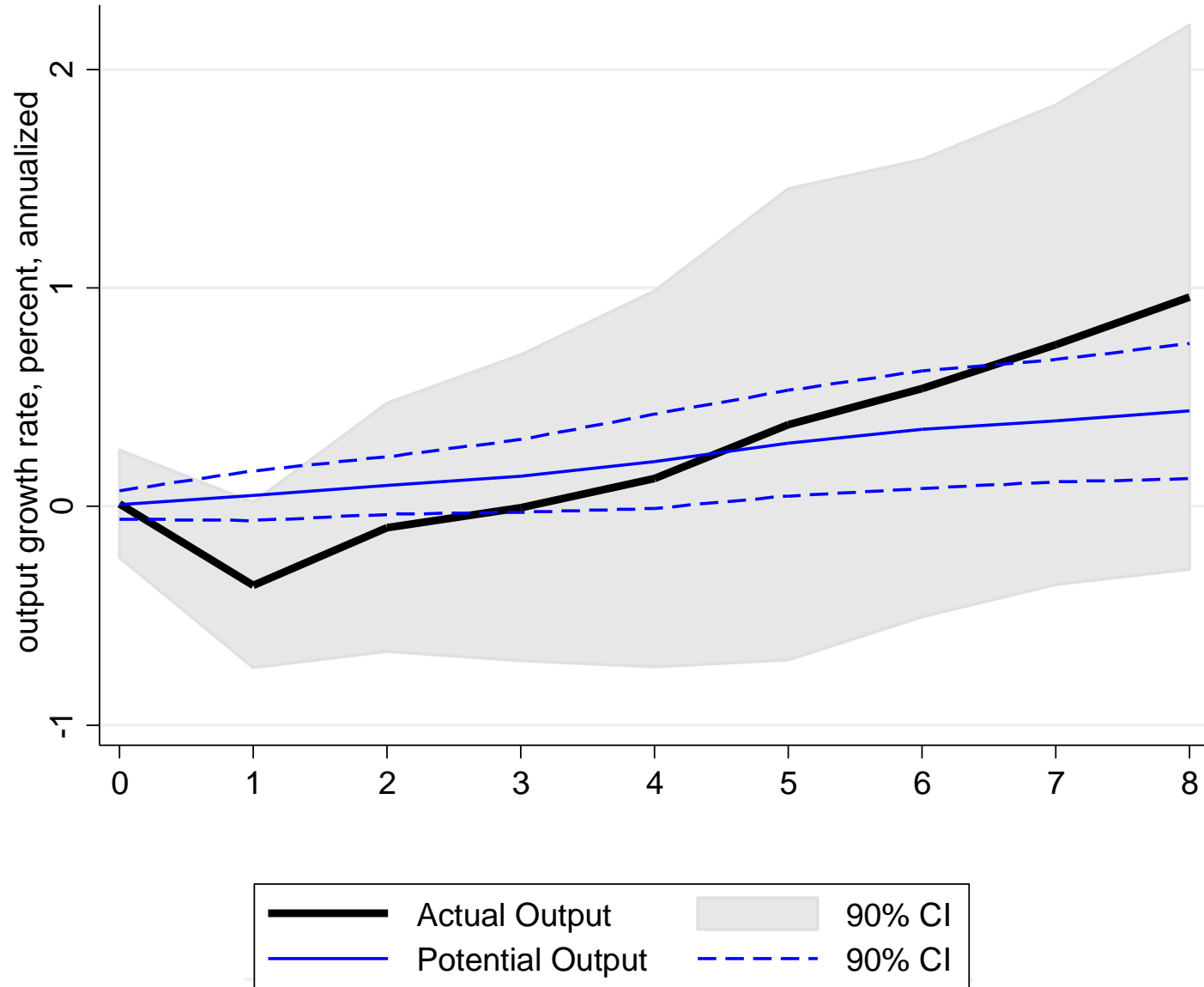


CYCLICAL PROPERTIES OF POTENTIAL OUTPUT



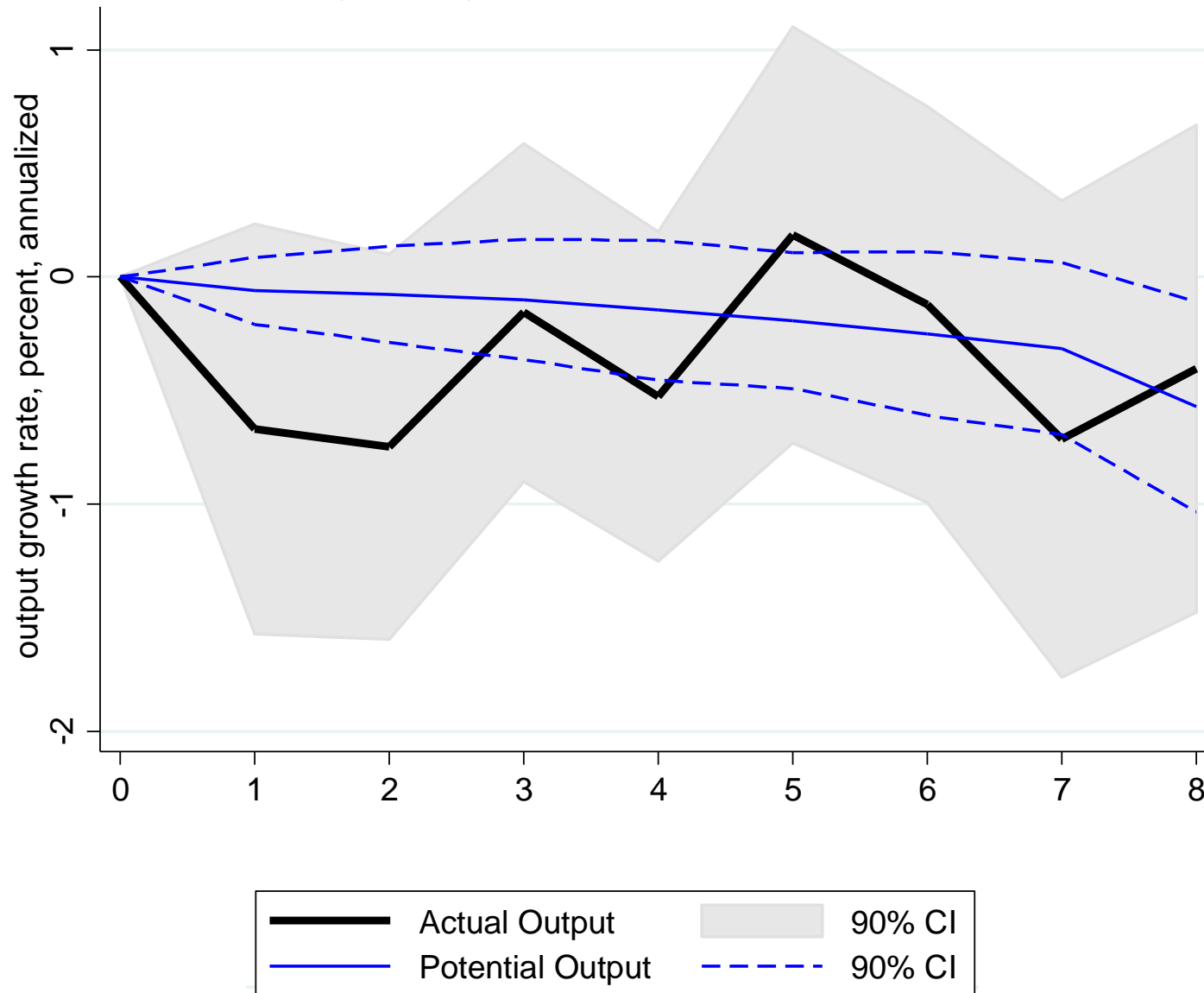
CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

