OPEC and Non-OPEC Production, World's Demand, and the Financialization of Oil

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Outline

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The Objective

Empirically examine factors influencing oil prices and OPEC's role in light of changes in the global oil market, accounting for

- The increasing importance of non-OPEC producers, including U.S. producers,
- World's demand,
- China's role as a significant export market, and
- The financialization of oil

Why it is Important

- The 1986 oil price shock led scholars to question OPEC's influence on the global oil market and oil prices; although market fundamentals differ greatly from 1986, the 2014 oil price drop has revived this debate (Dées et al. 2003; Kaufmann et al. 2004; Büyükşahin et al. 2016b; Cherney 2016).

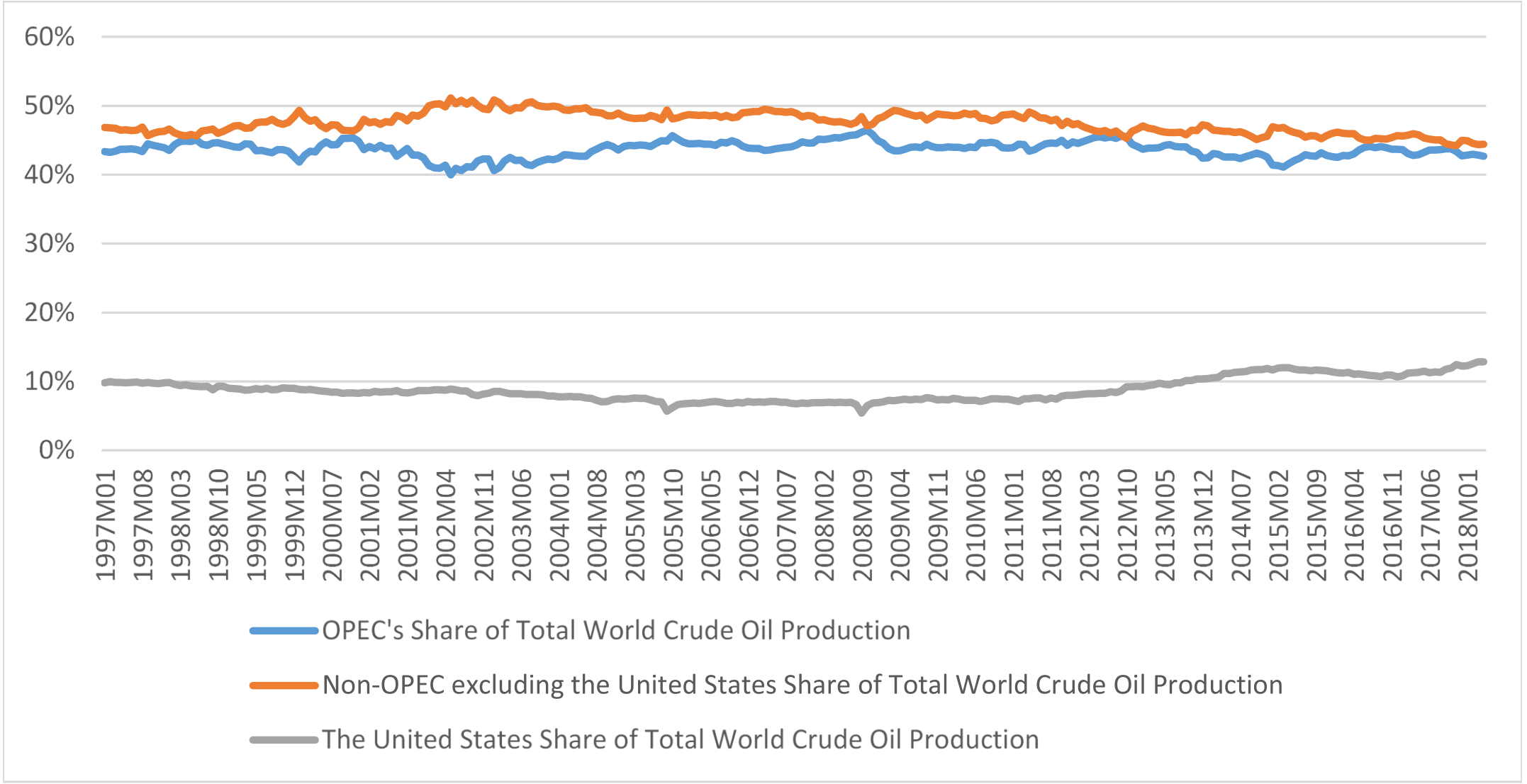
- This debate reveals the need for a better understanding of oil market dynamics.

