REAL EXCHANGE RATES and ECONOMIC GROWTH

Duygu YOLCU KARADAM

Department of Economics
Middle East Technical University
Ankara 06531 Turkey
Email: dyolcu@metu.edu.tr

Erdal ÖZMEN
Department of Economics
Middle East Technical University
Ankara 06531 Turkey
Email: ozmen@metu.edu.tr

Abstract

The effect of real exchange rate on economic growth is one of the most important issues of the recent policy debate. Undervalued real exchange rate policy pursued by some East Asian countries strenghtens the expansionary devaluation hypothesis. Especially with the wake of the recent global financial crisis, China's weak currency policy has led academics and policy makers to re-assess the merits of export-led growth strategies. On the other side, an alternative approach emphasizes the financial channel of real exchange rate changes in the context of the "balance sheet channel". Accordingly, real excahange rate depreciations can be contractionary in the presence of liability dollarization in developing countries. This paper examines empirically the effect of real exchange rate changes on economic growth using a wide panel data set over the period of 1960-2009. To this end, we apply not only the conventional panel data estimation procedures but also panel cointegration and the recent procedures taking into account the possible common correlated effects such as global shocks. The results suggest that, for industrial countries, the changes in real exchange rate have not any significant effect both in the long run and short run. However, for developing countries, real devaluations are found to be contractionary in the long run while there is no sufficient evidence of contractionary devaluation in the short run. Besides, the contractionary effect of devaluation increases with the degree of dollarization. Our results further support that East Asian countries are different as real exchange rate depreciations are expansionary for them.

JEL Codes: F43, F31, F34

Key Words: real exchange rate, growth, panel data, balance sheet effect

1. INTRODUCTION

Since the real exchange rate is a key relative price which affects the economy through many channels, the effect of real exchange rate (RER) changes on economic growth is one of the most important issues of the recent policy debate. According to the traditional Mundell-Fleming model, depreciation of the real exchange rate is expansionary via its effects on trade balance assuming that the Marshall-Lerner conditions are satisfied. (Dornbusch, 1980; Dornbusch and Werner, 1994). On the other side, real devaluations can have contractionary effects on real economy especially in developing countries. Diaz- Alejandro (1963), Frenkel and Johnson (1976), Krugman and Taylor (1978), Edwards (1986), Lizondo and Montiel (1988) were among the first that give theoretical support to contractionary devaluation mechanism. Inflationary effects of an increase in real exchange rate, negative supply side effects such as increased cost of imported inputs, and the income distribution effects are the main channels emphasized by the earlier contractionary devaluation hypothesis. Lizondo and Montiel (1988) provided a broad analtical overview of those channels and concluded that the net effect of the depreciation of RER on output is ambiguous theoretically. The net effect depends on whether the expenditure-switching effect is dominated by expenditure-reducing and the suply side effects. Therefore, the empirical evidence on the effect of depreciations on economic performance gained importance.

Cooper (1971) is possibly the earliest empirical study on this issue. He analyzed 24 devaluation episodes in 19 different countries in the 1959 – 1966 period and showed that devaluations are contractionary in the short run in most of the cases. One problem with this study was that it was unclear that the reduction in output is due to devaluation or changes of the other exogenous variables. Edwards(1986) extended this study by setting up a reduced form equation for output controlling for the effects of fiscal policy, monetary policy and foreign shocks. Using a pooled data of 12 developing countries, he found that devaluation is contractionary in the short run while it is neutral in the long run since the contemporenous and lagged effects of real exchange rate cancel each out. Morley (1992) again showed that devaluations reduce output, but it takes at least 2 years to have the full effect in his analysis. According to Kamin and Klau (1997), real devaluations are contractionary in the short run but this effect diminishes when spurious correlation and reverse causation between output and real exchange rate is controlled for. Similarly, based on the results of several VAR models, Kamin and Rogers (2000) concluded that real devaluation has led to high inflation and economic contraction in Mexico.

After the wave of financial crises in Latin America (Mexico in 1994-1995 and Argentina in 2001-2002) and East Asia (1997-1998), this literature came into prominance stressing a different problem this time. This new branch of the contractionary devaluation hypothesis emphasized mostly the financial channel of contractionary devaluation hypothesis in the light of the financial dollarization process taking place in a number of emerging economies over the last decades. These studies generally stress the mismatch between foreign currency denominated debt and domestic currency denominated revenues which is referred as Balance Sheet (BS) effect. According to Frankel (2005), the negative effects of devaluation are stronger than its positive effects attributing to the Calvo and Reinhart (2001) which estimated that exports do not increase but instead decrease after a devaluation in the short run. Frankel (2005) assert that the balance sheet effect is the dominant cause of the recessions followed many of the 1990s devaluations rather than the exchange rate the pass through (see also Frankel, Parsley and We, 2005). Similarly Cespedes *et al.* (2003) utilizing from a IS-LM-BP model, showed that negative BS effects dominate competitiveness effect when financial markets are less developed, the ratio of total debt to net worth is high and the share of foreign debt in total debt is high. Cespedes (2005) analyzed 82 large devaluation episodes in the period 1980 – 2001 and concluded that devaluation creates significant output losses in the short run while it creates a positive effect in the medium term. He also find that the countries with deeper financial markets experience lower output losses after a devaluation. Using different dollarization measures, for a panel data sample of 57 countries, Bebczuk *et al.* (2006) showed that when dollarization exceeds a level, contractionary effect of devaluation can dominate the expansionary effect which is the case for most of the developing countries. Galindo *et al*. (2006) provided similar results as Bebczuk *et al*. (2006) by concentrating on industrial employment data.[1]

Recently, successful experiences of China and other East Asian countries strenghten the view that maintaining an undervalued or competitive real exchange rate foster economic growth. Especially with the wake of global financial crisis, China's weak currency policy lead academics and policy makers to question the merits of export-led growth strategies. Although

[1] There are also firm-level studies especially on Latin American countries which show that the increase in real exchange rate (real depreciation) affects investments, sales and profits negatively in the high dollarized economies. (see Galindo *et al.* 2003, Bleakly and Cowan, 2008)

