



# A Slower Global Economy with a Recession Watch in 2019

## Implications for the Semiconductor Outlook

Surface Preparation and Cleaning Conference (SPCC)  
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*\*A global outlook based on Consensus Economics, Inc.  
CONSENSUS FORECASTS®*



# Outline

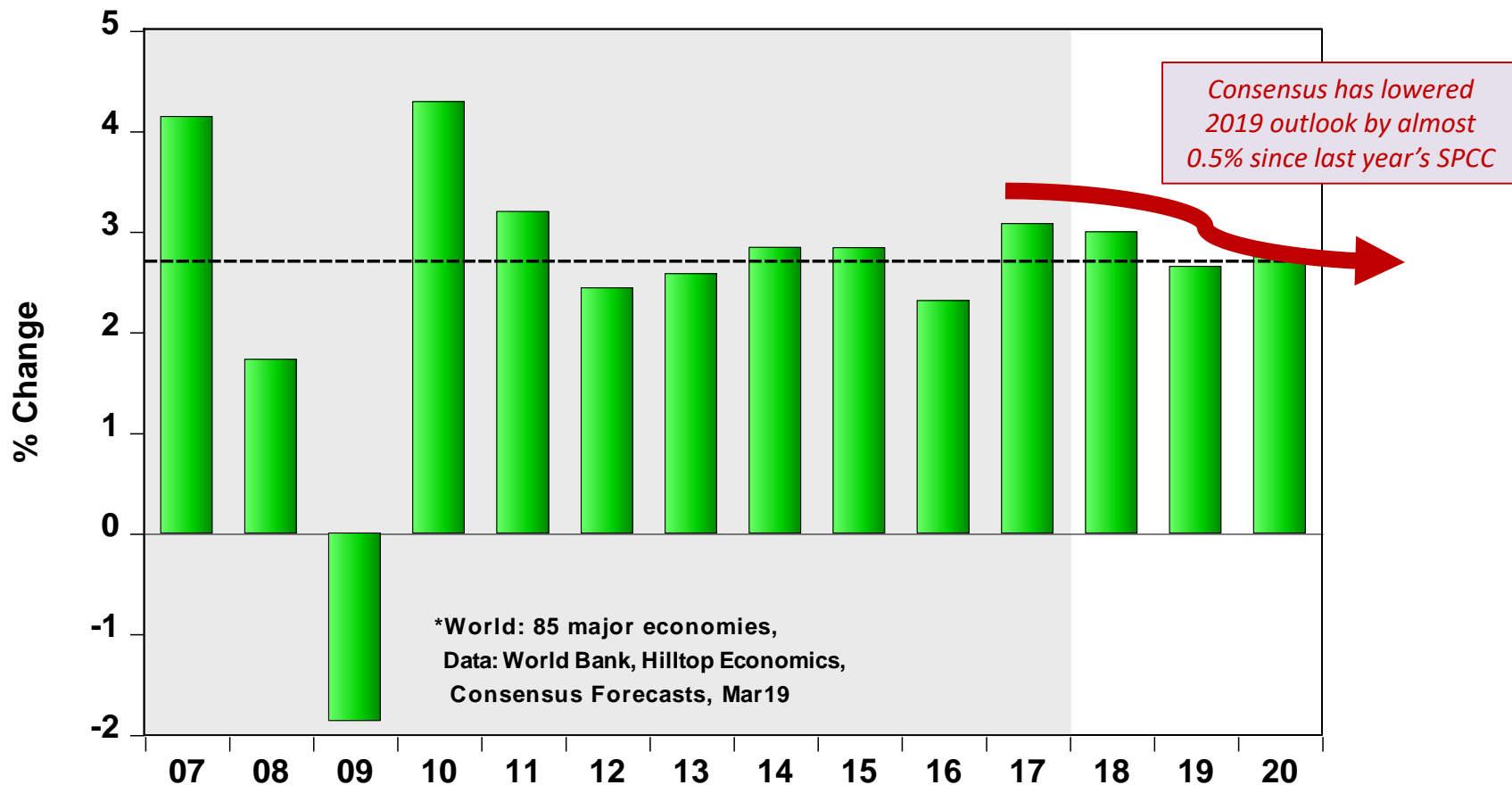
- **Forecast with key themes:**
  - Slower growth forecast from the Consensus
  - Higher uncertainty
  - Rising risk of recession
- **Recession Risk Dashboard**
- **Semiconductors:**
  - Near term risk
  - Long term strength

# Summary Overview: 2019-2020

- **Now in the *mature phase of the business cycle with decelerating growth and a rising risk of recession***
  - Healthy but more cautious consumer
  - Investment moderating despite need
  - Low inflation, diverging interest rates, currency unsettled
  - Higher economic policy uncertainty:
    - Domestic fiscal and monetary policy (China, US, EU, Japan)
    - Trade
    - Geopolitics
- **Less-healthy backdrop for semiconductor industry**

# Consensus: Growth Weakens to Trend in 2019-20

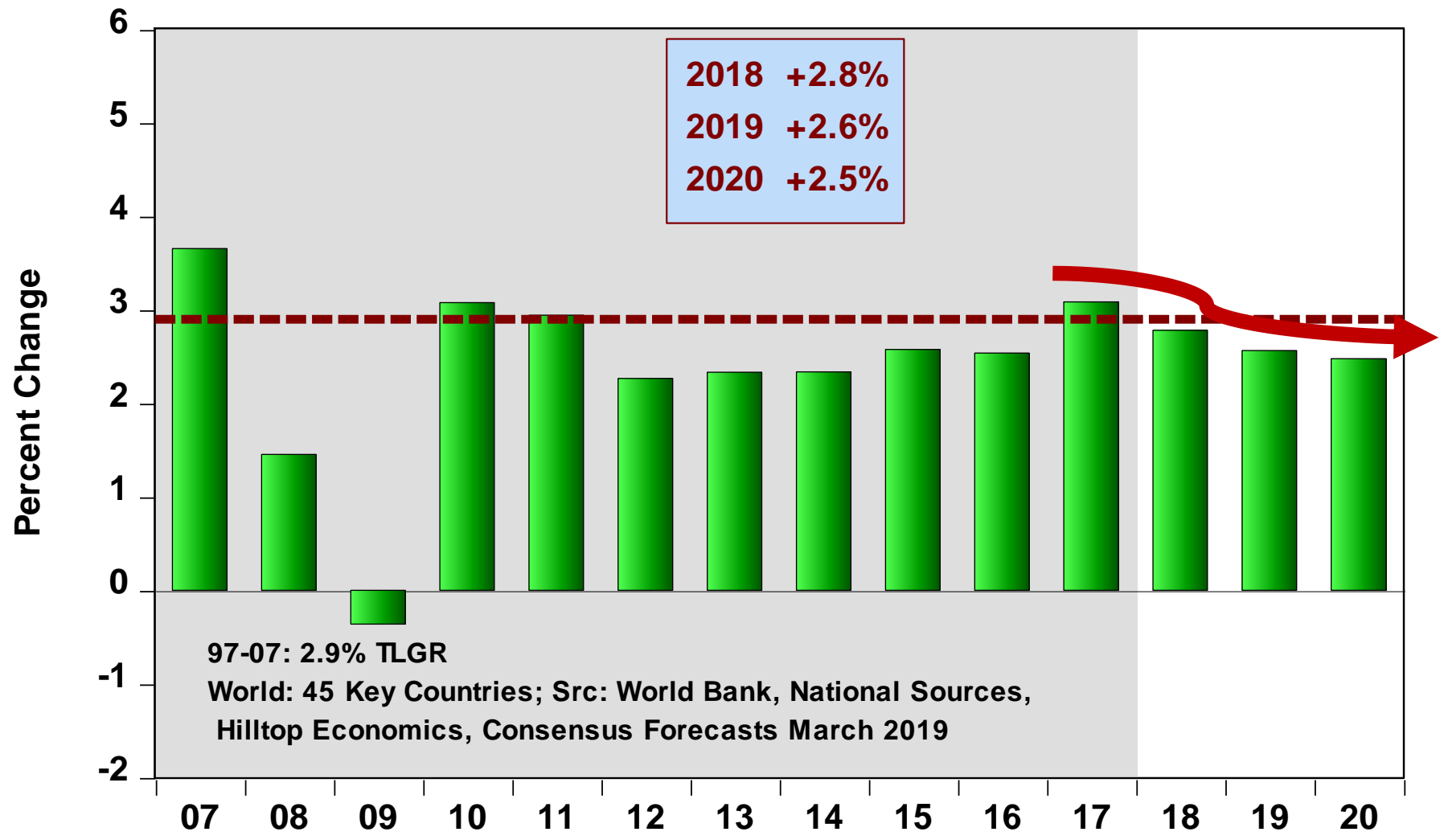
**World\* Real GDP Growth**  
**2018: 3.0% 2019: 2.7% 2020: 2.7%**



# Global Consumer Healthy

- Unemployment rates are low – below equilibrium
- Wages are stable to rising
- Inflation is low – at or below policy maker targets
- Oil prices are not a big problem
- Consumer debt is under control
- Confidence has slipped off the peaks of 2018

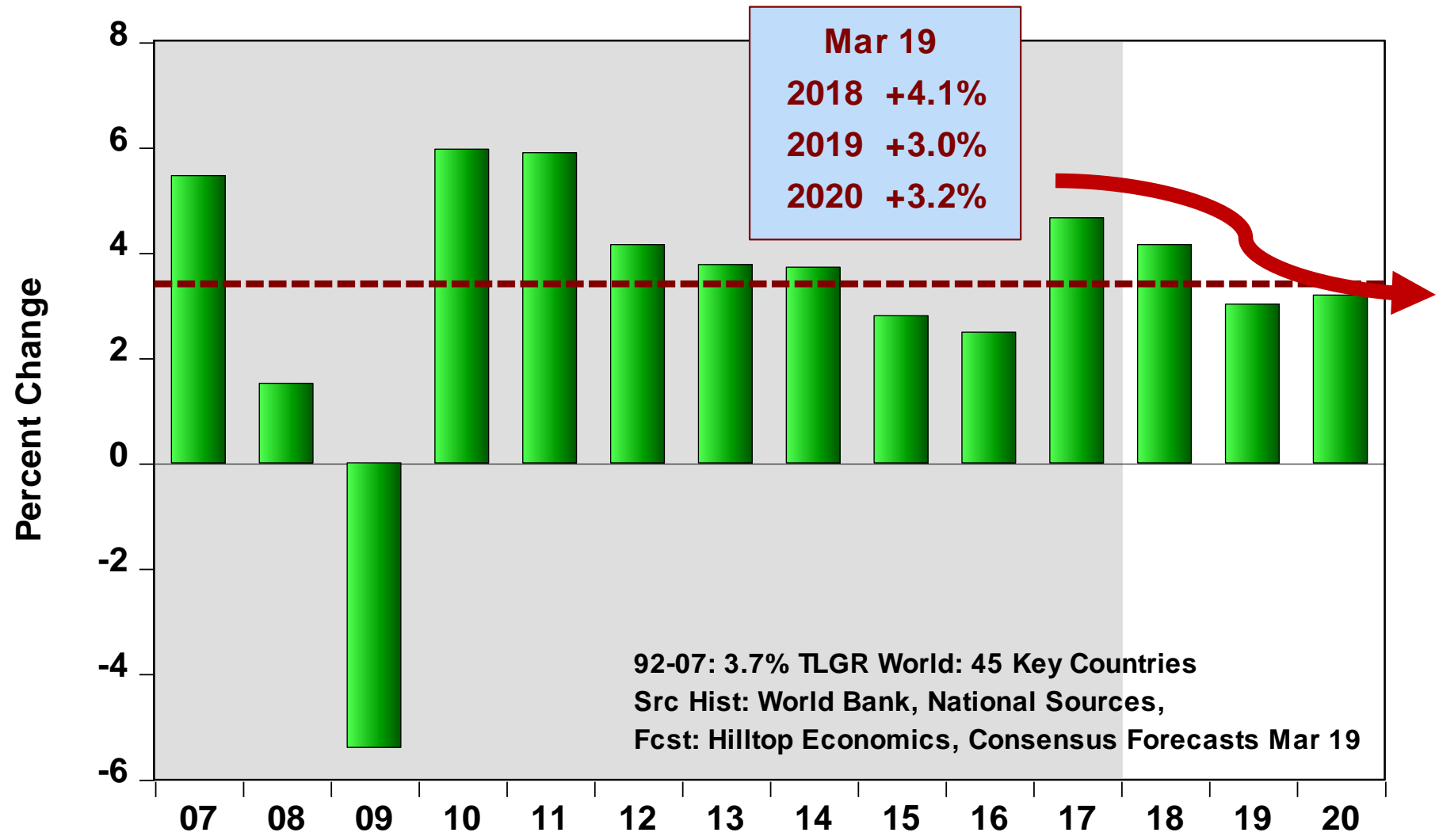
# World\* Real Consumption



## Investment Should Be Growing at this Point: Needed to Drive Cycle Higher

- **The largest developed economies are growing ABOVE their potential rate of growth (i.e. above capacity)**
  - Investment typically grows more rapidly when potential is reached
- **Revenue growth OK**
  - Real GDP growth (volume) now at 2.7%
  - Some inflation (price) on average from ~1% - 2%
  - “Revenue” now ~4 ½ %
- **Interest rates generally remain low**
- **Modest cost pressures in most regions**
- **Profitability still positive**

