

The Elusive “Great” Recovery: Causes and Implications for Future Business Cycle Dynamics

Federal Reserve Bank of Boston
October 14-15, 2016

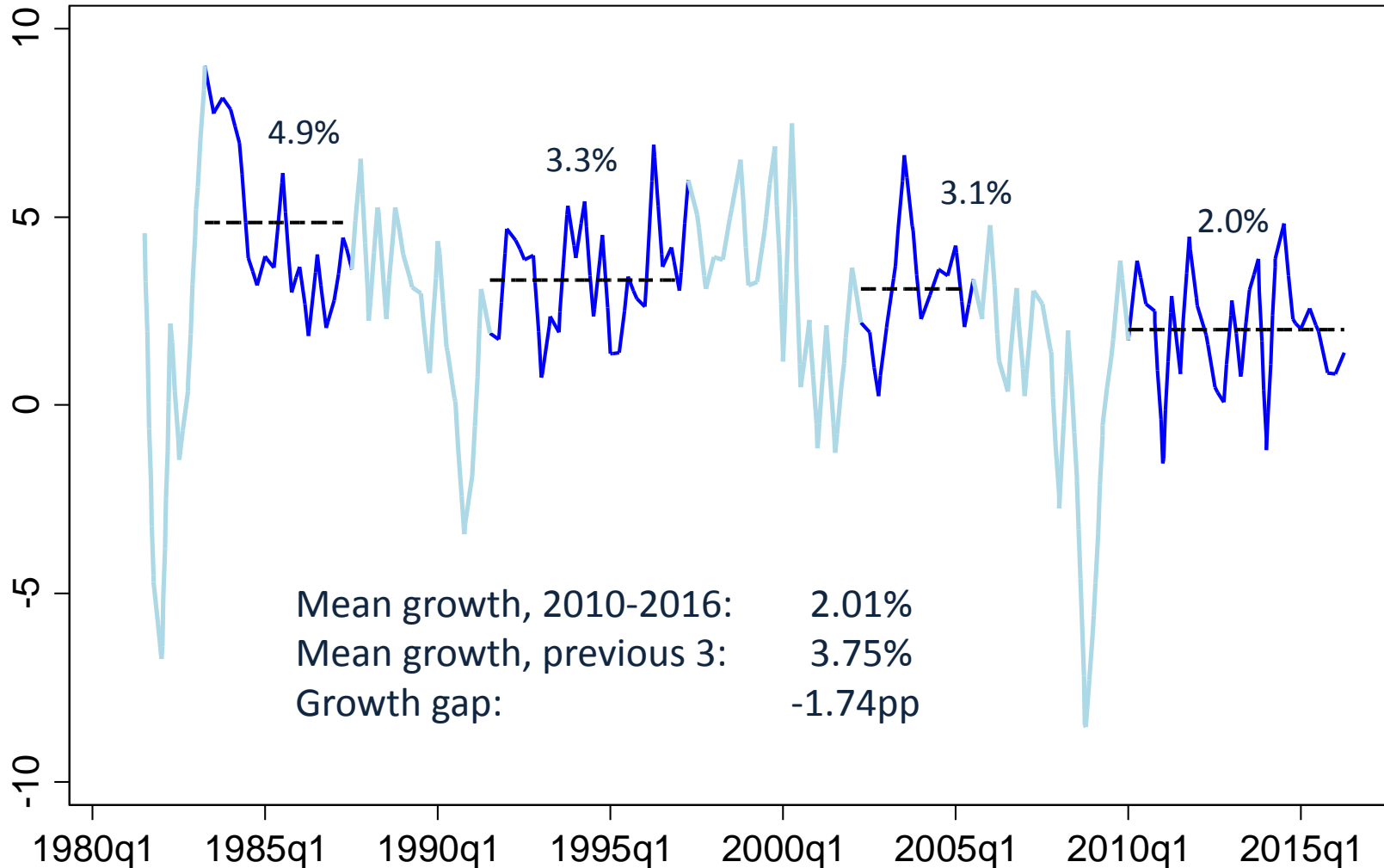
Why Has GDP Growth Been So Slow To Recover?

James Stock, Harvard Economics
Mark Watson, Princeton University

The Slow Recovery, 2010-2016

GDP growth in four recoveries

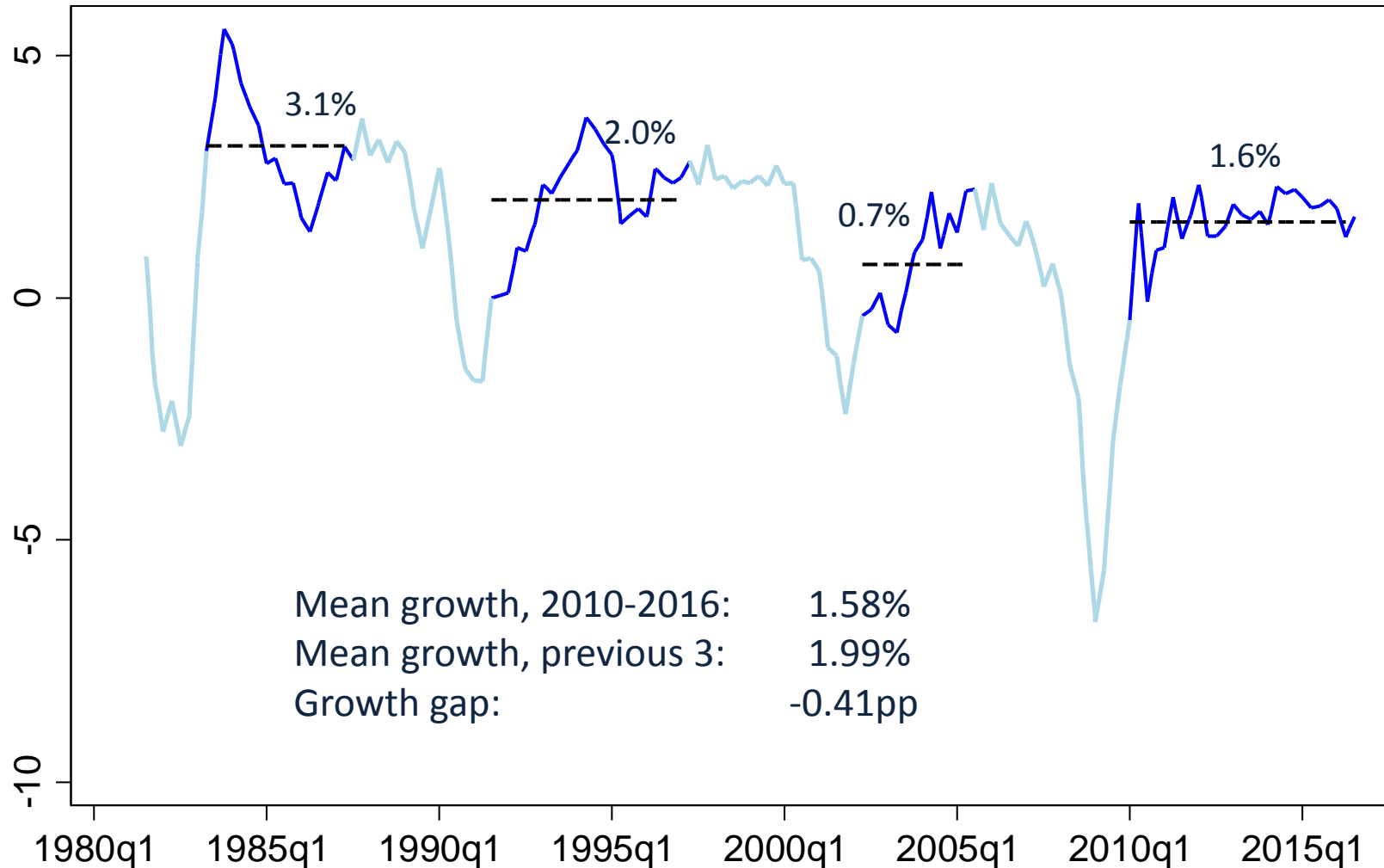
From the third quarter of the expansion while $ugap > 0$



The Slow Recovery, 2010-2016

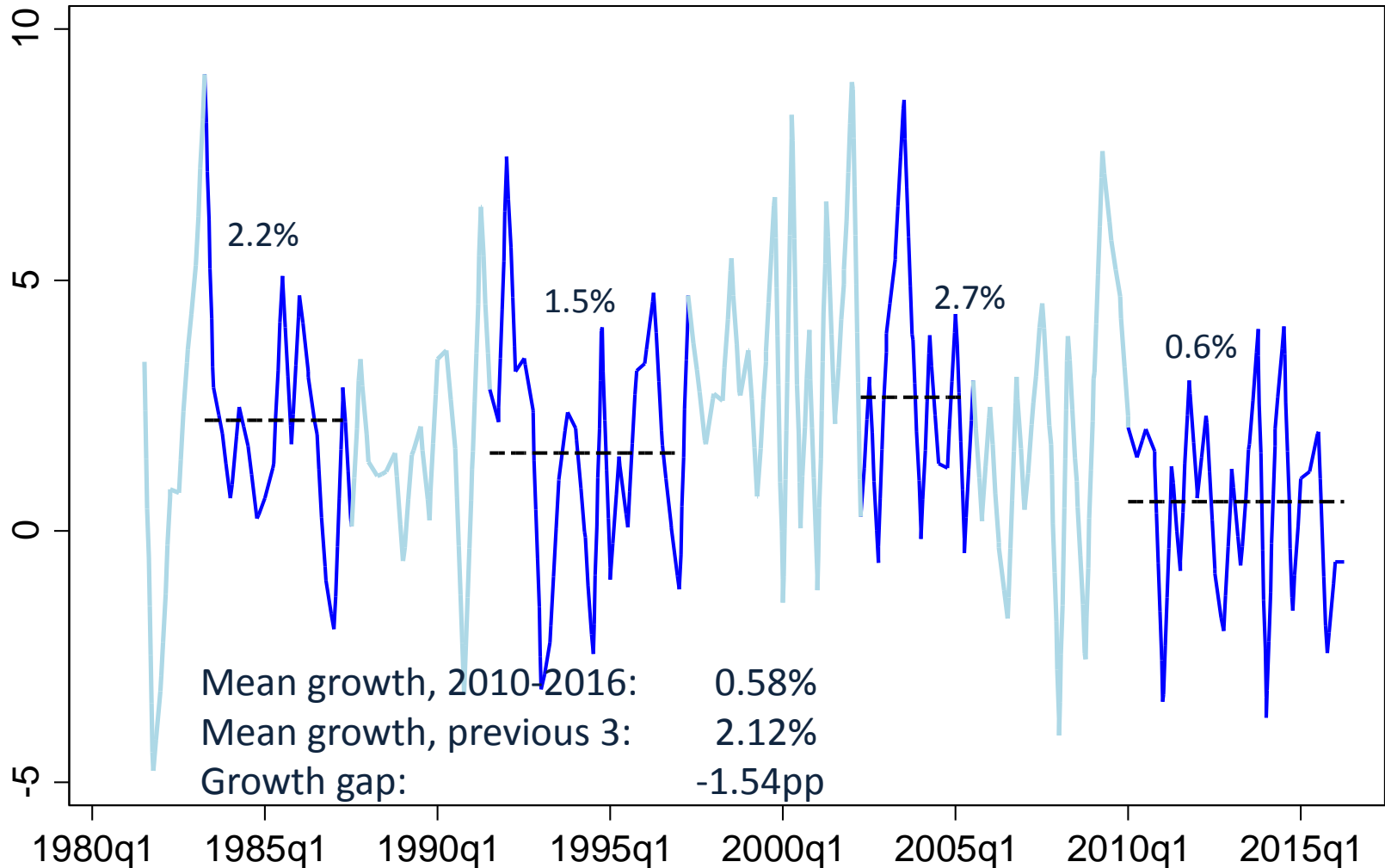
Payroll employment growth in four recoveries

From the third quarter of the expansion while ugap>0



The Slow Recovery, 2010-2016

NFB productivity growth in four recoveries
From the third quarter of the expansion while $ugap > 0$



Partial list of explanations for the slow recovery

1. Long term supply-side slowdown in potential GDP growth

- a. Demographic shifts
- b. Slower trend productivity growth

2. Chronic (structural) problems related to demand inadequacy

- a. Secular stagnation
- b. Inequality leading to slow consumption growth
- c. Hysteresis (labor market)

3. One-off explanations

- a. Lingering effects of financial crisis on residential, nonresidential investment
- b. Otherwise slow growth of private investment
- c. Weak international demand
- d. Fiscal headwinds
- e. Oil price volatility/collapse
- f. Policy failures
 - i. Fiscal policy uncertainty
 - ii. ZLB constraints on monetary policy

4. Measurement

- a. IT price measurement problems
- b. non-IT price measurement problems

Analytical Framework

Two questions, two decompositions

1. What is the contribution of the trend slowdown?

- Difference between 2010-2016 and the comparable stage of the previous three recoveries = difference in trends + difference in cycles
- Based on “bottom-up” estimates of the trend

2. How slow was the cyclical component of growth over 2010-2016?

- Actual growth = “predicted” as of 2009q4 + “unpredicted”
- Predicted is from a 139-variable dynamic factor model, with the forecasting model estimated over 1984q1-2007q4, using data through 2009q4 as the jumping-off point of the forecast

Caveats and mea culpa

- The prediction decomposition is not a true out-of-sample exercise.
- No identified structural shocks, so no structural decompositions
- Linear model, no ZLB, we can't measure details of monetary policy
- By using 2009q4 as a jump-off date, we condition on 2009 policies. Different policies would have produced different forecasts, but we don't pursue (don't identify) that counterfactual.
- We report growth rates to two decimals!

