

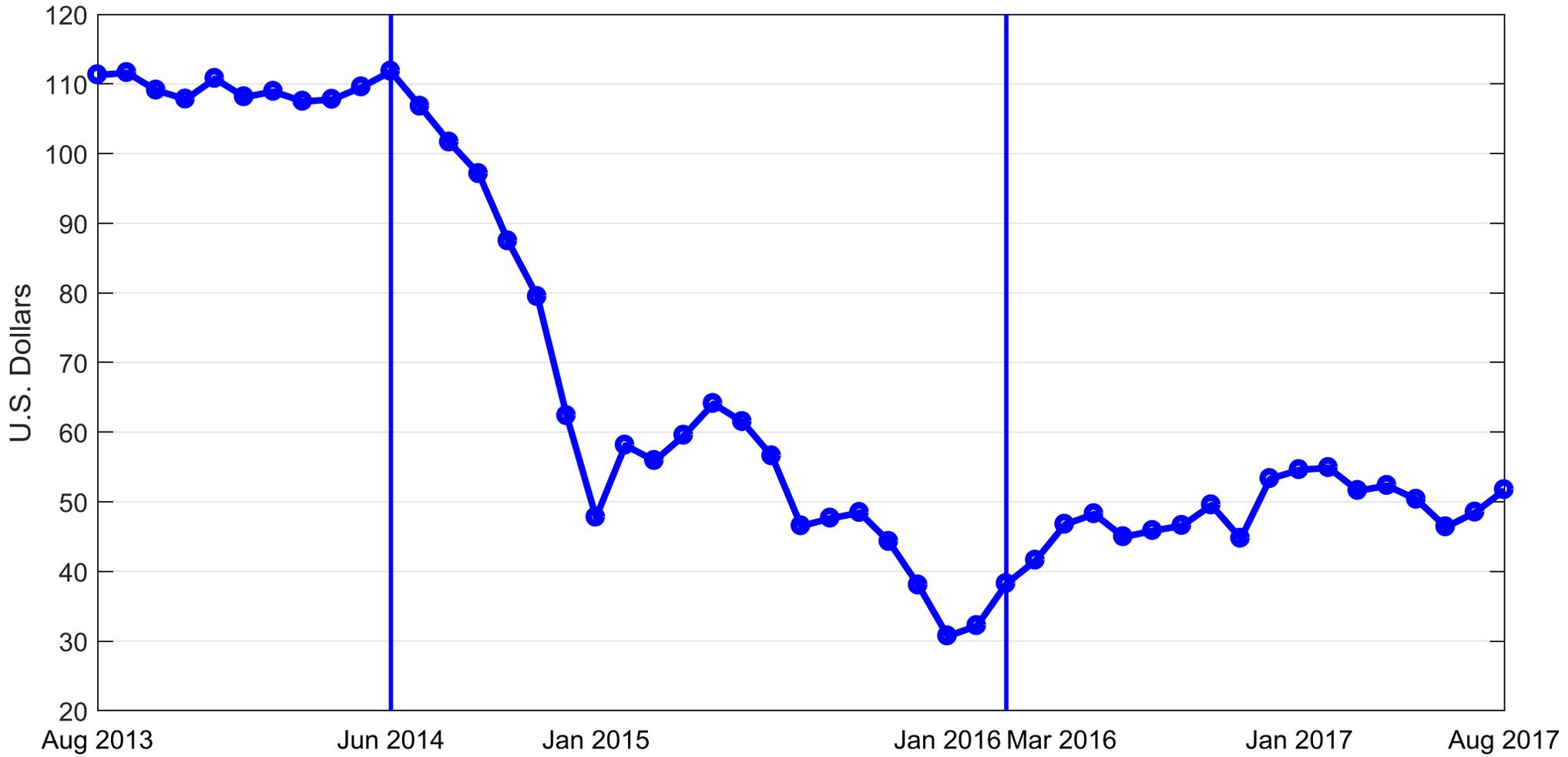
Lower Oil Prices and the U.S. Economy: Is This Time Different?

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Brent Price of Crude Oil: 2013-2017



A Look at the Facts

	Average Growth at Annual Rates (%)	
	2012Q1-2014Q2	2014Q3-2016Q1
Real GDP	1.8	2.2
Private Consumption	1.9	2.9
Nonresidential Investment	5.1	1.5
Exports	3.2	0.7
Imports	2.3	2.9

How Does an Unexpected Oil Price Decline Affect the Economy?