# World\* Real Investment





## Investment Should Be Growing at this Point: But Forecast to SLOW – What’s the Problem?

- ***Risk aversion*** is the problem again
- ***Economic policy uncertainty*** volatile and high on a global level
  - Trade wars (shifting international institutional arrangement)
  - US (post-stimulus fiscal policy, post-govt shutdown, monetary policy, immigration)
  - Europe (Brexit, Italy, France, EU-wide e.g. immigration)
  - China stimulus impact, international situations
  - Japan tax increases
  - ***Geopolitical concerns***
- ***Forecasts on a downward trajectory***
- ***Interest rates reflecting the uncertainty***

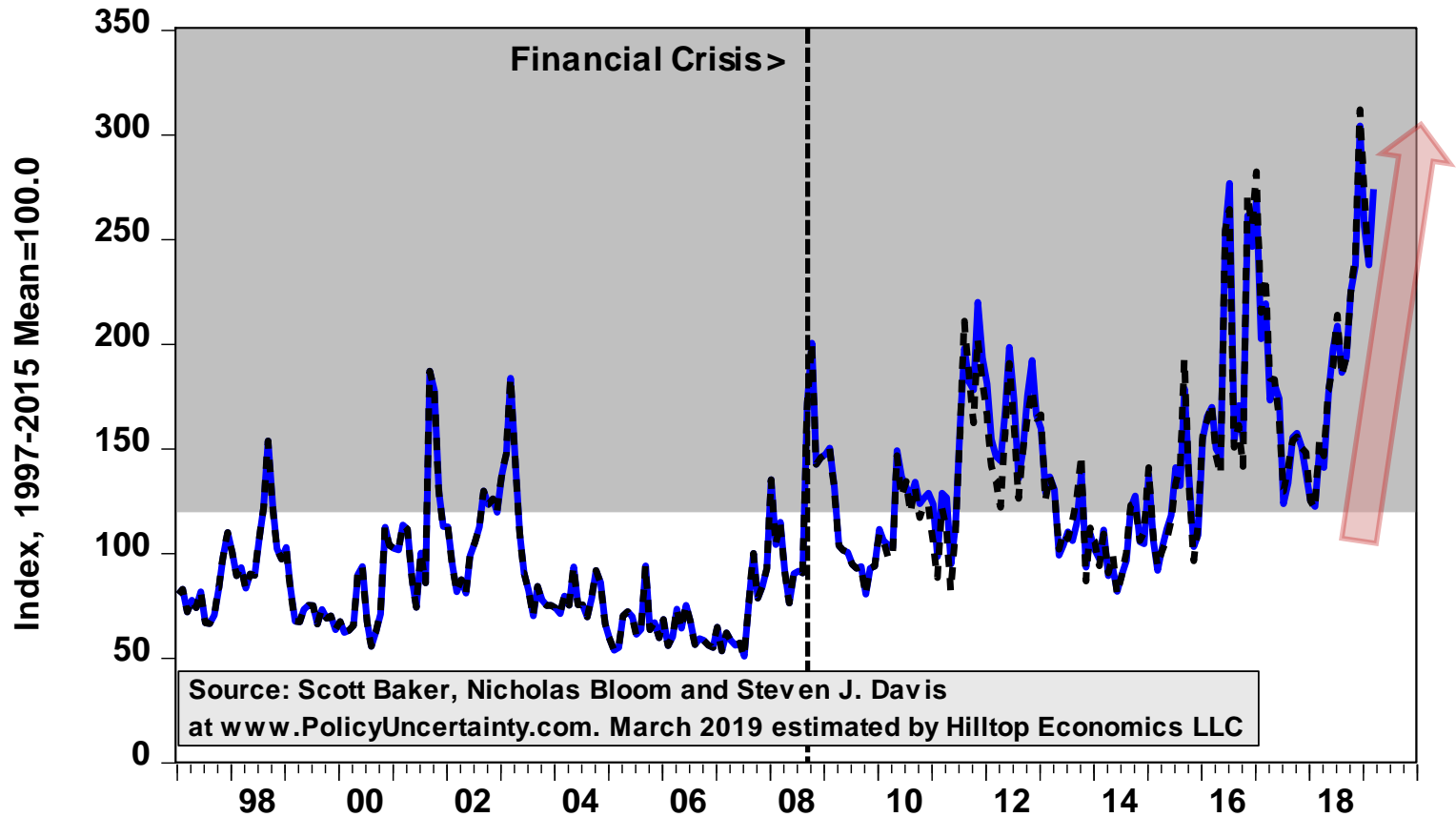
# Recession Watch Dashboard: Cautious (Yellow)

- Output momentum (Real GDP, Investment, Ind. Production)
- Employment momentum (Unemployment rates)
- Consumer confidence measures (US & majors)
- Equities (recovered & but still a bit volatile)
- Profits & Small Business Earnings (strong, but off peak)
- Oil Prices & Inflation (pressure eased)
- Global Economic Policy Uncertainty (Very high)
- World Consensus Forecast (weaker each month since April)
- U.S. Yield Curve (close to inverting)
- Interest Differentials (US vs EU rising)

*Recession watch: leading indicators that may help identify turning points that precede a downturn in the next 18 to 24 months*

# Uncertainty Peaked at Crisis Levels in January 2019

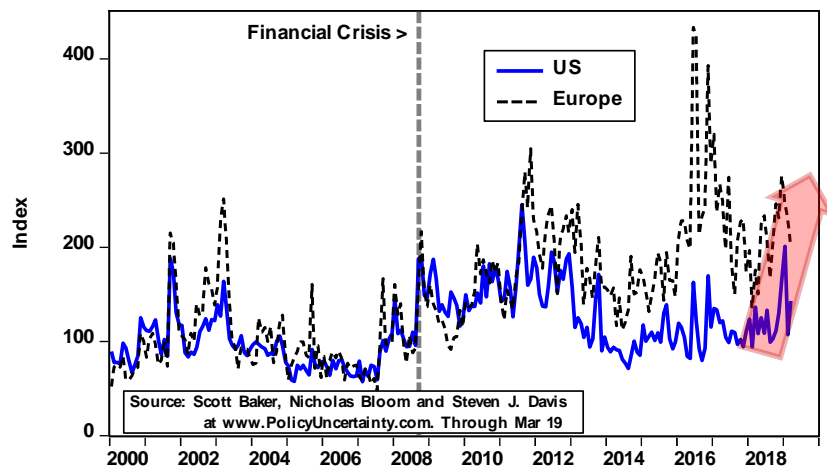
## Global Economic Policy Uncertainty



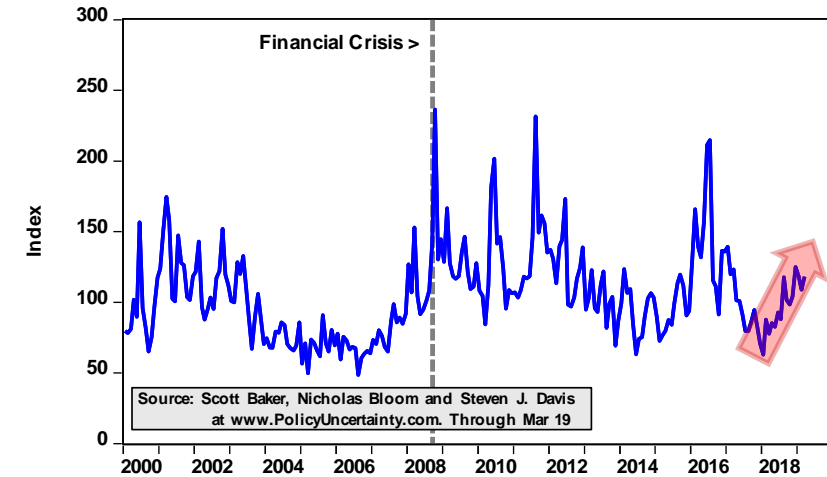
*Uncertainty over future economic policy skyrocketed back to levels high enough- in the grey zone on the graph- to dampen investment by the middle of 2018.*

# Uncertainty UP Everywhere (Even U.S.)

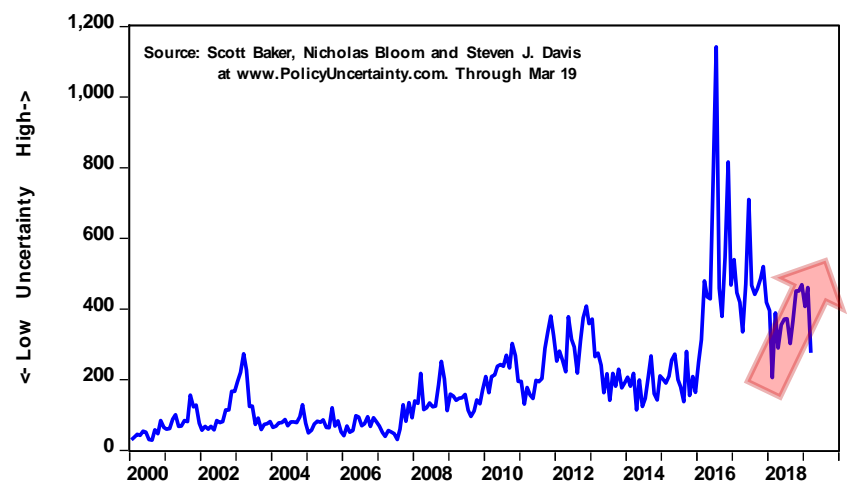
### Economic Policy Uncertainty: U.S. & Europe