there is a great uncertainity about the advanced countries' capacity to contunue absorbing developing countries' exports, according to the supporters of this view, tradable sector is the main driver of the economy in which the technology transfer and the learning by doing externalities are relatively rapid. Rodrik (2008) is one of the main advocators of this view. According to Rodrik (2008), by increasing the profitability of the tradable sector which suffers disproportionately from the institutional weaknesses and market failures, undervaluation of the real exchange rate facilitates economic growth in developing countries. Some other studies also provided empirical evidence of expansionary devaluation by proposing alternative channels. Using the same Balassa-Samuelson adjusted index of undervaluation as Rodrik (2008), Gala (2008) provides again a positive effect of undervaluation on growth arguing that the channels through which exchange rate levels affect long term growth can be related to investment and technological change. Levy-Yeyati and Sturzenegger (2007) examined the evolution of the exchange rate regimes in recent years and pointed out that there is a tendency to intervene to depreciate local currency which they called as "fear of appreciation".[2] Showing that these interventions managed to preserve a depreciated real exchange rate, they provided empirical evidence that this fear of appreciation leads to higher output and productivity growth which is not only restricted to short term cyclical changes but also leads to higher long term GDP growth. They also investigate the potential channels through which this effect works and showed that this positive effect of fear of appreciation comes from increased domestic savings and investment rather than export-led expansions or import subsitution. This saving channel was believed as contractionary by Diaz-Alejandro (1963) due to the negative effect on consumers and decline in domestic demand. Levy-Yeyati and Sturzenegger (2007) stress the financial constraint that firms with foreign currency liabilities are faced in case of a devaluation and combining this modern view with Alejandro (1963)' s story, they claimed that real devaluations should be expansionary. Because in this modern view, by the means of saving channel, real devaluations relaxes the borrowing constraints binding firms. Gluzmann *et al*. (2011) is the other study which suggests that real depreciations are expansioanry by the channel of savings and investment rather than foreign trade dynamics. However, according to Montiel and Serven (2008), international experience does not provide support for a growth strategy based on the increased saving rate by the help of depreciated real exchange rate.

[2] Calvo and Reinhart (2002) defined the de facto exchange rate intervention in officially floating regimes as "fear of floating" which is in fact used as the fear of depreciation in financially dollarized economies. This concept is the inverse of "fear of appreciation".

Besides these advocators, some authors are more sceptical to the undervalued real exchange rate. For example, Eichengreen (2008) warns about keeping real exchange rate low in that it have costs as well as benefits especially when the economy is sticked with the policy for too long. He emphasizes that a stable and competitive real exchange rate should be thougt as a facilitating condition for economic growth and the timing of the exiting the strategy is very important. There is the risk that the cheap currency policy can weaken the efforts for upgrading and productivity growth while increasing the dependence of growth on expansion on foreign markets. (Akyüz, 2009)

Despite the bulk of studies on the effect of the changes in real exchange rate on growth, they can significantly differ in the results they reach so the issue of whether the devalaution of the real exchange rate is detrimental or beneficial for the economy has not solved yet. With the recent global crisis, it began to be discussed by policy makers intensively in the context of exchange rate wars and global imbalances. Therefore, it has become more important to provide a reliable answer. Recent empirical attempts on the issue generally show similarity mainly in the econometric methods they use and in their approach to the real exchange rate measure used. We believe that econometric methodologies and different real exchange rate indexes used in empirical studies have deterministic effect on the empirical results. So, our main focus in this study is to point out some empirical issues that needs to be dealt with and to emphasize some shortcomings of the earliest econometric evidence. In this study, we aim to investigate the effects of real exchange rate on economic growth mainly adressing some econometric and empirical issues which we think that is important and ignored by the previous studies. By using a wide panel data set of countries, we estimate the link between real exchange rate and real GDP per capita income by differentiating the effects for developed and developing countries. The details of our empirical approach is given in part 2. After estimating the relationship between the real exchange rate and economic growth for industrial and developing countries, we examine the other charachteristics of countries that can affect this relationship. We believe that the effect of the changes in real exchange can differ substantially according to the level of liability dollarization, financial development, financial integration and trade openness of countries. In the literature, the most emphasized one is the liability dollarization. We estimate the effects of these charachteristics in order to clarify the most important factors that determine the real exchange rate and economic growth relationship. One last issue that needs to be examined is the regional factors. Since the East asian countries are seen as utilizing from competitive real exchange rate in order to sustain high growth rates, we also investigate whether East Asian countries are different from other regions or not.

The main findings are: (1) For industrial countries, the changes in real exchange rate have not any significant effect both in the long run and short run. However, for developing countries, real devaluations are found to be contractionary in the long run while there is no sufficient evidence of contractionary devaluation in the short run. (2) The contractioanry effect of devaluation increases with the degree of dollarization and decreases with the level of financial development. (3) East Asian countries are different as real exchange rate depreciations are expansionary for them.

2. DATA and EMPIRICAL METHODOLOGY

2.1. Data and the Model

We use the following conventional growth model which is a panel data version of Barro (1991):

$$y_{i,t} - y_{i,t-1} = (\alpha - 1)y_{i,t-1} + \beta' RER_{i,t} + \gamma' X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (1)$$

where y is the real GDP per capita, RER is the real exchange rate, X is a set of control variables, μ_i is the unobserved country-specific effects, ε is the error term. The subscripts i and t represent the country and time period, respectively. The lagged per capita income, $y_{i,t-1}$, is used as the conditional convergerce term in standart growth equations. The control variables other than the initial income per capita are goverment consumption, trade openness, financial development, investment and secondary schooling as an indicator of human capital. All variables except for secondary schooling and financial development are from World Development Indicators (WDI) database. The real effective exchange rate, our main variable of interest, is from Bank of International Settlements (BIS) for the countries whose data are not available in WDI. Human capital is proxied by the ratio of total secondary schooling to the population aged 15 and over which is provided by Barro and Lee (2010). The ratio of liquid liabilities to the GDP is used as a measure of financial development. The data on liquid liabilities are obtained from Beck, Demirgüç-Kunt and Levine (2000). All variables are expressed in natural logarithms and all control variables are defined as ratio to the GDP.

Our main variable of interest as explaining economic growth, real exchange rate, has a central importance in our study. Recent studies often follow two alternative apprpaches to this end. The first one is an earlier interested in the impacts of real exchange rate misalignments rather than the real exchange rate itself. These studies often argue that keeping the real exchange rate at wrong levels may creat distortions on the economy. Under the maintained hypothesis that the purchasing power parity hypothesis is valid, the real exchange rate misalignment is defined as the deviations of the real exchange rate from its equilibrium level. (Mundell, 1971; Dornbusch, 1974, 1980; Frenkel and Mussa, 1984) Recent studies mostly use the definition of Edwards (1989), which defines equilibrium real exchange rate (ERER) as the relative price of traded and non-traded goods that achieves internal and external equilibrium simultaneously.[3] Based on this definition of ERER, empirical efforts on the calculation the real exchange rate misalignment generally uses the "single equation approach".[4] In this approch, a long run relationship is estimated betwen the real exchange rate and its fundamentals such as net foreign assets, relative productivity differentials, the terms of trade etc. (see among others Cottani *et al*., 1990; Ghura and Grennes, 1993; Razin and Collins, 1999; Aguirre and Calderon, 2005; Macdonald and Veiera, 2010; Bereau *et al*., 2009) Inspite of its simplicity and popularity, the single equation approach is criticized in academic circles that it may lead to misleading results and their suggestions about disequilibrium patterns of countries contradict with each other. Edwards and Savastano (2000) reveales the problems of this method more expilicitly.

