Foreign capital and exchange rate movement in developing economies: a theoretical note

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Abstract

This study attempts to provide with underlying theoretical explanations for exchange rate appreciation due to foreign capital inflow. We use an extended three sector specific factor model to explain why and how an inflow of foreign capital boosts the price of a nontradable good that helps tilting the exchange in rate in favor of the host country. We also strive to look at the possible consequences on factor prices and on sectoral de-composition of a representative economy.

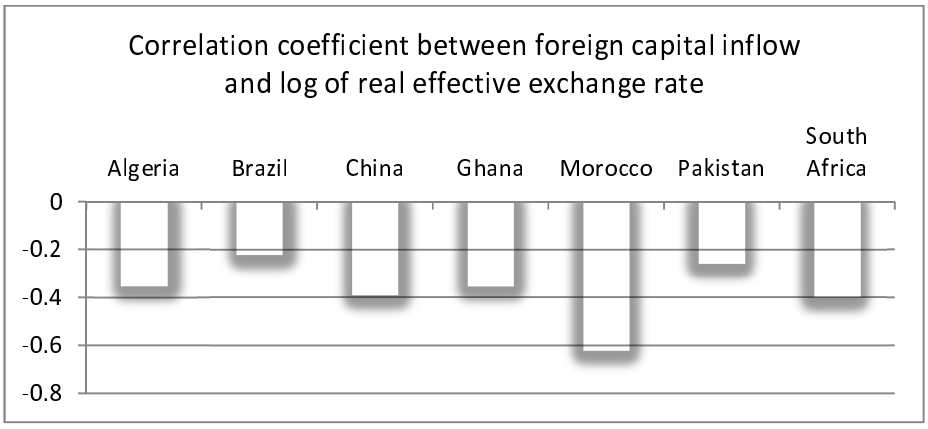
JEL classifications: F21, F31

Keywords: Foreign capital inflow, Real exchange rate, Developing economies

1. Introduction

Foreign exchange reserve, undoubtedly, resembles the structural and international strength of an economy that is connected with the rest of the world via trade. Hence there is no denying that one of the prime agendum of economic policy makers would be to guarantee a good exchange reserve along with a steady appreciation of real exchange rate. Keeping an eye to this sometimes international economic policies are framed in such a way that eventually promises to ensure the phenomena just described. One possible policy initiative is to invite foreign capital in a sector that is purely motivated to produce only exportable commodity. This is supported by one of the common features of the developing economies are plagued with – lack of domestic supply of capital or investment. The idea that we are going to use in this study is that domestic government's emphasis on export induces them to allow foreign capital or investment in such a sector that produces only exportable. These are often called export enclave.

Recent trend in capital inflow and exchange rate movement are somewhat interesting in the sense that the correlation coefficients between the log of real effective exchange rate (RER) and the Foreign Direct Investment (FDI)[1] as a percentage of GDP for the seven prominent developing countries are negative. This is reported in the following figure. Thus, FDI appreciates the RER which basically motivates us to find the underlying theoretical reasons.



[1] We have considered only FDI among different forms of foreign capital inflows because of three reasons. First, FDI constitutes the biggest part of capital flows in recent years probably because of the favorable treatment of FDI as a long-term investment from the government of the developing countries. Second, FDI has a tendency to concentrate more in the tradable sector for developing countries. Third, FDI is generally less volatile compared to other foreign capital flows.

Note that the data for foreign capital inflow only in export oriented enclaves are unavailable for most of the countries. We consider the FDI in an economy as proxy for the FDI in enclaves because, in recent years, most FDI is taking place in export enclaves. We cover a relatively shorter time period (1996-2012) for each country so that FDI in an economy can be a good proxy for the FDI in enclaves and we want to focus on those years after General Agreement on Trade and Tariff (GATT) policies came into effect. The data on FDI as are collected from the World Development Indicators published by the World Bank (2013) where as the data on RER are obtained from International Financial Statistics published by International Monetary Fund (2013).

Following Gruen and Corden (1970), Jones and Marjit (1992, 2008), Marjit (2003, 2005, 2008) this study considers a small, open economy with traded and nontraded goods sectors. The traded sector consists of both exportable and importable sectors. Using this three-sector model with export enclave, we analyze theoretically the possible impact on the RER when the foreign capital is directed to the export enclave by taking into account the interaction among these three sectors. Such an analysis can be of substantial interest while evaluating the RER movements in developing economies since policy makers should take into account the possible upshots of FDI on the RER while formulating the exchange rate policy. Since the idea of establishing the export enclaves to attract FDI is a recent phenomenon, so far no theoretical work has been done, to the best of our knowledge that specifically looks into the effect of FDI on the RER. Here it is worth mentioning how we define the RER. Traditionally, RER is defined in two ways. First, the RER is the domestic relative price of tradable goods (P_X or P_Y) to nontradable goods (P_Z), $\varepsilon = \frac{P_Y}{P_Z}$. This exchange rate plays an important role in domestic resource allocation. An increase in RER (exchange depreciation) will reallocate resources into the tradable sector from the nontradable sector, thus, making the domestic country more competitive in the international market. Second, the RER is defined using the purchasing power parity (PPP) approach. In this definition, the RER (ε_{PPP}) is the nominal exchange rate (E) multiplied by the ratio of foreign price level (P^*) to the domestic price level (P), $\varepsilon_{PPP} = E\frac{P^*}{P}$. In this work, we will use the first definition of measuring RER in the theoretical formulation. Edwards (1989) showed that these two measures tend to give similar results.