First Decomposition: Trends

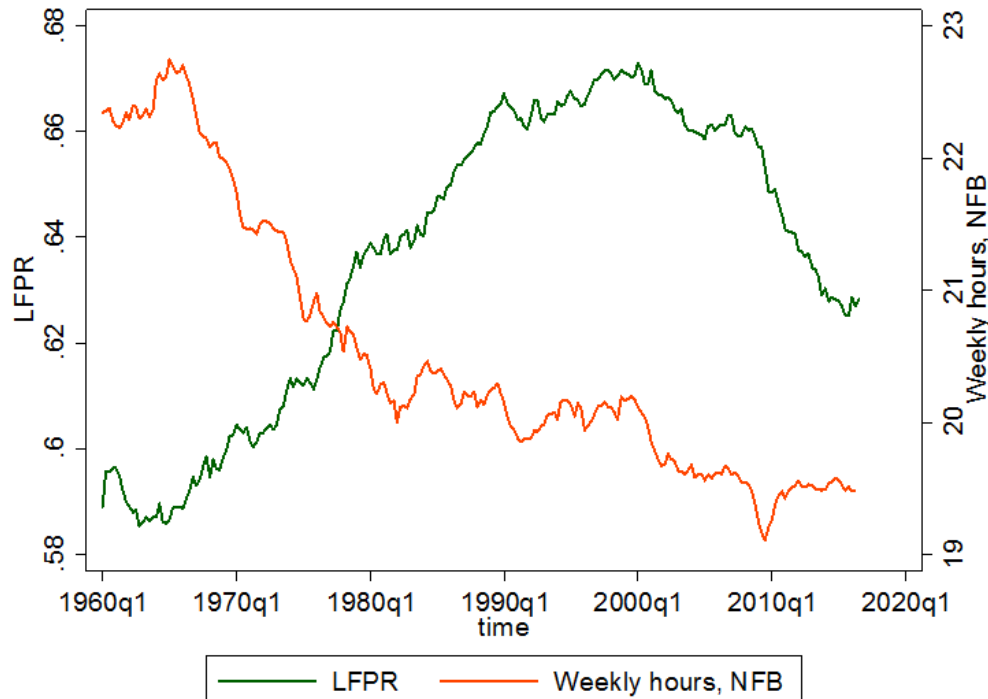
The first decomposition uses “bottom-up” trends estimated from industry-standard supply side identities (Gordon, CBO, OMB):

$$\Delta \ln E_t^{Payroll} = \Delta \ln \left(\frac{E_t^{Payroll}}{E_t^{HH}} \right) + \Delta \ln(emplrate_t) + \Delta \ln LFPR_t + \Delta \ln Popn_t$$

$$\Delta \ln GDP_t = \Delta \ln \left(\frac{GDP_t}{Y_t^{NFB}} \right) + \Delta \ln productivity_t^{NFB} + \Delta \ln hours_t^{NFB} + \Delta \ln \left(\frac{E_t^{NFB}}{E_t^{Payroll}} \right) + \Delta \ln E_t^{Payroll}$$

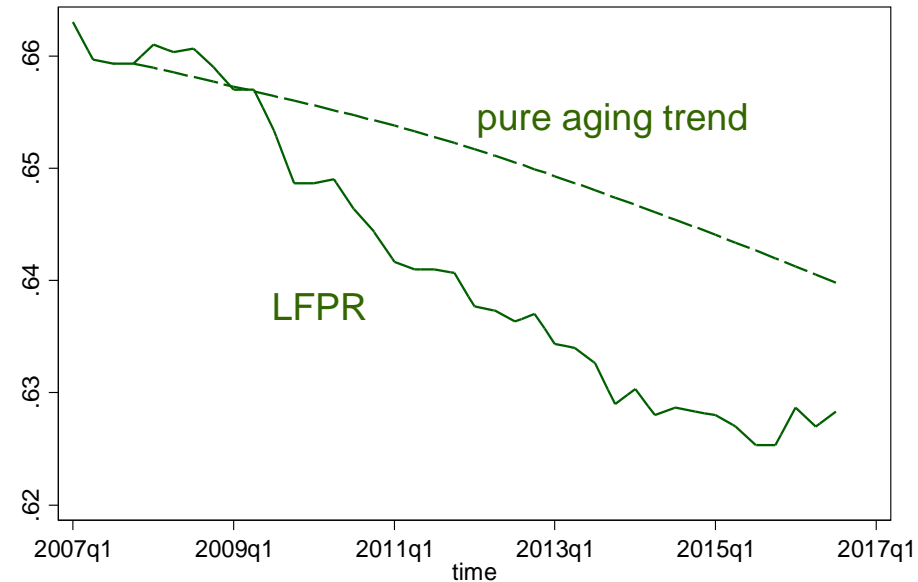
- All variables other than LFPR, population, and productivity: post-2007 trend is frozen at 2007q4 values of full-sample time series trend (biweight, BW = 100)
- Population: we condition on actual population growth (CPS measurement concept)
- Comparison period: 2010q1-2016q2 vs. previous three expansions (3rd quarter of expansion while CBO ugap > 0)

LFPR trend



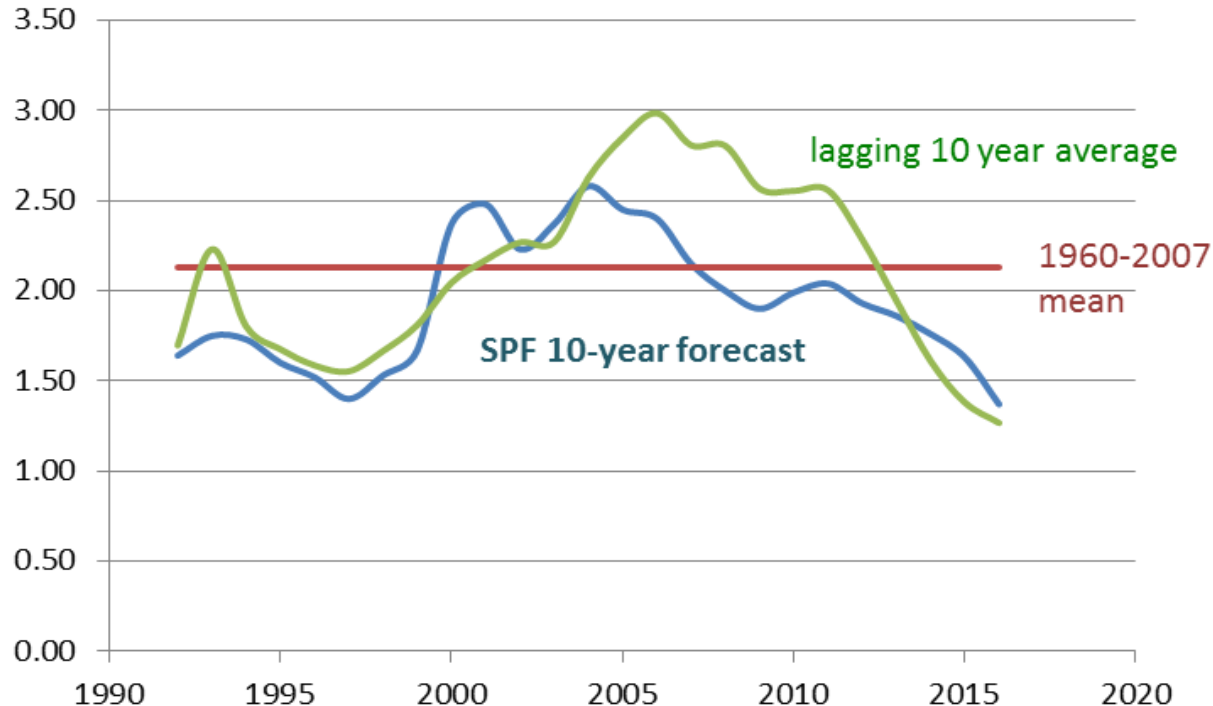
Our post-2007 **LFPR trend** (below) is a “pure aging” trend computed by fixing age/sex participation rates at their 2005-6 values and run through the evolving actual population age/sex shares.

This builds on a large literature, see Aaronson et. al. (2014)



Productivity trends

10-year NFB productivity growth: prior 10 years and
real-time SPF median forecast over next 10 years



- NFB labor productivity growth averaged 2.13% from 1960-2007
- Professional judgment on trend labor productivity growth is evolving (and seems to track lagged actuals); most recent SPF value is 1.37%
- CBO (2016) uses 1.8% for its 10-year economic projections
- Our post-2007 **productivity trend** is judgmental, we adopt 1.9pp

Decomposition #1

	Previous 3			2010q1-2016q2			Growth Rate Gap		
	Mean	Trend	Cycle	Mean	Trend	Cycle	Mean	Trend	Cycle
GDP	3.75	2.89	0.86	2.01	1.97	0.04	-1.74	-0.91	-0.82
Total employment (payroll)	1.99	1.58	0.40	1.58	0.84	0.74	-0.41	-0.74	0.34
NFB productivity	2.12	1.92	0.19	0.58	1.90	-1.32	-1.54	-0.02	-1.51
LFPR	0.22	0.12	0.10	-0.52	-0.37	-0.15	-0.74	-0.49	-0.25

Notes: All entries are percent growth at an annual rate, averaged over the period, or percentage point differences.

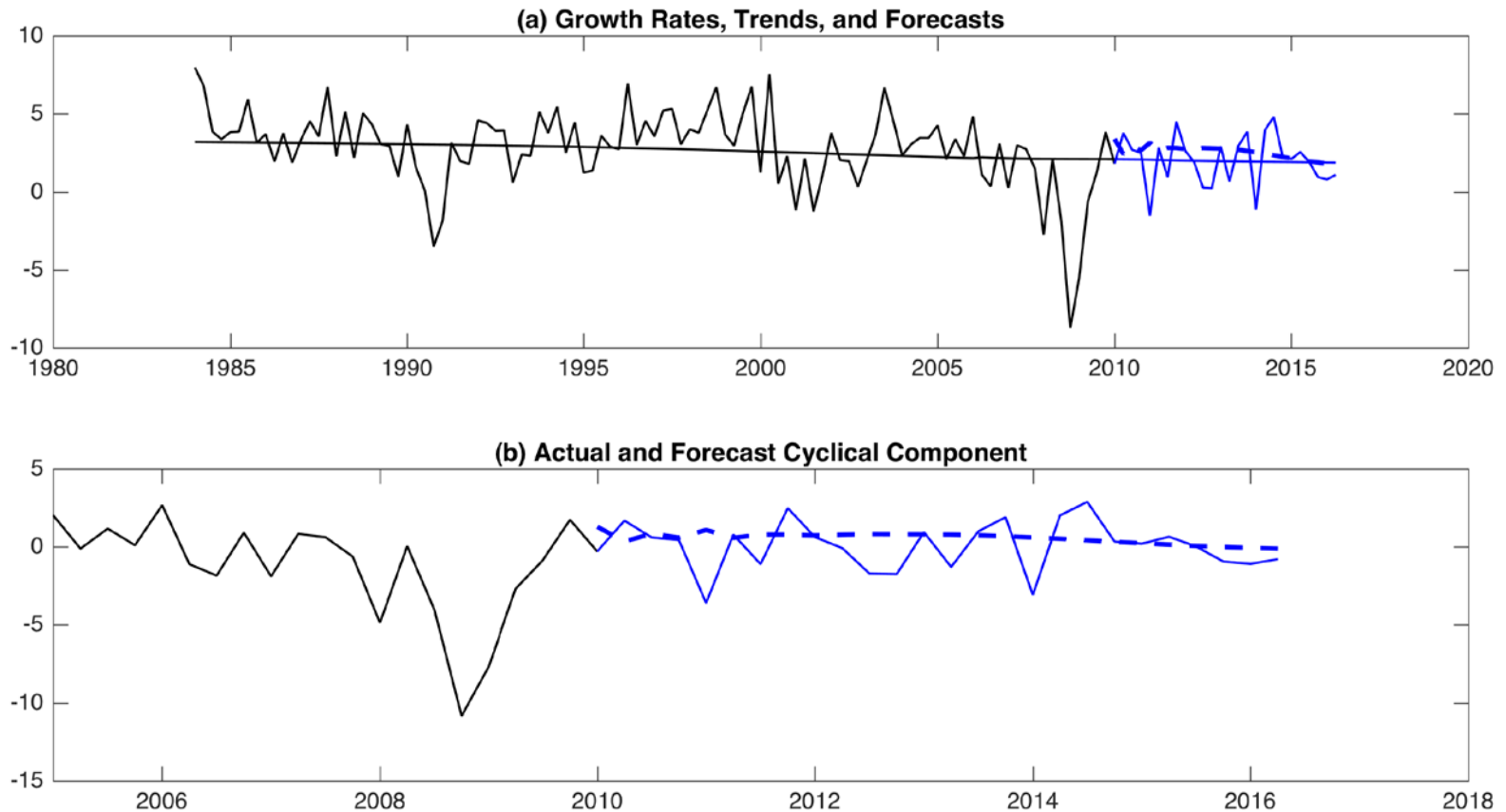
- The trend productivity is very uncertain, and reasonable estimates of the trend slowdown range from -0.7pp to -1.3pp.
- Slightly more than half the slow growth is non-Great Recession trend changes (0.91pp out of 1.74pp)
- These estimates are in line with CBO and earlier literature.

Decomposition #2: Predicted/unpredicted

Methods summary

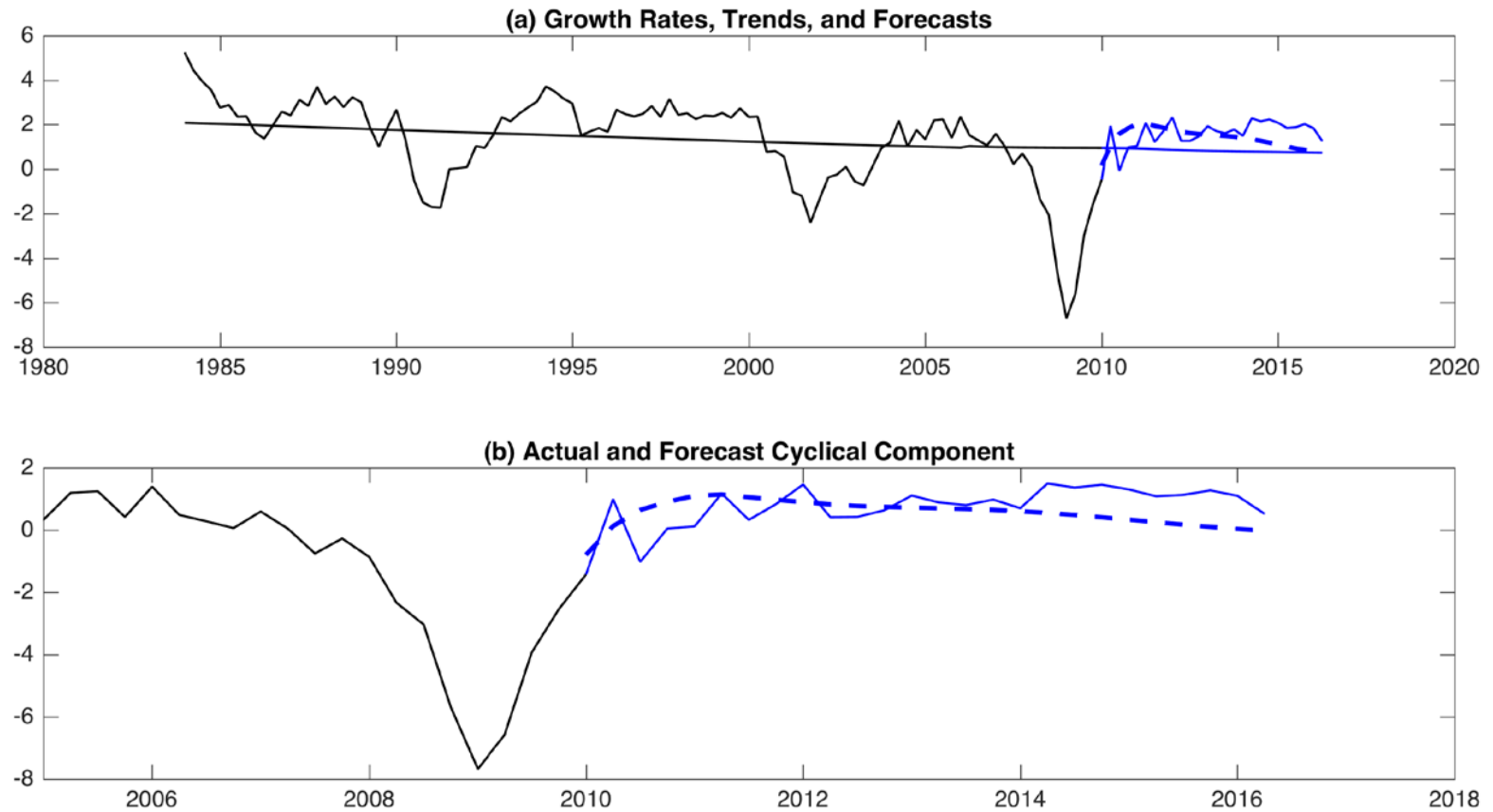
1. Estimate full-sample trends using biweight filter (bandwidth = 100)
2. Estimate factors by principal components using 139 series, growth rates/differences, all detrended
3. Estimate single-series forecasting model using factors and data 1984q1-2007q4
4. Use AR(2) for idiosyncratic component
5. Using factors and growth rate data (after subtracting out trend) through 2009q4 (“jumping-off point”), forecast cyclical components 2010q1-2016q2
6. This provides predicted/unpredicted decomposition
7. Predictions could be wrong because of post-2009 shocks or because of structural changes
8. Trend details:
 - a. Trends for the headline series for which we do bottom-up trend are imposed post-2007, for other series the trends are the 2007q4 time series trends, except that...
 - b. For GDP components we force the GDP identity (growth-shares approximation) on the trends by least-squares shrinkage (typically second-decimal changes).

