Effects of Oil Price Changes on Real Economic Activity: The Case of Turkey

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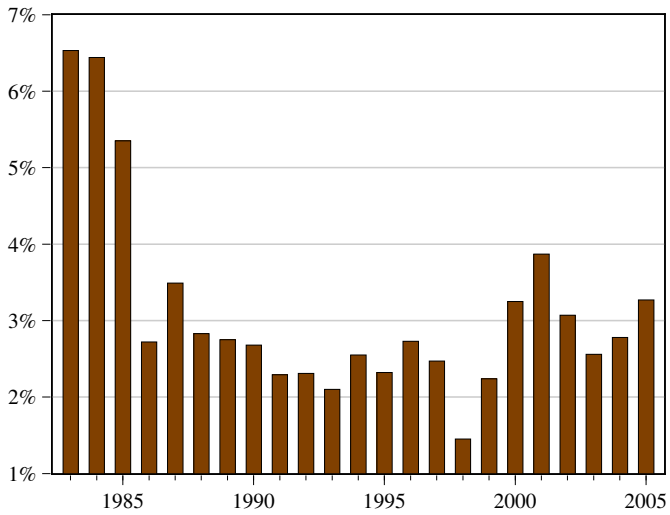
Outline

- Oil and energy use in Turkey
- Literature review
- Model
- Empirical results
  - Aggregate economy
  - Manufacturing sectors
- Conclusion

