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Energy price, regulatory price distortion and economic growth: A case study of China

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ABSTRACT

Energy prices are often distorted by government control, which is justified on the grounds that such control will help mitigate the negative impact of price volatility from oil imports, and thus positively affect the domestic economy. In this paper, we show in a two-sector growth model, that regulatory price distortion can negatively affect the economy, and then, based on the model, we empirically estimate the impact of the price distortion on output growth in China, using monthly, time series data from 2005M1 to 2012M12. In contrast to the usual argument for regulatory control to mitigate price volatility, we find that regulatory price distortion negatively affects output growth in China during both the short and long term, because it is robust to different measures of output and price distortion. Hence, the argument that using price regulation to protect economic growth is undermined, and subsequently, this study lends its support to energy price deregulation. A market oriented energy price regime may improve the resilience of the domestic economy to global oil price shocks.

1. Introduction

Policy makers generally believe that oil price shocks exert negative impacts on the domestic economy, and, due to this belief, price regulation in the energy market, such as price capping and subsidies, has been practised for a long time and is still prevalent in many countries (IEA, 2015). Many policy makers prefer to maintain price regulations on the grounds that these measures can insulate the domestic economy from the negative impacts of high oil prices and price volatility in the world market. For example, Brunei, and in the past, Indonesia and Malaysia, fixed their petroleum prices at a very low level (Wu et al., 2012).

Examining the impact of price distortion will have significant implications for policy makers. The consequences of price distortion due to energy price regulation may be beyond policy makers' expectations. Although policy makers hope such price regulation helps the domestic economy by reducing volatility, the induced distortion may actually exert negative impacts. If it can be demonstrated that the energy price distortion, resulting from regulations to reduce international price volatility, dampens a domestic economy, then the basis for maintaining price regulation will be undermined.

Despite its policy significance, to the best of our knowledge no previous study demonstrates how regulatory energy price distortion affects the relationship between international oil price and national economic development. Previous literature focuses on two distinct aspects of the relationship. On the one hand, debate focuses on the relationship between the international oil price and national economy without examining intermediate price regulation. The relationship between oil price shock, or volatility, and the macroeconomy has been debated since the early 1980s (Hamilton, 1983) when the first oil crisis occurred and global recessions followed (Jones et al., 2004; Segal, 2007). These studies were initially spurred on by the stagnation of the US economy in the 1970s, as oil price shocks were thought to be the only promising hypothesis that explained the stagflation (Barsky and Kilian, 2004). The issue of oil price shock revitalized in the 2000s with the fact that, between 2001 and 2008, the oil price rose more than 600% while in contrast, the average quarterly core inflation in the US was only about 2% over the same period (Clark and Terry, 2009). More recent studies examine details of oil price shock on the macroeconomy relationship. For example, An et al. (2014) found that the relationship between

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higher and lower oil prices and macroeconomy is asymmetric while Cunado et al. (2015) found this relationship may be different in different countries. Studies also extended from examining economic growth to stocks, household expenditure, etc. (Broadstock et al., 2014; Zhang et al., 2014) and to examining more complicated relationships (Zhang, 2008). In the Chinese case, the focus of this paper, previous studies (Ju et al., 2014; Ou et al., 2012; Tang et al., 2010; Zaouali, 2007) generally find a negative impact on economic growth. There is also a detailed study on how the oil price shocks affects consumption in China (Zhang et al., 2014).

On the other hand, there are numerous studies examining the relationship between subsidies and energy consumption, or emissions, or economic growth, without considering how price movement affects the outcome. For example, IEA (1999) found that the removal of energy subsidies would reduce energy consumption and CO_2 emissions in eight non-OECD countries. The IMF (2013) concluded that distorted energy prices will distort resource allocation to less productive usage, causing wasteful consumption. Wasteful consumption, as a result of fuel subsidies, was observed in the Nigerian case (Nwachukwu and Chike, 2011). A Chinese case study concludes that energy price distortions impede the improvement of energy consumption structures (Liu and Li, 2011). He et al. (2014) proved that competitive prices in the electricity market could achieve energy savings and simultaneously, have a positive impact on social welfare. Studies on the macroeconomic impact of energy subsidies often use CGE models and demonstrate that subsidies have a negative impact on economic growth, employment, and social welfare (Bhattacharya and Kojima, 2010; Wu et al., 2012).