Predicted/unpredicted decomposition: GDP

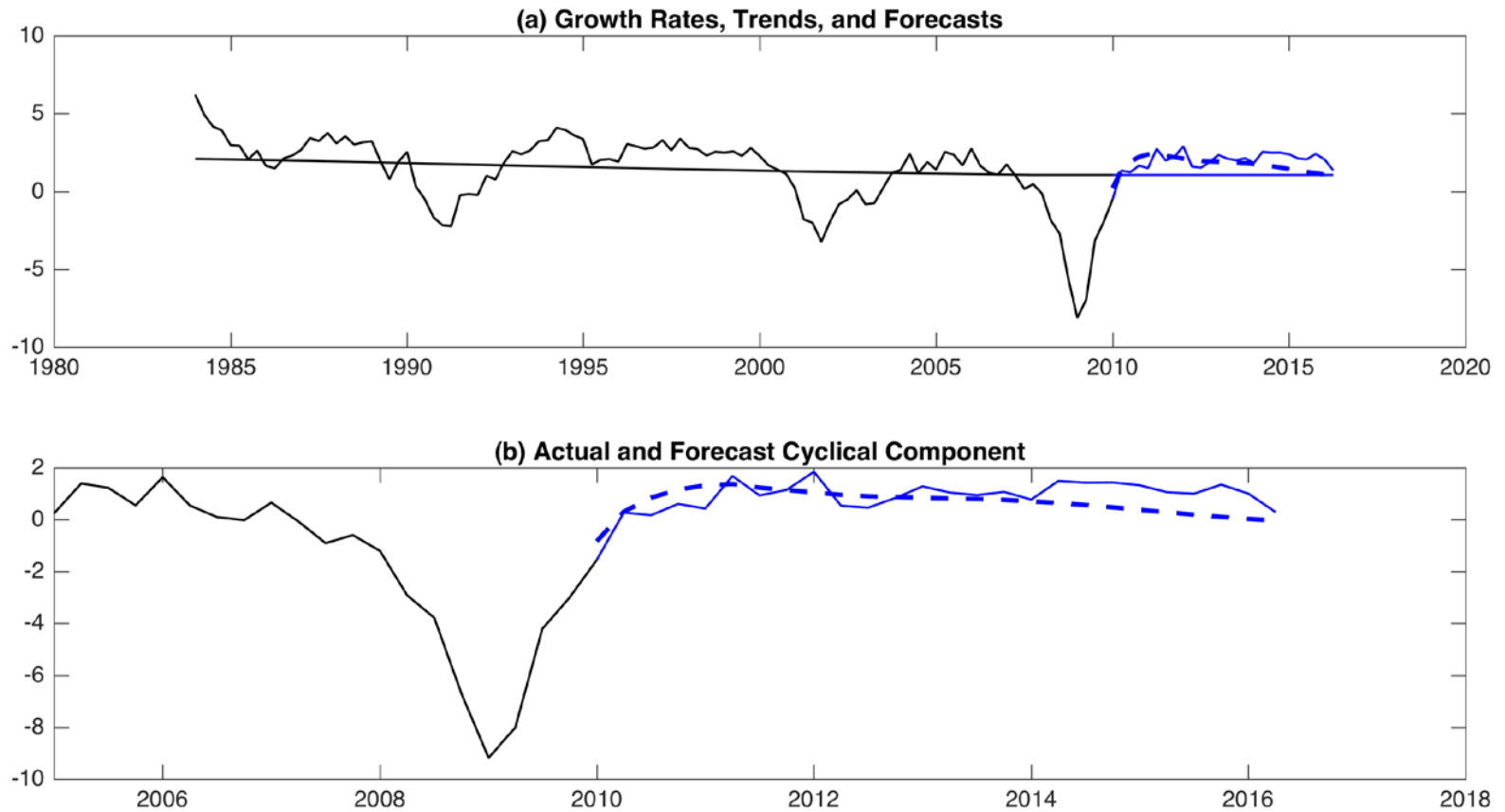


- Solid is actual. Blue is 2010-2016. Dashed is predicted using 1984-2007 forecasting model and data through 2009q4.
- Decomposition:
 - Actual mean GDP growth was 2.01%.
 - Trend = 1.97%, predicted cyclical = 0.56% so predicted = 2.53%.
 - The unpredicted shortfall is $2.01\% - 2.53\% = -0.52\text{pp}$

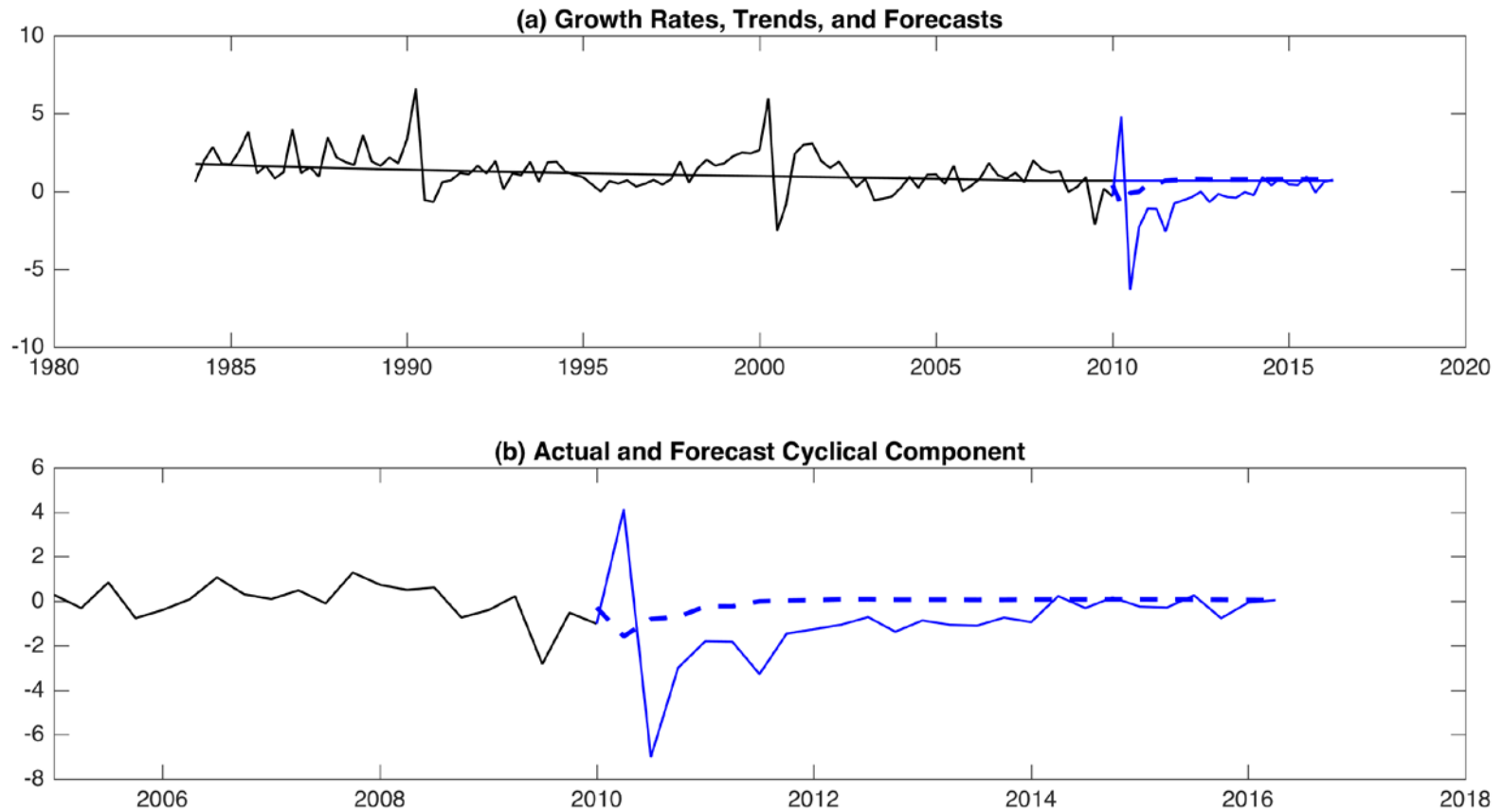
Establishment employment: total nonfarm



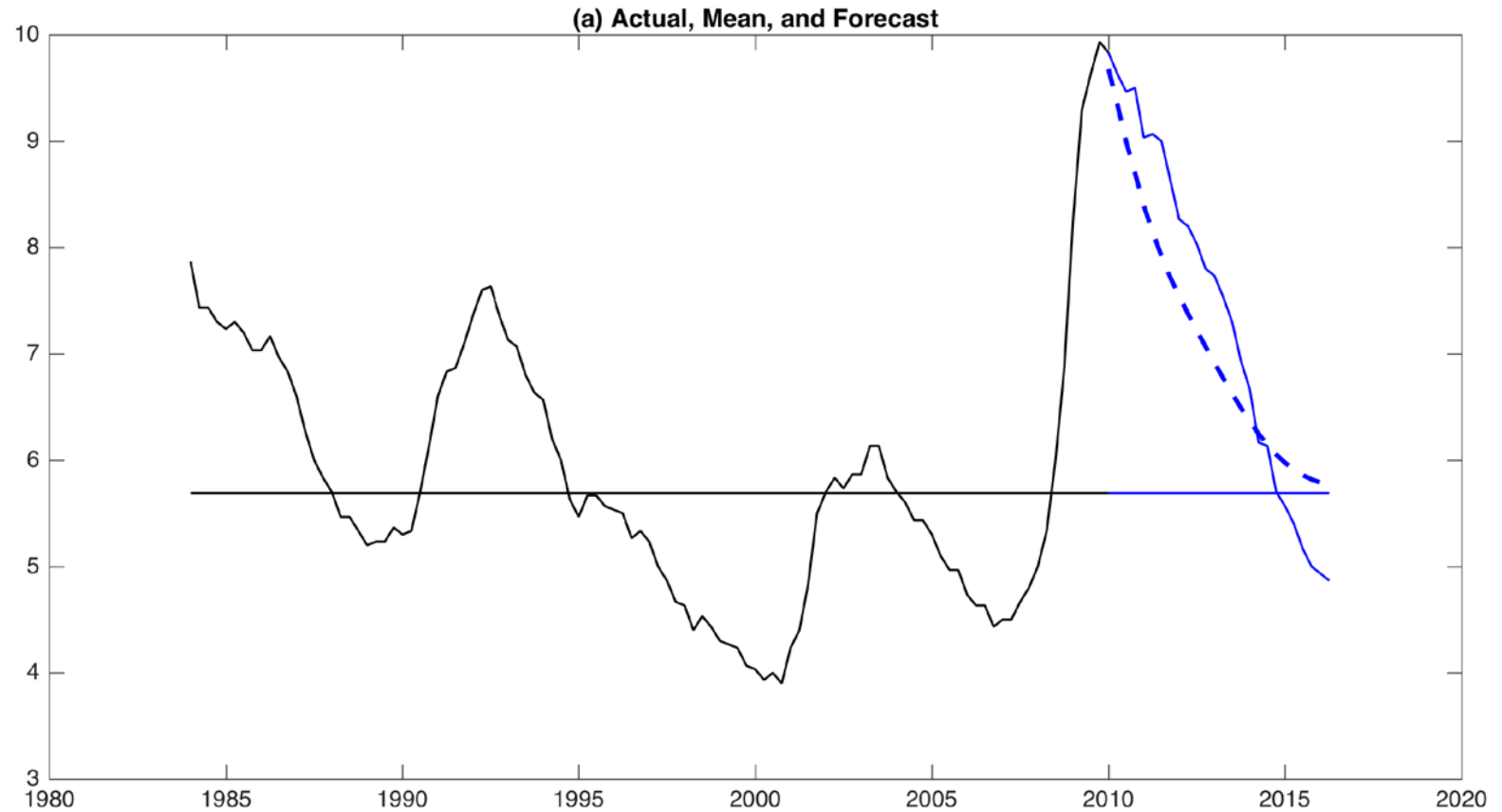
Establishment employment: private nonfarm