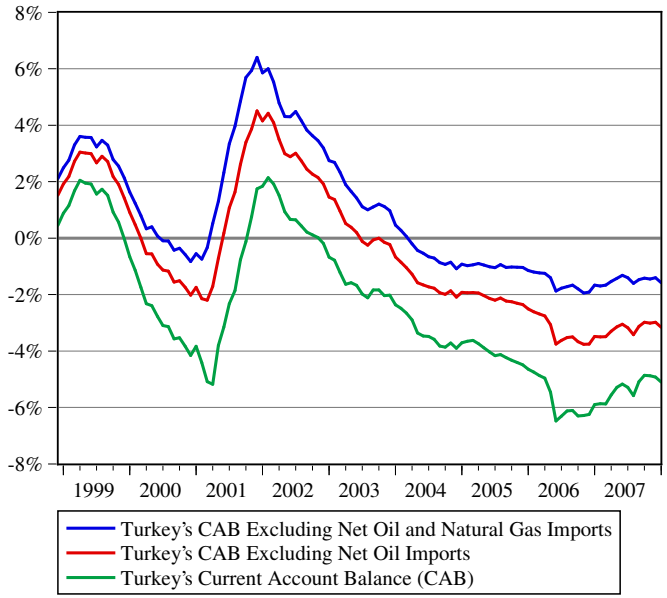
Oil and energy use in Turkey

Oil Consumption as a Percentage to Turkey's GDP



Source: Central Bank of Turkey and General Directorate of Petroleum Affairs

Annualized Current Account Balance of Turkey as a Ratio to Turkey's Nominal GDP

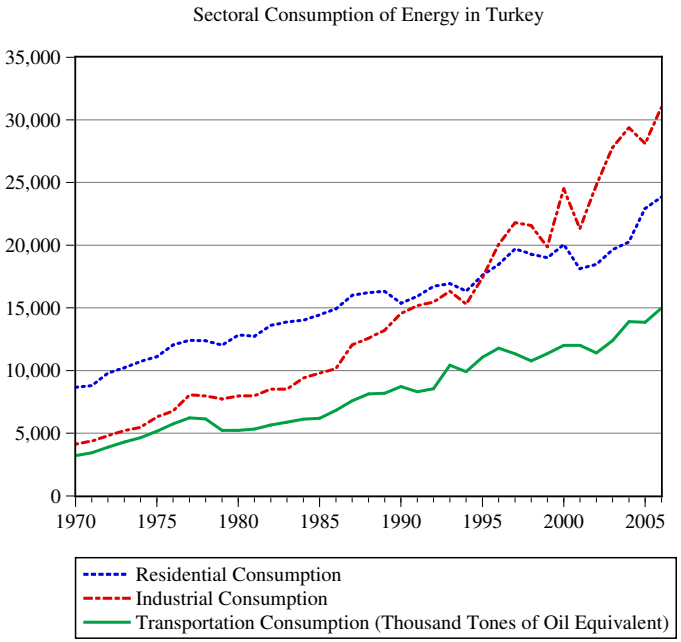


Source: Central Bank of Turkey and Turkish Statistical Institute

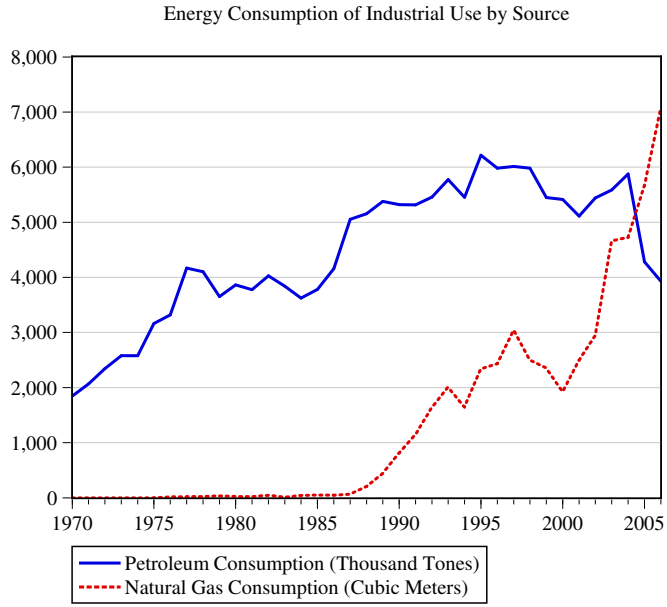
Oil and oil derivative consumption:

- 35% primary source of energy
- 3% of Turkey's GDP
- 90% provided by imports
- 38% of current account deficit

Oil and energy use in Turkey (cont'd)



Source: Ministry of Energy and Natural Resources of Turkey



(Source: Ministry of Energy and Natural Resources of Turkey)

- Demand for energy increasing faster in industrial usage compared to transportation and residential consumption
- Decreasing share of oil in manufacturing sectors
- Importance of natural gas increasing over time for industrial and residential consumptions

Literature review

- Hamilton (1983)
  - Unilateral negative causality from oil prices to the U.S. GNP
- Mork (1989)
  - Asymmetry present, threshold variable introduced
- Lee *et al.* (1995)
  - Asymmetry verified, volatility-based variable introduced
- Hamilton (1996)
  - Asymmetry confirmed,maximum past-price-based variable introduced
- Jiménez-Rodríguez and Sánchez (2005)
  - Relation valid for many of developed countries
- Blanchard and Galí (2007)
  - Disappearing effects of oil prices on output

Our contribution

- Exclusive investigation of a net oil importing small open economy
- Incorporation of global liquidity conditions
- Use of high-frequency data to capture dynamic effects

Model

- Bivariate VAR(13)
  - Real oil price, real GDP
- Multivariate SVAR(13)
  - Real oil price,FFR, VIX, domestic interest rate, real GDP
  - Short-term restriction matrix as

$$\begin{bmatrix} \epsilon_{ot} \\ \epsilon_{ft} \\ \epsilon_{vt} \\ \epsilon_{it} \\ \epsilon_{yt} \end{bmatrix} = \begin{bmatrix} b_{11} & 0 & 0 & 0 & 0 \\ b_{21} & b_{22} & 0 & 0 & 0 \\ b_{31} & b_{32} & b_{33} & 0 & 0 \\ b_{41} & b_{42} & b_{43} & b_{44} & 0 \\ 0 & b_{52} & b_{53} & b_{54} & b_{55} \end{bmatrix} \begin{bmatrix} u_{ot} \\ u_{ft} \\ u_{vt} \\ u_{it} \\ u_{yt} \end{bmatrix}$$