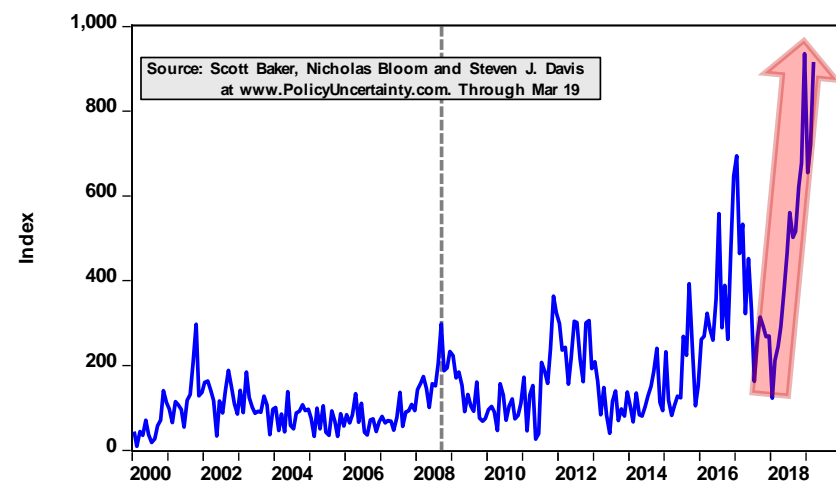
### Economic Policy Uncertainty: Japan



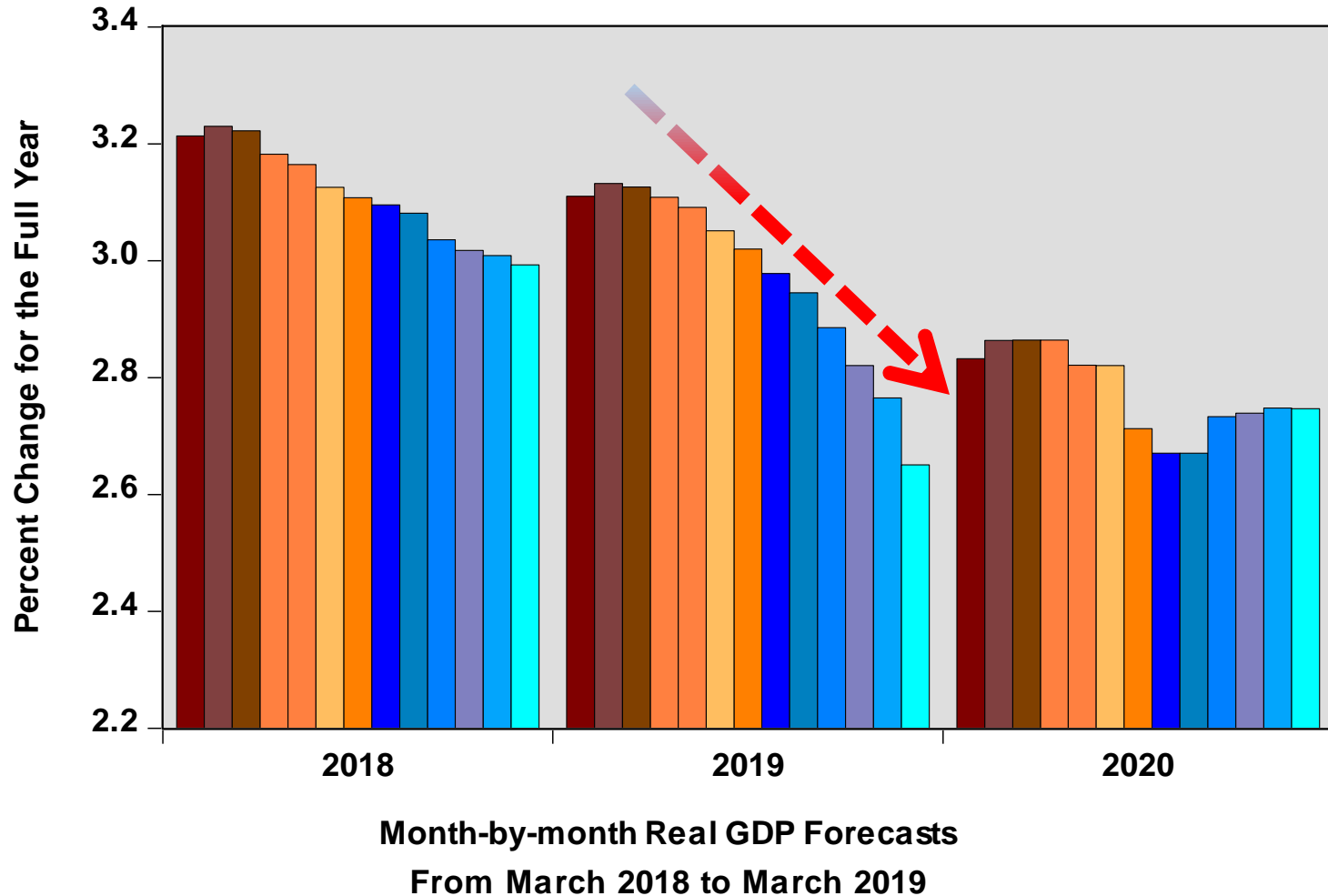
### UK Economic Policy Uncertainty



### Economic Policy Uncertainty: China

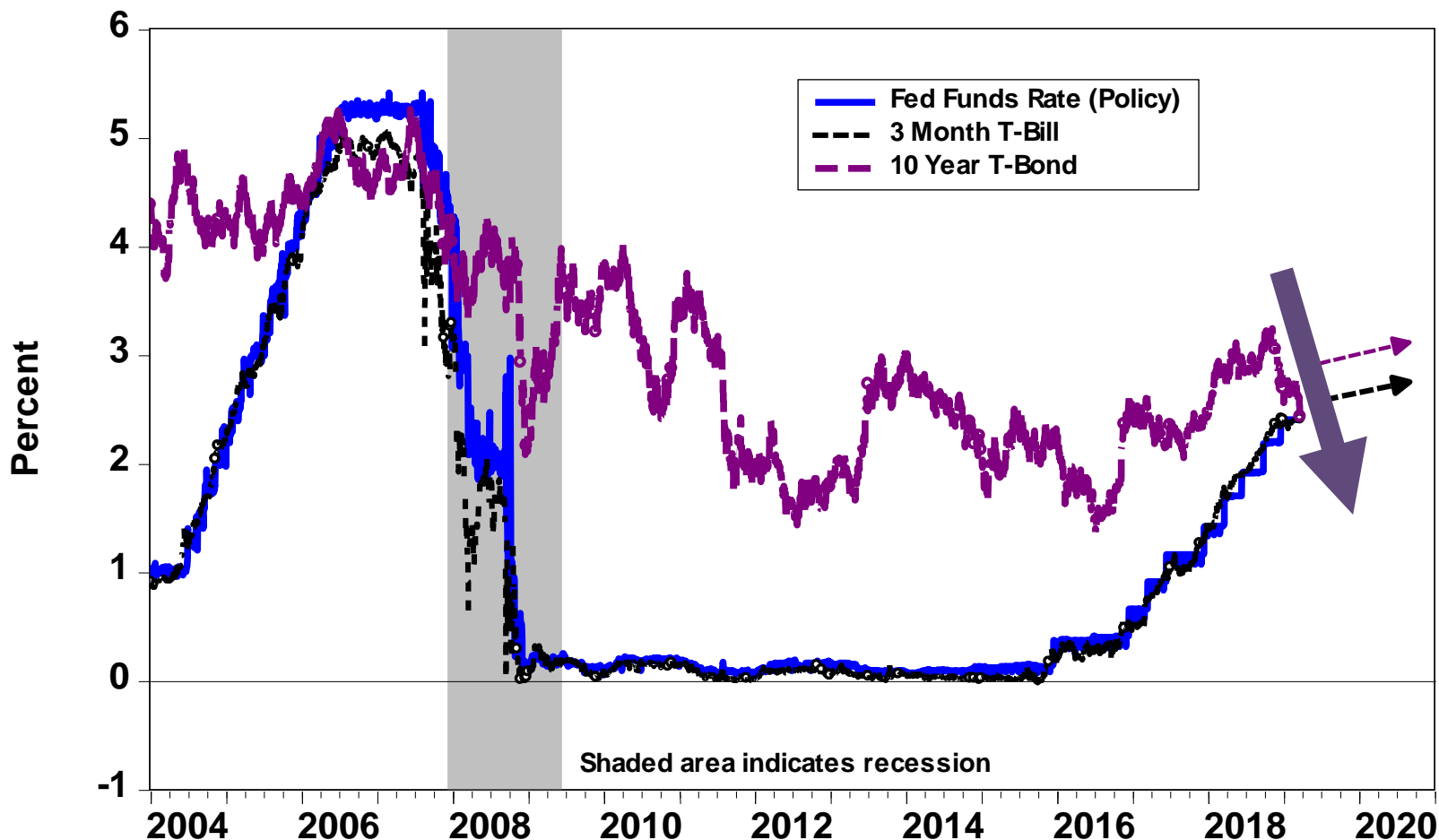


# Global Real GDP Forecasts for 2019 Lowered Eleven Months in a Row



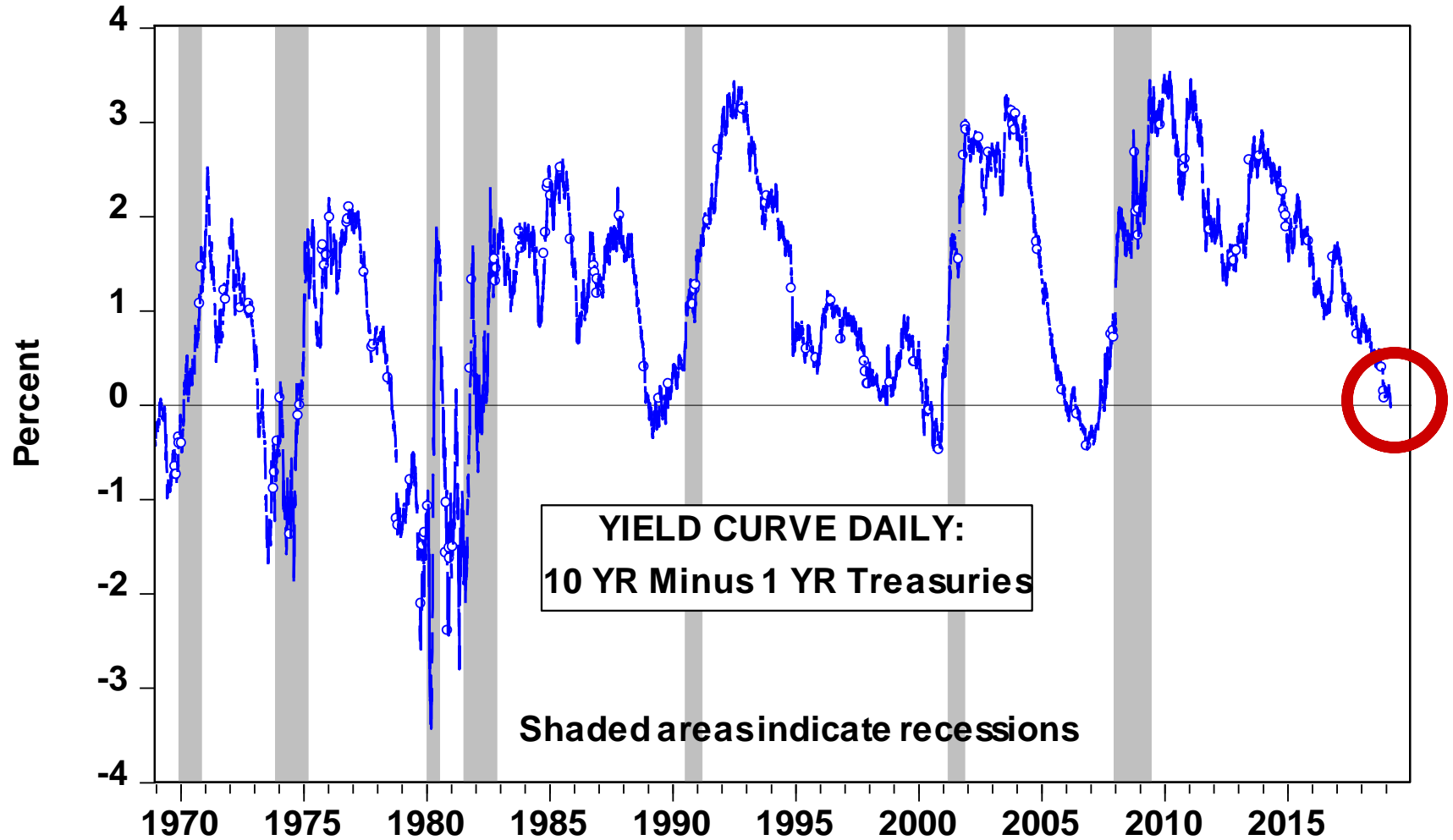
# Yield Curve on Verge of Signaling Recession

*Uncertainty & fear of recession driving U.S. longer-term rates lower;  
Consensus (the arrows) too optimistic as of the end of March*



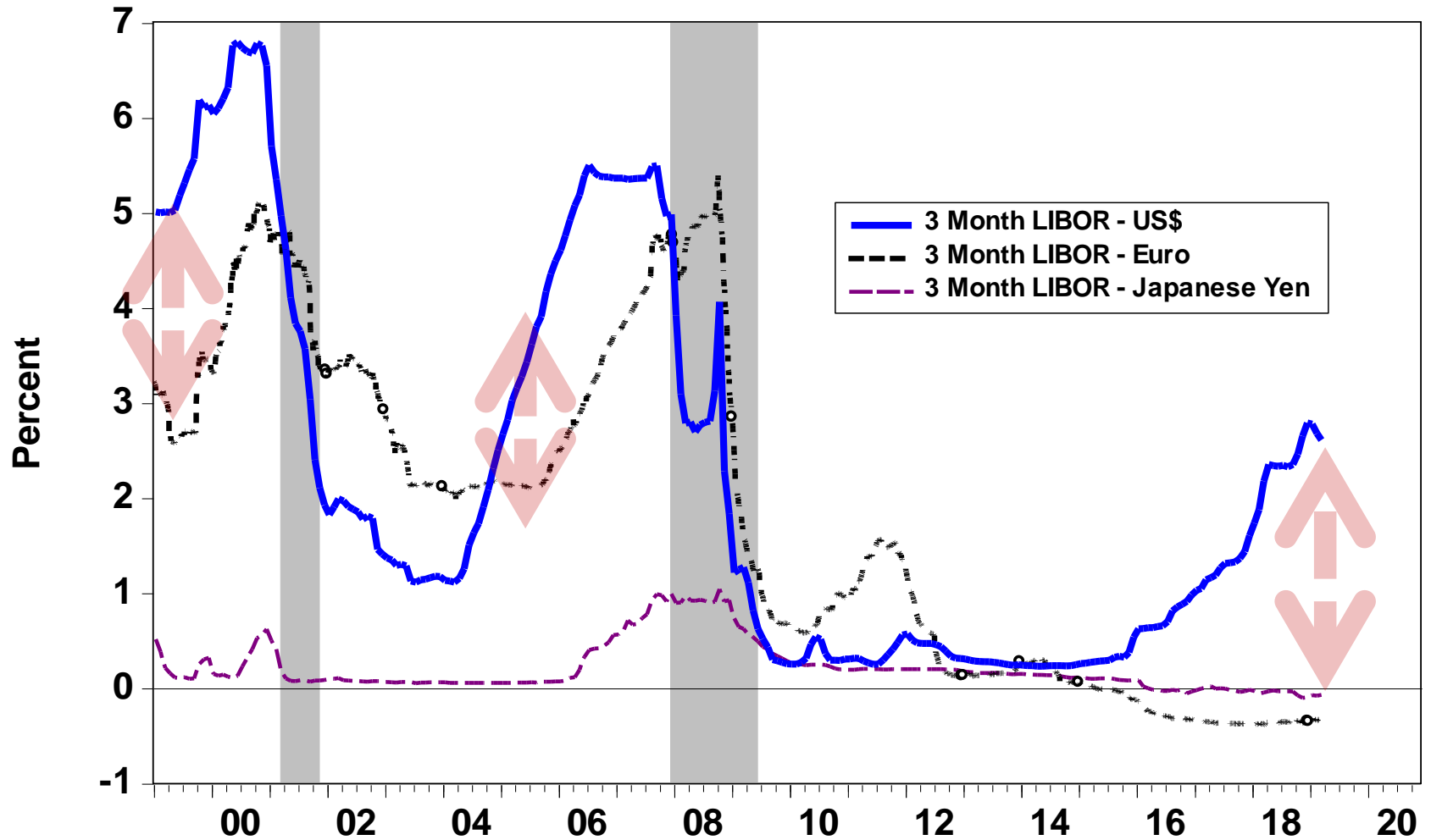
# U.S. Yield Curve Foreshadows Recession

