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Price volatility and demand for oil: A comparative analysis of developed and developing countries



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ABSTRACT

During the past three decades the global oil market has seen significant price volatility. Literature to date has not analysed the cross-country effect of the recent episode of price instability. Previous studies have either not considered this period or have not utilised panel data techniques and therefore have not provided a comparative analysis of developed and developing countries. This paper explores the income and price elasticities between these two country groups and discusses the economic implication of the results. We use a panel data analysis accounting for income and price asymmetry and apply the dynamic fixed-effects methodology to separate panels for developed and developing countries for the period 1980–2012. Sixteen countries are included in this analysis which account for over 65% of total global oil consumption. A particular focus is on the income and substitution effects. The results indicate heterogeneous response to oil price shocks. Developing countries have an income effect 6.3 times stronger than developed countries. The substitution effect in developed countries is 2.1 times stronger than in developing countries. Policy recommendations include the pursuing of oil-efficiency improving technology, and ensuring that regional consumption pattern variations are considered in policy formation.

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1. Introduction

Global energy consumption is valued at around \$3.65 trillion annually, making up approximately 5% of global GDP (BP, 2014; World Bank, 2014). More than one-third of world energy use is from oil, more than any other fuel (Rubin, 2012). Especially, oil as a transit fuel is of paramount importance for the economies worldwide. The volatility of global oil prices is, therefore, widely viewed as a source of concern for the world economy. At the same time, we have witnessed rapid economic growth in emerging economies and the rising living standards in these countries has seen a strong increase in oil usage. The developing countries are climbing the ‘energy ladder’ and moving to industrial enterprise.

The price of oil is important for most economic activities. Rubin (2012, p. 33) states an oil shock can “deep-six” an economy, as other consumption suffers as the effect of high oil prices is transmitted to the wider economy. Historical oil price shocks were caused primarily by supply disruptions and are strongly correlated with major geopolitical disturbances (Hamilton, 2003). Baumeister and Lutz (2016) give a recent review of previous oil price shocks. In the 2007–2008 price increase, no major war or instability is attributed to the shock. In fact supply remained constant (BP, 2014). The main cause suggested was a shock to demand. Hamilton (2009) postulated the cause as a classic shortage situation. The increased global

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demand required significant supply increases to sustain the pre-shock price level. This was not experienced and the primary issue was scarcity due to a demand shock.

The distribution of oil consumption is also changing. Demand in China is expected to surpass the US in 2029 and non-OECD Asian demand is expected to grow by six million-barrels per day through to 2030 (BP, 2013). In contrast, in OECD countries, demand fell between 2006–08 with the price increases suspected to have played a role (Wurzel et al., 2009). Yet the disparate consumption pattern between developing and developed countries is only scarcely analysed. A hypothesis is that the elasticities of income and price vary between developed and developing countries. Consideration of elasticities is taken by previous papers e.g. Gately and Huntington (2002) and Hamilton (1983).

This paper analyses the oil consumption effects of developed and developing countries during the period of an oil price shock. We use two cross-country panels which enable the comparison of consumption patterns between the two country groups (Appendix). We also use decomposition of the price and income series to account for asymmetric effect of these on consumption. In developing countries demand is expected to be fuelled by economic expansion (income effect), whereas, in developed economies, the substitution effect plays a larger role. Price elasticity of demand for oil should vary between the two panels. The period of analysis is 1980–2012, which provides a wide coverage of oil price instability and considers a more up to date panel than has previously been published.

The paper is structured as follows: Section 2 reviews the literature on the oil market and the development in estimation techniques. Section 3 considers the driving forces of an oil price shock and analyses their significance in the 2007–08 price shock. Section 4 sets out the methodology which underpins the analysis undertaken. Section 5 presents and interprets the results and establishes policy implications. Section 6 is conclusions.

2. Previous studies of oil price and consumption

The literature surrounding the economics of the oil market has evolved considerably since the 1970's. Studies initially sought to establish how oil consumption and other macroeconomic indicators were interrelated. Since the late 1980's, the use of asymmetric decomposition has been applied however there is varied support for its relevance. Newer studies have focused more on the developing economies and their growing energy demands. For example, Ratti and Vespignani (2015, 2013) found that increased liquidity in developing countries such as China and India had a large effect on real oil price increases.

A cross-country panel data analysis can aid understanding of global consumption patterns. However, due to the proximity of the recent oil shock there is a scarcity of literature investigating its economic impact.

Hamilton (1983) in his seminal work discussed the relationship with oil consumption and the wider economy. The paper highlights that all US recessions are preceded by an oil shock, where typically an increase in oil prices is followed 3–4 quarters later with a shock to domestic output. The study illustrated one of the first explicit relationships between oil and the lagged transmission to the economy and used causality testing to establish that the oil price was a key factor in the signalling of recession. Numerous studies following Hamilton (1983) have found a relationship between oil consumption and variables such as income, inflation, and exchange rates. Burbidge and Harrison (1984) find that during the period 1962–1981 in Canada, Japan, West Germany, USA and UK a shock of one-deviation to oil price leads to a rise in wages and inflation. They also found a significant decline in industrial production (a proxy for growth) following the shock in the US and UK though the effect is less significant in other countries.

Despite these findings the macroeconomic relationship has been questioned. Mork (1989) noted that in the period investigated in Hamilton's study all price movements were positive and questioned if the relationship would hold in periods of price decline. Through specifying separate variables for price increases and decreases, Mork mirrors the results of Hamilton (1983) during price increases. However, for price declines the result is statistically insignificant. Consequently, only positive price changes appear to transmit to the US economy. One must consider if such results would also hold for developing economies.

The asymmetry of oil prices was investigated using a Koyck (1954) lag-demand function with an additional price and/or income decomposition term in Gately and Huntington (2002). Results for OECD countries echo the findings of Mork (1989)—that price increases have greater effect on demand for oil than price decreases. Therefore failure to account for price asymmetry may bias estimations of demand. OECD countries experience an income response, which is “dramatically different from its effect in the developing countries” (Gately and Huntington, 2002, p. 16).

Indeed, the *global* effect may be negligible but that is a net effect. Comparison of developing versus developed economies yields different results. Rubin (2012) considers in the present scenario where oil demand is outstripping supply to be a ‘zero-sum’ situation. The analysis shows that emerging economies are price insensitive to oil in comparison to the industrialised economies. In part this is attributable to China and India experiencing large increases in income. This is due to what he describes as a “transformational development in the way life is lived” Rubin (2012, p. 142). It is argued that as the living standards change the income elasticity will be nearing unity.

There is a gap in the literature on economic impact of oil price shocks in developing countries. Tang et al. (2010) consider the Chinese economy, and observed that a rise in oil price leads to an increase in inflation and interest, but a negative effect on output and investment. The authors highlight the price controls and that they prevent the market from operating. Nonetheless, China reacts to price shocks, however this is significantly dampened as a result of price controls. They show

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