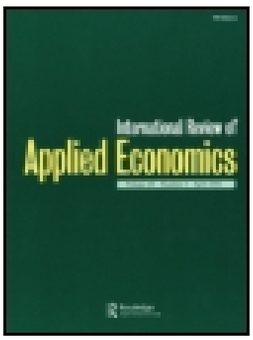

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Determinants of the real exchange rate in the long-run for developing and emerging countries: a theoretical and empirical approach

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ABSTRACT

This paper presents a new framework for the determinants of real exchange in the long-run in developing and emerging countries (DECs). We assume that currencies should be regarded as an asset. In consequence, dealers in the foreign exchange market play a crucial role on its dynamics. To set our model, we connect the model developed by Kaltenbrunner, which is grounded on chapter 17 of the General Theory, with productivity's differential effect. By doing so, it 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 new data-set, which comprises, among other variables, foreign portfolio flow, interest rate differential, external vulnerability measures, and international liquidity, on annual basis. The empirical results endorse this framework. Overall, it shows the primacy of financial factors as determinants of the long-run real exchange rate and points to the endogenous and self-perpetuating nature of international monetary system hierarchy.

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1. Introduction

This paper aims at presenting an alternative approach regarding long-run real exchange rate determinants. 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 affect the long-run real exchange rate.

Firstly, we present three different conventional approaches connected to long-run real exchange rate: Purchasing Power Parity (PPP), Balassa–Samuelson (BS) effect, and the model developed by Bergstrand (1991). As underlined by Dornbusch and Krugman (Dornbusch and Krugman 1976) and by Rogoff (1996), the great majority of economists believe in some variant of PPP. Among them, we stress the one that includes productivity differential (BS effect), which has a demand side explanation according to Bersgstrand (1991).

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In what follows, we show the post-Keynesian view, focusing on the role played by currency market participants (currency dealers and fund managers). Hence, we call attention to agent's decisions in an uncertain environment, which is led by social conventions and herd behavior. In this vein, portfolio flows, which allow agents to speculate, have a major effect on exchange rate.

Kaltenbrunner (2015) rearranged this approach for emerging and developing countries (DECs), considering the hierarchical nature of the international monetary system and DECs' idiosyncrasies. The author, from a structuralist economics point of view and based on chapter 17 of Keynes' General Theory (1936), presents an analytical model for exchange rate determination, underscoring liquidity premium role.

She assigns structural factors that drives liquidity premium of DECs' currencies, pointing out the liability side of international balance sheets based on a Minskyan approach. The liquidity premium is associated with the outstanding stock of external liabilities and the ability to force cash flows to meet them. Based on such view, and in line with Latin American economic thought, we suggest that productivity differential affects exchange rate, mirroring 'foreign exchange productivity'.

Afterward, we disclose an analytical model, combining post-Keynesian factors, as stated in Kaltenbrunner's model, with productivity differential effect. This new model takes into account short-run and long-run factors, as well as monetary and real ones, as mains drivers of real exchange rate. Hence, we discard the conventional theory, which assumes that only variables from the real side of the economy guide the exchange rate behavior.

In sum, the contribution of this paper is threefold: (i) it presents a new theoretical approach regarding the determinants of real exchange rate; (ii) it shows new empirical evidences by applying different econometrics techniques for a large set of DECs and a recent period; (iii) in a certain extent, the results are in line with the theoretical approach and suggest 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 concludes.

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.

When we discuss real exchange role according to such literature, we must 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 (1964b; Balassa 1964a; Samuelson 1964; Dornbusch 1985).

PPP theory assures that countries' relative prices drive 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).[1]

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.). 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. Besides this, there are commercial barriers that trigger spatial price differences.

The PPP weak version loosens 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.

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

However, even when we assess such theory under conventional view, we need to revise it to align with important theoretical issues. Productivity differentials is one of them, as proposed by Balassa and Samuelson, in 1964. Following their view, higher productive 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 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[2] 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 levels are more appreciated.

