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Real Effective Exchange Rate Volatility, Institutions and Financial Integration:

A Dynamic Panel Data Approach

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Abstract

The purpose of this paper is to provide new empirical evidence on the determinants of Real Effective Exchange Rate volatility, focusing on the role of institutions and financial integration. The econometric approach will consist on a GMM method for dynamic panels over the period 1980-2010 for a sample of 80 countries grouped into four regions: OECD, Latin America & Caribbean, Asia & High Income non OECD, Sub-Saharan Africa. The results were mixed. On the one side, only the OECD and Asian countries were able to reduce volatility. For instance in the former group, a positive 1.000 m u$d shock to FDI decreased volatility 3%. Furthermore, a higher respect for political and civil rights on the OECD countries decreased volatility 10%. On the other, the Latin American & Caribbean countries could suffer the consequences of premature opening, since volatility would increase 270% if financial integration pursued.

JEL-Code: E310, F310, F410, C230

Key Words: real effective exchange rate volatility, trade openness, institutions, financial integration, GMM estimator.

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I. Introduction

During the past three decades, Real Exchange Rate (RER) volatility has been on the center of many political and economic arguments. On the one hand when a country is on the right path (i.e. good institutions and a considerable degree of openness), RER volatility will be lower[1]. While on the other, RER volatility will be higher when the country is undergoing a crises phase due to capital movements.

Since the collapse of Bretton Woods in 1973, the switch to floating exchange rates and the lost decade in Latin America (1980), the volatility of the Real Exchange Rate (RER) has increased, with significant effects on growth. When a country is under growing fiscal deficits the fear of devaluations takes place. Therefore the policymakers should take this into account with caution[2].

Most of the literature focuses on RER fundamental shocks (i.e. public spending, productivity differentials and capital movements)[3]. Even though evidence points out into the right direction, yet little has been said about the role of institutions in explaining RER volatility.

'In order to perform macroeconomically well, a "high exchange rate" is neither necessary nor sufficient. What is paramount is for RER, among other variables, to be stable in the long run. Thus, the country risk premium will converge at international level and private investment will rise reaching the objective economic potential of the country'. (Ávila 1997)

A simple policy (First Best) would be *trade openness* as this will lead to a sizeable reduction in the cost of using the market, productivity will rise, the size of the market will expand (i.e. the variety of goods will enhance) and finally gross domestic per capita product will be higher.

Assuming a hypothetical situation where we only have two economies; the first one remains in autarky with trade balance deficit while the other is considerable more open

[1] It is important to bear in mind that volatility of the fundamentals (e.g. changes in public spending) may lead to changes of the RER level.
[2] Recall that if a country devaluates its currency, it not only changes its relative price of the traded goods against the non-traded, but also the numeraire of the entire economy.
[3] Others consider several shocks (i.e. changes in consumption and investment), yet it has not been proved the link.

to the world and is facing the same scenario[4]. In equilibrium we know that the Current Account (CA) must be equal to the negative value of capital account (KA)[5].

Hence, the question that arises is which one of them requires more effort to balance the equation. In this case, the most open economy will have a better performance since the rate of adjustment of the RER will be lower[6]. Thus opening to the world will allow the expansion of the basket goods by enhancing exports and imports, leading to a higher gross domestic per capita product.

Following the same line Ávila[7] argued that supranational integration agreements like Spain did during 1986-2002 should be pursued. The reason is that the likelihood of violating the contract drops instantly the moment the government commits to maintain its word. Therefore, RER volatility will tend to be lower the more costly is the termination of the settlement.

The remainder of the paper is organized as follows. In Section II, some theoretical background on RER[8] is given and simple model is discussed. Section III presents the link between REER[9], Institutions and Financial Integration. Section IV describes the data and methodology. Section V presents the empirical findings. Finally, Section VI offers some concluding remarks. The Appendix A.1 list the complete sample of countries and groups[10]; Appendix A.2 data sources and variables; Appendix A.3 Additional tables; Appendix A.4, shows the evolution of REER volatility for different groups; Appendix A.5 highlights the Argentinian case. Lastly, Appendix A.6 offers some comments about the Argentinean case.

[4] I want to thank professor Ávila for his personal notes.
[5] For simplicity we disregard the service account and the remittances (i.e. CA= X-IM=-KA), where CA= current account, X=exports, M=imports and KA=capital account.
[6] If the gap of exports and imports is significant it will no matter since a little variation of exchange rate will allow to balance again the equation. While the closed economy will need a bigger effort if they seek to balance their own equality.
[7] Antidotes against Argentinean-Risk; chapter II.
[8] In chapters I and II the analysis is based on the Macroeconomic Exchange Rate. Yet, the same logic can be applied to the Real Effective Exchange Rate.
[9] For more details of the definition of the Real Effective Exchange Rate see chapter II.II.
[10] The sample of 80 countries was divided into 4 groups: OECD; Latin America & Caribbean; Sub-Saharan Africa & MENA; Asia and High Income Non-OECD.

II. Traditional Theories

The traditional framework of Bela Balassa (1964) made a significant contribution to explain the role of RER. More precisely, he pointed out that international productivity differences are greater in the production of traded goods than in the non-traded, therefore the currency of the country with the highest productivity level will appear to be overvalued (i.e. appreciated) in terms of purchasing power parity[11]. This implies that not only are rich countries more productive but also more expensive (related to less productive nations)[12].

The Balassa-Samuelson effect states that countries with high productivity growth also experience high wage growth[13], which leads to a lower RER. Moreover, if a country is undergoing a demand excess in the non-tradable sector and trade balance surplus that changes its equilibrium (internal and external), then, the only way to restore the equilibrium is through an appreciation of RER.

But nowadays the role of real exchange rate in the growth process has been misunderstood. On the one hand, there are theories arguing that RER should be a control variable; thus, all the governments might use it as a policy instrument to enhance growth[14].

What they do not know is that 'there is no such thing as a free lunch'. When a certain country devaluates its currency, the relative price of the traded goods increases and the quantity of the non-traded goods falls, since the tradable industry expands.[15] Therefore, in order to enhance the production, resources must be re-assigned to get the necessary inputs.

On the other hand, Carlos Rodriguez and Larry Sjaastad (1979)[16] argued that since RER is P_T/P_{NT}, (where $P_T = \ price\ of\ traded\ goods\ and\ P_{NT} = \ price\ of\ non-traded\ goods$), its equilibrium level will be determined by the real sectors of the economy (i.e. supply of

[11] Gustav Cassel , a Swedish economist developed the theory of PPP in 1918
[12] This analysis is supported only by empirical evidence.
[13] Richest countries have higher wages because they are more productive.
[14] Rodrik 2008 "The Real Exchange Rate and Growth"
[15] Recall that according to the Monetary Approach to the Balance of Payments, when a country devaluates its currency the quantity of money expands in the long run, but in the short run it works like a tax to buy reserves. It is not a sustainable policy, since it only works in short periods.
[16] Carlos Rodriguez and Larry Sjaastad estimated the phenomenon called 'Atraso Cambiario' in Argentina.

exports, demand of imports and international capital account movements). Therefore, it is important to recognize that RER is *endogenous*. Its level depends on internal (i.e. public spending and technological change) and external forces (i.e. capital movements)[17].

In the same line, following Mussa[18], the exchange rate also adjusts to accommodate changes in the relative price of different national outputs, dictated by changes in underlying real economic conditions[19].

According to him, the RER plays an essential role in adjusting the relative price of national outputs to actual and expected changes in the real factors that determine the equilibrium value of it. Such variations are related to the quotient of P_T *and* P_{NT} (i.e. the real exchange rate)[20].

A. Basic Definition of Real Exchange Rate

According to many authors, RER represents the purchasing power of a currency unit over a basket of non-traded goods. Formally it can be written in this way:

$$\boldsymbol{e} = \frac{\boldsymbol{P_T}}{\boldsymbol{P_{NT}}} \quad \textbf{(1)}$$ Where $\boldsymbol{e}$=RER, P_T=tradable price, P_{NT}=non-tradable price.

Even though this is a simple definition, it is not easy to estimate. In order to get an approximated measure of its real value, one should consider an alternative definition:

$$\boldsymbol{RER}^{21} = \left[\frac{\boldsymbol{WPI_{US} * E}}{\boldsymbol{CPI}}\right] \quad \textbf{(2)}^{22}$$

Where WPI_{US} is the wholesale price index for United States, E= home country's nominal exchange rate and CPI is the home country's consumer price index.

[17] Jorge Avila 'Macroeconomics of Country Risk: The Argentine case'
[18] Michael Mussa 'A model of Exchange Rate Dynamics' 1982.
[19] For more details see Calvo and Rodriguez 1977.
[20] Those divergences come from PPP.
[21] Since the U.S is the main reference, its real exchange rate is the ratio of the product of the nominal exchange rate and its CPI to the product of the value of 1 dollar and the local currency CPI.
[22] According to Avila (1997), equation **(2)** gives a simple measure of competitiveness of home export industries, or rather the price of local exports in terms of the price of the service sector.

B. Alternative Definition[23]

If the objective is to explore the relationship between different sectors, Real Effective Exchange Rate is the right measure. We can define it as the weighted average of a country's currency value relative to a basket of other major currencies adjusted for the effects of inflation. The weights are determined by comparing different traded goods in terms of one country's currency (i.e. US with each other country within the index).

Following Zsolt Darvas[24] we define it as:

$$REER_t = \frac{NEER_t * CPI_t}{CPI_t^{(foreign)}} \quad (3)$$

$$\rightarrow \boldsymbol{REER} = \frac{\mathbf{1}}{\boldsymbol{REER_t}} \ (\mathbf{4}) \ (\boldsymbol{in\ order\ to\ maintain\ the\ same\ structure})$$

Where:

- $REER_t$ is the real effective exchange rate of the country under study against a basket of currencies of trading partners
- CPI_t is the consumer price index of the country
- $NEER_t = \prod_{i=1}^{N} S(I)_t^{(w)i}$ is the nominal effective exchange rate of the country, which is in turn the geometrically weighted average of $S(I)t$,the nominal bilateral exchange rate between the country under study and its trading partner *i* (measured as the foreign currency price of one unit of domestic currency)
- $CPI_t^{(foreign)} = \prod_{i=1}^{N} CPI(I)_t^{(w)i}$ is the geometrically weighted average of CPI indices of trading partners, CPI $(I)_t$ is the consumer price index of trading partner *i*, *w*(*i*) is the weight of trading partner *i*, and N is the number of trading partners considered. The weights sum to one, i.e. $\sum_i^N W^{(i)} = 1$

[23] Remark: Since the Real Exchange Rate (RER) is tough to estimate due to limited data, I will regard a different measure of the RER (i.e., the Real Effective Exchange Rate). Thus, I will assume that its level will follow the movements of the RER.

[24] The interested reader can obtain the dataset and methodology in http://www.bruegel.org or see the working paper Zolt, D., (2012a), "Real Effective Exchange Rates for 178 countries: a new database".

C. A Simple Model[25]

I will consider two assumptions:

i. Productivity in the tradable sector grows faster than in the non-tradable (empirical evidence).[26]

ii. Protection –other things equal– leads to a greater variability of the RER.

iii. Where the supply of traded goods $S_T \left\{ \overbrace{RER, TT, \pi}^{+} ; \overbrace{Q_{NT}}^{-} \right\}$ .Whereas the demand of traded goods $D_T \left\{ \overbrace{PS, \pi}^{-} \right\}$.

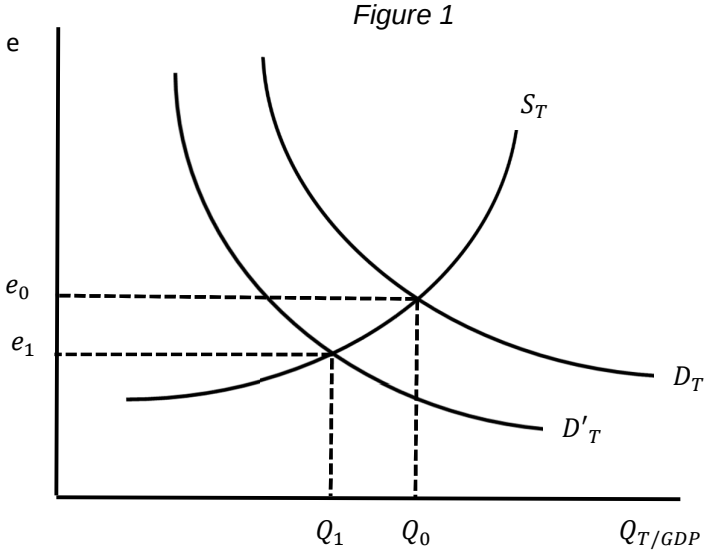
Remark

According to Sjaastad (1991), protection reduces the volume of trade and perhaps the margins of substitution between traded and home goods (i.e. non-traded) as well. Thus, '*the real exchange rate reacts more strongly to capital flows in highly protected economies than in those with liberal commercial policies'*.

Following the assumptions, one can make inferences about the level of RER analyzing three different situations.

a) The Government Increases its Public Spending (↑ PS)

Figure 1



Where RER= $e = \frac{P_T}{P_{NT}}$

$S_T = supply\ of\ tradables$

$D_T = demand\ of\ tradables$

$Q_T = output\ of\ tradables$

$Q_T = traded\ goods$

$Q_{NT} = non - traded\ goods$

$AD = aggregate\ demand$

$TT = terms\ of\ trade$

$\pi =$ country risk $-$ premium

$PS = public\ spending$

[25] Óp. cite 4.
[26] Bela Balassa 1964.

A higher tax burden needed to finance a higher public spending, reduces the demand of Q_T and Q_{NT}. However, the increase in PS focuses on Q_{NT}[27] , thus, this follows a lower RER. More precisely, in Figure 1 we can see that the supply of traded goods S_T remains unchanged while the demand moves shrinks.

b) Country Risk Premium Increases ($\uparrow \pi$)

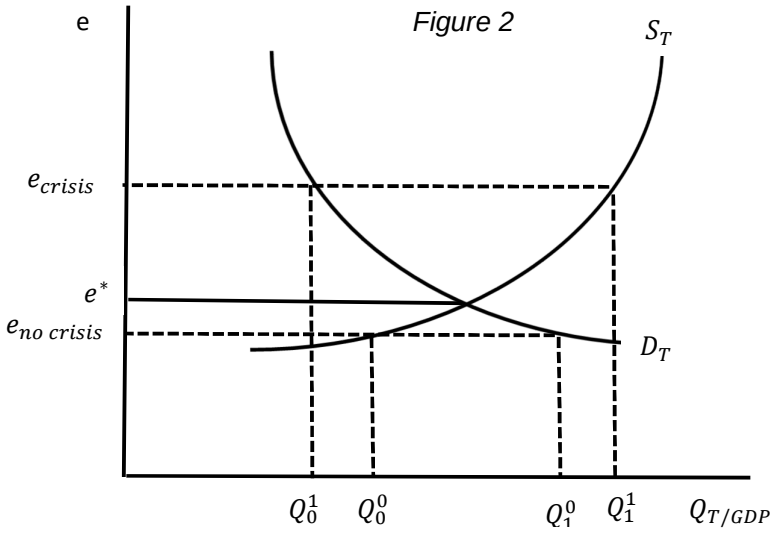


Figure 2 reflects a different situation. It is well known that country risk premium is a first order distortion which represents the financial cost of a country mistrust as source of fixed investment between the middle run and long run.[28]

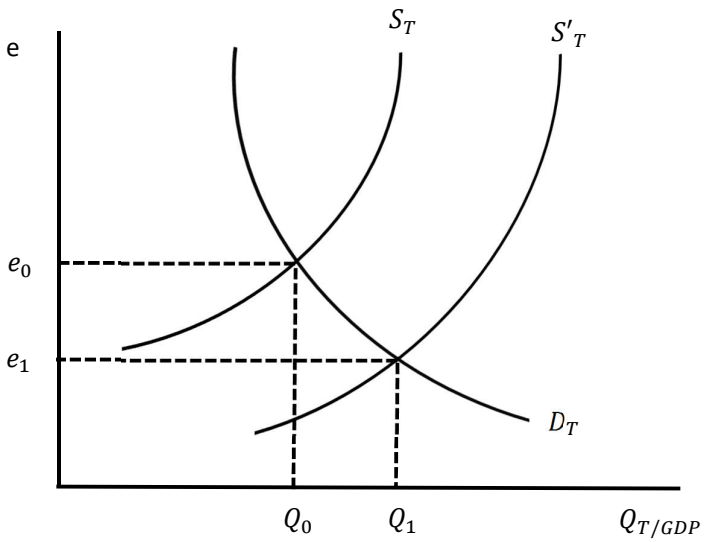
Therefore the analysis should be divided into two sequences[29]:

1. A higher risk premium triggers capital outflows, a contraction in aggregate demand (consumption and investment falls) and a higher real exchange rate follows (e_{crisis}). The reason is that $D_T - S_T \approx CA$[30] < 0.
2. A lower risk premium triggers capital inflows, an expansion in aggregate demand (consumption and investment grows) and a lower real exchange rate follows ($e_{no\ crisis}$). The reason is that $D_T - S_T \approx CA > 0$.