Does OPEC Still matter?

How do OPEC and non-OPEC oil production, world's oil demand, and the role of oil as a financial asset influence oil prices?

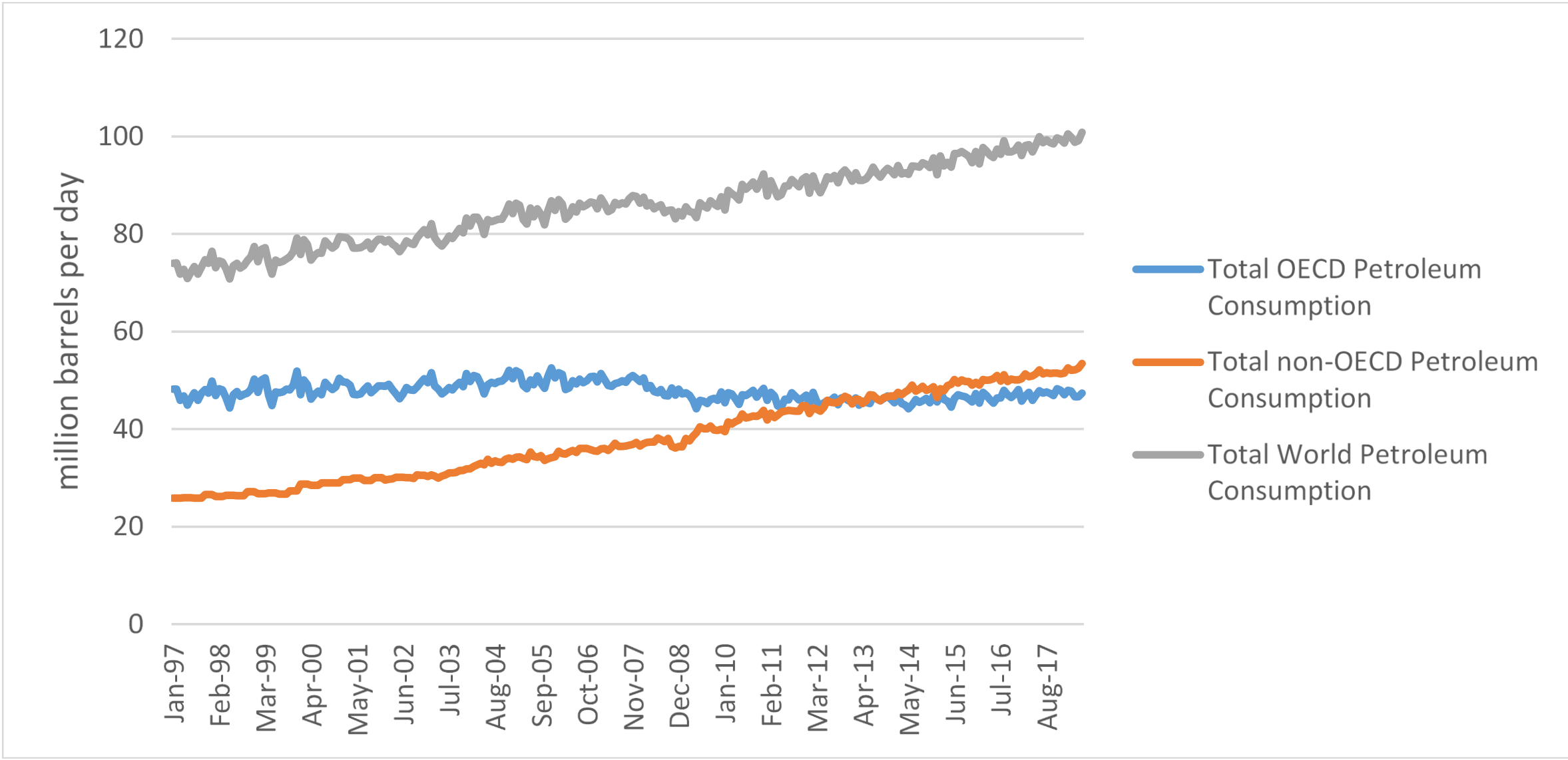
What is the mechanism through which China affects oil prices?