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 shown in this paper

3. Conventional theory flaws

The conventional literature developed many concepts and methods to assess exchange rate equilibrium in the medium-run and in the long-run (Macdonald 2000; Isard 2007). These approaches often derive from PPP, or from the internal and external equilibrium concept, or from statics techniques, which allows filtering permanent components from transitory ones. In the long-run, fundamentals dictates exchange rate path.

In this vein, conventional 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, 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 adjusts in current account will determine exchange rate variations (Kaltenbrunner 2015).

Thus, short-run deviations do not have long-lasting effects on real variables, assuming money neutrality[3] in the long-run. In addition, fundaments, which guide real exchange rate, do not modify over time, echoing agents' perfet foreseen (or with mensurable risks) of future.

Following this view, there is no role for exchange rate policy, once it does not affect the real economy. Short-run portfolio flows do not have permanent effect on exchange rate either.

Nevertheless, many papers that deal with the relation between growth and exchange rate (Rodrik 2008; Gala 2008; Missio et al. 2015, among others) suggest that overvaluation is harmful for growth at least. 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.

In addition, equilibrium concepts assume a gravity center around which exchange rate fluctuates. Therefore, there would be mechanisms keeping the real exchange rate attached to fundamentals. From this point of view, short-run financial flows would have a temporary effect on exchange rate.

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 ergodicity, 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 on exchange rate changes since it seeks for short-run profit opportunities.

Harvey's theory stress the role played by currency market participants (dealers and fund managers). His mental model identifies those factors that affect agents' decisions, considering market as a social phenomenon, in which dealers interact socially and professionally.

His main hypothesis (Harvey 2009) relies on the importance of aggregate expectation on the exchange rate path. The best strategy is to anticipate the expectations of market agents. However, under an uncertain environment, it may be better to copy decisions (conventional behavior[5]), which can even lead to herd behavior.

This decision is not arbitrary. The mental model[6] guides it, taking into account mainly expectations on foreign portfolio flows, which allows dealers to speculate. If agents

assume that nominal exchange rate will appreciate, there will be a raise in capital flows contemporaneously.

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

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

Hence, she formulates an alternative approach, which matches the importance of portfolio flows (interest rate differential) and the international liquidity premia on currency's price. To do so, she follows the structuralist view[7], taking into account Keynes theory regarding the own rate of interest of an asset (chapter 17 of General Theory).

According to it, domestic currency can be regarded as an asset class whose demand is determined by its net return relative to other currencies. Exchange rate, as the difference between domestic and foreign currency, is a manifestation of these differential returns. From this point of view, 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 expected appreciation, and international liquidity premia $-\left(q-c\right)+a+l$.[8]

At equilibrium, return of any currency should be equal to the currency with the highest international liquidity premia, i.e. the system's currency: $\left(q-c\right)+a+l=l^{*}$.

Currency expected appreciation corresponds to its own variation: $a=s^{e}-s$. Expectations are formed in line with Harvey's theory and are subject to social conventions and herd behavior.

Carrying costs of the domestic currency or financial instruments are significantly low, thereby they can be disregarded ($c=0$). Nevertheless, assuming that domestic currency is a class of international asset,[9] it has to offer pecuniary returns in order to be demanded by international investors.

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]:

$$r-(s^{e}-s)+l=l^{*} \tag{1}$$

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

Reformulating Equation (1) and taking into account that the system's currency return is not zero[11]:

$$(s^{e}-s)=(l-l^{*})+(r-r^{*}) \tag{2}$$

Such model (Equation 2) derives from Keynes' theory – the own-rate of interest of an asset (Keynes 1936). It can handle the empirical causality change between short-run interest

rate and exchange rate fluctuation. When the international liquidity premia is constant, or change slowly, expectations on interest rate determines the currency demand. Nevertheless, substantial changes in international liquidity premia may require interest rate adjusts to keep currency demand.

