

# The Economic Impact of Oil Supply Shocks on the G7 Countries

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## Exogenous Oil Supply Shocks since 1970

Date	Political Event
October 1973	Yom-Kippur War/ Arab Oil Embargo
October 1978	Iranian Revolution
September 1980	Iran-Iraq War
August 1990	Persian Gulf War
December 2002	Civil Unrest in Venezuela
March 2003	Iraq War

“Exogenous” here means that the shock to crude oil production is driven by political forces in oil-producing countries that evolve independently of the state of the global economy.

## **Exogenous Oil Supply Shocks Are Back in the News:**

“Over the weekend, Iran's president, Mahmoud Ahmadinejad, hinted that his country might be willing to use the "oil weapon" -- that is, curbing oil exports -- if faced with international sanctions.”

**New York Times, January 20, 2006**

“Venezuelan President Hugo Chavez has warned he could cut off oil exports to the United States. [...] Venezuela, the world's fifth largest oil exporter, ships 1.5 million barrels of oil a day to the United States.”

**CNN February 18, 2006**

## Key Question

How do shortfalls in crude oil production caused by wars and other exogenous political events in the Middle East affect oil prices, economic growth and inflation in major industrialized countries?

- Public discussion of this question has been shaped by the economic experience of the 1970s and early 1980s.

Our collective memory leaves no doubt that exogenous oil supply shocks are to blame for the economic malaise of the 1970s.

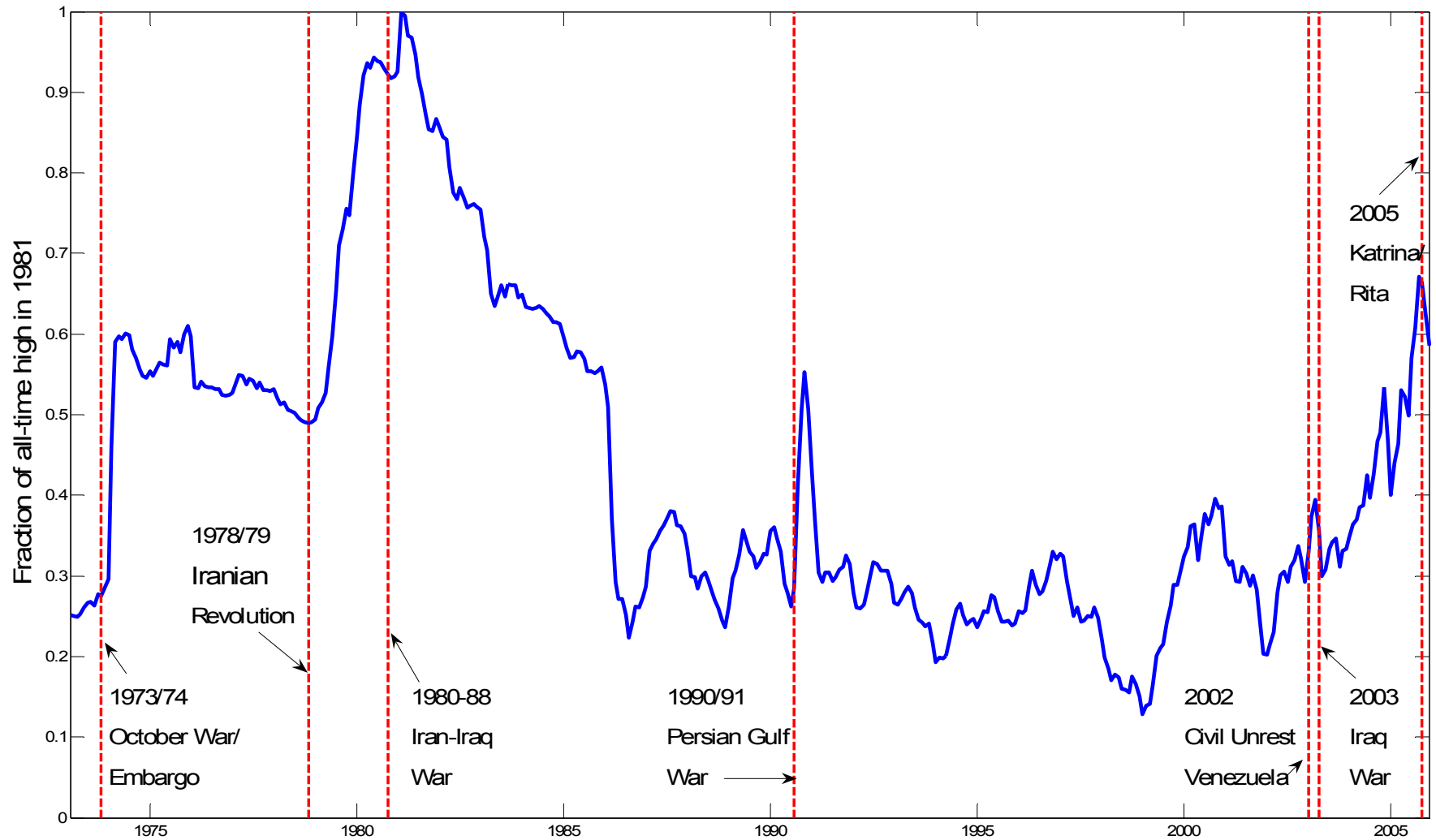
- An obvious concern is that history might repeat itself if a new oil supply shock were to occur.