Figure 1. Share of Total World Crude Oil Production (1997M01 -2018M04)



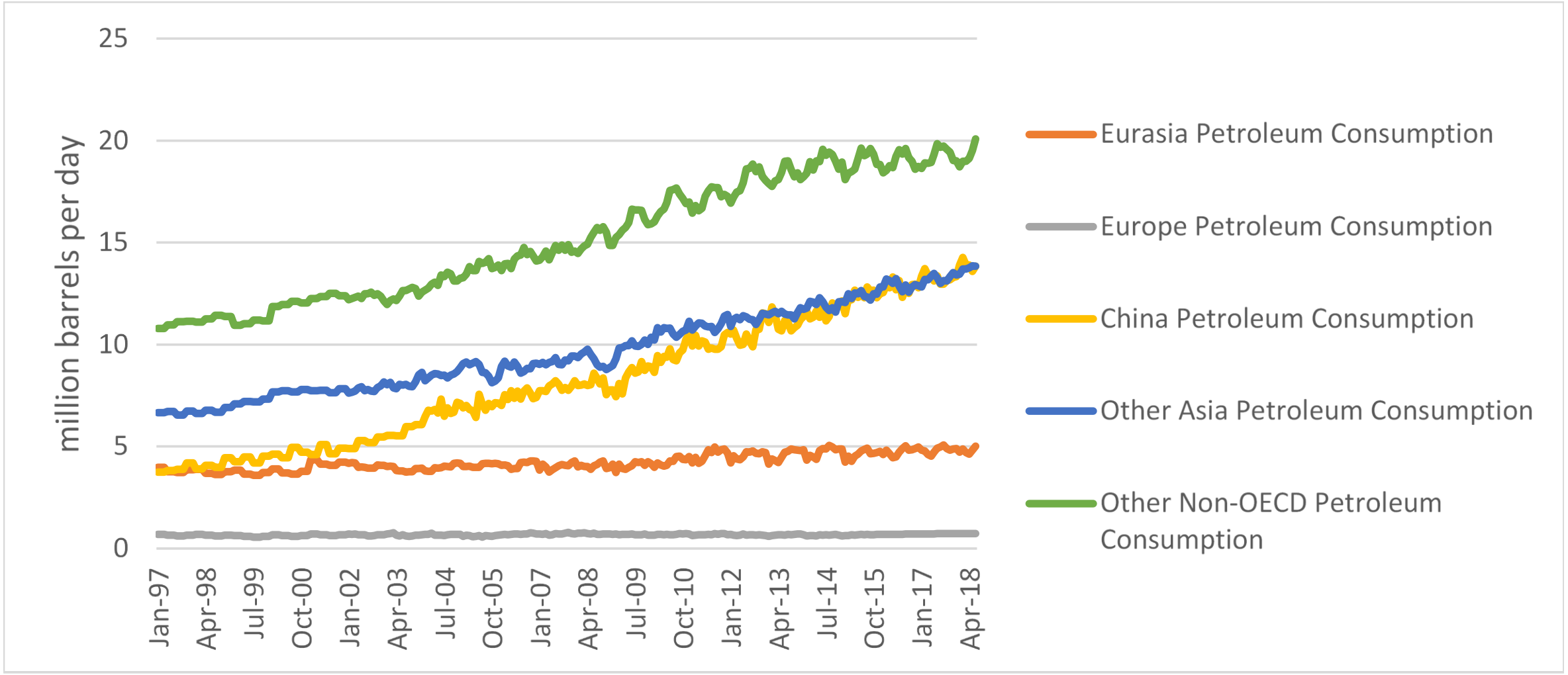
Source: EIA

Figure 1. World, OECD, and Non-OECD Petroleum Consumption (1997M01 -2018M06)