Hence, the main point of Kaltenbrunner's model is the relation between liquidity premia and exchange rate. To provide liquidity, a currency has to fulfill the following functions: medium of exchange, unit of account and international media of contract, and store of value.

Prates and Andrade (2013) argue that the international monetary system comprises an arrangement organized around a key currency. 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.

Currencies are ranked according to its convertibility. Currencies of emerging peripheral countries have a lower liquidity premium in relation to the key currency and other convertible ones, because they cannot provide liquidity in an international scenario. Thus, in times of increasing uncertainty, DECs assets are the first victims of the 'flight to quality' (i.e. to assets denominated in the key currency) by global investors. On the other hand, in situations marked by excess of international liquidity and higher appetite for risk, or eagerness to bet against the uncertain future (lower liquidity preference), when, normally, conventions (and expectations) about the future trajectory of the economy are more optimistic, and interest rates in core countries are low, 'emerging assets' incorporate a high expected appreciation which compensates for their lower liquidity premium (i.e. the attribute a exceeds the 'yield' or return implicit in the liquidity premium l) and, thus, become assets highly demanded by international investors. As a result, DECs' currency becomes even more volatile, preventing them to act as a stable unit of account.

Therefore, there are structural elements instead of conjunctural ones that affect exchange rate dynamics. Kaltenbrunner (2015) lists them:

(i) The short-run stock of net foreign debts (this idea is similar to the Smith one, 2002–2003). Any kind of short-run liability belonged to international investors undermines currency's liquidity premia, since sharp and sudden changes of exchange rate or the need to pay off debts and its service harms its ability to act as stable unit of account.
(ii) Debts payment's capacity through currency flows (Minsky 1994), which relies fundamentally on the relation between exportation and importation. In other words, the current account as a country's autonomous source of foreign exchange rate.
(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 1992) relies on many factors, such as the own asset features, the market structure, the agents who trade in the market and on the market maker. However, in currency markets, CB behavior, which acts as a market maker and as the lender of last resort, is constrained by the stock of international reserves and the exchange rate regime.

Minsky (1982) classifies economics units according to its ability to pay debts: hedge, when the cash flows from operations are expected to be large enough to meet the payment commitments on debts; speculative, when the cash flow from operations are not expected to

be large enough to meet payment commitments, even though the present value of expected cash receipts is greater than the present value of payment commitments; ponzi, situation in which cash payments commitments on debt are met by increasing the amount of debt outstanding. Nonetheless, countries are different from Minsky's economic units

In open economies, the issue is not to repay specific projects, but to generate foreign exchange to repay them. There may be projects or firms able to repay its debts. However, if countries are unable to provide foreign exchange, it may be not possible to repay them (Resende and Amado 2007).

In this vein, DECs countries are classified as ponzi units because they may not be able to generate foreign exchange. Consequently, in times of increasing uncertainty, agents are not prone to finance them. Additionally, they usually attract short-run financial flows, which enlarge their liability stock, downgrading its currency liquidity premia. Therefore, it perpetuates DECs monetary subordination (Resende and Amado 2007).

Besides, better fundamentals may only drag more short-run financial flows, which look for profits opportunities. Hence, it does not help to overcome DECs vulnerability. Instead of it, it may foster it.

In short, in line with 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 Keynes' 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.

Hence, in Kaltenbrunner (2015) model, structural factors, related to liquidity premia, guide the exchange rate. In addition, portfolio flows, driven by dealers who follow social conventions, as well as interest rate differentials, affect it. Thus, such model is a good start point.

Table 1. A post-Keynesian framework for exchange rate determination.

