

RER and Employment Growth: Emerging Economies

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Abstract

Economic theory suggests three main channels through which RER affects employment: the competitiveness, growth and the labor substitution channel which is also the main interest of this study. The mechanism works through the adjustment of production factors. An appreciation of the domestic currency would imply the relative price of imports to decline. As the capital goods constitute a significant part of the imports while labor is relatively a domestically produced good, the appreciation would make the capital relatively cheaper and thus, would encourage the substitution of capital for labor in the production process. Replacing labor with capital would result in a drop in the employment. While the former two channels have attracted considerable interest, the literature on labor intensity channel is quite scarce and the little piece of empirical evidence available is on firm level. However, we believe that this channel deserves to be paid further interest as it seems to be one of the key concepts to explain the structural unemployment problem which has been frequently discussed during the current crisis. To fill this gap, this study focuses on how the fluctuations in RER affect the capital-labor ratio, capital imports and thus the growth in employment by making use of a panel dataset for 20 developing countries. To our knowledge, this is the first study to provide a cross country evidence on the labor intensity channel.

1 Introduction

The role of RER in determining employment has attracted some interest recently. While the theoretical attempts heavily focus on the identification of the possible

channels through which RER affects employment, the empirical studies mostly focus on measuring the magnitude of the effect through these channels. The aim of this paper is to analyze the impact of RER on employment. To serve this aim, we conduct a cross country analysis where we make use of panel data for 20 developing countries.

There are three main channels addressed in the literature through which RER affects employment in an economy. The first channel is the macroeconomic (competitiveness) channel. It is argued that an undervaluation of domestic currency creates a competitiveness improvement for the exporting firms which would lead to higher net exports. Higher net exports, by pushing the aggregate demand up, consequently increases domestic production and employment.

The second is the development channel which depends on the assumption that the capital accumulation is a positive function of the profitability. Given this condition is satisfied, a depreciated RER corresponds to lower real wages and thus, higher profit rates in the traded goods sector which implies higher levels of capital accumulation. As a result, the growth in the traded goods sector accelerates and not surprisingly higher growth would imply higher employment. Finally, the labor intensity is the third channel. A decline in the real value of the currency, by driving the real wage down and the relative price of imported capital goods up, improves the labor/output ratio.

2 Literature Review

The research interest on the link between the RER and employment has been growing recently. In the earlier studies the focus was more on investigating whether such a link existed and the countries of interest were usually the developed ones. Branson and Love (1988) [5], Revenga (1992) [15]. Campa and Goldberg (2001)[6] finds empirical evidence for the impact of RER on employment dynamics and

wages. Their results implies that the RER has a significant influence on the labor market adjustments in the U.S. manufacturing industries and the response of wages is higher than the response of employment level (measured in both the hours worked and the number of jobs). The magnitude of these adjustments is sensitive to several factors such as the time period, the mark-up levels in the industries, the level of reliance to the imported inputs and the education level of the workers. Nucci and Pozzolo (2009) [11] examines the same phenomenon by using data from Italian manufacturing industries. Although their results for the impact on wages are in accordance with Campa and Goldberg (2001), they report higher responsiveness of employment compared to the former study¹.

There are several recent studies that shed light to the case in the developing countries. Providing also a theoretical overview of the channels through which RER affects employment, Frenkel and Ros (2006) [8] makes use of a data set that covers 17 Latin American countries in order to show that RER plays a significant and negative role in the determination of unemployment, as expected. The additional analysis they conducted on Argentina, Brazil, Chile and Mexico suggests that the impact provides empirical evidence for the effect through the labor intensity channel. Another study, analyzing the relationship within the context of liability dollarization in 9 Latin American countries, provides econometrics evidence indicating the significant impact of RER on employment through both competitiveness and balance sheet effects channels. The estimation results –in accordance with the previous studies– suggest a negative correlation through the competitiveness channel while in industries with high debt dollarization the correlation is positive through the balance sheet effects channel –i.e. a depreciation of the domestic currency results in a decline in the employment growth rate (Bebczuk