This makes it important to understand previous “oil shock” episodes.

## **Outline of the Presentation**

1. What is an “oil shock”?
2. The dynamic effects of these shocks on the U.S. economy
3. The dynamic effects of these shocks on other G7 Countries
4. Caveats

# Real Price of Imported Crude Oil: 1973.1-2005.11



Source: U.S. Department of Energy

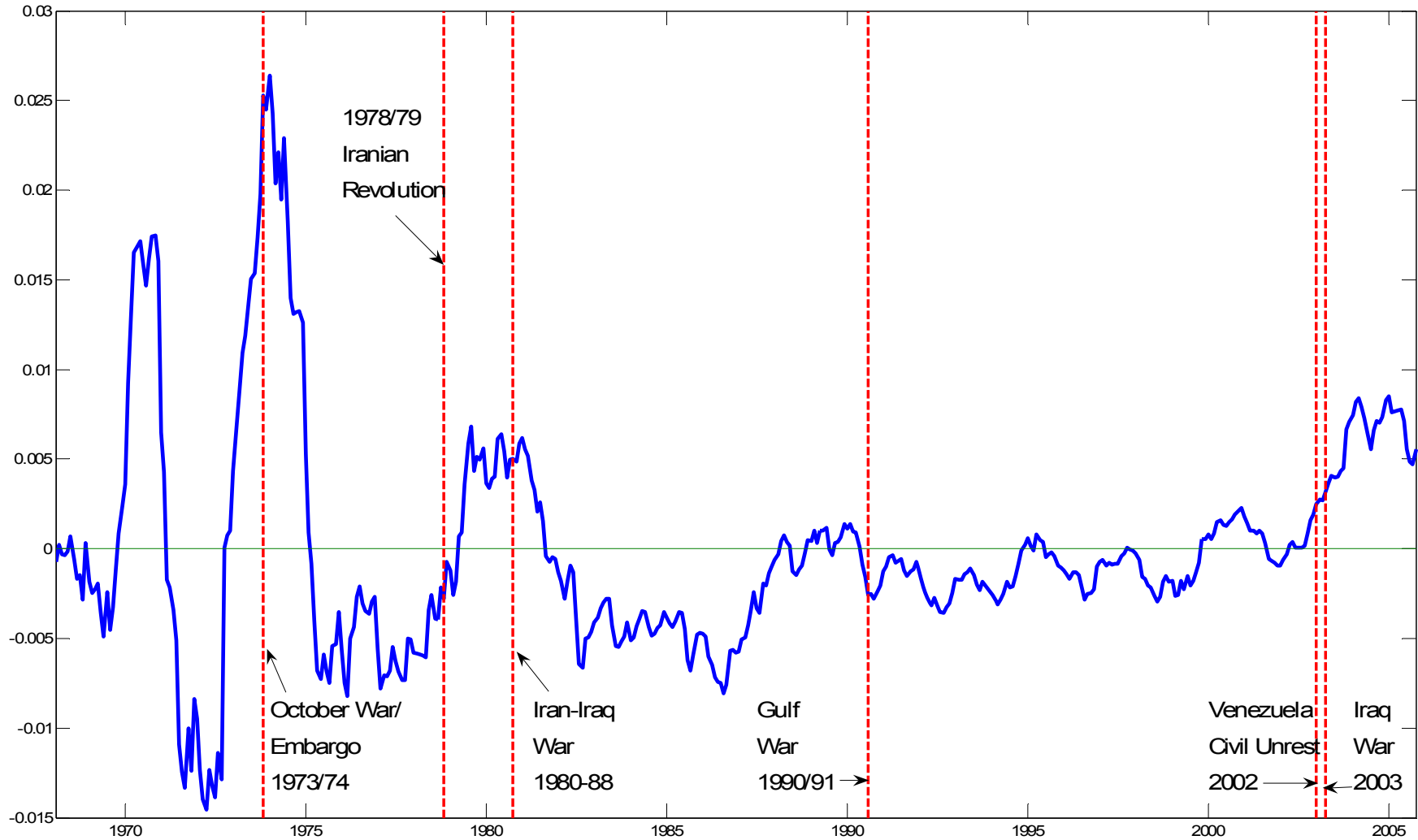
## **Political events in the Middle East versus global demand**

“A major political crisis will not cause a price shock when capacity cushions exist in other countries, while excess demand would cause prices to flare even in the absence of any political crisis”. Mabro (1998)

- Exogenous political events in the Middle East need not cause oil price shocks.
- In the presence of capacity constraints, shifts in the demand for oil can induce sharp increases in the price of oil (even in the absence of exogenous political events).