'Own rate of interest'	Exchange rate determinants	Post-Keynesian literature
$r - r^*$: yield diferences	Short-term financial returns (e.g. interest rates, equity prices)	Harvey (1998, 2002, 2009); Lavoie (2000, 2002–2003); Smithin (2002–2003)
$s^e - s$: appreciation/ depreciation	Context and time-specific expectations; psychological momentum	Davidson (1999, 2002); Harvey (1991, 2002, 2009); Alves, Ferrari Filho, and de Paula (1999–2000)
$l^* - l$: liquidity premium differential	Policy variables that indicate ability and willingness to maintain store of value function (e.g. exchange rate regime, central bank credibility, foreign exchange reserves.	German Monetary Keynesians (Herr 1992; Lüken genannt Klaßen 1993; Riese 2001; Herr and Hübner 2005):store of value
	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 ○ (e.g. market structure, market maker, etc.)	Minskyan account: medium term of contractual settlement

Source: Kaltenbrunner (2015, 241).

5. The model

The model presented by Kaltenbrunner (2015), which follows Equation (2), does not mention the productivity differential between countries as one of the long-run exchange rate determinants. Nevertheless, 'foreign exchange productivity', which relies on terms of trade, is associated with productivity.

According to Latin-American structuralist view (Furtado [1958]1974; 1964; Prebisch 1986), the most dynamic sector in the periphery is the primary product sector, while the industrial and services sector is heterogeneous, displaying productivity and technological gaps. Yet, terms of trade tend to be favorable to central economies, which exports high value-added goods, while peripheral economies exports commodities.

Low productivity levels cause low accumulation rate, preventing structural changes in DECs economies. Thereby, less productive countries depend on commodities cycles to generate foreign exchange. As a result, their ability to do so is constrained.

In order to finance its growth, DECs rely on the financial international system. The stock of liabilities increases and they become more vulnerable to international liquidity cycles. Furthermore, the difference between technical progress and productivity foster per capita differentiation between these countries groups, which, in its turn, affect real exchange rate (Bergstrand 1991).

In sum, productivity differences put pressure on DECs' exchange rate through the following channels: (i) decreases 'foreign exchange rate productivity'; (ii) enhances the dependence of DECs' growth cycles to the international financial system; (iii) augments BS effect between central and peripheral economies. Altogether, they contribute to devaluate DECs' exchange rate compared to advanced economies' one.

Actually, another theoretical approach explains the productivity differential effect. Lemos (1988) argue that urbanized places with a developed tertiary sector form a privileged space for production where development of production techniques is 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 is higher. On one hand, external economies of scale, based on agglomeration economics, foster exportation. On the other hand, non-tradable goods are more expensive.

Therefore, we assume that such effect should be regarded as one of the real exchange rate determinants in the long-run under a post-Keynesian approach. However, as monetary factors drive short-run portfolio flows, we believe that they matter most.

Thereby, we reshape Kaltenbrunner's model by adding productivity differential. To do so, we use the PPP adjusted by BS effect (Isard 2007). Assuming that the Law of One Price holds in transactional sectors, the BS effect can show the productivity differential effect on 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

$$P = P_N^{\alpha} P_T^{1-\alpha} = \left(\frac{P_N}{P_T}\right)^{\alpha} P_T \tag{3}$$

$$P^* = P_N^{*\beta} P_t^{*1-B} = \left(\frac{P_N^*}{P_T^*}\right)^{\beta} P_T^* \tag{4}$$

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:

$$R = sP^*/P \tag{5}$$

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

$$R = s\left(\frac{P_T^*}{P_T}\right)\left(\frac{P_N^*}{P_T^*}\right)^{\beta}/\left(\frac{P_N}{P_T}\right)^{\alpha} \tag{6}$$

Then, we combine Equation (2) to (6). First, we rewrite Equation (6) in log form:

$$R = s + \left(P_T^* - P_T\right) + \beta\left(P_N^* - P_T^*\right) - \alpha(P_N - P_T) \tag{7}$$

According to it, assuming that $s + (P_T^* - P_T)$ is constant, and that α and β have second-order effects, if the productivity of country A, $(P_N - P_T)$, 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 (2) as a nominal exchange rate function, we have:

$$s = s^e - (l - l^*) - (r - r^*) \tag{8}$$

According to Equation (8), nominal exchange rate is equal to expected spot exchange rate[12] less the difference between the currencies' liquidity premia between country A and country B, $(l - l^*)$, and less the short-run interest rate between both countries.