- Derived accumulated impulse-response functions
- Robustness check with asymmetric variables

Mork's (1989) oil price increase

$$o_t^+ = \begin{cases} o_t & \text{if } o_t > 0 \\ 0 & \text{else.} \end{cases}$$

Lee *et al.*'s (1995) scaled oil price increase (SOPI)

$o_t = \alpha_0 + \alpha_1 o_{t-1} + \ldots + \alpha_{12} o_{t-12}$

where $(u_t | u_{t-1}) \sim N(0, \sigma_t^2)$

$\sigma_t^2 = \gamma_0 + \gamma_1 \sigma_{t-1}^2 + \gamma_2 u_{t-1}^2$

$SOPI_t = \max\{0, (\hat{u}_t / \hat{\sigma}_t)\}$

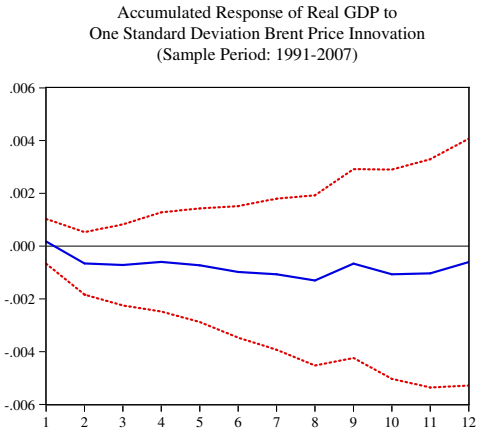
Hamilton's (1996) net oil price increase (NOPI)

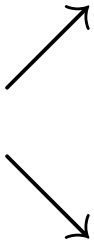
$NOPI_t^{36} = \max\{0, \eta_t\}$

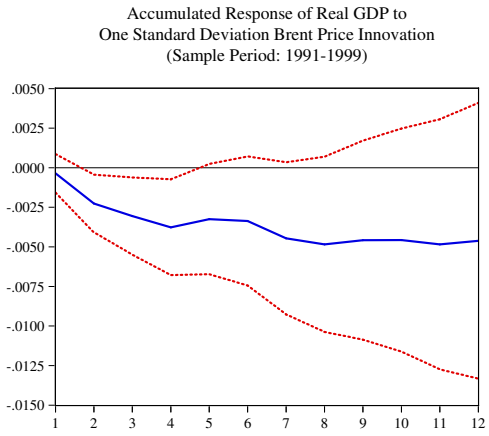
where

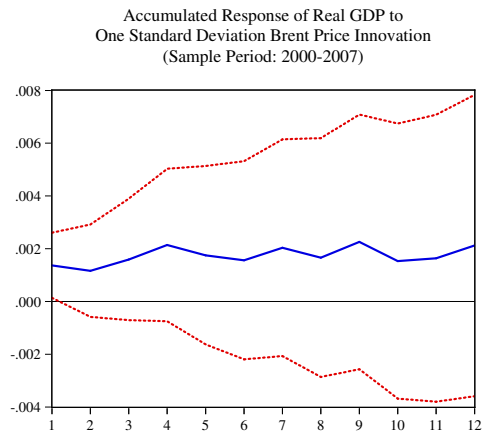
$\eta_t = p_t - \max\{p_{t-1}, \ldots, p_{t-36}\}$

