Determinants of the real exchange rate in the long-run for developing and emerging countries: a theoretical and empirical approach

Lúcio Otávio Seixas Barbosa
Frederico G. Jayme Junior
Fabrício J. Missio

Abstract: This paper present a new framework for the determinants of real exchange in the long-run in developing and emerging countries (DECs). We connect the model developed by Kaltenbrunner (2015), which is grounded on chapter 17 of the General Theory, with productivity's differential effect. By doing so, our frame states that even short-run factors and monetary variables affect the long-run real exchange rate. Moreover, it points out that the hierarchical nature of the international monetary system is crucial to understand exchange rate movements in DECs. Besides presenting such theoretical approach, our contribution is to test it empirically for 45 DECs from 1990 to 2008 by applying econometric techniques appropriate for panel data. We use a different dataset, which comprises, among other variables, foreign portfolio flow, interest rate differential, external vulnerability indicators and international liquidity, on annual basis. The empirical results endorses this framework. Overall, it shows the primacy of financial factors as determinants of the long-run real exchange rate, particularly new forms of external vulnerability linked to the rising share of foreign investor in domestic-currency financial assets, and points to the endogenous and self-perpetuating nature of international monetary system hierarchy.

Key-words: real exchange rate determination, developing and emerging countries, currency hierarchy.

Resumo: Este estudo apresenta uma nova abordagem dos determinantes da taxa real de câmbio no longo prazo para economias emergentes e em desenvolvimento (DECs). Conecta-se ao modelo desenvolvido por Kaltenbrunner (2015), o qual é fundamentado no capítulo 17 da Teoria Geral, o efeito do diferencial de produtividade. Dessa forma, sugere-se que mesmo variáveis monetárias e de curto prazo afetam a taxa real de câmbio de longo prazo. Além disso, aponta-se a importância da hierarquia do sistema monetário internacional sobre a taxa de câmbio dos DECs. Além de apresentar essa abordagem teórica, nossa contribuição é testá-la empiricamente para 45 DECs, de 1990 a 2008, por meio de técnicas para dados em painel. Utiliza-se um conjunto de dados diferentes, que compreende, entre outras variáveis, fluxos de portfólio, diferencial de juros, medidas de vulnerabilidade externa e a liquidez internacional, em base anuais. Em linhas gerais, os resultados mostram a primazia dos fatores financeiros na determinação da taxa real de câmbio no longo prazo, particularmente as novas formas de vulnerabilidade associadas à participação do investidor externos em ativos financeiros denominados em moeda doméstica, e indica a natureza endógena e de autoperpetuação da hierarquia do sistema monetário.

Palavras-chave: , determinação da taxa real de câmbio, países emergentes e em desenvolvimento, hierarquia de moedas

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Phd candidate at Minas Gerais Federal University
[2]Professor at Minas Gerais Federal University
[3]Professor at Minas Gerais Federal University

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1 Introduction

This paper aims to present an alternative approach regarding long-run real exchange rate determinants for emerging and developing countries (DECs). To do so, we reassess conventional and non-conventional theories related to such issue. Thereby, we propose a model, following the post-Keynesian approach, which states that even short run and monetary variables affects the long-run real exchange rate.

Firstly, we differ conventional theory from unconventional. On one hand, we present three different conventional approaches connected to long-run real exchange rate: Purchasing Power Parity (PPP)[1], Balassa-Samuelson (BS) effect and the model developed by Bergstrand (1991). On the other hand, we show post-Keynesian approach, which highlights portfolio flows as a main driver of the real exchange rate behavior.

In what follows, we present a new theoretical approach, which matches the PPP equation (considering BS effect) with the post-Keynesian theory grounded on the model developed by Kaltenbrunner (2015). This equation includes capital flows, interest rate differential, and liquidity premia as model variables. The first ones usually would be regarded as short-run factors, which should not influence the real exchange rate path under a conventional view; the last one shows that structural factors explain exchange rate changes. Although such model takes into account the BS effect, it is based mainly on the post-Keynesian theory. Thus, it is possible to connect both approaches.

The productivity differential effect is an empirical issue that has already been reinforced by many authors. Our contribution is to add productivity to Kaltenbrunner's exchange rate model. In addition, we rearrange such model in order to test it empirically.

Our theoretical approach takes into account monetary and real variables that affect the determinants of real exchange rate in the long-run and in the short-run. We discard the conventional theory, which assumes that only fundamentals guide the exchange rate behavior.

Although the long-run real exchange rate is an equilibrium concept, we should not suppose that such equilibrium is unique or that only sound fundamentals lead it. If we do so, there would be no role for exchange rate management as an economic development strategy. Many authors (Missio et al, 2015; Rodrik, 2007; Razin and Collins, 1997) show the opposite of it.

Hence, the contribution of this paper is threefold: i) it presents a new theoretical approach regarding the determinants of the real exchange rate; ii) we test such model empirically; iii) in a certain extent, the results are in line with the theoretical approach and suggests the primacy of financial factors.

This article is organized as follows. In the next section, we review the conventional theories. In the third section, we highlight its flaws. In the fourth section, the post-Keynesian view on the determinants of exchange rate is explored. Then, we develop our theoretical approach and test it empirically. The final section summarizes and conclude.

2 Conventional Theories

Conventional theories are those aligned with conventional literature or broadly speaking, with the mainstream. This paper uses both terms as synonyms and follows the mainstream economics definition from Colander, Hold and Rosser (2004). To sum up, the conventional literature (or mainstream) consists of the ideas debated in the most prestigious economic centers.

1 It is important to note that even the mainstream does not agree with PPP theory, but most of them believes in some variant of it (ROGOFF, 1996).

When we discuss the real exchange role according to such literature, we need to mention the PPP theory. It can be regarded as the starting point for the debate on long-run real exchange rate determinants, although even mainstream economists pointed out its flaws (Balassa, 1964; Samuelson, 1964;Dornbusch, 1985).

PPP theory assures that countries' relative prices drive the real exchange rate. Thereby, changes in prices level are the main real exchange rate determinants. This approach has been recognized as exchange rate inflation theory (Dornbusch, 1985) [2].

The PPP has two approaches: the strong and the weak one. The former depends on the Law of One Price, which states that the price of some goods is the same in all places when it is priced in the same currency.

Its validity relies on the lack of transactional costs (such as transports costs, informational cost, etc.). Nevertheless, we cannot neglect such costs, even in perfectly competitive markets. To have the same price in all places simultaneously it is necessary to assume that we can transport goods instantaneously and without cost from one place to another. Beside this, there are commercial barriers that trigger spatial price difference.

The PPP weak version weakens the initial proposition. It argues that relative price changes should be proportional to exchange rate changes. A rise in domestic relative price entails an equally relative domestic currency depreciation. Therefore, a one per cent rise in country A prices, compared to country B, causes a proportional exchange rate devaluation in country A, assuming transactional costs as given.

PPP theory advocates that exchange rate is a relative price, which fluctuates to reestablish underlying market equilibrium. If the exchange rate is fixed, the adjustment mechanism occurs via price level. In other words, if the price of a good is higher in the domestic economy, such a good will be imported until its price equals to foreign market price. When exchange rate floats freely, the adjustment mechanism occurs via nominal exchange rate (in this case, the exchange rate depreciates to equal internal and external prices, assuming that domestic price level is higher).