[27] This leads to an increase in P_{NT} , whereas P_T will remain unchanged or fall depending on the substitution and production effect. Moreover, the bidders of traded goods will perceive a lesser price for its merchandises and will pay higher wages for the labor on the non-tradable sector.
[28] Avila 2003 'Perspectivas de Crecimiento Argentino'
[29] I want to thank professor Ávila for explaining the clarity of this fundamental process.
[30] CA= Capital Account.

c) Changes in Terms of Trade (↑ *TT*)

Figure 3



Following Sjaastad analysis, in Figure 3, a positive shock in the terms of trade moves the supply curve towards right and downwards leading to a lower real exchange rate. The reason is that liberal commercial policies enhance the volume of commerce; therefore, the less barriers to trade, the lower will be the variability of RER.

Moreover, as he points out in (2002), 'barriers to trade (i.e. import protection) generate an import-competing sector unable to cope with foreign competition and also an inordinate dependence on natural-resource-based export activities such as agriculture and mining'[31].

Accordingly, free trade should be encouraged because the extent of the market will allow to increase the quantity of different goods. Moreover the efficient frontier of consumption will expand, thus re-assigning resources efficiently.

[31] This situation could lead to 'The Dutch Disease'.

Stylized facts

After reviewing this simple model one can summarize the role that RER fulfills in the economy.

[a]. A *higher RER* indicates *a greater internal purchasing power*[32]. Whereas a *lower RER* depicts a *lesser internal purchasing power*[33].

[b]. A *lower (higher)* level of the RER may be related to a *lower (higher) volatility* of the *capital flows*.

[c]. RER is *endogenous* its level depends on internal and external forces.

[d]. *'If a country is experiencing capital outflows it will require in equilibrium* a *higher difference between exports and imports (i.e. trade balance surplus). Yet, if there were no income effect over both curves*[34]*, then, an adjustment to RER must be done to generate the necessary surplus.' (Rodriguez & Sjaastad 1979)*

[e]. If the previous condition persists and all the corrections to the RER have been done, then, it will involve to diminish the absorption[35] (i.e. a decrease on expenditure) to reduce the domestic demand of imports and exports. Thus, the supply of exports and the demand of imports will move towards the generation of surplus[36] without a correction in RER.

[f]. It would be desirable that the policymakers take into account the possible effects of using the *RER as an instrument to increase growth*[37].

[g]. *'Protection –other things equal– will reduce the volume of trade, thus the real exchange rate will react more strongly to capital flows than those economies with more liberal policies'. (Sjaastad 2002)*

[h]. *'Country risk premium is the linkage between capital flows and aggregate demand'*[38].

[32] While this situation leads to a higher volume of commerce (exports and imports), the costs will be higher, thus, the imports will fall. However, according to Rodriguez and Sjaastad, we should not disregard the indirect effects between imports and home goods (i.e. non-traded).
[33] In this scenario, the quantity of imports will exceed the exports, following a trade deficit and ultimately capital inflows.
[34] Supply of Exports and Demand of Imports.
[35] Alexander Sydney (1952).
[36] As a consequence of that, no corrections on the RER will be needed.
[37] Policies focused on devaluate the real exchange rate, are not stable, since it only function as short-term tax and eventually they lead to greater variability if they are not accompanied by additional measures (e.g. a contraction of monetary supply).
[38] Op. cite 28.

III. Institutions and Financial Integration. Why are they relevant?

In a world where uncertainty is abundant, it is important to take into account the welfare loss due to volatility. However before doing that, one needs a simple definition of our main variable (i.e. volatility of REER[39]= std of REER). After that, it is useful to state a set of rules and regulations such as to enable the appropriate functioning of the economy.

Following Douglas C. North,[40] *'the concept of Institutions is fundamental since they would not exist in a frictionless world where there is no uncertainty. Institutions exist to reduce the world uncertainty. In a world without them, we would not know how to deal with each other. Institutions are the incentive system that structure human interaction. They can make predictable our dealings with each other every day in all kinds of forms and shapes'*[41].

Considering another view, Avila (2003) argued that the best antidote against volatility is to stimulate the use of the market by opening the economy. Hence, in order to get a good macroeconomic performance, all the countries should try to embrace trade agreements[42] among each other, especially emerging countries. Even though this sounds easy to implement, it takes years of debates and self-discipline.

Moreover according to Prasad et al (2003), financial integration and liberalization of capital flows reduce volatility as well as increase growth. Yet, the transition to capital mobility should be gradual, because a premature opening could result in significant costs[43].

Furthermore, it will depend on political incentives. Countries with poor institutions will try to protect their economy by closing the capital account. The mechanism through which it functions is capital controls. According to Frankel et al. (2001), capital controls in spite of reducing exchange rate volatility, increase the risk premium on domestic assets, thus increasing the domestic interest rate and reducing investment and growth.

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[39] From now on, I will regard the Real Effective Exchange Rate as my main variable.
[40] "The role of Institutions in Economic Development (2003)"
[41] Those wise words from him gave direction to another branch of explanations in a world where uncertainty is plentiful. Every theory can be explained considering this approach. In particular, real exchange rate volatility, the cornerstone of the economic system.
[42] According to him, there are three types of agreements: unilateral, bilateral and supranational.
[43] The empirical evidence is mixed. The case of Chile is gradual, while Japan did the opposite (forced). Yet, both cases were remarkable. For more details see Ávila (2003).

But the question remains, why would a country speculate with capital controls? To address this answer it is necessary to recognize the main characteristics of these nations. In general, they are more vulnerable to 'fiscal voracity' or 'fiscal hysteresis', this means that public spending is above its trend during expansions and this tendency continues even when the cycle is reverted. Therefore it is difficult to change this pattern when a government is 'populist'.

One thing is clear, there is nothing wrong with capital flows, since they are only driven by a wave of expectations searching for the best return on investment[44]. What really matters is to maintain the exchange rate stable across this process. Otherwise the temptation of capital controls will take place.

However according to Le Fort (2000), the expected impact of financial integration on REER fluctuations is low if the exchange rate system is more flexible. Indeed, a higher volatility of floating exchange rates can be offset by a high degree of capital mobility, which can help to absorb external shocks, even though it is not a guarantee against long-lived misalignments.

Despite the fact that evidence points out that those countries that opened to the world had a fantastic performance against volatility, still there are some grey zones to explain.

A. Institutions and Financial Integration: Is there a link with the REER?

According to Acemoglu et al. (2003), poor institutions lead to economic instability and to bad macroeconomic policies, through a variety of channels. Therefore output volatility may be enhanced thus reducing the well-being of society.

In order to address this issue, a populist administration will try to change the price of the traded goods at the expense of non-traded ones. Thus, the REER will adjust to higher (lower) values depending on the amount of the variation. One thing is clear, policy volatility might thus be the link between institutions and output volatility.

Following the other line, financial integration generates complex effects. On the one hand, it increases public spending volatility[45]. On the other, it has a direct disciplining effect on government expenditure; more financially open economies are associated with

[44] The process of financial liberalization should be gradual (i.e. rational). The policymakers would not dismantle all the controls until trade liberalization may largely complete.
[45] The interested reader can check the model discussed in section II (C).

lower spending. The reason is twofold: firstly, the government avoids the temptation of changing the numeraire of the economy and secondly, since it is more open to capital flows it will attract foreign investment as well as stimulate internal investment.

Furthermore, as Le Fort (2000) points out, financial integration and liberalization of the capital account increase efficiency in consumption smoothing and should have a stabilizing effect by favoring risk diversification. Hence, the variability of REER is more likely to be lower.

Despite knowing the benefits, it is important to bear in mind some caveats before a certain country proceed to open its economy.

First; it should have a sustainable current account deficit and a solid external position showing robust indicators of internal solvency and liquidity.

Second; it is desired to have low inflation and a real interest rate at international levels accompanied by a prudence fiscal policy[46].

Third; a healthy financial system with the appropriate prudential regulations.

Finally he suggests a floating currency system since it allows an independent monetary policy[47].

B. Institutions and Financial Integration: How can we measure them?

There are different ways to measure institutions and financial integration. In the former case, following A.Cukierman, S.Webb and B.Neyapti,[48] Central Nank Turnover rate (cbturn)[49] is a de facto measure of CBI[50]. It shows how independent it is the monetary policy from the government.

Even though it is a simple calculus, its accuracy is doubtful, since it only embodies a certain group of countries (e.g. emerging economies). To address this issue, Cukierman, and others[51] suggest using another measure: legal CBI (lvaw[52]), according to them, it

[46] I.e. a lower fiscal deficit or budget balance.
[47] According to him, intermediate (pegged) exchange rate systems which conduct to 'impossible trinity' problems should be avoided.
[48] The interested reader should see 'Measuring the Independence of Central Banks and Its Effect on Policy Outcomes' 1992.
[49] This measure is more accurate for emerging countries. For more details see Appendix A.2.
[50] Central Bank Independence.
[51] J.Vazquez, M.Guillen, E.Meade and C.Crowe also explored the CBI.
[52] Op cite 50.

indicates ‘what is the degree of independence that legislators meant to confer on central bank’.

Accordingly, a lower CBI is a potential source of REER volatility, since it not only creates misalignments but also fiscal dominance. Thus ‘the central bank enjoys greater freedom when the government cannot participate in or overturn its policy decisions’ and also, financial independence of the central bank relies upon restrictions that limit lending to the government (i.e. during elections the public spending is correlated with a lower CBI).

Another measure of ‘institutions’ might be the government’s ability to control the fiscal budget[53]. However, Rogoff and Sibert[54] argued that not only the existence of political leaders with different abilities to manage the government paramount, but also incomplete information about their suitability. Therefore, if the politicians are not well qualified and besides they have opportunistic incentives, fiscal deficits will be higher during elections, leading to a lower REER.

In another attempt to measure the quality of institutions, it is important to take into account the country risk premium[55]. In my case, I shall consider the quality of political and civil rights as a proxy of the mistrust of a certain country (i.e. the higher respect of the rights[56], the lower will be country risk premium; therefore the investors will be more likely to sink physical capital into the economy).

Finally, it is important to bear in mind the past of the government. If a country in the former years devaluated[57] its currency (i.e. for multiple reasons), that decision will leave a mark on it. According to Arnold Harberger, ‘Bad decisions affect credibility and institutions, thus correcting the course of action is though, and even if they admit and say ok we have mistaken and we will never do it again, the print will remain’.

Whereas financial integration is considerably simple to measure. Following Lane, Milesi-Ferreti[58] one is able to construct three different variables which depict financial

[53] In the literature it is known by the term Political Budget Cycle.
[54] For more details see Rogoff and Sibert (1988) ‘Elections and macroeconomic policy cycles’
[55] Op cite 45.
[56] According to Freedom House, the criteria is backwards: CR=1 & PR=1 →Freedom. The reason is that totalitarian regimes are more likely to suppress the rights of the people in order to remain in power. Thus if CR=6 & PR=6 →Not Free. The former case is USA, while the latter could be Algeria.
[57] Luc Laeven and Fabian Valencia dataset contains information about currency crises for many countries.
[58] See Lane and Milesi-Ferretti, "The External Wealth of Nations" (JIE December 2001) and "The External Wealth of Nations Mark II (JIE November 2007)

integration (i.e. $\mathcal{F}^1, \mathcal{F}^2, \mathcal{NFA}$)[59]. According to them, a decrease in the external position could led to a higher real exchange rate.

Furthermore, another measure of financial openness (de jure capital openness) is the Chinn-Ito index[60]. A higher number indicates a lower overall level of restrictions, therefore capital account liberalization[61]. It is based on four binary dummy variables reported in the IMF's Annual Report on Exchange Rates and Exchange Rate Restrictions. Therefore, according to them, financial liberalization should have a considerable weight on REER volatility.

Accordingly, by including a set of financial variables, the policy-makers will be able to evaluate potential scenarios about the behavior of REER before they take the decision of pursuing a financial integration process. For instance, regarding the ratio of total liabilities plus total assets over the gross domestic product (i.e.$\mathcal{F}^2$), a positive and significant coefficient may offset potential benefits if the household authorities do not take the necessary measures. Indeed, not only is a solid current account desirable but also a stable environment for businesses paramount (e.g. a higher respect of the law).

[59] Op cite 49.
[60] Chinn, Menzie D. and Hiro Ito (2008). "A New Measure of Financial Openness". Journal of Comparative Policy Analysis, Volume 10, Issue 3, p. 309 – 322 (September).
[61] Obstfeld (1984) found a link between REER movements and capital account. According to him, that relationship led to a REER appreciation in Latin American countries. Thus, it is important to take into account that the liberalization of the capital account is a powerful instrument to reduce volatility. However, not all the countries may afford an appreciation process

IV. Data and Methodology

To tackle the problem, it is necessary to emphasize the nature of the issue. Our main variable REER volatility (σ) may change across time. In order to capture its real variability, we need a panel data approach.

The advantages of using this method is widely known, firstly you may track the effects of changes in REER within countries. Secondly, no matter what measure of REER you use, the results are comparable across countries. Thirdly, you are able to control the unobserved heterogeneity of individuals, in this case countries. Finally, it allows to consider 'reverse causality', that is, some explanatory variables are likely to be jointly determined with REER volatility, therefore one must control for endogeneity issues. Therefore, the Arellano-Bond approach is adequate to treat this problem[62].

Data Sources

Data of the Real Effective Exchange Rate (REER) was obtained from the Bruegel Organization[63]. The majority of the independent variables were obtained from the World Bank (WDI), with the exception of Average per worker product (Total Economy Database), currency crisis[64], financial integration (Lane-Milesi-Ferreti), capital account opening (Chin-Ito Index) and institutional variables: Central Bank Independence (Kof); polity indicators (Polity IV); degree of liberties (Freedom House) and finally additional quality measures of institutions (The World Wide Governance Indicators)[65].

[62] For more details see Appendix B.
[63] Óp. cite 24.
[64] Óp. cite 57.
[65] Óp. cite 62.

A. Motivation

My hypothesis is that Real Effective Exchange Rate volatility (σ) depends not only on its fundamentals but also from the quality of institutions.

I will divide my approach in four parts. First, I will study two different channels of REER shocks (domestic, external). Second, I will compare and contrast two scenarios (i.e. one with good institutions (lower country risk premium) plus financial integration and another without them plus currency crises). Third, I will make inferences about REER volatility against the likelihood of a lower Central Bank Independence. Fourth, I will evaluate two possible scenarios given by a lower (higher) respect for political and civil rights against the REER volatility.

More precisely:

I. I will explore the nature of four different shocks to real effective exchange rate:
   a) Domestic real shocks affecting supply (productivity shocks), and demand (changes in consumption and investment).
   b) External shocks (changes in terms of trade, capital openness).
   c) Nominal shocks (i.e. money supply affecting nominal exchange rate)
   d) Currency Crisis (dummy variable equal 1 if the country experienced a currency crisis in the past, or 0 in contrary case).