The other approach on the measure of real exchange rate is the PPP based measure adjusted for Balassa-Samuelson effect which is first used by Dollar (1992) but gained popularity with Rodrik (2008).[5] According to Balassa (1964) and Samuelson (1964), since the productivity in traded goods will be greater in developed countries, the non-traded goods will be more expensive in developed countries than in developing countries. Then we expect the real exchange rate to be lower in developed countries. Based on this argument, Rodrik (2008) corrects for the Balassa- Samuelson effect by regressing the real exchange rate on a variable related to the degree of development of each country (typically, real GDP per capita) and then defines the undervaluation as the difference between the observed and the predicted real

[3] Edwards (1989) defines internal equilibrium as the situation in which non-traded goods market clears and the unemployment rate is in its natural level. Exxternal equilibrium is attained when current account is compatible with long run sustainable capital flows.

[4] The other approches are PPP-based measures of misalignment and General Equilibrium Simulation Models which are used less frequently.

[5] Dollar (1992) used this index as a measure of real exchange rate distortion in his study which examines the effects of outward orientation on growth.

exchange rate. Following Rodrik (2008), some studies used this index of undervaluation in investigating the growth effects of real exchange rates. (see Gala, 2008; Di Nino *et al*., 2011) However, Rodrik (2008)' s index of undervaluation is heavily criticized by Woodford (2008) as the use of this index exaggerates the strength and the robustness of the effect of real exchange rate on growth. According to Woodford (2008), there is no need to adjust for the B-S effect because the panel growth regression of Rodrik (2008) already includes country fixed effects which accounts for the differences in the real exchange rate levels of countries due to the percapita income differencies.

Based on the arguments mentioned above, in this study we use neither the Balassa-Samuelson adjusted index of Rodrik (2008) nor the misalignment measures of single equation approach. Instead we use only the level of real exchange rate. As the measure of real exchange rate, our preference is the real effective exchange rates instead of bilateral real exchange rates. The bilateral and multilateral real exchange rate indexes can move in different, and even opposite directions after the collapse of Bretton Woods system. As Edwards (1989) indicated, the use of bilateral indexes can result in misleading and incorrect inferences regarding the evolution of a country's degree of competitiveness. Therefore, it is necessary to use a multilateral index of real exchange rate especially when evaluating policy related situations.

Our sample consists of an unbalanced panel of 124 countries over the period 1960 – 2009. The sample is composed of 23 industrial and 101 developing countries. We tried to hold the dataset as large as we can, but we had to exclude the countries with the poorest data.

The growth equation above can be rewritten as a dynamic panel data model as in Islam (1995),

$$y_{i,t} = \alpha y_{i,t-1} + \beta' RER_{i,t} + \gamma' X_{i,t} + \mu_i + \varepsilon_{i,t} \qquad (2)$$

There are some econometric issues that we need to deal with when we estimate the regression equation. The first empirical issue to consider is the time series properties of the variables in the equation which is often neglected by the growth literature. Before proceeding to the estimation we need to investigate the integration properties of the variables. If the variables are difference stationary, we should apply panel cointegration techniques in which we estimate the long run relationship among the variables.The existence of a cointegration relationship among the variables allows us to differentiate the short run and long run dynamics in a panel ARDL framework. The other issue that we need to consider is the potential cross sectional dependence. There can be common shocks that affect all countries which will cause cross-section correlation between the regression error terms. Ignoring this cross section dependence can lead to inconsistence estimates (Phillips and Sul, 2003; Coakley, Fuertes and Smith, 2006; Pesaran, 2006). To the best of our knowledge, there is no study on the real exchange rate and growth relationship to deal with this important problem. The last issue is the dynamic nature of the regression equation and the possible endogeneity of the real exchange rate and the other control variables. One can use the GMM procedure which provides a consistent estimator for dynamic panel data models with potential endogenous explanatory variables. This is the most common method used in previous emprical studies which investigates the effect of real exchange rate on economic growth (Rodrik, 2008; Aguirre and Calderon, 2005; Di Nino *et al*., 2011; Gala, 2008; Macdonald and Vieira, 2010; Galiani *et al*., 2003). Consequently, we also consider the GMM estimation method in estimating our growth equation in this paper. Besides its convenience in dealing with the endogeneity and the reverse causation problem, it will also allow us to make comparison with the previous studies' results.

In the light of these econometric issues, this paper contributes to the literature in several ways. First, we estimate the long run relationship between the real exchange rate and the real GDP per capita by setting up the panel cointegration equation due to the time series properties of the data. Nonstationarity of the variables in the growth equation is generally ignored in the previous literature so this study fills this gap.[6] Second, utilizing from an ARDL model we estimate both long run and short run effects of real exchange rate on growth which allows us to explore different time dynamics of the relationship. Previous studies mostly relied on 5-year averaged data in order to focus on long run growth effects. This approach is useful for smoothing out business cycles but yearly or short term information is often missed. By using annual data and by means of an ARDL framework, we use the advantage of both short term and long term effects. Third, by using Pesaran (2006)'s Common Correlated Effects methodology, we also deal with the cross section dependence issue which is ignored by previous studies.

[6] The only study which takes the time series properties of the variables into account is Nouira and Sekkat (2012) in this context.

2.2. Unit root and cointegration tests

As the above discussion implies, the first step in the analysis is to examine the time series properties of the data. In order to account fort he potential cross-country dependence in the data, employ CIPS test of by Pesaran (2007) which removes the cross section dependence by augmenting the ADF regression with the cross-section averages of lagged levels and first-differences of the individual series. Table 1 reports the resuts of Pesaran (2007)'s panel unit root test. We report these results for lag orders 0, 1, 2, and 3. According to the CIPS test statistics for different lag orders, the null hypothesis of unit root cannot be rejected for the levels of the variables except for some lags. However, the first differences of the variables are seem to be stationary for all lags.

Table 1: Pesaran (2006) CIPS panel unit root test statistics

Lags	0	1	2	3
Real GDP per capita	5.551	1.885	5.297	5.304
ΔReal GDP per capita	-31.552*	-23.214*	-14.687*	-11.041*
real exchange rate	-6.112*	-4.946*	-1.731	-1.382
Δreal exchange rate	-27.284*	-19.955*	-11.080*	-11.945*
gov. consumption	-3.800*	-2.799*	0.687	0.793
Δgov. Consumption	-40.671*	26.429*	-16.812*	-12.888*
trade openness	-7.976*	-7.701*	-4.188*	-3.856*
Δtrade openness	-40.920*	-30.470*	-19.347*	-14.766*
financial dev.	0.807	-1.619	3.506	5.858
Δfinancial dev.	-23.215*	-18.172*	-9.214*	-1.703*
investment	-4.179*	-6.228*	-1.694	1.531
Δinvestment	-	-	-	-

Note: (*) indicates that the test is significant at the 5% level.