This paper is organized as follows. The basic model is described in section 2 along with the effects of an inflow of foreign capital on factor prices and RER. Then we briefly discuss related output effects. Section 3 concludes.

2.1. The Basic Model and Results

A simple amalgam of both the Heckscher-Ohlin and Ricardo-Viner-Jones models is used in a perfectly competitive small open economy with three sectors: a nontraded good sector producing Z, an importable good sector producing Y, and an exportable sector producing X, similar to Nowak et al. (2003). The structure closely follows Jones (1965, 1972) and the symbols used in this study are also extensively used in trade and development literature.[2]

Technology in all three sectors is concave and continuous and exhibits constant returns to scale. It is assumed that goods Y and Z are produced with labor (L_Y and L_Z, respectively) and domestic capital, (K_Y and K_Z, respectively), whereas X uses labor L_X and a different kind of capital. This is denoted by K^*. Note that this capital is available in both domestic and international market. Foreign capital K^* and domestically owned counterpart K_d^* are similar in nature. We consider a broad definition of foreign capital. It includes foreign physical capital, foreign production technology, and entrepreneurial skills, and its rent r^* captures the rate of return to K^*.

We assume that our representative economy has some capital K_d^* to begin with. However, there is a huge deficiency in such capital and that leads to much higher interest rate in domestic market. Say it is r^* whereas the interest rate prevails in the international market is $\bar{r}^*$. Let us sensibly assume that ($r^* \gg \bar{r}^*$). Deficiency in supply of such capital is the prime reason for the economy to set up an export enclave where considerable gap between r^* and $\bar{r}^*$ attracts foreign capital. Therefore, foreign capital is a function of the differences in interest rates

$$K^* = f(r^* - \bar{r}^*) \quad (1)$$

where $f'(r^* - \bar{r}^*) > 0$, assuming $(r^* - \bar{r}^*)\ \forall\ r^*$.

For brevity of our analysis we simplify it as follows:

$$r^* = \frac{1}{K^*} \quad (2)$$

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[2] L_i and, K_I $i = Y, Z$ represent allocations of labor and domestic capital, respectively, in the i^{th} sector. L_X represents labor allocation in the exportable sector

The full employment conditions for these factors can be represented as follows:

$$a_{LY}Y + a_{LZ}Z = \overline{L} - a_{LX}X \quad (3)$$

$$a_{KY}Y + a_{KZ}Z = \overline{K} \quad (4)$$

$$a_{KX}X = K^* + K_d^* \quad (5)$$

where the a_{ji}'s denote the technology of production, $\overline{L}$ and $\overline{K}$ are the total labor and domestic capital endowments in the economy, K_d^* is the amount of domestic capital that is particularly used in exportable sector.[3] K^* is the foreign capital employed in the exportable sector. The zero profit conditions in this competitive economy are:[4]

$$a_{LX}w + a_{KX}r^* = P_X^* \quad (6)$$

$$a_{LY}w + a_{KY}r = P_Y^* = 1 \quad (7)$$

$$a_{LZ}w + a_{KZ}r = P_Z \quad (8)$$

where w, r and r^* are the wage rate of labor, the rental for K, and the rental for K^* or K_d^*, respectively. The world price of Y is normalized to one so that P_X^* and P_Z represent the relative price of the exportable and nontraded good, respectively.

Finally, we define the RER as the domestic relative price of tradable goods (exportables and importables) to nontradable goods.

$$\varepsilon = \frac{\gamma p_X + (1-\gamma)p_Y}{p_Z} = \frac{p_Y}{p_Z} \quad (9)$$

where the numerator represents the composite price index for tradable goods in the economy and γ and $(1-\gamma)$ are the weights of exportables and importables. For simplicity, we assume that exportables are not consumed domestically, $\gamma = 0$ and the RER equals $\varepsilon = \frac{p_Y}{p_Z}$.

[3] The quantity of factor j required to produce a unit of good i that follows from the derivative properties of the unit costs functions by Shepherd's lemma.

[4] When both goods are being produced in a competitive equilibrium with constant returns to scale technology, the Euler condition states that the total product of a commodity will be exhausted in paying out the factors.