II. Study the causality between good (bad) institutions and financial opening against REER volatility.

III. Plot REER volatility against the likelihood of a lower Central Bank Independence (i.e. higher turnover rates during elections may provide a link through fiscal dominance, leading to more variability of the exchange rate).

IV. Plot REER volatility against the likelihood of a higher (lower) respect for political and civil rights (i.e. as a proxy of country risk-premium).

B. Estimation Strategy[66]

Since my dependent variable is Real Effective Exchange Rate volatility (σ), I will regress it against a vector of explanatory variables, controlling for potential endogeneity.

Due to limited data[67], I will consider five years' average of all variables. Moreover I have divided the sample of countries (80), into four groups (OECD, LA&CAR, SUB-SAHARAN AFRICA & MENA, ASIA & HIGH-INCOME NON-OECD)

Formally I will estimate the following equation[68]

$$\boldsymbol{Y_{it} = \gamma Y_{it-1} + \eta X_{it} + \Psi F_{it} + \delta Z_{it} + \in_{it} + \mu_{it}} \qquad (\mathbf{1})^{69}$$

Where

- Y_{it} is REER volatility (i.e. std[70] of LN REER)
- Y_{it-1} is the initial level of REER volatility
- X_{it} is a vector including the volatility of the fundamentals
- F_{it} is a measure of financial integration
- Z_{it} is a vector of controls {Exchange Rate Regime; Trade Openness, Degree of Political and Civil Rights of the Economy (i.e. Country Risk Premium); Capital Openness; and quality of Democracy}.
- μ_{it} is the unobserved country specific-effect
- $\in_{it}$ is a random disturbance $\sim N(o, \sigma^2)$

[66] Due to causality issues, the choice of exchange rate regime is endogenous. The reason is that the policymakers have their own incentives. Hence, the final decision will remain in their hands, and they will have to regard the structural features of the county concerned. Additionally, according to Levy-Yeyati, Sturzenegger and Reggio (2002), there are three approaches the theory of optimal currency areas (OCA), the financial integration (i.e. the impossible trinity theorem and balance sheet effects) and finally the political economy view of pegs as credibility enhancers.
Since my framework does not explore the determination of an exchange rate regime, I shall consider that its election will not matter. Indeed it will depend on the government (some governments have preferences for low inflation while others do not. Usually they use the exchange rate as a nominal anchor to reduce inflation. Yet, it is important to recall that with a fixed exchange rate, you disregard the monetary policy as an instrument, but you gain the fiscal policy. While with floating exchange rates you recover the monetary policy, but you lose the fiscal policy.

[67] For more details see Appendix B.

[68] I will expand the equation that Caporale, Amor and Rault explored.

[69] The general equation follows this structure: $\Delta RER_{it} = \sum_{j=1}^{k} \gamma_j \Delta RER_{i,t-j} + \beta' \Delta X_{it} + \mu_{it} + \epsilon_{it}$

[70] (I.e. the mean of the standard deviation collapsed into five years' average). Another way is to regard the Variation Coefficient (VC) or Arrufat, Buzzi, and Diaz Cafferata's approach: disentangle variability from volatility.

V. Empirical Evidence

A. Descriptive Statistics and Correlation Analysis

In this section I analyze five years' average[71] descriptive statistics and correlations for the panel over the period 1980-2010. More precisely, table 1 display the mean values of all the traditional shocks[72] as well as the evolution of our main dependent variable (σ).

According to table, it seems that Real Effective Exchange Rate volatility was much higher between 1980 and 1990[73]. For example the mean value of σ in 1985 was 0.12%. While by the end of the period (2005-2010) its amount decreased to 0.06%. The former case falls into the 'Lost Decade[74]' period, while the latter matches with more flexible policies regarding the liberalization of capital account and a good environment for business (e.g. more respect for political and civil rights).

Regarding the productivity shocks[75] (i.e. Balassa Samuelson Effect and Average per Worker Product), table 1 indicates that BSE was 0.62% in 1980 and by the end of sample decreased to 0.51%. The drop on this variable may indicate a higher productivity on developed countries. This findings are consistent with the evidence found by Balassa-Samuelson, that is to say, richer nations are more productive than the poorer ones, and thus, they are more likely to have a lower REER volatility.

Moreover, regarding the main tools that every government has (monetary and fiscal policy) we can account for their mean values. In the former case, $\Delta M2$ was 0.49% in 1980, then experienced an increase in 1990 (0.72%) and finally stabilized in 0.62% by the end of 2010. While in the latter, δPS was 0.09%, in 1980, then experienced an upturn in 1990 (0.13%) and finally decreased to 0.07% in 2010.

As for trade opening(O), literature already pointed out its benefits by expanding a basket of different goods[76]. Therefore, it appears that in 1980 (O) was 0.65%, which makes us think that a lower value might reflect a 'trade bolt' and a fear for foreign goods. This fragile situation was very important in LAT countries, since they suffered severe balance of payment crisis. Yet, by the end of the period (2005-2010) its value

[71] For example 80=1980-1985 average… 105=2005-2010 average.
[72] For example Public Spending, Monetary Supply, Terms of Trade, Balassa-Samuelson Effect, among others.
[73] This relationship is clear in Figure 5.
[74] This finding is consistent with some early studies (see Reinhart and Smith 2001).
[75] Another variable which was analyzed remained with no changes (its mean value was 0.048%).
[76] Dixit and Stiglitz pointed out that consumers prefer variety of goods rather than quantity.

increased to 0.90%, (almost 73%). The latter was accompanied by a lower overall restrictions in capital account (0.97), a clear sign of liberalization[77]. Why?

Until now, little has been said about the effects of financial opening and institutions. On the one hand, a higher financial integration increases efficiency in consumption smoothing and generates a stabilizing effect by favoring risk diversification. More precisely, if we analyze the Foreign Direct Investment (stock of assets) plus Portfolio equity liabilities (stock) over the GDP that ($\mathcal{F}^1$), we can see that there has been an increase followed by a lower volatility[78], since in 1980 its value was 0.04 (millions u$d) and by the end of period its value increased to 1.41 million u$d. On the other, analyzing variables which depict the quality of democracy (P) and political participation[79] (Θ), we can account higher mean values. For example in 1980 (P) was (-056)[80], however, by the end of the sample, its value became positive (4.14). Therefore, a priori, a higher quality of democracy may be a good indicator of healthy institutions, which favors a suitable environment for business.

However, those countries with poor institutions and 'bad reputation', (e.g. a lower respect for political and civil rights or a lower Central Bank Independence) will have a greater likelihood of a higher REER volatility. To capture that relationship, we proceed to perform two econometric exercises[81]. On the former, we tested a logit regression where the main variables were public spending volatility and Central Bank Turnover Rate (TOR), threshold TOR (i.e. the rate beyond which CBI begins to deteriorate) and finally Real Effective Exchange Rate volatility. Whereas on the latter, two logit models were evaluated in which we measured a higher (lower) likelihood of respect for political and civil rights in the economy, against REER volatility. The econometric results showed that institutional factors had an impact on REER volatility. In the former case, if we observe figure 1, a lower CBI generates a higher probability of fiscal dominance, which is manifested in increasing public spending volatility. While in latter, a higher (lower) respect for political and civil rights works as a proxy of a country risk-premium, whereby a higher (lower) respect of the rights, the lower (higher) will be σ.

[77]The interested reader may check the relationship between capital account, real effective exchange rate volatility and trade opening (figure A.4.1.2).
[78]This relationship is appreciated in Figure 6.
[79] A priori, a higher participation is a sign of healthy institutions.
[80] Negative values depict more autocratic governments.
[81] For simplicity we will only make inferences with graphics.

Correlations[82]

According to table 2, Real Effective Exchange Rate volatility (σ) is positive correlated with its fundamentals such as BSE, δPS, ΔM2, ΔTOT, ΔAWP, whilst a negative correlation is observed with trade opening (O). This results are consistent with other findings (Caporale, Amor, Rault: 2011). Although trade opening is negatively correlated with σ, if we regard a floating regime, the variable ceased to be significant. Additionally, financial integration variables that had an outstanding performance to reduce volatility were $\mathcal{F}^1$ and KA, where the latter is the most effective tool regardless the exchange rate regime, whereas the ratio of assets and liabilities over the gross domestic product is only significant with intermediate and floating exchange regimes.

The novelty of this analysis is the institutional variables. It can be observed that a higher respect for political and civil rights (ζ_{FREE}), a greater legal certainty of contracts (Γ) along with a higher effective of policies (E) are negatively correlated[83] with σ and all of them are essential to reduce volatility. Whereas on the other, a lower respect for political and civil rights ($\zeta_{\text{NOT FREE}}$) plus the fact of a currency[84] crisis episode in the past, are sufficient to enhance volatility, since both of them are positive and highly significant.

[82] Remark: correlation does not imply causality. The interested reader can check Appendix A.3 (correlations by group of countries).
[83] It is important to emphasize that all the coefficients are highly significant.
[84] A currency crisis represents a breakdown of the status quo, that is, a violation of the confidence that citizens have on their own currency.

Descriptive Statistics and Correlations

Table 1 Average Shares Full Panel

	80	85	90	95	100	105
Fundamentals						
σ	0.107	0.124	0.125	0.0762	0.0832	0.0621
	(0.107)	(0.113)	(0.180)	(0.0795)	(0.0851)	(0.0491)
BSE	0.622	0.699	0.735	0.531	0.668	0.501
	(0.452)	(0.516)	(0.512)	(0.456)	(0.518)	(0.321)
ΔM2	0.499	0.613	0.729	0.626	0.678	0.622
	(0.344)	(0.472)	(0.691)	(0.490)	(0.484)	(0.494)
ΔTT	0.0926	0.133	0.0859	0.0671	0.0461	0.0678
	(0.0589)	(0.0910)	(0.0671)	(0.0589)	(0.0351)	(0.0479)
δPS	0.0910	0.101	0.132	0.101	0.0588	0.0752
	(0.0653)	(0.0848)	(0.164)	(0.0900)	(0.0420)	(0.0535)
ΔAWP	0.0535	0.0462	0.0557	0.0379	0.0372	0.0418
	(0.0303)	(0.0294)	(0.0282)	(0.0182)	(0.0308)	(0.0336)
O	0.679	0.654	0.686	0.743	0.808	0.900
	(0.536)	(0.507)	(0.531)	(0.539)	(0.591)	(0.669)
Financial Integration						
$\mathcal{F}^1$	0.0412	0.0772	0.599	0.759	1.064	1.472
	(0.0802)	(0.173)	(4.39)	(5.02)	(6.56)	(8.90)
KA	-0.259	-0.246	0.162	0.636	0.852	0.976
	(1.34)	(1.45)	(1.46)	(1.45)	(1.51)	(1.54)
Institutions						
T	0.300	0.304	0.600	0.286	.	0.244
	(.)	(0.197)	(.)	(0.168)	.	(0.119)
Θ	2.879	3.876	2.127	4.631	4.561	5.147
	(10.51)	(7.29)	(13.38)	(10.98)	(12.42)	(11.36)
P	-0.566	0.892	0.345	3.257	3.491	4.143
	(11.90)	-9.740	(14.39)	(11.84)	(12.95)	(11.87)

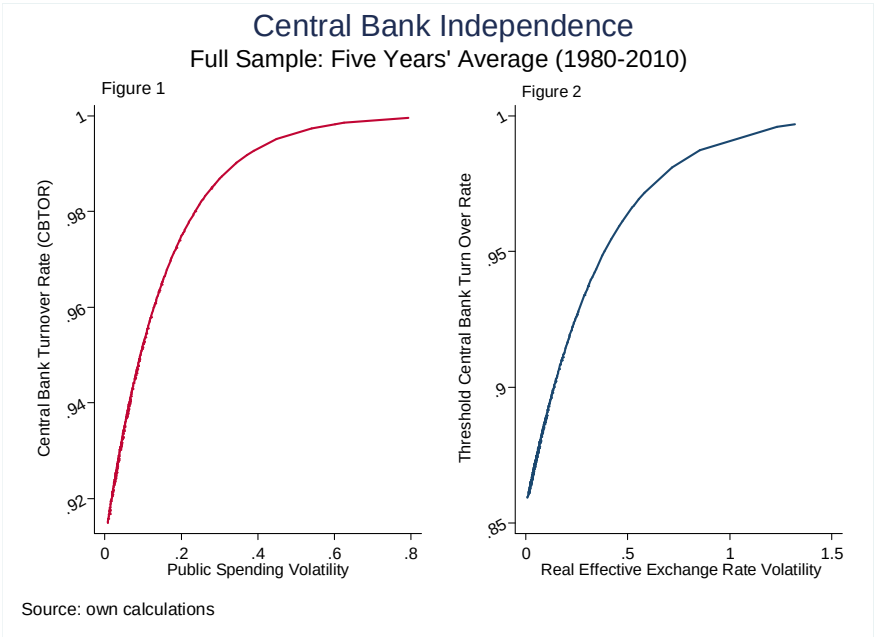
Note: Averages and Standard Errors in parenthesis.

Table 2 Correlations

Correlations Full Panel by Exchange Regime

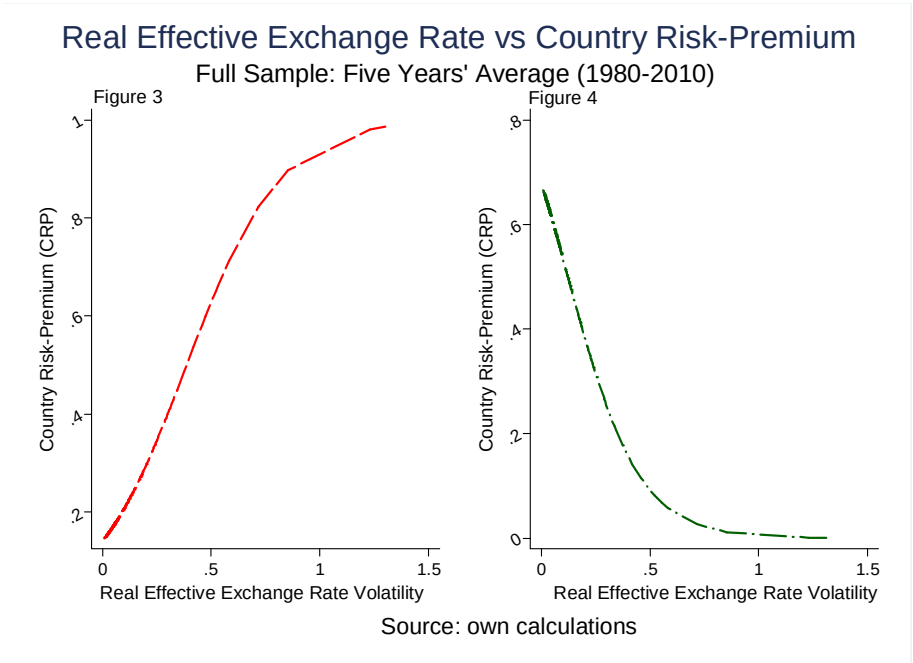
	Fixed		Intermediate		Floating	
	P.Corr	P-value	P.Corr	P-value	P.Corr	P-value
σ	1.000		1.000		1.000	
BSE	0.155	(0.070)	0.126	(0.040)	0.097	(0.497)
ΔM2	0.188	(0.038)	0.266	(0.000)	0.398	(0.003)
ΔTT	0.255	(0.006)	0.339	(0.000)	0.346	(0.020)
δPS	0.284	(0.001)	0.578	(0.000)	0.318	(0.017)
ΔAWP	0.209	(0.024)	0.061	(0.344)	0.240	(0.077)
Ω	0.718	(0.000)	0.425	(0.000)	0.358	(0.006)
O	-0.261	(0.002)	-0.260	(0.000)	-0.059	(0.663)
$\mathcal{F}^1$	-0.109	(0.195)	-0.127	(0.038)	-0.341	(0.009)
$\mathcal{F}^2$	-0.119	(0.158)	0.059	(0.333)	0.264	(0.045)
NFA	0.049	(0.561)	-0.072	(0.241)	0.056	(0.674)
KA	-0.277	(0.001)	-0.191	(0.002)	-0.452	(0.000)
T	0.189	(0.170)	0.194	(0.025)	0.300	(0.136)
M	0.178	(0.623)	-0.279	(0.135)	-0.477	(0.034)
I	-0.324	(0.041)	0.053	(0.538)	-0.099	(0.538)
Θ	-0.235	(0.006)	-0.207	(0.001)	-0.303	(0.025)
P	-0.275	(0.001)	-0.234	(0.000)	-0.334	(0.013)
ζ_{FREE}	-0.348	(0.000)	-0.235	(0.000)	-0.445	(0.001)
$\zeta_{\text{NOT FREE}}$	0.202	(0.016)	0.217	(0.000)	0.276	(0.039)
Γ	-0.206	(0.055)	-0.284	(0.001)	-0.683	(0.002)
E	-0.201	(0.060)	0.262	(0.002)	0.645	(0.005)