Empirical results: Excluding global liquidity



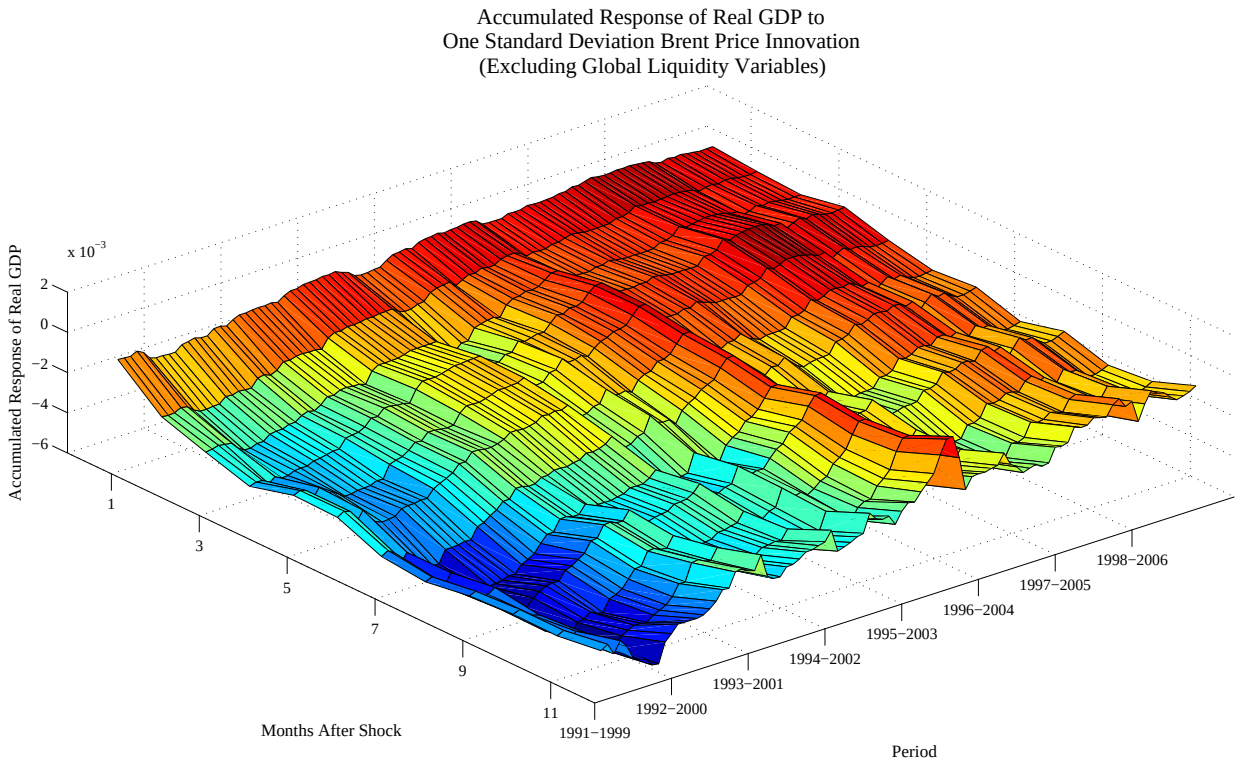






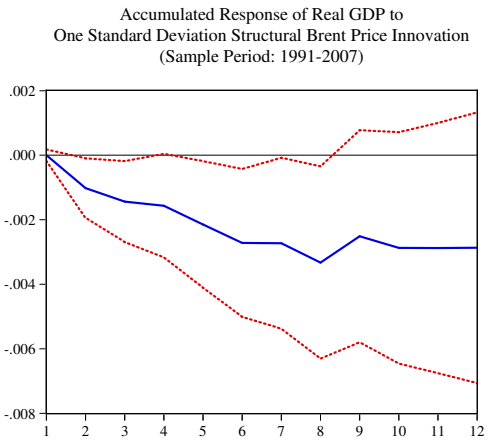
- Negative, yet insignificant response for the whole sample
- Negative, and significant response for the first period
- Positive, yet insignificant response for the second period

