Sector Specific Inflow of capital, Non-Traded sector and an Increase in Real Exchange Rate

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Abstract

This paper attempts to look at the effect of inflow of foreign capital only in the exportable sector on the factor prices and real exchange rate of the concerned economy. In doing so we frame a blend of Heckscher-Ohlin and Specific Factor model of trade which is popularly known as H-O nugget. We show that consequent upon an inflow of capital specific to exportable sector both the non-traded good production and return to the factor specific to non-traded good are reduced while the exportable production expands. The effect of such an inflow on real exchange rate is unambiguous and it increases.

JEL classifications: F21, F31

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

1. Introduction

The underlying reasons for allowing foreign capital in an economy are: to channelize resources in different direction of production, i.e. diversifying the production basket; to be connected with the rest of the world as to explore and redirect factors in line of comparative advantage; to explore the avenues to earn foreign exchange in order to strengthen the macroeconomic fundamentals of the economy etc. These conventional arguments are well thought of by economic policy makers in recent times. In what follows the developing countries, in particular, across the globe have opened their economies for foreign capital. In the present age of globalization, FDI has been considered as a major source of economic growth in less developed economies. FDI as a percentage of world GDP was only 0.51% in 1970 and it increased to 4.46% in 2000 and finally after great recession of 2007-08 to 2.07% in 2012 (World Bank, 2014). The following graph shows FDI as a percentage of GDP for the 21 countries from the lower middle income group (defined by the World Bank) over the period from 1995-2012

