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World oil prices and agricultural commodity prices: Evidence from an emerging market

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ABSTRACT

Oil prices are thought to have direct effect on agricultural prices followed by an indirect effect through the exchange rate. This paper examines the short- and long-run interdependence between world oil prices, lira–dollar exchange rate, and individual agricultural commodity prices (wheat, maize, cotton, soybeans, and sunflower) in Turkey. To this end, the Toda–Yamamoto causality approach and generalized impulse-response analysis for identification of the long- and short-run interrelationships are applied to the monthly data spanning from January 1994 to March 2010. The impulse–response analysis suggests the Turkish agricultural prices do not significantly react to oil price and exchange rate shocks in the short-run. The long-run causality analysis reveals that the changes in oil prices and appreciation/depreciation of the Turkish lira are not transmitted to agricultural commodity prices in Turkey. Hence, our results support neutrality of agricultural commodity markets in Turkey to both direct and indirect effects of oil price changes.

1. Introduction

The upward trend in agricultural commodity prices starting in 2003 and continuing till 2008 has raised concern for countries that depend heavily on food imports. The agricultural prices considerably increased from the beginning of 2006 to mid-2008. Although during the summer of 2008 commodity prices started to fall, by the end of 2008 they reached their early 2007 levels. Average prices of agricultural commodities in the world are still above their historical levels (Cooke and Robles, 2009; OECD, 2009: 22). The agricultural commodity prices in Turkey follow closely these international dynamics (see Fig. 2 in Section 3).

In order to apply appropriate policy options and to examine investment opportunities, both policy makers and global investors question the factors influencing the agricultural commodity markets. Piesse and Thirtle (2009) argue that since oil prices are expected to pick up following the current recession in the world economy, we need to improve the state of the world agriculture. They point out that agriculture has the potential to provide sufficient food and energy in the future if correct actions are taken now. Their suggestions of course are based on the presumption that world energy prices are the main factors causing a rise in world food prices.

In the literature, several studies focus on a number of different factors (see Cooke and Robles (2009) for a review) to understand the drivers of surging agricultural commodity prices. Abbott et al. (2008, 2009) reduce the number of these factors to three key determinants: excess demand, the value of US dollar, and the energy-agriculture linkage. However, the rise in energy prices is considered to play the key role in explaining the recent dynamics of the agricultural commodity prices in the world. Energy and agricultural markets have become closely linked as production of biofuels surged since 2006. Ethanol and biodiesel are substitutes for gasoline and diesel, thereby the recent surge in agricultural commodity prices are attributed to increasing usage of crops in production of biofuels.

Indeed, the link between energy and agriculture is not a new concern. An early study by Chenery (1975) notes the disruption in world trade due to rising oil and food prices. According to him substantial adjustments need to be made after the price rises due to changing productivities. He emphasizes the strain put on many developing countries as a result of the disequilibria experienced. The story does not seem to have changed too much since the 1970s. The joint upward trend in oil and food prices raises concern for many countries.

Historically, agriculture has been an energy-intensive sector and therefore one can draw a direct linkage from oil prices to agricultural commodity prices. As discussed in Hanson et al. (1993) an increase in oil prices is followed by an increase in input costs which in turn causes agricultural prices to rise. Another link between oil prices to agricultural commodity prices is through the exchange rates. According to Harri et al. (2009), there is an indirect effect of oil prices on agricultural prices through the exchange rates. Oil trade is conducted mainly in US dollars; hence, changes in oil prices have direct impact on local currencies of all countries. The appreciation/depreciation of local currency, in return, influences the agricultural commodity imports/exports and the local

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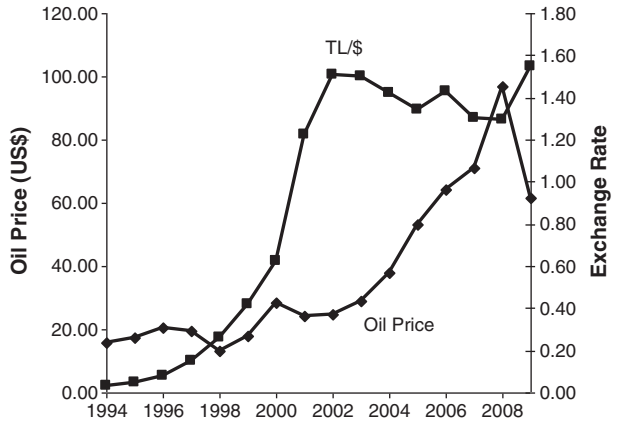

Fig. 1. Dynamics of the exchange rate and oil prices.

prices of these commodities. Therefore, there are two links from oil prices to agricultural commodity prices: a direct link from oil prices to commodity prices and an indirect link through exchange rates.