Concluding that the variables are integrated of order one, the next step is to test for the existence of a cointegration relationship among the variables. To this end, we use the standard panel cointegration test of Pedroni (1999). The results of panel cointegration test of Pedroni (1999) are reported in Table 2. The first four of the statistics given in Table 2 represents the within dimension panel cointegration statistics and the last three represents the between dimension panel cointegration statistics. All of the seven statistics reject the null hypothesis of no cointegration. The evidence of cointegration is also confirmed by the significance of the error correction term in error correction models estimated in subsequent parts.

Table 2: Pedroni (1999) Panel cointegration test results

Panel v-statistic	-3.457***
Panel rho-Statistic	14.039***
Panel PP-Statistic	3.932***
Panel ADF-Statistic	3.381***
Group rho-Statistic	17.582***
Group PP-Statistic	-2.302***
Group ADF-Statistic	-2.766***

Note: *** denotes the rejection of the null hypothesis at the 5% significance level.

2.3. Long run relationship between real exchange rate and economic growth

Based on the evidence of cointegration among the variables, we construct the long run relationship by estimating the level equation, equation 2, which is nothing more than a reparametrization of equation 1. While equation 2 consists lagged level of GDP per capita, y_{it-1}, as the standart conditional convergence term in growth literature, we exclude it from the cointegration equation since it will be illogical to consider the GDP per capita is cointegrated with its lag.[7] Secondary schooling is also excluded since it is not available annually. A linear time trend is also included in the long run equation.

We first estimate the long run equation for real GDP per capita with fixed effects methodology by splitting our sample into developing and industrial countries. Since the contractionary devaluation hypothesis mainly focused on developing countries in which balance sheet effects can be large, it will be more appropriate to examine the effects of the changes in real exchange rate for developed and developing countries seperately. There is not a common conclusion for both developed and developing countries that is agreed upon. For developing countries, while some authors showed that the standart Mundell-Fleming result may hold even in the presence of balance sheet effects, others suggest that depreciations can be contractionary if the balance sheet effects are large enough. The first three columns of Table 3 shows the estimation results of long run equations for three different samples, whole sample, developing countries and industrial countries. The sign of the real exchange rate is

7 y_{it-1} is included as the initial income level into the growth regressions and some studies includes the real per capita income level at the beginning of the period considered as the initial income level. For an unbalanced annual data this approach will not be suitable.

positive and significant in whole countries and developing countries sample. In other words, real depreciations are contractionary for developing countries.This result is in line with the the suggestions of the authors like Frankel (2005), Calvo and Reinhart (2001), Bebzcuk *et al.* (2006) which stress the balance sheet effect that exist in most of the developing countries. The last column of Table 2 shows the estimations for the industrial countries. Contrary to the results of developing countries sample, the real exchange rate is insignificant in industrial countries. Most of the teoretical and empirical literature argue that the traditional expansionary effects of a real depreciation continue to hold for industrial countries. Unlike developing economies, they can continue to utilize from the competitiveness effect of devaluation since they do not generally face with problems of foreign currency denominated debt. Our results does not support expansionary devaluation hypothesis for industrial countries. According to our estimations, real exchange rate is not a significant determinant of economic growth for industrial countries in the long run.

Table 3: Long run Equations
Dependent variable: Real GDP per capita

	FE			CCEP		
	whole sample	developing	industrial	whole sample	developing	industrial
REER	0.225***	0.221***	0.053	0.215***	0.194***	0.071
	(0.046)	(0.046)	(0.066)	(0.045)	(0.048)	(0.078)
Gov. Consumption	-0.084	-0.112	-0.054	-0.086	-0.111	-0.051
	(0.070)	(0.076)	(0.116)	(0.071)	(0.074)	(0.125)
Trade Openness	0.235***	0.246***	0.018	0.233***	0.236**	0.023
	(0.073)	(0.084)	(0.097)	(0.081)	(0.091)	(0.121)
Fin. Development	0.175***	0.231***	-0.022	0.167***	0.219***	-0.011
	(0.055)	(0.069)	(0.044)	(0.056)	(0.073)	(0.048)
Investment	0.166***	0.163***	0.240***	0.155***	0.137**	0.231**
	(0.053)	(0.059)	(0.084)	(0.053)	(0.056)	(0.095)
trend	0.014***	0.012***	0.021***	0.014***	0.005	-0.003
	(0.002)	(0.002)	(0.002)	(0.003)	(0.004)	(0.005)
Constant	-20.587***	-17.220***	-32.706***	-21.173***	-4.778	2.892
	(3.199)	(4.676)	(2.927)	(5.266)	(8.455)	(7.870)
Observations	2,024	1,273	751	2,024	1,273	751
No. Countries	80	57	23	80	57	23
R-squared	0.668	0.567	0.899	0.672	0.586	0.905
LLC	-11.049***	-8.926***	-3.304***	-11.221***	-8.250***	-0.052
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.479]
MW	407.302***	273.235***	44.266	398.45***	275.155***	69.260**
	[0.000]	[0.000]	[0.540]	[0.000]	[0.000]	[0.014]

Robust standard errors in parentheses.

*significant at 10%; ** significant at 5%, *** significant at 1%

LLC and MW denotes the Levin, Lin and Chu (1994) and Maddala and Wu (1999) panel unit root test statistics. The values in [.] are the p-values.

In whole countries and developing countries sample, all control variables except for goverment consumption are positive and significant as expected. Trade openness, financial development and investment affect real GDP per capita positively as theory predicts. Insignificance of goverment consumption in the long run is also consistent with economic theory. In industrial countries sample, investment is the only significant variable.

2.4. Cross Section Dependence

The fixed effects estimator assumes that the regressors are identically and independently distributed across countries. This assumption is most likely invalid in practice.In recent years panel data econometrics has emphasized the unobserved time-varying heterogeneity induced by unobserved common shocks which affects all individual units differently. These unobserved common factors cause cross section correlation or dependence across the errors of the regression. This cross section correlation is especially important for macroeconomics in which cross-country studies are widely used. One major source of this cross section dependence in cross-country data is global shocks, e. g. oil price shocks and international financial crises. (Bai and Kao, 2006) Except for global shocks, spatial spillover effects and increased financial and trade linkages among the countries cause cross section dependence. The ignorance of this cross section dependence may lead to inconsistent parameter estimates if unobserved common factors are correlated with the explanatory variables. (Phillips and Sul, 2003; Coakley, Fuertes and Smith, 2006; Pesaran, 2006)

The SUR-GLS approach to dealing with cross sedction dependence for small N large T panels does not work when N is of the same magnitude or grater than T because the estimated contemporaneous variance-covariance matrix cannot be inverted. In the panel time-series where both N and T are large, the usual approaches been either to ignore the possibility of cross-section dependence produced by time-specific heterogeneity or deal with it by including period dummies or fixed effects. But this assumes that the global shocks have identical effects on each unit which seems quite restrictive.In recent years, factor models have been largely used to charachterize the cross section spendence (Bai and Ng, 2002; Coakley *et al*., 2002; Phillips and Sul, 2003; Moon and Perron, 2004; Bai and Kao, 2004; Breitung, 2005; Pesaran, 2006) In these models, the disturbances areassumed to contain one or more unobserved factors which may influence each unitdifferently.