How important are shifts in global demand for the price of oil?

# Index of dry cargo freight rates as measure of global demand



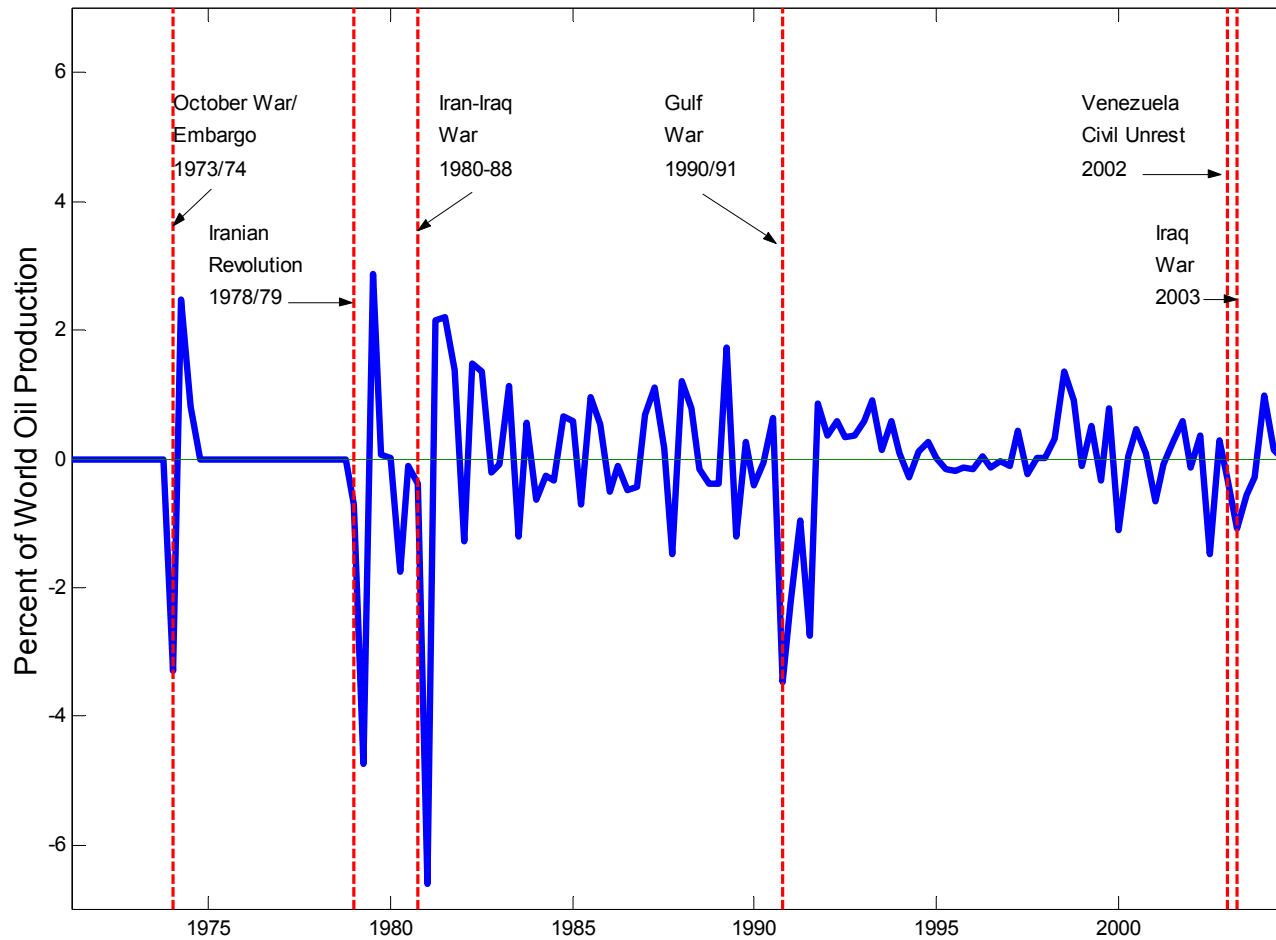
Source: Kilian (unpublished research) based on Drewry Monthly Shipping Statistics.