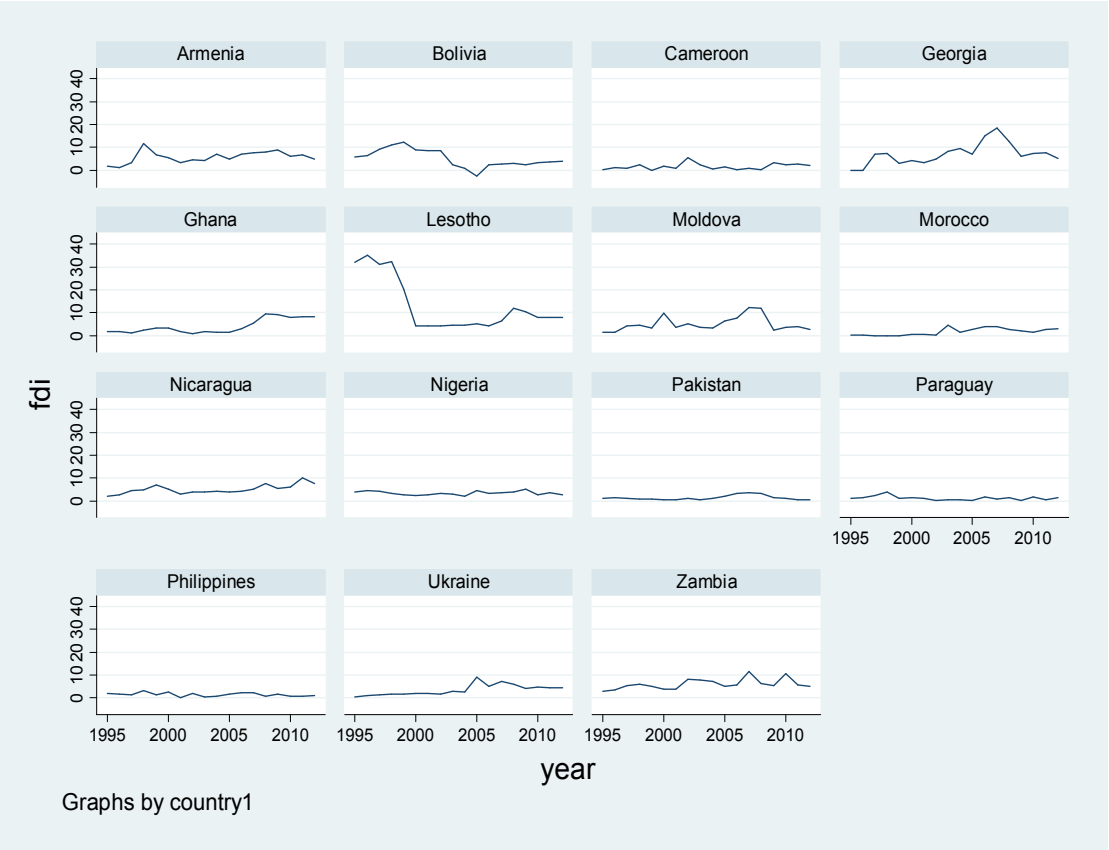

Figure 1: Country-wise time series graph of FDI inflow as a percentage of GDP

From this graph it is evident that for most of these countries overall FDI as a percentage of GDP increased during this time period. The driving factor for such an international economic policy is the shortage or absence of certain type of capital that can be used exceptionally only in the export sector. In an earlier paper Biswas et al (2014) has analyzed such concern but in a slightly different set up.

Formations of Special Economic Zones (SEZs), export enclaves are the examples of the policies and phenomenon discussed above. Precisely speaking in the current study we attempt to look at the decision of foreign capital inflow and try to justify it by examining if foreign capital inflow can influence the real exchange rate (RER) of the

economy and production of different commodities. Here it is worth mentioning that, we presume, the economy allows only that sort of foreign capital which it does not have to start with. This kind of assumption helps us to ignore the economic rift between foreign and domestic capital. And therefore influx of such foreign capital also does not have any factor price implication for domestic market of such capital, if any.[1] This makes our analysis easier to comprehend and also helps us to firmly focus on the prime agendum of the current study.

In this paper we formulate a general equilibrium trade model in line of Gruen and Corden (1970), Jones and Marjit (1992, 2008), Marjit (2003, 2005, 2008) etc. The structure is essentially a Heckscher-Ohlin nugget where we obtain a synthesis of Heckschler-Ohin (H-O) model and Specific Factor Model (SFM) of trade. In the existing literature this sort of amalgamation is often used for analyzing trade and development issues. Very recently Marjit and Mandal (2012), Mandal and Marjit (2010, 2012, 2013) have used similar framework in order to assess the effect of an institutional factor like corruption on trade pattern, trade volume, wage distribution, welfare etc. Later Mandal and Marjit (2013) introduced corruption associated with tariff restriction at the border. Then they examined the consequences of tariff reform on corruption activity and corruption related intermediators.

The present paper, nevertheless, though uses a structure akin to the model we mentioned in the above paragraph, is qualitatively different from those in many respects. Here we use a traditional pure trade theoretic model and will graduate

[1] This issue is nicely captured in Biswas et al (2014)

towards open economy macroeconomic issue. Such an attempt is really rare in the literature. To the best of our knowledge we have not seen much that use general equilibrium trade model and focuses on exchange rate movement. Without any prejudice we assume, to start with, that the country does not produce exportable commodity as it requires specific kind of capital which is not in supply domestically. So the economy begins with production of two commodities: one is importable and the other one is a non-traded one. For the current analysis, it does not matter whether this country imports in reality, if imports how do they finance or if the country always has deficit in trade balance. For brevity let us assume that the country does not import, per se, but the price of the commodity is determined internationally. Further we introduce non-traded good in order to define RER (Real Exchange Rate) in a common way found in the concerned literature and at the same time fits well with our model. We will explain the construction of RER in details later. Before we move to the next section we briefly point to the basic results of the papers. Due to an inflow of foreign capital in the export sector: Exportable production goes up whereas importable does not change; nontraded sector contracts; price of the nontraded good falls; and real exchange rate increases.

The paper proceeds as follows. Next section formulates the basic model and defines RER. Section 3 theoretically examines the influence of foreign capital inflow on factor prices, commodity output and RER. This is followed by detailed empirical results and implications. In this section we also attempt to synchronize between theoretical arguments and empirical findings. The last section concludes the paper.

2.1. The Basic Model and Results

We have a small open economy producing two goods following neo-classical assumptions. One is importable good (Y) and the non-traded good is Z. Price(s) of traded good is determined in the international market whereas price of Z has to be determined domestically. We also have another commodity in the analysis. This is exportable, X. But X is not produced a-priori, as it requires foreign capital. Sector X can also be defined as special economic zone (SEZ) or export enclave. We consider X in order to motivate on foreign capital inflow in a sector which particularly produces exportable goods.