Combining Equation (7) and (8), we have:

$$R = s^e - (l - l^*) - (r - r^*) + \left(P_T^* - P_T\right) + \beta\left(P_N^* - P_T^*\right) - \alpha(P_N - P_T) \tag{9}$$

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 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: despite ambiguous effect, 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: such prices differ because they are priced in different currencies. Besides, even if they were priced in the same currency, the weak link in the BS hypothesis is the assumption that relative price of tradable goods remain relative constant over time (ISARD, 2007).[13] Therefore, the higher the price level of tradable goods, the more appreciated it will be.

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

Therefore, this is the reshaped equation from a post-Keynesian view, which determines long-run exchange rate in DECs countries.

As argued, fundamentals by themselves only do not drive exchange rates. The expectations about its appreciation (or depreciation), as well as interest rate differential and international liquidity premia affect long-run real exchange rate. Thus, elements regarded as short-run – portfolio flows and interest rate differentials – matter to the exchange rate dynamics, once contemporaneous decisions can affect the economic 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 DECs' 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 guide 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 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 at the currency of the system. 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 currency of the system is determined by:

$$l - l^* = f(GFA\ (-), CA\ (+), FXr, ERR,\ Li\ (-)) \tag{10}$$

where *GFA* is the ratio between the stock of short-run obligations (gross foreign assets) and international reserves, which stands for the ability to repay debts, *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 the currency of such country is.

We note that Kaltenbrunner's approach does not mention ambiguous effects prompted by variables that drive exchange rate. Nevertheless, we must consider it:

(i) Current account surpluses mean that countries can generate foreign exchange, increasing currency's liquidity premia. However, if such fact is due to temporary increase in commodities' price, productivity does not increase. Hence, better 'temporary' fundamentals may just be followed by portfolio flows, increasing the stock of liabilities and decreasing currency's liquidity premia. As noted by Kaltenbrunner (2015), despite 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.
(ii) Higher international liquidity appreciates exchange rate through portfolio flows. At the same time, it diminishes currency liquidity premia since it increases the stock of outstanding debts.
(iii) On one hand, higher interest rate differentials attract more financial flows. On the other hand, it signals worse international monetary scenario.

Resende and Amado (2007) argues that peripheral economies behave as a mirror of international liquidity cycles. Their structural productive and financial system fragilities enhance its dependence on international financial system, which has a Mynskian behavior. When international liquidity grows, its stock of liabilities increases. Although such vulnerability may be disguised by current account surpluses, the authors claim that it is the factor responsible for downgrading peripheral economies to speculative and Ponzi grades.

Figure 1 summarizes the relation between real exchange rate and it is determinants. Portfolio inflows (*PI*), higher currency's international liquidity premia, price level's raise, and productivity appreciate the exchange rate. The international liquidity premia depends directly on the *GFA* and *CA*, and, indirectly, on *PI*.

Hence, the Equation (10) underlies Equation (9), which is the main equation of the model. Taking into account DECs particularities, these equations forge the long-run exchange rate determinants model.

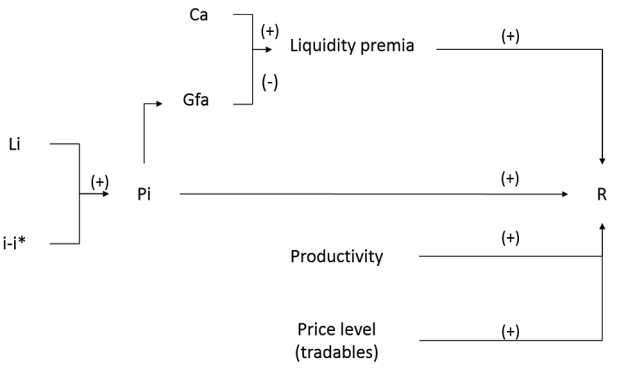

Figure 1. Real Exchange rate and its determinants.