¹Nucci and Pozzolo (2009) suggests that the reason for the diversion from Campa and Goldberg (2001) in terms of the sensitivity of employment to the changes in the RER is that the latter uses aggregate level data (i.e.industry level) whereas the former uses disaggregated (firm level) data.

et. al. 2006) [2]

Another study focusing on the link between the employment and RER in Latin American countries is Soto (2008) [17] which diverges from the existing literature in the sense that the causality runs from the employment towards the RER and therefore, RER is considered to be an endogenous variable in this study. The analysis is based on a general equilibrium model where the equilibrium level of RER is endogenously determined such that it would ensure simultaneous internal and external balance in the medium run. Empirical results implies that a 6% increase in unemployment is consistent with a 10% appreciation in RER. Yet, the treatment of RER as an endogenous variable has received criticism as most governments -especially those of developing countries- use policies to affect the RER (Rodrik, 2008). Bhalla (2008) [3] also submits empirical evidence from both developing and developed countries which suggests that the RER is not found to be mean reverting during different periods through 1960-2000 and thus, it is a policy variable rather than an endogenous variable.

Among the three channels explained above, the development channel has been the most popular one in the literature, from both theoretical and empirical aspects, which is hardly a surprise given the close links of this channel to the economic growth literature. Early studies attempted to check the association between the level of outward orientation of economies measured by the RER distortions and the economic growth. Evidence from 95 developing countries implies that there is a significant positive effect of outward orientation on the growth (Collar, 1992) [7]. In general, Asian developing economies that are classified as more outward oriented as they maintained undervalued exchange rates achieved higher level of growth compared to the Latin American and Asian economies through the period of 1976-1985.

Rodrik (2008) [16] examines the relation between the currency undervaluations

and growth rates by using a panel of 184 countries for the period of 1950-2004. The estimation results support the hypothesis that the undervaluation of the domestic currency has a positive and significant effect on growth in developing countries whereas the effect becomes insignificant when the whole sample of countries is considered ². Evidence also suggests that the effect on growth works through the size of the tradables such that undervaluation of currency leads to an increase in the relative size of the tradables and reallocating the resources towards the tradables, countries experience higher growth rates. Similar results supporting the negative(positive) impact of currency overvaluation(undervaluation) on economics growth are also submitted in several other studies (Razin and Collins, 1997 [13]; Polterovich and Popov, 2003 [12]; Gala, 2008 [9])

Replicating Rodrik's results, Razmi et al (2009) [14] shows that the difference between the responses of growth in developing and developed countries is sensitive to how the groups are formed in terms of the income levels. They provide further evidence supporting that the undervaluation of the domestic currencies causes higher investment growth in developing countries. Although this link between the RER and investment has been studied before empirical literature seems to be scarce. One of the few examples is Blecker (2007) [4], that also provides evidence from U.S. manufacturing sector in favor of the negative relation between the RER and investment. His analysis additionally, implies that the effect of RER through financial constraints outweighs the effect observed through the desired stock of capital channel.

In addition to investment, the impact of RER on growth could also be realized through the intermediation of domestic saving rates. Gala and Rocha (2008) [10] presents a short run income determination model where RER affects the domestic and foreign saving rate by changing the profit margins in the traded and non-

²In order to measure the level of undervaluation, he constructed an index which is a Balassa-Samuelson adjusted measure of domestic price level and is comparable across countries and time.

traded goods sector. Depreciation of the domestic currency results in higher levels of exports and investment and thus, higher income levels while consumption as a share of GDP is expected to drop ³. As expected, the overall effect would be an increase in domestic savings and a decline in foreign savings. An appreciation of the exchange rate, on the other hand, would lead to the opposite changes in the saving rates accompanied by current account deficits. The empirical results that are obtained from a dataset of 83 medium income countries provides robust evidence supporting this prediction of the model. A significant and positive relation between the undervaluation index of RER and domestic savings rate is reported and such a result implies that the favorable effects of maintaining a competitive currency on growth might work through the channel of domestic savings.