Seven (*eight?*) inversions, seven recessions in the past 50 years



# Different International Interest Rate Trends

*A risk to financial flows, currencies, and a contributor to uncertainty*

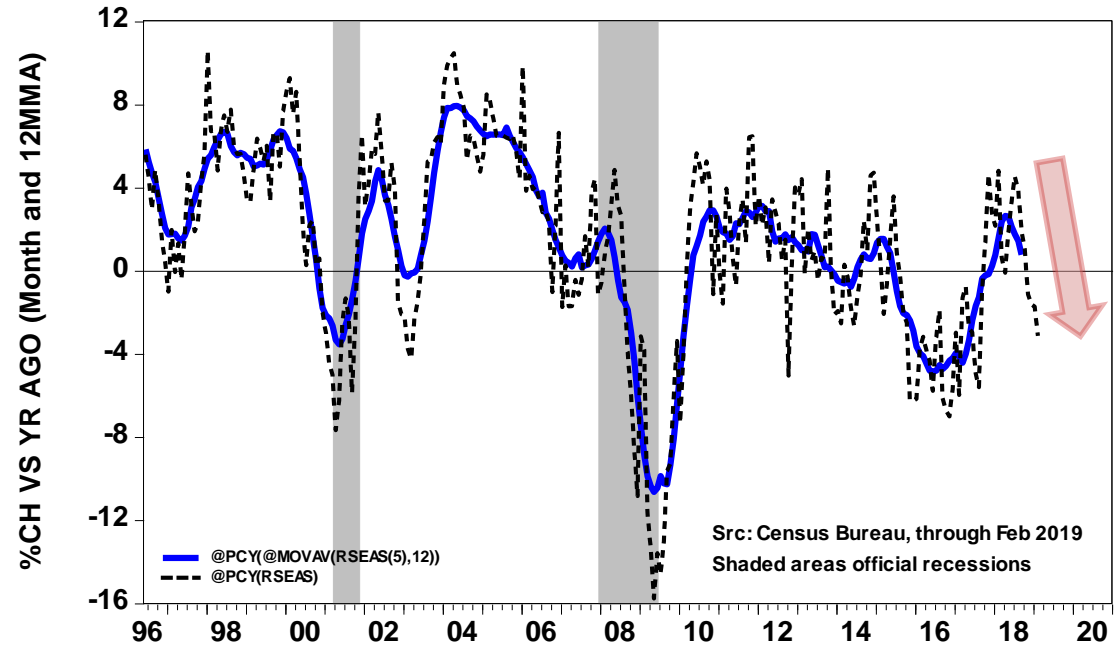




# Summary of Semiconductor Driving Forces in 2019

- Demand drivers from the economic outlook weakening
  - Slower investment growth weakens growth in:
    - Servers
    - PCs
    - Industrial applications
  - Moderating consumer growth dampens growth in:
    - Mobile phones
    - PCs
    - Autos
  - Evidence of inventory builds
  - Falling prices for key products & recently expanded capacity
  - Evidence of slowing trade, declining revenue
- **RESULT: Moderate decline in MSI in 2019**
- **LONG-RUN STAYS VERY HEALTHY: AI/5G/ML and continued expansion of the digitalization of the economy**

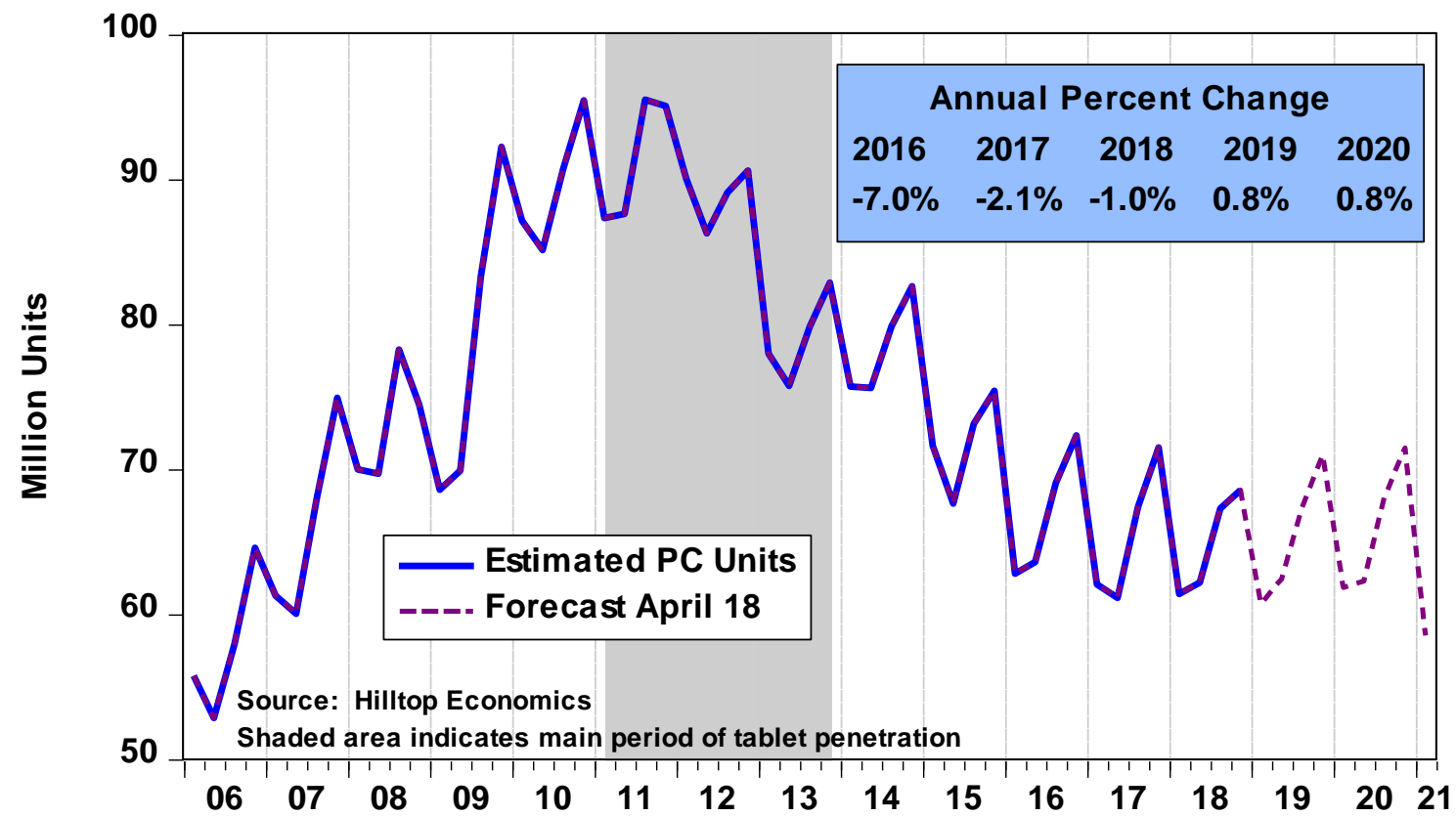
# U.S. Consumer Spending on Tech Goods Weakening



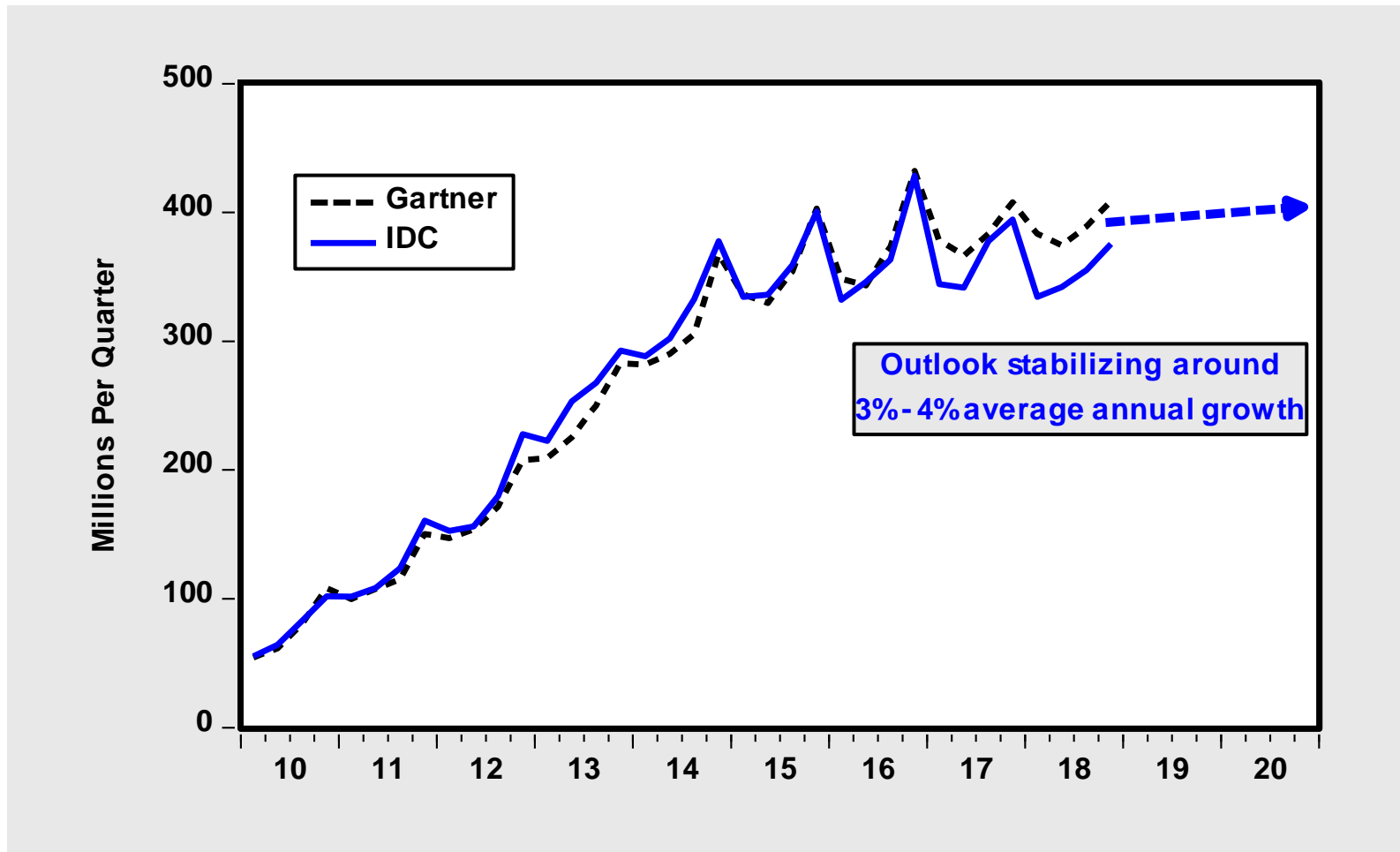
U.S. Consumer Spending on Technology									
	Jun 18	Jul 18	Aug 18	Sep 18	Oct 18	Nov 18	Dec 18	Jan 19	Feb 19
PCE (year % ch.)	5.1	5.4	5.4	4.7	4.9	4.7	3.8	3.7	--
PCE Technology Goods (year % ch.)	5.8	6.6	6.6	6.6	5.6	4.2	1.0	2.6	--
Information Processing Equip (year % ch.)	6.5	7.3	7.5	7.6	6.6	5.3	1.4	3.6	--
PCs and Peripherals (year % ch.)	6.9	7.6	7.9	8.1	7.2	6.0	1.8	4.3	--
Software and Accessories (year % ch.)	6.3	7.0	7.1	7.2	6.2	4.7	1.2	3.0	--
Calculators, etc. (year % ch.)	5.2	6.6	7.3	6.5	5.5	5.8	2.0	4.8	--
Telephone and Fax Equip (year % ch.)	3.6	4.7	4.0	3.5	2.4	0.6	(0.6)	(1.0)	--
Retail Sales: Electronics & Appliance Stores (year % ch.)	3.3	4.5	3.9	1.9	1.0	(1.2)	(1.6)	(1.7)	(3.1)