However, assessing such theory under conventional view, it needs to be revised to align it with important theoretical issues. Productivity differentials is one of them, as proposed by Balassa and Samuelson, in 1964. Following their view, higher productivity countries have a higher-level price, since international trade does not equalize prices of non-tradable goods. Also, workers with similar skills tend to have similar wages, irrespective to their working sector. Hence, in these countries, the exchange rate is overvalued. The reverse applies to less productive countries.

We highlight that the theory proposed by Balassa and Samuelson, as well as the widely known Heckser-Ohlin model, is connected to the supply side of the economy. The former via productivity and the latter via country's factor endowment. Nevertheless, there are conventional models that take into account the demand side, such as Bergstrand's model (1991).

The importance of this model is to identify a structural factor from demand side that affects the real exchange rate. Based on non-homothetic preference[3] assumption, the model, which is grounded in micro fundamentals, suggests that countries with higher income per capita have a higher demand for services. Thereby, their prices are higher and, as a result, their exchange rate level are more appreciated.

2 Following Dornbush (1985), this statement was proposed by Gustav Cassel during the First World War, although classic economists as Ricardo, Mill and Marshall advocated and developed PPP approaches.

3 Income-expansion path through the indifference curves of the representative consumer is not a straight line through the origin, generating an income elasticity of demand greater (less) than 1 for the non-traded service (traded commodity)

These three approaches – the PPP, the BS model and the Bergstrand's model – do not (obviously) cover all conventional theory related to this issue. Despite it, they are an important background to the non-conventional debate.

3 Conventional theory flaws

The PPP approach is connected with the efficient market hypotheses, where changes in relative prices restore the required and efficient equilibrium in production and exchange relations. Furthermore, the conventional theory of real exchange rate is based on the classical dichotomy, in which prices flexibility allows for differing real variables from nominal ones. In the short-run, price rigidity or sharp fluctuations might deviate real exchange rate from its fundamentals, but, in the long-run, international trade and current account adjusts will determine exchange rate variations (Kaltenbrunner, 2015).

The Quantity Theory of Money (QTM) is assumed to work. Following it, a rise in money circulation entails a rise only in prices level, considering that the velocity of money circulation is stable. The necessary assumptions to accept QTM theory are the same required to accept Say's Law - income flows paid to families in exchange for their labor are reverted to consumption of goods produced by businesses. The lack of cash hoarding causes a stable demand, thus assures the money circulation stability. Money's neutrality, in its turn, endorses that changes in its quantity will not affect real production, generating only inflation (Mollo, 2004).

Hence, following this view, there is no role for exchange rate policy, once it does not affect the real economy. As price adjusts, the real exchange rate is either constant or changes in line with underlying real variables. These short-run deviations will have no lasting effect on real variables. Nevertheless, many papers (Gala, 2007; Rodrik, 2008) that deal with the relation between growth and exchange rate reject this hypothesis. Such papers point out that exchange rate policy can entail a country structural change. Besides this, it is hard to assume that investment's decisions made currently due to exchange rate competitiveness do not affect productivity and, thereby, the long-run exchange rate. The exchange rate policy management is crucial in such view.

Broadly speaking, mainstream theory does not consider the financial capital role. It also assumes hypothesis not aligned with the post-Keynesian approach (money's neutrality and lack of cash hoarding, for instance). Therefore, is relevant to seek for alternative models, which are in line with the post-Keynesian view.

4 Post-Keynesian view

From the post-Keynesian view, there are not many papers that deal with long-run real exchange rate determinants, particularly. Harvey (1991, 1996, 2001, 2006, 2007, 2009, and 2012) is, probably, the main author that does it.

Among his papers, he shows, explicitly, the differences between the mainstream view and the post-Keynesian one. On one hand, the former claims that sound fundamentals[4] are the main drivers of long-run real exchange rates. On the other hand, the latter states that capital flows play the most important role of exchange rate changes since it seeks for short-run profit opportunities.

The author's main hypothesis (Harvey, 2009) relies on the importance of aggregate expectation on the exchange rate path. Hence, the most important strategy is to anticipate market agent's expectations. However, they might not be fulfilled, thereby it may be better to copy decisions from those that surround

4 The definition of fundaments is not straightforward under conventional theory. So, it is hard to list it (Harvey, 2001)

them. This decision is not arbitrary. The mental model[5] guides it, taking into account mainly expectations on foreign portfolio flows. If agents assume that nominal exchange rate will appreciate, there will be a raise in capital flows contemporaneously.

Following this theory, the exchange rate is not a market equilibrium price, and the short-run foreign portfolio flows have a major influence on its price. Thus, this approach distances itself from the mainstream view, which is grounded on the long-run equilibrium, according to economic fundaments.

Kaltenbrunner (2015), looking at Harvey theory, highlights that it does not differ developed countries from Developing Emerging Countries (DECs) ones. The former have deep and liquid foreign markets and a specific position in international monetary system. Thus, the process of exchange rate determination in DECs are very different given their varying institutional characteristics, size of financial markets, and, in particular, their differential integration into a hierarchic and structured international monetary system (Prates and Andrade, 2013).

Furthermore, Harvey's theory is too attached to agent's expectation and its formation in an uncertainty environment. Thus, it becomes too subjectivist and psychological. Beside this, it is hard to note regularities in the decision-making process. However, Keynes (1936) highlighted that it is possible to extract regularity patterns when they are formed according to group norms.

Kaltenbrunner (2015) formulates an alternative approach, which matches the importance of the interest rate and the international liquidity premia on currency's price. To do so, she follows the structuralist view[6], taking into account Keynes theory regarding the own rate of interest of an asset.

According to it, the domestic currency is considered an asset class whose demand is determined by its net return relative to other currencies. The exchange rate, as the difference between domestic and foreign currency, is a manifestation of these differential returns. From this point of view, the domestic currency has some especial features (Keynes, 1936): yield q, carrying costs c, expected appreciation a, and international liquidity premia l. Its net return is determined by its profitability less carrying costs, adding the expected appreciation and international liquidity premia - $(q-c)+a+l$ [7].

Following Kaltenbrunner (2015), international liquidity premia is the ability to exchange, quickly and without losing value, a currency by the system's currency to accomplish contractual obligations. At equilibrium, the return of any currency should be equal to the currency with the highest international liquidity premia, i.e., the system's currency.

$$(q-c)+a+l=l^{¿} \quad (1)$$

The liquidity preference state determines the currency net return. Assuming that if any change in one of these four elements is not compensated for others elements change, the demand for domestic currency will be altered. As a result, there will be sharps changes in the exchange rate.

The carrying costs of the domestic currency or financial instruments are significantly low, thereby they can be disregarded¿). On the other hand, its short-run returns are crucial to explain its dynamics in DECs countries, since domestic currency can be considered as a class of international asset. Domestic currency, in closed economies, is retained by its international liquidity premia. However, when it is regarded as a

5 See Harvey (2009)

6 The Structuralists (Minsky, 1975; Dow, 1996; Chick and Dow, 2002; Bibow, 2009; Kregel, 1980, 1982) argue that interest rate is not only defined exogenously by Central Bank (CB), but it is partially endogenous and mirrors market conditions, particularly through banks liquidity preference. The Horizontalists (Lavoie, 1984; Arestis and Eichner, 1998; Wray, 1992) state that banks can accommodate the real sector currency demand, which is, in its turn, totally provided by CB. Hence, interest rate is defined exogenously by the monetary autorithy.