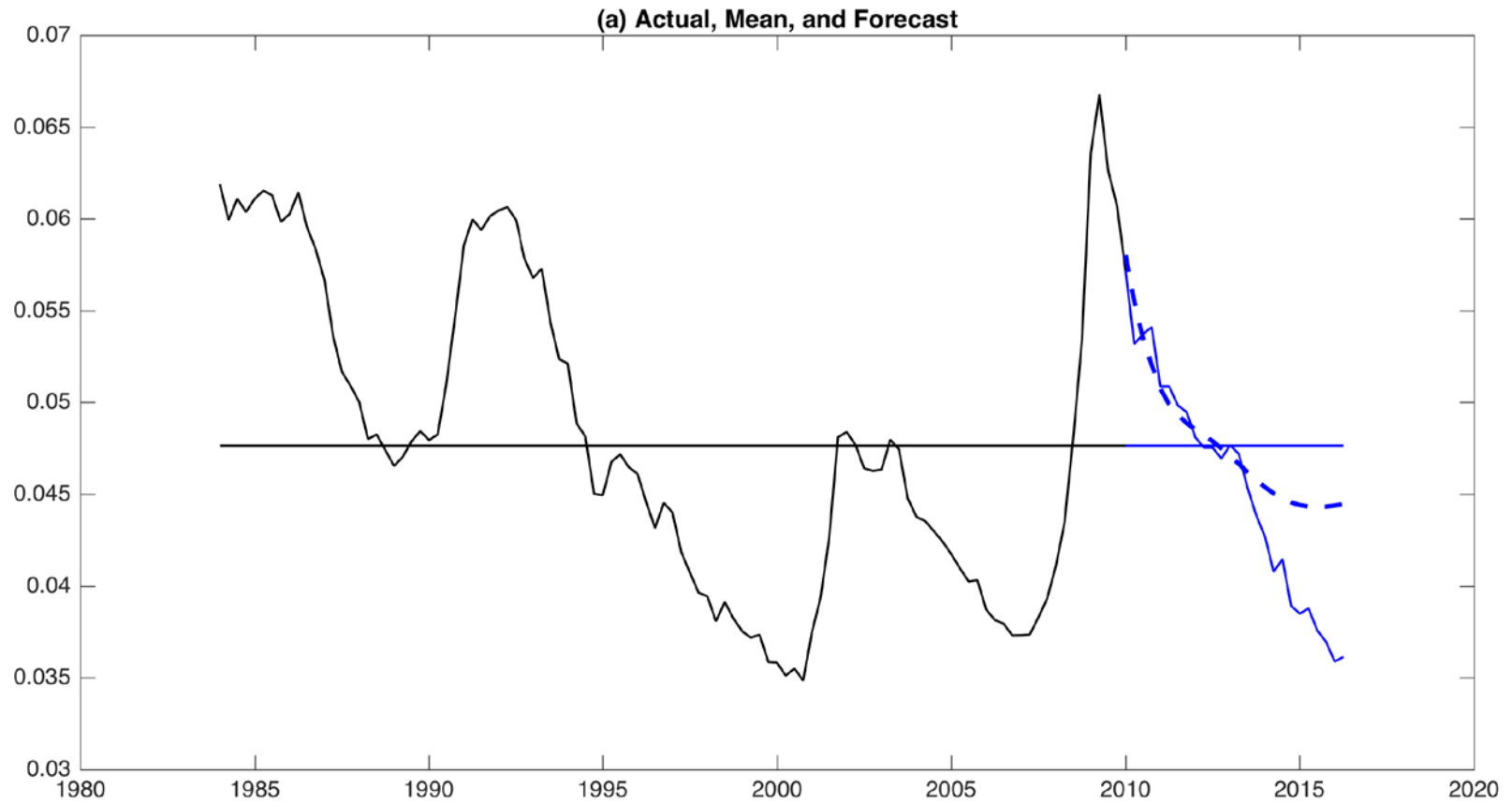
Establishment employment: Government



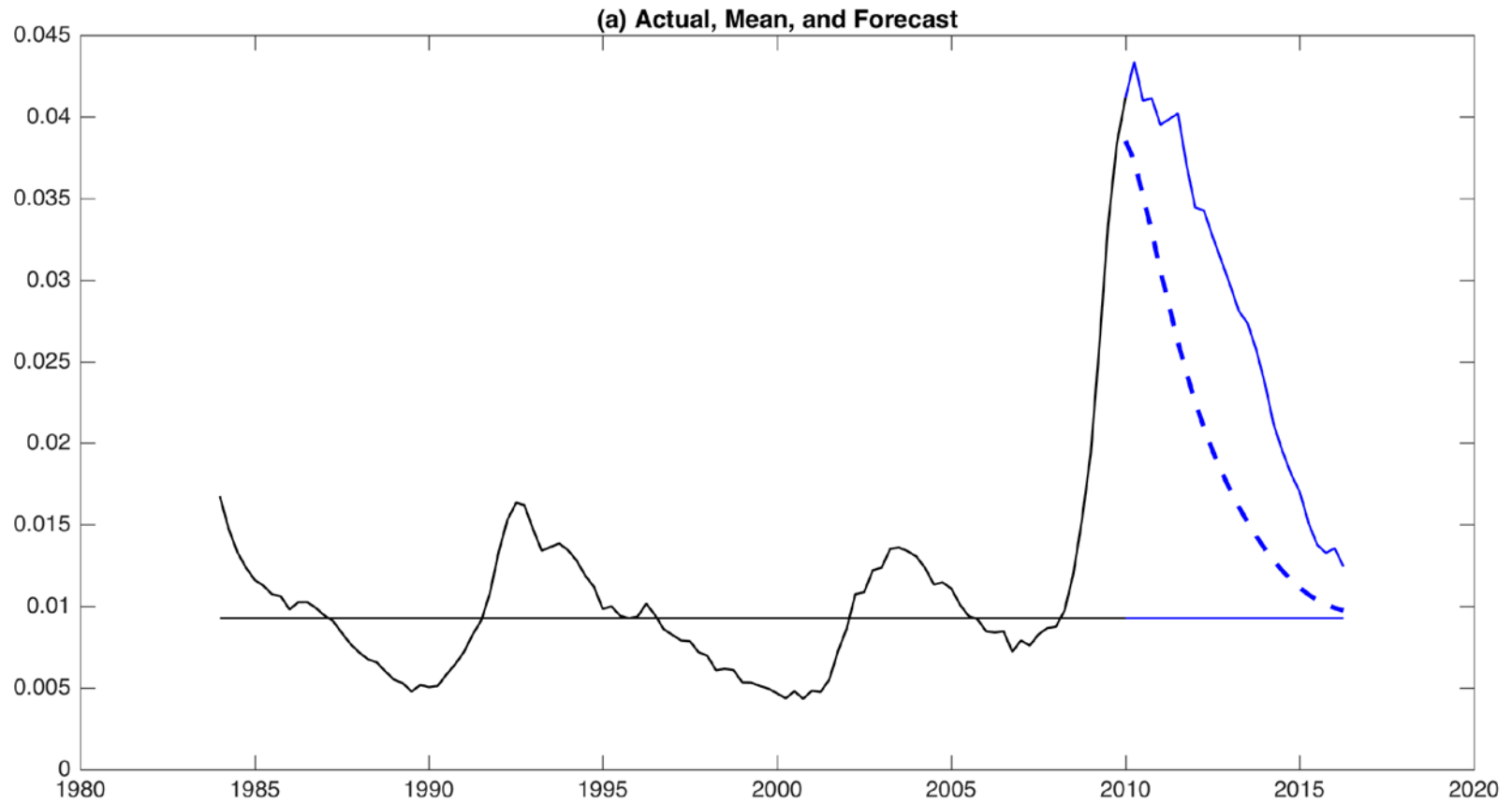
Unemployment rate



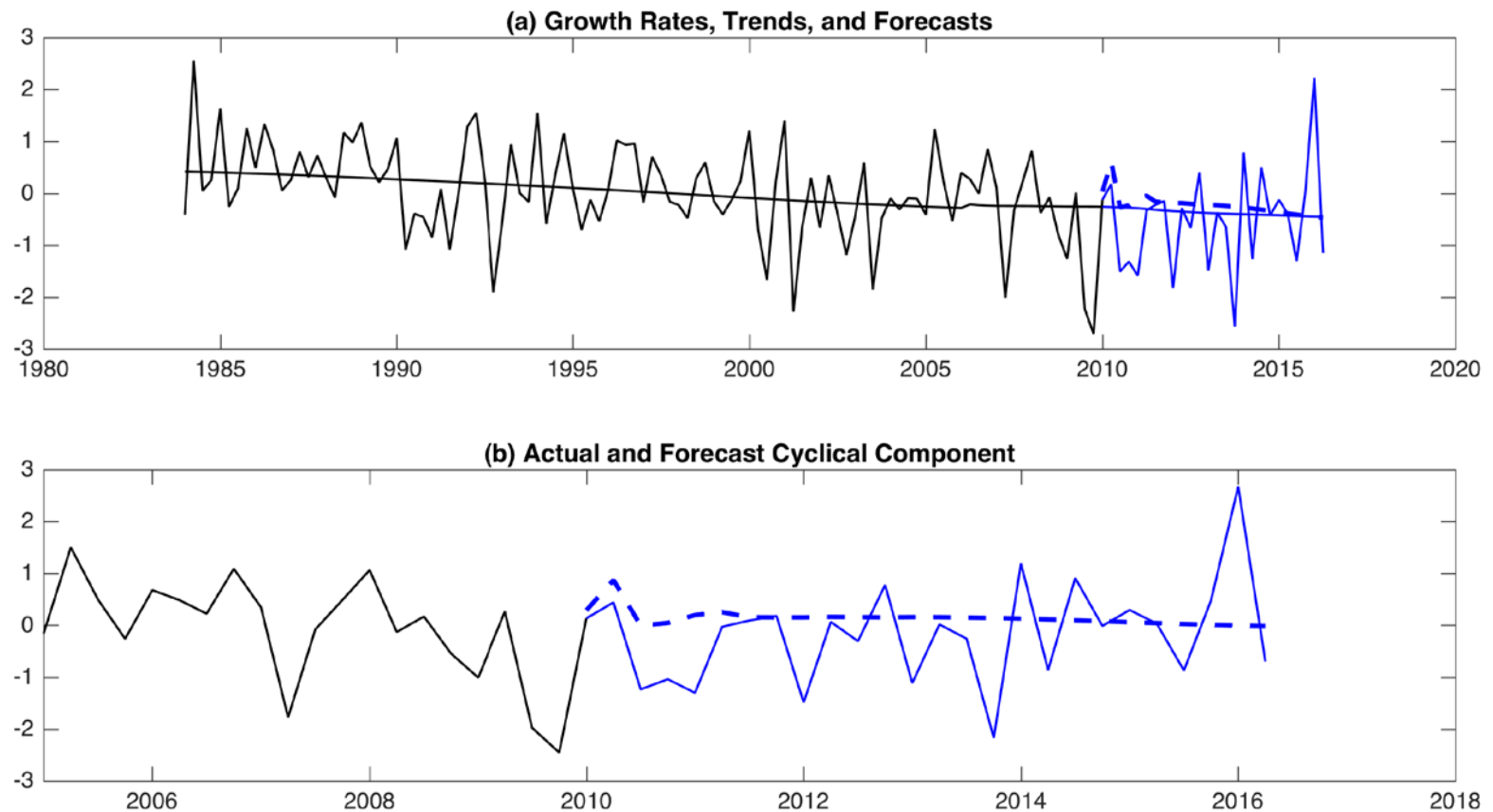
Unemployment rate: short term



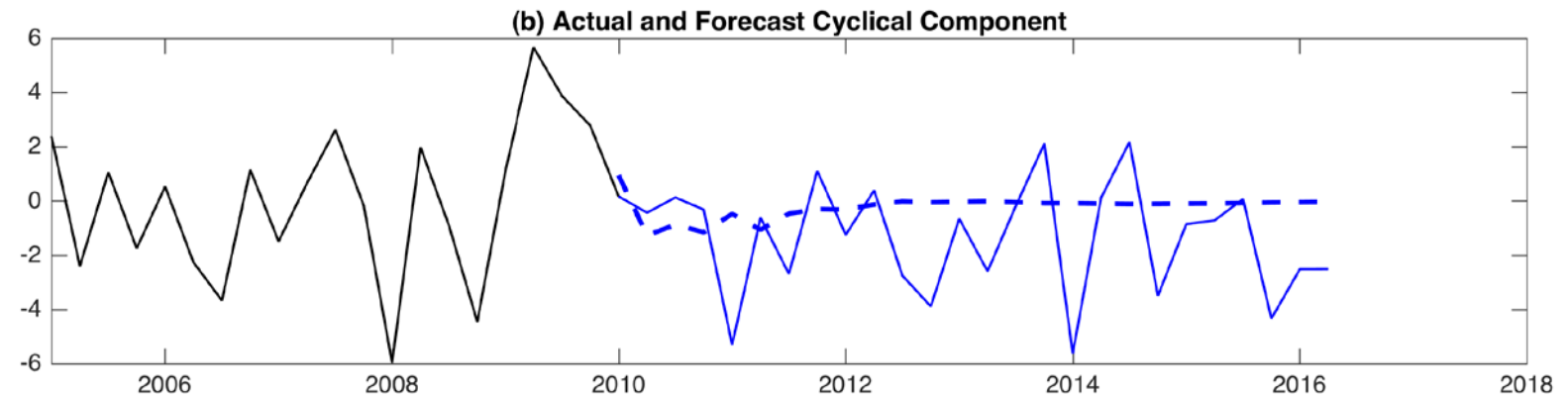
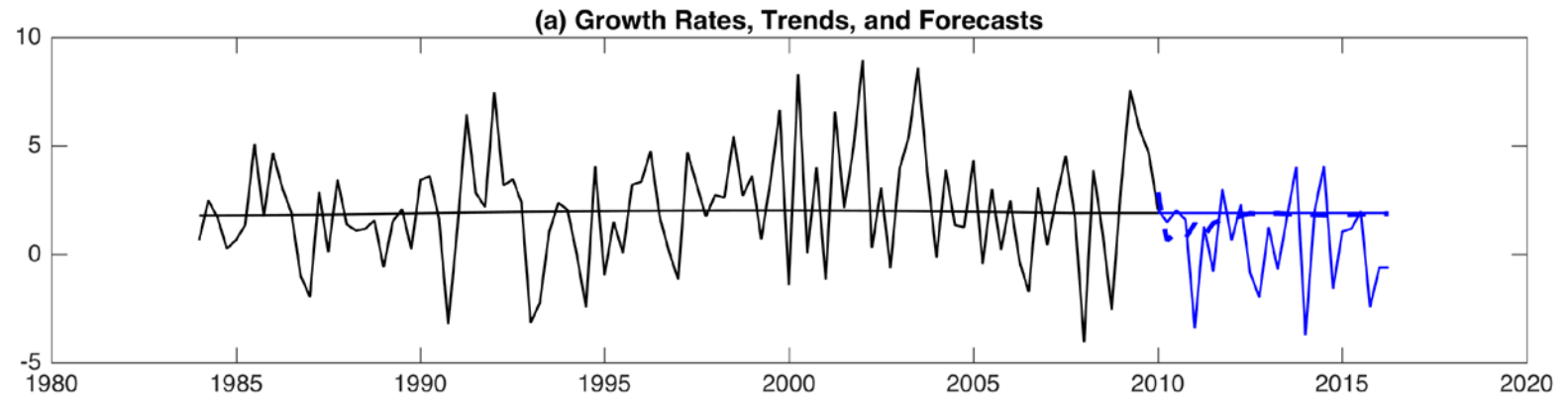
Unemployment rate: long term