Source: EIA

Figure 1. Non-OECD Petroleum Consumption (1997M01 -2018M06)



Source: EIA

Why it is Important (Cont'd)

- Expansionary production policies that privileged revenue while neglecting potential impacts of fluctuating supply volumes on prices, render oil producers unable to engage in price wars (Mabro 1998).

- Oil price movements affect terms of trade, incomes, wealth, inflation, exchange rates and employment, making oil exporters vulnerable to oil price shocks.

- It is important to understand the global oil market structure and assess the impact of changing market dynamics.

Literature Review

- EIA (2018)
- Pierru et al. (2018): OPEC's spare capacity had a positive impact on global macroeconomy, do not include the 2014 oil price drop
- Behar and Ritz (2017): uses calibration and accounts for shale production and current changes in market fundamentals
- Kaufman et al. (2004): applied time series analyses; but did not account for the shale revolution and recent changes in market dynamics.
- Ratti and Vespignani (2015) and Niklaus and Inchauspe (2013): employed VAR techniques to investigate OPEC versus non-OPEC behavior. The former accounted for global oil demand and the latter studied China's demand; however, their time periods ended in 2012.
- Kaufman et al. (2004), Ratti and Vespignani (2015), Niklaus and Inchauspe (2013) did not account for the impact of cyclical effects.

Literature Review (Cont'd)

- Büyükşahin et al. (2016) utilized an asymmetric band pass filter and Cuaresma et al. (2009) and Mu and Ye (2015) employed UCM to study cyclical movements and structural changes; however, those models did not include economic fundamentals.

- The above set of literature does not account for the role of oil as an asset. Although Caballero et al. (2008) and Fratzscher et al. (2014) examined this role, they did not consider oil market dynamics.

Contribution

We build on Kaufman et al. (2004), Ratti and Vespignani (2015) and the EIA (2018).

We extend these analyses by considering

- the 2014 prolonged oil price drop,
- OPEC and non-OPEC production,
- global demand for oil as well as China's demand, and
- the role of oil as a financial asset

and employing a VAR model which accounts for cyclical movements.

Methodology

VAR is used to simultaneously examine variables of interest, allowing interaction and feedback effects among them.

$$Y_t = A_0 + A_1 Y_{t-1} + \varphi D_t + e_t$$

where D_t is a $(dx1)$ matrix that includes exogenous deterministic components, and φ is a parameter matrix.

- A quadratic trend is significant for all variables of interest. The unit root results for the detrended variables after removing the quadratic trend show the variables are stationary.
- One objective is to account for cyclical movements.
- We employ level forms of all variables and include a quadratic trend.
- IRF, FEVD, Granger Causality

Data

$$\begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ b_{21} & 1 & 0 & 0 & 0 & 0 \\ b_{31} & b_{32} & 1 & 0 & 0 & 0 \\ b_{41} & b_{42} & b_{43} & 1 & 0 & 0 \\ b_{51} & b_{52} & b_{53} & b_{54} & 1 & 0 \\ b_{61} & b_{62} & b_{63} & b_{64} & b_{65} & 1 \end{bmatrix} \begin{bmatrix} REER_t \\ TSX_t \\ NOPECP_t \\ OPECP_t \\ WCons_t \\ PO_t \end{bmatrix} = \begin{bmatrix} b_{10} \\ b_{20} \\ b_{30} \\ b_{40} \\ b_{50} \\ b_{60} \end{bmatrix} + \begin{bmatrix} \gamma_{11} & \gamma_{12} & \gamma_{13} & \gamma_{14} & \gamma_{15} & \gamma_{16} \\ \gamma_{21} & \gamma_{22} & \gamma_{23} & \gamma_{24} & \gamma_{25} & \gamma_{26} \\ \gamma_{31} & \gamma_{32} & \gamma_{33} & \gamma_{34} & \gamma_{35} & \gamma_{36} \\ \gamma_{41} & \gamma_{42} & \gamma_{43} & \gamma_{44} & \gamma_{45} & \gamma_{46} \\ \gamma_{51} & \gamma_{52} & \gamma_{53} & \gamma_{54} & \gamma_{55} & \gamma_{56} \\ \gamma_{61} & \gamma_{62} & \gamma_{63} & \gamma_{64} & \gamma_{65} & \gamma_{66} \end{bmatrix} \begin{bmatrix} REER_{t-1} \\ TSX_{t-1} \\ NOPECP_{t-1} \\ OPECP_{t-1} \\ WCons_{t-1} \\ PO_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{REER_t} \\ \varepsilon_{TSX_t} \\ \varepsilon_{NOPECP_t} \\ \varepsilon_{OPECP_t} \\ \varepsilon_{WCons_t} \\ \varepsilon_{PO_t} \end{bmatrix}$$