## **Why we need a direct measure of the exogenous oil supply shocks**

- By any measure, a substantial component of oil price movements reflects shifts in demand for oil driven by global macroeconomic conditions.
  - We cannot simply assume that the major oil price increases are driven by exogenous forces such as wars and political conflicts in the Middle East.
- ⇒ What is needed is a direct measure of the exogenous production shortfalls based on plausible assumptions about how oil production would have evolved in the absence of exogenous political events in the Middle East.

Such a measure has recently been developed by Kilian (2006) using oil production data provided by the U.S. Department of Energy.

# Measure of Exogenous Oil Supply Shocks 1971.I-2004.III



Source: Kilian (2006)

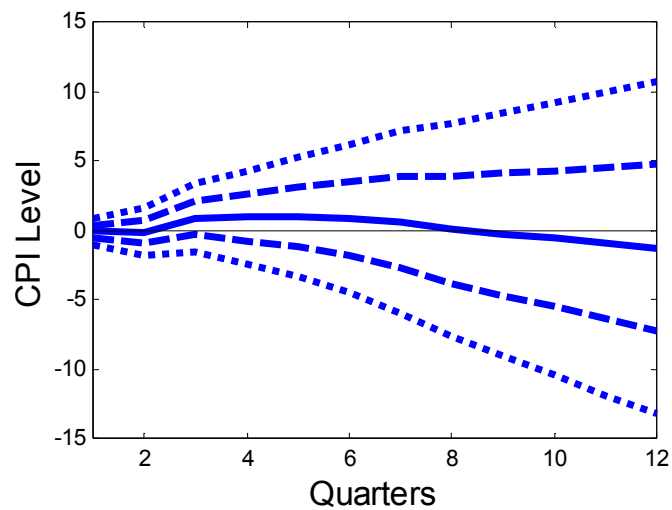
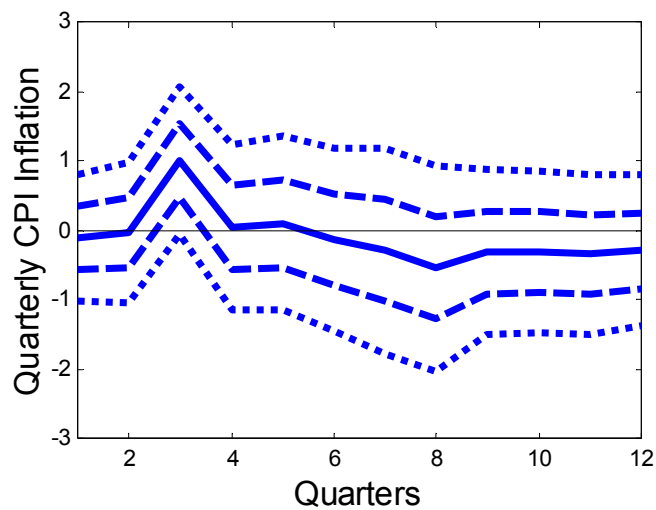
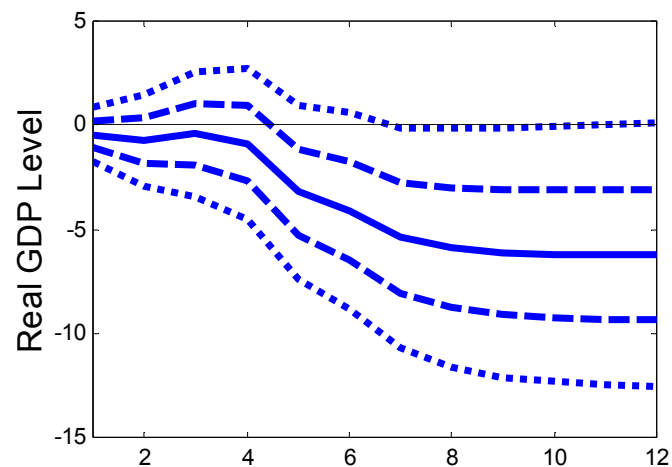
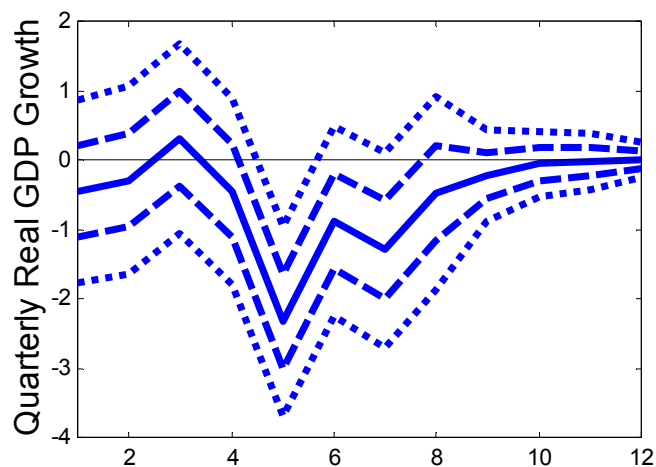
## Key questions:

- Can we expect a recession following an exogenous oil supply cutback?
- How long will it take for the recession to set in and how deep and protracted will it be?
- Do exogenous oil supply cutbacks cause a sustained increase in inflation?
- Do oil supply shocks by necessity cause "stagflation", a term coined in the 1970s to denote periods of economic stagnation as well as inflation?

## **The Dynamic Effects of Exogenous Oil Supply Disruptions on the U.S. Economy**

- Estimates for the U.S. economy suggest a sharp, temporary drop in real growth about five quarters after the shock rather than an immediate and sustained reduction in economic growth.
- They also suggest a spike in CPI inflation three quarters after the exogenous oil supply shock, as opposed to a sustained increase in inflation, as is sometimes conjectured.
- There is no evidence that exogenous oil production shocks cause stagflation.

# Dynamic Effects of a 10% World Oil Supply Disruption U.S. Estimates with One- and Two-Standard Error Bands



## Beyond dynamic multipliers ...

There is a tendency to think of exogenous oil supply shocks as adverse oil supply shocks. This need not be the case:

- Historically, exogenous production shortfalls have tended to be temporary. In that case, by construction, negative shocks to oil production are followed by positive shocks.
- In assessing the overall impact of exogenous oil supply shocks, it is therefore more informative to conduct a counterfactual historical simulation.

## **The cumulative effect of these shocks during selected episodes**

### U.S. Real GDP Growth

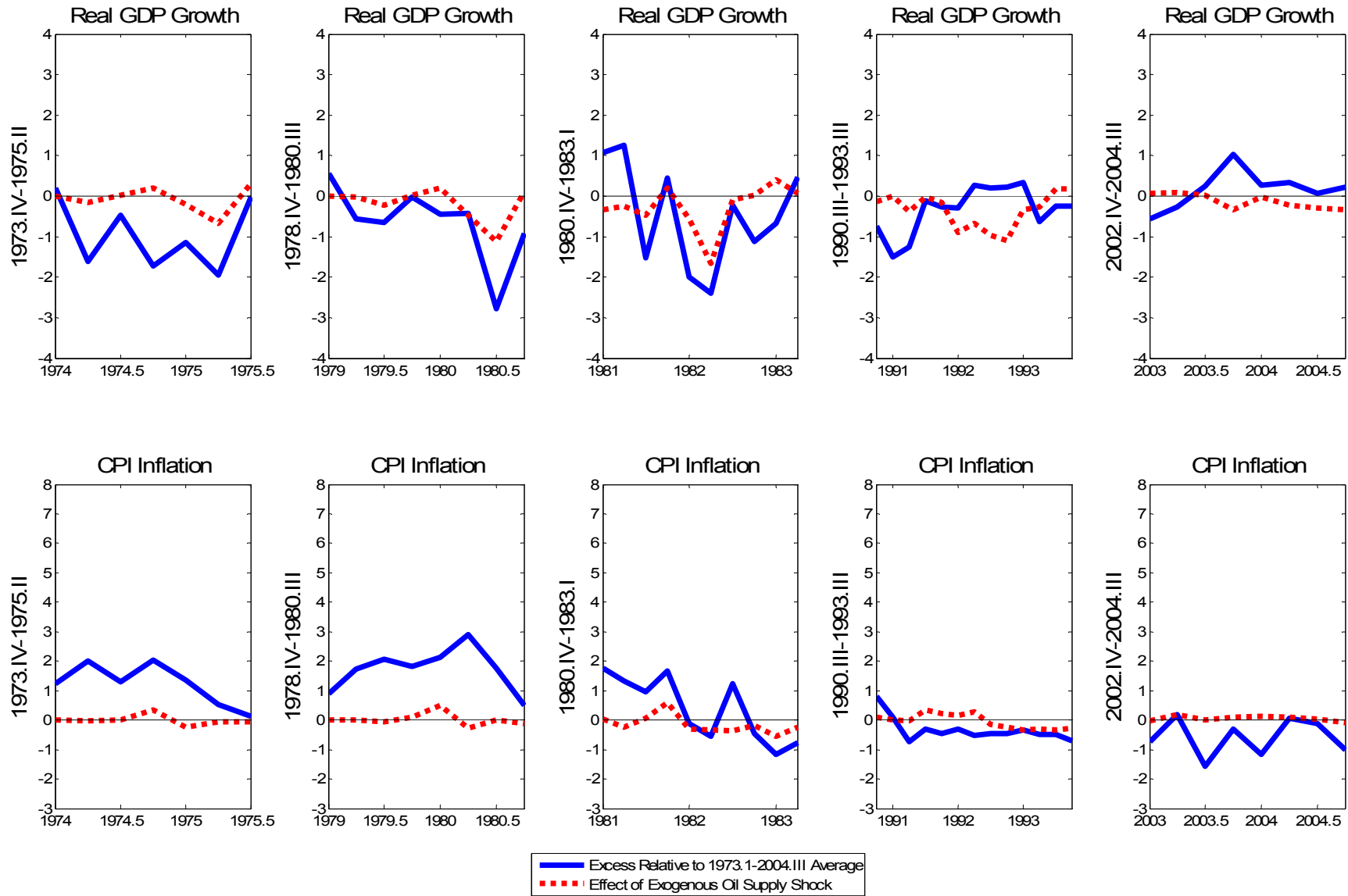
- The 1973/74 oil supply shock did not play a major role in the 1974/75 recession.
- There is no evidence of a large effect on real growth in 2003/04.
- The evidence of an effect in 1979/80 and 1980-1984 is limited mainly to one quarter each, in which these shocks contributed to abnormally low growth.
- The overall largest effect on growth occurred after the Persian Gulf War of 1990/91, albeit with a considerable delay.

