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Currency Misalignments and Economic Growth: The Foreign Currency-Denominated Debt Channel

Carl Grekou

Highlights

- We revisit the currency misalignments - growth nexus.
- We evidence the existence of a foreign currency-denominated debt through which currency misalignments affects growth thanks to valuation effetcs.
- Compared to the traditional competitiveness channel, this foreign currency-denominated debt channel works in the opposite direction.

Abstract

The literature on the growth effects of currency misalignments, although prolific, revolves around two main axes: the export-oriented growth literature which attributes positive effects to undervaluations (competitiveness gains) and the Washington Consensus view according to which any deviations from equilibrium hamper economic growth. In this paper, relying on a panel of 70 developing and emerging countries, we evidence the existence of a foreign currency-denominated debt channel through which misalignments impact growth. Compared to the traditional competitiveness channel, this channel works in the opposite direction. In particular, we show that, unlike overvaluations, undervaluations are more likely to cause valuation effects that tend to dampen the competitiveness effect. The paper therefore reconciles the two strands of the literature: undervaluations may have indeed a positive growth effect, but it is crucial to take into account the possible costs related to these undervaluations to have a clearer picture of the net total effect.

Keywords

Equilibrium Exchange Rate, Currency Misalignments, Debt, Valuation Effects, Economic Growth.

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F3, F43, C33, O11.

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RESEARCH AND EXPERTISE ON THE WORLD ECONOMY

Currency misalignments and economic growth: the foreign currency-denominated debt channel[1]

Carl Grekou*

1. Introduction

There is an ongoing debate on whether the level of the real exchange rate (RER) is truly a potential impediment to economic growth. There is as yet no agreement, and two positions can be identified. The first, the export-led growth theory, based on conventional competitiveness arguments highlights the asymmetrical nature of currency misalignments, positing that economic growth tends to be fostered by undervaluations (competitiveness gains) while dampened by overvaluations (competitiveness losses) —see, among others, Béreau et al., 2012; Couharde and Sallenave, 2013. This view is supported by several studies illustrating the positive impact of undervaluations on growth through several transmission channels. For example, Elbadawi et al. (2009), Levy-Yeyati and Sturzenegger (2007), Rodrik (2008) explain this positive effect by respectively an increase in exports, an expansion of savings, of capital accumulation, and of investment as well as through learning-by-doing externalities in the tradable sector. On the contrary, the so-called *Washington Consensus* (WC, thereafter), coined by Williamson (1990), considers that the RER level should be consistent in the medium-run with macroeconomic objectives to promote growth. It should therefore be sufficiently competitive to ensure external balance without exceeding a threshold above which it could lead to internal imbalances (such as inflation, resource depletions). Thus, the WC view argues in favour of a real exchange rate close to its equilibrium level, i.e. that satisfying both external and internal balances. Any misalignment, i.e. deviation from this equilibrium level, is considered as prejudicial for growth.

More recently, open economy models, based on the Bernanke-Gertler-Gilchrist (1999) financial accelerator, have highlighted a transmission channel that can reconcile these two different viewpoints. Indeed, this literature shows, that, if a country's debt is denom-

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inated in foreign currency, the real exchange rate affects the country's net worth through a balance sheet effect and, in the presence of financial imperfections, also the cost of capital. This channel is particularly relevant for developing and emerging economies given their relatively large share of foreign currency-denominated debt and the presence of financial imperfections. In an earlier work, Grekou (2015) extends the empirical literature on the growth effect of currency misalignments by taking into account these valuation effects —stemming from the variation in the foreign currency-denominated (FCD) debt— and finds, for the CFA zone countries over the 1985-2011 period, that the competitiveness channel is dampened by the increase in the foreign currency-denominated debt due to valuation effects.

In this paper we investigate this issue further by examining (*i*) if currency misalignments affect the FCD debt through valuation effects, (*ii*) how this FCD debt channel interacts with the traditional competitiveness channel on economic growth, and (*iii*) whether the exchange rate regime plays a role in the diffusion of these valuation effects underlying the FCD debt channel. Accordingly, our empirical analysis proceeds in four steps. As a first step, we resort to the Behavioral Equilibrium Exchange Rate (BEER) approach to assess currency misalignments. We then examine the channels through which currency misalignments may influence economic growth, by distinguishing a direct transmission channel, the competitiveness channel, and an indirect one, the FCD debt channel, through which currency misalignments affect the FCD debt and economic growth. To this end, we rely on Bayesian techniques to address the issue of model uncertainty and then investigate the existence of the FCD debt channel using panel fixed-effects and system generalized method of moments (SGMM) estimators to ensure the robustness of our results. After identifying the existence of valuation effects, we analyze to what extent they are influenced by the exchange rate regime in place. In a final step, we conduct additional analyses to validate our results.

