Energy Policy 72 (2014) 78–86

Contents lists available at ScienceDirect

Energy Policy

journal homepage: www.elsevier.com/locate/enpol

Does China factor matter? An econometric analysis of international crude oil prices

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HIGHLIGHTS

- The paper detects the role of China's crude oil imports in Brent oil price changes.
- China's crude imports do not matter for oil prices in the long run or short run.
- The blame for China's crude imports on oil price changes has no solid evidence.
- Significant causality runs from Brent prices to China's crude oil net imports.
- China's crude imports contribute less to Brent prices than US dollar exchange rate.

ARTICLE INFO

Article history:
Received 11 March 2014
Received in revised form
16 April 2014
Accepted 18 April 2014
Available online 28 May 2014

Keywords:
Crude oil price
Crude oil imports
China factor

ABSTRACT

Whether China's crude oil imports are the culprit of oil price volatility these years has not been quantitatively confirmed. Therefore, this paper empirically investigates the role of China's crude oil net imports in Brent price changes from October 2005 to November 2013 based on an econometric analysis. The results indicate that, during the sample period, China's crude oil imports do not significantly affect Brent price changes, no matter in the long run or short run. Therefore, the blame for China's crude oil imports to cause the dramatic fluctuations of international oil price has no solid evidence. Also, there exists significant uni-directional causality running from the Brent price to China's crude oil imports at the 5% level. Besides, the response of the Brent price to China's crude oil imports is found positive but slight, and the Brent price responds more significantly to US dollar exchange rate and OECD commercial inventory than to China's crude oil imports in the short run. Finally, the contribution of China's crude oil imports to Brent price movement is about 10%, which is less than that of US dollar exchange rate but larger than that of Indian crude oil imports or OECD commercial inventory.

1. Introduction

In the past years, international crude oil price has experienced significant up-and-downs and attracted extensive attention across the world. The historical data indicates that the oil price gradually entered into the high-level stage after the year of 2005 and increased to a record high in July 2008, i.e., $147 per barrel. Afterwards, due to the global financial crisis, world oil demand slashed and oil price dramatically slumped towards about $30 per barrel. Since February 2009, however, oil price has experienced short-term low-level fluctuations and then rebounded continuously. At the end of 2010, oil price reached $100 per barrel again. From 2011 to 2013, oil price remained volatile on a high level with a slight upward trend. Recognizing that crude oil is the basic material and engine of economic activities, a large number of studies have investigated the impact of crude oil price fluctuations on different economic variables, such as GDP, inflation, unemployment, investment, stock prices, exchange rates and fundamental industries. For example, Rogoff (2006) suggests that the increase in oil prices during 2003–2005 has contributed to a 1.5% decrease in global output. Cunado and Gracia (2005) argue that oil price changes may Granger-cause economic growth in Japan, South Korea and Thailand. Lee et al. (1995) imply that the response of GDP to oil price changes depends mainly on the stability of the oil price environment. Specifically, oil price changes in a stable environment are more likely to have greater influence on GDP than in a volatile environment. Bergvall (2004) finds that real oil price shocks explain most of the long-run variance of real exchange

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http://dx.doi.org/10.1016/j.enpol.2014.04.026
0301-4215/

rate in Norway and Denmark. Park and Ratti (2008) indicate that oil price movement may negatively affect stock prices in the US and 13 European countries. In particular, some literature sheds light upon the influence of oil price changes on China's economy. For example, Faria et al. (2009) examine the effect of oil price on China's exports and find that Chinese growth may lead to an increase in oil prices that has a stronger impact on its export competitors, which is due to the large labor force surplus of China. Du et al. (2010) find the significant effect of oil prices on economic growth and inflation in China. Ou et al. (2012) find that China's prices are raised and the responses of China's crude oil price, import price index, producer price index, retail price index and consumer price index to the WTI crude oil price changes weaken gradually during 1997–2011. Zhang and Chen (2014) indicate that the aggregate commodity market is affected by both expected and unexpected oil price volatilities in China and the impact of unexpected oil price volatilities becomes more complex after 2007. Wang and Zhang (2014) investigate the effect of global oil price shocks on China's four fundamental industries, i.e., grains, metals, petrochemicals and oil fats, and find that the asymmetric effect of oil price shocks does exist in the four markets and that the negative oil price shocks have stronger influence on the four markets than the positive shocks do.