# Stable PC Outlook, Minimal Growth

## Estimated Global PC Sales

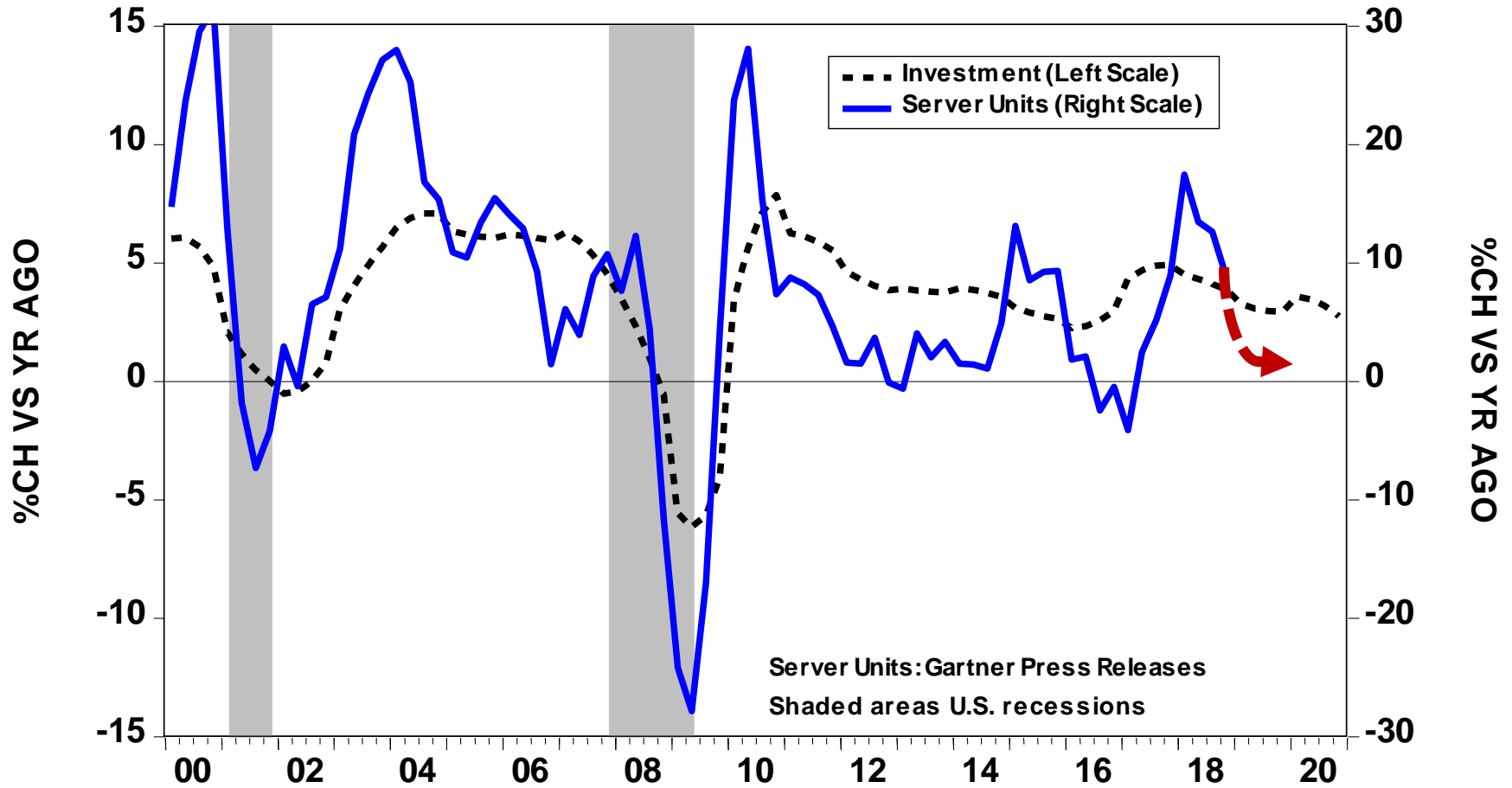


# Global Smartphones Grow Slowly



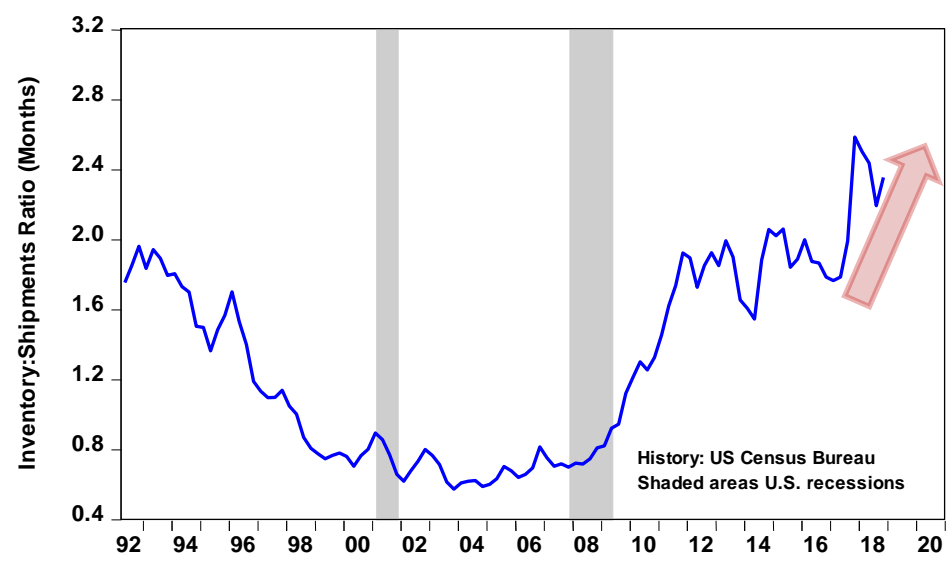
# Servers

**Likely heading to low single-digit unit growth temporarily with the slipping in investment growth – 5G, AI, ML will sustain growth after 2020**

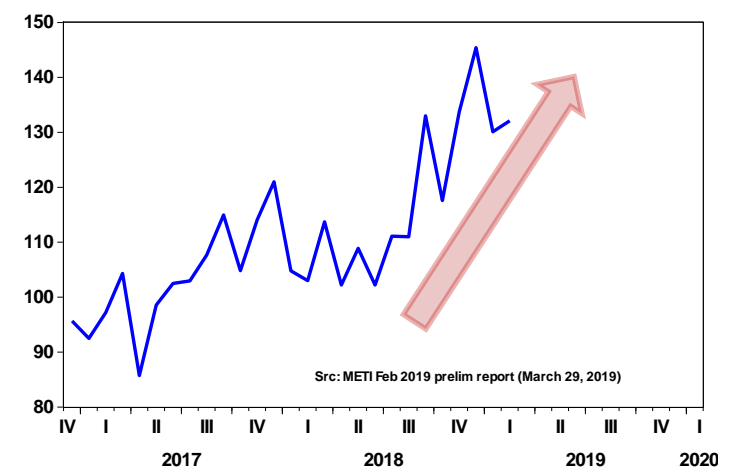


# Hints of Inventory Building (Upstream and Downstream)

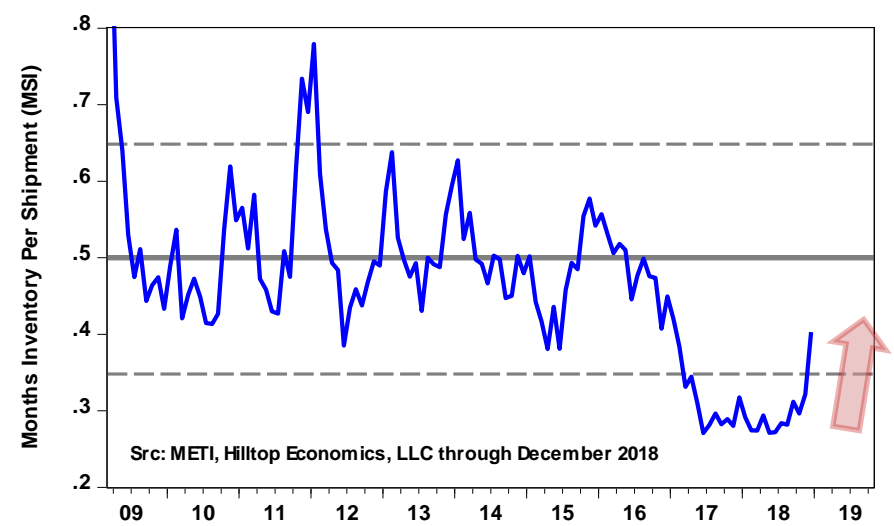
US Computers & Peripheral Devices



Information and Communications Electronics Equipment  
Inventory-Shipments Ratio (Indexed)

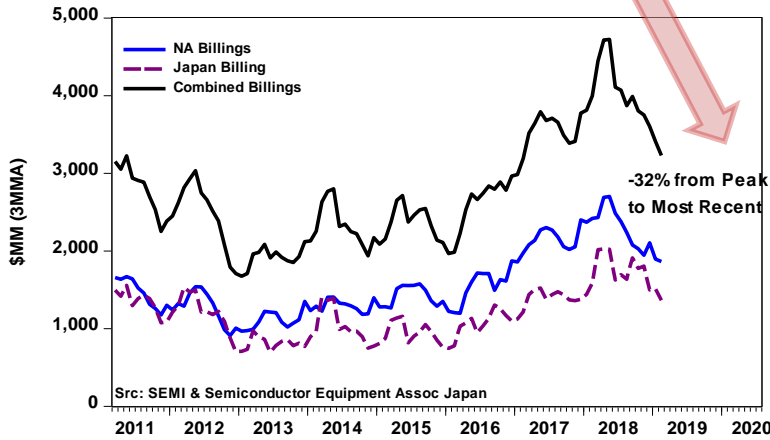


Japan (METI) Wafer Data  
Inventories Divided by Shipments

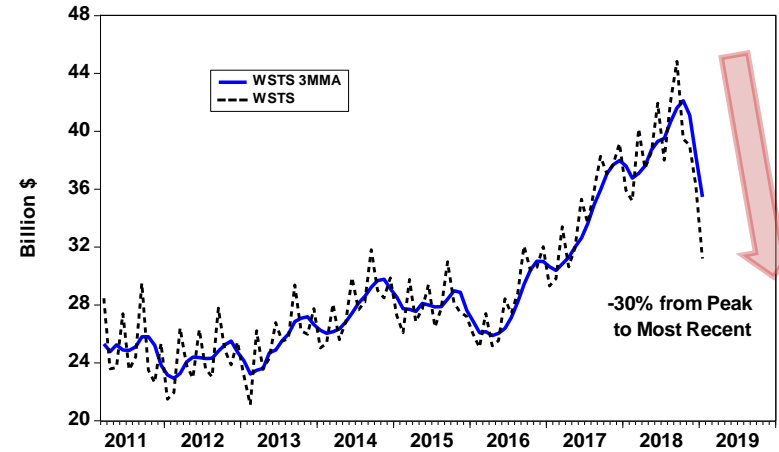


# Lots of Semiconductor Measures Turning Down

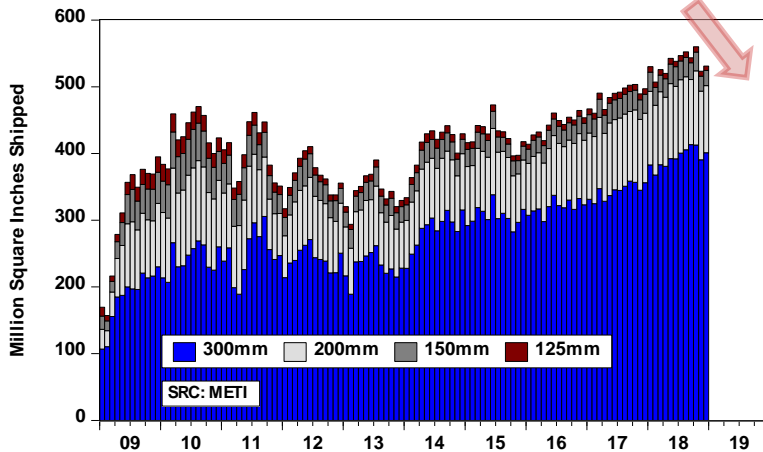
Semiconductor Equipment Billing  
North American & Japanese Manufacturers



WSTS Revenue



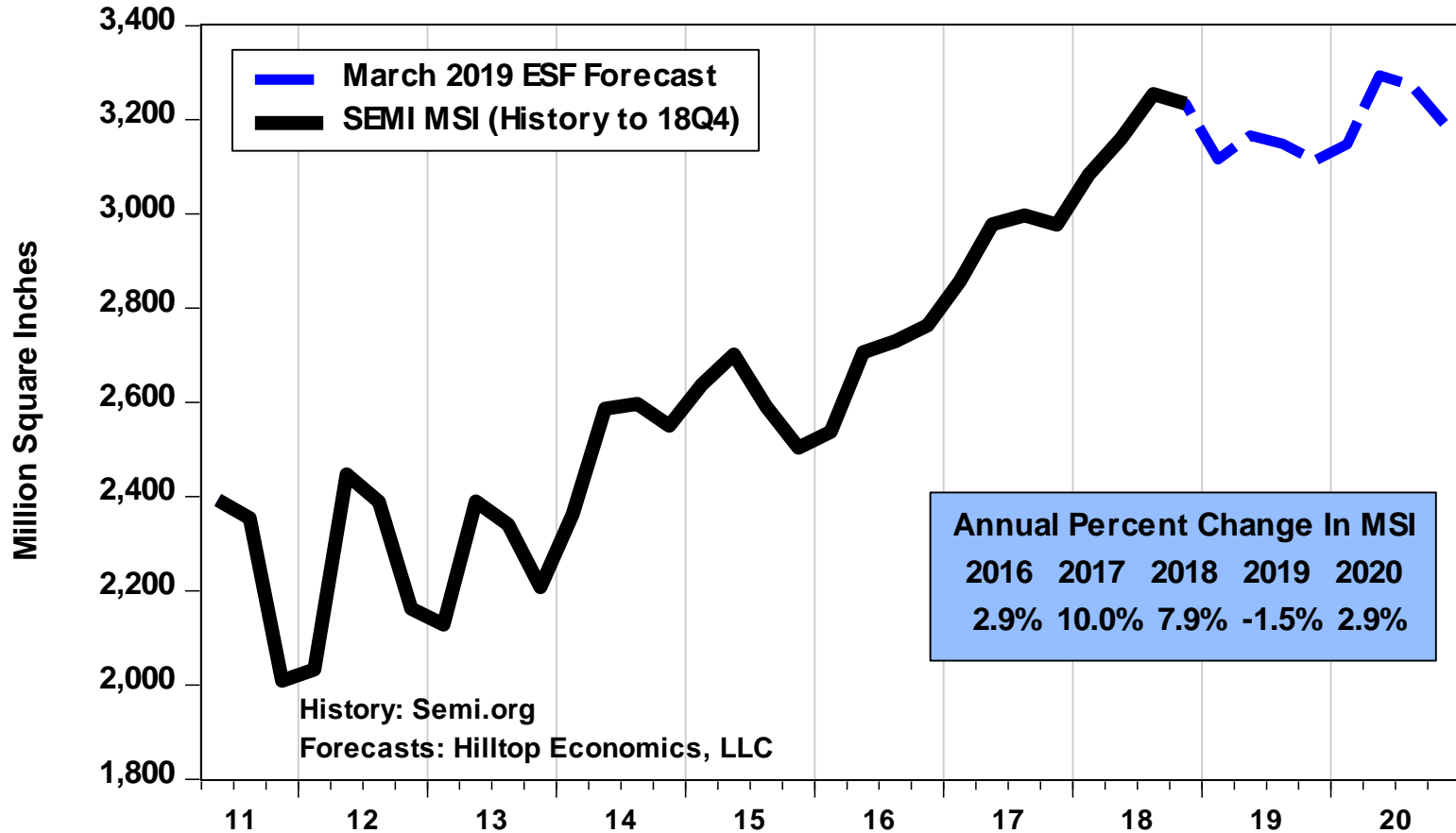
Wafers From Japanese Manufacturers



As a reminder, South Korea releases its trade data earlier than most other major economies and is a key link in the global supply chain, making it a bellwether for trade.