B. Influence of Institutions over REER Volatility



$Note_1$: Values have been scaled to observe when a lesser IBC starts being operational

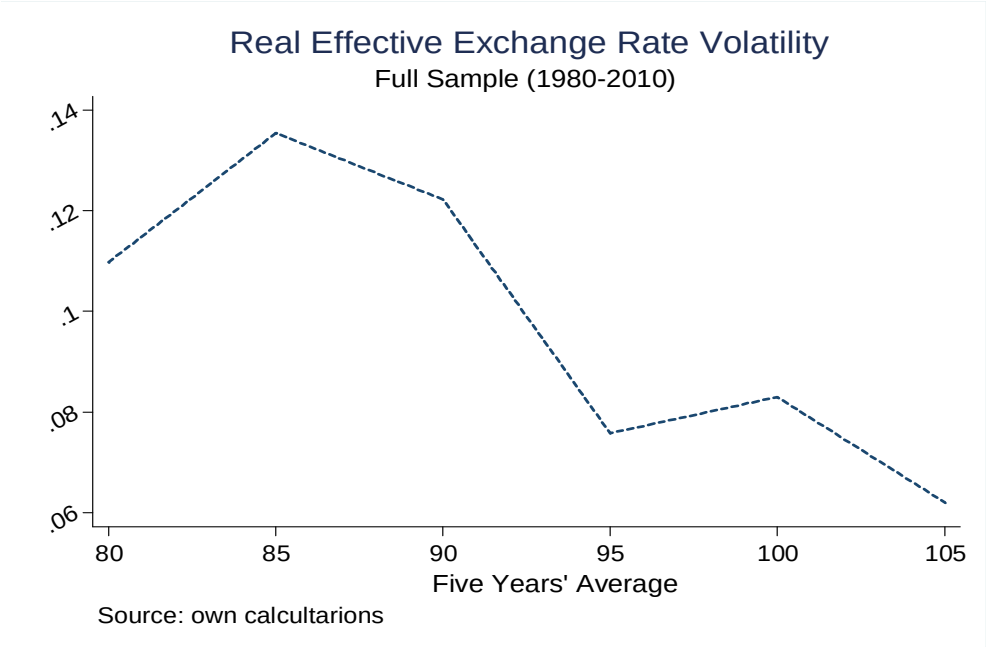
$Note_2$: The following countries were excluded from the full simple since they had no data on Central: Burkina Faso, Cameroon, Ivory Coast, Gabon, Mali, Niger and Togo.



Note: The Country-Risk Premium (CRP) is a binary variable. In figure 4 it takes de value of 1 if there is a higher respect of civil and political rights. Thus, the CRP will be lower and so it will be the probability that the REER (σ) increases volatility. In figure 3, the CRP takes the value of 1 if there is no freedom, therefore the CRP will be higher and so will be the probability that REER (σ) volatility grows

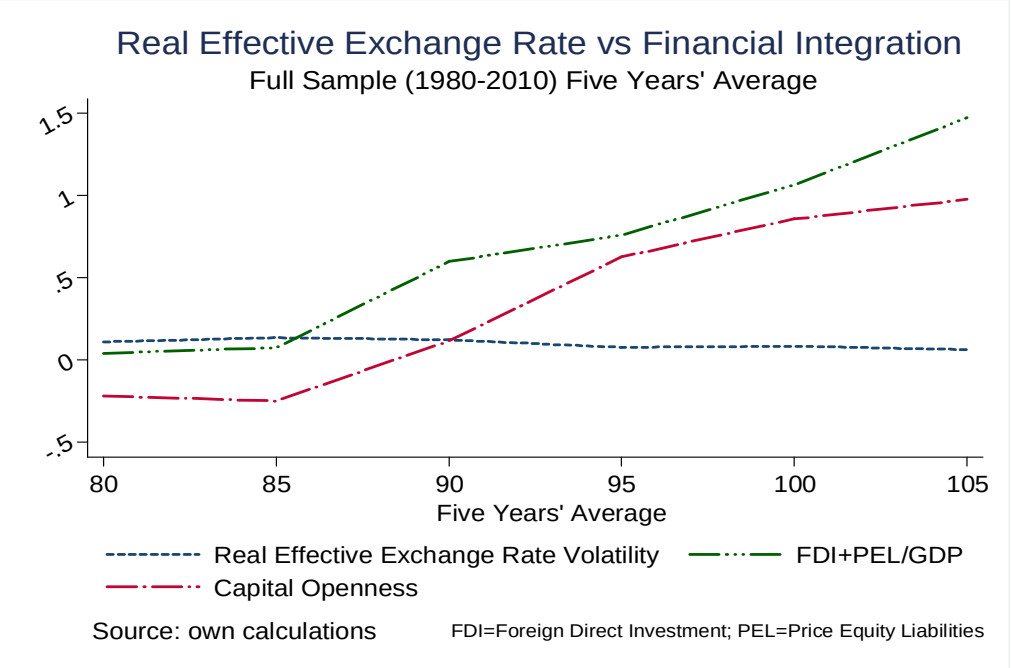
C. Influence of Financial Opening over REER Volatility

Figure 5: Real Effective Exchange Rate Volatility (80 countries)



Note: It can be seen that the REER (σ) volatility suffered an abrupt fall after the financial reforms adopted by the majority of the countries in the sample.

Figure 6: Financial Integration & Capital Account Openness



Note: As seen in Figure 6, a major financial opening produced by a laxity in controls in the capital account helps to achieve a lower REER (σ) Volatility.

D. GMM Results

The panel estimates equation **(1)** using the GMM system estimator of Arellano and Bond (1991). The results are reported in table 3.

In order to evaluate the likelihood of a Financial Integration process, two models[85] were carried out for the full sample. Model [I] includes the Financial Integration vector (i.e. $\mathcal{F}^1$, $\mathcal{F}^2$). Whereas in the second model [II] those variables were excluded.

The results were mixed. On the one hand, a positive 1.000 million u$d shock to FDI of portfolio investment would reduce volatility by 2.5%. While on the other, a positive 1.000 million u$d shock to the total liabilities and assets relative to the GDP would lead to an increase in volatility by 0.9%.

On the other, it is important to highlight that not only external shocks matter, but also but also households. For instance, a 1% positive shock to the volatility of public spending results in a 0.41% or 0.34% increase in the volatility of REER according to models [I] or [II]. Whilst a 1% positive shock to the volatility of terms of trade generates a 0.70% decrease in volatility (σ) according to model [I]. In addition, the monetary shock also plays a role in model [II], being statistically significant at 10%. Meanwhile, trade openness (O) has a statistically significant effect at 5% level, with a 1% increase reducing REER volatility by 0.042% according to model [I][86].

The novelty of this paper is the inclusion of institutional variables. For example, a currency crises episode (Ω) will increase REER volatility by 124% and 95% according to models [I] or [II]. Furthermore, a higher respect forpolitical and civil rights (i.e. a lower country risk premium) will reduce REER volatility by 2.83% according to model [I]. Conversely, a lower respect for political and civil rights (i.e. a higher country risk premium) will increase REER volatility by 5.32% according to model [II].

Nevertheless, a group analysis will provide a broader scope to our issue. For example, columns 3 and 4 depict two different cases. On the one hand, OECD countries while on the other, LATCAR (i.e. Latin America & Caribbean).

[85] At the end of subsection D (Table 4) the reader can appreciate another grouping criteria (e.g. by income per capita).
[86] This findings are consistent with other studies (Caporale, Amor, Rault: 2011), although they used a different estimator of Arellano-Bond.

The formers 'achieved the target', since REER volatility was lower[87] while the latter group exhibited certain persistence in volatility due to bad policies implemented and a poorer institutional quality. Furthermore, it is important to highlight a 1% positive shock in public spending results in a 0.42% reduction in volatility for the former group; whilst the latter displayed an increase in 0.55% in volatility. What is the reason of such disparity?

Conventional wisdom suggests that political budget cycles are positively correlated during elections. Hence, REER volatility should react in a positive way. But in this case, since the OECD countries have a higher respect of the procedures and enforcements, fiscal surplus could have been used as an 'insurance' during a crisis phase (i.e. higher revenues in t-1 period are used to reduce volatility in current periods).Whereas in LAT-CAR countries, we tend to observe a lower enforcement of budget rules, whereby REER volatility tends to be positive.

Regarding the external shocks, we can also observe an opposite behavior between this two groups. For instance, a 1% positive shock to the volatility of terms of trade (ΔTT) increase in 0.95% REER volatility for the OECD countries while in LAT-CAR would result in a 1.27% decrease. According to Rodriguez and Sjaastad[88], a possible explanation may be the influence of indirect effects over the level of exchange rate. Additionally, volatility of trade openness (O) also presents an antagonistic result. On the one hand, (O) has a negative and statistically significant effect at 1% level for the OECD countries while on the other, in LAT-CAR countries, an increase in 1% in (O) results in a 0.110% growth in REER volatility. Therefore, trade opening should be gradual for this last group of countries, in this way the Current Account (CA) will strengthen, thus, countries may avoid the 'Dutch Decease'. Lastly, according to the traditional framework of Dornbusch (1976), a positive 1% monetary shock results in a 0.081% increase in σ for LAT-CAR countries.

As for financial integration, the evidence is mixed. On the one hand, a positive 1.000 million u$d shock to FDI of portfolio investment reduces (increases) REER volatility by 3% (270%) both significant at 1%. The former case corresponds to OECD countries, which possess a higher degree of financial development whereas the latter falls into

[87] More precisely, the first lag was negative and significant at 1%. The converse occurs in LAT-CAR countries, since the first lag was positive and significant at 1%.
[88] The reader can recall the stylized facts and the model discussed in section II (C).

LAT-CAR group, countries that according to Le Fort (2000) did not accompany liberalization with prudential policies (i.e. premature opening). On the other hand, a positive 1.000 million u$d shock to the total liabilities and assets relative to the GDP increased volatility by 1.1% (OECD) and 6.9% in LAT-CAR countries. It is noteworthy that both financial variables were significant at 1% level.

However, by including institutional variables into the model, we can delve more into the sources of REER volatility for both groups. For instance, a higher respect for political and civil rights resulted in a 10.59% reduction in volatility (OECD) and an increase in 0.09% for LAT-CAR. Hence, with healthier institutions, the investors will be more likely to sink physical capital onto the economy. The reason? A suitable environment for business. Thus, it can be concluded that OECD countries have a lower country risk-premium than LAT-CAR, even though its coefficient was not significant.

At first glance, volatility of policies and compulsory violation of contracts could lead to 'dead end-roads'. For instance, a currency crisis (devaluation[89]) implies a disruption of the status-quo and a loss in currency confidence. In the case of LAT-CAR countries, the inclusion of the dummy variable[90] (Ω) might enhance 250% REER volatility. Therefore, it is important to bear in mind the negative effects over volatility before devaluation takes place.

Lastly, column 5 and 6 report the results for African countries (Sub-Saharan & MENA[91]) and 'Asian Tigers' along with other high-income countries not members of the OECD group. In African countries, monetary and real demand shocks are the main determination of volatility as well as the first lag of σ[92]. More precisely, a positive 1% shock in the volatility of money supply results in a 0.162% increase in the volatility of REER. Even though, other domestic shocks such as $(\Delta M2)$ and (ΔPS) seem to have no effect over REER volatility, we cannot disregard productivity shocks. In particular, a 1% positive shock in volatility of annual growth rate of real gdp (i.e. Balassa Samuelson Effect) in Asian countries, results in a 0.118% increase in σ. Unlike African countries,

[89] The interested reader on a case analysis may check Appendix A.6 (Argentina).
[90] For additional regressions check Table A.3.6 from the Appendix.
[91] That is, Middle East and Northern Africa.
[92] Op cite 86.

the ‘Asian Tigers’ own a higher stability in REER volatility[93]. The reasons seem to be sequential opening along with prudential policies.

Moreover, analyzing trade openness volatility (O), it appears to have a stabilizing effect on REER, since its coefficient was negative and statistically significant effect at 1% level for both groups (AFRICA & ASIA-HI). Whereby free trade should be encouraged since it is an appropriate measure to reduce volatility.

As for financial integration, the evidence points out that RER volatility would increase 6.8% for African countries and only 3% for the Asian and High-Income. Yet, if we include public spending volatility on the first group, then, the impact of financial integration would be (5%)[94] instead of 6.8%. Hence, active fiscal policies may be suitable at the beginning of any liberalization process.

By including institutional variables, it can be appreciated that the best antidote against REER volatility is a higher respect for political and civil rights. The success observed in Asia and High-Income countries it makes us think that a proper country risk-premium (measure as a higher respect for political and civil rights) decreased REER volatility by 10.26% being significant at 5%.

To conclude, the choice of the exchange rate regime only had a significant effect of 5% in both groups (i.e. AFRICA and ASIA-HI), not for the remaining groups (for that reason the variable was not included in table 3). However, according to Levy Yeyati Sturzenegger and Reggio, the choice of any exchange rate will depend on particular features of each country, thus, the scope of this paper will not delve into that area of research.

[93] Since its first lag of σ was negative and statistically significant at 5%.
[94] Op cite 90.

Table 3
Two-Step Arellano-Bond Regressions (System)
Full Sample of 80 countries: Five Years' Average (1980-2010)

Dependent Variable: Real Effective Exchange Rate Volatility (σ)						
Explanatory Variables	Full Sample Regressions		Regressions by Groups			
	Model [I]	Model [II]	OECD	LAT-CAR	AFRICA	ASIA-HI
σ_{t-1}	0.221***	0.208**	-0.794***	0.364***	0.409**	-0.772**
	(3.15)	(2.13)	(-5.41)	(3.39)	(2.63)	(-2.42)
BSE	-0.006	-0.001	0.001	-0.005		0.118*
	(-0.41)	(-0.08)	(0.11)	(-0.22)		(2.04)
ΔM2	0.019	0.020*		0.081**	0.162**	
	(1.42)	(1.83)		(2.85)	(2.45)	
ΔTT	-0.706*	-0.419	0.954**	-1.217***		-0.008
	(-1.71)	(-1.63)	(2.43)	(-4.28)		(-0.02)
ΔAWP	0.056	0.123				
	(0.21)	(0.34)				
δPS	0.418***	0.344***	-0.428**	0.550**		0.085
	(3.13)	(3.00)	(-2.85)	(2.18)		(0.19)
O	-0.042**	-0.018	-0.033***	0.110*	-0.096***	-0.055**
	(-2.57)	(-1.44)	(-3.04)	(1.98)	(-3.18)	(-2.64)
$\mathcal{F}^1$	-0.025*		-0.030***	2.701***		
	(-1.97)		(-2.78)	(3.10)		
$\mathcal{F}^2$	0.009*		0.011***	0.069*	0.068**	0.003**
	(1.97)		(2.77)	(2.01)	(2.79)	(2.38)
NFA				0.000[95]		
				(1.51)		
Ω	0.813***	0.674**		2.501***	0.125	0.467
	(2.72)	(2.52)		(4.21)	(0.34)	(1.61)
ζ_{FREE}	-0.028*		-0.101***			-0.098**
	(-1.81)		(-5.00)			(-2.98)
$\zeta_{NOT\ FREE}$		0.052*		0.001	0.013	
		(1.80)		(0.00)	(0.54)	
Err					0.055**	0.040**
					(2.10)	(2.89)
Constant	0.023	0.014	0.140***	-0.199***	-0.295***	
	(0.94)	(0.85)	(4.18)	(-5.30)	(-3.12)	
Observations	264	264	73	76	107	50
Countries	80	80	29	17	22	12
AR(1) Test	0.017	0.024	0.060	0.051	0.048	0.000
AR(2) Test	0.154	0.163	0.463	0.154	0.512	0.514
Sargan Test[96]	0.131	0.071	0.143	0.080	0.975	0.103

Note: t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

[95] The real coefficient of $\mathcal{NFA}$ is (0.0000005421), therefore it is highly insignificant.
[96] If the p value of this test (with a Chi2 distribution) is close to 1, it will not compromise consistency of the estimator, but it will dramatize the distance of the feasible estimator GMM with respect to its asymptotic ideal.

