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Estimating the effects of global oil market shocks on Australian merchandise trade

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ABSTRACT

In this paper, we examine the dynamic responses of Australian merchandise trade to global oil market structural shocks. The analysis employs monthly data over the period June 1986 to January 2013 and vector generalized autoregressive conditional heteroscedasticity (VGARCH), structural vector autoregression (SVAR), and parametric nonlinear models. We find that an increase in the oil price driven by shocks in global economic activity exerts a significant influence on Australian merchandise exports, and thereby merchandise trade as a whole, for periods of more than one year. However, the responses of merchandise imports to oil price shocks are more modest and persist for only a few months. Finally, uncertainty in future global oil prices, as measured by volatility in the 3-month-ahead price, strongly and negatively affects Australian international commodity markets.

1. Introduction

Since it was first refined in China around 2000 BC, oil has increasingly dominated almost every aspect of the global economy. For instance, numerous studies conclude that increasing oil prices forecast most recessions in the modern era. For example, in seminal work, Hamilton (1983) observed that an oil price increase has preceded all post-WWII US recessions other than in the 1960s. Subsequently, many studies have confirmed Hamilton's (1983) finding, although some suggest that the 1973, 1979 and 1990 recessions in the US are more attributable to monetary policy than any oil price shocks (Burbidge and Harrison, 1984; Gisser and Goodwin, 1986; Bernanke et al., 1997).

Nevertheless, as a tradable commodity, most consider oil as a primary impetus for international trade, with oil price volatility accounting for major uncertainty in the future prices of nearly all goods and services. In turn, this encourages consumers to postpone their purchases of durable commodities and for firms to delay investment. Assume international trade to be a function of aggregate expenditure, the resultant weakening of current aggregate demand given the decline in domestic consumption and investment may reduce the volume of international trade.

As a macroeconomic sector forming economic output, international trade transfers the effects of global oil price shocks to GDP, with most extant research suggesting that oil price shocks have a significant influence on international trade. For

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instance, Backus and Crucini (2000) showed that oil price movements explain much of the changes in global trade during the period between 1972 and 1987. Employing a dynamic equilibrium model for eight developed countries, Backus and Crucini (2000) concluded that oil prices and not exchange rates more accurately explain the terms of trade. Using a structural vector autoregression (SVAR) model, Otto (2003) confirmed the positive relationship between oil price shocks and the terms of trade, and more importantly, demonstrated a similar relationship for both developed and developing countries.

Likewise, Baffes (2007) concluded that oil price shocks have strong effects on the prices of traded commodities. Using annual data for 35 primary commodities traded internationally during 1960–2005, Baffes (2007) argued that increases in oil prices reduce industrial production through declining disposable income. Finally, using an autoregressive distributed lags (ARDL) model, Hassan and Zaman (2012) concluded that oil price shocks reduce international trade for Pakistan.

Current research suggests that the trade effects of oil price shocks vary depending on different economic circumstances. For example, building upon Backus and Crucini (2000), Bodenstein et al. (2011) found that under complete but not incomplete financial markets, oil price shocks have no effect on the nonoil terms of trade. Chen and Hsu (2012) employed a data set for 84 countries and compared the effects of oil price shocks between net oil importing and exporting countries, showing that oil price shocks have a negative impact on the international trade of the former and an insignificant positive effect on the international trade of the latter.

Lastly, Le and Chang (2013) also observed that the effects of oil price shocks on trade balance are country specific. Using Toda and Yamamoto's (1995) causality test and generalised impulse–response functions, Le and Chang (2013) showed that in Japan, as an oil-importing country, the oil price impacted both oil and nonoil trade balances, whereas in Malaysia, as an oil-exporting country, the causation ran from oil price shocks to oil and overall trade balances. However, in Singapore, as an oil-refining country, there was no such causality detected. Bollino (2007), Kilian et al. (2009), and Korhonen and Ledyaeva (2010) obtained similar results concerning the effects of oil price shocks on trade balances.

Reviewing these studies reveals three major gaps in the literature. Firstly and foremost, no study addresses the effects of oil price shocks on the international trade of an economy with roughly equal oil production and consumption, such as in Australia. Second, there is little evidence addressing the responses of international trade to structural oil market shocks. Accordingly, it is currently unclear whether oil price shocks with separate origins affect the terms of trade identically. Finally, the number of studies employing relatively high-frequency data is somewhat limited, and this is likely to obscure some pertinent features of this sort of analysis.

These motivate us to consider the effects of global oil price shocks with different supply and demand origins on Australia's merchandise trade. To do so, we first estimate the global oil market structural shocks using the SVAR model proposed by Kilian (2009). We then consider possible dynamic nonlinear causation running from oil market shocks to Australia's merchandise trade. Finally, given the importance of uncertainty relating to future oil prices, we calculate oil price volatility using several alternative measurement methods and then analyse impulse–response functions using vector autoregression (VAR).

The remainder of the paper is structured as follows. Section 2 discusses Australia's merchandise trade with its leading trading partners. Sections 3 and 4 present the data, methodology and empirical results, respectively. Finally, Section 5 summarises the main findings.

2. Global oil prices and Australian merchandise trade

Merchandise trade comprises goods that add or subtract from the stock of material resources of a country by entering (imports) or leaving (exports) its economic territory. Goods simply transported through a country (goods in transit), or temporarily admitted or withdrawn (except for goods for inward or outward processing), are not included. For this reason, a major early driver of merchandise trade was shipping and shipping costs. For example, technological progress in international shipping during 1850–1913 led to a significant reduction in the cost of international trade for many countries, including Australia (North, 1958, 1968; Harley, 1980, 1989; Saif and Williamson, 2004). Econometric evidence has subsequently linked recent declines in shipping costs to rapid growth in international trade during early globalisation (Estevadeordal et al., 2003). However, there is no evidence supporting this linkage during the recent years. Overall, countries with adjacent borders and the possibility of land transport account for roughly 23% of global international merchandise trade by value (1%–5% in Africa, the Middle East and Asia, 10%–20% in Latin America, and 25%–35% in Europe and North America) (Hummels, 2007). Obviously, for nonadjacent countries, all merchandise trade is by sea or air.

Australia as a country with no adjacent land neighbours such that only the sea and air modes are available for its international trade. The necessity of trading with partners farther afield has raised Australia's cost of trade compared with many other countries. Consequently, we expect any shock in global oil prices to significantly impact upon its trade volume. Tables 1 and 2 provide some statistics concerning Australia's international trade with its top-10 partners. As shown in Table 1, more than a quarter of Australia's exports, contributing about 5.5% to Australian GDP, are with China and the US, even though both are a significant distance from Australia. Equally importantly, nearly 80% of Australia's export trade volume with these top-10 partners is as merchandise trade. Of Australia's export markets, New Zealand is the closest, but only accounting for about half a percent of merchandise exports.

As shown in Table 2, the composition of Australia's top-10 merchandise importing countries is similar to that for exports, except that India and Taiwan replace Germany and Thailand. Consequently, Australia's imports travel father than its exports. Table 2 also shows that with China accounting for 15% of Australia's total imports, and the US, UK, and Germany another