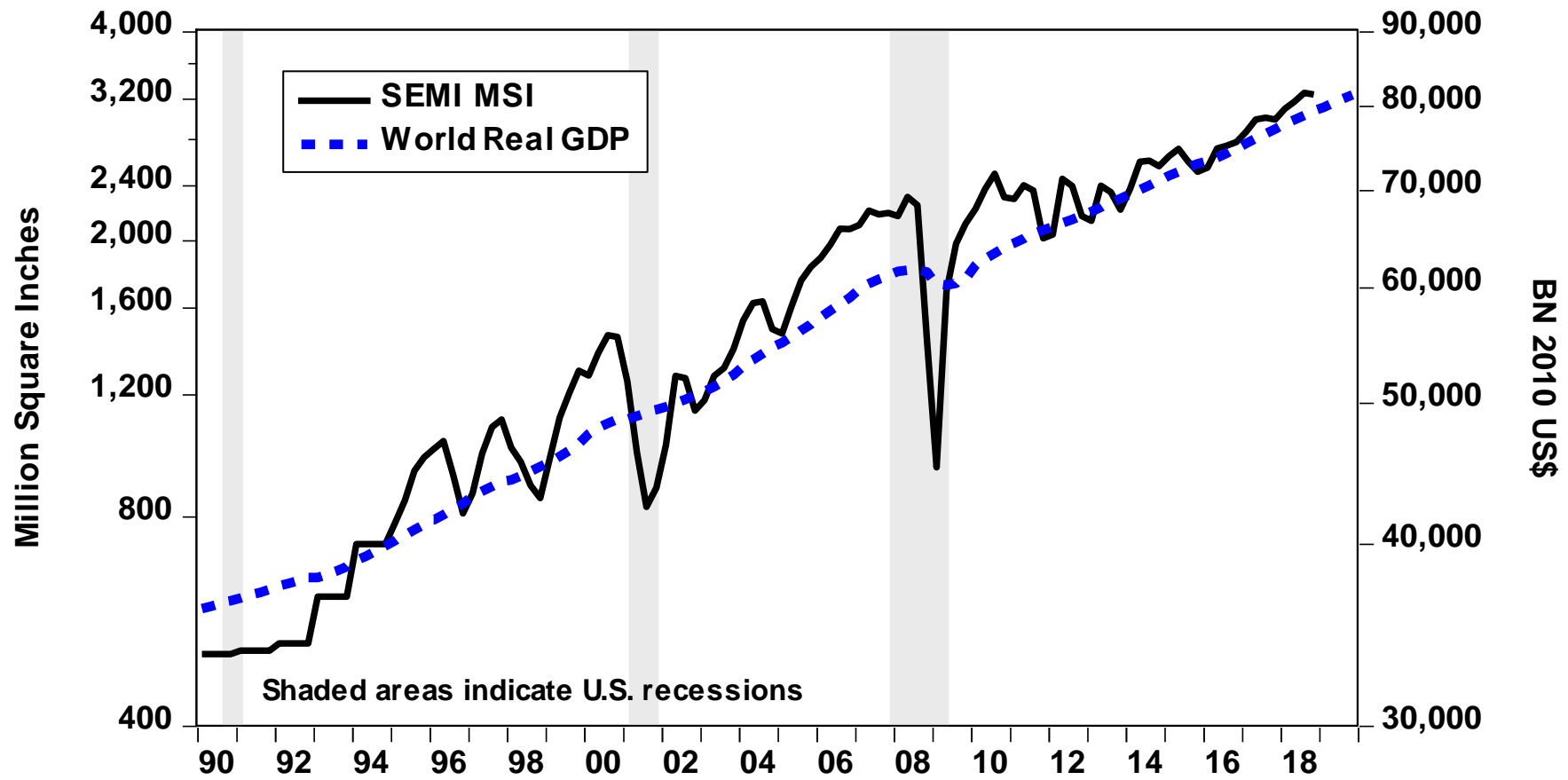
# Weaker Final Demand Pulls MSI Down in 2019

## Semiconductor MSI Outlook

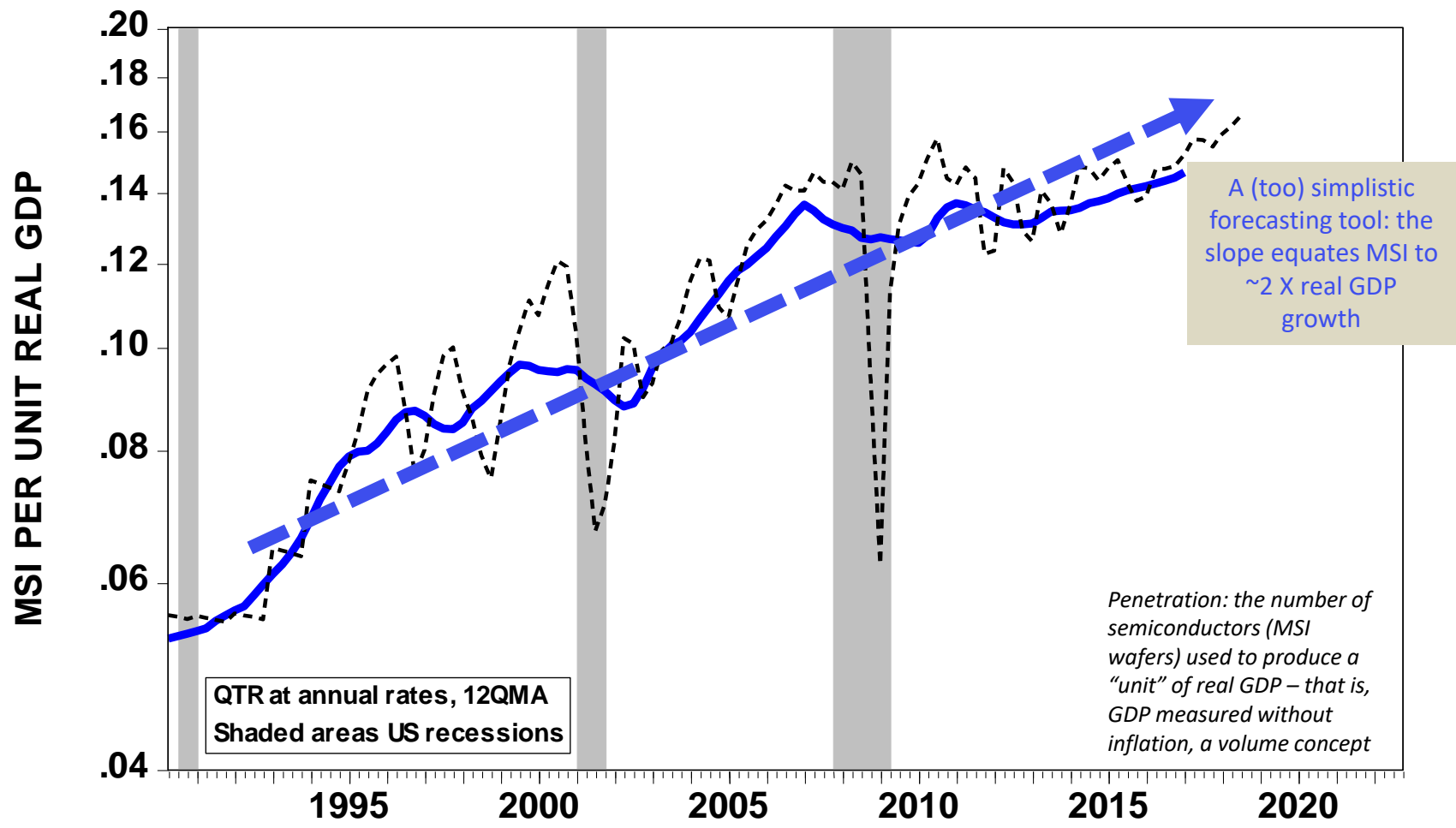




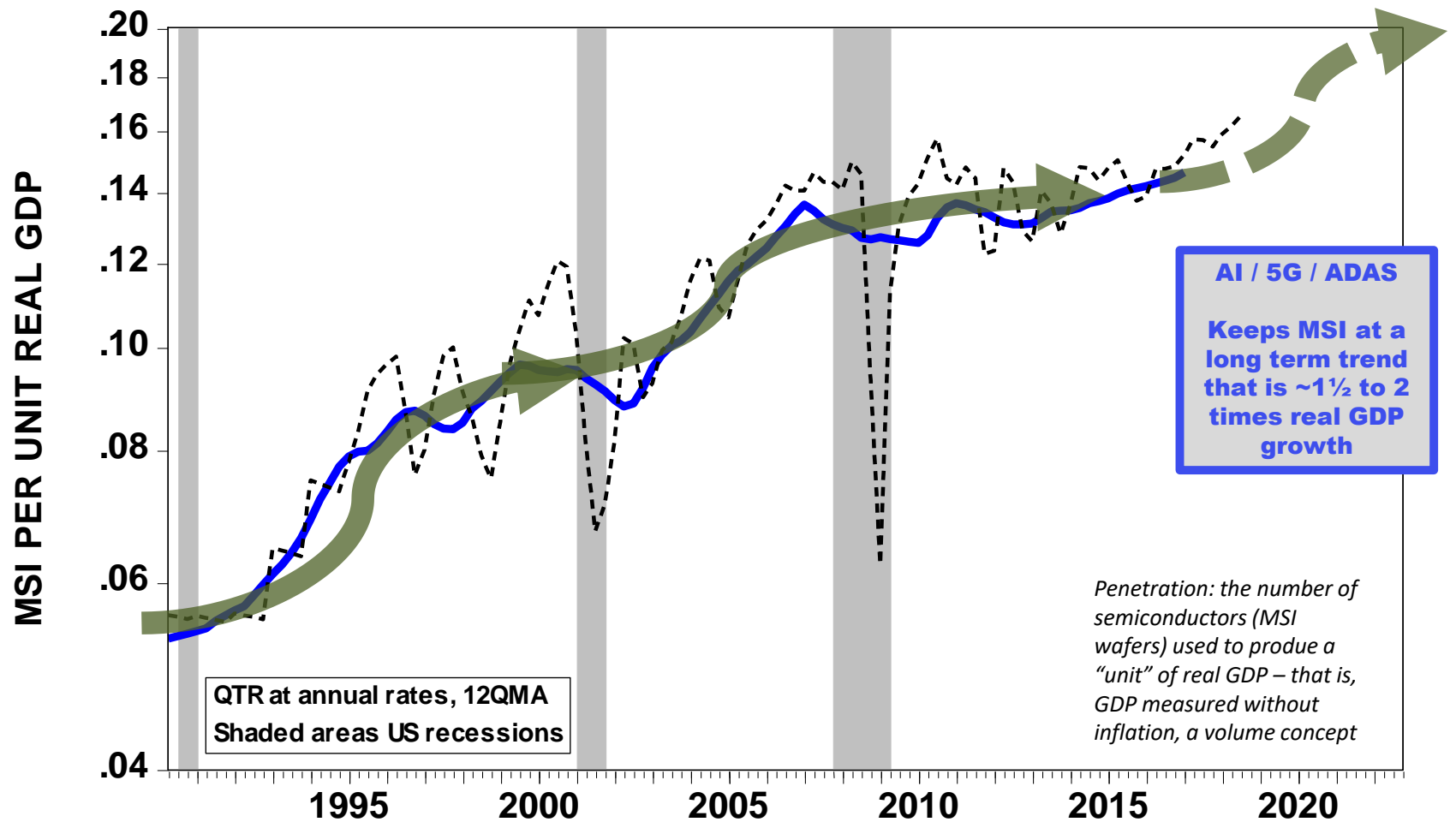
# Semiconductors VS. World Real GDP



# Semiconductor Penetration of the Global Economy



# Semiconductor Penetration of the Global Economy



# Summary: 2019-20

- The world economy has moved into a decelerating phase of the business cycle.
- Consensus expects slightly below-trend growth in key final demand measures that drive semiconductors (investment, consumption).
-  Recession risks rising (economic policy uncertainty).
- Semiconductors slide in 2019, but surge back to a healthy trend (1.5 to 2 times real GDP growth) once past the down cycle.