$REER_t$ is U.S. REER, TSX_t is the TSX composite price index, $NOPECP_t$ is non-OPEC crude oil production, $OPECP_t$ is OPEC crude oil production, $WCons_t$ is world petroleum demand, and PO_t is Brent oil price.

1997:01 and 2018:04: described by Hamilton (2013) and Ratti and Vespignani (2015) as “a new industrial age” characterized by remarkable economic growth in emerging economies.

Robustness

- S&P commodity spot index, S&P 500, total open futures
- Results are robust to different orderings and variations of the model.
- Real Price of oil
- Dummy variables
- Seasonal Dummy variables instead of seasonally adjusted variables
- U.S. crude oil production in place of total non-OPEC production
- China’s Demand in place of World’s Demand
- China and the rest of the world, OPEC, the U.S., and the remaining non-OPEC countries production.
- 1965-2017 annual data, focusing on production and consumption.

Main Findings

- It is important to separate U.S. production from other non-OPEC production, and separate China's demand from the rest of the world's demand to capture how interactions between different players in the market affect oil prices, world demand, and production.

- Oil price changes are attributable primarily to changes in the rest of the world's demand and the role of oil as a financial asset.

- The rest of the world's demand significantly and directly affects oil prices. China's direct impact on oil prices is insignificant and China's demand explains relatively less of the oil price variation than the rest of the variables.

Main Findings (Cont'd)

- The chief driver of OPEC production is the rest of the world's demand, which is affected mainly by U.S. production and China's demand. OPEC has an imperative role in balancing the market.

- U.S. production could have a positive impact on oil prices due to high production costs; however, such an effect is short-lived.

- U.S. production has a larger impact on oil prices than OPEC production at shorter time horizons, whereas OPEC production has a larger impact at longer time horizons.

Main Findings (Cont'd)

- U.S. and the rest of non-OPEC production respond to market conditions, including oil price movements and each other, as well as OPEC production.

- China's demand explains some of the variation in U.S. production, whereas the rest of the world's demand explains some of the variation in other non-OPEC production.

- In this context, although other non-OPEC production responds to market conditions, it is useful to note the role it tends to play in balancing the market, as reflected in its response to world demand.

Main Findings (Cont'd)

- China's demand is mainly driven by the rest of the world's demand, U.S. production, and the TSX index, followed by the U.S. REER.

- China's impact on world demand and consequently on oil prices is not driven by the usual story of a surge in domestic demand, but rather by a surge in China's exports of refined products. This is reflected through the impact of the China variable on and its response to the rest of the world's demand.

Conclusion

(a) OPEC significantly balances oil markets, implying that OPEC still matters

(b) The role of oil as a financial asset is integral in explaining oil price movements

(c) U.S. oil production affects oil prices, but the influence of other non-OPEC production should not be underestimated

(d) China's demand for crude oil affects oil prices, but focusing on China rather than global demand overlooks other important market segments and dynamics in the oil market and global economy

(e) China's impact on oil prices is driven by exports of refined products as well as domestic demand.