Another recent study that is chasing a clue of the influence of RER on economic growth is Bhalla (2008) [3]. An important contribution of his study is that he suggests a new formulation of RER ⁴ that implies a non linear S-shaped relation between RER and per capita income. His comparison of models of RER determination concludes that the new formulation has the highest explanatory power. The effect of RER on growth is realized through investment. The hypothesis that a competitive RER attracts higher levels of investment as profitability increases and therefore, stimulates growth is supported by the empirical evidence. The results also imply that the effect of a change in the undervaluation is much stronger than the level effect.

The labor intensity channel, on the other hand, has not attracted the same

³This result of the model is reached based on the assumption that the tradable sector outweighs the non tradable sector with imported inputs. Otherwise, a depreciation of the currency might lead to lower levels of investment as the relative price of capital would be higher.

⁴The justification for the S-shaped relationship is the declining share of the agriculture sector in the developing countries. As these economies grow, the share of the agriculture sector which provides low value added drops leading to first a sharp improvement in average income and then a gradual improvement in per capita income.

amount of interest the development channel did. Yet, there exist a somewhat close literature that relates the RER movements to labor productivity. In a recent study, Leung and Yuen (2009) [1] proposes two channels through which the RER movements influence the labor productivity: the relative input prices and the capital/labor ratio. The empirical part of their work that is based on the panel evidence from the Canadian manufacturing companies implies that there exists a negative link between the K/L ratio and the relative price of inputs (i.e. the user cost-wage ratio). Furthermore, they show that although the price of domestic currency is found to be negatively correlated with the user cost of capital and positively correlated with the K/L ratio, the effect is small in magnitude. The results from the GMM analysis suggests that a 10% depreciation of the currency results in a 0.6% fall in the total K/L ratio.

3 A simple theoretical model

Following Yanhui and Wang (2006) [18] we assume a representative firm operating in perfectly competitive foreign markets and product price is given. The firm purchases labor inputs from domestic resources but the capital inputs from foreign markets, and its product is sold in both domestic and foreign markets as well. The profit function can be written as follows,

$$\sum \delta^t [(1 - \eta)P_t + \eta E_t P_t^*] Q_t - W_t L_t - E_t K_t^* - Z_t \quad (1)$$

where $Q_t = L_t^\beta K_t^{*\alpha} Z_t^{1-\alpha-\beta}$, $0 \leq \alpha, \beta \leq 1$, δ is the discount rate; $\eta \in [0, 1]$ is the share of exports in firm's total sale; P , Q , W and L represent price, output, wage and labor respectively; subscript t is time period and E is the nominal exchange rate.

Let $e_t = E_t P_t^* / P_t$ be the real exchange rate. The export share is η is assumed to be an increasing function of real exchange rate, e . The imported capital goods,

K^* is also assumed to be a function of real exchange rate, but the value of $K^*(e)$ depends upon the elasticity of import demand.

Differentiating profit function with respect to L_t we get

$$[P_t(1 - \eta) + \eta E_t P_t^*] \beta L_t^{\beta-1} K_t^{*\alpha} Z_t^{(1-\alpha-\beta)} = W_t \quad (2)$$

The equilibrium labor demand can be found as:

$$L^* = [A \beta K_t^{*\alpha} Z_t^{(1-\alpha-\beta)} / W_t]^{1/(1-\beta)} \quad (3)$$

where $A = [P_t(1 - \eta) + \eta E_t P_t^*]$.

According to the above equation labor demand has many determinants. Wage level, prices of domestic and foreign goods, real exchange rate, export share and capital good imports simultaneously set the optimal level of employment. After taking the logarithm on both sides we get

$$l_t^* = a_0 + a_1 \gamma_t + a_2 k_t^* + a_3 z_t + a_4 w_t \quad (4)$$

where $\gamma_t = \ln A$ and small letters denote the natural logarithms of the respective variables.

Ignoring the firm's domestic part of sales we have $\gamma = p + e + \eta$. Thus the general form of labor demand by the representative firm can be written as

$$l_t^d = a_0 + a_1(p + e + \eta) + a_2 k_t^* + a_3 z_t + a_4 w_t \quad (5)$$

By differentiating l_t with respect to e_t we can find the effect of real exchange rate on labor demand as

$$[\partial l^* / \partial e] = [\eta + (e - 1)\eta_e] / [(1 - \beta)\gamma] + \alpha k_e^* / [(1 - \beta)K^*] \quad (6)$$

Equation (6) illustrates the mechanisms of influence of real exchange rate on labor demand. Real exchange rate affects the optimal level of employment through export price, variation in export share and import costs, and more importantly through the optimal level of capital stock.