Considering a panel of 68 emerging and developing countries over the 1980-2015 period, our empirical analysis provides evidences on the existence of a foreign currency-denominated debt channel through which misalignments impact growth. Compared to the traditional competitiveness channel, this channel works in the opposite direction. In particular, we show that, in developing countries, unlike overvaluations, undervaluations are more likely to cause valuation effects that tend to dampen the competitiveness effect. The paper therefore reconciles the two strands of the literature: undervaluations may have indeed a positive growth effect, but it is crucial to take into account the possible costs related to these undervaluations to have a clearer picture of the net total effect.

The paper proceeds as follows. In the next section, we review the main arguments that motivate our analysis. Section 3 presents our methodologies and describes the data. The results of our econometric analysis are discussed in Section 4. The last section provides some concluding remarks.

2. Theoretical considerations and related literature

2.1. Currency misalignments and growth

The extensive literature addressing the issue of the growth effect(s) of currency misalignments, usually considers currency misalignments as a serious threat to growth as they induce distortions in relative prices of non-traded to traded goods. This latter assertion has been empirically proven since the early works of Cavallo et al. (1990) and Ghura and Grennes (1991) which argue that better economic performances are usually linked to lower levels of real exchange rate misalignments. This is also the observation of international organisations which, with the "*Washington Consensus*", have maintained that both under- and overvaluation situations were bad for growth. The basic idea behind this statement is that the equilibrium level of the real exchange rate, by satisfying both internal and external balances, maximizes economic growth. If any deviation of the real exchange rate from this equilibrium level may have some benefits, it could also have costs: undervaluations may lead to overheating and unnecessary inflationary pressures while overvaluations may cause external imbalances. This view has been recently supported by results evidenced by Berg and Miao (2010) and Schröder (2013). The literature on the global imbalances (see, among others, Blanchard and Milesi-Ferretti, 2011) sheds more light on the need to limit currency misalignments and therefore also falls within this scope.

However, this strand of the literature has also been debated in the literature, being matched by the questioning of the Washington Consensus. Indeed, another view has progressively emerged maintaining that, beyond the size of misalignments, the effects of currency misalignments on growth could depend on the nature of these misalignments, i.e. depend on whether currencies are under- or overvalued. In particular, the export-oriented growth literature tempers the WC view, by pointing to asymmetrical impacts of misalignments on economic growth. Collins and Razin (1997) and Aguirre and Calderón (2005), show that nonlinearities are inherent to the currency misalignments-growth link: economic growth is positively correlated with undervaluations while negatively impacted by overvaluations. This result has been reinforced by several studies based on regime switching models (see for instance, Béreau et al., 2012; Couharde and Sallenave, 2013). To support the idea of a positive growth effect of undervaluations, some studies suggest a number of transmission channels. Among them, Rodrik (2008) argues that undervaluation has a positive effect on the relative size of the tradable sector, and especially of industrial economic activities which in turn may boost growth. For Elbadawi et al. (2009), the positive effect of undervaluations operates through export diversification and sophistication. Gala (2008) also supports the export-led growth theory but in his view, investment and technological change are the two important channels through which exchange rates levels affect growth.[2] A relatively undervalued currency should lead to lower real wage levels and higher profit margins and then contribute to more employment and investment by increasing capacity utilization. In the same vein, Gluzmann et al. (2011), in line with the work of Levy-Yeyati and Sturzenegger (2007), suggest that undervaluation fosters growth by the channel of savings and investment rather than foreign trade dynamics: an undervalued exchange rate tends to increase the investment and the domestic saving rate, which in turn stimulate economic growth by increasing the rate of capital accumulation.