Military spending shock (Ramey 2016)



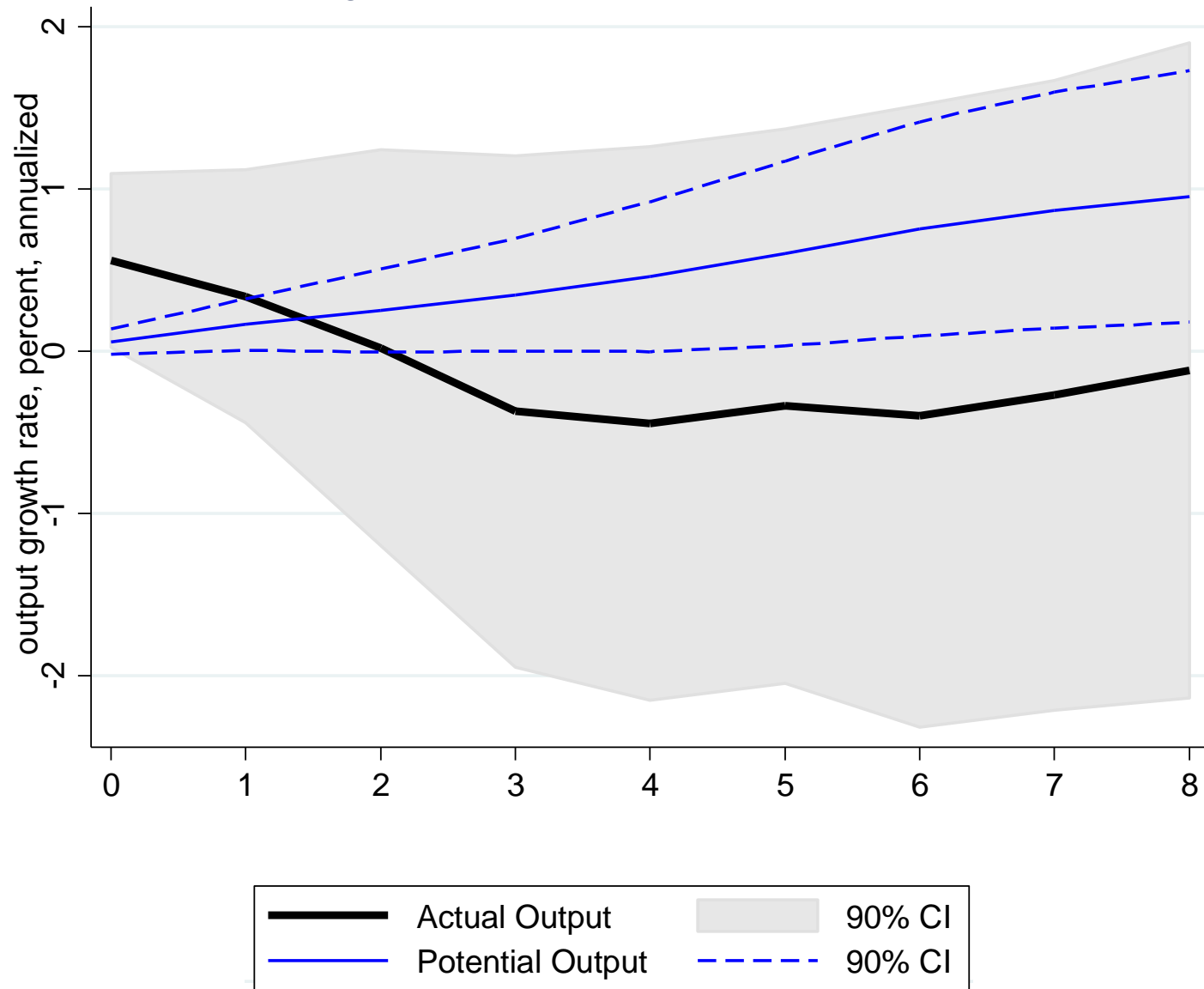
CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