In this study we employ the Common Correlated Effects Pooled (CCEP) Estimator introduced by Pesaran (2006). The general factor model that is used by Pesaran (2006) is as follows:

$$y_{i,t} = \alpha_i' d_t + \beta_i' x_{i,t} + \gamma_i' f_t + \varepsilon_{i,t}$$

where y_{it} is a scalar dependent variable; d_t is a nx1 vector of variables that do not differ across units; x_{it} is a kx1 vector of observed regressors which differ across units; f_t is a rx1 vector of unobserved factors, which may influence each unit differently and which may be correlated with the x_{it}; ε_{it} an identically and independently ditributed disturbance term.

Pesaran (2006) uses the cross sectional means of the dependent variable and the explanatory variables as the proxies for the unobserved common factors. Thus, he suggests including the means of y_{it} and x_{it} as additional regressors to remove the effect of these factors as follows:

$$y_{i,t} = \alpha_i' d_t + \beta_i' x_{i,t} + \gamma_i' f_t + \delta_{0i}\overline{y_t} + \delta_i' \overline{x_t} + u_{i,t}$$

Pesaran (2006) showed that the parameters of this auxiliary regression which is constructed by augmenting the original regression by the cross sectional averages of the dependent and explanatory regressors can be consistently estimated by OLS. This estimator is called Common Correlated Effect (CCE) estimator. Pesaran (2006) proposes two CCE estimators: a pooled version (CCEP) in which the fixed effects estimator is augmented by cross-section avarages of the dependent and the independent variables, and a Mean Group version (CCEMG) where the same cross section averages are added to each country regression and the country parameters are averaged across i. In this study we use the CCEP estimator. Kapetanios, Pesaran and Yamagata (2006) showed that this estimator is robust to a wide variety of data generating processes and has lower bias than alternative estimation methods. The results of the CCEP estimator are reported in the last three column of Table 3. The effect of real depreciation on GDP per capita is still negative and significant but somewhat smaller than the FE estimates for whole sample and developing countries. Contractionary effect of depreciation still holds for developing countries after controlling for the unobserved common factors while the coefficient of interest is again insignificant for industrial countries sample.

2.5. Long run and Short run Dynamics

After estimating the long run equation, we estimate a panel error correction model -based on the cointegration relationships estimated in the previous section- where long- and short-run effects are estimated jointly from a general autoregressive distributed-lag (ARDL) model. In the time series context, the estimation of the long run relationships among I(1) variables are studied by Engle and Granger (1987), Johansen (1995) and Phillips and Hansen (1990). These approaches proposed that the long run relationships only exist between integrated variables and the standart estimation and inference are incorrect. Pesaran and Smith (1995) and Pesaran and Shin (1999) have argued against these approaches showing that the long run ralationship between both integrated and stationary variables can be consistantly and efficiently estimated by small modifications to standart methods. In Pesaran and Shin's (1999) ARDL approach to long run modeling, there is no need to pretesting the order of integration of the variables because the method is valid for both I(0) and I(1) variables. The main requirement for the validity of this methodology is that there exist cointegration relationship among the variables of interest. The errors of the dynamic specification needs to be serially uncorrelated and the regresors need to be strictly exogenous in order to find consistent and efficient parameter estimates. As Pesaran and Shin (1999) showed this prerequisite can be met by sufficiently augmenting the lag orders of the dynamic model. Based on these advantages, we will estimate the short run and long run effects of the real exchange rate on economic growth by the panel version of ARDL approach. This aproach will allow us to confirm the cointegration relationship in our long run models for different subsamples and analyze whether the contractionary devaluation result we found for all countries and developing countries sample from the estimation of long run equations is still valid in the short term.

We estimate the following panel ARDL (p, q, r, …, r) model,

$$y_{it} = \alpha + \sum_{j=1}^{p} \lambda_{ij}\, y_{i,t-j} + \sum_{j=0}^{q} \gamma_{ij} RER_{i,t-j} + \sum_{j=0}^{r} \delta_{ij} X_{i,t-j} + \mu_i + \varepsilon_{it} \qquad (3)$$

where y is the logarithm of real GDP per capita, RER is the logarithm of real exchange rate, X is a set of control variables which consists the logarithm of goverment consumption, trade openness, financial development and investment, μ_i is the unobserved country-specific effects. The panel ARDL model can be reparametrized as an error correction model (ECM) which is given in equation (4) as,

$$\Delta y_{it} = \alpha + \emptyset\left(y_{i,t-1} - \theta_1 RER_{i,t-1} - \theta_2 X_{i,t-1}\right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*}\, \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \gamma_{ij}^{*}\, \Delta RER_{i,t-j}$$
$$+ \sum_{j=0}^{r-1} \delta_{ij}^{*}\, \Delta X_{i,t-j} + \mu_i + \varepsilon_{i,t} \qquad (4)$$

where Δ is the first difference operator. The stationary residuals from the cointegration equations estimatedin the previous part are usedfor the error correction term $(y_{i,t-1} - \theta_1 RER_{i,t-1} - \theta_2 X_{i,t-1})$ which indicates the deviations from the long-run equilibrium. Ø denotes the speed of adjustment. A negative and significant coefficient on Ø ensures the existance of the cointegration relationship among the variables. θ_1 and θ_2 are considered as long run coefficients and λ_j, δ_j and γ_j are short run coefficients. The lag orders p, q and r are assumed to be equal. The maximum lag length is set to be 2. The optimum lag order is selected by using Akaike and Schwartz Information Criteria. Both AIC and SBC chose the lag order as 2. Thus, panel ARDL (2,2,2, …, 2) model is estimated for all samples based on the cointegration equations estimated in the previous part.

After estimating the standart panel ARDL model, we also apply Pesaran (2006)'s CCEP methodology to our ARDL equation in order to control for cross section dependence. The estimated panel ARDL-CCEP model is the following:

$$\Delta y_{i,t} = \alpha + \emptyset\left(y_{i,t-1} - \theta_1 RER_{i,t-1} - \theta_2 X_{i,t-1}\right) + \sum_{j=1}^{p-1} \lambda_{ij}^{*}\, \Delta y_{i,t-j} + \sum_{j=0}^{q-1} \delta_{ij}^{*}\, \Delta RER_{i,t-j}$$
$$+ \sum_{j=0}^{r-1} \gamma_{ij}^{*}\, \Delta X_{i,t-j} + a_i \overline{y_t} + b_i \overline{RER_t} + c_i \overline{X_t} + \sum_{j=1}^{p-1} d_{ij}\, \Delta \overline{y}_{t-j} + \sum_{j=0}^{q-1} e_{ij}\, \Delta \overline{RER}_{t-j}$$
$$+ \sum_{j=0}^{r-1} f_{ij}\, \Delta \overline{X}_{t-j} + \mu_i + \varepsilon_{i,t} \qquad (5)$$

