Volume 9, Number 34, Summer 2020

Examining the Role of Productivity, Monetary Shocks and Non-Traded Goods in Exchange Shocks in Iran (Using a DSGE Model Approach)

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Abstract

This study investigated the share of non-trade goods prices in real exchange rate fluctuations with two economic characteristics, such as openness and price stickiness using a DSGE model. The main characteristic of this model is that both s trade and non-trade goods have been taken into account. Three scenarios were developed for this purpose. The impact of 5% shock on productivity, a 10% monetary shock, and a combination of these two shocks in scenarios 1-3 was investigated. The results indicate that productivity shocks have led to a decline in real exchange rates due to the relative price fluctuations of non-traded goods. The results of the second scenario indicate that monetary shocks increase the real exchange rate by changing relative price of traded goods. In the third scenario, monetary and productivity shocks reduced real exchange rates. The results of the scenarios for this model show that changes in the relative price between traded and non-traded goods are the main channel through which productivity shocks are transmitted to the real exchange rate. Therefore, economic characteristics have a significant effect on the transmission mechanism and the overall volatility of the real exchange rate in response to both types of shocks.

Key Words: Non-Trade goods, Dynamic stochastic general equilibrium, Monetary Shocks and Productivity

JEL Classification: O24, F31, E19, B22.

1. Introduction

Since the exchange rate is an interface between foreign and domestic prices, as well a means of developing the exports and reducing the imports at the same time, changing this important economic variable can have far-reaching effects on other economic variables. Given that the real exchange rate measures the ratio of the relative price of commercial goods to the relative price of non-commercial goods, an increase in the price of a commodity relative to a non-commercial commodity indicates an increase in the real exchange rate. Thus, the effective exchange rate is a weighted indicator of the real exchange rate. If domestic prices rise, while foreign prices are assumed to remain unchanged, the price of non-commercial goods will relatively increase. As the real exchange rate falls, so will the country's international competitiveness, as resources are transferred

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from the commodity exchange to non-trade goods, reducing competitiveness and disrupting trade balance. Also, studies by Bornstein et al. (2006) show that the share of relative value of traded and non-traded goods increases the total variance of real exchange rate fluctuations by more than fifty percent in some countries. Mendoza (2002), on the other hand, provided evidence that the relative price between exchange and non-exchange goods may be more important than what the results of parasite show. Calderon (2004) found that in addition to monetary factors affecting real exchange rate fluctuations, other factors such as the degree of openness of trade can affect these fluctuations. Carrera and Restate (2008) in their paper showed that real shocks have a permanent effect on the real exchange rate of Latin America. It uses the relative value of non-trade goods. The purpose of this study is to answer the question of whether productivity and monetary stimuli can affect the real exchange rate through non-trade goods.

2. Method

2-1. DSGE model in status of two countries

In this section, we try to design and estimate a model that is compatible with the characteristics of Iran's economy. For this purpose, this economy is considered as a small open economy. Another feature of Iran's economy is the existence of all kinds of nominal adhesions. The presence of nominal adhesions means that there is a time interval for adjusting the true value. This can affect economic policies as well as the transformation of economic functions. For this purpose, we used a study from Kanka (2014) in which the main path of transfer of productivity and monetary shocks into real exchange rate fluctuations is through changes in relative prices between exchange and non-trade goods.

2-2. Households

There is a group of households with the same characteristics. They receive wages (W) from large, highly competitive companies, and profits (PR) from retail companies. Each household supplies labor (L) to both sectors (exchange and non-exchange). They have access to a complete set of international exchange bonds, which are spent on purchasing bonds as much as z_t of the budget (by paying the national currency in period *t*). In this case, C indicates the consumption indicator, P the price index for the consumer basket, and Qt ($z_t + 1 \mid z_t$) shows the price of bonds in Z_t mode. If the condition $z_t + 1$ is fulfilled, it will be paid. And Dt ($z_t + 1 \mid z_t$) indicates the amount of bonds held at the end of period *t*. Household preferences for consumption and work are explained by the utility function (1), in which β is the factor of mental decline and (z_t) is the probability of the occurrence of z_t mode over time.

$$P_t(Z^t)C_t(Z^t) + \sum_{z_{t+1}} \{Q_t(Z_{t+1}|Z^t)D_t(Z_{t+1})\} = D_{t+1}(Z^t) + W_t^H(Z^t)L_t^H(Z^t) + W_t^H(Z^t)L_t^H(Z^t) + PR_t^H(Z^t) + PR_t^N(Z^t) \quad (1)$$

$$U_0 = \sum_{t=0}^{\infty} \beta^t \sum_{z^t} prob(Z^t)[(1-\sigma)^{-1} C_t(Z^t)^{1-\sigma} - (1-\omega)^{-1} L_t^H\ (Z^t)^{1+\omega} - (1-\omega)^{-1} L_t^N\ (Z^t)^{1+\omega}\ ]$$

2-3. Production

The bulk product for each product is produced by a competitive firm that uses labor as the sole producer. In the stable state, a proportion of the household workforce g is devoted to the production of non-trade goods and the rest is spent on the production of exchange goods. Production performance in Section J is shown by Equation (2). A indicates labor productivity.