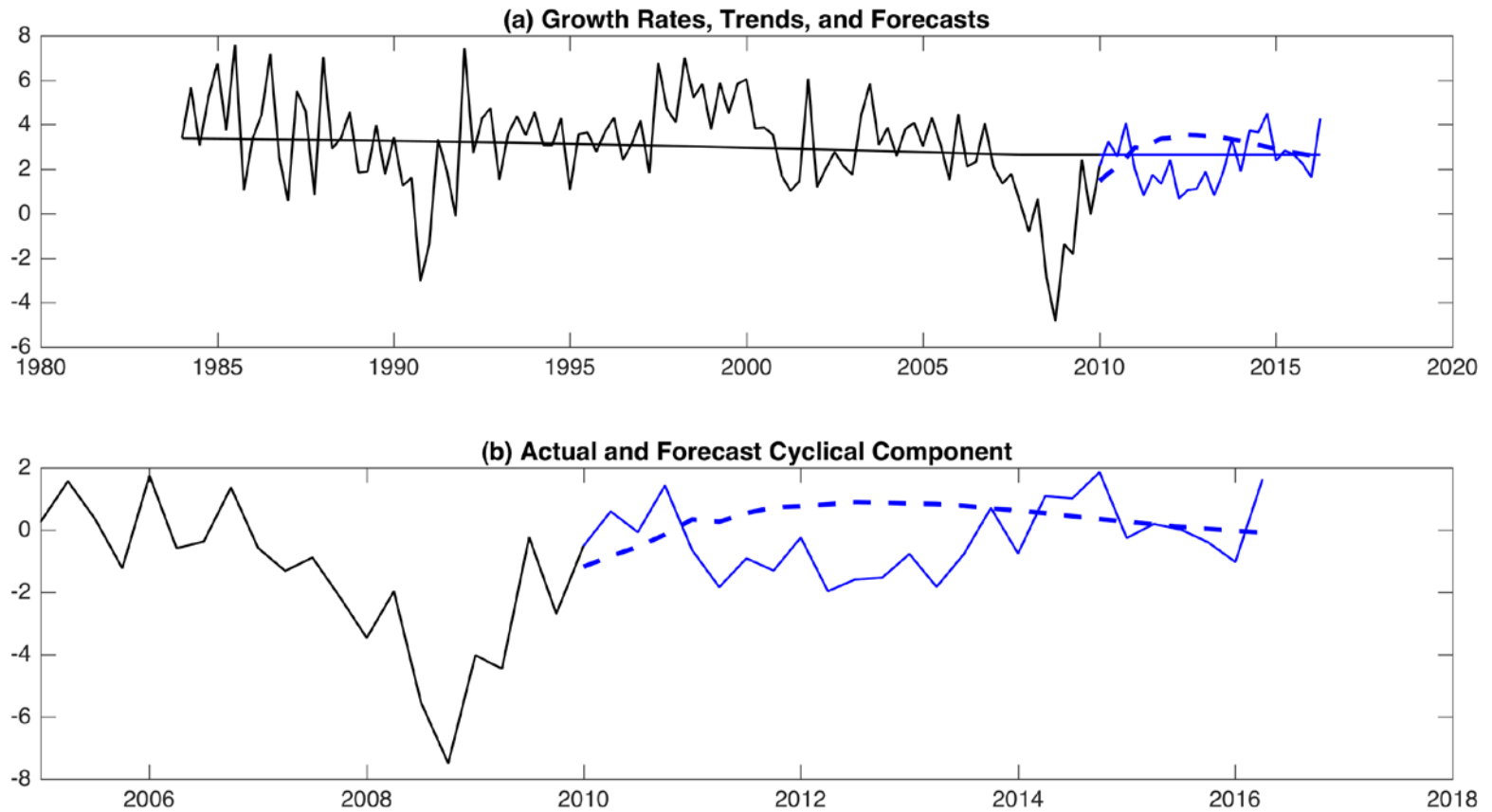
Labor Force Participation Rate (quarterly growth rate)



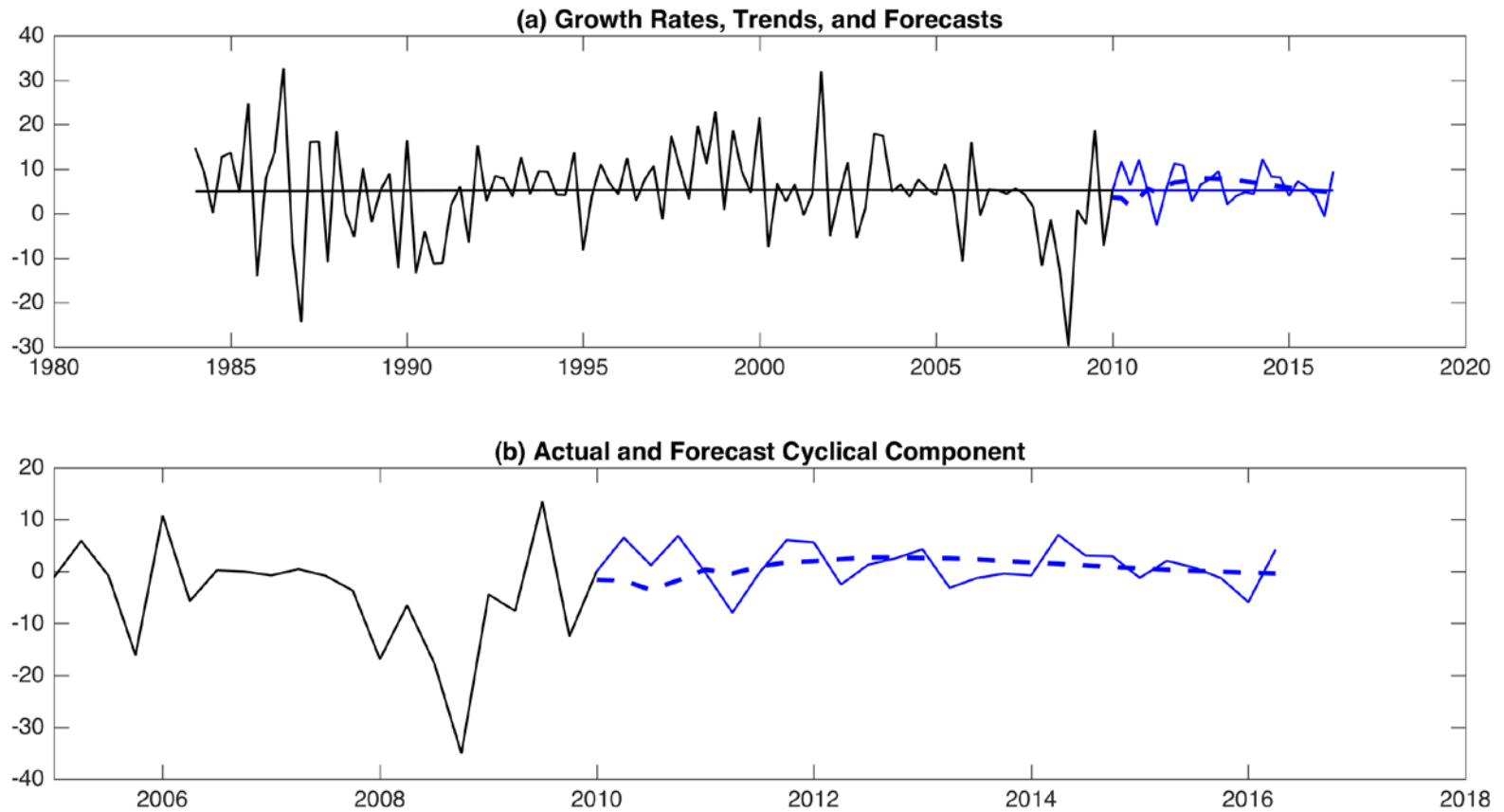
NFB labor productivity



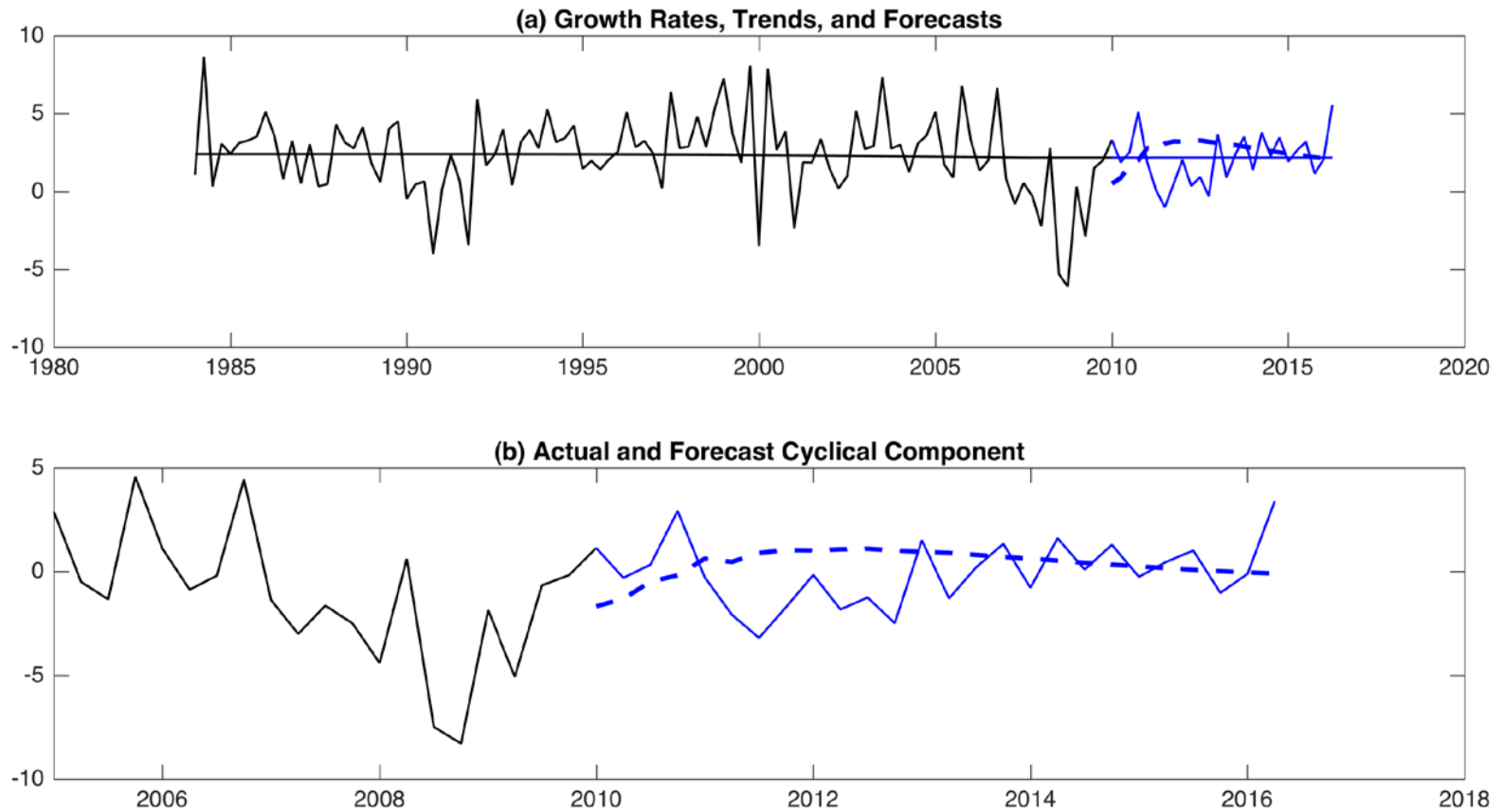
GDP components: PCE



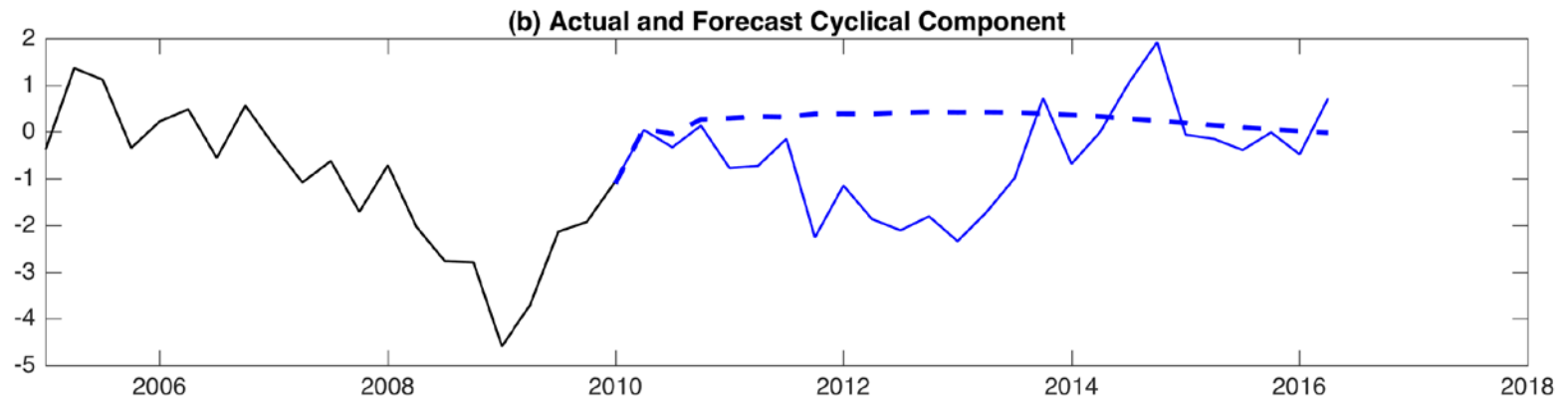
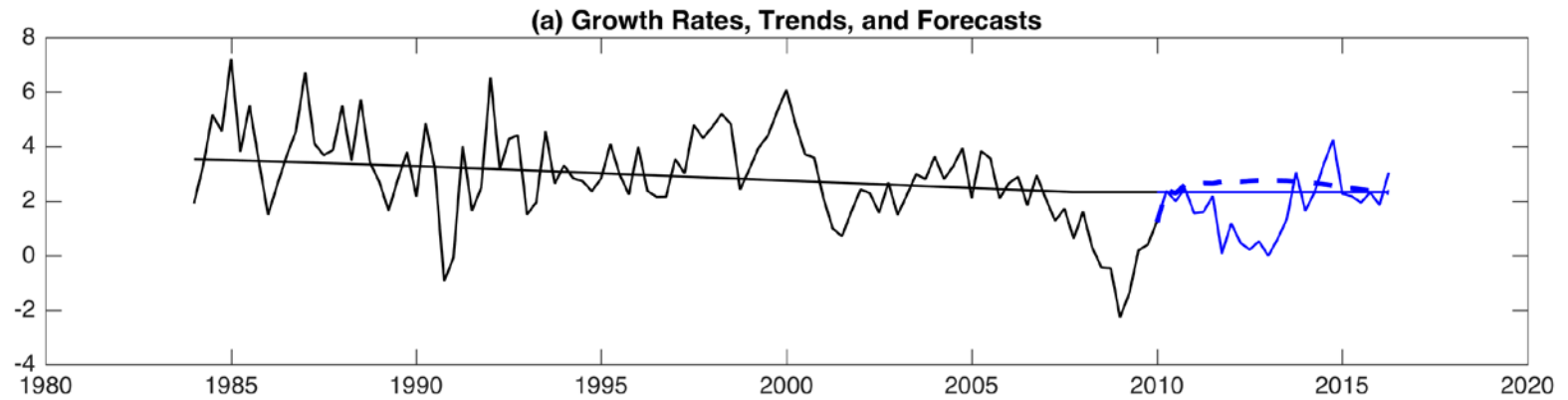
GDP components: PCE - durables