7 Prates and Andrade (2013) develop a similar argument.

class of international asset, it has to offer higher returns to investors, in order to make up for it lower international liquidity premia compared to other currencies[8].

The international liquidity premia, in its turn, is the currency attribute that places it in the currency hierarchy. The system's currency is used for international trade; it is the main denominator of credit payments and international finance; and acts as the main reserve value of the system. One one hand, the international liquidity premia can change due to exogenous reasons attached to changes in international liquidity preferences. On the other hand, it can change due to endogenous reasons related to issues that lead people to retain money, such as speculation and precaution. The former is associated with short-run gains while the latter is linked to the uncertainty in monetary economy.

As a result of lower international liquidity premia of DECs' currency, investor requires higher yield. Such claim becomes clear in crisis periods, in which the liquidity preference rises, and the capacity of this currency to act as a stable[9] currency unit is undermined.

Thus, assuming that international interest rate is mainly responsible for currency yield $(q=r)$; that expect appreciation corresponds to $a=s^e-s$; and that carrying costs are null, i.e, $c=0$, we have[10]:

$$r-(s^e-s)+l=l^{¿} \tag{2}$$

The change of expected exchange rate is negative because depreciation entails an exchange rate rise.

Reformulating equation (2) and taking into account that the system's currency return is not zero[11]:

$$(s^e-s)=(l-l¿¿¿)+(r-r^{¿})¿ \tag{3}$$

Such model (Equation 3) derives from Keynes' theory - the own-rate of interest of an asset (Keynes, 1936). It can handle the empirical causality change between the short-run interest rate and the exchange rate fluctuation. When the international liquidity premia is constant, or change slowly, the interest rate determines the currency demand. Nevertheless, substantial changes in international liquidity premia may require interest rate adjusts to keep currency demand.

Thereby, the equation above can show the underlying factors that move the exchange rate. The focus is essentially on short-run financial flow. It does not consider, for instance, foreign direct investment flows or those associated with importation and exportation.

On the other hand, there are structural elements instead of conjunctural ones that affect exchange rate dynamics. The currency's international liquidity premia is one of them. The sterling and the dollar had been regarded as the main credit sources during some time (Minsky, 1994). Due to path dependence[12] and to their financial sector primacy, many international debt contracts are still based on their currencies, although they are not the main creditor nation (Kaltenbrunner, 2015).

Kaltenbrunner (2015) lists the international liquidity premia determinants, showing structural elements that could turn the liquidity premia into an endogenous element:

i. The short-run stock of net foreign debts (this idea is similar to the Smith one, 2002-2003). The exchange rate has a direct effect on the debt and on the countries debt services. Liabilities also

8 This analysis can be extended to any assed denominated in domestic currency whose liquidity is similar, i.e., is like an investment in currency.

9 These ideas are aligned with the currency hierarchical claim which was developed by Prates (2005).

10 This model looks like a slight modification of the Uncovered Interest Parity (UIP) model where the l's are some kind of risk premia. However, it is not an *ad-hoc* risk premia that invalidates such theory, but the liquidity premia itself.

11 According to Prates (2005), the dollar interest rate, which is the system basic rate, is the smallest, since it pays for the system's currency, regarded as the safest and the most liquidity asset. The interest rate outside the core corresponds to the dollar interest rate plus country risky.

12 The path dependence assumes that the starting point or unpredictable events can affect the final aggregate output.

denominated in foreign currency put a pressure on currency to generate foreign currency to pay off debts and its service.

ii. Debts payment's capacity through currency flows (Minsky, 1994), which relies on the relation between exportation and importation.

iii. The ability to refinance debts relies on international liquidity. In an international context, this ability means to be capable of changing quickly and at a low cost the domestic asset into the currency in which the finance is denominated (or, in a word, convertibility). The "institutional" liquidity (Carvalho, 2002) relies on many factors, such as the own asset features, the market structure, the agents who trade in the market, and on the CB, which acts as a market maker and as the lender of last resort lending.

According to Kaltenbrunner (2015), a Minskyan interpretation of currencies' international liquidity premia and international monetary hierarchies set out a broader post Keynesian framework for exchange rate determination based on Keyne's "own rate of interest". Table 1 summarizes the different elements of this equation, their empirical manifestations, and the corresponding post Keynesian exchange rate theory.

Table 1 – A post Keynesian framework for exchange rate determination

"Own rate of interest"	Exchange rate determinants	Post Keynesian literature
$r - r^{¿}$: yield differences	Short-term financial returns (e.g. interest rates, equity prices)	Harvey (1998, 2002, 2009); Lavoie (2000, 2002-3); Smithin (2002-3)
$s^e - s$: appreciation/depreciation	Context and time specific expectations; psychological momentum	Davidson (1999, 2002a, 2002b); Harvey (1991, 1999, 2002, 2009); Alves, Ferrari Filho, and de Paula (2000)
$l^{¿} - l$: liquidity premium differential	Policy variable that indicate ability and willingness to maintain store of value function (e.g., exchange rate regime, central bank credibility, foreign exchange reserves. Structural variables that indicate position in international debtor-creditor relations: • Stock of short-term external obligations ▪ Autonomous foreign exchange rate productivity (current account) ▪ Institutional factors ▪ (eg. market structure, market maker, etc.)	Minskyan account: medium term of contractual settlement

Source: Kaltenbrunner (p. 241, 2015).

Besides such factors, the productivity gap between DECs and developed countries affects real exchange rate dynamics as well. The Latin-American structuralist view (Prebisch, 1949; Furtado, 1958, 1964) points out that uneven terms of trade entail transfer of productivity gains from primary-exporter economies to central ones. This factor, associated with the difference between technical progress and productivity, foster the per capita differentiation between these countries groups, which, in its turn, affects the real exchange rate (Bergstrand, 1991). The low productivity level causes low accumulation tax, preventing basic structures changes in peripheral economies.

Hence, although Kaltenbrunner (2015) approach is a good starting point, it is necessary to reformulate it to develop a model for the real exchange rate. We argue that productivity differential cannot be neglected. The next section discusses such issue and formulates a model to the long-run real exchange rate determinants.

5 The Model

The model presented by Kaltenbrunner (2015), which follow equation (3), do not mention the productivity differential between countries as one of the long-run exchange rate determinants.

Nevertheless, when we consider that productivity gains from peripheral economies are transferred to central countries, we assume that the latter are more productive. Thus, according to the BS effect, their currency would be more appreciated.

From a theoretical perspective, the PPP adjusted by BS effect is one of the available methodologies to access equilibrium exchange rate (Isard, 2007). Assuming that the Law of One Price holds in transactional sectors, the BS effect can show the productivity differential effect on the exchange rate (Dibooglu, 1996; Dutton and Strauss, 1997; Isard, 2007).

To endogenize such effect, we follow a model that differentiates tradable goods from non-tradable ones.