2.2. The foreign currency-denominated debt channel

The different aforementioned transmission channels are so far those discussed in the literature. However, although less explored, there are reasons to believe that the effects of currency misalignments on growth might also be channelled by the debt and more precisely by the foreign currency-denominated debt through valuation effects.[3] With the inclusion of a FCD debt channel, two antagonistic effects can be associated to currency misalignments. Taking into account the potential asymmetric effect that currency misalignments may have on economic growth, it can be expected that undervaluation, on the one hand, fosters growth thanks to competitiveness gain, while at the same time hampering it —in the other hand— by increasing the burden of the FCD debt.[4] In a

[2] A relatively undervalued currency may also help to avoid financial crises and therefore put the economy on a more sustained development path.

[3] As aforementioned, the existence of this FCD debt channel in the currency misalignments-growth nexus, has been, to the best of our knowledge, addressed by Grekou (2015) —but only for the CFA zone countries. Most studies on valuation effects —and their output effects— concentrate on real exchange rate movements during currency crises (Céspedes, 2005; Frankel, 2005; Galindo et al., 2003).

[4] We do not discuss the effects of debt on growth. For a discussion on the effects of debt —namely the debt overhang theory, we refer to Cordella et al. (2005) and Patillo et al. (2011). Note also that we do not necessarily postulate that debt has always a negative impact on growth but rather that changes in the debt level due to valuation effects are negative for growth since they imply solely supplementary costs

similar way, it can be expected that overvaluation hampers growth via a competitiveness loss and meanwhile fosters it by reducing the FCD debt (FCD debt channel; positive valuation effects).[5] Ignoring these interactions between currency misalignments and the FCD debt could thus considerably blur our perception of the overall effect of currency misalignments. This is especially true for developing —and probably in a lesser extent for emerging— countries which are subject to valuation effects due to their currency variations and their important FCD debt stocks (Calvo and Reinhart, 2001; Céspedes et al., 2004). The depreciation of the domestic currency considerably increases the FCD debt burdens, leading thus to a decrease in firms production because of corporate financial distress, absence of trade credit and increasing costs of imported inputs and goods. These balance sheet effects also weaken the government fiscal position and the banks' balance sheets. Conversely, an appreciation reduces the value of the FCD debt and improves the ability to borrow. These balance sheet effects are inherent to developing/emerging countries as they generally cannot borrow in their own currencies (phenomenon better known as the "original sin"; see Eichengreen and Hausmann, 1999) and have therefore an important FCD debt stock. The causes of this situation are manifold but are primarily related to the financial markets development, the credibility of national macroeconomic policies and to institutional factors (Ul Haque, 2002; Goldstein and Turner, 2004). The exchange rate variations —and therefore misalignments— have thus important interactions with the FCD debt. Hence, ignoring these latter could considerably blur our perception of the overall effect of currency misalignments on economic growth.

An other key issue when dealing with identifying the diffusion of valuation effects on growth that has not received sufficient attention in the literature is how exposure to valuation effects on FCD debt may be impacted by the exchange rate regime (ERR, hereafter). The reason why this relationship matters is that basic economic theory tells us that the ERR might operate both directly on the valuation effects of FCD debt stocks and indirectly through the real exchange rate dynamics.

As stressed by Dubas (2009) and Coudert and Couharde (2009), fixed ERR coun-

without any provisioning of financial resources.

[5]It should however be noticed that this logic of the two antagonistic valuation effects (negative for undervaluation; positive for overvaluation) simply describes/underlies the FCD debt channel and in any manner postulates a "general rule". Indeed, depending on the misalignments regime (i.e. under- / overvaluations), other effects can be at work. This is especially true for the overvaluation regime for which the relationship between the change in the exchange rates and the debt is far for obvious. In fact, in contrast with the FCD debt channel mechanism, it can be expected that overvaluations stemming from appreciations, by easing financial conditions lead to an increase in the external debt (see the risk-taking channel; Bruno and Shin (2015a, 2015b), Kearns and Patel (2016)).

tries and more specifically pegged currencies tend to exhibit relatively more important misalignments (and consequently are more prone to currency crises). They are exposed to both valuation effects related to movements in the anchor currency and those related to parity adjustments. Moreover, as these countries benefit from credibility —conventionally associated to their irrevocable commitment to a fixed ERR— and guaranteed convertibility of their currency, they are more likely to borrow on financial markets. On the other hand, floating ERR are generally associated with higher volatility of the exchange rates in short-medium run —due to its sensitivity to expectations and news. Furthermore, putting together speculation with the observed hysteresis in exchange rate, the whole in an increasing financial integration context, the deviations are not corrected in the short/medium run and may even be exacerbated by further irrational behaviours. As a consequence, this short/medium run volatility is an important source of exchange rate misalignments, which may, under some circumstances, be even greater than under fixed ERR (Edwards, 1987). Thus, regarding this indirect effect of the ERR, one could expect less valuation effects for the ERR minimizing currency misalignments.