Y is produced by two inputs: labor (L) and capital (K). Whereas Z uses L and a different type of capital or land (T). So L is mobile between Y and Z, and K is specific to Y, and T is specific to Z. On the other hand X can be produced by L and foreign capital, K^*. So, again K^* is specific to X. Therefore, L is mobile across all sectors. Note that in absence of K^*, X is not produced in the economy. If X is defined as SEZ, to motivate on inflow of foreign capital let us assume that r^* is higher than r_I^* (return to K^*) in international market). If the government intends to set up SEZ, it sets $r^* > r_I^*$. So r^* is fixed by government policy. This may also capture some other benefits that accrue to foreign capitalists in some form or other. This is the incentive that induces foreign capitalists to supply capital in the concerned country. Simultaneously, small country assumption ensures that host country can have as much as K^* at the given price r^*. So price adjustment for foreign capital due to higher supply is surpassed. In fact in an earlier paper Biswas et al (2014) talked about such mechanism and examined how factor

price itself can lead to changes in exchange rate. Unlike Biswas et al (2014), in this paper price of non-traded good Z follows standard Cobb-Douglas preference pattern.

Therefore following set of equations define the model[2] (Jones, '65, '71).

Competitive price equations guarantee the equality between cost of production and price

$$a_{LX}w + a_{K^*X}r^* = P_X \quad (1)$$

$$a_{LY}w + a_{KY}r = P_Y \quad (2)$$

$$a_{LZ}w + a_{TZ}R = P_Z \quad (3)$$

Factors are fully employed. This implies

$$a_{LX}X + a_{LY}Y + a_{LZ}Z = \bar{L} \quad (4)$$

$$a_{KY}Y = \bar{K} \quad (5)$$

$$a_{TZ.}Z = \bar{T} \quad (6)$$

$$a_{K^*X}X = K^* \quad (7)$$

Note that $\bar{L}$, $\bar{K}$, $\bar{T}$ and K^* are the endowment of factors. Except K^*, all other factors are fixed in supply.

Again demand for Z is denoted by

$$(1-\beta)P_Z Z = \beta\{P_X X + P_Y Y - r^*K^*\} \quad (8)$$

$0 < \beta < 1$ is the fraction of total value of goods produced or income net of repatriation is spent on non-traded good. r^*K^* is the cost of capital that is repatriated by foreign capitalist. This means, without prejudice, we assume hundred percent

[2] To build the system of equations, we use the following notations: P_i = Price of jth good, j = *X, Y, Z* ; w = Return to labor, *L;* r = Return to capital, *K;* *R* = Return to *T;* a_{ij}= Technological co-efficient; θ_{ij} = value share of ith factor in jth commodity; λ_{ij} = employment share of i in j production; *K*= Total supply of K; L= Total supply of labor; T= Total supply of T; a *hat* over a variable represents proportional change.

repatriation of benefit accrued to the capita owned by them[3]. Thus the set-up of basic model is now complete. Before we are transferred to the effect of foreign capital inflow let us very briefly describe the solution mechanism of the said model. In a sense, equation (7) is not relevant for domestic economy as this condition entails full employment of foreign capital. So even in absence of this our model has to be self-explanatory and deterministic. We have six unknown variables $\{w, r, R, P_Z, Y, Z,\}$ to solve from (2)-(6) and (8). Because when there is no K^*, both (1) and (7) are redundant. (2) and (3) together represents SFM. Equation (2) –(6) solve for $\{w, r, R, Y, Z,\}$ following any standard SFM solution. This is determined for any given P_Z. Once Y and Z (and r^*K^*) are calculated we get P_Z from (8). Thus the model is solved.

