Cross-Country Differences in the Effects of Oil Shocks

Gert Peersman  
*Ghent University*

Ine Van Robays  
*Ghent University*

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• Macroeconomic consequences of oil shocks across a set of countries which are very diverse with respect to the role of oil and energy in the economy
  – Oil/energy importing and exporting countries
  – Relevance of non-oil energy products also taken into account to assess cross-country differences

• Distinguish between several types of oil shocks
  – Peersman (2005), Kilian (2009), Peersman and Van Robays (2009): effects crucially depend on the underlying source of oil price shift in US and Euro area

• Has impact changed over time; and can time variation be explained by changes in macroeconomic relevance of oil and other sources of energy?
Net import oil and non-oil energy

Tonnes of oil equivalent / GDP (millions USD, PPP weighted): average 1986-2008

- Euro area: 71 (oil), 30 (non-oil energy)
- United States: 55 (oil), 2 (non-oil energy)
- Japan: 67 (oil), 62 (non-oil energy)
- Switzerland: 22 (oil), 47 (non-oil energy)

In paper also Germany, France, Italy and Spain.
Benchmark SVAR model

\[
\begin{bmatrix}
X_t \\
Y_{j,t}
\end{bmatrix} = c + A(L) \begin{bmatrix}
X_{t-1} \\
Y_{j,t-1}
\end{bmatrix} + B \begin{bmatrix}
\varepsilon_t^X \\
\varepsilon_j^Y
\end{bmatrix}
\]

**Oil market variables (X)**
- Global oil production
- World crude oil price (US dollars)
- World economic activity

**Country-specific variables (Y)**
- Real GDP
- Consumer prices
- Nominal short-term interest rate
- Nominal effective exchange rate

- Sample period 1986Q1-2010Q4 with 3 lags
  - Structural break in oil market dynamics in 1986Q1
Identification of three types of oil shocks

- Peersman and Van Robays (2009): sign restrictions on oil market variables
  - Oil supply shocks
  - Oil demand shock driven by global economic activity
  - Oil-specific demand shock
- No restrictions on other (country-specific) variables

<table>
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<th>$Q_{oil}$</th>
<th>$P_{oil}$</th>
<th>$Y_{wd}$</th>
<th>$Y_j$</th>
<th>$P_j$</th>
<th>$i_j$</th>
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<td>Oil supply shock</td>
<td>&lt;0</td>
<td>&gt;0</td>
<td>≤0</td>
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<tr>
<td>Global economic activity shock</td>
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<tr>
<td>Oil-specific demand shock</td>
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<td>≤0</td>
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Oil supply shock => output

Euro area
United States
Japan
Switzerland
Canada
Norway
Australia
United Kingdom
Oil supply shock => consumer prices

- Euro area
- United States
- Japan
- Switzerland
- Canada
- Norway
- Australia
- United Kingdom

Graphs show the impact of oil supply shock on consumer prices over time for different countries.
Oil supply shock => exchange rate

- **Euro area**
- **United States**
- **Japan**
- **Switzerland**
- **Canada**
- **Norway**
- **Australia**
- **United Kingdom**
Oil supply shock => interest rate

- Euro area
- United States
- Japan
- Switzerland
- Canada
- Norway
- Australia
- United Kingdom
Global economic activity shock => output

- Euro area
- United States
- Japan
- Switzerland
- Canada
- Norway
- Australia
- United Kingdom
Global economic activity shock => consumer prices
Oil specific demand shock => output

- **Euro area**
- **United States**
- **Japan**
- **Switzerland**
- **Canada**
- **Norway**
- **Australia**
- **United Kingdom**
Oil specific demand shock => consumer prices
Source of oil shock does matter

• Oil supply shocks
  – Oil and energy importing countries: permanent decline economic activity and rise of consumer prices
  – Oil and/or non-oil energy exporting countries: output increases, while consumer prices decline or remain constant probably due to exchange rate appreciation

• Oil demand shocks driven by economic activity
  – Output and consumer prices rise in all countries: role of oil and other forms of energy does not matter for cross-country differences

• Oil-specific demand shocks
  – All countries experience a (temporary) decline in economic activity, hardly an inflationary effect: role of oil and other forms of energy does not matter
Relevance of oil/energy and time variation of effects

• Several studies find reduced impact of oil price shocks on output and prices in more recent periods, and refer to decreased dependency on crude oil as a possible explanation (e.g. Blanchard and Gali 2010)

• Baumeister and Peersman (2008): comparisons over time are seriously distorted and misleading because of structural change in oil market
  – Considerable decline of price elasticity oil demand and supply since mid 1980s
    • Also found in Krichene (2002), Ryan and Plourde (2002), Cooper (2003), Kilian (2008), Hamilton (2009), Baumeister and Peersman (2010)
  – Conclusion depends on way of normalization: reduced impact of oil supply shock over time when normalized on oil price shift (e.g. 10% oil price increase), but stronger effects when normalized on oil production (e.g. 1% fall oil production)
    • Different oil supply shocks are compared over time
    • Story is same for oil demand shocks and declining price elasticity oil supply
Relevance of oil/energy and time variation of effects

- Illustration: oil supply shock and normalization on similar oil price increase

High price elasticity oil demand 1970s

Low price elasticity oil demand 1990s
Relevance of oil/energy and time variation of effects

- Cross-country dimension could avoid normalization problem by comparing **relative changes** over time
  - Normalization problem essentially the same for all countries
  - If role and share oil/energy in economy is important for time variation: changes over time should be more favorable for countries that improved their net oil and energy position the most over time

![Improvement net import of oil ('86-'08 versus '70-'85)]
Impact oil supply shock over time

- Impact normalized on 10% oil price increase

### Figures

**Euro area**

**United States**

**Japan**

**Switzerland**

**Canada**

**Norway**

**Australia**

**United Kingdom**

*1986-2010 sample period*

*1970-1985 sample period*
Relevance of oil/energy and time variation of effects

- Countries that improved their net oil and energy position the most over time, became less vulnerable to oil supply shocks relative to other countries.
Conclusions

• Role of oil and non-oil energy matters to explain cross-country differences in the effects of oil supply shocks
  – Output decreases in oil and energy importing countries, whereas output increases (or constant) in oil and energy exporting countries

• Role does not matter for effects of oil demand shocks driven by economic activity or oil specific demand shocks

• Countries that improved their net oil and energy position the most over time, became less vulnerable to oil supply shocks relative to other countries
  – Not the case for demand shocks driven by economic activity or oil-specific demand shocks