- Reduction in firms' costs of production (*cost channel*)
 - ⇒ Industry-level analysis of excess stock returns:
 - Oil-intensive sectors did at best only marginally better
Petroleum & gas (-28%), Chemicals (-6%), Rubber & plastics (+4%)
 - Sectors sensitive to consumer demand did far better than average
Beer & liquor (+10%), Tourism (+11%), Retail sales (+14%)
- Changes in spending (*demand channel*)
 - Household consumption
 - Business investment

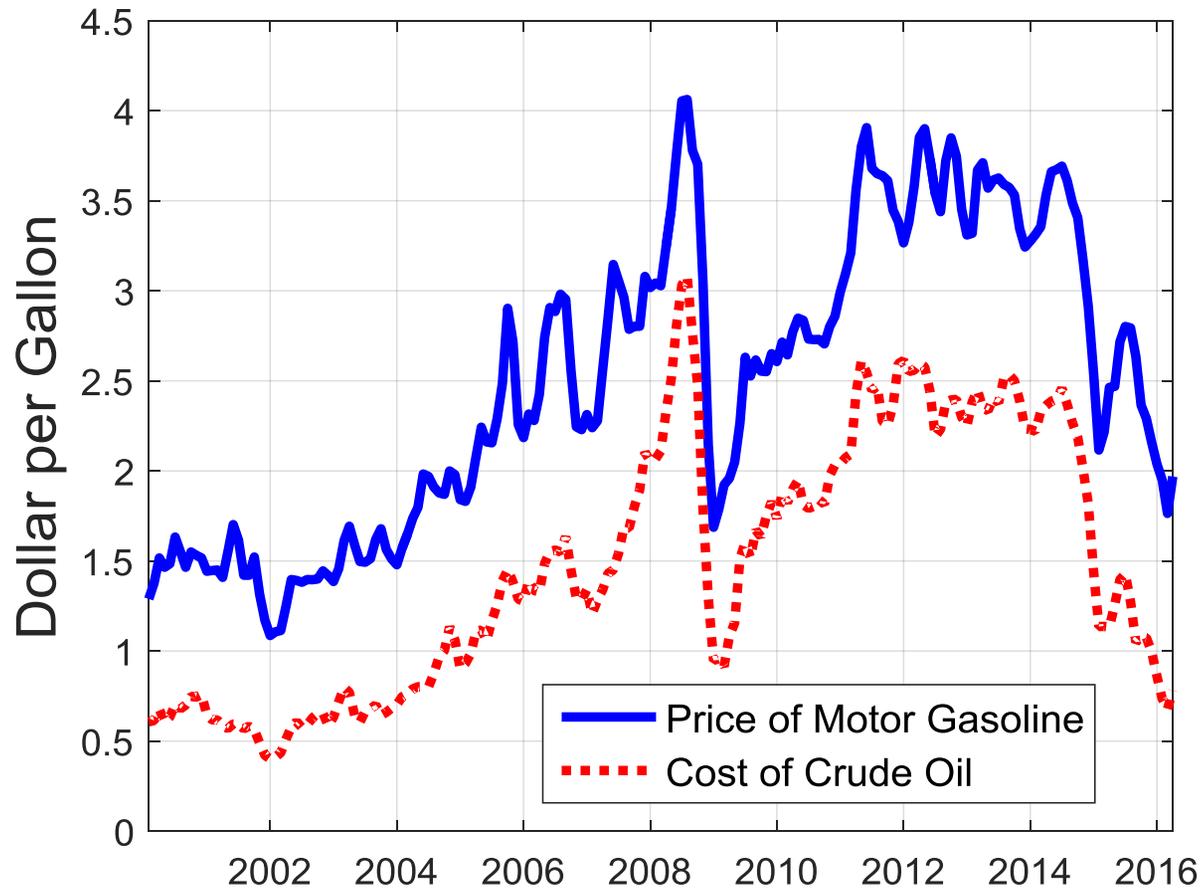
The Oil Tax (Rebate)

“... higher oil prices lower American income overall because the United States is a major oil importer and hence much of the proceeds are transferred abroad. ... Thus, an increase in the price of crude oil acts like a tax on U.S. households, and ... tends to have a dampening effect on consumer spending.” (Yellen 2011)

- ➔ Oil price shocks are terms of trade shocks.
- ➔ They cause changes in discretionary spending which affect real GDP through a Keynesian multiplier.
- ➔ The same process works in reverse when the price of oil drops, resulting in an oil tax rebate.