Regarding the direct impact of the ERR on the valuation effects, one can infer that the valuation effects on the debt stock might be weaker for pegged ERR if a part of the debt is denominated in the anchor currency. As a matter of fact, the extent to which the debt is denominated in foreign currency(ies) is often seen as one of the sources of fear of floating (Calvo and Reinhart, 2002). Indeed, due to the peg of the domestic currency (this is especially true in case of hard peg), the anchor currency denominated debt does not vary; so the larger the FCD debt composition in the anchor currency, the lower the valuation effects. However, valuation effects also depend on the credibility of the peg (Bleaney and Ozkan, 2011) and on the variations of the anchor currency vis-à-vis third currencies —in case of a multiple currencies composition of the FCD debt. Fixed ERR can thus isolate the economy from these valuation effects if the composition of the foreign indebtedness is coherent with the anchor currency or the basket peg and if the ERR is credible enough. Conversely, for floats, the valuation effects are total. The ERR might therefore play a catalytic/isolating direct role in the diffusion of the valuation effects underpinning the FCD debt channel.

In view of this, it appears that the relationship between currency misalignments and economic growth is not as straightforward as it seems, especially when considering the FCD debt channel. In addition, the relationship may be complicated by the diffusion of valuation effects associated with the ERR.

3. Empirical framework

3.1. Assessing equilibrium exchange rates and currency misalignments

The determination of the equilibrium real exchange rate (ERER) is a prerequisite to our analysis. In order to do so, different approaches are available (see Driver and Westaway, 2004).[6] However, three approaches are generally used in the literature: (*i*) the Fundamental Equilibrium Exchange Rate (FEER; Williamson, 1994) approach also called the *macroeconomic approach*; (*ii*) the Behavioral Equilibrium Exchange Rate (BEER; Clark and MacDonald, 1998) approach or the *macro-econometric approach*, and (*iii*) the external sustainability approach (IMF, 2006). In the FEER approach, currency misalignments are computed as the differences between the current account (CA) projected over the medium term at prevailing exchange rates and an estimated —or assumed— equilibrium current account, or "CA norm". The BEER approach directly estimates an equilibrium real exchange rate for each country as a function of medium- to long-term fundamentals of the REER. The external sustainability approach calculates the difference between the actual current account balance and the balance that would stabilize the net foreign asset position of the country at some benchmark level.

In this paper, we rely on the BEER approach to assess the equilibrium exchange rates. This choice is first motivated by the fact that the other two approaches have an important normative content. Indeed, one of the difficulties when assessing equilibrium exchange rates is to identify the long run equilibrium path of the economy. The BEER approach which is more pragmatic, does not require to estimate or to make assumptions on the long run values of the economic fundamentals (such as current account norms for instance) as in the FEER approach. Second, in contrast with the BEER approach, (*i*) the FEER approach does not take into account stock effects (through the dynamics of the net foreign asset position and of the stock of capital), and (*ii*) the external sustainability approach focuses on external balance therefore neglecting internal balance. Hence, the BEER approach allows us to take into account, for each country, both internal and external balance without any ad-hoc judgments.[7]

To assess the equilibrium real exchange rate (ERER), the BEER approach consists

[6] Indeed, the lack of consensus on the definition of equilibrium exchange rates has made it very difficult to establish a unique approach.