5.1. Empirical evidence

The estimation strategy involves a selection of two different samples of countries, based on data available from 1990 to 2008. More specifically, we use an unbalanced sample for a broad sample of 45 DECs (n) during 18 years (t), and a balanced sample for a reduced sample comprising 24 DECs.[14] The frequency of data is annual as we want to assess long-run movements.

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 presents 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.[15] 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.

The list of data in the research resembles the theoretical model as show in Table 2. However, it must be noted that price level and productivity are absolute measures, although in the model they appear as relative ones (compared to the country which issues the currency of the system). Furthermore, 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

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	2
(ii) Emerging and Developing Asia	5	2
(iii) Emerging and Developing Europe	5	5
(iv) Latin American and the Caribbean	17	11
(v) Middle East and North Africa	5	3
(vi) Sub-Saharan Africa	8	1

Note: Classification according to WEO – World Economic, 2014.

Table 2. 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
Pric	Produtor price index (or consumer price index if PPI is not available)	Index	IFS
PI (S^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 and 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 and Rogoff (2017)
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 and Rogoff (2017)
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 and Rogoff (2017)
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 dólar	WEO

Note 1: When abbreviation 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.
Source: Own Elaboration.

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,[16]) we add the stock of debt and portfolio equity liabilities[17] to short-term debt. From our point of view, such measure as a proportion of international reserves is the best way to portrays

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 (2017) 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). 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.

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[18] and the modified Wald test for panel data heteroskedasticity, and the test for including time effects.[19]

The general form of the equation to be estimated is given by Equation (11) and its functional form is linear.

$$\begin{aligned} RER_{i,t} = {} & \beta_0 + \beta_1 pibperc_{i,t} + \beta_2 li_{i,t} + \beta_3 ca_{i,t} + \beta_4 pric_{i,t} + \beta_5 i_{i,t} + \beta_6 pi_{i,t} + \beta_7 gfa_{i,t} \\ & + \beta_8 fxrmr1_{i,t} + \beta_9 fxrmr2_{i,t} + \beta_{10} fxrmr3_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \end{aligned} \tag{11}$$

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.[20]

The results are reported in Table 3. First, we adjusted the model of Equation (11) 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 3 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 test. The

Table 3. Determinants of the real exchange rate – OLS (pooled regression) × fixed effects × random effects × fixed effects (Driscoll and Kray), 1990–2008.