4 Data and Summary Statistics

We use an unbalanced panel for 20 developing countries ⁵. The frequency of the data is annual. World Development Indicators, Extended World Penn Tables and International Financial Statistics databases are the main data sources⁶ The summary statistics for the variables of main interest are provided below.

As it is indicated in the literature, it is the deviations from the equilibrium RER that is expected to influence growth and employment dynamics rather than the level of RER, we make use of an undervaluation index that we calculated using Rodrik (2007)'s method. The calculation follows the three main steps ⁷. First, we calculate the log of real exchange rate for each country by using the log of the ratio of the nominal exchange rate to purchasing power conversion factors.

⁵The countries under investigation are Argentina, Brazil, Chile, Colombia, Egypt, Ethiopia, Hungary, India, Indonesia, South Korea, Malaysia, Mexico, Morocco, Peru, the Philippines, Poland, South Africa, Sri Lanka, Thailand and Turkey. The time periods considered for each country are specified in the appendix

⁶See Appendix for a detailed description of the variables and the data sources used in the analysis.

⁷The variables used in the calculation of the undervaluation index are taken from the World Penn Tables 6.2 database.

$$\ln RER_{it}^a = \ln(XRAT_{it}/PPP_{it}) \quad (7)$$

In the second step, in order to account for the Balassa-Samuelson effect –i.e. to reflect the lower non tradable prices in low income countries- we run the following regression.

$$\ln RER_{it} = \alpha + \beta \ln rgdpc_{it} + f_t + u_{it} \quad (8)$$

Table 1: Summary statistics

Variable	Mean	Median	Std. Dev.	N
lnEMP	16.63	16.52	1.06	527
lnCLR	9.48	9.52	1.05	524
lnRER	0	0.04	0.44	505
lnRGDPCG	8.59	8.67	0.68	505
GFCFGDP	0.22	0.21	0.06	495
lnCAPFLOW	7.41	7.51	1.32	527
MIMT	0.32	0.33	0.11	498
MXMT	0.21	0.20	0.13	496

We then get the forecasts of RER values $\ln RER_{it}$ using the panel regression of the adjusted RER. At the final step we subtract the $\ln RER_{it}$ from the realized values of RER calculated at the first step to get the misalignment.

If the RER is above 1, it indicates that the domestic currency is depreciated in real terms. As indicated above, we use the logarith of RER which centers around mean 0 with a standard deviation of 0.438.

Before moving to a detailed analysis of the results from the panel regressions, we will make use of a set of descriptive statistics and graphs to provide the reader