$$Y_t^j(Z^t) = A_t^j(Z^t) L_t^j(Z^t) \quad (2)$$

2-4. Monetary policy

The central bank selects its policy instruments, periodic nominal interest rates, past interest rates, future expected inflation, and current production gaps. The Central Bank's policy rule is described in Equation (3), where $\bar{R}$ represents the nominal interest rate, which is constant (equal to the real interest rate plus the target inflation rate π) and δ determines the degree of stability of the interest rate. Monetary shocks (v) are the deviation of interest rates from the target rate of the Central Bank, which is exogenous and i. i. d. (Nestor Azkan, 2014).

$$R_t(Z^t) = \delta R_{t-1}(Z^{t-1}) + (1-\delta)\Big[\bar{R} + \delta_\pi \sum_{z_{t+1}} prob\big((z_{t+1}|z^t)(\pi_{t+1}(z^{t+1}) - \bar{\pi}\big) + \delta_y y_t(Z^t) + V_t(z_t)\Big] \quad (3)$$

3. Model estimation

3-1. Execution of scenarios

Research scenarios

Scenario 1	3٪ and 5% increase in productivity and its impact on the relative price of exchange and non-trade goods, consumption, exchange rate improvements and real exchange rate
Scenario 2	10% increase in monetary policy and its impact on the relative prices of exchange and non-trade goods, consumption, exchange rate improvements and real exchange rate
Scenario 3	A 3% increase in productivity and a 10% increase in monetary policy and its impact on the relative prices of exchange and non-exchange goods, consumption, exchange rate improvements and real exchange rate

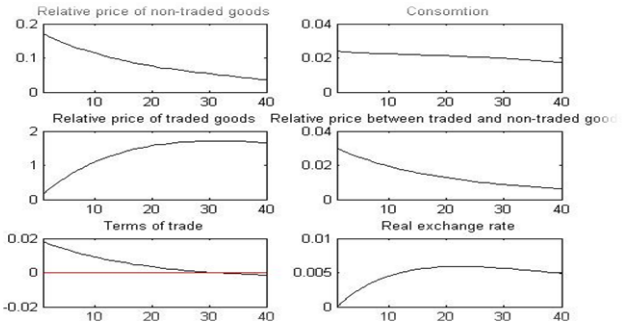

Fig. 1. Reaction of pattern variables to a 3% increase in roductivity impulses

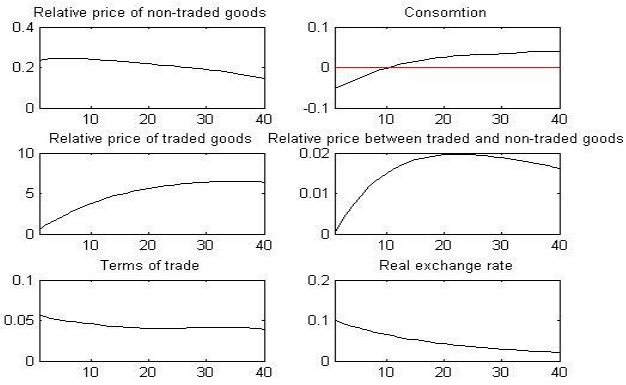

Fig. 2. Reaction of model variables to a 5% increase in productivity mpulses

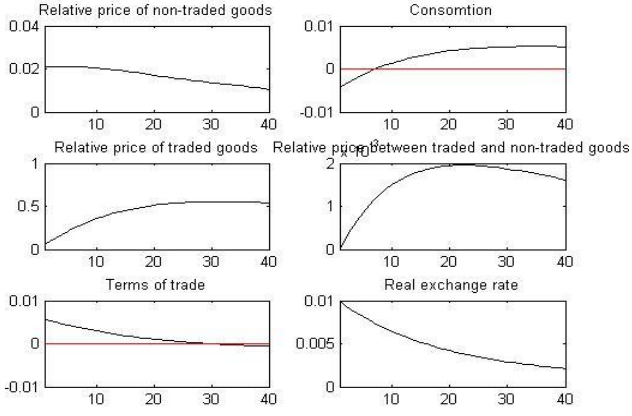

Fig. 3. 10% increase in the impulse caused by monetary policy

4. Conclusion

The results of the development of the three scenarios show that the main channel of transmission of monetary and productivity impulses into real exchange rate fluctuations is through relative price changes between exchange and non-trade goods. In the first scenario, productivity shocks have caused real exchange rates to fluctuate through relative price fluctuations. The results of the second scenario indicate that monetary shocks increase real exchange rates exclusively through changes in the relative price of goods. The results of the third scenario show the effect of monetary shocks and productivity at the same time. The real exchange rate is declining, and the trade exchange rate is stabilizing after going down. These results have important implications for economic modeling. In this model, in order to examine the effects of the relative price of non-exchangeable goods on the real exchange rate, it is assumed that a proportion of the goods is non-exchangeable. And they affect the real exchange rate through productivity shocks. On the other hand, the elimination of non-trade goods in a model based on monetary shocks may produce less noticeable effects. Instantaneous model response functions show that real exchange rate fluctuations depend on productivity shocks and how these shocks affect the relative price of non-exchangeable goods. A boost by reducing production in the non-trade goods reduces the relative price of these goods and causes a real decrease in price while this impulse in the commodity exchange sector increases the relative price of commodity goods. In the case of monetary shocks, the change in the real exchange rate depends on the change in the price of domestic and foreign exchange goods.

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