How Much Consumption Stimulus?

U.S. Price of Gasoline and Cost of Crude Oil per Gallon, 2000.1-2016.3



⇒ Oil price decline fully passed through to retail gasoline prices

How Much Consumption Stimulus?

- PP_t = percent change in the real gasoline price (weighted by the share of gasoline in total consumer expenditures)

Δc_t = growth rate of consumption

- Regression model:

$$\Delta c_t = \alpha + \sum_{i=1}^6 \beta_i \Delta c_{t-i} + \sum_{i=0}^6 \gamma_i PP_{t-i} + u_t$$

- Sensitivity analysis:

PP_t measure may be refined by allowing for changes in the U.S. dependence on oil and gasoline imports

⇒ does not affect substantive conclusions

- Regression estimates:

Cumulative effect of purchasing power shocks on U.S. real private consumption since June 2014: **1.2%**

⇒ maps into *predicted* increase in spending of 2.8%

Breakdown:

1. Operating cost effect: 0.15%

Increase in purchases of new motor vehicles of 6.7% weighted by the share of 2.3% in total consumption

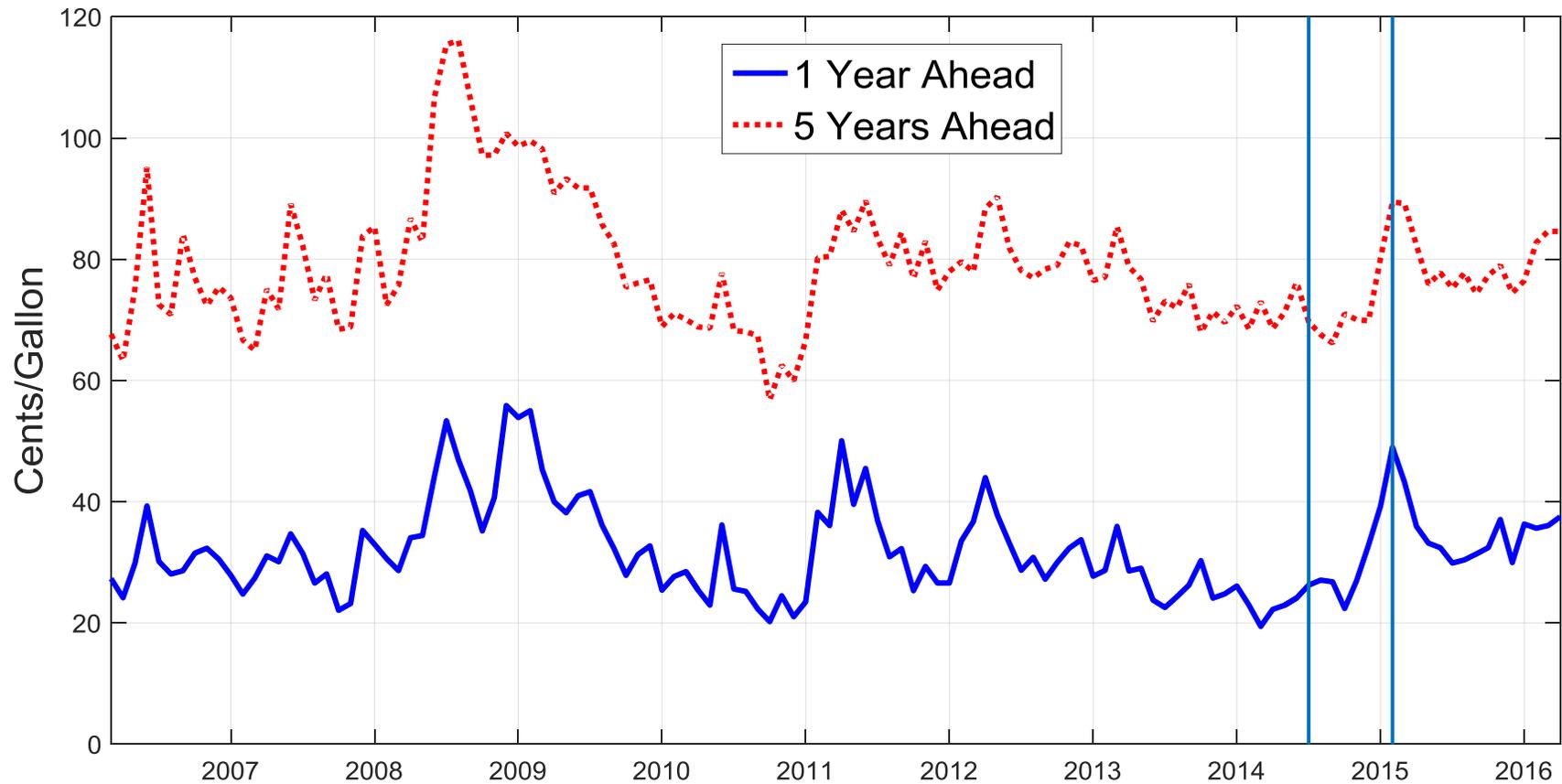
2. Discretionary income effect: 1.05%

Did Other Forces Hold Real GDP Growth Back?

- Asymmetry hypothesis:
 - Oil price increases are unambiguously bad for growth
 - Oil price decreases may have no effect since stimulus is offset by two mechanisms:
 1. *Higher uncertainty about future oil and gasoline prices*
(Bernanke 1983, Pindyck 1991, Kellogg 2014)
 2. *Costly reallocation of resources in response to relative price shocks*
(Hamilton 1988, Bresnahan and Ramey 1993)
 - a. Labor
 - b. Capital

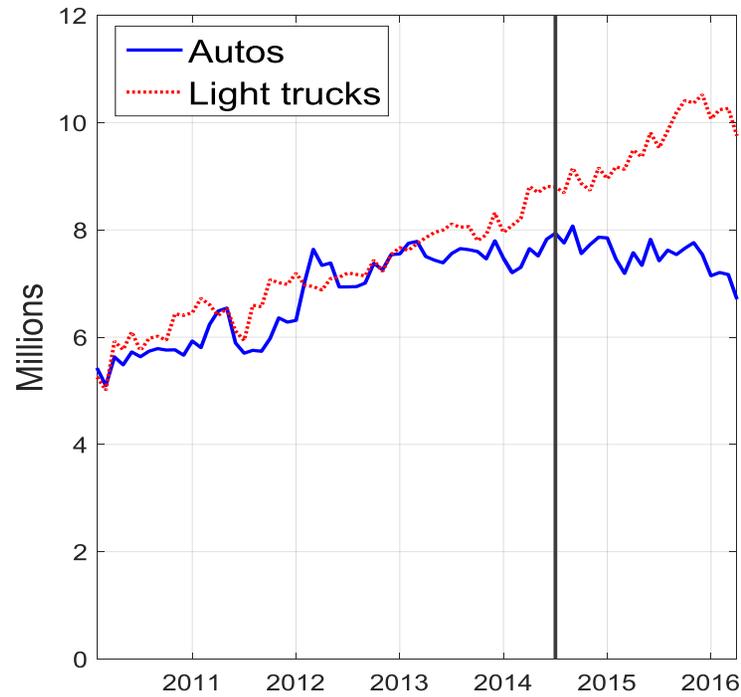
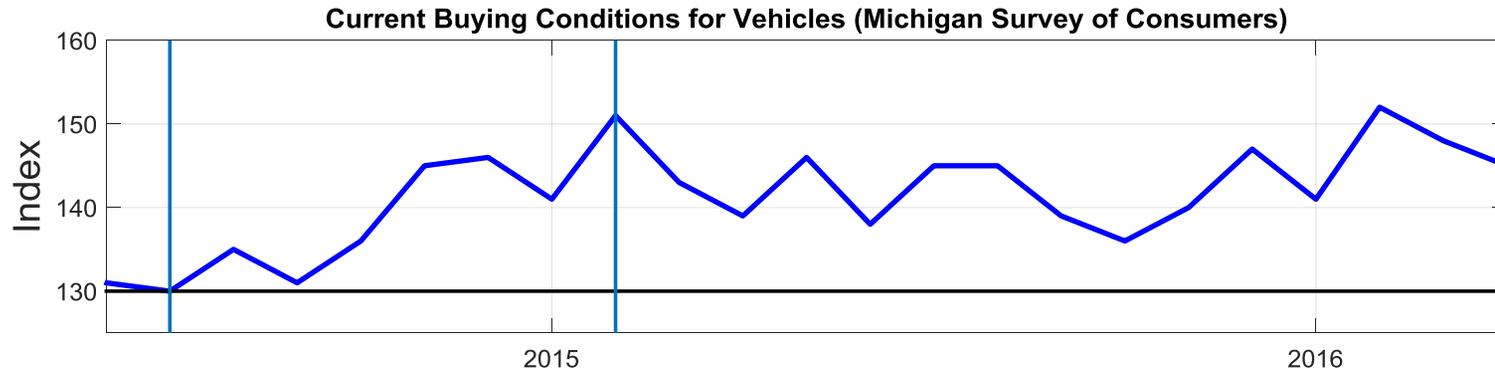
1. Did Uncertainty Slow Automobile Purchases?