## U.S. Inflation

- Exogenous oil production shocks had hardly any effect on CPI inflation during any episode.

This evidence is consistent with the view that the abnormally high U.S. inflation rates of the 1970s can be attributed to domestic macroeconomic policies rather than external shocks.

# U.S. Real GDP Growth and CPI Inflation Relative to Long-Run Average and Estimated Effect of Exogenous Oil Supply Shocks



## **Extended Analysis:**

### **The Dynamic Effects for the G7 Countries**

#### (1) Real GDP Growth:

There is a fair degree of similarity in the real growth responses of G7 economies.

An exogenous oil supply disruption typically causes a temporary reduction in real GDP growth that is concentrated in the second year after the shock.

#### (2) Consumer Price Inflation:

Consumer price inflation responses are more varied. The median inflation response peaks after three to four quarters.

Exogenous oil supply disruptions need not generate sustained inflation or stagflation.

Evidence of sustained inflation and stagflation (as in the case of Germany) therefore must reflect a favorable institutional environment.

## **Extended Analysis:**

### **How would the G7 countries have fared in the absence of exogenous oil supply shocks?**

(1) The evolution of CPI inflation in the G7 countries would have been remarkably similar overall to its actual path, consistent with a monetary explanation of the high inflation of the 1970s.

(2) There is no evidence that the 1973/74 and 2002/03 oil supply shocks had a substantial impact on real growth in any G7 country.

This finding is consistent with an important role for demand-led oil price increases during these episodes.

(3) For some G7 countries, the 1978/79, 1980, and 1990/91 shocks contributed to lower real growth.

## Case Study: “Iran 2006”

### Estimated Effects of a 5% Permanent Reduction in Oil Supply

	Expected Effect on Annual Real GDP Growth		
	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year
U.S.	-0.5	<b>-2.5</b>	-0.2
Italy	0.2	<b>-1.9</b>	-0.2
France	0.0	<b>-1.4</b>	-0.4
U.K.	-1.9	<b>-2.2</b>	0.2
Germany	0.3	<b>-2.6</b>	-0.6

	Expected Effect on Annual Consumer Price Inflation		
	1 <sup>st</sup> Year	2 <sup>nd</sup> Year	3 <sup>rd</sup> Year
U.S.	<b>0.5</b>	-0.5	-0.6
Italy	<b>1.2</b>	0.2	-0.0
France	<b>1.2</b>	0.6	0.2
U.K.	<b>0.1</b>	-0.3	-0.5
Germany	<b>1.6</b>	1.4	1.0

NOTE: These estimates are subject to considerable sampling uncertainty.

## **Caveats: Limitations of Extrapolating from the Past**

- Analysis is based on a small number of events only:  
Estimates are imprecise
- Policy responses matter
- Changes in the oil market:
  - Demand for oil has increased, as emerging economies have entered the oil market.
  - It is unclear whether the long-run supply of oil will increase as much as it did in the past.
  - More advanced alternative technologies (alternative fuels, fuel efficiency, energy conservation).
- Precautionary demand:
  - The role of market psychology and the media

## References

Kilian, L. (2006), Exogenous oil supply shocks: How big are they and how much do they matter for the U.S. economy?