2.2. Real Exchange Rate (RER)

We define RER (ε) as the domestic relative price of tradable goods (exportables and importables) to nontradable goods.

$$\varepsilon = \frac{\gamma P_X + (1-\gamma) P_Y}{P_Z}$$

where the numerator represents the composite price index for tradable goods in the economy and γ and $(1-\gamma)$ are the weights of exportable and importable, respectively. For simplicity, we assume that exportable are not consumed domestically, $\gamma = 0$ and the RER, $\varepsilon = \frac{P_Y}{P_Z}$. Here it is worth mentioning why we consider the above definition of the RER. If all the goods and services are traded we have ample scope for

[3] Host country does not claim any price or cost of using domestic infrastructure, administrative help etc. This is also one kind of benefit that foreign capital gets. This could again be considered as another factor to attract foreign capital.

designing and defining RER. But the scope becomes really constricted if the economy produces nontraded good along with other traded goods. Nontraded good cannot be left aside as this induces changes in traded goods' production and factor prices of the economy. So the RER should take into account both traded and nontraded good, and to the best of our knowledge the above is the only definition that takes care of both the goods.

3.1. Inflow of K^* and factor prices

Following some targeted policies instituted by government if specific capital K^* flows in, immediately exportable production either starts producing or expands. This is apparent from K^* −employment ondition. When X increases it draws some L other sectors comprising of Y and Z. now the question is which sector will release L or if both then which one would do it more. We shall come to these issues later. Now let us look at the factor price implications. Given P_X and P_Y, w is determined from equation (1) (considering the fully blown set up including X) because of constant r^* indicating a non-changing w. This again implies unaltered r in equation (2). So, $\widehat{w} = \hat{r} = \hat{P}_X = \hat{P}_Y = \hat{r}^* = 0$.

From (7) $\hat{a}_{K^*X} + \hat{X} = \widehat{K}^* \Rightarrow \hat{X} = \widehat{K}^*$ (9)

Note that substitution of factors in X not possible for that $\widehat{w} = \hat{r}^* = 0 \Longrightarrow \frac{\widehat{w}}{\hat{r}^*} \Longrightarrow$ $\hat{a}_{K^*X} = 0$. Same is the case for Y as $\frac{\widehat{w}}{\hat{r}} = 0$. Therefore output of Y will not change as K is fixed.

$\hat{a}_{KY} + \hat{Y} = \widehat{K} = 0 + \hat{Y} \Longrightarrow \hat{Y} = 0$ (10)

So we are left with the option of contraction of Z. This can only make way for increased supply of L in X, and hence an increase in X. When any specific factor of production increases this outcome is apparent as we have rule out unemployment of any factor whatsoever.

Intuitively, Z can decrease if and only if a_{TZ} increases. This is ensured from (6) where supply of T is constant. a_{TZ} will increase only when R falls and a fall in P_Z can guarantee such a decrease in R.

Using elasticity of substitution in Z

$$\hat{a}_{TZ} = \sigma_Z \, \theta_{LZ}\left(\hat{w} - \hat{R}\right) \tag{11}$$

Or, $\hat{a}_{TZ} = (-)\sigma_Z \, \theta_{LZ}\hat{R} \qquad (\because \hat{w} = 0)$

And from (6) $\hat{a}_{TZ} + \hat{Z} = \hat{T} \Rightarrow \hat{Z} = (-)\hat{a}_{TZ} = \sigma_Z \, \theta_{LZ}\hat{R}$ (12)[4]

Again from (4), (5) and (7)

$$\lambda_{LX}\hat{K}^* + \lambda_{LZ}\hat{Z} = 0 \Rightarrow \hat{Z} = (-)\frac{\lambda_{LX}}{\lambda_{LZ}}\hat{K}^* < 0 \tag{13}$$

Comparing (12) and (13)

$$\hat{R} = (-)\frac{1}{\sigma_Z \, \theta_{LZ}}\frac{\lambda_{LX}}{\lambda_{LZ}}\hat{K}^* < 0 \tag{14}$$

The underlying reason for a fall in R is relatively easy to follow. An increase in X attracts L that comes from Z. When L moves out of Z some T becomes either unemployed or excess in supply. Since our model does not permit unemployment, excess supply of T pushes down R.

Thus we propose that

[4] σ_Z is the elasticity of substitution between L and T in Z.

Proposition I: *Following an inflow of foreign capital in the export sector*

(a) Exportable production goes up whereas importable does not change;

(b) All other factor prices remain same;

(c) Return to T falls; and

(d) Nontraded sector contracts.