U.S. Consumers' Uncertainty about the Future Price of Gasoline



NOTES: Uncertainty is measured by the standard deviation of the responses of survey participants to the question about the expected change in the price of gasoline one year and five years ahead. The vertical bars correspond to June 2014 and January 2015, when uncertainty peaked.

Buying Conditions and Vehicle Sales



⇒ No support for uncertainty hypothesis

2a. Frictions in the Reallocation of Labor?

Changes in Labor Market Indicators in U.S. Oil States, 2014.6-2016.3

	Percent Share of Mining and Logging Jobs in Employment	Unemployment Rate in Percent	Labor force
Alaska	-0.4	-0.4	-4,900
Montana	-0.5	-0.3	9,500
New Mexico	-0.9	-0.6	-1,000
North Dakota	-2.4	0.4	1,700
Oklahoma	-0.9	-0.1	82,700
Texas	-0.7	-0.8	270,600
Wyoming	-2.2	1.0	-6,000

- ⇒ These declines in the unemployment rate cannot simply be explained by migration away from oil states.
- ⇒ No evidence that frictional unemployment matters in oil states.

2b. Frictions in the Reallocation of Capital?

- Number of oil rigs down by 75% since October 2014. Petroleum railcar loads down by 30% since September 2014.
- Underutilization of capital extends to other sectors in oil states.
- How much does this underutilization of capital matter?

Percent change at annual rates	2014Q3-2015Q4
Real GDP	2.4
Excluding Oil-Producing States	2.3
Oil-Producing States	2.7

⇒ No evidence that underutilization of capital matters either.

⇒ Reallocation hypothesis not supported.

The (Non-Oil) Business Investment Stimulus

⇒

- $\Delta inv_t^{ex\ oil}$ = quarterly growth rate of real private nonresidential investment (excluding structures and equipment investment by the oil sector)
- The magnitude of this investment stimulus largely depends on the consumption stimulus.
- After averaging the PP_t measure by quarter, we estimate:

$$\Delta inv_t^{ex\ oil} = \sum_{i=1}^4 \beta_i \Delta inv_{t-1}^{ex\ oil} + \sum_{i=0}^4 \gamma_i PP_{t-i} + u_t.$$

- The estimated cumulative stimulus for $inv_t^{ex\ oil}$ between 2014Q2 and 2016Q3 is **2.2%**.

How Much Does the Shale Oil Sector Matter for Real GDP Growth?

- U.S. domestic crude oil production increased as a result of the fracking revolution since late 2008
- How different would growth have been without the oil sector?

Percent Change at Annual Rates	2014Q3-2015Q4
Real GDP (Value Added)	2.4
Excluding Mining Sector	2.4
Mining Sector	2.4

- ⇒ Direct impact is negligible
- ⇒ Other transmission channels?

Investment Spending by the Oil Sector

- Effect of lower oil-related investment on real investment growth

Percent Change at Annual Rates	2014Q3-2016Q1
Private Fixed Nonresidential Investment	1.5
Excluding Oil Investment	4.6
Oil Investment Only	-48.2