The results of the panel ARDL equations are represented in Table 4.The parameter estimates of the panel ARDL model for all countries, developing countries and industrial countries samples is given in the first three column of Table 3. Since the regressors which are insignificant in the long run can be significant in the short run, we included all regressors in the short run dynamics while excluding the insignificant regressors of the the long run

Table 4: ARDL estimations

	ARDL			ARDL-CCEP		
	whole sample	developing	developed	whole sample	developing	developed
Error corr. term	-0.057***	-0.061***	-0.002	-0.055***	-0.057***	-0.024
	(0.009)	(0.011)	(0.011)	(0.009)	(0.011)	(0.014)
Δrgdp per capita	0.343***	0.319***	0.501***	0.323***	0.271***	0.440***
	(0.048)	(0.056)	(0.051)	(0.048)	(0.056)	(0.045)
ΔREER	0.050**	0.050**	0.034***	0.030*	0.027	0.020
	(0.022)	(0.023)	(0.012)	(0.015)	(0.018)	(0.017)
ΔREER(-1)	-0.006	-0.004	-0.011	-0.002	-0.007	-0.006
	(0.011)	(0.013)	(0.010)	(0.010)	(0.011)	(0.011)
Δfinancial dev.	-0.040**	-0.037*	-0.055***	-0.037**	-0.032*	-0.054***
	(0.016)	(0.019)	(0.015)	(0.016)	(0.018)	(0.015)
Δfinancial dev.(-1)	-0.002	-0.011	0.034**	0.002	-0.003	0.031**
	(0.012)	(0.013)	(0.012)	(0.012)	(0.013)	(0.013)
Δtrade open.	0.046**	0.036	0.062***	0.004	0.003	0.030
	(0.020)	(0.023)	(0.016)	(0.018)	(0.020)	(0.024)
Δtrade open.(-1)	0.055***	0.065***	-0.031**	0.063***	0.063***	-0.007
	(0.017)	(0.019)	(0.012)	(0.017)	(0.018)	(0.018)
Δinvestment	-0.001	-0.002	0.000	-0.003	-0.004	-0.000
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.002)
Δinvestment(-1)	-0.005***	-0.005***	-0.003*	-0.004**	-0.004**	-0.002
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Δgov. cons.	-0.024	-0.010	-0.323***	-0.006	0.003	-0.224***
	(0.017)	(0.016)	(0.043)	(0.016)	(0.015)	(0.041)
Δgov. cons.(-1)	-0.017	-0.015	0.026	-0.014	-0.012	0.023
	(0.016)	(0.016)	(0.038)	(0.016)	(0.016)	(0.033)
Constant	0.012***	0.012***	0.010***	0.010***	0.010***	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)
Observations	1,638	975	663	1,638	975	663
R-squared	0.191	0.176	0.545	0.284	0.272	0.633
Number of id	76	53	23	76	53	23

Robust standard errors in parentheses
*significant at 10%; ** significant at 5%, *** significant at 1%

equation from error correction term. Error correction coefficient (Φ) is negative and significant in whole countries and developing countries sample indicating that there exist a cointegration relationship among the variables of the long run equation. The insignificance of the error correction coefficient of industrial countries sample is not surprising since all regressors except for the investment were insignificant in the long run equation.

The short run coefficient of the real exchange rate is positive and significant in all samples. In developing countries the depreciation of real exchange rate affects per capita GDP growth negatively in the short run as well as in the long run.The short run coefficient of real exchange rate is also positive and significant for industrial countries although we failed to have enough evidence on contractionary devaluation hypothesis in the long run. According to this result, for industrial countries, the depreciation of real exchange rate can have negative growth effectsin the short term while it has no effect in the long term. Among the control variables, the effects of the financial development on per capita GDP growth is negative and significant in the short run although its effect is positive in the long run. This point is consistent with the suggestions of Aghion, Bacchetta and Banerjee (2004) which found that countries that are going through a phase of financial development may become more unstable in the short run. The same result verified by Loayza and Ranciere (2002) empirically. Trade openness has a positive and significant coefficient in the short run as well as in the long run. The short run coefficient of investment is negative and significant.

The last three columns of Table 4 represents the results of the panel ARDL-CCEP model in which we augment the ARDL model with cross-section averages of the dependent and independent variables. The coefficient of the error correction term is again negative and significant in whole countries and developing countries sample while insignificant in industrial countries sample. The real exchange rate is positive and significant in the short run only in whole countries sample. It is no longer significant in developing countries sample when we add cross-section means to the model. The parameter estimates of control variables are similar to the estimates of panel ARDL model.

2.6. Endogeneity

As it is given at the beginning of this chapter, equation 1 is the standart growth regression used in the growth literature. In the previous sections we estimated the level equation, equation 2, which is nothing more than a reparametrization of equation 1. We constructed the panel cointegration relationships based on the time series properties of our variables. While equation 2 consists lagged level of GDP per capita, y_{it-1}, as the standart conditional convergence term in growth literature, we exclude it from the cointegration equation since it will be illogical to consider the GDP per capita is cointegrated with its lag.[8] Estimation of equation 1 including the initial income per capita as a control variable is the most common appraoch used in the growth literature and especially in the literature of real exchange rate and growth relationship. The standart estimators like “fixed effects” (within) estimator will be inappropriate for the estimation of this dynamic model. GMM estimators

[8] y_{it-1} is included as the initial income level into the growth regressions and some studies includes the real per capita income level at the beginning of the period considered as the initial income level. For an unbalanced annual data this approach will not be suitable.

which are introduced by Holtz-Eakin, Newey, and Rosen (1988), Arellano and Bond (1991), and Arellano and Bover (1995) are generally used as the optimal estimators in dynamic panel data models which accounts for the biases induced by the inclusion of initial income level and controls for the reverse causality and potential endogeneity of the explanatory variables. Our panel ARDL model that we estimated in the previous section accounts for the endogeneity of the regressors by augmentation of the model by increasing the lag orders of the variables. However, we also employ the GMM method and estimate the growth equation by including the initial income level in order to compare our result with other studies that investigate the effects of real exchange rate on economic growth. Since the GMM estimators are developed for "small T, large N" panel data models, studies generally use the non-overlapping five year averages of the time series. This also help to smooth business cycle fluctuations and focus on long run growth effects. Therefore, we transform our time series data into non-overlapping five year averages when conducting GMM.

The "first difference GMM" estimator which is developed by Arellano and Bond (1991) first transforms the variables into first differences in order to omit the individual fixed effects, then use the lags of the levels of the variables as instruments. Alonso-Borrego and Arellano (1999) and Blundell and Bond (1998) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. Therefore, Arellano and Bover (1995) and Blundell and Bond (1997) introduced a "system GMM estimator" that combines the regression in differences and the regression in levels in a system. The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged differences of the corresponding variables. Thus, we employ a system GMM procedure using 5-year averaged data.