Table 4
Two-Step Arellano-Bond Regressions (System)

Dependent Variable: Real Effective Exchange Rate Volatility (σ)

	Regressions by Income per-capita					
Explanatory Variables	Developing Countries Income per-capita lower to 6000 u$d			Developed Countries Income per-capita higher to 6000 u$d		
	[I]	[II]	[III]	[IV]	[V]	[VI]
σ_{t-1}	0.180***	0.127**	0.133**	-0.526**	-0.436**	-0.515**
	(2.76)	(2.02)	(2.14)	(-2.43)	(-2.61)	(-2.61)
BSE	0.018	0.015	0.014	0.077**	0.051**	0.046**
	(0.59)	(0.43)	(0.48)	(2.47)	(2.50)	(2.11)
ΔM2	0.002	0.019	0.031	0.095***	0.041**	0.049**
	(0.06)	(0.93)	(1.54)	(3.71)	(2.14)	(2.59)
ΔTT	0.378*	0.339	0.421**		-0.039	-0.078
	(1.94)	(1.59)	(2.18)		(-0.08)	(-0.19)
δPS	0.212	0.384*	0.231	0.397	0.879*	1.001**
	(0.94)	(2.01)	(1.06)	(0.89)	(1.85)	(2.29)
O	-0.042***	-0.048***	-0.055***	-0.068**	-0.046**	-0.044**
	(-2.96)	(-3.67)	(-4.85)	(-2.48)	(-2.13)	(-2.10)
$\mathcal{F}^1$	0.086*	0.101**	0.072	0.014	0.006	
	(1.88)	(2.12)	(1.29)	(1.15)	(0.50)	
$\mathcal{F}^2$	0.017*	0.021*	0.025**	0.004	0.004	0.004
	(1.82)	(2.00)	(2.62)	(1.18)	(1.18)	(1.22)
KA			0.007	-0.030*	-0.024	-0.020
			(1.44)	(-1.87)	(-1.30)	(-1.14)
Ω	0.520***	0.512**	0.432*			
	(2.92)	(2.66)	(1.94)			
ζ_{FREE}	-0.023*		-0.026**	-0.041*	-0.010	-0.012
	(1.78)		(-2.27)	(-1.70)	(-0.24)	(-0.34)
$\zeta_{NOT\ FREE}$		0.025				
		(1.05)				
Err			0.023			
			(1.53)			
Constant	-0.055	-0.089**	-0.122***			
	(-1.10)	(-2.54)	(-3.02)			
Observations	213	213	211	142	88	88
Countries	46	46	46	34	34	34
AR(1) Test	0.006	0.006	0.010	0.003	0.043	0.037
AR(2) Test	0.173	0.512	0.318	0.519	0.398	0.353
Sargan Test	0.970	0.986	0.964	0.052	0.121	0.150
Hansen Test	0.576	0.810	0.680	0.387	0.361	0.323

Note: t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

VI. Concluding Remarks

The evidence presented in this paper indicates that Real Effective Exchange Rate Volatility (σ) not only depends on domestic shocks[97] (e.g. $\delta PS, \Delta M2, BSE, \Delta TT$, among others), but also Institutions and Financial Integration fulfil an important role.

Indeed, institutions are paramount. Accordingly, an important variable, usually disregarded on other studies is the Central Bank Independence. That is, the higher Central Bank Turnover Rate (TOR), the greater the likelihood of an increase in REER volatility, where the relationship is positive and exponential[98]. Furthermore, the best antidote against volatility is the proliferation of healthy institutions, since they will work towards a lower Country Risk-Premium and they will generate a suitable environment for business. For instance, a higher respect for political and civil rights, will lead to a Lower Country Risk-Premium, thus, a lower REER volatility (σ). On the contrary, a lower respect for political and civil rights will lead to a Higher Country Risk-Premium, hence, a higher REER volatility (σ).

As for Financial Integration, the results were mixed[99]. On the one hand, only the OECD countries successfully reduced REER volatility (3%). On the other, the Latin American and Caribbean group could suffer more volatility (270%) if Financial Integration is pursued without prudential policies.

Overall, my findings suggest that in order to reduce the Real Effective Exchange Rate Volatility (σ), the healthier the institutions, the better. Moreover, it will depend on political incentives and particular features of each group. The best policy for one group should not be regarded as a successful for another one. However, a more gradual approach towards trade and financial liberalization is preferable rather than a 'leap of faith'.

While the adoption of an appropriate econometric method[100] for the treatment of endogenous variables and reverse causality was effective, a future research will lead me to delve into additional channels to gain more knowledge of this issue.

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[97] Op cite 86.
[98] Remark: this is a potential scenario. TOR is a de facto measure, that is, governed in the absence of legal framework but actually led in practice.
[99] Africa and Asia-High-Income displayed a higher (σ), even though they held a better position if we compare them with the other remaining groups.
[100] Op cite 62.

A. Appendix

A.1. Sample of Countries (80)

Table A.1.1

Algeria	Congo, DR.	Honduras	Malaysia	Singapore
Argentina	Costa Rica	Hong Kong, China	Mali	South Africa
Australia	Côte d'Ivoire	Iceland	Malta	Spain
Austria	Denmark	India	Mexico	Sri Lanka
Bahrain	Dominican Rep.	Indonesia	Morocco	Sudan
Bangladesh	Ecuador	Ireland	Netherlands	Sweden
Belgium	Egypt, Arab Rep.	Israel	New Zealand	Switzerland
Bolivia	El Salvador	Italy	Nicaragua	Thailand
Botswana	Ethiopia	Japan	Niger	Togo
Brazil	Finland	Jordan	Nigeria	Trinidad &Tobago
Burkina Faso	France	Kenya	Norway	Turkey
Cameroon	Gabon	Korea, Rep.	Panama	Uganda
Canada	Germany	Kuwait	Paraguay	United Kingdom
Chile	Ghana	Luxembourg	Peru	United States
China, Mainland	Greece	Madagascar	Poland	Uruguay
Colombia	Haiti	Malawi	Portugal	Venezuela, RB

Distribution by Groups

Table A.1.2 OECD

Australia	Korea, Rep.
Austria	Luxembourg
Belgium	Mexico
Canada	Netherlands
Chile	New Zealand
Denmark	Norway
Finland	Poland
France	Portugal
Germany	Spain
Greece	Sweden
Iceland	Switzerland
Ireland	Turkey
Israel	United Kingdom
Italy	United States
Japan	

Table A.1.3 LATIN AMERICA-CARIBBEAN

Argentina	Honduras
Bolivia	Nicaragua
Brazil	Panama
Colombia	Paraguay
Costa Rica	Peru
Dominican, Rep.	Trinidad & Tobago
Ecuador	Uruguay
El Salvador	Venezuela, R.B
Haiti	

Table A.1.4 SUB-SAHARAN AFRICA & MENA[101]

Algeria	Jordan
Botswana	Madagascar
Burkina Faso	Malawi
Cameroon	Mali
Congo DR	Morocco
Côte d'Ivoire	Niger
Egypt	Nigeria
Ethiopia	South Africa
Gabon	Sudan
Ghana	Togo
Kenya	Uganda

Table A.1.5 ASIA-HIGH INCOME[102] NON-OECD

Bangladesh	Kuwait
Bahrein	Malaysia
China	Malta
Hong Kong	Singapore
India	Sri Lanka
Indonesia	Thailand

[101] The countries are: Algeria, Egypt, Jordan and Morocco. These countries belong to the group of Middle East and Northern Africa (MENA).
[102] The countries are: Bahrein, Hong Kong, Kuwait and Malta.

A.2. Data Sources and Variables

Table A.2.1

Variables	**Definition and Sources**
Dependent Variable**(σ)**	Volatility of $REER_t = \frac{TCNE_t * IPC_t}{IPC_t^{Extranjero}}$ standard deviation: $LN\left(\frac{1}{REER_t}\right)$ five years' average. Source: www.bruegel.org
Independent Variables (Averaged over Five-Years)	
Fundamentals (in LN)	
Balassa-Samuelson Effect (BSE)	Standard Deviation of Annual Growth Rate of real GDP. Source: WDI.
Volatility of Public Spending (δPS)	Standard Deviation of changes in government consumption as % of GDP. Source: WDI.
Volatility of M2 ($\Delta M2$)	Standard Deviation of growth rate of M2 (money and quasimoney annual %). Source: WDI.
Volatility of Terms of Trade (ΔTT)	Standard Deviation of changes in the terms of trade. Source: WDI.
Volatility of Average Product per Worker (ΔAWP)	Standard Deviation of average worker product. Source: Total Economy Database.
Real GDP p.c	Mean of Real Gross Domestic Product per capita 2005 in u$d. Source: USDA.
Currency Shock	
Currency Crisis (Ω)	Dummy variable taking 1 if the country experienced a currency crisis in the past, or 0 in contrary case. Source: Luc Laeven y Fabián Valencia 2012. "Systemic Banking Crises Database: An Update"
Trade Opening (O)	Trade Openness (exports+ imports in current u$d/GDP). Source: WDI.
Financial Integration (in levels)	
$\mathcal{F}^1$	FDI assets (stock) + Portfolio equity liabilities (stock)/ GDP current u$d. (source Lane and Milesi-Ferreti, 2011 database).
$\mathcal{F}^2$	Total liabilities + Total assets/ GDP current u$d (source Lane and Milesi-Ferreti, 2011 database).
NFA	Net foreign Assets (Total liabilities - Total assets) (source Lane and Milesi-Ferreti, 2011 database).
Capital Openness KA	The Chinn-Ito Index. A de jure measure of financial openness (source http://web.pdx.edu/~ito/Chinn-Ito_website.htm). A higher number indicates a lower overall level of restrictions, therefore capital account liberalization. Source: http://web.pdx.edu/~ito/Chinn-Ito_website.htm
Exchange Rate Regime	Reinhart and Rogoff annual coarse classification modified according this criteria: 1=Fixed 2= Intermediate [category 2(crawling peg) and 3(crawling bands and managed bands) were merged] 3= Floating [category 4(free floating) ; 5(freely falling) and 6(black market) were merged]

Table A.2.2 (Cont.)

Institutions	
Central Bank Turnover Rate (T)	$$TOR = \frac{Number\ of\ Central\ Bank\ Governor\ Changes}{Number\ of\ years\ or\ part\ of\ years}$$ *Proxy of Central Bank Independence (de facto)*. Source: http://www.kof.ethz.ch/en/indicators/data-central-bank-governors/
Threshold TOR (Φ)	$$\Phi = \frac{1}{Legal\ Term\ of\ Office\ of\ the\ Central\ Bank\ Governor\ (years)}$$ The threshold TOR is the inverse of the legal term of office of the governor. It is the turnover rate, beyond which Central Bank Independence begins to deteriorate. Source: own calculations based on Kof.
Legal Central Bank Independence (M) y (I)	Central Bank Independence. The former variable (M) is the Grilli, Masciandaro and Tabellini index for 9 OECD countries. It is an update by Davide Romelli, who provided me the data. Source: http://davideromelli.wordpress.com/my-research/dynamic-cbi/ The latter (I) is an update of Cukierman index. Updated by Guillen,M and Jacomé,V (1989-2000)
Degree of Liberties (ζ)	Dummy Variable taking 1 for free economies and 0 for not free [Own calculations]. This variable was created considering the index of political rights (PR) and civil rights (CR) from the Freedom House:: https://freedomhouse.org/ PR=1 high; PR=6 low Status of the Economy: PR+CR=F/NF/PF CR=1 low; CR=6 low Note: lower values indicates more freedom. For example: USA: PR=1, CR=1, Status=F. Where F=freedom, NF=not free and PF=partial free is the omitted category.
Rules (Γ)	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contact enforcement, property rights, the police, and the courts as well as the likelihood of crime and violence. (Source: Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi (2010). "The Worldwide Governance Indicators")
Effectiveness (E)	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation and the credibility of the government's commitment to such policies. Source: The Worldwide Governance Indicators, 2014 Update.
Polity (P)	Indicator of the quality of government. Ranges from +10 (strongly democratic) to -10 (strongly autocratic). (Source: Polity IV)
Democracy (θ)	Indicator of the competitiveness of political participation, the openness and competitiveness of executive recruitment and constraints of the chief executive. This variable ranges from (0-10). Higher values depict better political conditions. Source (Polity IV)

A.3. Additional Tables

Nota: Promedios y Errores Estándar en paréntesis

Table A.3.1 Descriptive Statistics

	80	85	90	95	100	105
Institutions						
Γ	.	.	.	0.251	0.272	0.262
	.	.	.	(1.07)	(1.08)	(1.09)
E	.	.	.	0.346	0.356	0.316
	.	.	.	(1.06)	(1.09)	(1.06)
ζ_{FREE}	0.448	0.478	0.488	0.513	0.535	0.548
	(0.475)	(0.490)	(0.474)	(0.477)	(0.489)	(0.499)
$\zeta_{\text{NOT FREE}}$	0.192	0.187	0.158	0.143	0.113	0.110
	(0.360)	(0.361)	(0.300)	(0.333)	(0.298)	(0.288)
Φ	0.250	0.178	0.200	0.185	.	0.181
	(.)	(0.0963)	(.)	(0.0860)	.	(0.0787)
M	0.494	0.499	0.549	0.624	0.680	0.688
	(0.221)	(0.214)	(0.174)	(0.178)	(0.177)	(0.184)
I	0.380	0.380	0.580	0.580	.	.
	(0.179)	(0.179)	(0.223)	(0.223)	.	.
Financial Integration					.	.
$\mathcal{F}^2$	1104,0	1549,0	3624,0	3869,0	4906,0	6218,0
	(1.49)	(1.81)	(15.13)	(15.37)	(19.33)	(25.11)
NFA	-5554.6	-12483.3	-15583.4	-18685.1	-29669.0	-39864.8
	(36910.3)	(51055.4)	(97171.9)	(155265.0)	(303242.4)	(456853.9)

Note: Averages and Standard Errors in parenthesis.