[7] We do not postulate that the BEER methodology achieves superior performance against other equilibrium exchange rate approaches. Indeed, all these approaches, far from being opposed to each other, are rather complementary insofar as they assess equilibrium exchange rates over different time horizons (Bénassy-Quéré et al., 2010). As such, the IMF *Consultative Group on Exchange Rate Issues* (CGER) methodology consists in using these three approaches (IMF, 2006).

in estimating a long-run relationship between the real exchange rate and a set of *fundamentals*, i.e. variables influencing the real exchange rate in the long run. This set of fundamentals derives from various theoretical models. Among many, the works of Edwards (1988, 1994), Elbadawi (1994), Hinkle and Montiel (1999) and Elbadawi and Soto (2008) have provided suitable theoretical and empirical frameworks to investigate equilibrium real exchange rates and their fundamentals in developing and emerging countries. We consider four fundamentals that have found to be the most important fundamentals of real effective exchange rates for emerging and developing countries: (*i*) the relative productivity of the tradable sector, (*ii*) the net foreign asset position, (*iii*) the terms of trade, and (*iv*) the government consumption. Hence, the long-run relationship to be estimated is the following:

$$reer_{i,t} = \mu_i + \beta_1 rprod_{i,t} + \beta_2 nfa_{i,t} + \beta_3 tot_{i,t} + \beta_4 gov_{i,t} + \varepsilon_{i,t} \qquad (1)$$

where $i = 1, \ldots, N$ and $t = 1, \ldots, T$ respectively indicate the individual and temporal dimensions of the panel. $reer_{i,t}$ is the real effective exchange rate (in logarithms), an increase in the index indicates a real appreciation; $tot_{i,t}$ is the logarithm of terms of trade, an increase indicates an improvement; $rprod_{i,t}$ stands for the relative productivity against country i's main trading partners (the Balassa-Samuelson effect) also expressed in logarithm; $nfa_{i,t}$ and $gov_{i,t}$ stand respectively for the net foreign asset position and the government consumption (in percentage of GDP). μ_i are the country-fixed effects and $\varepsilon_{i,t}$ is an error term. While an improvement in the net foreign assets position as well as an increase in the relative productivity is expected to appreciate the equilibrium real effective exchange rate, the impact of the changes in the terms of trade is theoretically ambiguous. This is because of the existence of two antagonistic effects: a positive substitution effect and a wealth effect.[8] The impact of changes in government consumption is also theoretically ambiguous. Indeed, as government consumption is biased towards non-traded goods, a rise in government consumption leads to an increase in the relative price of non-tradable goods and causes the equilibrium exchange rate to appreciate. On the other hand, a growing budget deficit might lead to a depreciation of the real exchange rate.

[8]Following an improvement in the terms of trade, domestic producers shift their production towards tradable goods. This will cause wages in this sector to increase relative to the ones in the non-tradable goods sector. Wages equalization across the sectors will then drive up the overall price level and thereby lead to a real appreciation. However, at the same time, a positive wealth effect (reflected in the improved current account) may generate higher demand for non-tradable goods and necessitate a real depreciation to restore internal balance.

Following the estimation of equation (1), currency misalignments are obtained from the difference between the observed real effective exchange rate ($reer_{i,t}$) and its equilibrium level ($reer^{*}_{i,t}$) —i.e. the fitted value of the real effective exchange rate derived from the estimation of equation (1):

$$Mis_{i,t} = reer_{i,t} - reer^{*}_{i,t} \tag{2}$$

Defined in such way, a negative sign indicates an undervaluation (i.e. $reer_{i,t} < reer^{*}_{i,t}$) whereas a positive sign indicates an overvaluation (i.e. $reer_{i,t} > reer^{*}_{i,t}$) of the real effective exchange rate.

3.2. Investigating the existence of the FCD debt channel

To investigate the existence of the FCD debt through which currency misalignments may impact economic growth, we adopt a rather simple approach.[9] More specifically, we first include in a growth equation variables related to the two aforementioned channels: the competitiveness channel and the FCD debt channel (see equation (3)). Indeed, the variables $Under$ (undervaluations) and $Over$ (overvaluations) are, as can be seen, incorporated directly as explanatory variables in the equation but also in interaction with two variables: $Exports$ and $Debt$.[10] The interactions between $Under/Over$ and $Exports$ are made to account for the competitiveness channel. The FCD debt channel is investigated via interaction terms between both undervaluations and overvaluations and the debt variable. Each of these interaction terms is supposed to (i) capture the effect of currency misalignments on the exports/debt, i.e. the competitiveness/valuation effect(s), and (ii) accountable the overall impact of this(ese) competitiveness/valuation effect(s) on economic growth —depending on the currency misalignments' regime (i.e. undervaluation or overvaluation).

$$\begin{aligned} \Delta y_{i,t} = {} & \mu_i + \lambda_t + \beta_1 Under_{i,t} + \beta_2 Over_{i,t} + \delta_1 Exports_{i,t} * Under_{i,t} \\ & + \delta_2 Exports_{i,t} * Over_{i,t} + \gamma_1 Debt_{i,t} * Under_{i,t} + \gamma_2 Debt_{i,t} * Over_{i,t} \\ & + \theta' X_{i,t} + u_{i,t} \end{aligned} \tag{3}$$

[9]While this simple approach can be questionable, we preferred this latter to threshold type of modelling —such as Panel Smooth Transition Regression (PSTR) model- because estimating such model implies a common threshold for all the economies. This point is highly debatable even if we are interested in average effect.