<http://www-personal.umich.edu/~lkilian/paperlinks.html>

Kilian, L. (2005), The effects of exogenous oil supply shocks on output and inflation: Evidence from the G7 countries.

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Barsky, R.B., and L. Kilian (2004), Oil and the macroeconomy since the 1970s, *Journal of Economic Perspectives*, 18(4), Fall, 115-134.

Barsky, R.B., and L. Kilian (2002), Do we really know that oil caused the Great Stagflation? A monetary alternative, in B. Bernanke and K. Rogoff (eds.), *NBER Macroeconomics Annual 2001*, 137-183.

# Appendix

# What is driving the price of crude oil?

## Supply of oil:

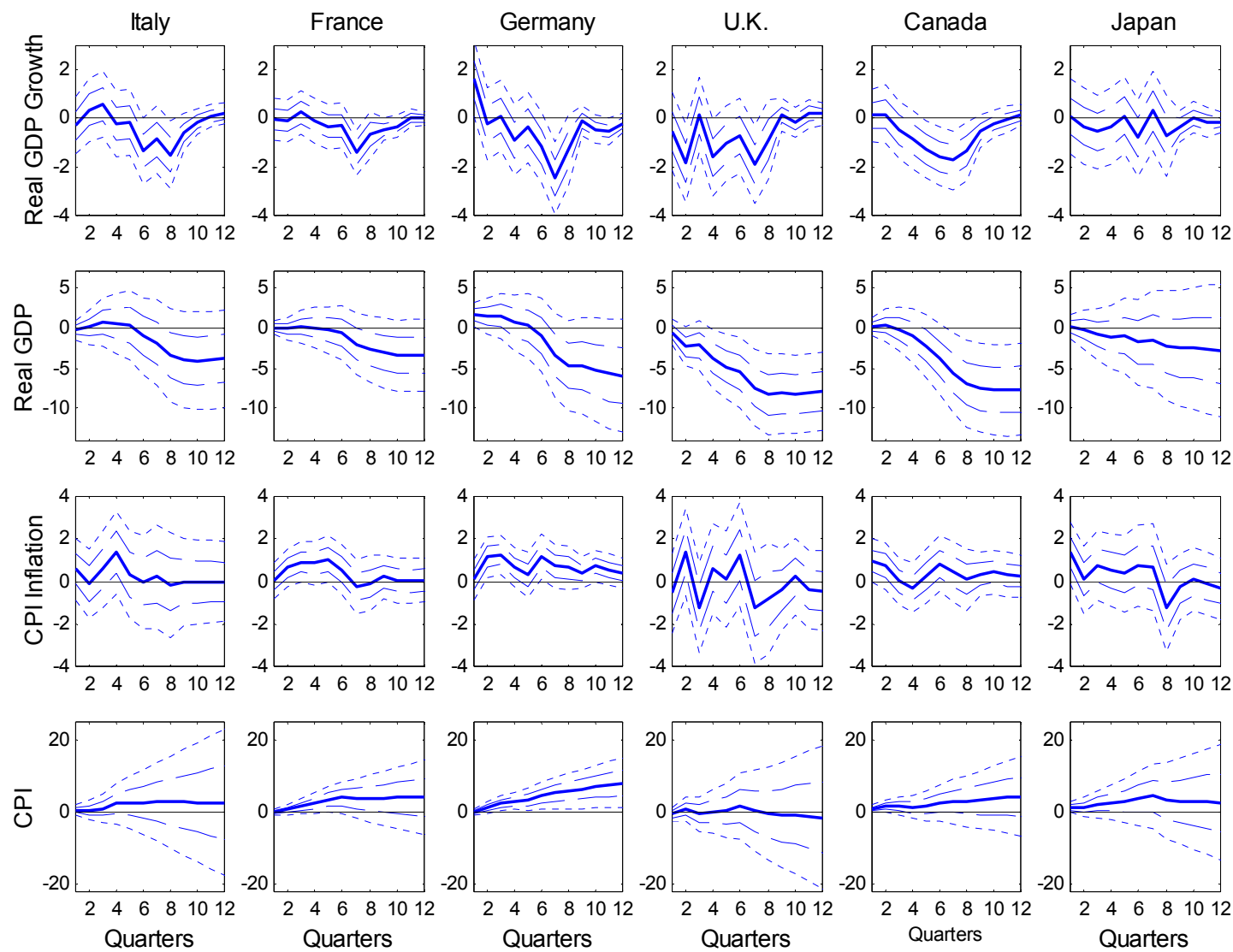
- Exogenous shocks to oil production driven by wars and revolutions
- Endogenous short-run supply decisions of OPEC:
  - Strength of demand for oil
  - Real interest rate (opportunity cost of holding oil stocks)
- Endogenous long-run supply responses to the price of oil:
  - Capacity adjustments (typically delayed by several years)

