

# **DEMOGRAPHIC CHANGE AND THE RISING OIL DEMAND IN OPEC**

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## **Overview**

The world's largest oil supplier, the Organization of Petroleum Exporting Countries (OPEC), is quickly becoming a major consumer of its own product. During the past few decades, domestic oil consumption in OPEC member countries has increased to one quarter of its total production, rivaling international demand from other important oil consumers including United States, China and Europe (Gately et al., 2013). One of the main structural forces underlying the surge in oil demand is OPEC's rapidly growing population. Thanks to the improvements in life expectancy and the relatively slow decline of fertility, total population in OPEC countries have been growing at 2.33% per annum between 1970 and 2014, and increasingly concentrated in the working ages (between 15 and 64). Since growing domestic demand undermines OPEC's ability to profit from exports to the international market, and may also lead to greater price volatility, it is crucial to understand the effects of the changing demographics on oil demand within these countries, so that policymakers and other stakeholders can make informed decision. To achieve this goal, this research investigates the demand of two oil products, gasoline and distillate oil (diesel and fuel oil), and using panel data from nine OPEC member countries: *Algeria, Iran, Kuwait, Libya, Nigeria, Qatar, Saudi Arabia, United Arab Emirates and Venezuela*. Two main demographic factors, i.e. size and age structure of the population, along with income and price subsidies are accounted for as main determinants of oil demand.

## **Data & Methods**

Panel data are collected and compiled for the nine OPEC countries for the period 1995-2014. The size of total population and the share of working age cohort are the two demographic variables employed to respectively reflect the extensive and intensive aspects of oil consumption by the population. Income is represented by real GDP per capita. These data are primarily from World Bank, with missing information being furnished with data from UN and IMF. Aggregate consumptions of gasoline and diesel oil are reported by The World Energy Balance (IEA, 2016). Prices of the two oil products are compiled from GIZ international fuel prices database and data provided in Coady et al. (2010), with missing values supplemented by data from various issues of OPEC Annual Statistical Bulletin.

Several panel unit root tests, including those developed by Pesaran (2007), Im et al. (2003), Breitung (2000), Hadri (2000), and Maddala and Wu (1999) are employed to account for the nonstationarity of the data. The Pedroni panel cointegration test (Pedroni, 2004) and Fully Modified OLS approach are then applied to check for cointegration and estimate long run elasticities, respectively.

## **Results**

Gasoline is mostly used for transportation in the residential sector, whereas diesel oil is more used in the industrial and commercial sectors, primarily for large vehicles and heavy machinery, and power generation. The results are quite consistent with intuition based on the distinctions of the two fuel types. Population size is significant in both cases. The same finding is also true for share of 15-64 age group in total population with larger elasticities. The significant and positive effect of population and the age group on gasoline and distillate oil consumption is theoretically consistent with STIRPAT framework and empirically is in line with prior studies.

The long-run impact of diesel price on its consumption was found negative and significant while price of gasoline does not provide explanatory power in explaining gasoline consumption. Possible explanation for these findings is that although both diesel and gasoline prices are considerably cheap in the selected countries, diesel is mainly used by industry and other business sectors and they respond to price changes accordingly because of their profit margin. However, it is not the case for gasoline as it is mainly used for transportation in the residential sector. This probably suggests that even though both residential and business sectors rely on cheap energy supply, businesses are more responsive to the incurred costs and quicker to adjust consumption in the face of price changes.

## Conclusions

This research investigates the impacts of demographic change (as represented by population growth and age structure change), income and price subsidy on the consumption of gasoline and distillate oil products in nine OPEC member countries. The results suggest that total population and working age structure are important for both products. Since the rapid population growth and young age structure are projected to persist in the near future, oil consumption may continue to grow at a fast pace in the coming decades, despite increasing efforts in OPEC countries to curb domestic consumption through policy reform such as subsidy reduction. The policy implications of this research is that as a main driver of oil consumption, demographic change should deserve more attention.

## References

- Breitung, J. (2000): "The local power of some unit root tests for panel data." In *Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, edited by Badi H. Baltagi, Thomas B. Fomby and R. Carter Hill, 161-177. Emerald Group Publishing.
- Chakravorty, U., F. Fesharaki and S. Zhou (2000): "Domestic demand for petroleum in OPEC countries." *OPEC Review* 24 (1):23-52.
- Coady, D., R. Gillingham, R. Ossowski, J. Piotrowski, S. Tareq and Justin Tyson (2010): "Petroleum product subsidies: costly, inequitable, and rising." IMF Staff Position Note. International Monetary Fund.
- Gately, D., N. Al-Yousef and H. M. H. Al-Sheikh (2013): "The rapid growth of OPEC's domestic oil consumption." *Energy Policy* 62:844-859.
- Hadri, K. (2000): "Testing for stationarity in heterogeneous panel data." *The Econometrics Journal* 3 (2):148-161.
- Im, K. S., M. H. Pesaran and Y. Shin (2003): "Testing for unit roots in heterogeneous panels." *Journal of Econometrics* 115 (1):53-74.
- Maddala, G. S. and S. Wu (1999): "A comparative study of unit root tests with panel data and a new simple test." *Oxford Bulletin of Economics and statistics* 61 (S1):631-652.
- Pedroni, P. (2004): "Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis." *Econometric Theory* 20 (3):597-625.
- Pesaran, M. H. (2004): "General diagnostic tests for cross section dependence in panels." In *Cambridge Working Papers in Economics*: University of Cambridge.
- Pesaran, M. H. (2006): "Estimation and inference in large heterogeneous panels with a multifactor error structure." *Econometrica* 74 (4):967-1012.
- Pesaran, M. H. (2007): "A simple panel unit root test in the presence of cross-section dependence." *Journal of Applied Econometrics* 22 (2):265-312.
- Pesaran, M. H., A. Ullah and T. Yamagata. (2008): "A bias-adjusted LM test of error cross-section independence." *The Econometrics Journal* 11 (1):105-127.