Monetary policy shock (Romer and Romer 2004)



CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

Gov't spending shock (Auerbach and Gorodnichenko 2012)



CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

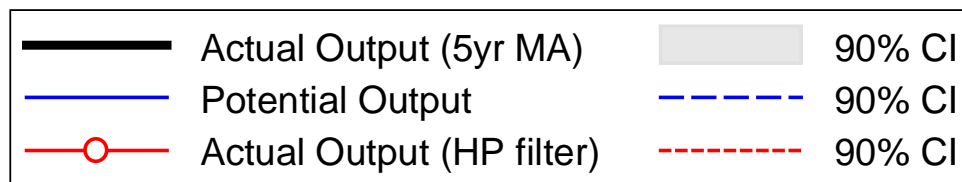
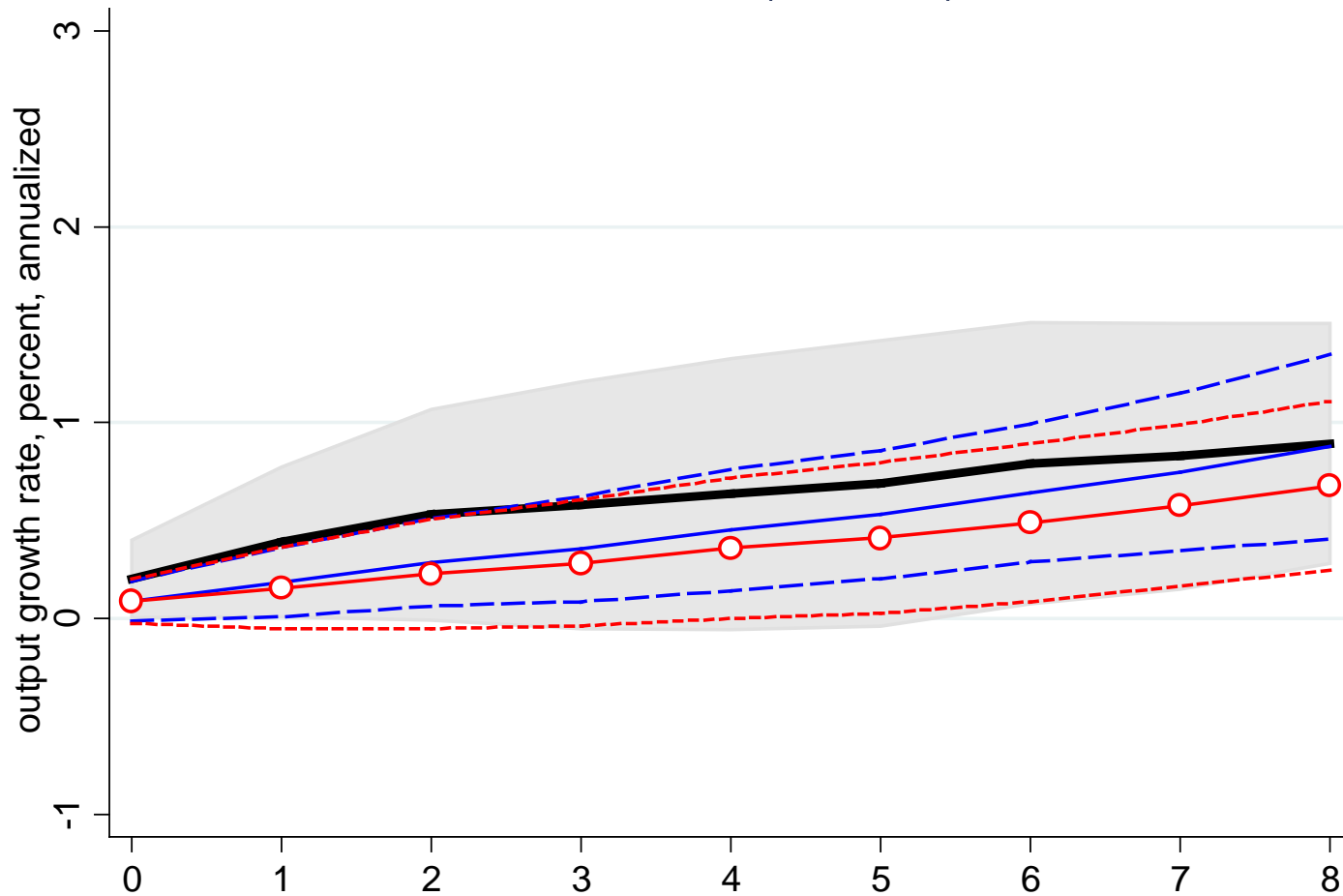
- Recap:
 - Estimates of potential output respond to “supply” and (transitory) “demand” shocks.
 - Response of estimates of potential output are delayed.
 - Responses of estimates of potential output catch up with responses of actual output within two years.

CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

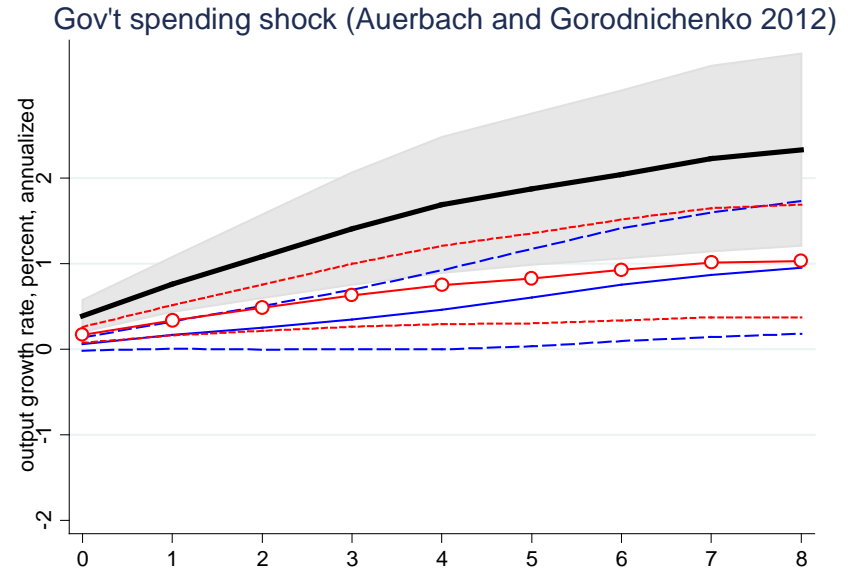
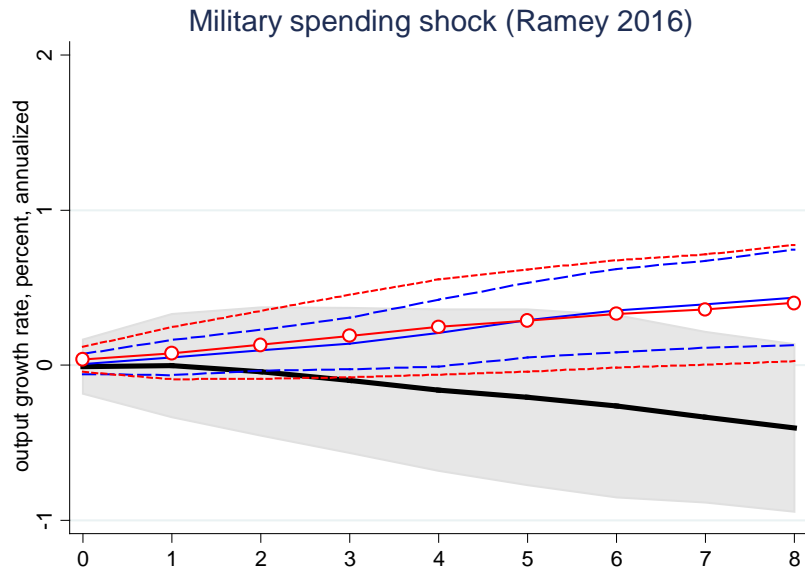
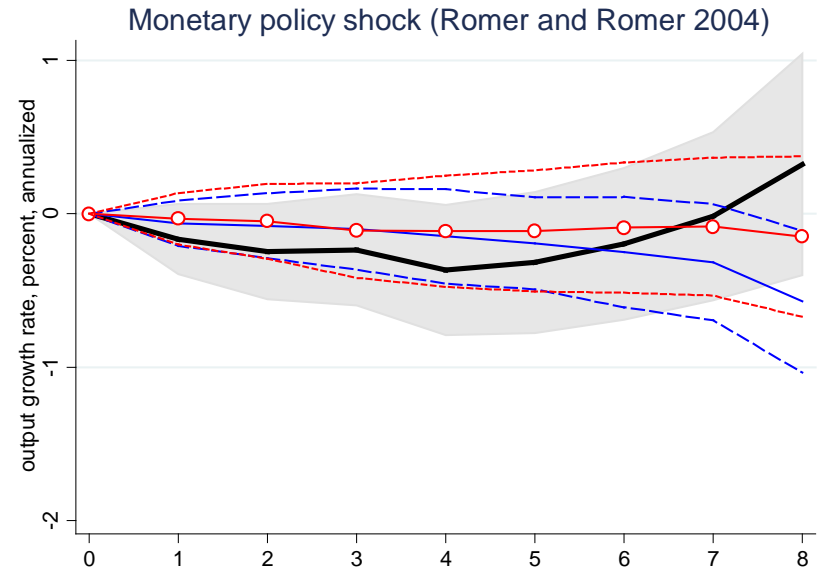
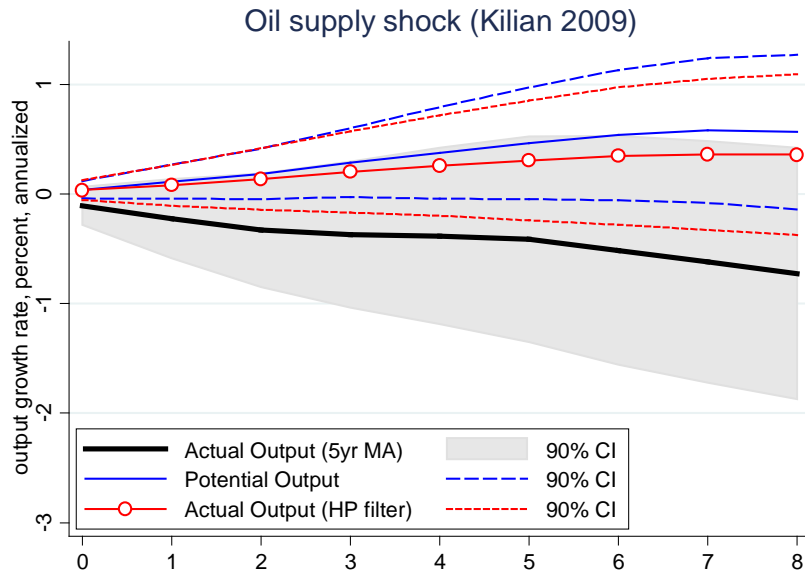
- Recap:
 - Estimates of potential output respond to “supply” and (transitory) “demand” shocks.
 - Response of estimates of potential output are delayed.
 - Responses of estimates of potential output catch up with responses of actual output within two years.
- Why do estimates of potential output respond to *all* shocks?

CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

TFP shock (Fernald)



CYCLICAL PROPERTIES OF POTENTIAL OUTPUT



CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

- Recap:
 - Estimates of potential output respond to “supply” and (transitory) “demand” shocks.
 - Response of estimates of potential output are delayed.
 - Responses of estimates of potential output catch up with responses of actual output within two years.
- Why do estimates of potential output respond to *all* shocks?
- When using the HP-filtered series, we can very *closely* replicate the response of estimated potential GDP after every shock.

CYCLICAL PROPERTIES OF POTENTIAL OUTPUT

- Recap:
 - Estimates of potential output respond to “supply” and (transitory) “demand” shocks.
 - Response of estimates of potential output are delayed.
 - Responses of estimates of potential output catch up with responses of actual output within two years.
- Why do estimates of potential output respond to *all* shocks?
- When using the HP-filtered series, we can very *closely* replicate the response of estimated potential GDP after every shock.
- Interpretation: observing a downward revision in Greenbook estimates of potential GDP is *not* informative about whether the associated declines in actual GDP are likely to be sustained or not.

CROSS-COUNTRY EVIDENCE

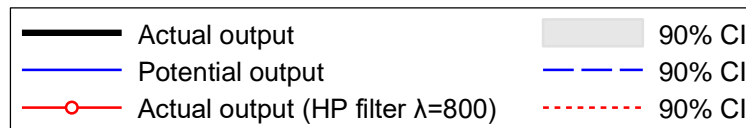
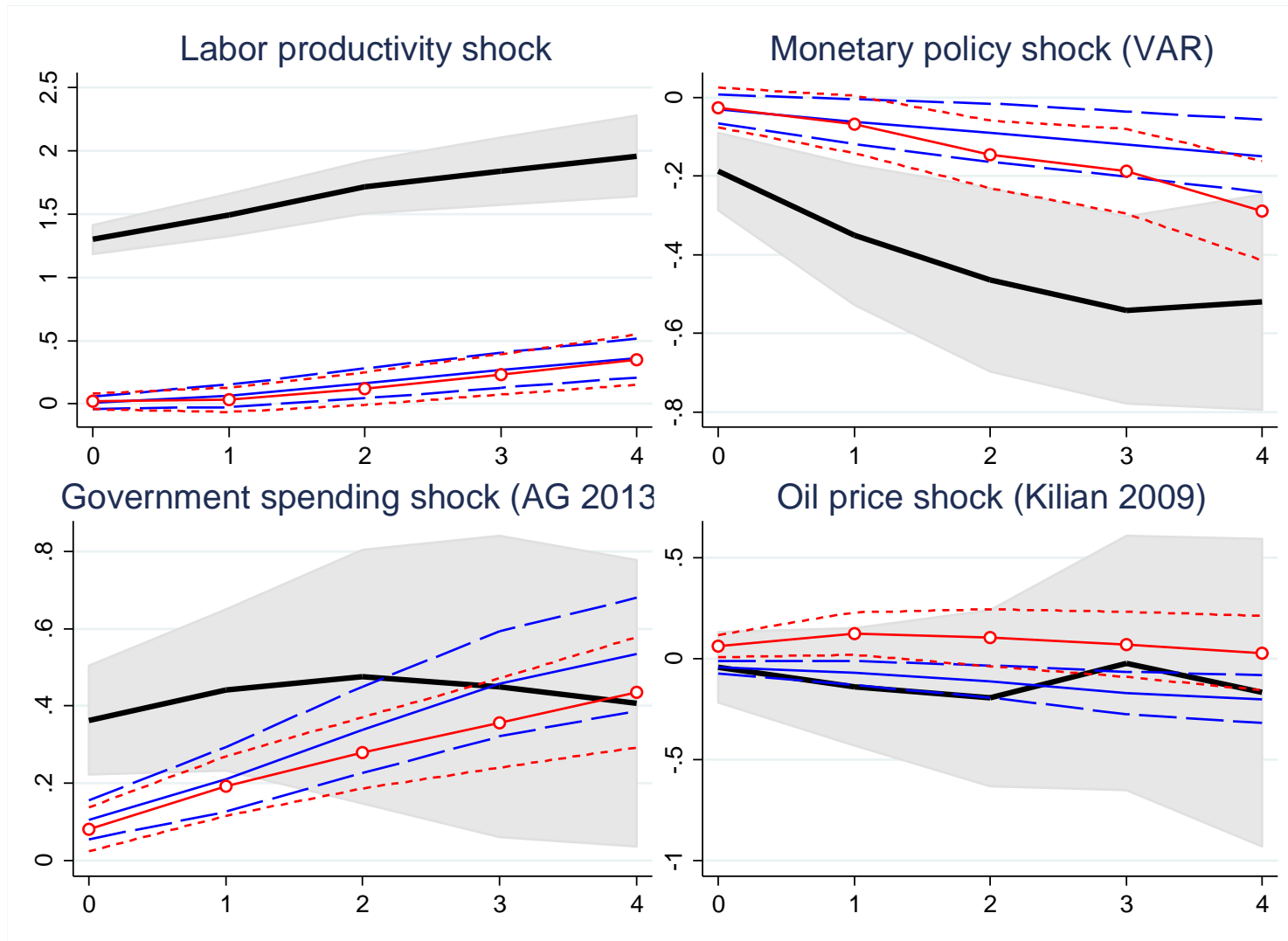
■ Econometric framework:

- Actual output: $\Delta \log Y_{j,t} = \alpha_j + \delta_t + \sum_{k=0}^K \phi_k \epsilon_{j,t-k} + error$
- Potential output: $\Delta \log Y_{j,t|t}^* = \beta_j + \kappa_t + \sum_{k=0}^K \psi_k \epsilon_{j,t-k} + error$