	OLS with pooled data (*robust*)		Panel data (fixed effects)		Panel data (random effects)		FE/ Driscoll and Kray	
Dependente variable: 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	0.0001	−0.0002	0.0017***	0.0034***	0.0008***	0.0016***	0.0017**	0.0034***
	(0.51)	(−0.76)	(4.39)	(5.56)	(3.46)	(3.50)	(2.28)	(5.62)
Li	−0.0045***	−0.0024***	−0.0038***	−0.0032***	−0.0034***	−0.0024***	−0.0038***	−0.0032***
	(−3.74)	(−4.64)	(−5.76)	(−5.06)	(−4.85)	(−3.44)	(−6.28)	(-6.28)
Ca	−0.2600***	−0.3122***	−0.3270***	−0.2346**	−0.3627***	−0.3696***	−0.3270***	−0.2346
	(−3.87)	(−2.62)	(−4.18)	(−1.98)	(−4.73)	(−3.18)	(−4.82)	(−1.86)
Pric	0.2075***	0.3508***	0.1474**	0.1011	0.1152**	0.1347**	0.1474	0.1011
	(3.55)	(7.84)	(2.54)	(1.56)	(2.21)	(2.22)	(1.57)	(1.04)
I	−0.3437***	−0.2432***	−0.1534***	−0.1282***	−0.1839***	−0.1558***	−0.1534*	−0.1282*
	(−3.87)	(−3.22)	(−3.72)	(−3.07)	(−4.34)	(−3.67)	(−2.16)	(−2.02)
Pi	0.1213	0.1099	0.2972***	0.3615***	0.2501**	0.3024***	0.2972	0.3615**
	(1.06)	(0.91)	(3.03)	(3.58)	(2.47)	(2.93)	(1.79)	(2.39)
Gfa	−0.2383**	0.7118***	−0.1491***	−0.0409	−0.2277***	0.1265	−0.1491***	−0.0409
	(−2.06)	(4.74)	(−2.79)	(−0.30)	(−4.77)	(0.94)	(−4.08)	(−0.57)
fxrmr1	0.0000	0.0001	−0.0001	−0.0001	−0.0001	−0.0000	−0.0001	−0.0001
	(0.49)	(1.24)	(−1.24)	(−0.90)	(−0.89)	(−0.40)	(−1.56)	(−1.62)
fxrmr2	−0.0000	0.0000	0.0001***	0.0000**	0.0000***	0.0001***	0.0001*	0.0000
	(−0.93)	(1.46)	(2.99)	(2.51)	(2.86)	(3.03)	(1.95)	(1.65)
fxrmr3	−0.0003*	−0.0003*	−0.0005***	−0.0004**	−0.0005***	−0.0004**	−0.0005***	−0.0004*
	(−1.88)	(−1.76)	(−3.50)	(−2.36)	(−3.43)	(−2.29)	(−3.11)	(−2.22)
Test for choosing the right model			Broad Sample	Reduced Sample	Reduced Sample		Reduced Sample Decison	
F-test			21.00	19.01				
Prob > *F*			0.00	0.00	Fixed Effects		Fixed effects	
Hausman Valor (χ^2)			28.36	27.97				
Prob > χ^2			0.00	0.01	Fixed effects		Fixed effects	
N			564	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.

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 (VIII), 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 associated with a valuation of 0.3 units (0.003×100) – estimation (VIII). Although it is significant, it seems to be a much smaller change when compared to other results based on Rodrik's (2008) measure (Berg and Miao 2010; Macdonald and Vieira 2010)

In turn, an increase in 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$S 4 trillion. On the other hand, a rise in US$ 10 billion in portfolio flow has an effect of approximately 3 units in the opposite direction. In average, the absolute value of portfolio flows is around 8 billions.

Thereby, we infer that an increase in international liquidity has an ambiguous effect on real exchange rate. On one hand, portfolio flows appreciate the real exchange rate. As pointed out by Harvey's mental model, if agents expect a currency valuation, they adjust 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, argue 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 associated with a devaluation from two to three units. Hence, sound fundamentals may attract volatile capital. In addition, if we replace CA by terms of trade, the results are still ambiguous. In other

words, it can be positive or negative, although we stand that terms of trade are a better way to measure a country capability of generating flows in its favor.

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).[21] Thus, such measure may have a major role regarding the liquidity premia of DECs' currency.

Kaltenbrunner and Painceira (2015) suggest 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 Minsky'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, the price level of tradable goods are not significant, whereas the interaction between international reserves and exchange rate regime – shows that dirty floating exchange regime is 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. We stress that the stock of outstanding obligations, followed by portfolio flows, plays a major role on exchange rate. Thereby, instead of fundamentals, real exchange rate is driven by structural factors associated with currency's liquidity premia and by portfolio flows.

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:

$$\begin{aligned} RER = {} & \beta_0 + \beta_1 RER_{i,t-1} + \beta_2 pibperc_{i,t} + \beta_3 li_{i,t} + \beta_4 ca_{i,t} + \beta_5 pric_{i,t} + \beta_6 i_{i,t} + \beta_7 pi_{i,t} \\ & + \beta_8 gfa_{i,t} + \beta_9 fxrmr1_{i,t} + \beta_{10} fxrmr2_{i,t} + \beta_{11} fxrmr3_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \end{aligned} \tag{12}$$

The results for Equation (12) are presented in Table 4. 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.[22]

It is important to note that the BS effect is no longer significant. As argued above, the BS effect, even if significant, has a minor effect on real exchange rate. Moreover, the international liquidity has a positive effect on real exchange rate, validating its ambiguity.

