Pass-through of oil prices to domestic prices: Evidence from an oil-hungry but oil-poor emerging market

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ABSTRACT

This paper aims to investigate the changes in the impact of world oil prices on consumer and producer prices in Turkey, an import dependent country in terms of crude oil and oil petroleum products. According to many researchers, the oil price pass-through to domestic prices has been decreasing recently. We estimate a recursive VAR model on rolling windows to evaluate the changes in the pass-through of oil prices to domestic prices. For the period 1990–2012, we identify an increasing trend in the pass-through of oil prices to domestic prices in Turkey. The increasing pass-through may be attributed to the changes in relative prices: As oil becomes more important in the overall cost structure, firms become more responsive to its price. The results also suggest that the impact of oil prices on producer prices is almost two times higher than the impact on consumer prices. Moreover, the gap between the oil price pass-through to producer prices and the pass-through to consumer prices increased during this period.

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1. Introduction

A large amount of studies show that rising oil prices contributed to falling output and increased inflation during the 1970s and early 1980s, and that falling oil prices boosted output and lessened inflation during the mid to late 1980s (Brown et al., 1995). The moderation in oil prices during the 1980s and 1990s shifted the attention of macroeconomists from the study of oil prices. However, since 2000, oil prices have once again risen and taken on a central role in economic research. This time the volatility and the level of oil prices are higher. As discussed in LeBlanc and Chinn (2004), in this environment the understanding of the empirical linkage between oil prices and inflation is very important not only for conducting a proper monetary policy but also for firms to adopt their pricing policies. This linkage is crucial particularly for an emerging economy like Turkey that relies heavily on foreign sources of oil and imports a substantial level of petroleum containing products.[1]

Historically, the Turkish economy has been plagued by high and persistent inflation. Diboğlu and Kibritçioğlu (2004) argue that one of

the reasons for inflation in Turkey is increases in the prices of major imported inputs. In addition, economic growth was not accompanied by a stable macroeconomic environment, particularly in the period from 1980 to 2000, and the implemented stabilization policies could not succeed. Since the severe financial crisis of February 2001, a structural transformation process has been implemented involving not only the transition to inflation targeting, but also the introduction of the floating exchange rate regime coupled with the new central bank law, and structural reforms aimed at reducing the public sector burden on the economy as well as promoting competition and productivity (Basci et al., 2008). These policies have been successful in decreasing inflation from its historical high levels. However, the high and volatile nature of oil prices is one of the main challenges for the new monetary policy. In short, Turkey has a substantial current account deficit and a considerable part of this deficit is comprised of energy related imports. In such a case vulnerability to the exposed oil price and exchange rate shocks will be high, which in turn rarifies conducting a proper monetary policy. This dilemma puts forward the importance of oil price pass-through (OPPT) for countries like Turkey. Furthermore, a clear understanding of OPPT can also be helpful for policymakers in deciding future energy policy.

Our aim is to investigate the OPPT to consumer and producer prices for the period 1990–2012. Although the OPPT is very important for developing economies such as Turkey, the number of studies is relatively small. Thus, this paper serves to fill this gap by presenting new research on Turkey. Second, after the financial crisis of February 2001, Turkey switched from a high inflation to a low inflation regime, so this study allows us to test the hypothesis of Taylor (2000) which suggests that the OPPT will be lower in a low inflation environment. Third, a majority

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[1] Approximately 90% of oil demand is imported (EMRA, 2012). In 2012, Turkey's total imports accounted for 236.5 billion US Dollars, and almost 74% constituted intermediate goods including unprocessed materials incidental to industry, processed materials incidental to industry, unprocessed fuels and oils, parts of investment goods, parts of transportation vehicles, unprocessed materials of food and beverages, processed materials of food and beverages, and processed fuels and oils.

of the studies in the literature report that the OPPT has decreased in many countries over time. This study enables us to examine whether or not this is valid for Turkey.

To examine the OPPT between 1990 and 2012 we employ McCarthy's (1999) model of pricing along a distribution chain, expressed and estimated as a VAR model. To investigate the change in the OPPT over time we estimate this VAR model on rolling windows, i.e. we employ a rolling VAR approach.

The rest of the paper is organized as follows. Section 2 introduces the literature review. Section 3 describes the model and the data. Section 4 reports the empirical results. Section 5 presents a discussion of the findings. Section 6 provides a conclusion and policy implications.

2. Literature review

The literature on the impact of oil prices on inflation is mainly dominated by studies of developed economies with the majority of them finding that the impact of oil prices on domestic prices has decreased over time. Hooker (2002) examines the pass-through issue using quarterly U.S. data from 1962:Q2 to 2000:Q1. Estimating a Phillips curve, he finds that the OPPT has been negligible since 1980. De Gregorio et al. (2007) examine 34 developed and developing countries employing a Hooker-type approach, as well as rolling VARs, by using quarterly data spanning from 1965:Q1 to 2005:Q1. According to their results, a decline in the OPPT is a generalized feature of many of the 34 developed and developing countries. Blanchard and Gali (2007) estimate regular VARs for the U.S., France, the U.K., Germany, Italy, Japan and rolling VARs for the U.S. They find that the dynamic effects of oil shocks have decreased considerably over time, which confirms the results of the aforementioned authors. Chen (2009) estimates a time varying OPPT coefficient using a Phillips curve for 19 industrialized countries between 1970:Q1 and 2006:Q4. The results indicate that the degree of the OPPT varies across countries and is positively correlated with energy imports. In addition, the pass-through coefficient is unstable over time, declining recently. Shioji and Uchino (2010) examine the impact of oil prices on Japanese domestic prices using a time varying VAR model. They find that the OPPT declined for the 1980–2000 period but increased in the 2000s when oil prices were on the rise. Valcarcel and Wohar (2013) estimate a Bayesian structural VAR that allows for time-varying parameters and stochastic volatility using the U.S. quarterly data from 1948:Q1 to 2011:Q2. Their results imply that the OPPT has become negligible since the 1980s.