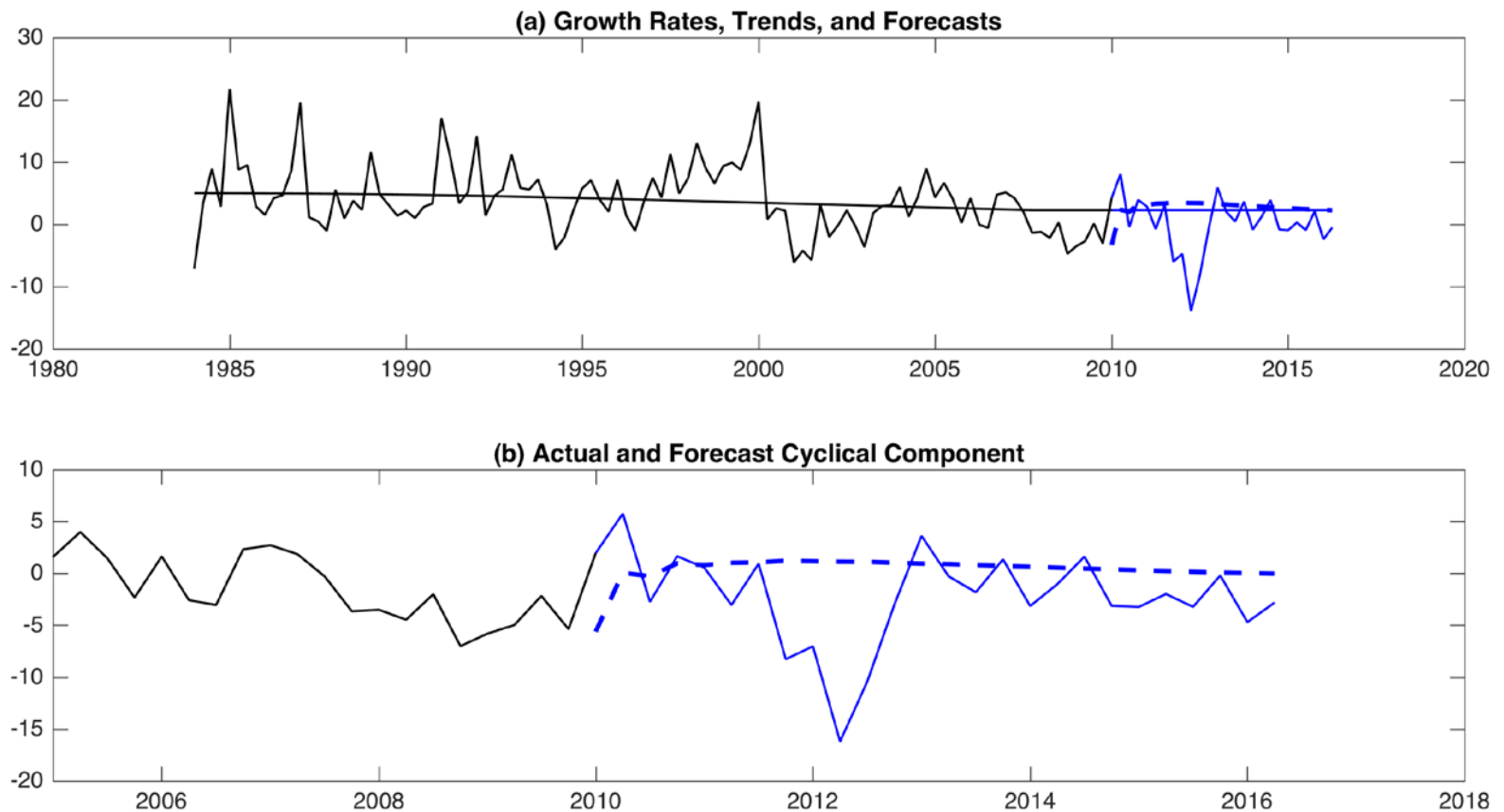
GDP components: PCE - nondurables



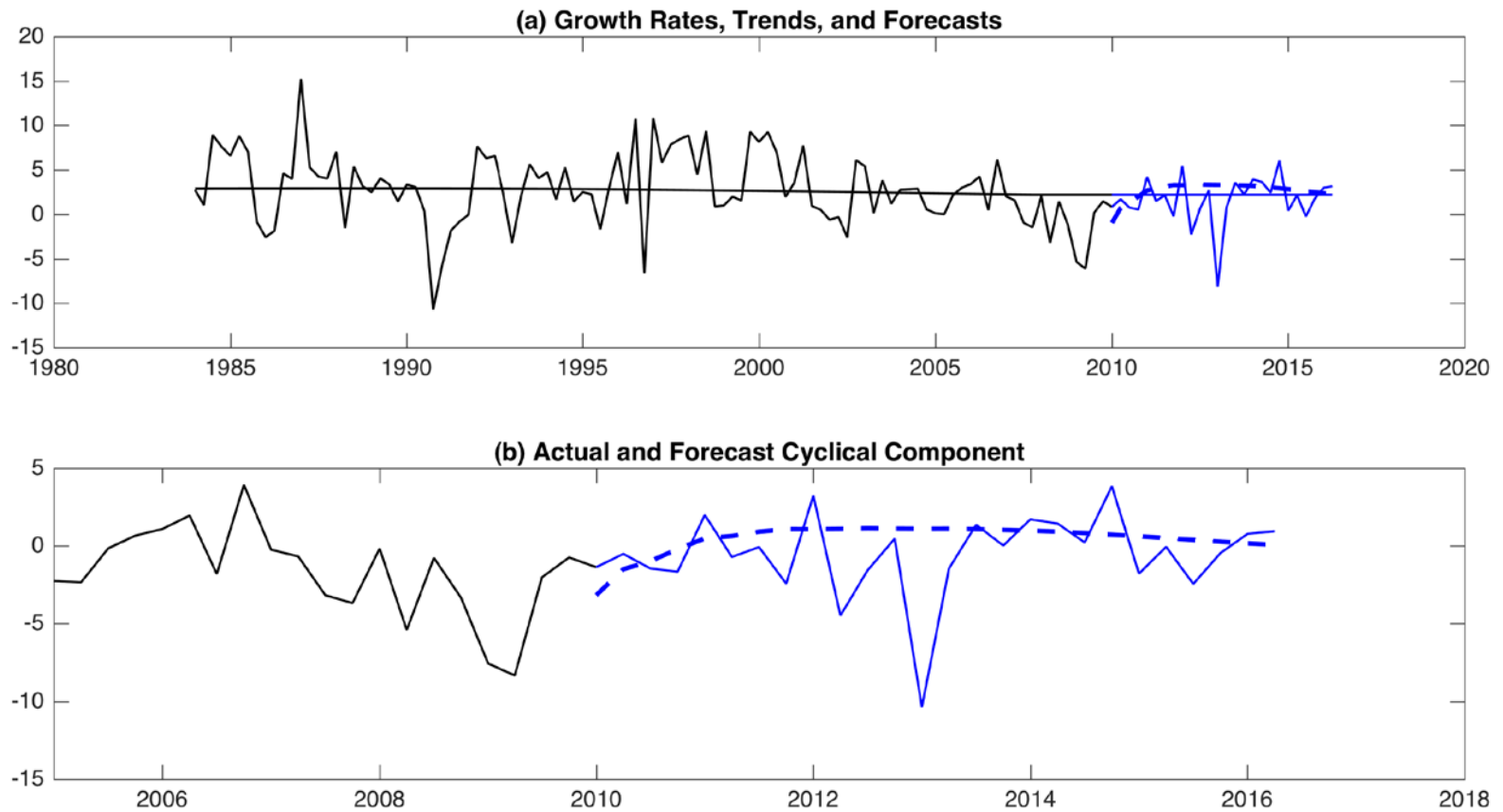
GDP components: PCE - services



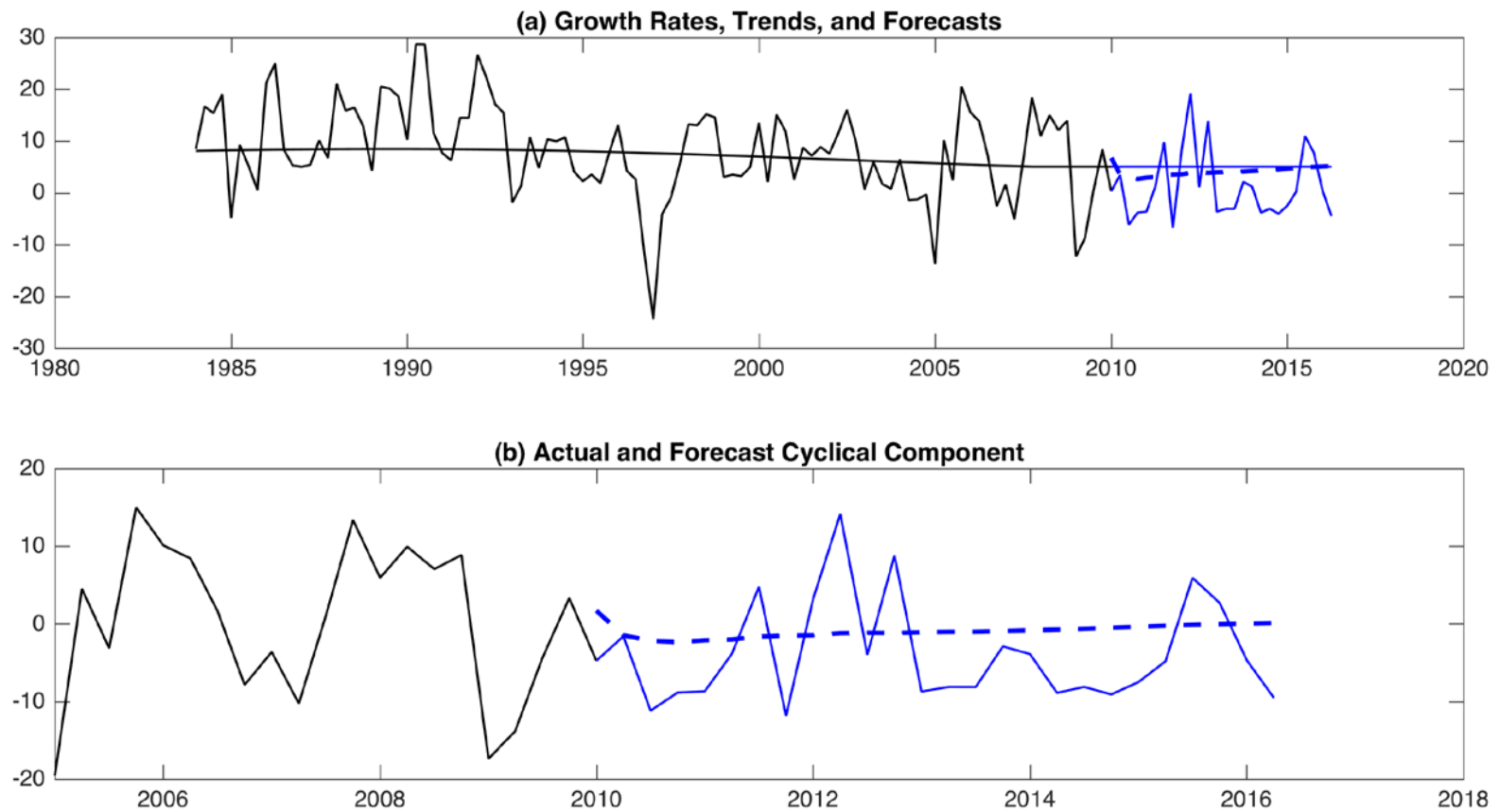
GDP components: PCE – services: financial services and insurance



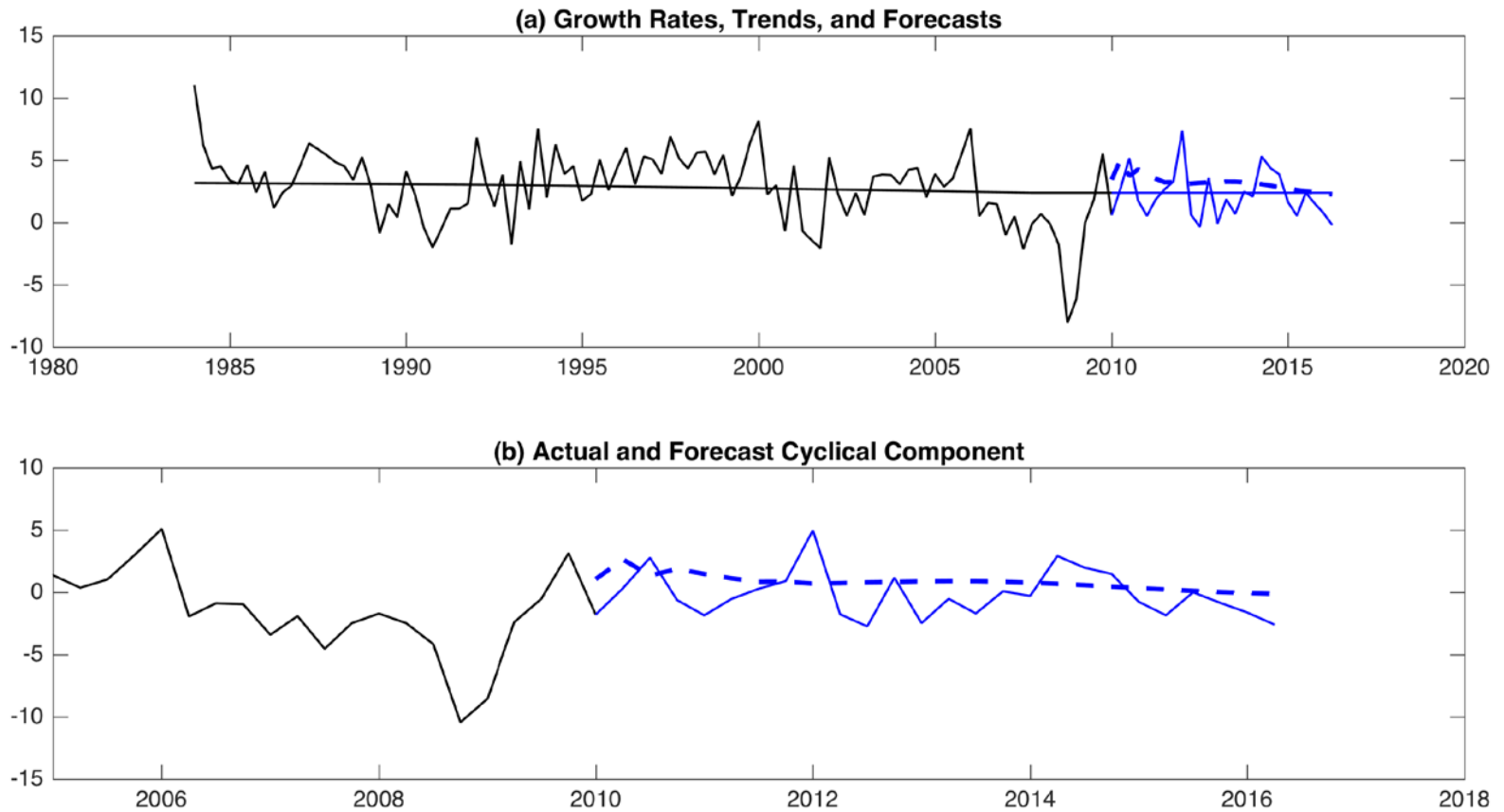
GDP components: PCE – services: other services