Furthermore, the results suggest that there is some inertia in the exchange rate dynamics. The positive effect indicates that there is an appreciating trend regarding DECs' currency.

Table 4. Determinants of the real exchange rate, System-GMM (*one step robust*), 1990–2008.

	System-GMM	
Dependent variable: *R*	Large sample (I)	Reduced sample (II)
L.r	0.7838***(17.25)	0.8425***(19.43)
Pibperc	−0.0000(−0.12)	−0.0001(−0.34)
Li	0.0002(0.93)	0.0005*(1.74)
Ca	−0.1935***(−2.96)	−0.2181**(−2.17)
S	−0.0364(−0.83)	−0.0694(−1.40)
I	−0.0938(−1.39)	−0.1303***(−4.03)
Pi	0.1705**(2.35)	0.1029*(1.80)
Gfa	−0.1387***(−4.85)	−0.1262(−1.04)
fxrmr1	0.0000(1.15)	0.0000(1.09)
fxrmr2	0.0000**(2.32)	0.0000**(2.71)
fxrmr3	−0.0005**(−2.55)	−0.0004**(−2.38)
N	554	310
Arellano–Bond Test for AR(1) in first difference	$z = -3.10$	$z = -3.38$
H0: There is no first-order correlation in the residuals	pr = 0.00	pr = 0.00
Arellano–Bond test AR(2) in first difference	$z = -2.42$	$z = -1.63$
H0: There is no first-order correlation in the residuals	pr = 0.01	pr = 0.10
Hansen test for overidentification	χ^2 (125) = 37.31	χ^2 (89) = 19.55
H0: The model is well specified and all overidentifications are correct	Prob > χ^2 = 1.00	Prob > χ^2 = 1.00

Notes:The values of the *t*-statistic are in parenthesis. The regressions do not include time dummies. Independent variables possible non-exogenous: pibperc,ca, pric, gfa, i e pi.
*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

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.

In summary, the results of the econometric tests indicate 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 real exchange rate in the long-run. Besides, it suggests that financial factors may play the main role over the exchange rate.

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 have 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 confirm 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, policy-makers 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.

Notes

1. 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.
2. 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).
3. Money does not effect real production, engendering inflation only.
4. The definition of fundaments is not straightforward under conventional theory. So, it is hard to list it (Harvey 2001).
5. (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 1973, 114).
6. See Harvey (2009).
7. The Structuralist;) 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 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.
8. Prates and Andrade (2013) develop a similar argument.
9. This analysis can be extended to any assed denominated in domestic currency whose liquidity is similar, i.e. is like an investment in currency.
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. 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. Expected exchange rate is a function of portfolio flows.
13. The data show substantial cumulative changes over time when prices are measured at the sectoral level.

14. In the broad sample missing data is around 20%. The countries comprising the samples can be requested by email to authors.
15. It is possible that presence (or absence) of missing values is not random, which could lead to a specification bias.
16. As a robustness check, we use net foreign assets (NFA).
17. We do not consider the stock of other investments liabilities.
18. Test discussed by Wooldridge (2000) and developed in Stata by Drukker (2003).
19. For more details on the employed econometric methodology, see Cameron and Trivedi (2005), Greene (2003) and Wooldridge (2000).
20. For capturing the time-specific effect we used dummy variables that, for simplicity, will not be reported.
21. If we use Net Foreign Assets (NFA/GDP), the results are very similar. The results can be requested by email to authors.
22. In the broad sample, instead of variable's differences, we used orthogonal deviations. Hence, Arellano-Bond test is not valid.

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