## Demand for oil:

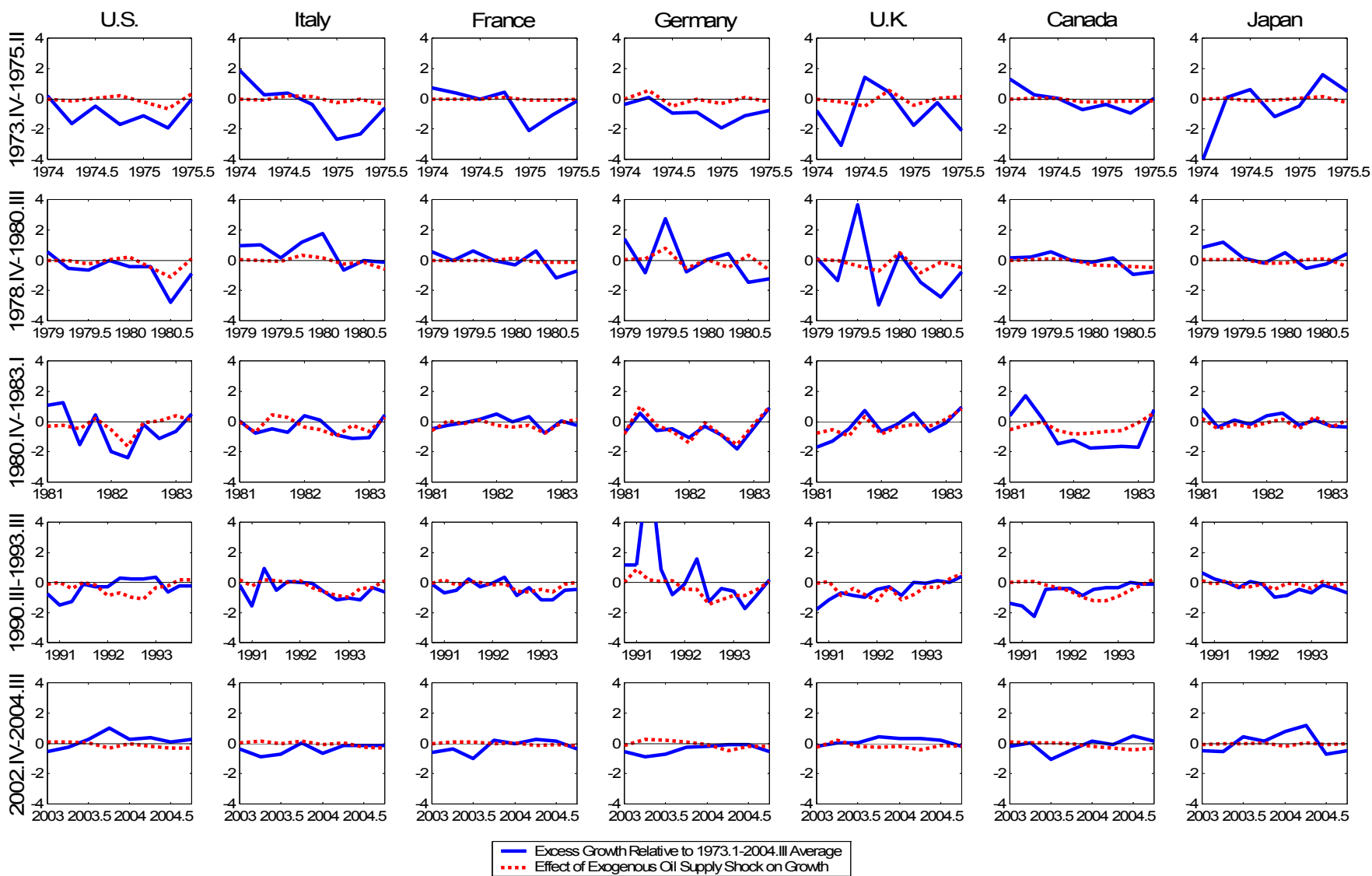
- Demand for oil driven by the strength of the world economy
  - Global business cycle:
    - Productivity growth
    - Monetary stimulus
    - Exchange rates
  - Structural shifts in the demand for oil:
    - Emerging economies
    - Adoption of new technologies
- Precautionary demand for oil driven by fears about future oil supplies

# Dynamic Effects of a 10% World Oil Supply Disruption

## Estimates with One- and Two-Standard Error Bands



# Comparison of Real Growth Experience by Oil Shock Episode



# Comparison of CPI Inflation Experience by Oil Shock Episode