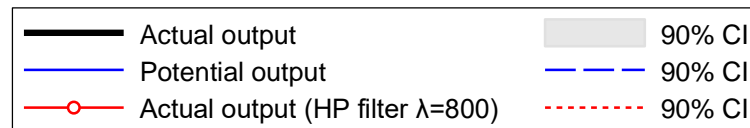
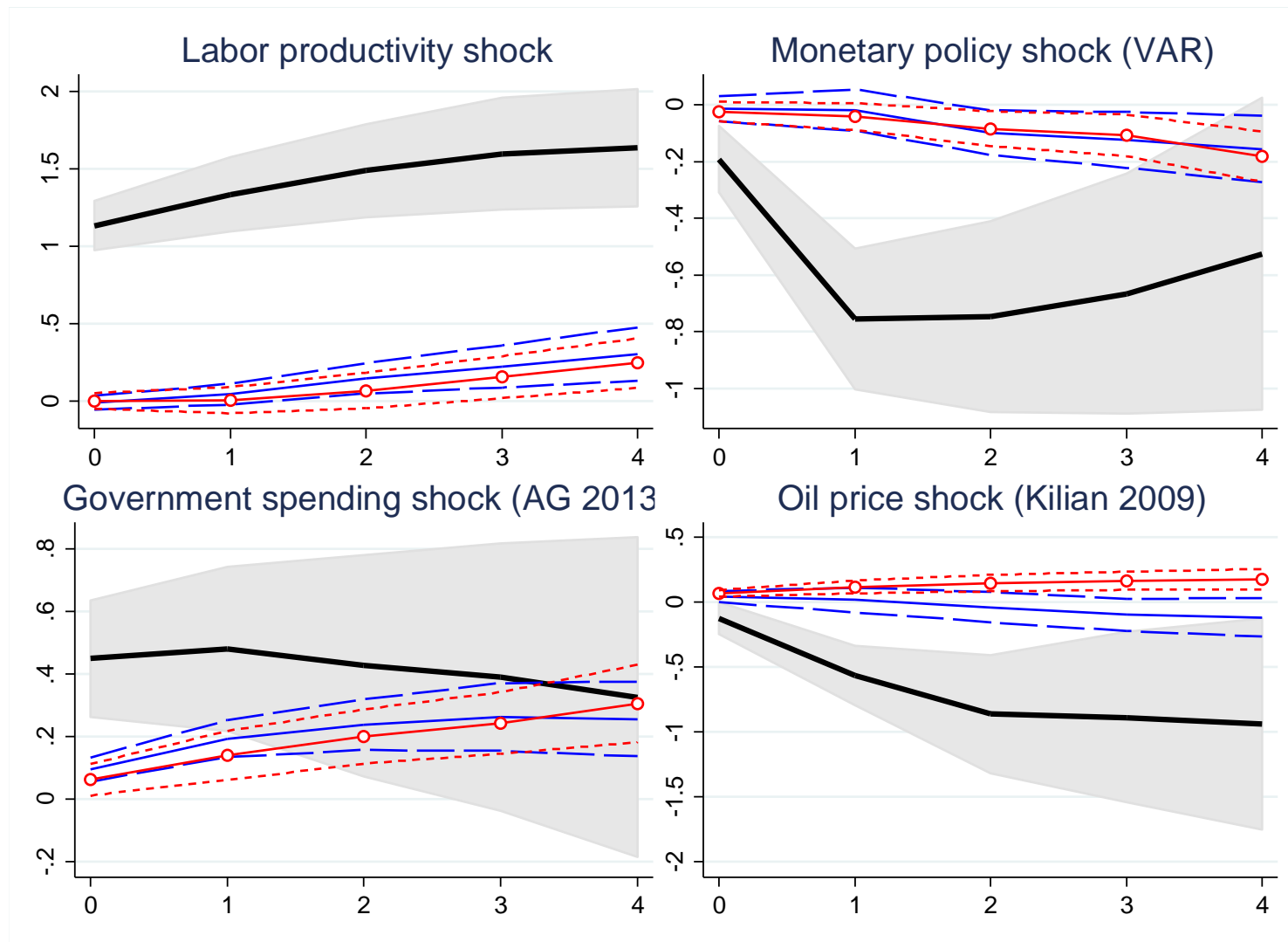
■ Shocks ϵ :

- “Supply” (permanent):
 - Labor productivity shocks
 - Oil price shocks (Kilian, 2009) interaction with oil sufficiency
- “Demand” (transitory):
 - Monetary policy shocks (vector autoregression)
 - Government spending shocks (Auerbach and Gorodnichenko, 2012)