Let

$$P = P_N^{\alpha} P_T^{1-\alpha} = ¿ \tag{4}$$

$$P^{¿} = P_N^{¿\beta} P_t^{¿1-B} = ¿ \tag{5}$$

Where P_T and P_N denotes the price of tradable and non-tradable goods in country A; $P_T^{¿}$ e $P_N^{¿}$ are the corresponding prices in country B; and P and $P^{¿}$ are the aggregate price levels in the two countries; and α and β are the weighting parameters of price composition (tradable and non-tradable).

Let s denotes the nominal exchange in country A per units of country B, and R denotes real exchange rate, we have:

$$R = s\, P^{¿} / P \tag{6}$$

Replacing (4) and (5) in (6):

$$R = s\left(\frac{P_T^{¿}}{P_T}\right)¿ \tag{7}$$

Equation (7) is one of the methodologies that economists have used to estimate equilibrium exchange rate in recent years. Such methodology presumes that the real exchange rate should remain stable over time. In addition, the PPP equation adjust by BS effect suggests a tendency for real exchange rate to appreciate over time for relatively fast growing countries and depreciate for relatively slow growing countries. Its level shows that richer countries have an appreciated currency.

However, we note that this equation comes from the PPP analytical framework, which is even criticized by the mainstream economists. Despite its critics, this theory is grounded in conventional view[13]. It was highlighted by Dornbush and Krugman p. 540, 1976) - "Under the skin of any international economist lies a deep-seated belief in some variant of the PPP theory of the exchange rate" - and by Rogoff (p. 647, 1996) - "While few empirical literates economists take PPP seriously as a short-term proposition, most instinctively believe in some variant of purchasing power parity as an anchor for long-run real exchange rate".

It is important to note that economists from different streams believe that productivity differentials are, in certain extent, connected to the determinants of real exchange rate. At least, many misalignment exchange rate index considers it (Rodrik, 2007; Berg and Miao, 2010).

13 When we count how many papers has the term PPP in its tile in the Jstore base, we note that between 1990 and 2002 it appeared 34 times, and between 2000 and 2010, it appeared 52 time. Thus, it points out that there is a renewed interest in this theory.

Actually, another theoretical approach explains the BS effect. Lemos (1988) and Resende e Matos (2007) argue that urbanized places with a developed tertiary sector form a privileged space for production where development of production techniques are more prone to happen. They are a special locus for production. As a result, the rent of this land is high, in a manner that the differential of service's costs portrays it.

Analogously, in higher productivity countries, the price of non-tradable goods are higher. On one hand, external economies of scale, based on agglomeration economics, foster exportation. On the other hand, non-tradable goods are more expensive. Thus, we believe that the BS effect should be regarded as one of the real exchange rate determinants in the long run.

Instead of reformulating the PPP equation integrally, we will reshape it in line with the post-Keynesian view, taking into account the productivity differential effect in our model. As aforementioned, the BS effect is not necessarily a supply-side issue. In addition, uneven terms of trade augment differences in GDP per capita.

We combine equation (3) to (7). First, we rewrite equation (7) in log form:

$$R = s + \left(P_T^{¿} - P_T\right) + \beta\left(P_N^{¿} - P_T^{¿}\right) - \alpha\left(P_N - P_T\right) \tag{8}$$

According to it, assuming that $s + \left(P_T^{¿} - P_T\right)$ is constant, and that α and β have second order effects, if the productivity of country A, $\left(P_N - P_T\right)$, rises more than country B, the real exchange rate will appreciate in the former country. Otherwise, if the productivity of country B, $\left(P_N^{¿} - P_T^{¿}\right)$, increases faster than country A, the real exchange rate will depreciate.

Rewriting equation (3) as a nominal exchange rate function, we have:

$$s = s^e - \left(l - l¿¿¿\right) - \left(r - r^{¿}\right)¿ \tag{9}$$

According to equation (9), the nominal exchange rate is equal to the expected spot exchange rate[14] less the difference between the currencies' liquidity premia between country A and country B, $\left(l - l¿¿¿\right)¿$, and less the short-run interest rate between both countries.

Combining equation (8) and (9), we have:

$$R = s^e - \left(l - l¿¿¿\right) - \left(r - r^{¿}\right) + \left(P_T^{¿} - P_T\right) + \beta\left(P_N^{¿} - P_T^{¿}\right) - \alpha\left(P_N - P_T\right)¿ \tag{10}$$

Therefore, DECs real exchange rate relies on the following factors:

i. Expected spot exchange rate: is linked to the main factor that guides exchange rate expectation, i.e., portfolio flows (Harvey, 2009). Net portfolio inflows usually appreciate the exchange rate, because they allows investors to speculate.
ii. Liquidity premia: the bigger the difference between the currency under assessment and the system's currency, the more depreciated will be such currency.
iii. Short-run interest rate: the bigger the difference between the currency's interest rate under assessment and the system's currency, less depreciated will be such currency.
iv. Tradable goods price level: usually, we assume that tradable price level is equal to the foreign market. Thus, the term $\left(P_T^{¿} - P_T\right)$ would vanish from equation (10).

14 The expected exchange rate is a function of portfolio flows.

v. Productivity level: the bigger the productivity difference between the country that has system's currency and the country under assessment, the more depreciated will be the currency of the latter country.

Rewriting equation (10), assuming for simplicity that the tradable goods price level are equal between countries, we have:

$$R = s^e - (l - l¿¿¿) - (r - r^{¿}) + \beta\left(P_N^{¿} - P_T^{¿}\right) - \alpha\left(P_N - P_T\right)¿ \qquad (11)$$

Therefore, this is the reshaped equation from a post-Keynesian view, which determines long-run exchange rate in DECs countries. When we define nominal exchange rate according to Kaltenbrunner's model (2015), PPP is no longer suitable, since there is not a constant relation between exchange rate and countries price level ($\frac{P}{s\,P^{¿}} = 1$).

Furthermore, fundamentals by themselves only do not drive exchange rates. The expectations about its appreciation (or depreciation), as well as interest rate difference and international liquidity premia affects long-run real exchange rate. Thus, elements regarded as short-run and financial ones are important to the exchange rate dynamics, once contemporaneous decisions can affect the economics path.

Notwithstanding, structural issues related to liquidity premia and productivity have to be considered when we explain the real exchange rate behavior in the long-run. There are elements that define the currency position in the hierarchy of the international monetary system, and they often change slowly. Countries' productivity, in turn, is related to the productive structure, so it modifies only in long-run.

Thereby, we formulated a model capable of assembling structural issues, which resemble country economies, without neglecting short-run aspects that interfere with economic agents' decisions. To specify better the model, we specify the role played by each variable, in what follows.

The expected spot exchange rate can be understood from the mental model formulated by Harvey (2009). In such model, Harvey presents the "Keynesian fundamentals" (base factors) that guides agent's predictions: interest rate, economic growth, inflation and liquidity. These four factors affect the following process: importation and exportation, foreign direct investment, and foreign portfolio investment. Following his view, agents would rather base their prediction on the closest inputs that drive the exchange rate, mainly, in foreign portfolio flows, which are the dominant force in the currency markets.

The expected spot exchange rate, $\Delta s^e = s^e - s$, depends on the net foreign portfolio flows (Harvey, 2009). We add to this equation an error term, since predictions may be wrong and other elements can affect the expected spot exchange rate.

$$s^e = s + \Delta s^e + \varepsilon \qquad (12)$$

This is a conventional equation except for how excpectatives are formed. Expected spot exchange rate, s^e, is basically determined by agent's expectation. Exchange rate expectations might be regarded as exogenous (Lavoie, 2000). Nevertheless, we assume that it is based on conventional behaviour (Keynes,

1936)[15]. Besides, it is guided according to Harvey's mental model, which states that portfolio flows are the main force in the currency market.