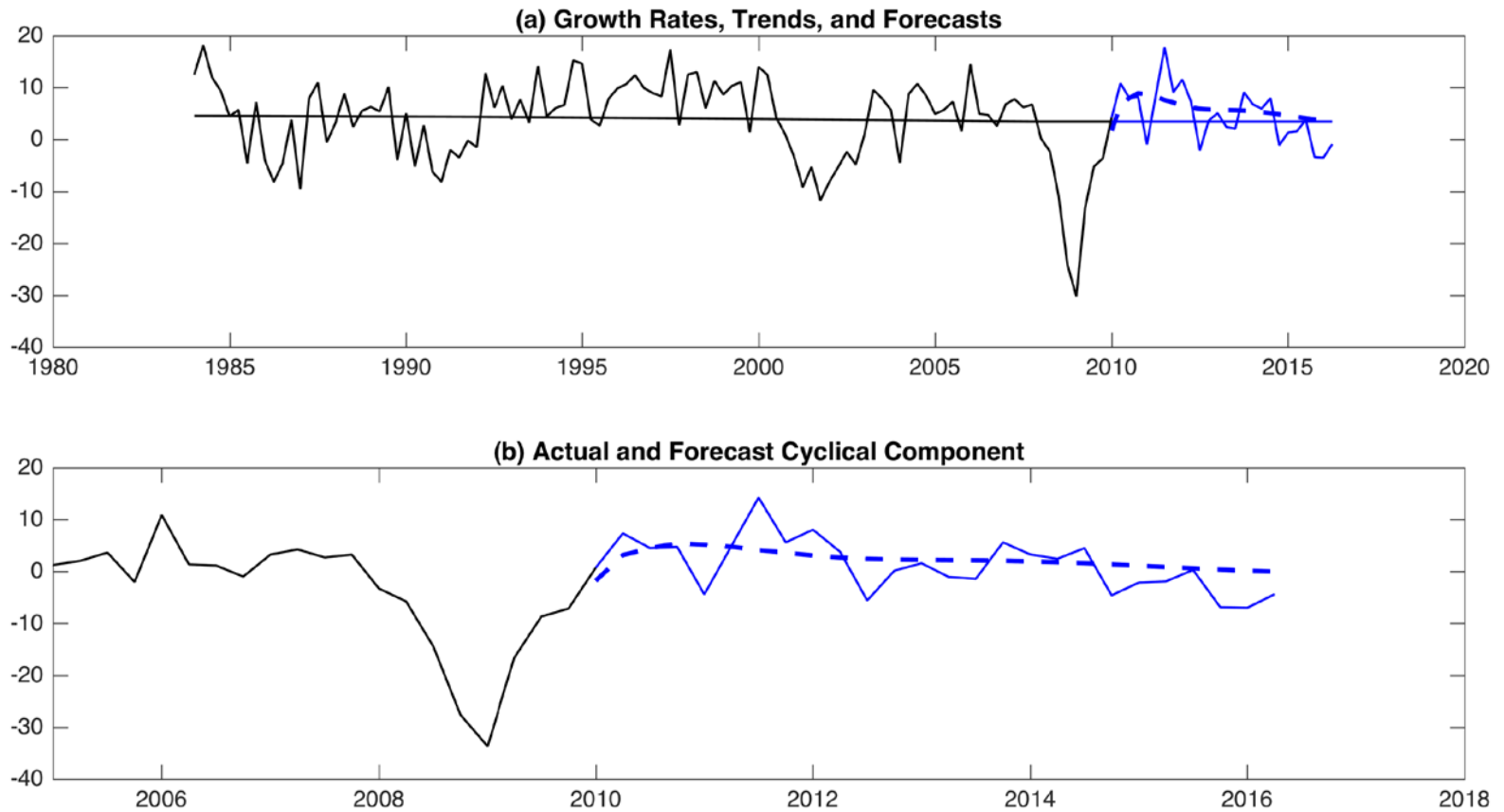
GDP components: PCE – services: NPISH



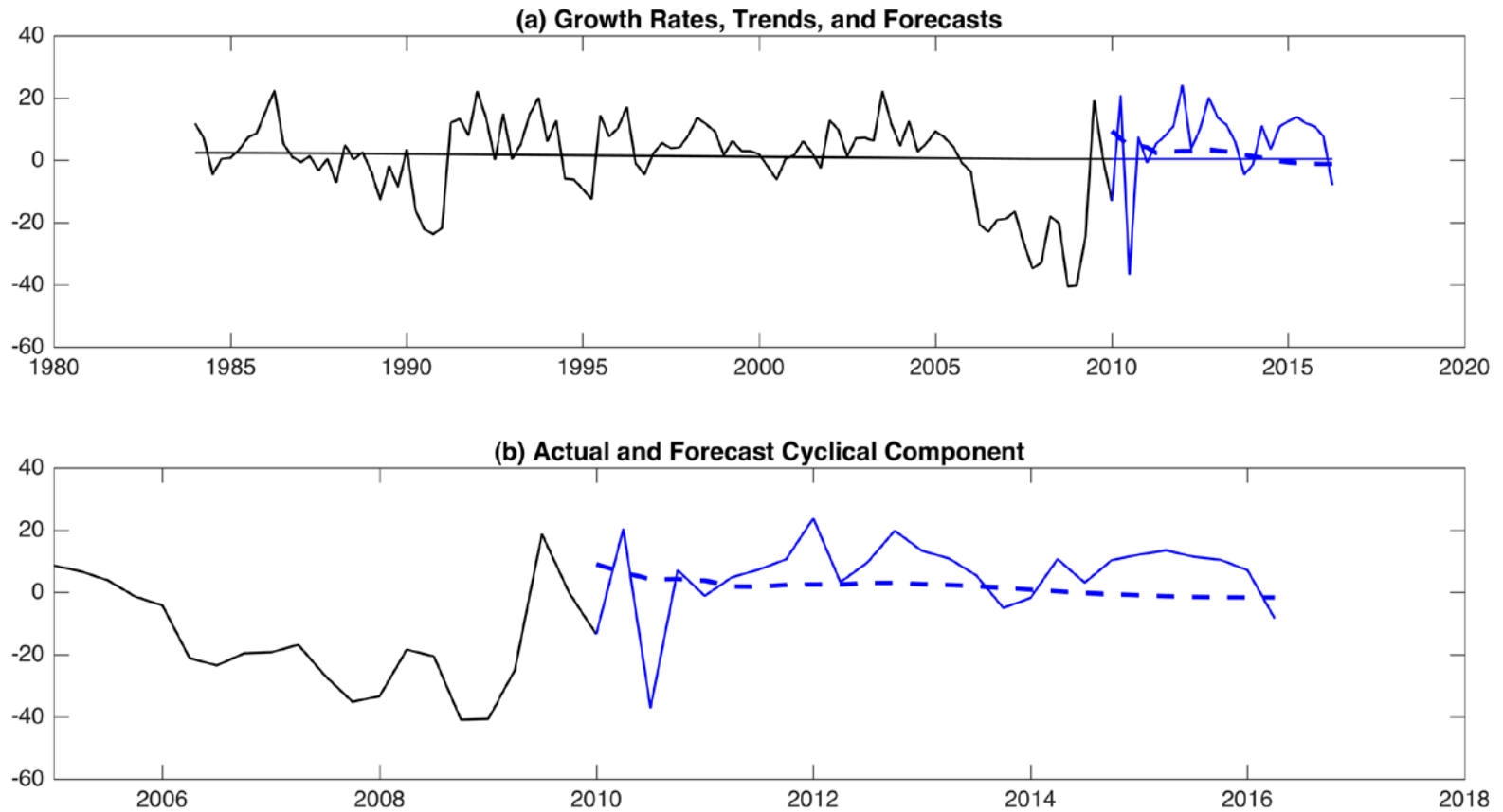
GDP components: Investment



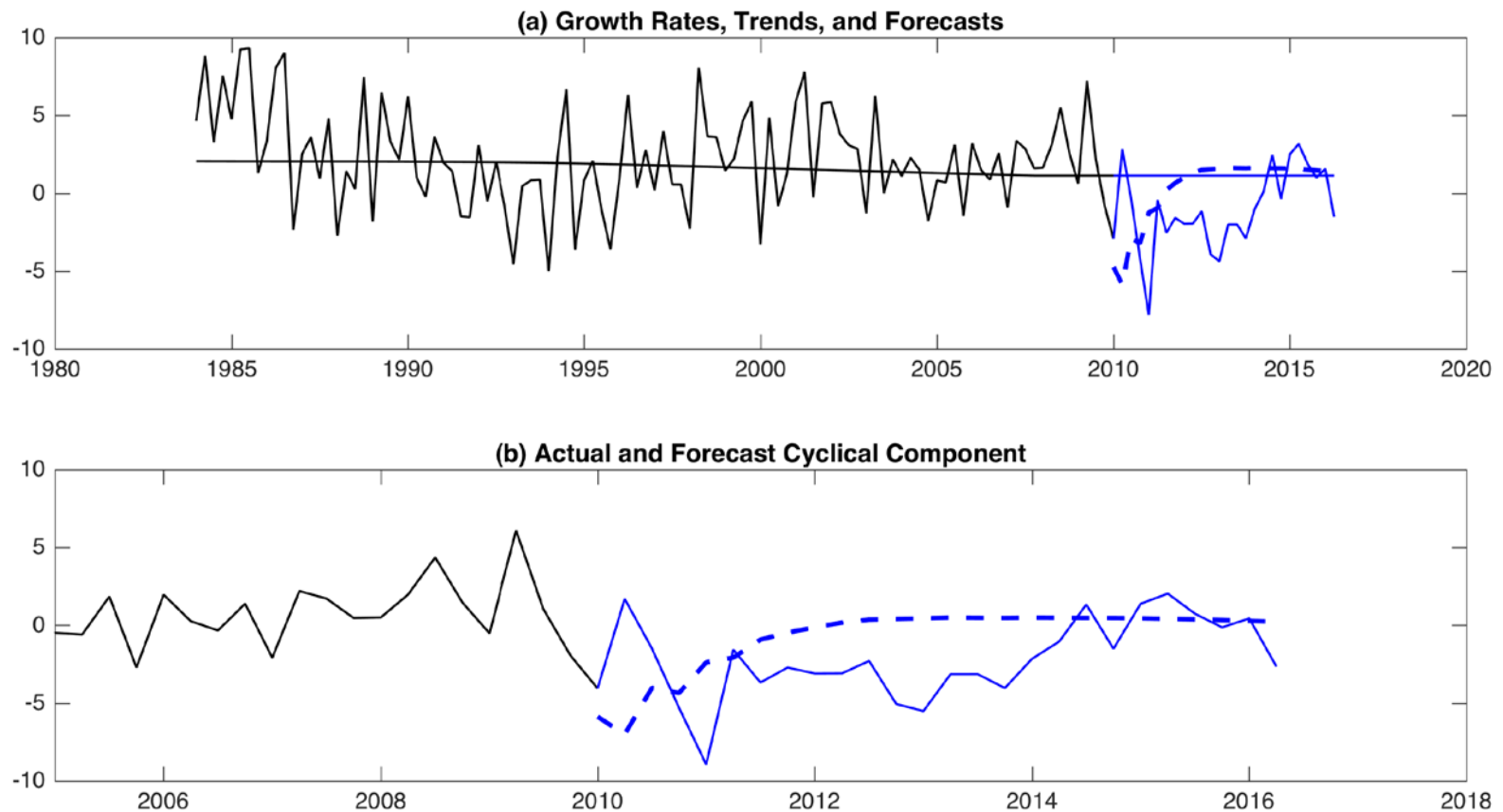
GDP components: Investment – fixed private nonresidential



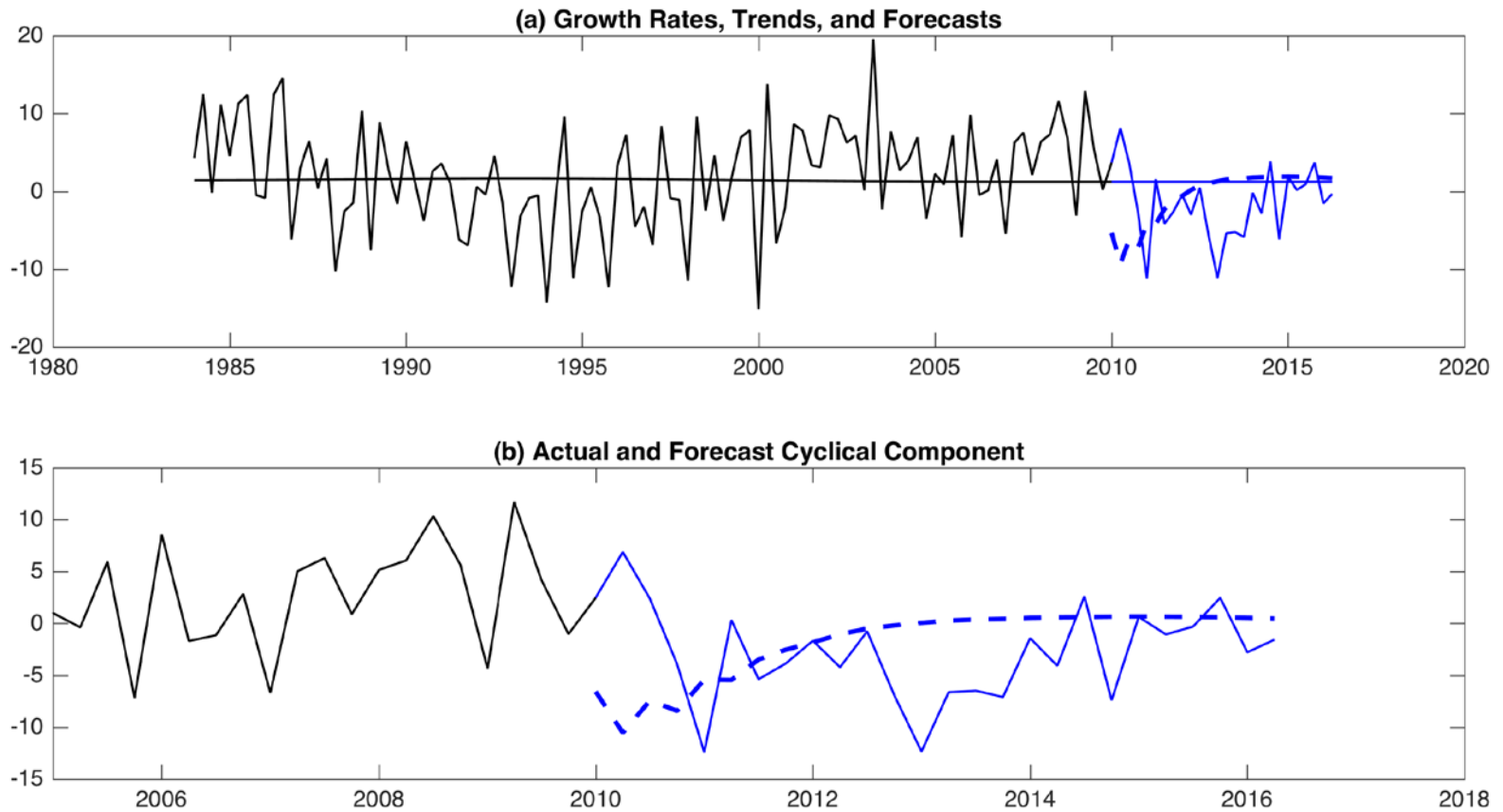
GDP components: Investment – residential