[10]The distinction between $Under$ and $Over$ is made to investigate the existence of asymmetries in the currency misalignments growth relationship.

where $i = 1, \ldots, N$ denotes the country, and $t = 1, \ldots, T$ the time. $\Delta y_{i,t}$, the dependent variable is the growth rate of real GDP per capita; $X_{i,t}$ is a k-dimensional vector of growth determinants including the FCD debt. μ_i (resp. λt) represent the country (resp. time) fixed effects, and $u_{i,t}$ is an independent and identically distributed error term.

Following equation (3), β_1 and β_2 capture the direct effect that under- and overvaluations exert on economic growth[11] while δ_1 and δ_2 capture the effect that under- and overvaluations exert on the exports —i.e. the competitiveness channel. The coefficients γ_1 and γ_2 in equation (3) capture the effect the FCD debt has on economic growth, conditional to currency misalignments, i.e. valuation effects. Statistically significant coefficient(s) will thus reflect the existence of valuation effects and therefore of a FCD debt transmission channel.

However, since the interpretation of the interaction terms can be puzzling, we focus in a second equation (see equation (4)) on the direct effects currency misalignments exert on the FCD debt. $Under$ is now taken in absolute values. Hence, ω_1 (resp. ω_1) capture the direct valuation effects on the FCD debt due to undervaluations (resp. overvaluations).

$$\Delta Debt_{i,t} = \mu_i + \lambda_t + \omega_1 Under_{i,t} + \omega_2 Over_{i,t} + \phi' X_{i,t} + u_{i,t} \qquad (4)$$

where $X_{i,t}$ is a set of control variables; μ_i and λ_t represent respectively the country fixed effects and time fixed effects, and $u_{i,t}$ is an independent and identically distributed error term.

3.3. Data

The first dataset used in this paper is related to the assessment of the currency misalignments. As aforementioned, these latter are deduced from the estimation of a long run relationship between the real effective exchange rate and a set of fundamentals. However, the focus of our analysis imposes us to construct specific real effective exchange rate indices to capture the effects of exchange rate changes through both the external trade channel (i.e. competitiveness effects) and the financial channel (i.e. valuation effects on the foreign currency-denominated debt). The real effective exchange rate indices we use are therefore the average of two real effective exchange rate indices: (i)

[11] Based upon the definition of misalignments (equation (2)), a negative coefficient on undervaluations (resp. overvaluations) supports the hypothesis that undervaluations (resp. overvaluations) foster (resp. harm) growth.

a trade-weighted real effective exchange rate, and (ii) a debt-weighted real effective exchange rate.

$$REER_{i,t} = \theta_{i,t}^{Trade} \times REER_{i,t}^{Trade} + \theta_{i,t}^{Debt} \times REER_{i,t}^{Debt} \quad (5)$$

where $REER_{i,t}^{Trade}$ (resp. $REER_{i,t}^{Debt}$) is the trade-weighted (resp. debt-weighted) real effective exchange rate. $\theta_{i,t}^{Trade}$ (resp. $\theta_{i,t}^{Debt}$) corresponds to the trade's (resp. debt's) weight, defined as follows:

$$\theta_{i,t}^{k} = \frac{k_{i,t}}{Trade_{i,t} + Debt_{i,t}} \quad (6)$$

Both real effective exchange rate indices are calculated as the weighted averages of real bilateral exchange rates against each partner as defined below:

$$REER_{i,t}^{k} = \prod_{j=1}^{N} \left(\frac{NER_{ij,t} \times P_{i,t}}{P_{j,t}} \right)^{w_{ij,k,t}} \quad (7)$$

where $NER_{ij,t}$ is the nominal bilateral exchange rate between the domestic country i and its partner j, measured as the foreign currency price of one unit of domestic currency. $P_{i,t} and \mathrm{P}_{j,t}$ stand respectively for the domestic and foreign price indices (in our case the consumer price indices) and $w_{ij,k,t}$ corresponds to the k-weight (i.e. trade weight or debt weight) attributed to partner j at period t.