## • Growth Rates:

Annual % Change	2017	2018	2019	2020
World Real GDP	3.1	3.0	2.7	2.7
Investment	4.7	4.1	3.0	3.2
Consumption	3.1	2.8	2.6	2.5
<i>SEMI MSI</i>	10.0	7.9	(1.5)	2.9



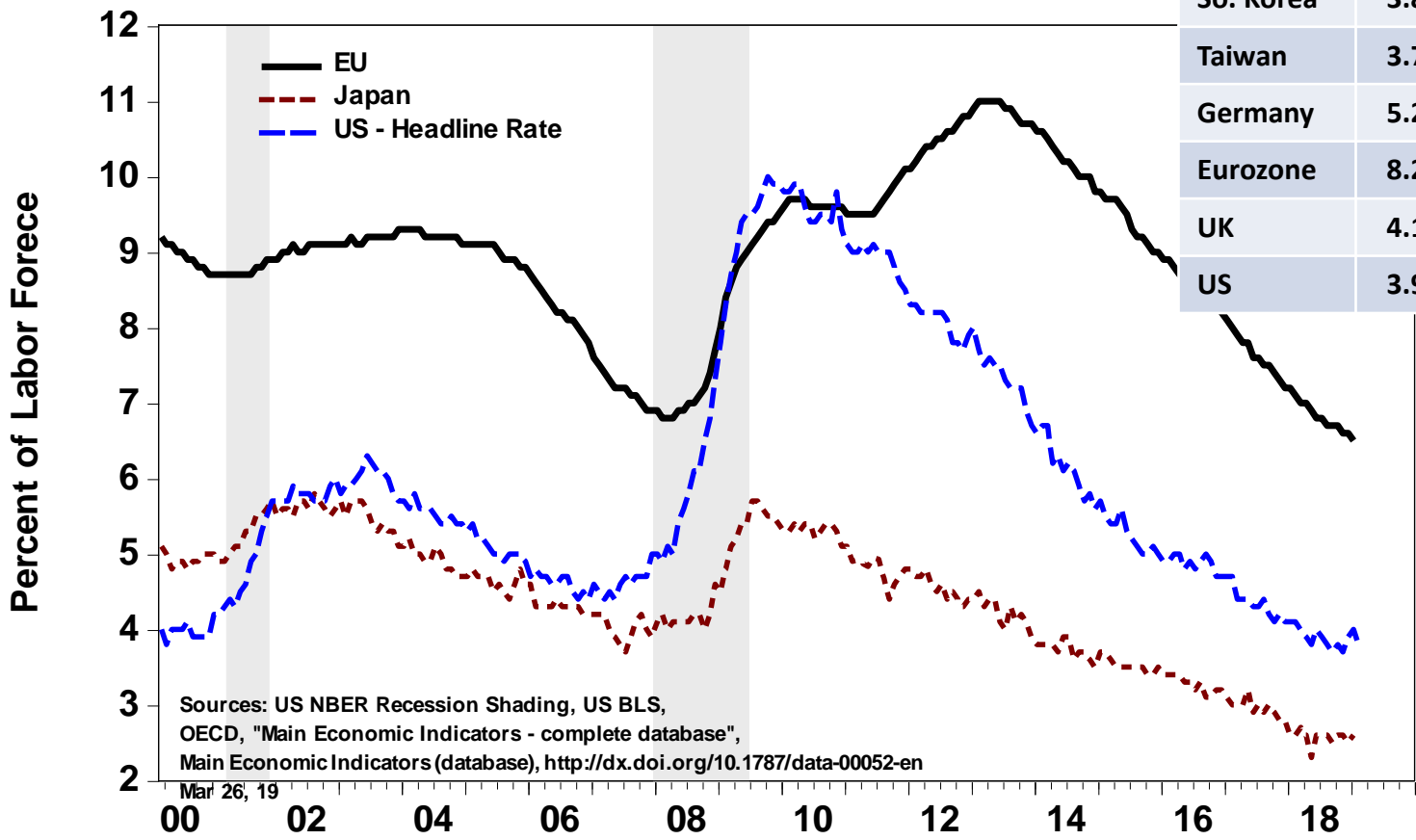
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# Jobs Markets Support Consumption

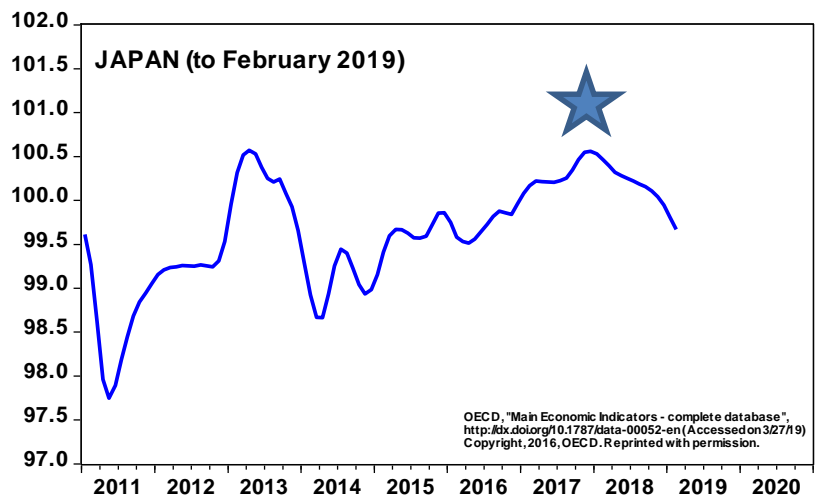
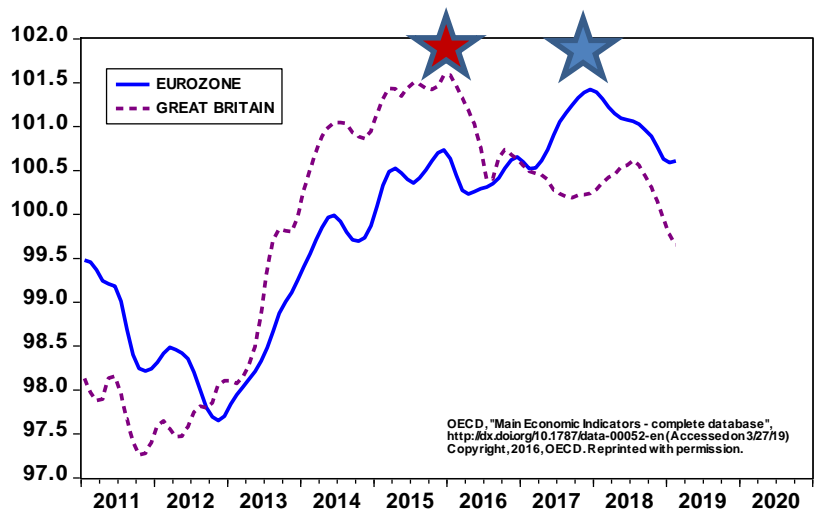
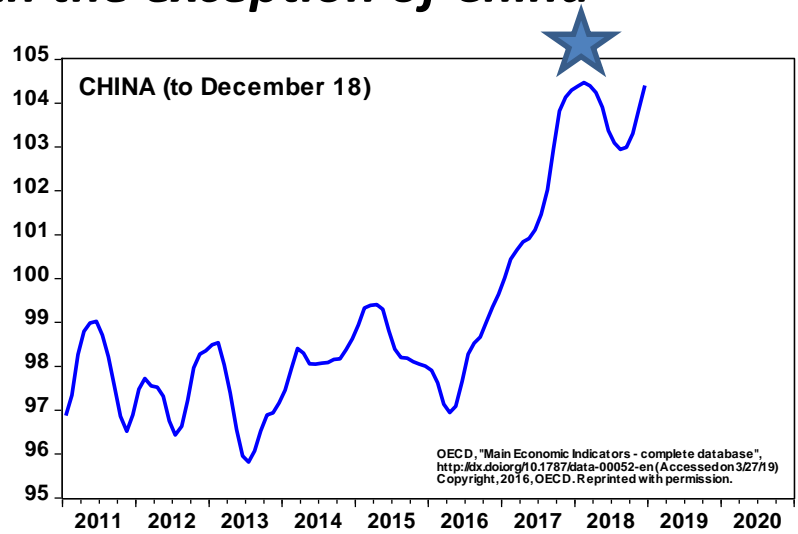
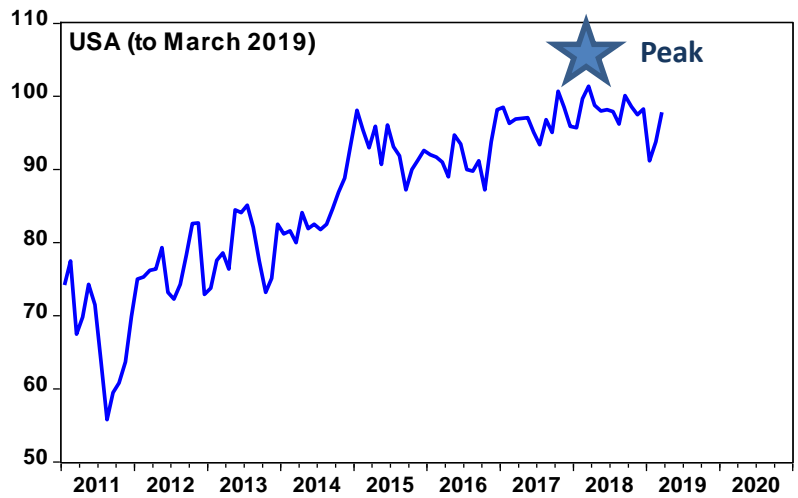
## Unemployment Rates



% Unemp.	2018	2019	2020
Japan	2.4	2.4	2.4
So. Korea	3.8	3.9	3.9
Taiwan	3.7	3.7	3.8
Germany	5.2	4.9	4.8
Eurozone	8.2	7.8	7.6
UK	4.1	4.1	4.2
US	3.9	3.7	3.7

Sources: US NBER Recession Shading, US BLS, OECD, "Main Economic Indicators - complete database", Main Economic Indicators (database), <http://dx.doi.org/10.1787/data-00052-en>

# Consumer Confidence Indexes Are High But off the 2018 peaks, with the exception of China



# CPI Inflation Weakens in 2019

*Despite tightness in labor markets and closed output gaps*

CPI % Change	2016	2017	2018	2019	2020
China	2.0	1.6	2.1	2.1	2.1
Japan	(0.1)	0.5	1.0	0.7	1.0
South Korea	1.0	1.9	1.5	1.3	1.6
Taiwan	1.4	0.6	1.4	0.8	1.1
Germany	0.5	1.8	1.8	1.5	1.6
France	0.2	1.0	1.9	1.3	1.5
Italy	(0.1)	1.2	1.2	0.9	1.2
UK	0.7	2.7	2.6	2.2	2.2
US	1.3	2.1	2.4	1.8	2.2

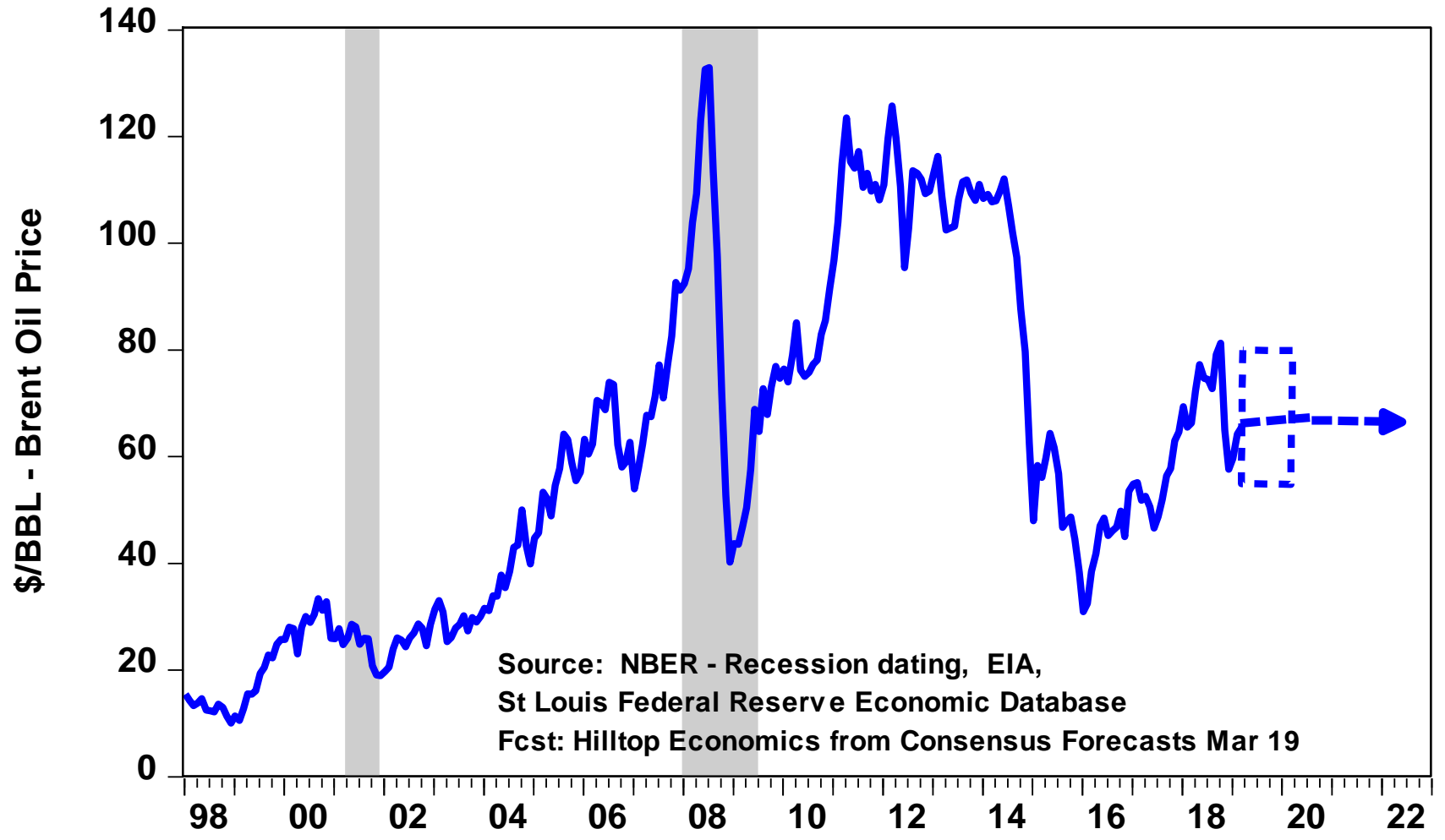
Hilltop Economics, Based on Consensus Forecasts, March 19