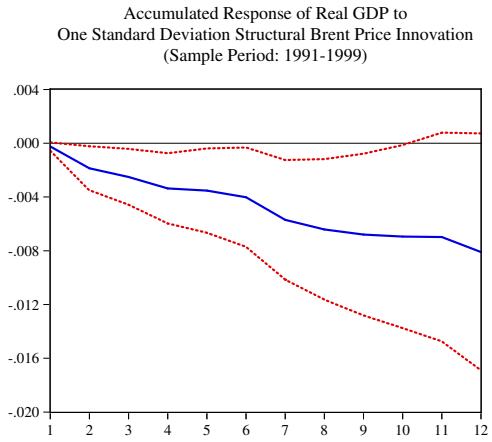
Empirical results: Excluding global liquidity (cont'd)

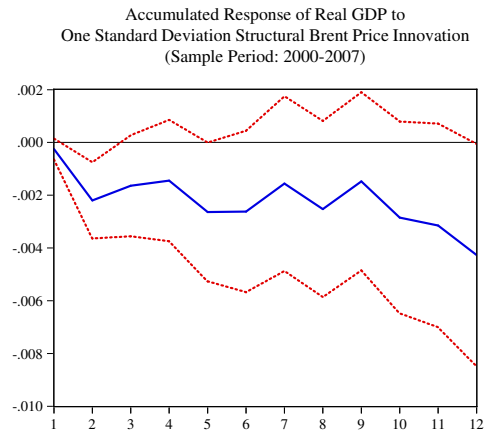


- Diminishing response of output
- Disappearing statistical significance

Empirical results: Including global liquidity

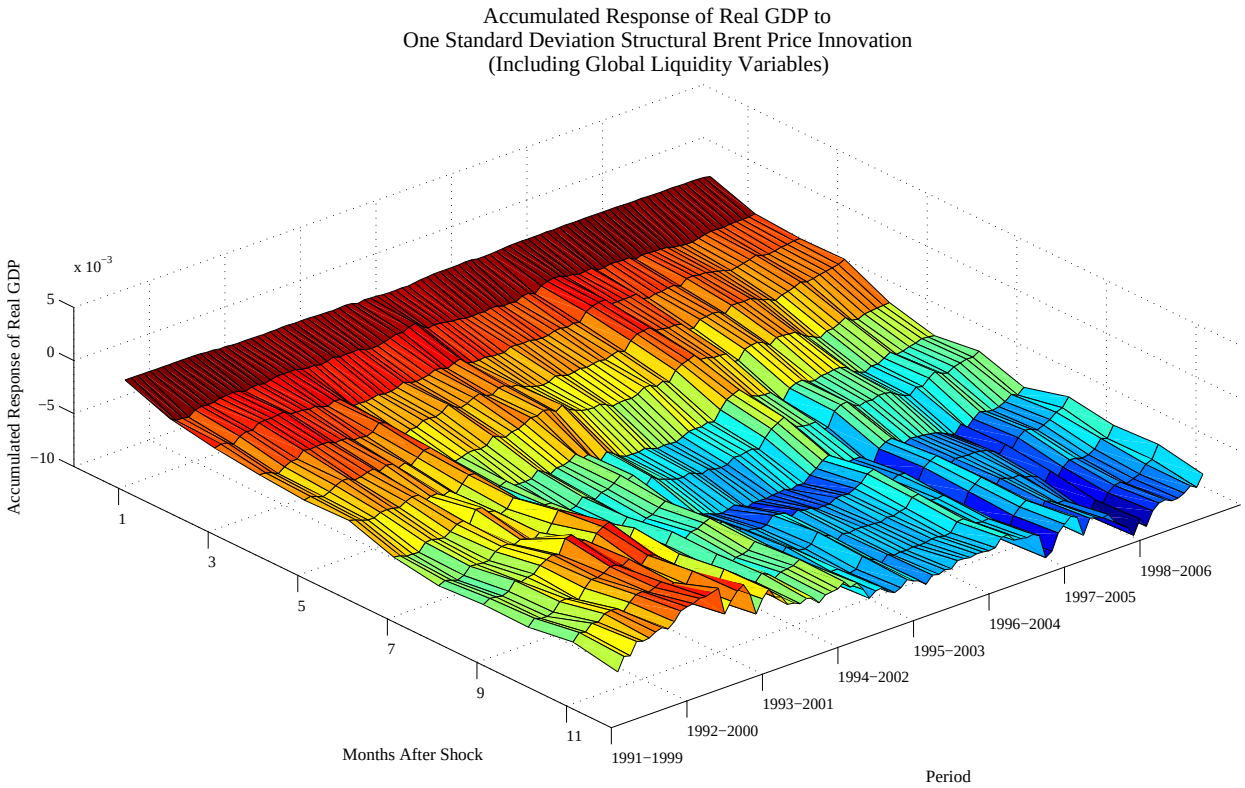






- Negative, and significant response for whole period, as well as sub-periods
- Significance disappear once global liquidity variables excluded
- Positive and significant responses of FFR and domestic interest rate

Empirical results: Including global liquidity (cont'd)



- Relatively stable responses over time
- Slightly increasing responses in absolute value

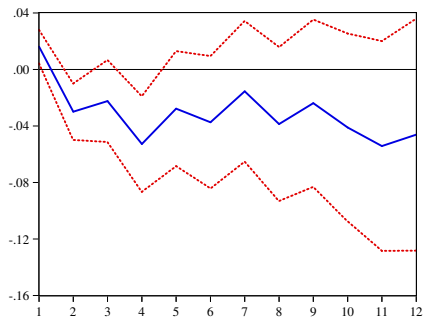
Empirical results: Manufacturing sectors

- Bivariate and Multivariate VARs
  - IPI and Manufacturing sector indices instead of real GDP
- Real exchange rate included
- Crude oil prices $\nrightarrow$ manufacturing sectors
- Oil derivative price index employed
  - Diesel oil, gasoline, kerosene, heating oil and fuel oil

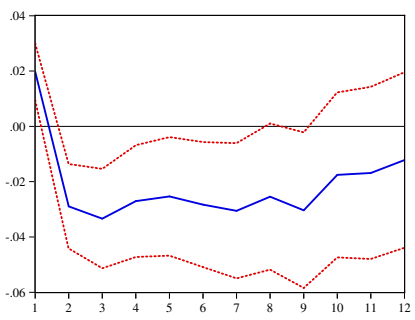
Empirical results: Manufacturing sectors (cont'd)