We use the trade-weighted real effective exchange rates from the CEPII's $EQCHANGE$ database which are calculated vis-à-vis 186 trade partners using time-varying weights (see Couharde et al., 2017). Regarding the debt-weighted real effective exchange rates, we rely on the currency composition of the public and publicly guaranteed external debt stocks to define the weights (*World Development Indicators* database, World Bank).[12] More specifically, the weights —which sum to one— are derived from data on debt in US dollar, euro (and its predecessor currencies), British pound sterling, Japanese Yen, Swiss franc and Special Drawing Rights (SDR).[13] The nominal bilateral exchange rates are calculated using the country's nominal exchange rates vis-à-vis the US dollar, extracted from the *World Development Indicators* (WDI) database.

We use the overall weights and trade partners for the calculation of the relative pro-

[12]This issue of the debt measure is discussed further below.

[13]Since the SDR is a basket of currencies, we augmented the weights of these currencies using their share in the basket.

ductivity, proxied here by the relative real GDP per capita (in PPP terms).[14] The net foreign asset positions are extracted from the Lane and Milesi-Ferretti (2007) database (extended to 2014) and updated to 2015 using information on national current accounts (WEO, IMF *World Economic Outlook*). Data on terms of trade and the government consumption are from the WDI database.

The second dataset mobilized for this study is composed of the variables used for the growth regressions. We consider the real GDP per capita growth rate as the growth indicator —and so the dependent variable. Regarding the selection of the growth determinants, we follow the literature on growth determinants and model uncertainty (see for instance Sala-I-Martin, 1997; Mirestean and Tsangarides, 2009) to select an initial set of determinants then resort to Bayesian Model Averaging (BMA) techniques to tackle the issue of model uncertainty.[15] Based on the BMA results, we retain 9 growth determinants among an initial set of 23 potential determinants. First, we identify a robust effect of the Solow model's determinants and human capital variables namely, investment, population growth, life expectancy, age dependency ratio, and the initial level of GDP per capita. We also identify two macroeconomic variables as robust namely government consumption and the foreign currency-denominated debt.[16] Finally, two additional variables are identified as robust regressors of economic growth by the BMA approach: (*i*) a measure of regional major episodes of political violence (MEPV), and (*ii*) foreign direct investment. In addition to these determinants, we include dummy variables to account for (*i*) the Initiative for Heavily Indebted Poor Countries (HIPC initiative), and (*ii*) Crises.[17]

The issue of the debt measure

The debt measure plays a key role in our analysis. Among the different debt measures, we here rely on a composite debt (FCD debt, thereafter) which is the sum of the public and publicly guaranteed external debt stocks (PPG debt; see Figure 1) and of the IMF

[14]Due to a lack of available data at the sectoral level, PPP GDP per capita are usually used to approximate the relative productivity differentials between sectors. The *EQCHANGE*'s trade weights can be downloaded here: http://www.cepii.fr/CEPII/en/bdd_modele/tools.asp?id=34

[15]See Appendix C.

[16]The identification of the FCD debt, our key variable of interest, as a robust growth determinant further underlines the importance of the FCD debt transmission channel.

[17]The crises dummy variable —that scores 1 for crisis years; 0 otherwise— is constructed using information provided by Laeven and Valencia (2012) —updated to 2016. We consider all the different types of crises (i.e. systemic banking crisis, currency crisis and sovereign debt crisis).

credits.[18] Both series are from the WDI database. As can be seen in Figure 1, this debt, particularly the PPG debt —and contrary to what its name suggests, contains both public and private creditors and account for the largest share of the external debt. Compared to other debt series —from other sources such as the Bank for International Settlements (BIS), our FCD debt measure allows us to have —and by far— a wider coverage. Indeed, while the BIS debt statistics give data for 46 countries of our panel, there are only data on the US dollar/Euro composition of this debt. Furthermore, (locational) banking statistics cover only seven countries of our panel with available data (starting in the best case from 2000Q4) for only four of them.[19] Another motivation for this choice also lies in the fact that data on the currency composition of the external debt (US dollar, euro and pre-euro national currencies, Yen, British Pound, etc) are available only for the PPG debt —IMF credits are in Special Drawing Rights. While it could be argued that the PPG debt represents an important part of the total external debt (see Table 1) and, as such, one could extrapolate the currency composition of the PPG debt to the total external debt, we decided not to do so —at least in the baseline analysis— as it would introduce bias by potentially overestimating the debt currency weights. This is especially true for the EMEs as the share of the PPG debt (in the overall external debt stock) considerably decreases since the end of the 1980s (see Figure 4).