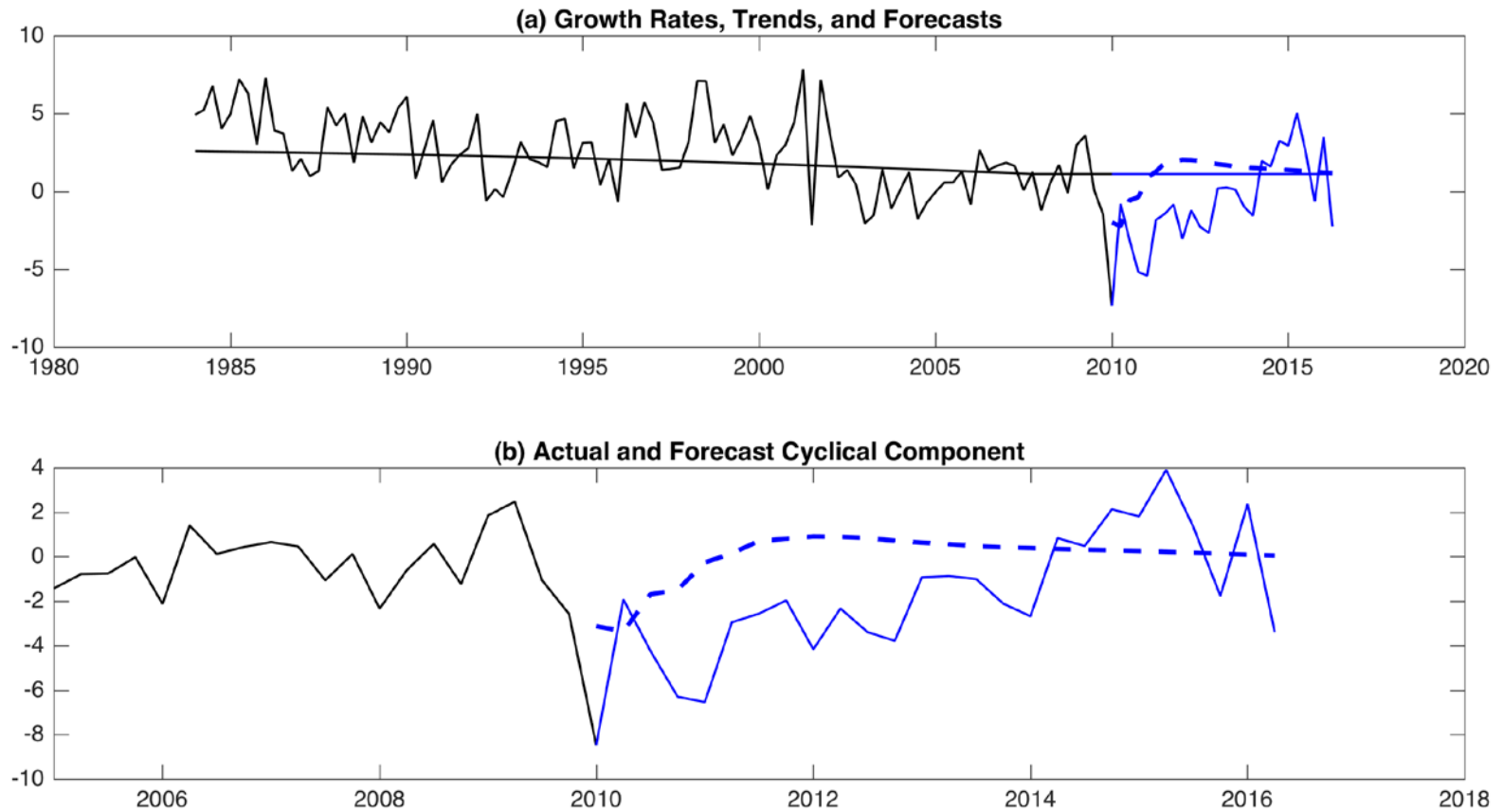
GDP components: Government spending



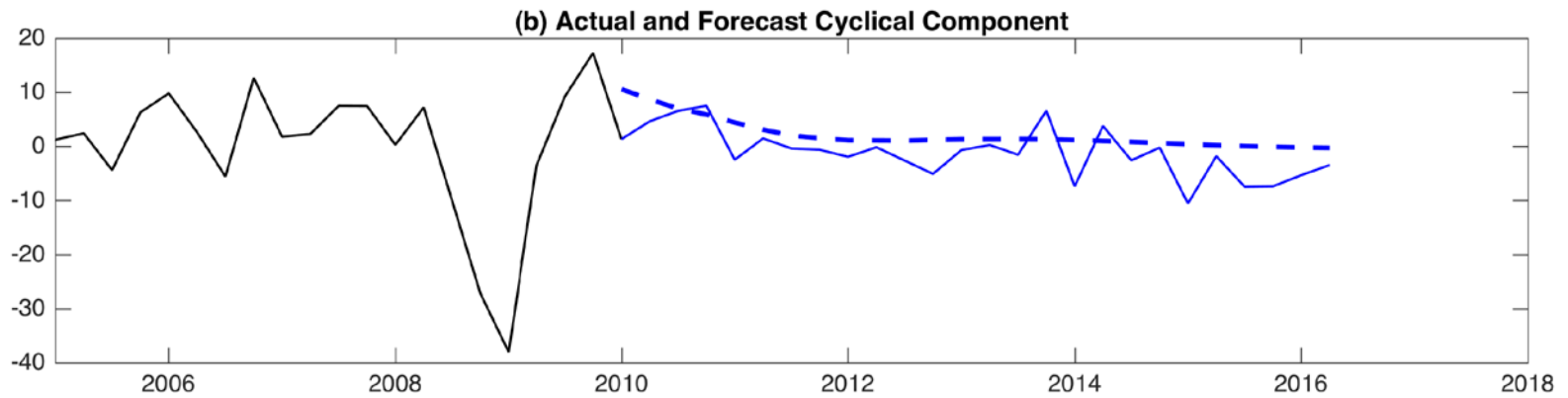
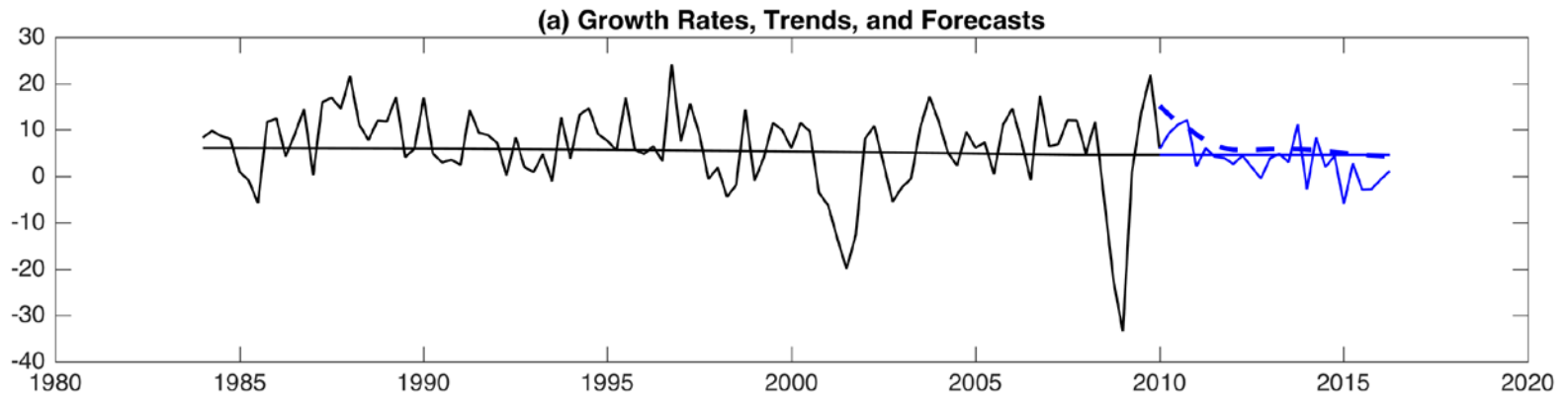
GDP components: Government spending - federal



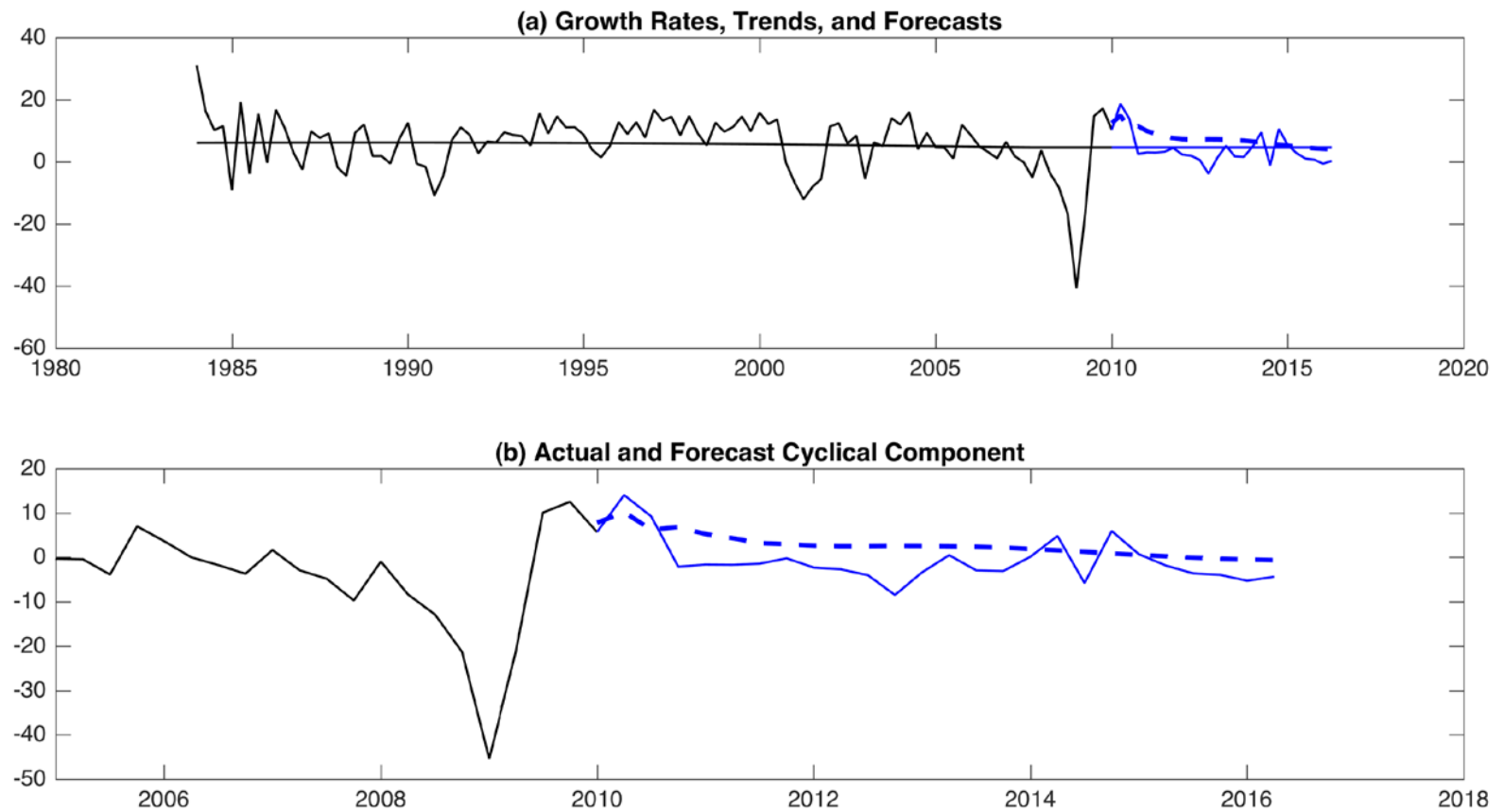
GDP components: Government spending – state & local



Exports



Imports



Predicted/unpredicted Decomposition: Summary

	Mean growth rates, 2010q1-2016q2				
	Actual	Post-2007 trend	Cycle: Actual	Cycle: Forecast	Unexplained
GDP	2.01	1.97	0.04	0.56	-0.52
Total employment (payroll)	1.58	0.84	0.74	0.54	0.20
Labor force (CPS)	0.51	0.76	-0.25	0.10	-0.35
LFPR	-0.52	-0.37	-0.15	0.14	-0.29
NFB output	2.53	2.37	0.16	0.73	-0.57
NFB total hours	1.95	0.47	1.48	0.98	0.50
NFB employment	1.73	0.66	1.07	0.67	0.40
NFB avg. weekly hours	0.22	-0.19	0.41	0.30	0.11
NFB productivity	0.58	1.90	-1.32	-0.23	-1.09
Employment: private	1.94	1.06	0.88	0.65	0.23
Employment: government	-0.28	0.69	-0.97	-0.10	-0.87

Sensitivity analysis: These decompositions are robust to specification changes, except for NFB productivity. Other specifications give larger predicted cyclical movements (so smaller unexplained shortfall). Also, LFPR cyclical contribution is somewhat sensitive, other specifications yield ~0.

Predicted/unpredicted decomposition: pp contributions to GDP

	Contributions to mean GDP growth rates, 2010q1-2016q2				
	Actual	Post-2007 trend	Cycle: Actual	Cycle: Forecast	Unexplained
GDP	2.01	1.97	0.04	0.56	-0.52
Consumption	1.60	1.54	0.25	0.21	-0.16
PCE-goods	0.79	0.69	0.05	0.10	0.00
PCE-durable goods	0.47	0.38	0.09	0.06	0.03
PCE-nondurable goods	0.33	0.31	-0.01	0.05	-0.04
PCE-services	0.81	0.86	-0.26	0.10	-0.15
Investment (GDPI)	0.85	0.40	0.54	0.52	-0.07
Fixed private investment	0.77	0.40	0.37	0.30	0.07
FPI-nonresidential	0.58	0.39	0.15	0.28	-0.08
FPI-residential	0.18	0.01	0.17	0.05	0.12
Government	-0.20	0.20	-0.42	-0.15	-0.25
G-Federal	-0.12	0.09	-0.21	-0.14	-0.07
G-State & local	-0.09	0.11	-0.21	0.00	-0.19
Net exports	-0.19	-0.18	-0.04	-0.16	0.15
Exports	0.45	0.59	-0.15	0.29	-0.43
Imports	-0.65	-0.77	0.11	-0.45	0.58
Imports ex. petroleum	-0.71	-0.76	0.02	-0.42	0.47
Petroleum imports	0.03	-0.02	0.04	-0.05	0.09

Summary of empirical results

1. Roughly half of the slow growth, relative to past 3 recoveries, is slower trends (largely demographics)
2. Relative to 2009q4 “prediction,” we estimate the GDP growth shortfall as -0.5pp
3. Labor market recovery:
 - Employment (both establishment and household) has been stronger than would have been expected; unemployment rate on track
 - Main underperformance is in long-term unemployment, labor force, and LFPR
4. Private aggregate demand isn’t particularly weak
 - Consumption growth made small net negative contribution
 - Although services is weak, especially in 2012-13, especially finance, other, and NPISH
 - Some weakness in private fixed investment, mainly compensated by residential
5. Clear weakness in government spending and hiring
 - Federal: in 2012-13
 - State & local: 2011-2013
6. Weakness in exports, especially 2011-2014.
7. Productivity puzzle is roughly -1.1pp, after accounting for cyclical component. Depending on trend assumption, this could be -0.9 to -1.3pp.

And the explanations?

1. Half the slowdown is trends (demographics)
2. Little evidence for weak private demand stories as major factors (secular stagnation, income inequality, policy uncertainty/real options, lingering financial crisis, oil price volatility)
3. Evidence for two “one-off” explanations:
 - i. Weak government expenditures & hiring
 - ii. Weak international demand
4. Maybe some room for mismeasurement as an explanation?