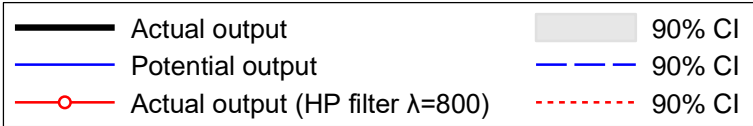
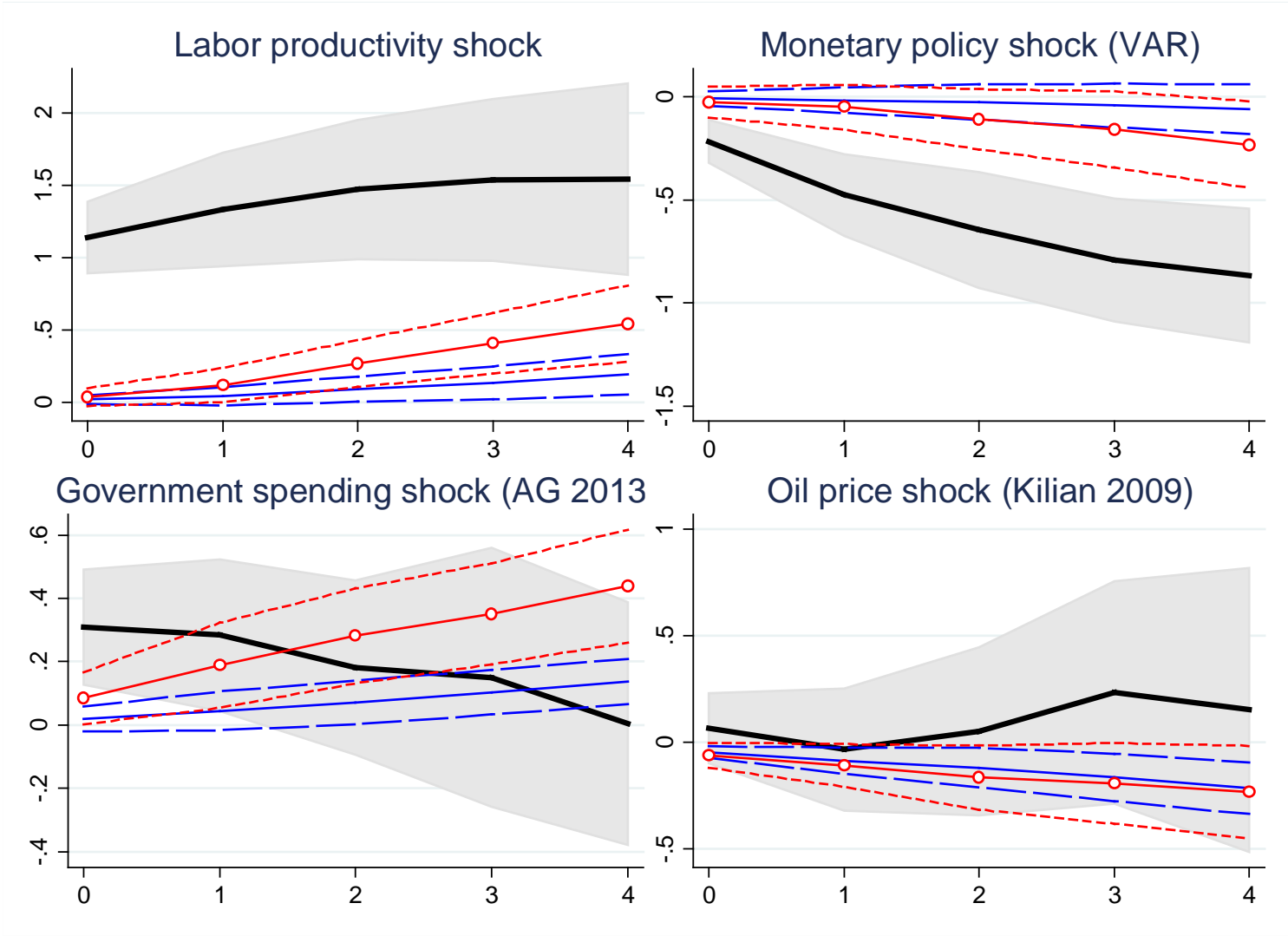
CROSS-COUNTRY EVIDENCE: OECD



CROSS-COUNTRY EVIDENCE: IMF



CROSS-COUNTRY EVIDENCE: CONSENSUS ECONOMICS



CONCLUDING REMARKS

- What we find:
 - private and public estimates of potential GDP respond gradually but systematically to all of the economic shocks that we consider
 - private and public estimates of potential GDP deviate little from what one would expect from simple univariate time series estimates of potential GDP

CONCLUDING REMARKS

- What we find:
 - private and public estimates of potential GDP respond gradually but systematically to all of the economic shocks that we consider
 - private and public estimates of potential GDP deviate little from what one would expect from simple univariate time series estimates of potential GDP
- The fact that private and public forecasters now attribute much of the decline in output across countries since the Great Recession to changes in potential GDP tells us potentially little about whether these changes in output are in fact likely to persist or whether they can be reversed through monetary or fiscal policies.

CONCLUDING REMARKS

Way forward?

CONCLUDING REMARKS

Way forward?

- Use additional macroeconomic variables to better identify supply and demand shocks rather than relying on univariate processes. Kuttner (1994) and Blanchard and Quah (1989) provide two ways of doing so.

CONCLUDING REMARKS

Way forward?

- Use additional macroeconomic variables to better identify supply and demand shocks rather than relying on univariate processes. Kuttner (1994) and Blanchard and Quah (1989) provide two ways of doing so.