The international liquidity premia can be regarded as an endogenous structural issue. It relies on three factors listed by Kaltenbrunner (2015): short-run outstanding external obligations, the capability of engendering flows via current account and the institutional liquidity. However, changes in the economic environment (crisis) alter the agents' liquidity preference sharply. Thus, when international liquidity is low, investors prefer to allocate their resources in assets denominated in the system's currency. The opposite occurs when international liquidity is high. In other words, the international liquidity premia can change due only to exogenous factors.

Hence, we have that the difference between the international liquidity premia of DEC countries and the international liquidity premia of the system's currency is determined by:

$$l - l^{¿} = f\,¿ \qquad (13)$$

where *GFA* is the ratio between the stock of short-run obligations and international reserves (a vulnerability indicator), *CA* is the current account balance divided by GDP, i.e., the country's capacity to generate currency flows in its favor, *FXr* and *ERR* are, respectively, international reserves and exchange rate regime (the CB ability to provide currency liquidity is mainly associated to its international currency stock and to the exchange rate regime, instead of being a mirror, strict-sensu, of institutional liquidity), and *LI* is the international liquidity attained to exogenous factors that modify the international liquidity premia.

Disregarding the possibility of ambiguous effect of each variable on real exchange rate, we assume as follows. The smaller the GFA ratio, the better will the country external position be. The bigger the capacity of a country to generate flows in its favor, the bigger will the current account balance be. The higher the international reserves level, the easier the CB can provide liquidity to the currency market (according, however, with the current exchange rate regime). And last but not least, the bigger the international liquidity, the bigger will be the capital flows to DECs, which in its turn can enlarge the GFA ratio.

Following the post-Keynesian structuralist approach, we assume that the interest rate is partially endogenous, i.e., the CB can determine the short-run interest rate partially, but it is subject to commercial banks liquidity preference.

In such case, the difference between interest rate, $(r - r^{¿})$, is compounded, to a certain extent, by an exogenous component, which is attached to the goals of each country monetary policy. *Ceteris paribus*, the bigger the interest rate differential, the more attractive is the currency of such country.

Figure 2 summarizes the relation between the real exchange rate and it is determinants, showing that there may be ambiguous effects underlying the theoretical approach. Portfolio inflows (*PI*), higher currency's international liquidity premia and productivity appreciates the exchange rate.

15 (1) The present is a much more serviceable guide to the future than a candid examination of past experience would show it to have been hitherto. (2) The existing state of opinion as expressed in prices and the character of existing output is based on a correct summing up of future prospects, so that we can accept it as such unless and until something new and relevant comes into the picture. (3) Knowing that our own individual judgment is worthless, we endeavor to fall back on the judgment of the rest of the world which is perhaps better informed. The psychology of a society of individuals each of whom is endeavoring to cop y the others leads to what we may strictly term a conventional judgment (Keynes 1973b: 114).

The international liquidity premia depends directly on the *GFA* and *CA*, and, indirectly, on *PI*. A current account surplus indicates that the country is more capable of generating foreign currency in its favor. In consequence, its currency has a higher international liquidity premia. Nevertheless, such surpluses may be correlated to short-run issues, which may attract mainly short-term portfolio investments, increasing the external liabilities. This, in turn, affects negatively the international liquidity premia of the exchange rate, once the country becomes more susceptible to sudden-stops episodes. In other words, there is a greater exposure of the domestic currency to volatile capital flows.

As noted by Kaltenbrunner (2015), despite of low and stable inflation, strict central bank independence, and a war chest of foreign exchange rate reserves, DECs have remained subject to an elevated degree of external vulnerability. Moreover, it is the capital flows themselves create a country's stock of outstanding obligations, which weigh on its currency's liquidity premium. Hence, the same factors that increases it in the eye of foreign investor also slowly undermine this premium as they attract more capital flow.

Hence, the theoretical approach may lead to ambiguous effects. On one hand, the international liquidity (*LI*) appreciates the domestic currency, increasing the portfolio investment flows. On the other hand, it depreciates the domestic currency, since the stock of short-term outstanding obligations increases. Kohler (2010) presents evidence that in the international financial crisis of 2008, investment currencies (in particular those with high interest rates) depreciates sharply, whereas funding currencies appreciated, large unrelated to countries' economic conditions. The interest rate differential acts in a similar way.

The portfolio investment, which guides the agent's predictions on the expected spot exchange rate, moves in the same direction of *LI* and interest rate differentials. There are two remaining points: i) besides *PI*, the current exchange rate affects the agent's exchange rate prediction model; ii) the interaction between reserves and exchange rate regime show the CB's ability to provide liquidity to the system.

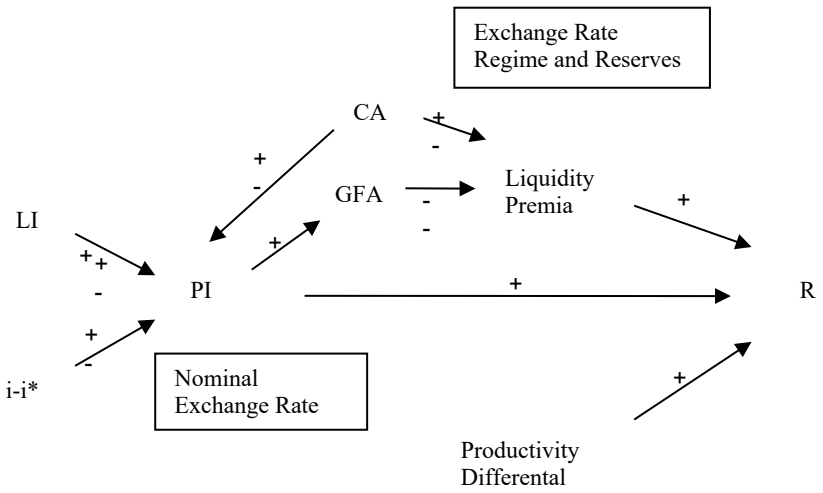

Figure 1: Real Exchange rate and its determinants

Hence, the equation (12) and (13) underlies equation (11), which is the main model's equation. We intend to endogenize the expected spot exchange rate and the difference between the international currency liquidity premia. Taking into account DECs particularities, these tree equations forge the long-run exchange rate determinants model.

5.1 Empirical Evidence

The estimation strategy involves a selection of two different sample of countries, based on data available from 1990 to 2008. More specifically, we use an unbanlanced sample for a broad sample of 45 DECs (n) during 18 years (t), and a balanced sample for a reduced sample comprising 24 DECs[16]. The frequency of data is annual.

The sample ended in 2008 due to change from Balance of Payments Manual (BPM) 5 to BPM6 methodology. Since such change, there is no one-to-one mapping. After reviewing the conversion matrix, we decide not to link foreign portfolio data, since they show huge differences. In addition to sign changes, which are explained by the conversation matrix, there are substantial value differences, which in turn are not enough documented.