In fact, the sharp volatility of oil price is supposed to be driven by numerous factors, such as economic crisis, oil supply and demand, OECD commercial inventory, OPEC behaviors, US dollar exchange rate, local military conflicts, natural hazards, and speculative trading activities (Kaufmann et al., 2004; Adams and Shachmurove, 2008; Zhang et al., 2008; Kaufmann and Ullman, 2009; Zhang and Wei, 2011; Zhang, 2013; Zhang and Wang, 2013). For example, Kaufmann et al. (2004) find that there is statistically significant relationship among real oil prices, OPEC capacity utilization, OPEC quotas, the degree to which OPEC exceeds these production quotas, and OECD stocks of crude oil, and that these variables may Granger-cause real oil prices but real oil prices do not Granger-cause these variables. Zhang et al. (2008) indicate that the influence of US dollar exchange rate proves quite significant in the long term; however, its short-term and instant influence turns out to be quite limited. Zhang and Wei (2011) detect the dynamic influence of advanced stock market risk on WTI crude oil price returns and argue that the influence of advanced stock market risk on the oil market appears significantly time-varying, but not constant; in particular, the American stock market has a larger risk than that of the Japanese and British markets, on average. Zhang (2013) examines the influence of speculative activities on WTI crude oil prices during 2007–2010 and finds that the instantaneous feedback of speculators' position changes on crude oil price returns proves statistically significant and dominates the linear feedback relationship between them during the sample period, although speculation does not appear a significant driver of crude oil price movement in the lead-and-lag sense. Among those contributing factors of oil price movement, the role of some major crude oil importers has also captured close attention of academia and practitioners, such as that of China.

As shown in Fig. 1, China's crude oil consumption constantly reached a record high in recent years due to its rapid economic growth, expanding middle class population, increasing motorization and urbanization, and the growing demand of strategic petroleum reserves (Leung, 2010; Wei et al., 2008). Due to the limited domestic crude oil production, China has become a crude oil net importer since 1996 and China's crude oil imports and foreign dependence degree have been seen continuous and tremendous upsurges. In 2009, China's crude oil foreign dependence degree first surpassed 50% and by the end of 2013, its crude oil foreign dependence degree had reached 57%, which not only indicates China's increasingly serious energy security problem

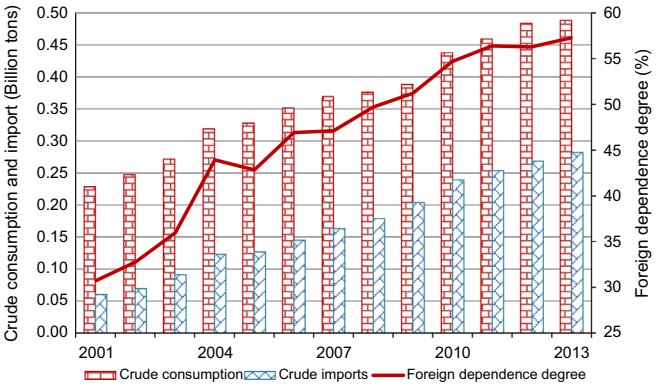

Fig. 1. China's crude oil imports, consumption and foreign dependence degree.

overseas but also reflects that fact that China has become a giant participant in international crude oil market. In fact, according to BP statistical review of world energy (BP, 2013), China was the world's second largest oil consumer after the United States and the second largest net importer of crude oil in 2012.

Moreover, it should be noted that due to the restrained crude oil regulatory policies in China, its crude oil imports are negotiated mainly in cash (i.e., in spot markets) rather than in derivatives like futures, with weak capability to resist the extreme risks of international crude oil market. Consequently, it can be seen that China's crude oil imports increase when international crude oil prices rise but when oil prices decline, China does not import much; and the higher international crude oil prices approach, the more crude oil China may import (GACC, 2001; Wu et al., 2007, 2008, 2009). Under this circumstance, China has incurred substantial extra losses for its crude oil imports in recent years. For instance, in 2013, China imported 282 million tons of crude oil; and if international crude oil prices rose one US dollar per barrel, China's crude oil-importing enterprises had to pay about 13 billion RMB more. However, a lot of blame has also been placed on China for its huge crude oil imports to raise international crude oil prices. These facts appear confusing and it seems that China may be innocent, but few quantitative and solid proof has been provided previously.

Therefore, in this paper, we would like to conduct some quantitative studies to empirically investigate whether or not China's ever-increasing crude oil imports should be considered as one of the main drivers of international crude oil price movement in recent years, and what contribution has been made by China to oil price changes; in other words, does China factor matter in international crude oil price movement? Does China deserve that much blame in the international oil market? Also, between China and India, two of the largest emerging countries and giant crude oil importers in the world, the crude oil imports of whom may contribute more to the oil price changes. The answers to these questions may be helpful for related investors to forecast oil price changes and policy makers to regulate the international crude oil market.

The rest of the paper proceeds as follows. Section 2 proposes the related literature review. Section 3 presents the data definitions and empirical methodologies. Section 4 provides the empirical results and analyses. And Section 5 puts forward main conclusions as well as policy implications.

2. Related literature review

Since the beginning of 1990s, China has been actively engaging itself in the international crude oil markets, and currently China