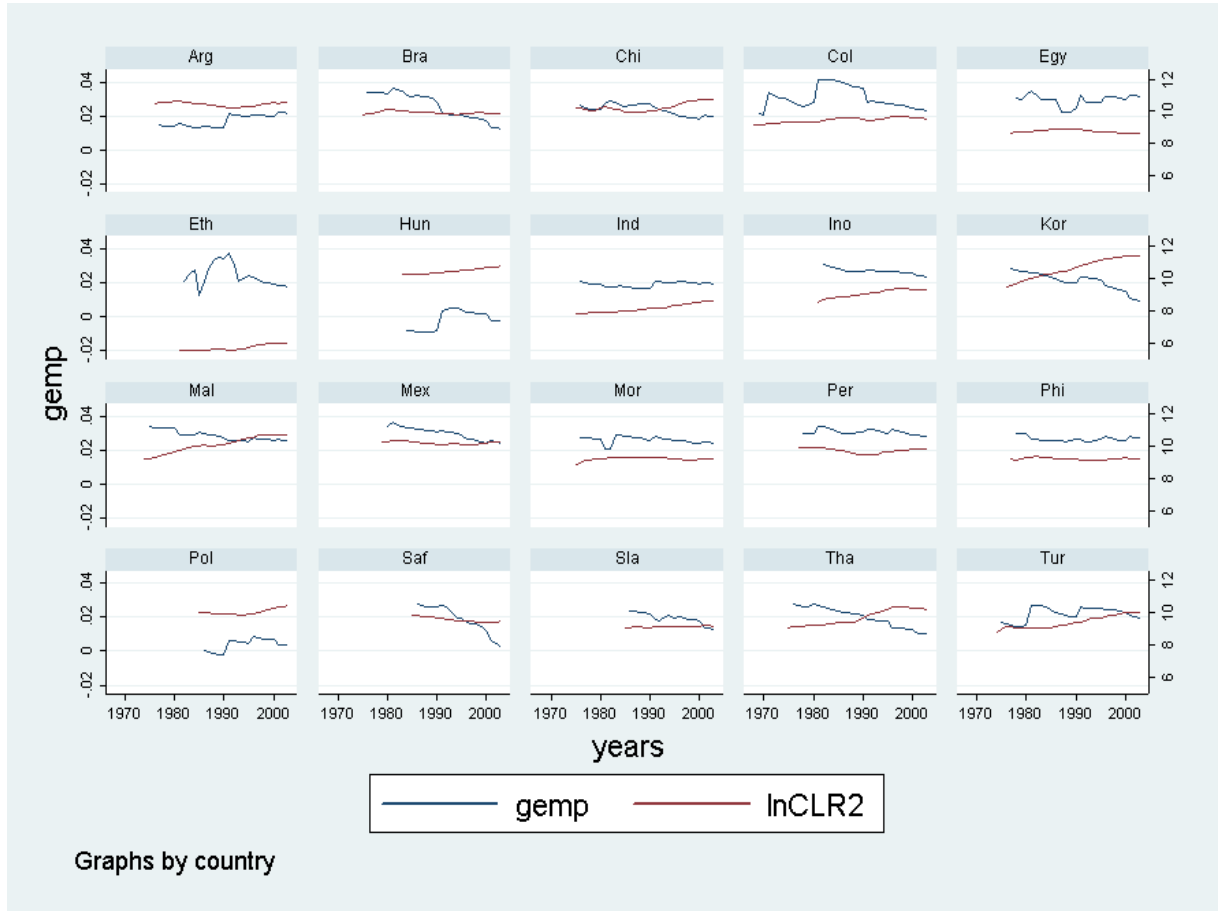


Figure 1: Employment Growth and Capital Intensity

with a better picture of the relationship among the variables of interest in this study.

5 Econometric Analysis

We use equation (6) as the basis for our econometric analysis.

Initially we test our claim that real exchange rate undervaluation (an increase in $\ln RER$) has a significant effect on the capital intensity (reverse of the labor intensity). Controlling for the share of investment in GDP as a proxy for the ac-

Table 2: Growth of Capital Intensity: FE Panel Regression

Variable	Coefficient	(Std. Err.)
lnrgdpch	-0.061**	(0.014)
lngfcf	0.059**	(0.009)
lnRER	-0.040**	(0.009)
lncapflo	0.007**	(0.002)
Intercept	-1.088**	(0.150)
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N	350	
R ²	0.297	
F _(23,326)	34.497	
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Significance levels :	† : 10%	* : 5% ** : 1%

cumulation motive and the real average gdp per capita as a proxy for both the development level and the average wage level we find that real exchange rate over-valuation increases the growth of capital intensity.

The impact of capital flows persist even if we take the level of capital intensity and control for the average income as well as the share of imports in international trade.

Table 3: Capital Intensity

Variable	(1)	(2)
Capital Flows (lnicapflo)	0.668*	
Real GDP per capita (lnrgdpch)	0.04*	0.63*
Share of Imports in Trade (mimt)		0.534**
F Stat	82.5	45.6
Number of Observation	384	481

Fixed-Effect Panel Data Regression;

* and ** denote significance levels at 1% and 5% respectively

Table 4 illustrates our main argument. In all regressions, real exchange rate undervaluation has a positive and a significant effect on the level of employment.