- Derived real oil price index $\nrightarrow$ Overall manufacturing sector
- Derived real oil price index $\rightarrow$
  - Wood and wood products
  - Chemicals and chemical products
  - Rubber and plastic products

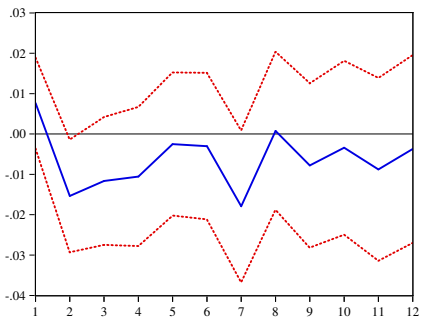
Man. of Wood and Wood Products



Man. of Chemicals and Chemical Products



Man. of Rubber and Plastic Products



- Strong evidence for
  - Electrical machinery
  - Radio, TV and communication apparatus sectors
- Asymmetry present
- Multivariate variables heterogeneously essential

Conclusion

- Excluding global liquidity and financial conditions, diminishing significance and response
- Including global liquidity and financial conditions, stable significance and response
- Positive and significant responses of FFR and domestic interest rate
- Essentiality of oil derivative rather than crude oil prices for manufacturing sectors
- Manufacturing sectors of wood products, chemical products, rubber and plastic products, electrical machinery, and communication devices highly prone to negative effects

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