It must be noted that for some countries the number of observations is severely limited, i.e. the series present many missing values. This traditionally requires the adoption of one of the following strategies: focusing on a restricted sample of countries for a relatively long period, or focusing on a short time span for a large sample of economies. Both alternatives offer challenges, because the former prevents the study of the relationships of interest in the developing and less-developed economies, while the latter neglects the dynamics and the evolution of these relationships. Furthermore, as the missing observations are not taken into consideration when estimating a regression, excluding these observations may cause estimation bias[17]. If there are systematic differences between countries that report data and those that do not, then there is an identification problem. The existence of a sample selection bias means that it may not be possible to make inferences for the totality of countries. Hence, the interpretation of the econometric results must take these limitations into account.

Box (1) presents a detailed description of the number of countries, and the number of countries per group, that compose each sample according to the classification of the World Economic Outlook.

Box 1 – Composition of the broad and reduced sample

	Broad Sample	Reduced Sample
	Number of Countries	Number of Countries
Emerging and Developing Economies (Total)	45	24
(i) *Commonwealth* of Independent States	5	24
(ii) Emerging and Developing Asia	5	
(iii) Emerging and Developing Europe	5	2
(iv) Latin American and the Caribbean	17	2
(v) Middle East and North Africa	5	5
(vi) Sub-Saharan Africa	8	11

Note: Classification according to WEO – World Economic, 2014

The list of data in the research resembles the theoretical model as show in Table 1. In some cases, it is important to be aware of the building data strategy. First, we chose the real effective exchange rate based on consumer price index (CPI), instead of based on unit labor cost (ULC), because the former has more data available. Second, to build short-run gross foreign liabilities data (GFA[18]), we add the stock of debt and portfolio equity liabilities[19] to short-term debt. From our point of view, such measure as a proportion

16 In the broad sample missing data is around 20%. The countries comprising the samples can be requested by email to authors.

17 It is possible that presence (or absence) of missing values is not random, which could lead to a specification bias.

18 As a robustness check, we use net foreign assets (NFA)

19 We do not consider the stock of other investments liabilities, following Gentio and Araujo (2012).

of international reserves is the best way to portray country external vulnerability, since it shows how fast a country would have to change its nominal exchange rate when facing sudden-stops episodes. Third, we employ interactions between dummies, representing the exchange rate regime, and international reserves. These are control variables, inasmuch as the level of international reserves depends on the exchange rate regime. The latter was based on Ilzetzki,Reinhart and Rogoff (2008) classification. Moreover, we follow Coudert and Couharde (2009) to have a broad classification (R1, fixed; R2, intermediary; R3, floating). Finally, to construct data on international liquidity, we follow Plihon (1995) and Resende e Matos (2007). We sum the absolute value of the following components of the Balance of Payments: portfolio investment" (liabilities and assets), "other assets" (liabilities and assets), "financial derivatives" (liabilities and assets) from G7 countries. Then, we deflated it by the US producer price index. We opt to use the moving average, as there are adjustment costs. In other words, the average oscillation of international liquidity affects macroeconomic variables.

Table 1: List of the variables in the research

Abbreviation	Comments	Unit of measurement	Source
R	Real effective exchange rate based on consumer price index (CPI)	Index	IFS
S	Nominal exchange rate	National currency/US dólar	IFS
PI (ΔS^e)	Expected spot exchange rate variation measured by net Foreign Portfolio Investment (FPI)	Billions US Dollar	IFS
GFA	Short-run gross foreign liabilities plus external debt as a fraction of international reserves	Millions US Dollar	Own elaboration base on data from Lane e Milesi-Ferreti (2007), WDI and IFS.
CA	Current account balance as a percentage of GDP	%	WDI
FXRMR1	Interaction between fixed exchange rate regime (dummy variable) and international reserves	Millions US Dollar	Own elaboration base on data from IFS and Ilzetzki,Reinhart e Rogoff (2008)
FXRMR2	Interaction between dirty floating exchange rate regime (dummy variable) and international reserves	Millions US Dollar	Own elaboration base on data from IFS and Ilzetzki,Reinhart e Rogoff (2008)
FXRMR3	Interaction between floating exchange rate regime (dummy variable) and international reserves	Millions US Dollar	Own elaboration base on data from IFS and Ilzetzki,Reinhart e Rogoff (2008)
LI	Moving average of sum of "portfolio investment" (liabilities and assets), "other assets" (liabilities and assets), "financial derivatives" (liabilities and assets) from G7 countries deflated by Producer Price Index (PPI)	Billions of US Dollar	Own elaboration base on data from IFS and FRED
I (r-r*)	Interest rate differential in relation to US interest rate	%	Own elaboration base on data from IFS
Pibpc $(P_n^* - P_t^*)-(P_n - P_t)$	GDP *per capita* based on PPC	US constant dollar	WEO

Source: Own Elaboration
Note 1: When abbreviaton does not correspond to the abbreviation from the mathematical model, we include it in brackets.
Note 2: IFS – International Financial Statistics; WDI – World Development Indicators; WEO – World Economic; FRED – Federal Reserve Economic Data.

The exercise is carried out based on econometric techniques appropriate for this type of data. More specifically, different techniques for panel data (fixed and random effects) are used, as well as the conventional specification and identification tests of the model, namely the F test for the presence of fixed effects, the Hausman test for the choice of the fixed and random effects models, the Wooldridge serial

correlation test[20] and the modified Wald test for panel data heteroskedasticity, and the test for including time effects[21].

The general form of the equation to be estimated is given by equation (14).

$$RER_{i,t} = \beta_0 + \beta_1 ca_{i,t} + \beta_2 gfa_{i,t} + \beta_3 s_{i,t} + \beta_4 pibperc_{i,t} + \beta_5 i_{i,t} + \beta_6 fxrm1_{i,t} + \beta_7 f. \qquad (14)$$

where $i = 1, \ldots, N, t = 1, \ldots, T$; $\beta's$ are the parameters to be estimated; μ_t is the time specific effect; η_t captures the non-observed effects of each country i that are invariant over time; ε_{it} is the idiosyncratic error; and the i and t subscripts refer to countries and time-periods respectively. The time-specific term aims at controlling international conditions that change over time and affect the real exchange rate, whereas the non-observable country-specific term captures factors that influence it and are potentially correlated with the explained variables[22].

The results are reported in table 2. First, we adjusted the model of equation (14) using the OLS method with pooled data, so as to establish comparison. Nevertheless, the preceding model assumes contemporary exogeneity of the explanatory variables. This requires regressors to be uncorrelated with the idiosyncratic error in the same period. However, this condition, necessary for the consistency of this estimator, may not be met due to the omission of relevant variables in the regression model. One way of solving this problem is using panel data and explicitly considering non-observed individual effects, which can be identified in the analysis.

Table 2 also presents the results of model selection tests. We first tested for the presence of fixed effects. In this case, we performed the F-test, and rejected the null hypothesis that the idiosyncratic errors are independent and identically distributed, which allows for the conclusion that the fixed effects model is more appropriate than the OLS model with pooled data. Finally, to choose between fixed and random effects we used the Hausman (1978) test. The results show that the null hypothesis of the non-systematic coefficients is rejected for both samples, indicating the fixed effects model.