As will be shown in the literature review that follows, the interactions between oil prices, exchange rates, and agricultural commodity prices are not clear-cut, and the relationship is largely empirical. To the extent of our knowledge the direct and indirect effects of oil prices are not well studied for individual agricultural commodity prices in emerging markets or for developing countries. In this paper, we empirically assess the direct and indirect effects of world oil prices on agricultural commodity prices in an emerging market, Turkey, for the January 1994–March 2010 period. Following the suggestion of Baffes (2007), we examine how individual agricultural commodity prices, rather than an aggregate index for the agricultural sector prices, are affected by changes in oil price and the exchange rate. To that respect we employ a procedure developed by Toda and Yamamoto (1995) to test for long run Granger causality and generalized impulse responses by Koop et al. (1996) and Pesaran and Shin (1998) to examine how each variable in the system responds to a generalized one standard deviation shock. The Toda and Yamamoto (1995) approach is superior to traditional approaches, because it avoids pre-test biases in the cointegration tests and cointegrating equation estimations. It is a rather flexible approach such that it can be applied to series with arbitrary degrees of integration. The generalized impulse responses are also superior to traditional impulse responses. The generalized approach results are not sensitive to the order by which variables enter the VAR system.

Agricultural commodity prices are of great economic importance in Turkey, since the agricultural sector accounts for 8% of total production, 27% of total employment, and 9% of total exports as of 2008 (OECD, 2009: 200). Turkey also depends heavily on imported oil and the Central Bank of Republic of Turkey follows a flexible exchange rate regime. Although the conditions for both direct and indirect links between world oil prices, exchange rates, and agricultural commodity prices exist in Turkey, we find that the Turkish agricultural commodity prices are neutral to both effects. Furthermore, even though the correlations between agricultural prices and oil prices have increased after 2006, due to the recent upward trend in both price series, our re-examination for the sub-sample from January 2006 to March 2010 substantiates that neutrality.

Although a lot has been learned about world commodity prices (Cashin et al., 2002), information on how local agricultural commodity prices respond to oil and exchange rate shocks is limited. Better insight on the dynamics of local agricultural prices will help policy makers establish sound monetary, energy, and agricultural policies. Producers will benefit from this information in crop selection and in determining the extent to which they are exposed to the exchange rate risk as well as to changes in world energy markets. Finally, investors will be able to identify portfolio diversification options in various local agricultural commodity markets seen as alternative investment areas.

The rest of the paper is organized as follows. The next section is devoted to the literature on the oil prices-agricultural commodity prices nexus, data is described in Section 3 followed by the methodology and empirical findings in Section 4, and finally the concluding remarks are presented in Section 5.

2. Literature review

The increases in agricultural prices in the early 2000 s have renewed interest on the causal relationship between energy prices and agricultural commodity prices. The focus of recent studies on the link between agricultural commodity and oil prices is based on either the role of biofuels or the exchange rate changes. The literature on the oil spills on various commodity markets is huge (see for example Soytas et al. (2009), Hammoudeh et al. (2008), and Sari et al. (2010) for brief reviews concerning metals prices; Kaltalioglu and Soytas (2009) and Baffes (2007) for food prices; Ewing and Harter (2000) and Borenstein et al. (1997) for other energy prices). Here we focus on the impact of energy price changes on agricultural markets. Note that Soytas et al. (2009) and Kaltalioglu and Soytas (2009) also utilize the TY procedure and generalized impulse response analysis.

In an early study, Hanson et al. (1993) analyze the effects of a world oil price shock on U.S. agriculture within the context of an economy-wide environment by means of Computable General Equilibrium model. The study concludes that oil prices affect agriculture not only through direct and indirect input costs but also through exchange rate and foreign borrowing. However, authors note that the impacts of oil price shocks vary among agricultural commodities. Some studies find even no link between oil prices and agricultural commodities. For example, Yu et al. (2006) investigate the dynamic relationships between major traded edible oil prices (world prices of soybean, sunflower, rapeseed, and palm oil) and world crude oil prices by applying the Johansen cointegration approach and directed acyclic causality approach to weekly observations from January 1999 to March 2006. Authors find that the shocks in crude oil prices do not exert any significant influence on the variation of edible oil prices. Zhang and Reed (2008) examine the impacts of world crude oil prices on China's corn, soy meal, and pork prices for period January 2000–October 2007. By applying a VARMA model, Granger causality test, impulse response functions, variance decomposition, and cointegration analysis, authors conclude that the world crude oil prices are not a major factor contributing to the recent soaring in the selected agricultural prices of China. Kaltalioglu and Soytas (2009) investigate the inter-temporal link among world food, crude oil and agricultural raw material prices for the period January 1980–April 2008 by means of impulse–response functions. The study concludes that the changes in the oil prices do not have any significant effect on world food and agricultural raw material spot prices. Mutuc et al. (2010) extend this strand of empirical literature by plotting response of cotton prices in the U.S. with respect to fluctuations in world oil prices. Applying the structural vector error correction model to monthly data spanning from January 1975 to February 2008, the authors show that oil prices explain only 3% of the variability in the cotton prices in the long-run. Accordingly, the rise in cotton prices in US cannot be attributed to oil price shocks. Using a simple econometric model, Baffes (2007) estimates the pass through of crude oil prices to the non-energy commodity index as 16%. At a disaggregated level, he finds that the food price index has the second largest pass through after the fertilizer index. He points out the need to supplement his findings through individual commodity analysis. Zhang et al. (2010) examine the relationship between several fuel prices (ethanol, gasoline, and oil) and prices of agricultural commodities (corn, rice, soybeans, sugar, and wheat). They apply cointegration analysis to world prices and their results imply that in the long run agricultural