Correlations by Groups

Table A.3.2 LATIN AMERICA & CARIBBEAN

Correlations by Regions and Exchange Rate Regime

	Fixed		Intermediate		Floating	
LATCAR	P.Corr	P-value	P.Corr	P-value	P.Corr	P-value
σ	1.000		1.000		1.000	
BSE	0.154	(0.024)	0.102	(0.080)	0.143	(0.099)
ΔM2	0.282	(0.000)	0.297	(0.000)	0.373	(0.000)
ΔTOT	0.249	(0.000)	0.316	(0.000)	0.349	(0.000)
δPS	0.409	(0.000)	0.457	(0.000)	0.428	(0.000)
ΔAWP	0.204	(0.007)	0.083	(0.178)	0.198	(0.039)
Ω	0.508	(0.000)	0.419	(0.000)	0.396	(0.000)
O	-0.247	(0.000)	-0.261	(0.000)	-0.173	(0.040)
$\mathcal{F}^1$	-0.075	(0.262)	-0.125	(0.029)	-0.167	(0.043)
$\mathcal{F}^2$	-0.074	(0.273)	0.044	(0.446)	0.195	(0.018)
$\mathcal{NF}$A	-0.001	(0.987)	-0.050	(0.383)	0.037	(0.654)
KA	-0.293	(0.000)	-0.242	(0.000)	-0.368	(0.000)
T	0.275	(0.007)	0.171	(0.037)	0.210	(0.079)
I	-0.143	(0.223)	0.045	(0.581)	-0.039	(0.744)
Θ	-0.091	(0.180)	-0.190	(0.001)	-0.208	(0.013)
P	-0.096	(0.156)	-0.212	(0.000)	-0.236	(0.005)
ζ_{FREE}	-0.184	(0.006)	-0.227	(0.000)	-0.284	(0.001)
$\zeta_{\text{NOT FREE}}$	-0.002	(0.979)	0.169	(0.003)	0.220	(0.008)
Γ	-0.300	(0.001)	-0.291	(0.000)	-0.350	(0.004)
E	-0.259	(0.003)	-0.274	(0.001)	-0.341	(0.005)

Table A.3.3 SUB-SAHARAN AFRICA & MENA

Correlations by Regions and Exchange Rate Regime

	Fixed		Intermediate		Floating	
AFRICA	P.Corr	P-value	P.Corr	P-value	P.Corr	P-value
σ	1.000		1.000		1.000	
BSE	0.118	(0.085)	0.140	(0.011)	0.088	(0.267)
ΔM2	0.046	(0.519)	0.209	(0.000)	0.172	(0.025)
ΔTOT	0.300	(0.000)	0.287	(0.000)	0.181	(0.023)
δPS	0.424	(0.000)	0.494	(0.000)	0.313	(0.000)
ΔAWP	0.093	(0.200)	0.053	(0.356)	0.090	(0.269)
Ω	0.552	(0.000)	0.468	(0.000)	0.444	(0.000)
O	-0.424	(0.000)	-0.308	(0.000)	-0.296	(0.000)
$\mathcal{F}^1$	-0.087	(0.195)	-0.136	(0.012)	-0.171	(0.024)
$\mathcal{F}^2$	-0.095	(0.159)	0.036	(0.507)	0.274	(0.000)
$\mathcal{NF}$A	0.009	(0.894)	-0.057	(0.297)	0.029	(0.700)
KA	-0.347	(0.000)	-0.201	(0.000)	-0.241	(0.001)
T	0.261	(0.011)	0.227	(0.005)	0.280	(0.026)
I	-0.242	(0.039)	0.017	(0.834)	-0.014	(0.912)
Θ	-0.344	(0.000)	-0.247	(0.000)	-0.220	(0.004)
P	-0.376	(0.000)	-0.268	(0.000)	-0.233	(0.002)
ζ_{FREE}	-0.309	(0.000)	-0.232	(0.000)	-0.172	(0.024)
$\zeta_{\text{NOT FREE}}$	0.301	(0.000)	0.223	(0.000)	0.127	(0.099)
Γ	-0.348	(0.000)	-0.251	(0.001)	-0.228	(0.046)
E	-0.331	(0.000)	-0.222	(0.004)	-0.217	(0.058)

Table A.3.4 ORG FOR ECONOMIC CO-OP & DEVELOPEMENT

Correlations by Regions and Exchange Rate Regime

	Fixed		Intermediate		Floating	
OECD	P.Corr	P-value	P.Corr	P-value	P.Corr	P-value
σ	1.000		1.000		1.000	
BSE	0.115	(0.066)	0.127	(0.018)	0.083	(0.244)
ΔM2	0.141	(0.031)	0.211	(0.000)	0.193	(0.011)
ΔTOT	0.267	(0.000)	0.371	(0.000)	0.457	(0.000)
δPS	0.261	(0.000)	0.583	(0.000)	0.402	(0.000)
ΔAWP	0.171	(0.008)	0.112	(0.044)	0.231	(0.001)
Ω	0.476	(0.000)	0.424	(0.000)	0.404	(0.000)
O	-0.267	(0.000)	-0.253	(0.000)	-0.315	(0.000)
$\mathcal{F}^1$	-0.094	(0.126)	-0.066	(0.218)	-0.076	(0.282)
$\mathcal{F}^2$	-0.101	(0.101)	-0.057	(0.290)	-0.074	(0.291)
$\mathcal{NF}$A	0.049	(0.427)	0.014	(0.797)	0.035	(0.616)
KA	-0.236	(0.000)	-0.249	(0.000)	-0.417	(0.000)
T	0.259	(0.006)	0.259	(0.001)	0.321	(0.001)
M	-0.396	(0.002)	-0.396	(0.002)	-0.396	(0.002)
I	-0.181	(0.038)	-0.081	(0.278)	-0.165	(0.054)
Θ	-0.231	(0.000)	-0.247	(0.000)	-0.411	(0.000)
P	-0.270	(0.000)	-0.279	(0.000)	-0.452	(0.000)
ζ_{FREE}	-0.336	(0.000)	-0.295	(0.000)	-0.525	(0.000)
$\zeta_{\text{NOT\_FREE}}$	0.149	(0.016)	0.236	(0.000)	0.399	(0.000)
Γ	-0.132	(0.123)	-0.360	(0.000)	-0.602	(0.000)
E	-0.141	(0.100)	-0.342	(0.000)	-0.589	(0.000)

Table A.3.5 ASIA & HIGH INCOME NON-OECD

Correlations by Regions and Exchange Rate Regime

	Fixed		Intermediate		Floating	
ASIA&HINC	P.Corr	P-value	P.Corr	P-value	P.Corr	P-value
σ	1.000		1.000		1.000	
BSE	0.164	(0.024)	0.134	(0.023)	0.188	(0.037)
ΔM2	0.158	(0.037)	0.263	(0.000)	0.368	(0.000)
ΔTOT	0.298	(0.000)	0.339	(0.000)	0.391	(0.000)
δPS	0.250	(0.000)	0.568	(0.000)	0.302	(0.001)
ΔAWP	0.149	(0.053)	0.033	(0.594)	-0.056	(0.535)
Ω	0.660	(0.000)	0.424	(0.000)	0.442	(0.000)
O	-0.217	(0.002)	-0.236	(0.000)	-0.228	(0.009)
$\mathcal{F}^1$	-0.103	(0.154)	-0.101	(0.084)	-0.132	(0.134)
$\mathcal{F}^2$	-0.114	(0.112)	-0.003	(0.958)	-0.124	(0.161)
$\mathcal{NF}$A	0.002	(0.977)	-0.081	(0.166)	0.018	(0.837)
KA	-0.157	(0.031)	-0.182	(0.002)	-0.311	(0.000)
T	0.095	(0.400)	0.192	(0.021)	0.257	(0.044)
I	-0.220	(0.088)	0.056	(0.512)	-0.001	(0.997)
Θ	-0.216	(0.003)	-0.198	(0.001)	-0.299	(0.001)
P	-0.269	(0.000)	-0.217	(0.000)	-0.299	(0.001)
ζ_{FREE}	-0.327	(0.000)	-0.206	(0.000)	-0.171	(0.054)
$\zeta_{\text{NOT FREE}}$	0.213	(0.003)	0.193	(0.001)	0.248	(0.005)
Γ	-0.238	(0.011)	-0.281	(0.001)	-0.518	(0.000)
E	-0.226	(0.017)	-0.259	(0.002)	-0.486	(0.000)

Table A.3.6
Two-Step Arellano-Bond (System): Additional Regressions

Dependent Variable: Real Effective Exchange Rate Volatility (σ)

Explanatory Variables	Regressions by Groups						
	OECD	LAT-CAR		AFRICA			ASIA-HI
σ_{t-1}	-0.638***	0.204**	0.284**	0.263*	0.169*	0.161**	0.759*
	(-6.45)	(2.22)	(2.17)	(1.98)	(1.83)	(2.15)	(2.02)
BSE	0.002		-0.095*				0.013
	(0.20)		(-1.84)				(0.45)
ΔM2		0.181**	0.001	0.098**	0.056	0.042	
		(2.67)	(0.01)	(2.32)	(1.13)	(1.15)	
ΔTT	0.707**	0.779	0.233			0.122	0.644**
	(2.54)	(0.88)	(0.63)			(0.55)	(2.42)
ΔAWP	-0.590						
	(-1.55)						
δPS	-0.394**	-0.090	0.144	0.456**	0.360**	0.397**	-1.128
	(-2.18)	(-0.15)	(0.38)	(2.44)	(2.17)	(2.32)	(-1.55)
O	-0.012	-0.016	-0.037**	-0.079**	-0.094***	-0.105**	0.028
	(-0.67)	(-0.68)	(-2.17)	(-2.21)	(-2.96)	(-2.75)	(0.98)
$\mathcal{F}^1$	-0.012						
	(-0.60)						
$\mathcal{F}^2$	0.004			0.050*	0.069**	0.069***	-0.001
	(0.61)			(1.73)	(3.25)	(3.23)	(-0.46)
KA		-0.024**	-0.12				
		(-1.99)	(-1.61)				
Ω	0.348			0.035			1.364**
	(1.53)			(0.12)			(2.82)
ζ_{FREE}	-0.063**	-0.057**	-0.002		-0.031**	-0.024	
	(-2.10)	(-2.25)	(-0.07)		(-2.36)	(-1.66)	
$\zeta_{NOT\ FREE}$				0.022			0.124
				(0.73)			(0.88)
Err				0.048***	0.046***	0.036*	0.017
				(3.12)	(2.99)	(1.79)	(1.26)
Constant	0.135***	-0.081	0.092	-0.250***	-0.212***	-0.202***	-0.011
	(3.95)	(-1.20)	(1.14)	(-3.70)	(-3.91)	(-3.10)	(-0.16)
Observations	73	80	76	107	107	107	50
Countries	29	17	17	22	22	22	12
AR(1) Test	0.093	0.040	0.081	0.072	0.087	0.088	0.001
AR(2) Test	0.245	0.932	0.357	0.424	0.393	0.378	0.243
Sargan Test	0.067	0.296	0.242	0.982	0.938	0.948	0.127
Hansen Test	0.869	1	1	0.637	0.634	0.680	1

Note: t-statistics in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Remark:
The inclusion of the variable KA (capital account openness) in LAT-CAR group reduced 56% the lag of REER volatility (σ_{t-1}), yet, it increased 45% $\Delta M2$. Additionally, if we estimate another model regarding the BSE, now trade opening becomes significant at 1% with the expected sign. Furthermore, the inclusion of a currency crisis variable and a higher country risk-premium ($\zeta_{NOT\ FREE}$) for the Asian group, has the objective to evaluate potential scenarios. Even though only 3 countries devaluated their currencies: Indonesia (1998, 2008); Malaysia (1998) and Thailand (1998) it is interesting to observe what would have happen under this circumstances. As we expected, the inclusion of Ω in OECD countries was not significant at all.

A.4. Additional Graphics: Full Sample

Figure A.4.1.1

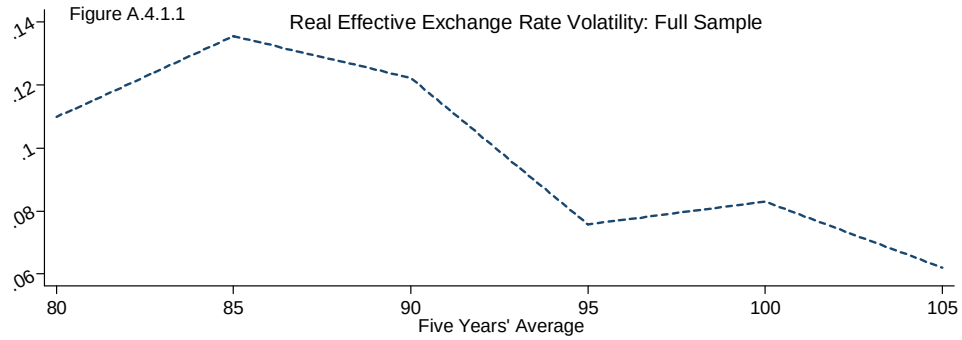
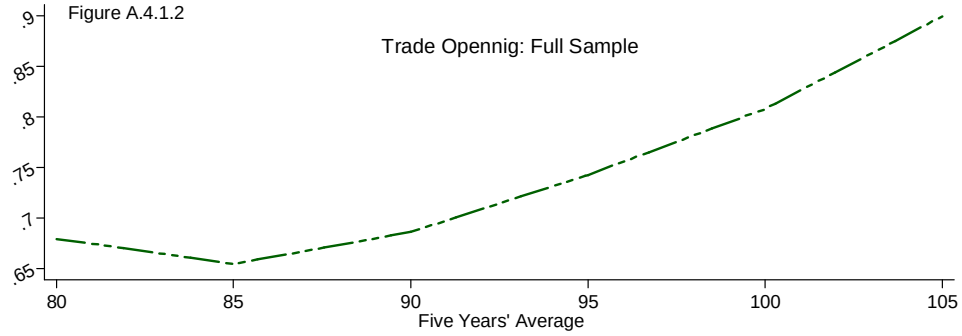


Figure A.4.1.2



Source: own calculations

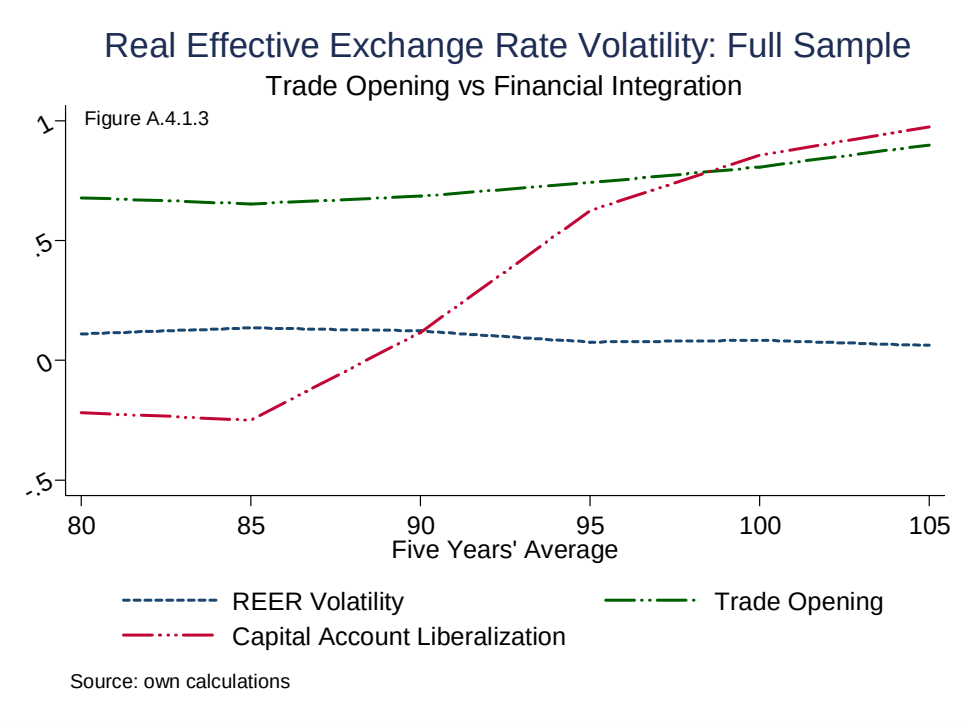
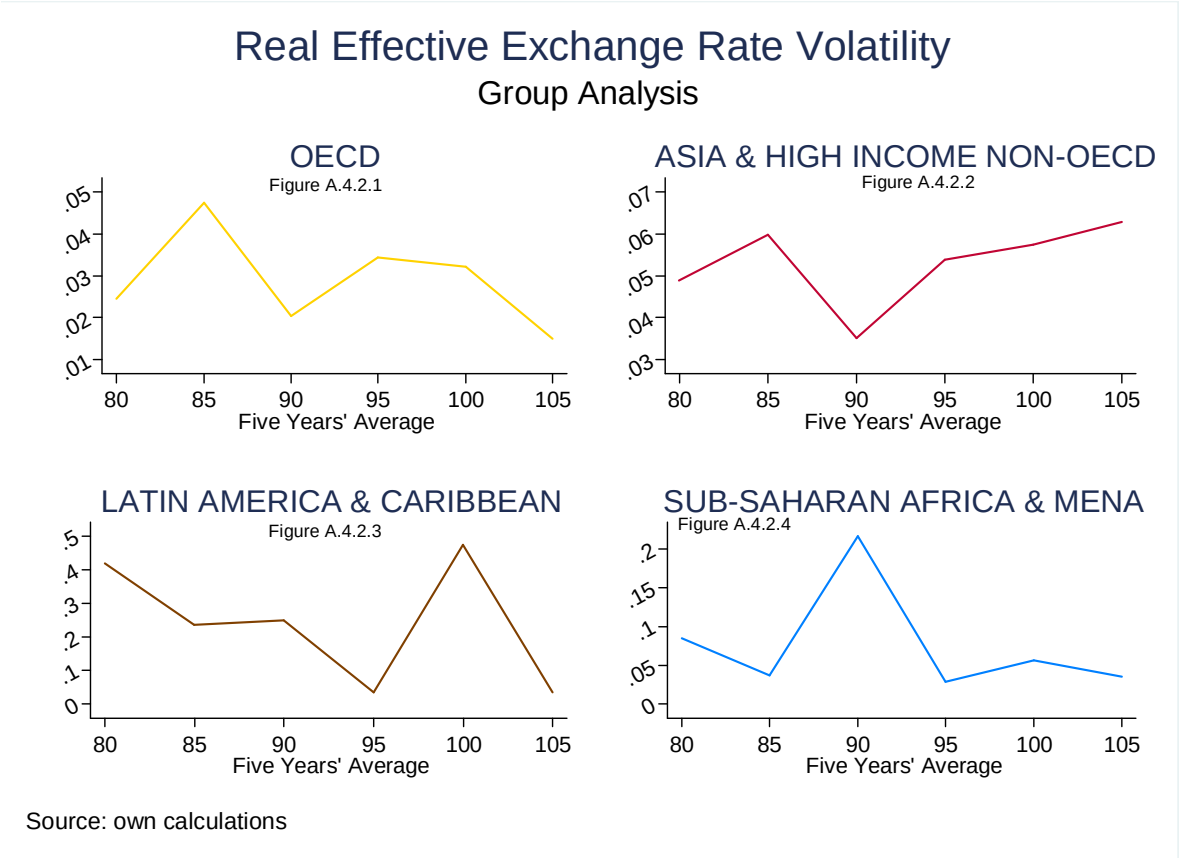