- Effect of lower oil-related investment on real GDP growth

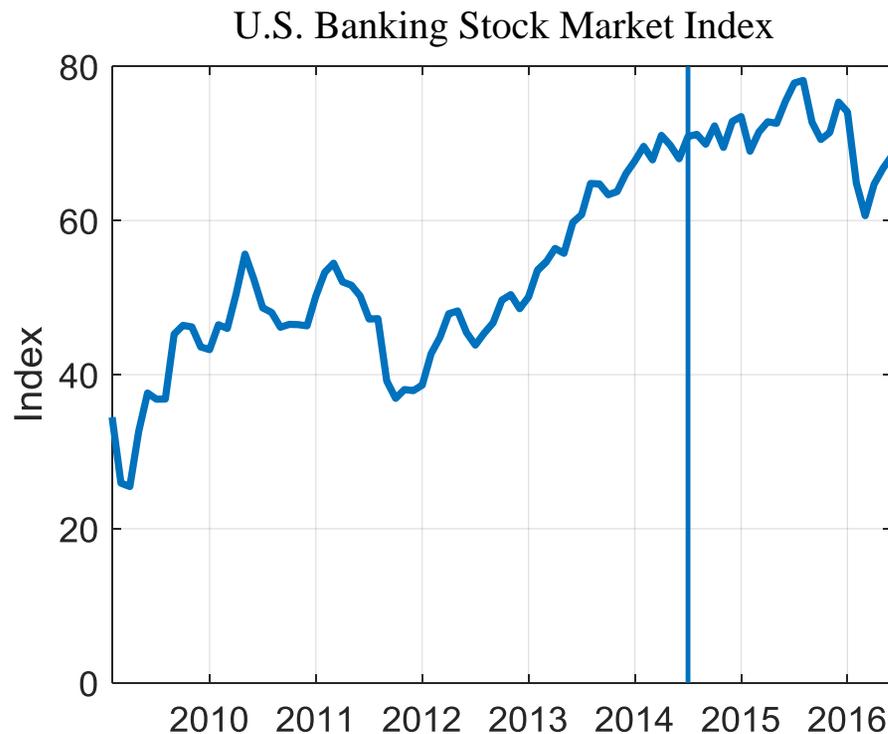
Percent Change at Annual Rates	2014Q3-2016Q1
Real GDP	2.2
Excluding Change in Oil Investment	2.6

⇒ No evidence of spillovers to investment in other sectors.

Were There Other Structural Changes?

1. Financial contagion

- Lending to shale oil producers exposed banks to oil price risks



⇒ No evidence of oil price decline causing bank stock prices to decline. Share of bad oil loans is small.

Were There Other Structural Changes?

2. Shift in consumers' behavior

- Instead of spending, consumers could use discretionary income to
 - pay off mortgage or credit card debt
 - increase savings
 - acquire financial assets

⇒ No empirical support for these hypotheses

Were There Other Structural Changes?

3. Petroleum trade balance improved as exports of refined products were growing faster than oil imports (contrary to the traditional pattern)

Percent Change at Annual Rates	2014Q3-2016Q1
Real GDP	2.19
Excluding the Change in the Petroleum Trade Balance	2.16

⇒ There is evidence of a structural change associated with the shale oil boom, but the quantitative effect is small.

Net Stimulus from Unexpectedly Low Oil Prices

Effect on Real GDP of	Percent of Cumulative Real GDP Growth 2014Q3-2016Q1
Effect on Private Consumption...	0.70
Non-Oil-Related Business Investment	0.22
Oil-Related Private Nonresidential Investment	-0.57
Petroleum Trade Balance	0.04
Net Stimulus	0.39

Is This Time Different From 1986?

Overall, more similarities than differences

- U.S. real GDP growth relative to trend is similar
- Pattern of consumption and investment responses is similar

Differences:

- Recent oil price decline twice as large as in 1986
- Composition of investment
 - Now: stronger contraction of oil-related investment
 - 1986: both oil and non-oil investment declined
- Recent oil price decline reflected in part a global economic slowdown which also slowed growth of U.S. real exports

Net Stimulus from Unexpectedly Low Oil Prices

Effect on Real GDP of	Percent of Cumulative Real GDP Growth	
	2014Q3- 2016Q1	1986Q1- 1987Q3
Discretionary Income Effect on Private Consumption	0.61	0.28
Operating Cost Effect on Private Consumption	0.09	0.08
Non-Oil-Related Private Nonresidential Investment	0.22	0.11
Oil Related Private Nonresidential Investment	-0.57	-0.43
Petroleum Trade Balance	0.04	-0.41
Net Stimulus	0.39	-0.37

Conclusions

- It is widely documented that oil price shocks have at best **modest effects** on the economy. This episode is no exception.
- Conventional linear models of the transmission of oil price shocks go a long way in explaining the evidence for 2014-16.
- Oil investment depends on whether the real price of oil is expected to fall below the **breakeven price**.
- Standard models of the transmission of oil price shocks to the U.S. economy may have to be adapted to account for this **nonlinear behavior between the real price of oil and oil investment**.