The results of the system and difference GMM estimations are given in Table 4. The specification tests of Hansen and the second order serial correlation verify the validity of moment conditions. After controlling for endogeneity and reverse causation, the effect of real exchange rate is still positive and significant for whole countries and developing countries sample. GMM estimation results confirm the contractionary effect of depreciation in developing economies. The result for the industrial countries is also unchanged. The real exchange rate has no effect on economic growth for those economies. Among the control variables, secondary schooling and goverment consumption are the significant ones.

Table 5: GMM Estimations

Dependent variable: Growth of real GDP per capita

	Whole countries		developing		developed	
	Two-step System	Two-step Difference	Two-step System	Two-step Difference	Two-step System	Two-step Difference
initial income	-0.043	-0.361*	-0.0888**	-0.1852	0.0145	0.0772
	(0.028)	(0.189)	(0.0418)	(0.1639)	(0.0135)	(0.1464)
REER	0.491***	0.607***	0.2552*	0.2621**	0.0709	0.1875
	(0.161)	(0.159)	(0.1314)	(0.1252)	(0.1250)	(0.1556)
trade openness	0.016	0.382	0.1225	0.1346	0.1825**	0.4381**
	(0.074)	(0.255)	(0.1029)	(0.1382)	(0.0727)	(0.1833)
gov. consumption	-0.146*	-0.102	-0.1990***	-0.1391	-0.1268	-0.4587**
	(0.088)	(0.286)	(0.0752)	(0.1012)	(0.1209)	(0.1979)
sec. schooling	0.238***	0.171	-0.0013	-0.1438	-0.0858***	-0.2073***
	(0.090)	(0.159)	(0.1370)	(0.1396)	(0.0304)	(0.0762)
investment	0.018	0.388	0.1289	0.1061	-0.0697	-0.4148**
	(0.140)	(0.324)	(0.1093)	(0.1503)	(0.1034)	(0.2065)
fin. development	0.038	0.278*	0.0867	0.2051**	0.0045	-0.1257*
	(0.047)	(0.156)	(0.0559)	(0.0898)	(0.0321)	(0.0658)
Observations	399	327	249	199	150	128
Number of id	72	72	50	50	22	22
hansenp	0.808	0.764	0.692	0.477	0.977	0.703
ar2p	0.102	0.775	0.120	0.251	0.506	0.964
ar1p	0.0229	0.0456	0.0251	0.0159	0.00740	0.158

Robust standard errors in parentheses

*significant at 10%; ** significant at 5%, *** significant at 1%

2.7. Asian Countries

One of the most discussed issues in international economics is the regional differences in the economic performance of countries. East Asian countries have been performing higher growth rates than their counterparts in Latin America nearly for 30 years. Sachs (1985) point out their exchange rate management and trade regime as the main diffence between these two regions. According to Sachs (1985), by pursuing an export-based industrialization strategy with the help of competitive exchange rates, East Asian countries achieved higher and sustainable economic performance than Latin American countries which fallowed generally an inward-oriented strategy with overvalued real exchange rates. In this context, using an outward orientation index based on real exchange rate distortion and variability, Dollar (1992) investigated the relationship between outward orientation and economic growth and concluded that shifting to an Asian level of outward oriantation and real exchange rate stability Latin American countries can substantial gains regarding to economic growth.[9] This competitive real exchange rate policy pursued in East Asian countries strenghten the traditional expansionary devaluation view.

In the literature there are some empirical studies on this issue with different claims. According to Kamin and Klau (1998), there is no significant differences among the regions and devaluations are contractionary in Asian countries as well as Latin American countries in the short run. Upadhyaya and Upadhyay (1999) concluded that devaluation does not make any effect on output in Asian countries in short, medium and long run. Kim and Ying (2007) confirmed that devaluations are strongly expansionary in several East Asian countries contrast to the case of Mexico and Chile in the pre-1997 crisis period. However, they indicated that devaluations could be contractionary in East Asian countries as well as Latin American countries when the post-crisis data are included into the estimation.

Remembering that our long run estimates indicated that real devaluations are contractionary for developing countries, in this section we investigate whether the same result holds for East Asian countries as well. To this end, we interact the East Asian countries dummy with the real exchange rate and add it to our long run equations. The results are given in Table 5. The coefficient on the interaction term is significant and negative. Our results shows that East Asian countries are different and the depreciation of real exchange rate is expansionary in East Asian countries.

2.8. The Effects of Financial Dollarization and Other Country Characteristics

Despite the contractionary effects of devaluation is emphasized by authors such as Edwards (1986) and Morley (1992), it was believed that the negative effects of a devaluation will be offset by the positive effects of increased exports and the overall effect will turn to be positive. This was the dominant view before the currency crisis of 1990s. After the recessions followed by the devaluations in 1990s, some authors like Frankel (2005) and Calvo and

[9] East Asian countries is also known for their high levels of saving and investment. Some authors associate these high saving levels to their undervalued currencies. (Dooley *et al.* (2004), Bhalla (2007)) The saving channel is one of the channels of real exchange rate-growth relationship which is have not aggreed upon yet. (see also Montiel and Serven, 2008; Levy-Yeyati and Sturzenegger, 2007).

Table 5: Asian countries

	FE	CCEP
REER	0.273***	0.257***
	(0.040)	(0.043)
REER*Asian dummy	-0.682***	-0.687***
	(0.215)	(0.220)
Gov. Consumption	-0.053	-0.055
	(0.062)	(0.062)
Trade Openness	0.207***	0.199***
	(0.059)	(0.063)
Fin. Development	0.148***	0.139***
	(0.040)	(0.040)
Investment	0.193***	0.181***
	(0.055)	(0.054)
Constant	-20.367***	-19.937***
	(3.188)	(5.249)
Observations	2,024	2,024
R-squared	0.708	0.712
Number of id	80	80

Robust standard errors in parentheses.
(***) , (**) and (*) denote the significance at the 1% level, 5% level and 10% level respectively.

Reinhart (2001) pointed out to the balance sheet effects and asserted that the negative effects of the devaluation can be stronger than the positive effects. According to these authors firms may not increase their production because of corporate financial distress, absence of trade credit and increased costs of imported inputs even for the purpose of exports. The main reason is the phenomenon called "financial dollarization" which is a problem of most of the developing economies. Emerging markets generally cannot borrow in their own currency. This is named as "original sin" by Eichengreen and Hausmann (1999). As a result of original sin, the residents of developing countries save and borrow in foreign currency. This produces a currency mismatch in the economy as a whole. When firms' assets are denominated in domestic currency and liabilities are denominated in foreign currency, this currency imbalance creates balance sheet problems in the case of sharp real exchange rate depreciation.