Researchers propose various reasons for the change in the OPPT. According to De Gregorio et al. (2007) the following factors help to explain why oil shocks have had limited inflationary effects: the reduction in oil intensity of economies, a reduction in exchange rate pass-through, a more favorable inflationary environment (price changes by firms take place less frequently by rarifying oil price increases to pass through to domestic prices easily) and the fact that the current oil price increase is largely the result of strong world demand. Blanchard and Gali (2007) show that credible monetary policy, greater wage flexibility and change in industrial structure have contributed to this decline. Chen (2009) proposes that an appreciation of domestic currency, a more active monetary policy in response to inflation and a higher degree of trade openness are major causes of the recent decline in the OPPT. The study argues that energy intensity may have played a minor role in the evolution of pass-through overtime. Blinder and Rudd (2008) point out three widely considered causes of the decline in the OPPT, namely, increased credibility of monetary policy, greater wage flexibility and changing industrial structure. According to Bernanke et al. (1997), one of the reasons for the low OPPT is tight monetary policy.

Examination of the literature on OPPT reveals that the contribution of studies with respect to emerging economies, in particular Turkey, remains rather limited. Kibritçioğlu and Kibritçioğlu (1999) examine the pass-through for Turkey between 1986:01 and 1998:03 by employing a VAR model. They are unable to find any evidence in favor of a significant

pass-through effect. However, Berument (2002) used Turkey's input-output table from 1990. Their evidence suggests that when wages and the other three factors of income (profit, interest and rent) are adjusted to the general price level that includes oil price increases, the inflationary effect of oil prices becomes significant.

3. Model and data

In order to examine the pass-through of oil prices to domestic prices we use a five variable recursive VAR model based on the methodology of McCarthy (1999).[2] The model contains the following endogenous variables: oil prices, output gap, nominal exchange rate to the U.S. Dollar, producer prices and consumer prices. The methodology relies on a model of pricing along a distribution chain in which inflation in period t is comprised of components of expected inflation based on the available information at the end of period $t - 1$ and effects of period t supply, demand, external exchange rate, producer prices and inflation shocks. We assume that supply shocks are identified by the dynamics of oil price inflation in local currency and that demand shocks are identified by the dynamics of the output gap after considering the contemporaneous effect of supply shocks. Furthermore, external exchange rate shocks are identified by taking into account contemporaneous supply and demand shocks. Structural shocks are recovered from the VAR residuals using the Cholesky decomposition of the variance–covariance matrix. The system can be represented as follows:

$$\pi_t^{oil} = E_{t-1}\left(\pi_t^{oil}\right) + \varepsilon_t^{oil} \tag{1}$$

$$\widetilde{y}_t = E_{t-1}\left(\widetilde{y}_t^{oil}\right) + \varepsilon_t^{oil} + \varepsilon_t^{\widetilde{y}} \tag{2}$$

$$\Delta e_t = E_{t-1}(\Delta e_t) + \varepsilon_t^{oil} + \varepsilon_t^{\widetilde{y}} + \varepsilon_t^{\Delta e} \tag{3}$$

$$\pi_t^{ppi} = E_{t-1}\left(\pi_t^{ppi}\right) + \varepsilon_t^{oil} + \varepsilon_t^{\widetilde{y}} + \varepsilon_t^{\Delta e} + \varepsilon_t^{ppi} \tag{4}$$

$$\pi_t^{cpi} = E_{t-1}\left(\pi_t^{cpi}\right) + \varepsilon_t^{oil} + \varepsilon_t^{\widetilde{y}} + \varepsilon_t^{\Delta e} + \varepsilon_t^{ppi} + \varepsilon_t^{cpi} \tag{5}$$

where π_t^{oil} is oil price (in nominal U.S. Dollars) inflation, $\widetilde{y}_t$ is output gap, Δe_t is change in logarithm of the nominal exchange rate relative to the U.S. Dollar, π_t^{ppi} is producer price inflation rate, π_t^{cpi} is consumer price inflation rate, and $\varepsilon_t^{oil}, \varepsilon_t^{\widetilde{y}}, \varepsilon_t^{\Delta e}, \varepsilon_t^{wpi}, \varepsilon_t^{cpi}$ are oil price inflation, output gap, change in exchange rate, producer price inflation and consumer price inflation rate shocks respectively. E_{t-1} denotes the expectation of a variable conditional on information available at period $t - 1$. In estimation the expectations are introduced to the model by linear projections of the lags of the variables.[3] The system allows for tracing the dynamic effect of oil price shocks on consumer prices along the supply chain starting from real output, moving to the exchange rate, then to the producer prices that contain a relatively high proportion of tradable goods and finally to the consumer prices that contain a smaller proportion of tradable goods (Leigh and Rossi, 2002).

We use monthly data covering the period 1990:01–2012:02. Average crude oil price in terms of nominal U.S. Dollars is obtained from GEM commodities published by the World Bank. The nominal exchange rate relative to the U.S. Dollar, consumer price index (CPI), producer

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[2] Leigh and Rossi (2002) and Kara and Öğünç (2008) use the methodology of McCarthy (1999) to evaluate the exchange rate pass-through in Turkey.

[3] Making this replacement, the model can be expressed and estimated as a VAR using a Cholesky decomposition to identify the shocks.