- Combine information from public estimates of potential GDP with private sector forecasts, as the latter appear somewhat more successful at isolating supply shocks from demand shocks.

CONCLUDING REMARKS

Way forward?

- Use additional macroeconomic variables to better identify supply and demand shocks rather than relying on univariate processes. Kuttner (1994) and Blanchard and Quah (1989) provide two ways of doing so.
- Combine information from public estimates of potential GDP with private sector forecasts, as the latter appear somewhat more successful at isolating supply shocks from demand shocks.
- Avoid excessive use of model-averaging, or at least avoid including simple approaches like HP-filters among the class of models used, since these mechanically induce movements in estimates of potential after cyclical demand-driven fluctuations.

CONCLUDING REMARKS

Way forward?

- Use additional macroeconomic variables to better identify supply and demand shocks rather than relying on univariate processes. Kuttner (1994) and Blanchard and Quah (1989) provide two ways of doing so.
- Combine information from public estimates of potential GDP with private sector forecasts, as the latter appear somewhat more successful at isolating supply shocks from demand shocks.
- Avoid excessive use of model-averaging, or at least avoid including simple approaches like HP-filters among the class of models used, since these mechanically induce movements in estimates of potential after cyclical demand-driven fluctuations.
- More generally, the absence of clear ways to successfully estimate potential output suggests that the practice of relying on “judgement” by professional economists should not be discontinued anytime soon.