The next step is to check robustness. In order to do so, we used the modified Wald test for heteroskedasticity in regression models with fixed effects and the Wooldridge test for serial correlation in the panel model. Results indicate that the errors of the model are serially correlated and heteroskedastic. Hence, we ran a model with Driscoll and Kraay (1998) corrections for the standard errors of the coefficients estimated via fixed effects. The structure of the idiosyncratic error is assumed to be heteroskedastic, serially correlated, and, possibly, correlated between groups (panels). In this case, the standard errors are robust to various forms of cross-sectional ('spatial') and temporal (when the temporal dimension becomes large) dependency.

With the correction for heteroskedasticity and serial correlation, the estimations of the coefficients of interest in the proposed model are, for the most part, statistically significant. In order to analyze the coefficients, we will look at estimations (VII) and (VII), in which the standard errors were corrected by Driscoll and Kray.

The estimates suggest that the BS effect influences DECs' exchange rate. An increase in GDP per capita of US$ 100 is associate with a valuation of 0.3 units (0.003*100). Although it is significant, it seems to be a much smaller change when compared to other results based on Rodrik's (2008) measure.

In turn, an increase of US$ 100 billion in international liquidity engenders a devaluation of roughly 0.3 units. The average international liquidity from 1990 to 2008 is about U$S 4 trillion. On the other hand, a rise of US$ 100 billion in portfolio flow has a similar effect in the opposite direction. It is important to note that international liquidity is considerably bigger than portfolio flows.

20 A test discussed by Wooldridge (2000) and developed in Stata by Drukker (2003).

21 For more details on the employed econometric methodology, see Cameron and Trivedi (2005), Greene (2003) and Wooldridge (2000).

22 For capturing the time-specific effect we used dummy variables that, for simplicity, will not be reported.

Thereby, we infer that an increase in international liquidity has an ambiguous effect on real exchange hand. On one hand, portfolio flows appreciates the real exchange rate. As pointed out by Harvey's mental model, if agents expect a currency valuation, they adjusts their portfolio in order to profit. On the other hand, currency's international liquidity premia is linked to external vulnerability. In face of a rise in the stock of short-run external liabilities, investor may change their portfolio looking for investments tied to safer currencies. Hence, DECs' currency devaluate.

Kaltenbrunner e Painceira (2015), looking at Brazil, argues that the surging share of foreign investors in Brazilian assets has increasingly tied exchange rate movements to international market and funding conditions. In addition, foreign investors' exposure to domestic currency assets changed the interaction between foreign portfolio decisions and the exchange rate as it has (i) made the exchange rate a crucial element of domestic returns and (ii) shifted the currency mismatch from domestic units to international financial investors.

In this vein, a 1% increase in the short interest rate differential accounts for a devaluation of around two units. Again, there is an ambiguous effect: such raise attracts capital flows, which would appreciate the real exchange rate, but at the same time, it enlarges the stock of short-run external liabilities, contributing to diminish currency's international liquidity premia.

In turn, a 1% increase in current account balance/GDP (CA) ratio is associate with a devaluation from two to three units. Hence, sound fundamentals may attract volatile capital. Nevertheless, if we replace CA by terms of trade, it appreciates the real exchange rate. We argue that terms of trade are a better way to measure a country capability of generating flows in its favor. According to structuralist approach, as a country develops its productive techniques, it can benefit from international trade by exchanging sophisticated goods for primary ones.

It should be noted that the vulnerability index (GFA) has the most sizeable effect on real exchange rate. A 1% increase in such index is responsible for a devaluation of 15 units (0.15*100)[23]. Thus, such measure may has a major role regarding the liquidity premia of DECs' currency.

Kaltenbrunner e Painceira (2015) suggests that the large exchange rate movements in Brazil were the result of new forms of external vulnerability (NFEVs), such as the one portrayed by GFA. In line with Minky's emphasis on the liability side of (international) balance sheets, Brazil's NFEVs show that the exchange rate movements can become entirely independent of the economic situation as changes in funding conditions force international investors to adjust their portfolios. In sum, from a Minskyan point of view, country's stock of (short-term) external liabilities, as opposed to economic fundamentals, will be the main determinant of its external vulnerability.

Last, investor's expectations on the nominal exchange rate depends on its current level. The more it is depreciated, the bigger is the devaluation expectation. The control variables - the interaction between international reserves and exchange rate regime - show that dirty floating exchange regime are associated with appreciated currencies. This pattern is associated with the fear of floating behavior (Calvo and Reinhart, 2002). The monetary authority, in order to avoid inflationary pressures, let the exchange rate appreciates.

Overall, the results endorse the theoretical approach summarized by Figure 1. Furthermore, they suggest that external vulnerability guides investors' behaviour. Although in the short-run they speculate through capital flows, which appreciates the real exchange rate, they assume that a raise in short-term rate differentials, in international liquidity or even in current account surplus may increase external vulnerability in the long-run. Thereby, currency's liquidity premia is an important driver of real exchange rate.

23 If we use Net Foreign Assets (NFA/GDP), the results are very similar, although the coefficient is much bigger. The results can be requested by email to authors.

Table 2: Determinants of the real exchange rate – OLS (pooled regression) x fixed effects x random effects x fixed effects (Driscoll and Kray), 1990-2008

	OLS with pooled data (*robust*)		Panel data (fixed effects)		Panel data (random effects)		FE/ Driscoll and Kray	
R	Broad Sample (I)	Reduced Sample (II)	Broad Sample (III)	Reduced Samle (IV)	Broad Sample (V)	Reduced Sample (VI)	Broad Sample (VII)	Reduced Sample (VIII)
Pibperc	0.0002	-0.0003	0.0013***	0.0030***	0.0008***	0.0016***	0.0013	0.0030***
	(1.14)	(-1.60)	(3.47)	(4.94)	(3.04)	(3.27)	(1.64)	(4.89)
Li	-0.0033***	-0.0004	-0.0026***	-0.0024***	-0.0023***	-0.0014**	-0.0026***	-0.0024***
	(-2.86)	(-1.22)	(-5.07)	(-4.57)	(-4.23)	(-2.49)	(-7.34)	(-7.04)
Ca	-0.3601***	-0.7076***	-0.3277***	-0.2493**	-0.3717***	-0.3707***	-0.3277***	-0.2493*
	(-5.07)	(-4.92)	(-4.22)	(-2.13)	(-4.86)	(-3.24)	(-5.10)	(-2.08)
S	-0.0027*	-0.0056***	-0.0152***	-0.0115***	-0.0045*	-0.0102***	-0.0152**	-0.0115**
	(-1.81)	(-4.32)	(-3.74)	(-2.83)	(-1.68)	(-2.90)	(-2.98)	(-2.70)
I	-0.4717***	-0.3895***	-0.2009***	-0.1596***	-0.2205***	-0.1884***	-0.2009**	-0.1596**
	(-5.22)	(-4.35)	(-5.37)	(-4.19)	(-5.69)	(-4.90)	(-2.65)	(-2.43)
Pi	0.0351	-0.0258	0.2646***	0.3393***	0.2267**	0.2862***	0.2646	0.3393*
	(0.32)	(-0.23)	(2.74)	(3.41)	(2.25)	(2.83)	(1.55)	(2.15)
Gfa	-0.2812***	0.5532***	-0.1511***	0.0022	-0.2352***	0.1142	-0.1511***	0.0022
	(-3.02)	(3.84)	(-2.86)	(0.02)	(-4.95)	(0.86)	(-3.53)	(0.03)
fxrmr1	0.0000	0.0001*	-0.0001	-0.0001	-0.0001	-0.0000	-0.0001	-0.0001
	(0.04)	(1.82)	(-1.38)	(-1.03)	(-1.02)	(-0.65)	(-1.63)	(-1.80)
fxrmr2	-0.0000	0.0000**	0.0001***	0.0001***	0.0001***	0.0001***	0.0001**	0.0001*
	(-1.31)	(2.34)	(3.68)	(3.08)	(3.22)	(3.51)	(2.57)	(2.19)

fxrmr3	-0.0003*	-0.0003	-0.0005***	-0.0003**	-0.0005***	-0.0004**	-0.0005***	-0.0003*
	(-1.79)	(-1.28)	(-3.38)	(-2.28)	(-3.38)	(-2.29)	(-3.28)	(-2.17)