Figure A.4.1.3

Source: own calculations

Graphic Analysis for the Different Regions of the Panel:



Source: own calculations

Real Effective Exchange Volatiltiy

Financial Openness vs Trade Openness

Figure A.4.2.5

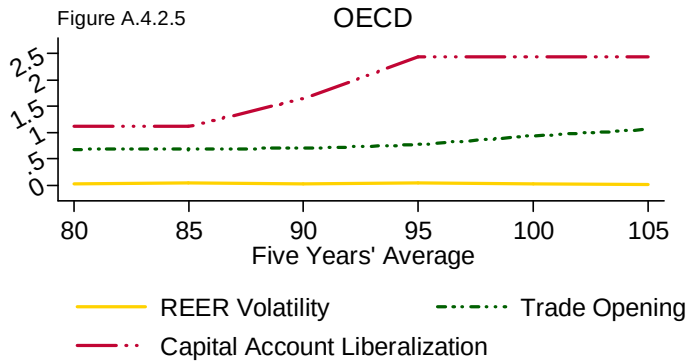


Figure A.4.2.6

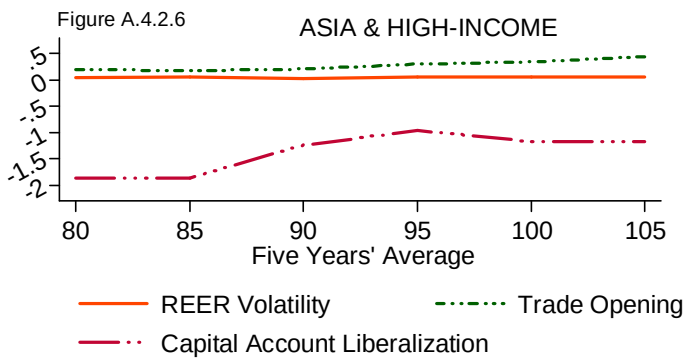


Figure A.4.2.7

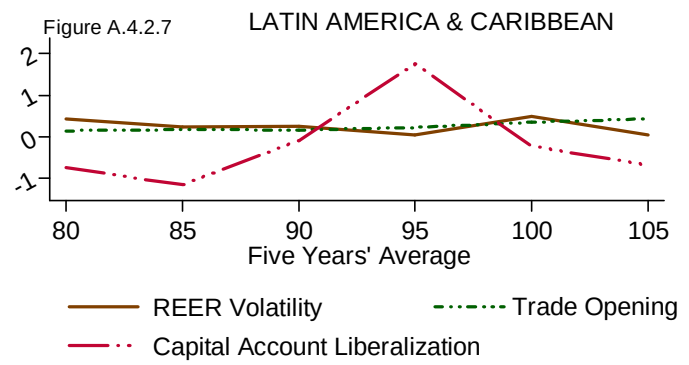
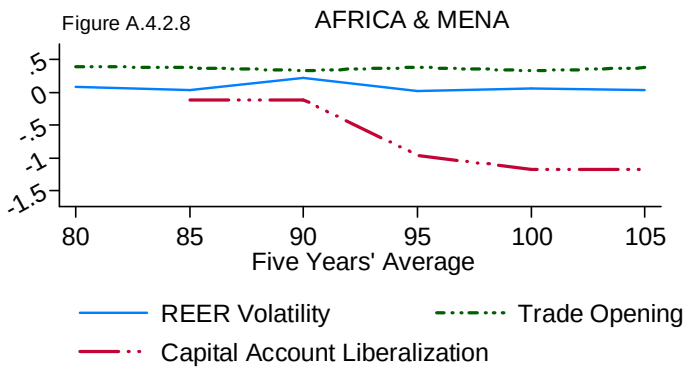


Figure A.4.2.8



Source: own calculations

A.5. Case of Analysis: Argentina

Figure A.5.1: Real Effective Exchange Rate Level (REER)

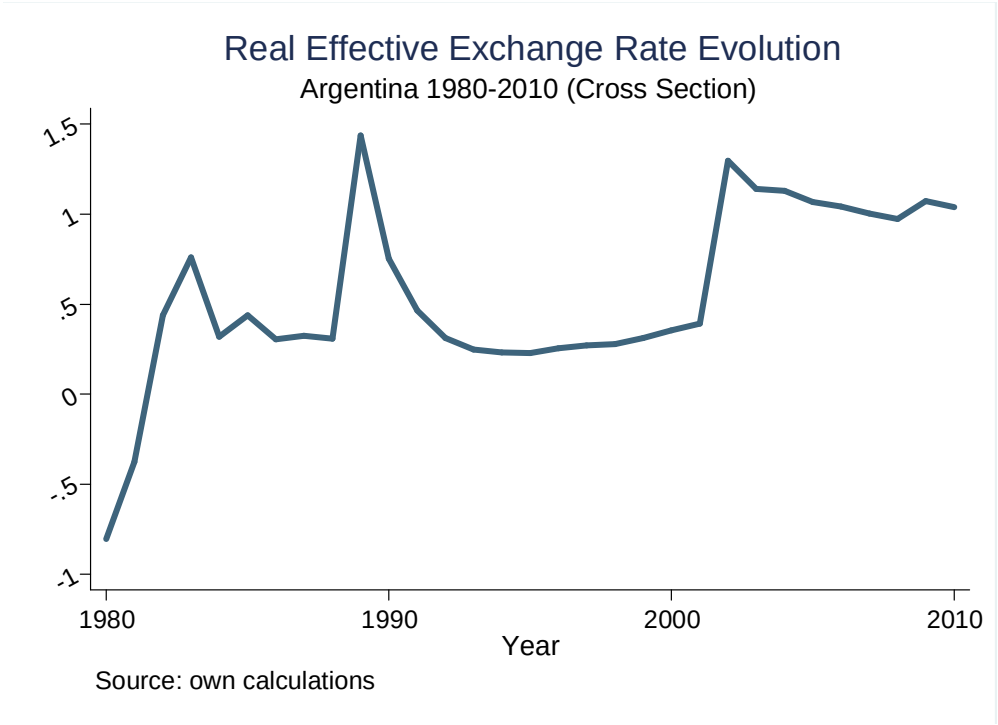


Figure A.5.2: REER (Sectorial) vs RER (Macroeconomic) (Levels)

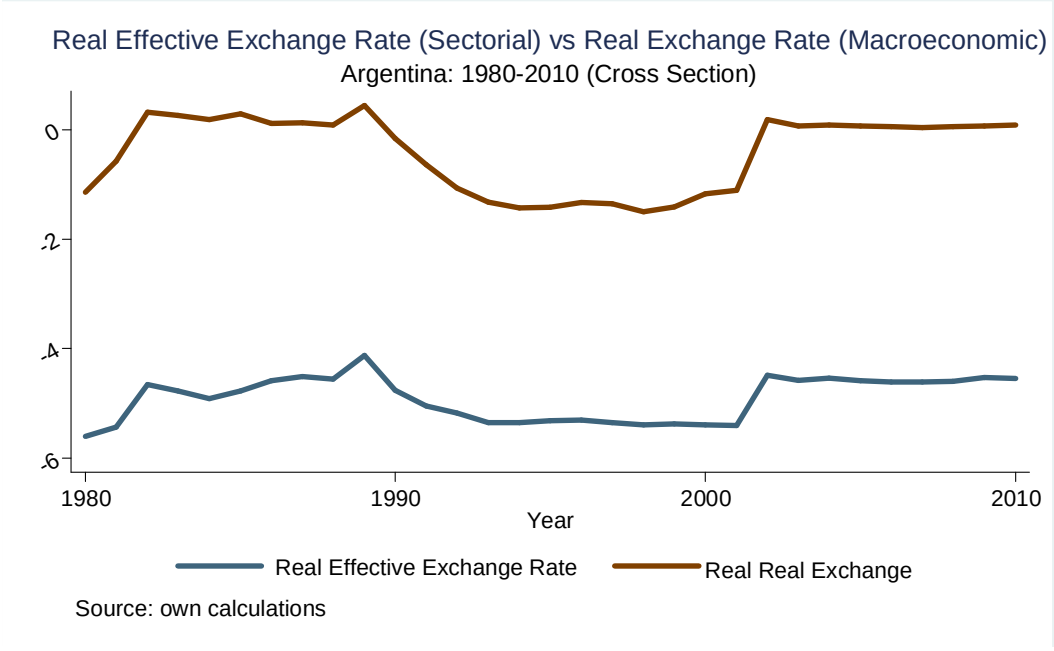


Figure A.5.3: REER Volatility vs RER Volatility

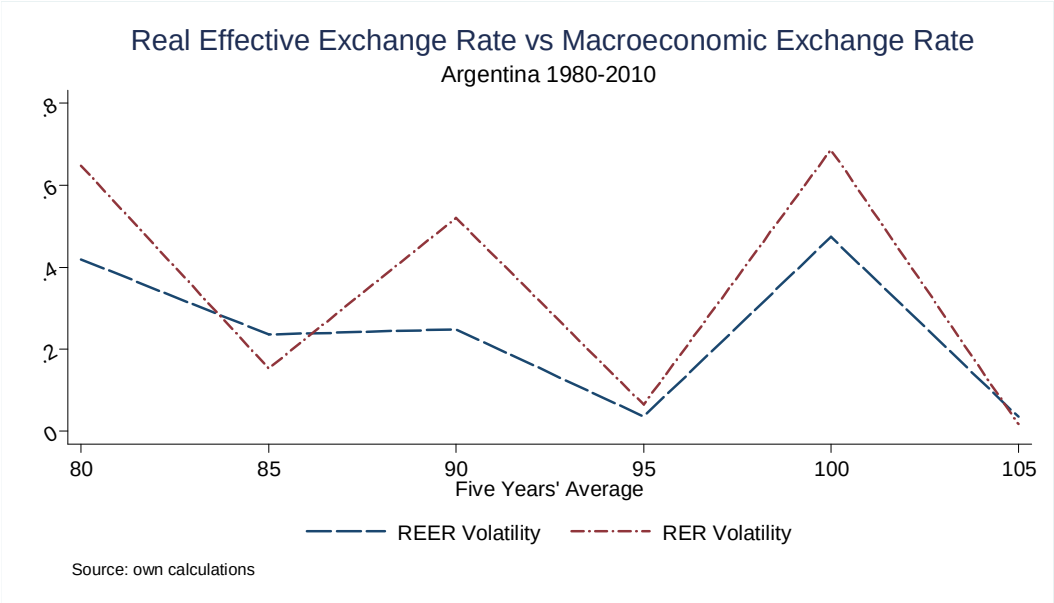


Table A.5.1 Real Effective Exchange Rate Volatility vs Real Exchange Rate Volatility

	80	85	90	95	100	105	***Total***
REER	0.419	0.236	0.248	0.035	0.474	0.034	0.241
RER	0.648	0.153	0.521	0.064	0.687	0.016	0.348

Source: own calculations

Using the data from Table A.5.1, we can confirm that Real Exchange Rate volatility was higher than the Real Effective Exchange Rate. Nonetheless, it is important to highlight that the lowest level of volatility was reached in period 95 for both currencies (i.e. for the sectorial exchange rate and the macroeconomic one). After that, the Argentinean economy began a path of dollarization of its Current Account Balance, which at the end of 2002 devaluation, led to a 'Balance Sheet Effect'. Despite reducing real wages, the majority of devaluations had an overwhelming impact on the economy, since the reallocation of tradable goods at the expense of non-tradable was traumatic for a country with inordinate dependence of commodities (e.g. soy). More precisely, Figure A.5.4 shows the RER volatility performance on each currency crisis.