3.2. Increase in K^* and RER

As we have mentioned in the introduction that RER crucially hinges upon P_Z since all other commodity prices are given and determined in the international market. Therefore we have to solve for endogenous P_Z. In fact we already have a hint that R would fall. R may fall in case of a reduction in P_Z only. Here we now check mathematically the effect on P_Z, and we also provide with economic arguments for such result.

Cobb-Douglas demand for Z expressed in (8) gives

$$\hat{P}_Z = \hat{K}^* \left[\frac{1}{1-\beta}\left\{\beta(S_X - S_{K^*}) - \frac{\lambda_{LX}}{\lambda_{LZ}}(\beta+1)\right\}\right] \qquad (15)$$

where, $S_X = \frac{P_X.X}{P_Z.Z}$; $S_{K^*} = \frac{r^*K^*}{P_Z.Z}$

$\hat{P}_Z \gtrless 0$ if $\beta\ \lambda_{LZ}(S_X - S_{K^*}) \gtrless (1+\beta)\lambda_{LX}$. $(1+\beta)\lambda_{LX}$ is always positive. So when $S_{K^*} > S_X$, $(1+\beta)\lambda_{LX} > \beta\ \lambda_{LZ}(S_X - S_{K^*})$. This is unambiguous. This inequality, nevertheless, may hold true even if $S_{K^*} < S_X$. But that requires another condition. Therefore, P_Z would fall straightaway if $S_{K^*} > S_X$. However, S_{K^*} can never be greater than S_X as r^*K^* constitutes a part of $P_X.X$ implying $S_X > S_{K^*}$ naturally. So the

arguments we just made for an unambiguous outcome is directly refuted. In what follows the precise condition for P_Z to rise or fall is

$$\beta\ \lambda_{LZ}(S_X - S_{K^*}) \gtrless (1+\beta)\lambda_{LX}$$

$$\text{Or, } \frac{\lambda_{LZ}}{\lambda_{LX}} \gtrless \frac{(1+\beta)}{\beta}\frac{P_Z.Z}{w.L_X} \Rightarrow \frac{a_{LZ}.Z}{a_{LX}.X} \gtrless \frac{(1+\beta)}{\beta}\frac{P_Z.Z}{w.L_X} \Rightarrow \frac{a_{LZ}.w}{P_Z} \gtrless \frac{(1+\beta)}{\beta} \Rightarrow\ \theta_{LZ} \gtrless \frac{(1+\beta)}{\beta} \qquad (16)$$

Again, an increase in P_Z is not possible as R has to fall as we discussed earlier. R would be decreased only when P_Z is reduced. A careful investigation of (16) ensures that $\frac{(1+\beta)}{\beta} > 1$ and $\theta_{LZ} < 1$ since θ_{LZ} is the value share of L in Z. Thus P_Z must fall which is what we also got for a reduction in R. Consequently, RER= $\varepsilon = \frac{P_Y}{P_Z}$ will get a boost.

Proposition II: *RER will increase consequent upon an inflow of foreign capital in the export sector.*

Proof: See discussion above.

In this connection, it is worth to mention that in a recent paper Biswas et al (2014) found the opposite result: RER decreased on the assumption that domestic r is greater than international r but domestic r is a decreasing function of K inflow. Contrary to that, in this study we have an increase in RER. This result is primarily driven by three things. Domestic r is constant and set at a level higher than international r; Z uses a specific capital unlike the previous model; and Pz is determined by the C-D preference function.

Empirical Evidence

Corroborating empirical part is built on two annual data series from World Bank database (2014) viz; net inflows of foreign direct investment as a percentage of GDP (gross domestic product) denoted hereafter as FDI and (log of) Real effective exchange rate index (2005 = 100)[5] denoted by RER for the time period from 1995 to 2012. We considered this time frame specifically to look at the effect of inflow of foreign capital only in the exportable sector, which is a relatively new phenomenon for these economies and we also focused on the time period after the General Agreement on Trade and Tariff (GATT) act of 1994. Based on our assumption of small economies we focused only on lower-middle income countries as found in World Bank database. Out of 48 such countries we obtained data for the FDI and RER series only for 21 countries from 1995 to 2012. Now out of these 21 countries we found 13 countries to have positive correlation between FDI and RER, commensurate with our theoretical findings (see Table 1).