The studies that look for a firm-level empirical evidence for the balance sheet effect generally focused on Latin American countries for which the dollarization is more persistent. Aguiar (2004) studied the firm-level investment performance of Mexican firms after 1994 crisis. He concluded that while the exporters outperform non-exporters in terms of profits and sales after the devaluation, their investment is constrained by weak balance sheets. Focusing on 450 firms from five Latin American countries, Bleakly and Cowan (2005) showed that firms holding more dollar debt do not invest less than their counterparts after a depreciation. Since firms match the currency denomination of their liabilities with the exchange rtae sensitivity of their profits, the negative balance sheet effects of a depreciation are offset by the larger competitiveness gains of these firms.

There are also a few studies which explores this balance seet effect in macro level (see Bebzchuk *et al.*, 2006; Cespedes, 2005). In this part we investigate the effect of dollarization on the real exchange rate and growth relationship. Financial dollarization literature generally use two different measures of dollarization.[10] The first one is deposit dollarization which uses the ratio of foreign deposits in total deposits. According to Levy-Yeyati (2005) deposit dollarization can be used as a sensible proxy for domestic loan dollarization, since they often mirror each other due to presence of prudential limits on banks' foreign exchange positions. The other one is the liability dollarization that generally uses the ratio of external debt to GDP. We use the deposit dollarization which is provided by Levy-Yeyati (2005).[11] In the first column of Table 6, we added the deposit dollarization and its interaction with real exchange rate to the long run regression in order to see financial dollarization affects the relationship between real exchange rate and growth. We expect a negative coefficient on the dollarization variable and a positive coefficient on the interaction term which mean that dollarization itself negatively effects real GDP and the contractionary effect of real depreciations increases with the level of dollarization. The results are compatible with our expectations. The coefficient of dollarization is negative indicating that dollarization is detrimental for economic growth. The coefficient of the interaction term is significant and positive which verifies that real depreciation becomes more and more contractionary as the dollarization ratio of a country increases.

We also examine whether the effect of real exchange rate on growth varies with other factors such as development of the financial system, openness to trade and financial integration. As mentioned above, real devaluations can have negative effects on the economy if aggregate demand is constrained by the net worth of agents and if a considerable amount of the borrowing of these agents are denominated in foreign currency. However, a more financially developed market will help to reduce the negative effects of depreciation on

[10] See Levy-Yeyati (2005), Arteta (2005) and Reinhart *et al.* (2003) for a broad discussion of financial dollarization and its measurement.
[11] The data is recently updated until 2009.

Table 6: Financial Dollarization, Financial Development, Trade Openness and Financial Integration Effects

Fixed Effects Estimation
Dependent Variable: Real GDP per capita

	Financial Dollarization Effects	Financial Development Effect	Trade Openness Effect	Financial Integration Effect
REER	0.092	0.520***	0.199***	0.249***
	(0.056)	(0.159)	(0.045)	(0.040)
Gov. Consumption	-0.089	-0.043	-0.078	-0.105
	(0.063)	(0.063)	(0.071)	(0.070)
Fin. Development	0.076**	0.535**	0.174***	0.181***
	(0.032)	(0.224)	(0.056)	(0.051)
Trade Opennness	0.039	0.186***	0.150	0.209***
	(0.051)	(0.057)	(0.135)	(0.071)
Investment	0.202***	0.186***	0.171***	0.185***
	(0.044)	(0.054)	(0.053)	(0.053)
Dollarization	-1.642**			
	(0.676)			
Fin. Integration				0.001
				(0.001)
REER*dollarization	0.303**			
	(0.139)			
REER*Fin.development		-0.085*		
		(0.045)		
REER*Openness			0.000	
			(0.000)	
REER*Fin. Integration				0.009
				(0.006)
trend	0.020***	0.015***	0.014***	0.013***
	(0.001)	(0.002)	(0.002)	(0.002)
Observations	1,492	1,965	2,024	1,943
R-squared	0.835	0.699	0.669	0.686
Number of id	71	78	80	78

Robust standard errors in parentheses.
(***) , (**) and (*) denote the significance at the 1% level, 5% level and 10% level respectively.

aggregate demand by making the conditions of borrowing less sensitive to changes in net worth. Therefore, we can expect the contractionary effects of real depreciations be lower in economies where the financial markets are more developed. This point is stressed by a few studies such as Cespedes, Chang and Velasco (2003). Openness to trade can be another factor that affects the real exchange rate and growth relationship. In countries with higher trade to GDP ratio, since the expenditure-switching effects can be stronger and this can weaken the negative effects of real depreciations. Lastly, we examine the effects of countries' financial integration degree by using the financial integration index of Lane and Milesi-Feretti (2007).[12] Recent research emphasize the importance of valuation effects of real exchange rate changes. The valuation effect refers to the impact of capital gains and losses on the international balance sheet. Such valuation affects has grown in recent years as the scale of the cross-border financial holdings increased. (Lane and Milesi-Ferretti, 2007) In that respect, the financial impact of a depreciation can be important since the increase in the domestic currency value of foreign assets may be offset by the increase in the domestic value of foreign currency liabilities.

In the last three column of Table 6, we report the effects of these additional factors. Among the three factors mentioned above, the effect of financial development is the only significant one. The sign of the interaction term is negative indicating that as financial markets are more developed, the contractionary effect of devaluation decreases.

3. CONCLUSION

The empirical literature on the effect of real exchange rates on growth provide mixed results. Despite the contractionary effects of depreciation due to the adverse balance sheet effects in the emerging economies has emphasized by a number of studies, recent evidence seem to be supporting mostly the positive growth effects of the competitive real exchange rates. The latter generally stand on the successful experiences of China and East Asian countries which pursue an undervalued exchange rate. However, the econometric methods used in the empirical analysis can have deterministic effect on the results reached. The growth regressions used by the empirical studies on this issue generally ignore the problems that can emerge by the nonstationarity of the variables in the growth equation and the cross sectional dependency among the countries.

The main contribution of our study is the investigation of the relationship between the real exchange rates and economic growth by i) taking account the time series properties of the variables in our growth regression, ii) using a real exchange rate index that do not lead to any exaggerating or misleading results, iii) dealing with the potential cross sectional dependence.

The results of our long run equations support that the depreciation of the real exchange rate is contractionary in developing countries and this contractioanry effect increases with the degree

[12]We updated the data of Lane and Milesi-Feretti (2007) up to 2009.

of dollarization of the country. Similarly, the financial development level is a significant determinant of the effect of depreciations and the negative effect of real depreciations decrease as the financial development of the country increases. However, investigating whether the East Asian countries are different, we found that depreciations are expansionary for East Asian countries as opposed to other developing countries. For industrial countries, the changes in real exchange rates have not any significant effect in the long run. Our results are also supported by Pesaran (2006)'s Common Correlated Effects methodology and the GMM procedure implying that they are robust to the cross section correlation and reverse causality considerations.

By utilizing from a panel ARDL model, we also investigate the short run effects of real exchange rate depreciations. The results of panel ARDL estimations do not fully support the contractionary devaluation in the short run.

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