Figure A.5.4: RER Volatility vs Currency Crisis

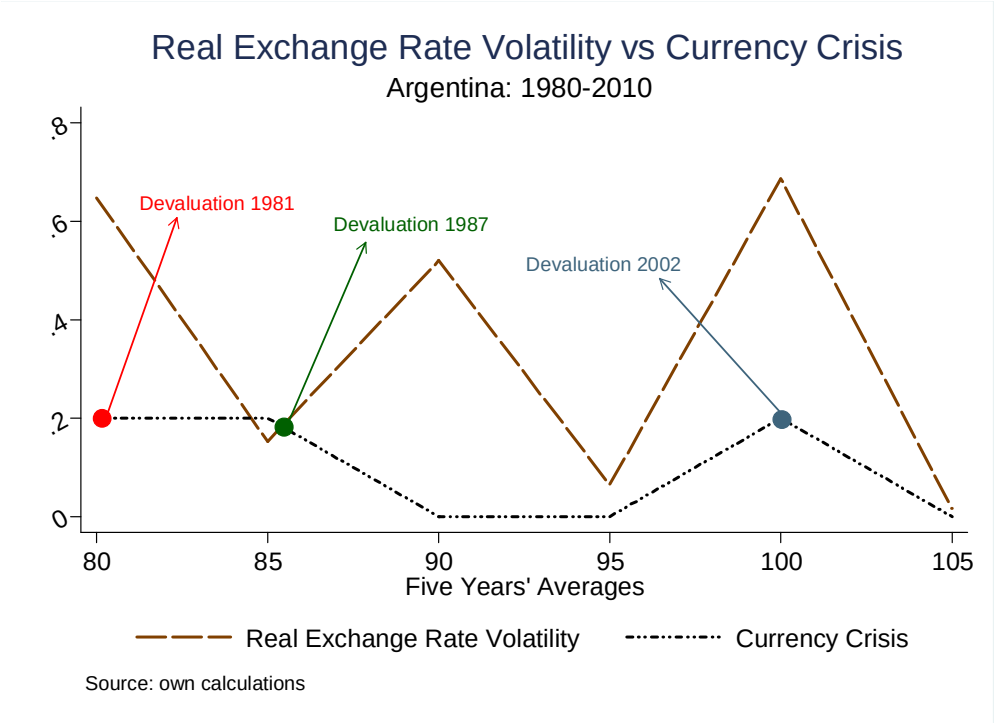


Figure A.5.5: RER Volatility vs Domestic Shocks

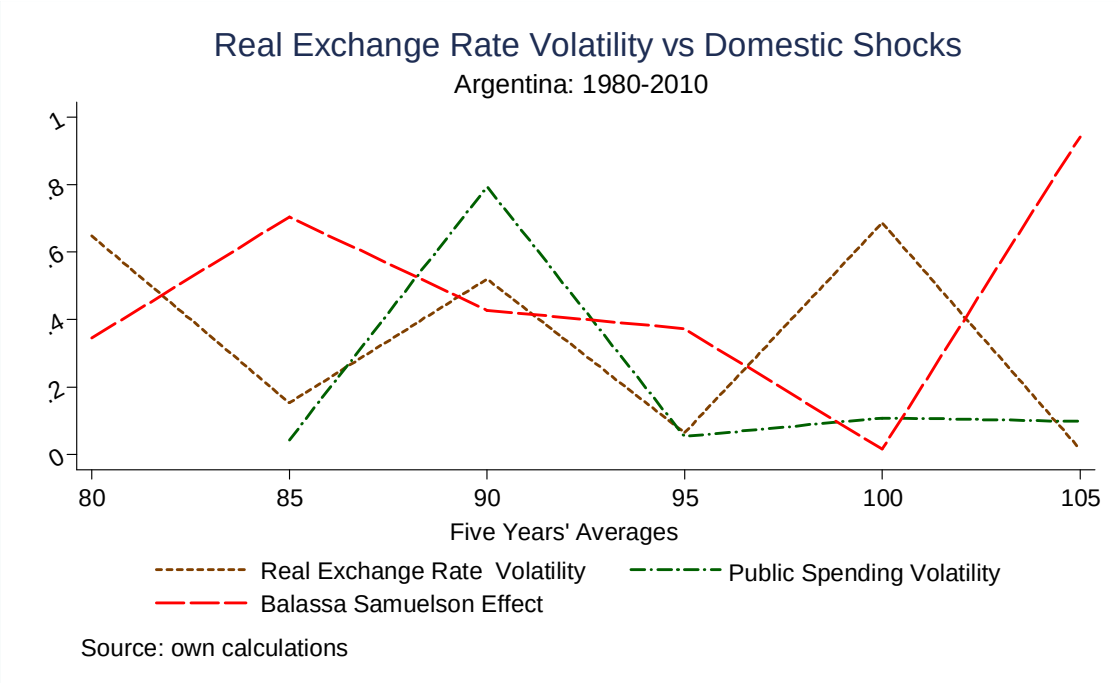


Figure A.5.6: RER Volatility vs Monetary Base Volatility

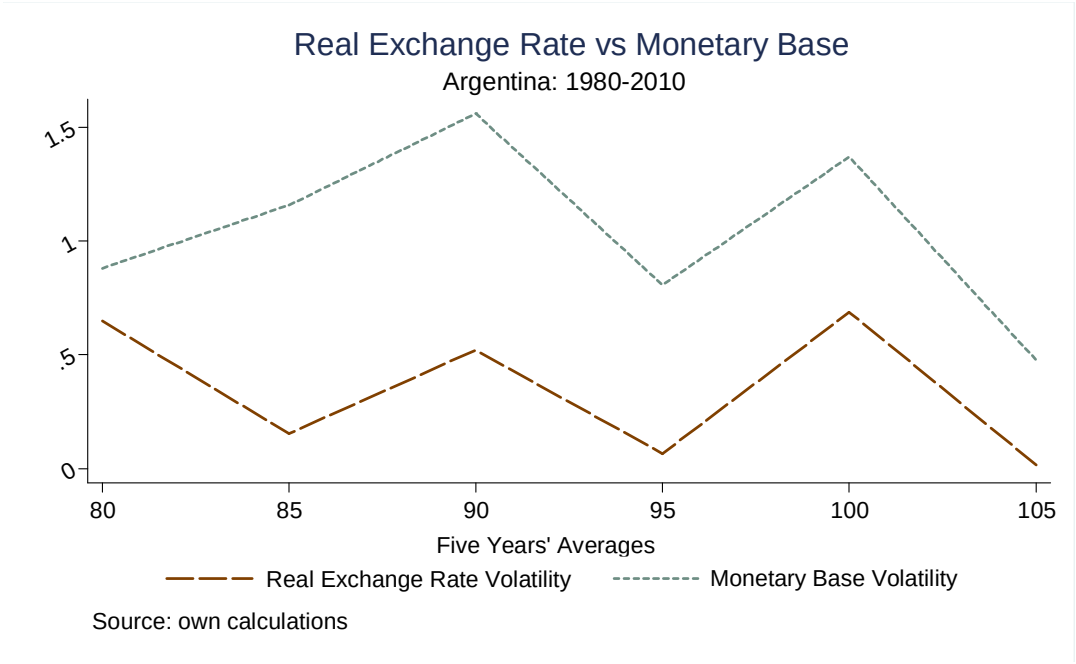
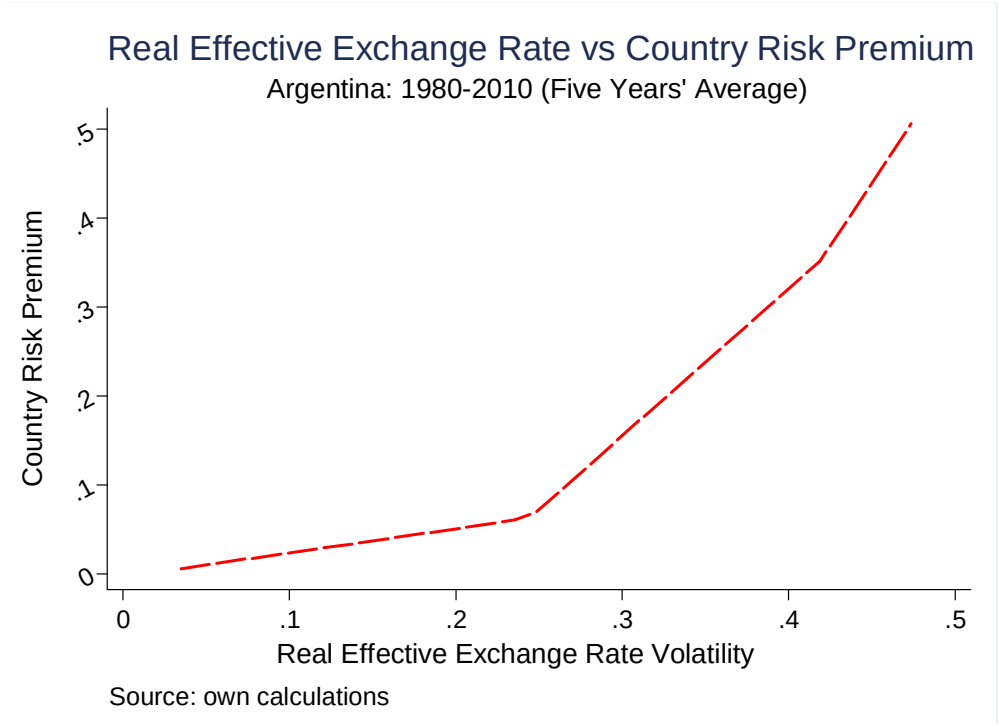


Figure A.5.7: Higher Country Risk Premium (Potential Scenario)



Note: Country Risk-Premium (CRP) is a dummy variable. It takes the value of 1 if there is no freedom; 0 in c.c. Hence, a lower respect for political and civil rights is a synonym of a higher CRP. Conversely, a higher respect for political and civil rights works as a lower CRP.

A.6. Additional comments case of analysis: Argentina

In Figures A.5.1 and A.5.2 we can appreciate the bond that exists between the Real Effective Exchange Rate (REER) and the Real Exchange Rate (RER)[103]. Indeed, since the country exhibits inordinate dependence of natural resources (e.g. agriculture goods), we can conclude that the former follows the movements of the latter, that is the levels.

Nonetheless, Figures A.5.5 and A.5.6 depict another situation. The former includes an interaction among three variables, the Macroeconomic Exchange Rate, Public Spending and Balassa Samuelson Effect. From the graphical relationship, we can observe that that the productivity shock (i.e. Balassa Samuelson Effect) is inversely related with REER (σ). During 1985 and 2000 periods, the higher the volatility of the growth rate of the real GDP (BSE), the lower the Real Exchange Rate (RER) volatility was and its level was more appreciated. Conversely, during the 2000-2005 periods, a lower BSE was related to a higher RER volatility and therefore, a more depreciated exchange rate. At first sight, the higher the wages in dollars, the more costly the economy becomes. Therefore, a certain government may want to lessen the costs in order to enhance the production of traded goods and stabilize the trade balance. The usual mechanism is through a devaluation process. Furthermore, analyzing the public spending volatility, we can conclude that since the 1990 period, there has been a remarkable drop due to the convertibility plan. Yet, figure A.5.6 depicts that monetary base volatility is still above the RER volatility.

Finally, if we analyze the institutional variables, we can account two cases. In the former, we can see the effect that devaluations had over RER volatility (Figure A.5.4), whilst in the latter, we can examine a potential scenario given by a higher Country Risk-Premium (Figure A.5.7). The reader can easily notice that an aftermath of devaluations is a higher RER volatility whereas a potential scenario given by a lower respect for political and civil rights (i.e. a higher Country Risk-Premium) results in a greater likelihood of a higher REER volatility[104].

[103] The Macroeconomic Exchange Rate was constructed using data from the WDI (World Development Indicators) regarding the U.S currency as a reference. Hence, the RER for Argentina is equal to: $\boldsymbol{ln}\left[\frac{\boldsymbol{Nominal\ Exchange\ Rate}^{(Argentina)}\times \boldsymbol{Wholesale\ \ Price\ Index}^{(U.S)}}{\boldsymbol{Consumer\ Price\ Index}^{(Argentina)}}\right]$.

[104] Analogously, the same exercise can be done for the Real Exchange Rate (RER).

B. Econometric Appendix

Generalized Method of Moments

According to Judson and Owen[105] we can set a common specification for fixed panel data:

$$\boldsymbol{Y_{it} = \gamma Y_{it-1} + X'_{it}\beta + \eta_i + \varepsilon_{it}} \quad \textbf{(1)}$$

Where η_i is a fixed-effect, X_{it} is (k-1)*1 vector of exogenous regressors and $\varepsilon_{it} \sim N(o, \sigma^2)$ is a random disturbance.

The model assumed in equation **(1)** includes as one of the regressors a lagged dependent variable. Therefore, it will lead to biased and inconsistent estimators, even if the random disturbance is uncorrelated.

In order to solve this problem, Nickell (1981) derived an expression for the bias of γ when there are no exogenous regressors, showing that the bias approaches zero as T approaches to infinity. Despite working hard, it did not solved the problem. Thus his estimator would only perform well when the time dimension is large enough.

In other attempt to address the former issue, Anderson and Hsiao proposed to re-estimate equation (1) when T is not large. They proposed to use instrumental variables. To remove the fixed effect they first differentiate equation (1) to obtain:

$$\boldsymbol{(Y_{it} - Y_{it-1}) = \gamma(Y_{it-1} - Y_{it-2}) + (X_{it} - X_{it-1})'\beta + (\varepsilon_{it} - \varepsilon_{it-1})} \quad \textbf{(2)}$$

It is important to stress that now errors $(\varepsilon_{it} - \varepsilon_{it-1})$ are correlated with one of the independent variables $(Y_{it-1} - Y_{it-2})$ and they recommend instrumenting for $(Y_{it-1} - Y_{it-2})$ with Y_{it-2} or $(Y_{it-2} - Y_{it-3})$ or Y_{it-3} which are uncorrelated with the disturbance but correlated with$(Y_{it-1} - Y_{it-2})$.

Nevertheless, Arellano and Bond (1991)[106] noticed that the framework of Anderson and Hsiao was a special case within a general one. They discovered that there are many instruments. The intuition of the problem is simple, instrumental variables do not exploit all the information available in the sample. The insight is to estimate a dynamic

[105] Estimating Dynamic Panel Data Models: A Practical Guide for Macroeconomists (1996)
[106] The GMM procedures gain efficiency by exploiting additional moment restrictions.

model simultaneously with instrumental variables in lags and levels. Therefore using the GMM[107] one is able to construct a more efficient estimator for dynamic panels.

There are two types of GMM estimators:

1) **The First-Difference:** all variables are first differenced to eliminate individual and time-specific effects. One is able to use variables in levels (lagged twice or more) and then used as instruments for the explanatory variable assuming that the errors of the equation are not correlated.
2) **System[108]:** Since lagged variables are weak instruments, Arellano and Bover (1995), Blundell and Bond (1998) proposed a system estimator. Their main assumption is the combination of the equations in first differences with equations in which the level variables are instrumented by their first difference. They argued that the initial conditions remain valid even for persistent series. More precisely, the Arellano-Bond estimator starts specifying the model as system of equations, one by period, and allows that the instruments in each equation differ[109].

Hence, the GMM estimator reduces to this form[110]

$$\boldsymbol{\delta_{GMM} = (X' Z^* A_N Z^{*\prime} X)^{-1} X' Z^* A_N Z^{*\prime} Y} \qquad (\mathbf{3})$$

Where X is a K × N (T-2) matrix of regressors and Y is an N (T-2) × 1 vector of dependent variables, but Z_i^* is a block diagonal matrix whose *s*th block is given by

$\left(Y_{i1} \ldots . Y_{is} X_{i1} \ldots . X_{i(s+1)}\right)$ For s=1….T-2. Then $Z^* = (Z_1^{*\prime} \ldots . Z_N^{*\prime})'$

The definition of A_N will determine the type of estimator. In my case I shall use the two step system estimator, due to its level of accuracy[111]. Formally:

$$\boldsymbol{A_N = \left\{\frac{1}{N}\sum_I^N Z_I^{*\prime}\, \Delta\hat{e}_i \Delta\hat{e}_i{}' Z_I^*\right\}^{-1}} \qquad (\mathbf{4})$$

Where $\Delta\hat{e}_i = (\Delta\hat{e}_{i3}, \ldots\ldots, \Delta\hat{e}_{iT})$ *are the residuals from a consistent one − step estimator of* ΔY_i.

[107] This method provides a solution to the problems of simultaneity bias, reverse causality and omitted variable bias. (Kpodar, 2007)
[108] However, when using the GMM system, one needs to bear in mind that if T is not small, the number of lags of an instrument should be limited in order to prevent the number of instruments from being higher.
[109] That is, on the next late periods there are more lagged instruments available to use.
[110] The interested reader can check a deeper proof in Arrellano and Bond (1991).
[111] The other is the one step GMM estimator.

Robustness Arellano-Bond Estimator (A-B)

To properly assess the validity of the empirical results, Sargan and Hansen tests are displayed. The former has the null hypothesis of 'the instruments as a group are exogenous'. Therefore, the higher the p-value of the Sargan statistic the better[112]. While the latter, provides the same analysis as Sargan and statistical properties of the estimators. Hence, if we do not reject the null hypothesis, the model specification will be correct and the instruments are exogenous.

Lastly, the Arellano-Bond test for autocorrelation has a null hypothesis of no autocorrelation and is applied to the differenced residuals. The test for AR (1) process in first differences usually rejects the null hypothesis but this is expected since

$$\Delta e_{it} = e_{it} - e_{i,t-1} \; and \; \Delta e_{i,j-1} = e_{i,j-1} - e_{i,j-2} \quad both \; have \quad e_{i,j-1} \qquad \textbf{(5)}$$

The test for AR (2) in first differences is more important, because it will detect autocorrelation in levels. Therefore, if we reject the null hypothesis, the model will not be dynamic.

[112] The specification test suggest that our model has been correctly identified. In fact, the GMM estimator could be interpreted as a linear combination of all the feasible estimations of an over-identified model. The rule of thumb says that a p-value>0.05 indicates that the specification is correct

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