To fill this gap, this paper intends to revisit the literature on impact of oil prices on economic development giving consideration to domestic price distortion due to regulation, both theoretically, through a two-sector growth model, and empirically, using a time-series analysis of China's situation.[1] This paper focuses on China, a large developing economy. On the one hand, China's fast economic growth creates a huge demand for resources such as oil, while on the other hand it also maintains a number of intervention measures, such as price control and manipulated fuel tax, in the domestic liquid fuel (hereafter fuel) market. Since 2009, imported oil has accounted for more than half of total oil consumption in China, and at the same time the oil price has become more volatile. Investigating the impact of price distortion, which occurs due to intervention measures, will lead to significant implications for policy makers, not only in China, but also in other developing economies that regulate energy prices. Later, our empirical exercise will reveal that such distortion can do harm to the industrial output. Another feature of this study is to combine the theoretical modelling with empirical analysis, where the theoretical modelling provides guidance for the empirical exercise, and the empirical exercise is implemented using a widely used technique, the Autoregressive Distributed Lag Model (ARDL).

The contribution of this paper is four folds. First, we innovatively introduce the role of fuel price distortion into the well-examined nexus of oil price shock and macroeconomy. We argue that market distortion will have a significant negative impact on the relationship. Second, we illustrate the impact of price distortion in a two-sector growth model. Our two-sector model is consistent with a recent study that calls for structural models, including the oil market, to be used to disentangle cause and effect in the relationship between oil prices and the economy (Kilian, 2014). Third, we propose a novel measurement of the price distortion. The price distortion is measured as relative differences between average gasoline prices in China and the New York Harbor, conventional gasoline, regular spot price. In contract, previous studies, such as Lin and Jiang (2011), use the US gasoline retailing price as a reference, which suffers from tax distortions. Fourth, our empirical exercise focuses on China, a large, fast growing, developing economy with high dependence on imported oil and price distortion, which leads to significant implications for policy makers both in China, and other developing countries.

The rest of the paper proceeds as follows. Following the introduction, in Section 2 we present a discussion of oil consumption and the energy pricing mechanism in China, providing background information for the subsequent exercise, and we explain the method of measuring price distortion in China. Section 3 presents a two-sector growth model, where we illustrate that oil price distortion indeed affects the domestic economy. Using implications from the theoretical model in Section 3, we then empirically test the impact of price distortion in China in Section 4. Section 5 concludes the paper with policy implications.

2. Fuel pricing mechanism and price distortion in China

Due to its escalating volume of oil consumption, increasing dependence on oil imports, and gradually liberalizing domestic oil pricing mechanism, researchers have expected a more active interaction between the world oil price and China's macro-economy (Du et al., 2010; Wu et al., 2013). Therefore, not surprisingly, China is a good case to study the role of market distortion and oil price shocks. In this section, we will discuss the pricing mechanisms in the fuel market, and measure the associated price distortion.

2.1. The oil consumption and pricing mechanisms

China's energy consumption, as well as its dependence on imported oil, has been increasing dramatically in the past two decades and is expected to continuously grow into the future (IEA, 2015). From 1990 to 2013, China's GDP grew at an annual rate of 9.9% on average, and is expected to grow at an annual average rate of 4.8% during the period 2013 to 2040 (IEA, 2015). Such fast economic growth leads to strong demand for energy. In 2009, China became the world's largest energy consumer.

Meanwhile, China has successfully adopted a gradual approach to removing subsidies (Lin and Jiang, 2011). Before 1998, energy prices were heavily regulated, and often under-priced, due to the notion that energy is critical to economic growth and social development (Ouyang and Sun, 2015). In the 1980s and 1990s, China adopted a dual-track pricing system, under which prices for most oil products were tightly regulated, while the rest were traded in the market, more or less freely. A market-based petroleum pricing mechanism was adopted in 1998 and in October 2001, oil product prices were linked to major international futures markets (Du et al., 2010). They were first benchmarked against the Singapore futures market, and later, in 2001, the benchmark was extended to Singapore, Rotterdam and New York futures markets, where an unpublished weight was used in setting domestic prices (Du et al., 2010). In 2006, this price benchmark was changed from refinery product prices to the Brent, Dubai, and Minas crude oil prices. This price benchmarking, while it enables domestic markets to follow international markets, is also intended to insulate domestic markets from the volatility of oil prices in the global markets (IEA, 2010). Due to this intention, even with those liberalization reforms implemented in early 2000, the pricing regime was plagued by ad hoc subsidies and non-transparent, inconsistently enforced, pricing behaviours.

In 2009, China introduced a formula based pricing mechanism for oil products. According to this formula, domestic fuel prices may be adjusted when international crude oil prices, measured as a weighted average of the Brent, Dubai and Cinta crude oil prices, change by more than 4% over a period of 22 working days (Government of China, 2008).

This pricing mechanism tends to smooth the price volatility in the fuel markets. When the average crude oil price is below US$80 a barrel, domestic gasoline prices move relatively freely; between US$80 and US$130 a barrel, domestic prices are responsive, but cannot increase as much as the crude oil price does; and above US$130, fuel tax breaks

[1] Note that oil price regulations have different effects on the economy, depending on whether the country is an oil importing or exporting economy and whether price regulations are imposed on oil consumption or production. In this paper, we focus on the oil importing country (China) and the price regulations are imposed on oil consumption.