Test for choosing the right model	Broad Sample	Reduced Sample	Broad Sample Decision	Reduced Sample Decison
F-test	22.60	24.18		
Prob>F	0.00	0.00	Fixed Effects	Fixed effects
Hausman Valor (χ^2)	40.64	19.03		
Prob> χ^2	0.00	0.01	**Fixed effects**	**Fixed effects**
Número de obs.	1037	330		

Notes: * p<0.10, ** p<0.05, *** p<0.01. The values of the t-statistic are in parenthesis. (i) OLS pooled estimate are already corrected for potential; ii) F-test: H_0: all errors are independent and identically distributed (iid); iii) Hausman test: H_0: the differences in the coefficients of the tested model is not systematic; iv) the constant is significant in all models; v) all estimates includes time dummies , apart from estimate II.

Nevertheless, the panel regressions performed above accept the (strong) hypothesis of strict exogeneity of the regressors with respect to the idiosyncratic errors. Under the violation of this condition, both estimators are inconsistent. However, it is possible to relax strict exogeneity by assuming that the regressors are sequentially exogenous with respect to the idiosyncratic errors, conditional to the unobserved effects. The assumption of sequential exogeneity is consistent with the presence of the lagged dependent variable among the regressors (dynamic models of panel data). These models control the existence of a correlation between past values of the dependent variable and the contemporaneous values of other explanatory variables, thus, eliminating potential sources of bias of the estimators associated with this type of correlation (Blundell and Bond, 1998; Wooldridge, 2000). Following Blundell and Bond, we estimate the following regression:

$$RER = \beta_0 + \beta_1 RER_{i,t-1} + \beta_2 gfa_{i,t} + \beta_3 s_{i,t} + \beta_4 pibperc_{i,t} + \beta_5 i_{i,t} + \beta_6 fxrm1_{i,t} + l \qquad (15)$$

The results for equation (15) are presented in table 3. The Hansen test of overidentifying restrictions and the Arellano-Bond test for the correlation of the second order error term are as expected, showing that the model is correctly specified[24].

It is important to note that the BS effect and international liquidity are no longer significant. As argued above, the BS effect, even if significant, has a minor effect on real exchange rate. The international liquidity might play its role only through capital flows, assuming that when it is higher, portfolio flows are higher as well.

Furthermore, the results suggest that there is some inertia in the exchange rate dynamics. The positive effect indicate that there is an appreciating trend regarding DECs' currency. If we consider the real exchange rate as a proxy for country competitiveness, we note that it is not trivial to change it. Besides, it does not happen in short span of time.

Table 3: Determinants of the real exchange rate, System-GMM (*one step robust*), 1990-2008

Dependent variable: R	*System-GMM*	
	Large Sample (I)	Reduced Sample (II)
L.r	0.7479***(13.30)	0.8051***(15.08)
Pibperc	-0.0001(-0.56)	-0.0001(-0.81)
Li	0.0001(0.59)	0.0003(1.43)
Ca	-0.1680**(-2.54)	-0.1768*(-1.80)
S	-0.0027***(-3.06)	-0.0027***(-3.23)
I	-0.0786(-1.46)	-0.0790**(-2.17)
Pi	0.1886**(2.28)	0.1362**(2.51)
Gfa	-0.1347***(-4.58)	-0.1001(-0.77)
fxrmr1	0.0000(0.69)	0.0000(0.49)
fxrmr2	0.0000(1.64)	0.0000**(2.25)
fxrmr3	-0.0005***(-2.77)	-0.0004**(-2.68)
Arellano-Bond Test for AR(1) in first difference	z=-3.00	z=-3.03
H0: There is no first order correlation in the residuals	pr=0.00	pr=0.00
Arellano-Bond test AR(2) in first difference	z=-2.47	z=-1.64
H0: There is no first order correlation in the residuals	pr=0.01	pr=0.10
Hansen test for overidentification	chi2(125)=38.82	chi2(89)=18.40
H0: The model is well specified and all overidentification are correct	Prob>chi2=1.00	Prob>chi2=1.00

Notes: *P<0.05, **P<0.01, ***P<0.001. t statistic in brackets. The regressions do not include time dummies. Independent variables possible non-exogenous: pibperc,ca, s, gfa, i e pi.

In summary, the results of the econometric tests indicates that the theoretical model is encouraging. Combining short-run elements with long-run ones seems to be a reasonable approach to identify the determinants of the real exchange rate in the long-run. Besides, it suggests that financial factors may play the main role over the exchange rate.

24 In the broad sample, instead of variable's differences, we used orthogonal deviations. Hence, Arellano-Bond test is not valid.

6 Concluding remarks

This article has developed a non-conventional theoretical approach to explain the determinants of real exchange rates in the long-run. Based on Keynes' "own rate of interest" equation in chapter 17 of the General Theory and on the assumption that productivity differentials' are meaningful, we model the real exchange rate behavior. This new analytical approach allows us to put together the post-Keynesian theory to the empirically and theoretically relevant issue, which states that higher GDP *per capita* is associated with appreciated currencies.

We focus on exchange rate from DECs, since their currency have a subordinated role in the international monetary system. These countries remain investment currencies, which can be exchange against the funding currency any time. Hence, fundamentals by themselves do not guide real exchange rate. On the contrary, health macroeconomic fundamentals can attract more capital flows, further increasing the country's external vulnerability.

Instead of fundamentals, real exchange rate is substantially driven by structural factors related to the international liquidity premia. New forms of external vulnerability linked to the rising share of foreign investor in domestic-currency financial assets has a major impact on DECs' currency. Moreover, from a Minskyan view, capital flows themselves create the fragilities which then determine their own behave and instabilities. The empirical results confirms the ambigous effect of interest rate differential and international liquidity. On one hand they appreciate the exchange rate through portfolio flows; on the other hand, they depreciate it by risign external vulnerability.

In addition, productivity differentials do not have a main effect on the real exchange rate, although they might contribute to appreciate it. Thus, it should be noted that financials factors are more relevant than variables attached to fundamentals.

Seeing that short-run financial variables can be regarded as the main determinants of the real exchange rate in the long-run, it has serious policy implications. Fundamentally, if we assume that it can be a proxy for competitiveness, policymakers must adopt permanent current account regulations in order to reduce a country's external vulnerability. Otherwise, sudden stops will produce an extreme volatile environment, preventing such countries to develop a growth strategy.

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