[5] Series codes: FDI--BX.KLT.DINV.WD.GD.ZS, RER--PX.REX.REER

Table 1: Correlation coefficient (ρ) between FDI and RER

Country	ρ	Country	ρ	Country	ρ
Armenia	0.538	Lesotho	0.730	Philippines	0.202
Bolivia	0.588	Moldova	0.124	Samoa	0.311
Cameroon	0.168	Morocco	-0.630	Solomon Islands	0.122
Cote dlvoire	-0.611	Nicaragua	-0.383	Ukraine	-0.081
Georgia	0.291	Nigeria	0.398	Zambia	0.457
Ghana	-0.375	Pakistan	-0.250		
Guyana	0.326	Papua-New Guinea	-0.286		
Kiribati	-0.361	Paraguay	0.348		

Since our goal is to analyze the relationship between FDI and RER in multiple countries over the above mentioned time periods we considered a pooled time series and cross section data for the 21 countries over 18 years. Thus, there are 21 cross-sectional units and 18 time periods. In all, therefore, we have 378 observations. The value of correlation coefficient of FDI and RER over these 378 observations is 0.125. This study used three panel data models namely pooled OLS, Fixed effect model (FE) and Random effect model (RE) to analyze these correlations using equations 17a, 17b, and 17c:

$$RER_{it} = \beta_1 + \beta_2 FDI_{it} + u_{it} \qquad (17a)$$

where i = 1, 2,…, 21 and t = 1, 2, . . . , 18 and $E(u_{it}) \sim N(0, \sigma_u^2)$.

At the outset, equation (17a) is estimated with ordinary least squares on pooled time-series cross-section data. Thereafter, we have considered a fixed effect (FE) model (17a) by adding dummy for each country so that we are able to estimate the pure effect of the explanatory variables on the RER by controlling for the unobserved heterogeneity.

$$RER_{it} = \beta_{1i} + \beta_2 FDI_{it} + u_{it} \qquad (17b)$$

Each dummy (β_{1i}) is absorbing the time-invariant effects, if any, particular to each country. FE model takes care of the effect of time-invariant characteristics from the regressors; therefore we can access the FDI's net effect on the RER.

Since we considered 21 different countries we have a reason to believe that differences across countries may have some influence on the RER therefore we proceed by considering a random effect model (17c). The results are reported in the Table 2.

$$RER_{it} = \beta_1 + \beta_2 FDI_{it} + e_i + u_{it} \qquad (17c)$$

where e_i is a random error term with a mean value of zero and variance of σ_e^2.

All panel data regression models pass the standard F test for overall significance at the 1% level. Since we have used the time-series cross-section data for different countries, the residuals might be suffered from heteroskedasticity problem and it is corrected by providing t-value based on heteroskedasticity corrected robust estimation method. The impact of FDI on the RER is largely consistent with our analytical model. The estimated coefficient of the FDI in the RER equation is positive and statistically significant for all the three panel data models.

Table 2: Panel data analysis: RER determination

Variables	OLS (Pooled)	FE	RE
FDI	0.004**	0.009***	0.007****
	(3.02)[a]	(3.10)	(3.18)
Constant	4.645***	4.626***	4.631***
	(462.58)	(407.25)	(202.86)

[a] t-value (corresponding to robust standard error) in parentheses.
*** Significant at 1% level. ** Significant at 5% level. * Significant at 10% level.

To decide between the FE and RE for the appropriate model particular to our dataset we conduct a Hausman test where the null hypothesis is the preferred model is RE model and we found that we failed to accept the null since Prob>chi2 = 0.0357 (<0.05). This result is expected as we considered all economies from lower middle income groups (classified by World Bank) so among them we may not have the random effect, and FE model can be considered as the appropriate model. We also conducted the Lagrange Multiplier (LM) test for the panel effect with the null hypothesis that the variance across countries is zero and the result indicate we failed to accept the null hypothesis which substantiates our empirical analysis with panel data instead of considering separate OLS regression for each country. Moreover, the differences among the three approaches in this study are modest. Result suggests that, on average, a 1% increase in FDI across time and between countries causes about 0.01% overall increase in RER. These results based on the panel data provide strong support to the hypothesis that the foreign capital inflow causes increase in RER across small economies.

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