In addition to the undervaluation variable, the coefficients of other variables

under different specifications should be investigated as they show the channels we explained above. For instance the positive and significant coefficient of real GDP per capita in column (1) supports the arguments for development channel. In a similar manner, in column (3), the positive coefficient of export share indicates that in addition to the effect through the development channel, the effect through the competitiveness channel is at work.

Table 4: Employment Level

Variable	(1)	(2)	(3)	(4)	(5)	(6)
RER Undervaluation (lnRER)	0.2*		0.068*	1.234*	0.356*	0.135
Capital Flow (lncaflo)					0.024*	0.028*
Real GDP per capita (lnrgdpch)	0.429*	0.298*	0.243*	0.202*	0.493*	0.367*
Capital Intensity (lnCLR)		0.196*		0.19		-0.111*
RERlnCLR				0.119*		
Share of Exports in Trade (mxmt)			1.34*	1.324*		1.23*
F-Statistics	505	505	479	479	384	370
Number of Observations	887	892	957	972	503	576

Notes: Fixed-Effect Panel Data Regression; * and ** denote significance levels at 1% and 5% respectively

One would immediately realize that the sign of the capital-labor ratio in column (2) is in contradiction with our expectations as the theory suggests a negative relation between the employment and the capital intensity. However, once we control for the capital inflows –as specified in column (6)- the sign turns into negative, as expected.

In column (4) we also check if the interaction between the undervaluation and CLR plays a significant role. The positive and significant coefficient implies that the higher is the capital intensity, the larger becomes the impact of undervaluation on employment. The rest of the variables are in accordance with what the theory suggests except CLR which is statistically insignificant in this specification.

6 Conclusion

In the existing literature, three main channels through which RER affects employment: the competitiveness, growth and the labor substitution channels. While the former two channels have attracted considerable interest, the literature on labor intensity channel is quite scarce and the little piece of empirical evidence available is on firm level. Yet, we believe that this channel deserves to be paid further interest as it seems to be one of the key concepts to explain the structural unemployment problem which has been frequently discussed during the current crisis. Therefore, in this study we attempted to shed light on how the fluctuations in RER affect the capital-labor ratio, capital imports and thus the employment

For the theoretical motivation we use a modified version of Yanhui and Wang (2008)'s model which addresses the three channels we investigate. Then for the econometric part of the study we made use of an unbalanced panel data set that includes annual observations for 20 emerging countries. The longest time period covers the 1968-2003 period while the shortest covers 1985-2003.

Our empirical results are in accordance with what the theory suggests. Our main finding is that undervaluation has a positive effect on employment level and this finding is robust under different specifications. Moreover, the positive impact of the share of exports and the real GDP per capita on employment support our argument for the competitiveness and the development channels. We observed the negative impact of capital intensity when we control for the capital inflows and this observation favors the argument for the labor intensity channel.

The economic policy conclusions of our paper are rather obvious especially for the labor abundant countries such as Turkey. Keeping the real exchange rate competitive (fighting against overvaluation) will enhance the optimal utilization of the idle resource, namely unemployed labor force. Although increasing openness and investment are important in terms of long run steady growth, employment performance will be largely dependent on the relative prices of capital and labor,

hence the real exchange rate when the capital goods are mostly imported as in the case of emerging economies.

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Appendix

Table 5: Definitions of Variables

Variable	Definition	Source
lnRER	log of real exchange rate misalignment calculated following Rodrik(2008)	Penn World Table(PWT) 6.2
lnEMP	log of the number of employed workers	Conference Board
cap	estimated net fixed capital, 2000 PPP, chain index	Extended Penn Table 3.0
lnCLR	log of capital-labor ratio, calculated using "emp" and cap"	Conference Board and EPT 3.0
XRAT	exchange rate, (1 US dollar=? Local currency)	PWT 6.2
PPP	purchasing power parity over GDP	PWT 6.2
lnRGDPCH	log of real GDP per capita, 2005 constant prices, chain series	PWT 6.2
MIMT	share of manufactured imports in total merchandise trade	World Development Indicators
MXMT	share of manufactured exports in total merchandise trade	WDI
GFCFGDP	gross fixed capital formation, constant LCU	WDI
CAPFLO	current account credit*(-1)	International Financial Statistics