Because of small economy assumption prices of traded goods are determined in the rest of the world. The model has seven unknown variables (r^*, w, r, P_Z, X, Y and Z). These values can be solved from equations (2) – (8). Once P_Z is determined we can have the effect on RER as P_Y^* is given. One distinctive feature of the model is the determination of the price of non-traded good (P_Z) from the price equation. So this study departs from the conventional approach of determining the price of non-traded goods based on demand-supply equilibrium in isolation which is another value addition of the current paper.

Inflow of foreign capital depresses r^* from equation (2). w has to rise as P_X^* is constant (see equation 6). Therefore r must fall in (7). Thus we get the values of w and r that directs us to solve the value of P_Z. Hence, given factor endowments $\bar{L}$, $\bar{K}$, K_d^* and K^* equation (3) to (5) determines X, Y and Z. However, note that change in factor prices may indicate some factor substitution in the model. We will discuss it later.

2.2. Inflow of Capital and Prices

In this sub-section we will systematically evaluate the impact of foreign capital accumulation in the above model. By totally differentiating the equations we derive the standard Stolper-Samuelson results:

$$\hat{r}^* = -\frac{\hat{K}^*}{K^* r^*} < 0 \; ; \; \hat{w} = -\hat{r^*}\frac{\theta_{K^*X}}{\theta_{LX}} = \frac{\hat{K}^*}{K^* r^*}\frac{\theta_{K^*X}}{\theta_{LX}} > 0 \; ; \; \hat{r} = \frac{\theta_{K^*X}}{\theta_{LX}}\frac{\theta_{LY}}{\theta_{KY}} = (-)\frac{\hat{K}^*}{K^* r^*}\frac{\theta_{K^*X}}{\theta_{LX}}\frac{\theta_{LY}}{\theta_{KY}} < 0$$

$$\hat{P}_Z = \frac{\hat{r}^*\theta_{K^*X}}{\theta_{LX}}\left(\frac{\theta_{KZ}-\theta_{KY}}{\theta_{KY}}\right) = (-)\frac{\hat{K}^*}{K^* r^*}\frac{\theta_{K^*X}}{\theta_{LX}}\frac{(\theta_{Kz}-\theta_{KY})}{\theta_{LY}}$$

where the hat "^" notation denotes the proportional changes of the respective variable, θ_{ji} denotes the cost shares. Since the nontraded sector is labor-intensive (we assume that Z is labor intensive and Y is capital intensive), we have $(\theta_{KZ} - \theta_{KY}) < 0$. Therefore, P_Z must rise when foreign capital comes in as $\hat{r}^* < 0$. Given the small country assumption, the price index for tradables is given, and thus an increase in $\hat{P}_Z$ indicates a proportionate decrease in ε, RER appreciation. Therefore the following proposition is immediate:

Proposition: *An inflow of foreign capital in the export sector leads to appreciation of RER if* $(\theta_{KZ} - \theta_{KY}) < 0$. ■

Now let us move to the output effects. It is also not less interesting as changes in factor prices open factor substitution possibility. It seems a-priori that an inflow of foreign capital should increase X. But it is not so apparent as r^* falls and w rises. This calls for factor substitution, inducing producers to use more K^* instead of L per unit of X as labor is dearer now. Hence X rises subject to the condition that the degree of substitution should not be very high. If producers' intensity to use K^* rises significantly, output of X may in fact go down eventually. This is shown as

$\hat{X} = \widehat{K^*}\left(1 - \frac{\sigma_X}{r^*K^*}\frac{\theta_{K^*X}}{\theta_{KY}}\right)$[5]. In what follows $\hat{Y} = (-)\frac{1}{|\lambda|}\widehat{K^*}\left(1 - \frac{\sigma_X}{r^*K^*}\frac{\theta_{K^*X}}{\theta_{KY}}\right)\lambda_{LX}\lambda_{KZ}$ and $\hat{Z} = \frac{1}{|\lambda|}\widehat{K^*}\lambda_{LX}\lambda_{KY}\left(1 - \frac{\sigma_X}{r^*K^*}\frac{\theta_{K^*X}}{\theta_{KY}}\right)$[6].

3. Conclusions

This note provides with a plausible explanation why countries allowing foreign capital in the export sector experience an appreciation of RER. Here we have argued that the inflow of foreign capital puts it mark on factor prices and hence even in a competitive set up, a nontraded good may enjoy an increase in the price. This is not channelized through equilibrium price determination via demand-supply equality, rather more interestingly it is directed by factor prices. We have also shown that inflow of such capital may not guarantee an expansion of export sector. However, any developing economies flooded with huge labor supply is likely to observe the desired expansion as labor price should not rise to a considerable extent to offset the benefit bestowed by an increase in capital specific to exportable sector.

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[5] σ_X indicates elasticity of substitution in X.

[6] $|\lambda|$ is the determinant representing factor intensity of Y and Z. $|\lambda| < 0$ as Y is K intensive.

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