2018 actual vs. forecast: China: -0.2, Germany: +0.1, US & Japan no error



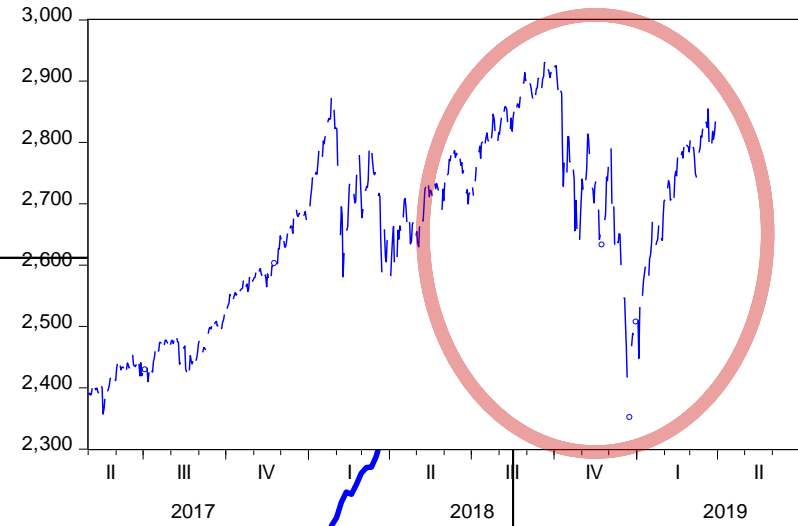
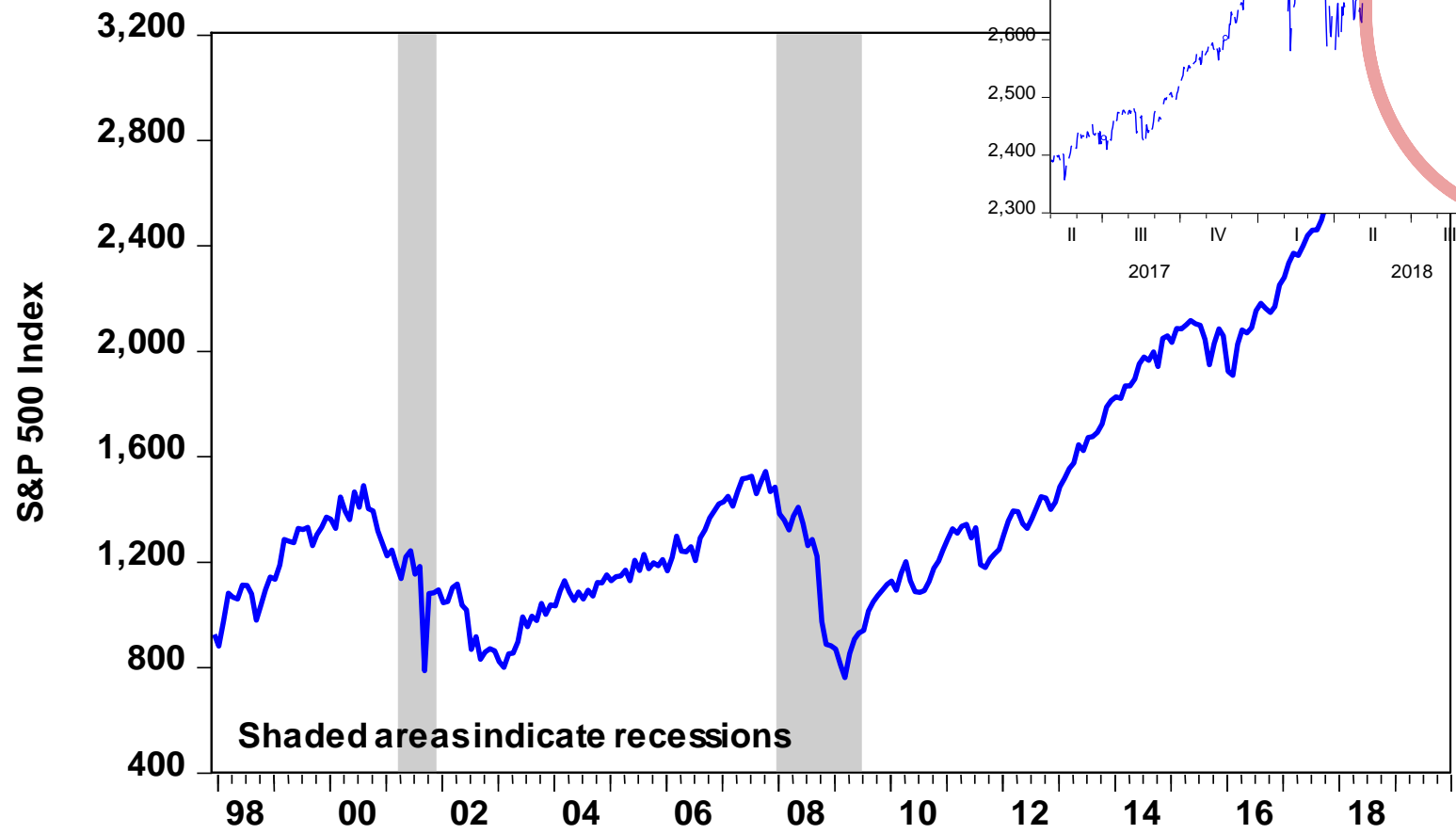


# Oil Prices

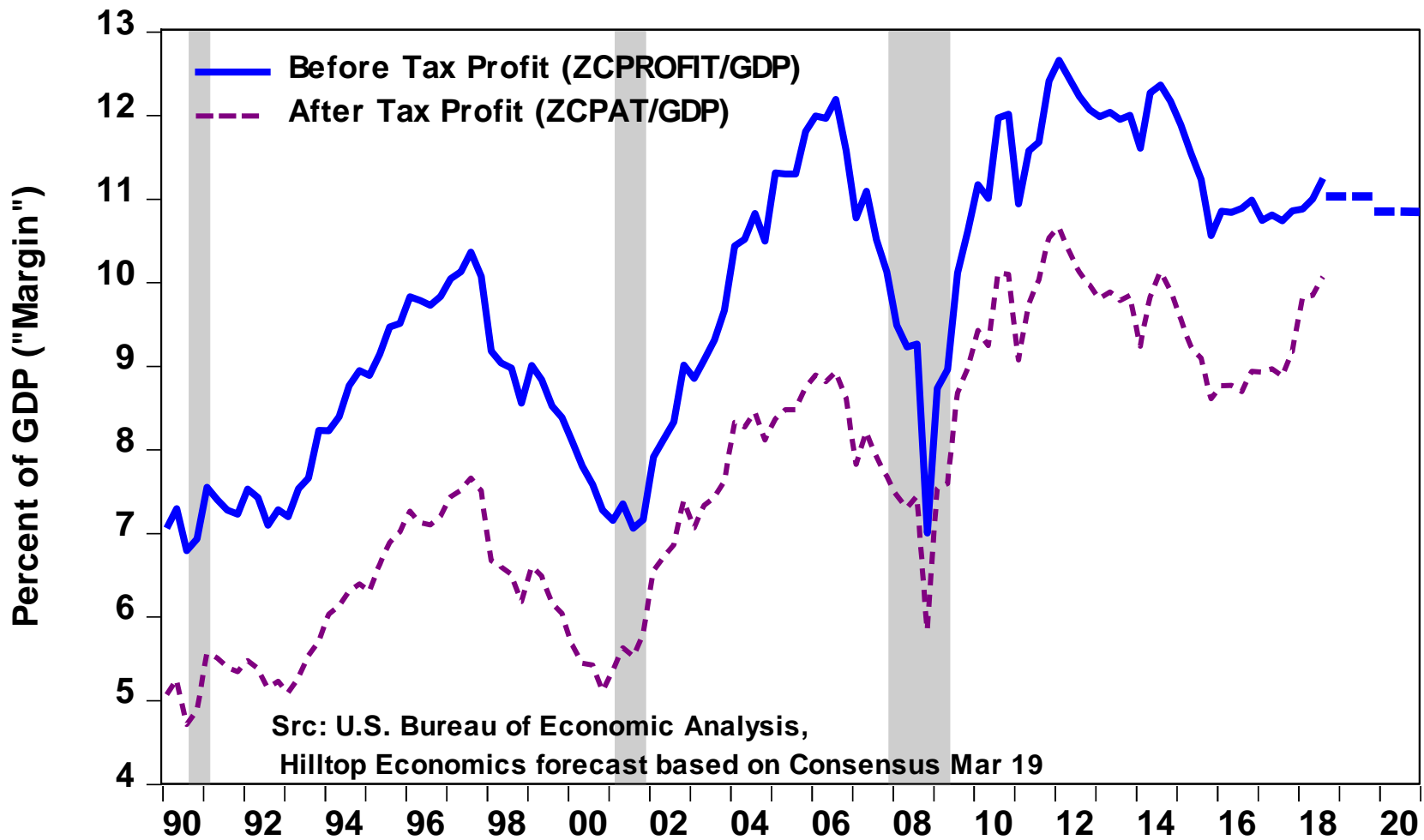


Source: NBER - Recession dating, EIA,  
St Louis Federal Reserve Economic Database  
Fcst: Hilltop Economics from Consensus Forecasts Mar 19

# Equity Prices Well Above December Lows as of End-March, but Volatility Unsettling

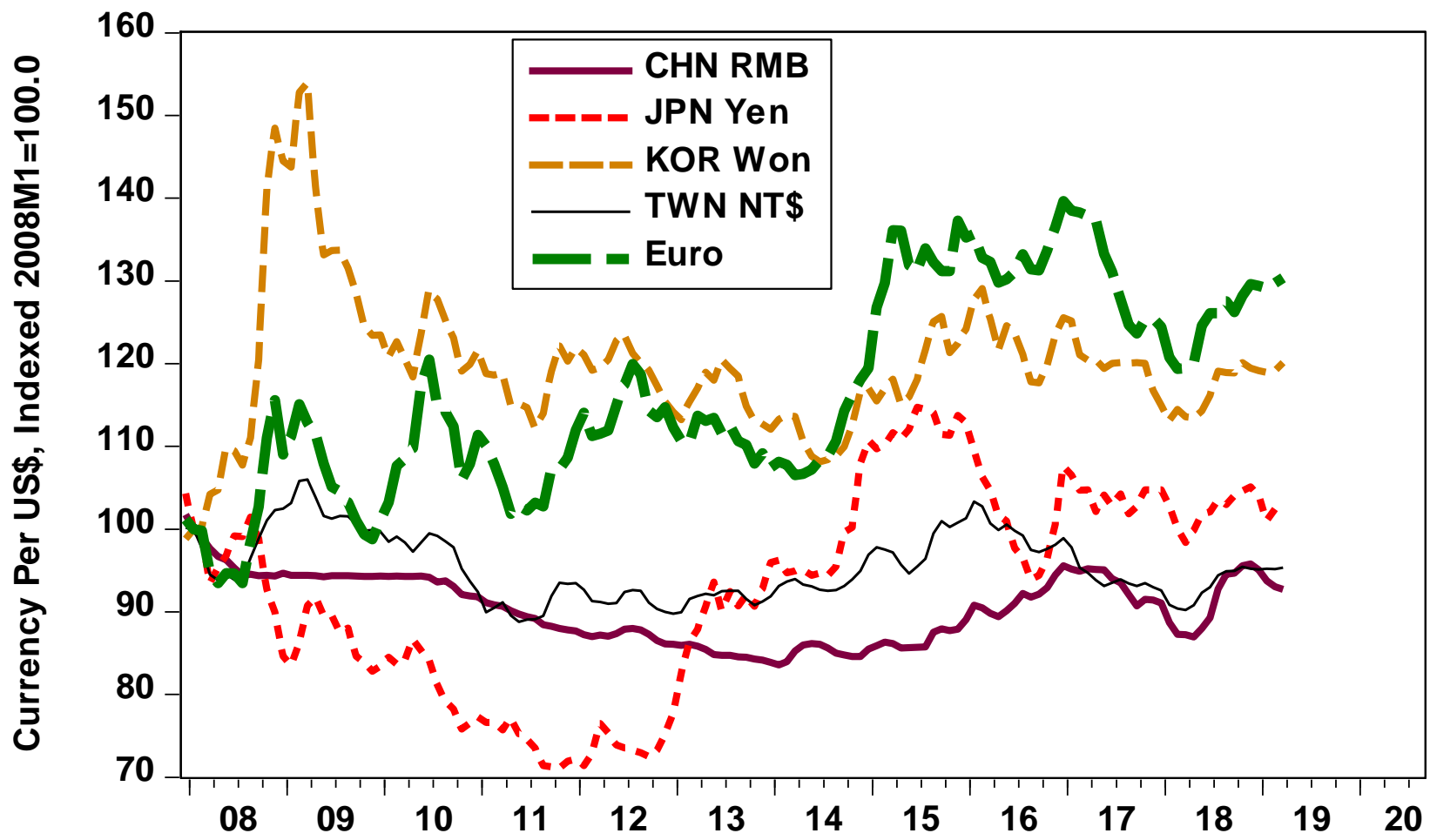


# Consensus: Profits Grow in Line with Revenue At Least Through 2020



Src: U.S. Bureau of Economic Analysis,  
Hilltop Economics forecast based on Consensus Mar 19

# Dollar Strengthened, Trade War an Issue



# Metrics

- **Real GDP:** Gross Domestic Product (final “real” or “volume” demand for goods and services, in the largest 85 countries measured in Billions of 2010 US\$ - that is, with inflation removed)
  - **Real consumer spending** (for key 45 countries in Consensus Economics)
  - **Real business investment** (for key 45 countries in Consensus Economics)
  - *WHY Real GDP and its final demand components? Semiconductors have become so ubiquitous, used in almost every product and in support of almost every service, that broad final demand measures best explain MSI trends.*
- **Million Square Inches (MSI)** of silicon wafers shipped to semiconductor manufacturers (Source: SEMI.ORG)
  - *WHY MSI? Best volume measure of semiconductors, to relate to the volume of demand as measured by real GDP and other units of products*
- **WSTS semiconductor revenue** (World Semiconductor Trade Statistics) - \$000 sales by major region reported by WSTS.ORG
- Semiconductor **Equipment Billings** (~90% of worldwide semiconductor equipment sales)
  - Reported for North America by SEMI.ORG
  - Reported for Japan by SEAJ.ORG



# Semiconductor Data Concerns

- Disconnect between MSI and WSTS revenue
- U.S. Government shutdown
- METI discontinuing monthly wafers (?)
- MSI quarter-to-quarter distortions due to increases in long-term contracts (?)