As a result of its importance, the availability of data on the FCD debt —and its currency composition— served as the main countries selection criterion.[20] Nonetheless, among the countries that crossed the data availability barrier, we excluded Indonesia and South Africa from our sample as the FCD debt levels were not significant. Overall, our initial sample consists of 68 developing countries and emerging economies and data covers the 1980-2015 period.[21] We rely on annual rather than 5-years averaged data. The reasons for doing so are various. First, while working with averaged data presents the advantage to remove business cycle effects from the growth rate, it has the disad-

[18] *"The public and publicly guaranteed debt" comprises long-term external obligations of public debtors, including the national government, political subdivisions (or an agency of either), and autonomous public bodies, and external obligations of private debtors that are guaranteed for repayment by a public entity."* World Bank, International Debt Statistics.

[19] By the way, note that the lack of data in the BIS banking statistics database (on the *total claims* and the *total liabilities*) obliges us to focus exclusively on the liabilities side of the banking sector and hence to not address specifically the issue of balance sheet effects owing from the valuation effects. More broadly, the lack of data on the assets side explains our focus on the liabilities side.

[20] Very few countries were excluded because of the lack of data regarding the exchange fundamentals or growth determinants.

[21] Our country groupings are that of the IMF see: https://www.imf.org/en/Publications/WP/Issues/2016/12/31/Classifications-of-Countries-Basedon-their-Level-of-Development-How-it-is-Done-and-How-it-24628

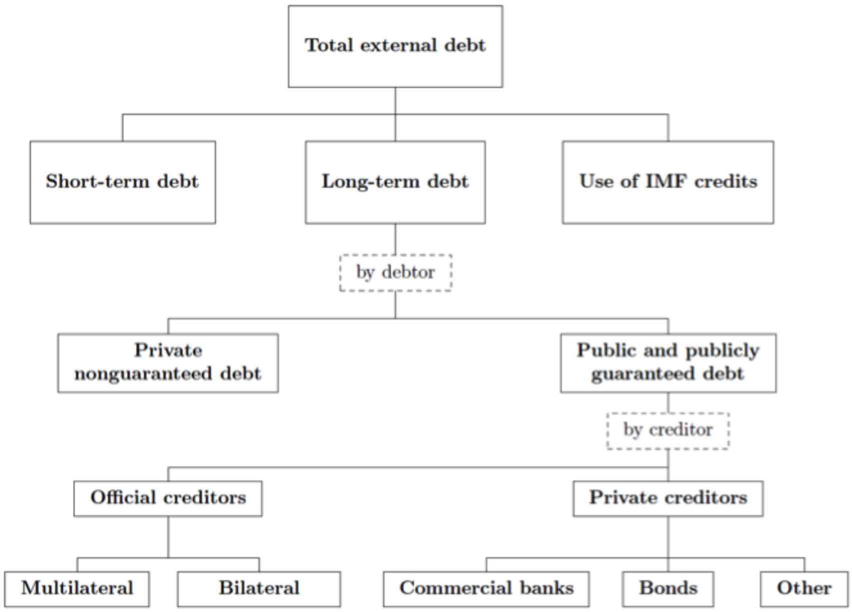

Figure 1 — External debt and its components

Source: International Debt Statistics 2017 (World bank), Appendix.
Note: Bonds include publicly issued and privately placed bonds. Credits of other private creditors include credits from manufacturers, exporters, and other supplier of goods, plus bank credits covered by a guarantee of an exports credit agency.

Table 1 — Summary statistics on debt

	DCs		**EMEs**	
	% Debt	% GDP	% Debt	% GDP
Total external debt		77.03 (73.8)		44.9 (30.73)
Short-term debt	9.06 (7.68)	7.61 (13.3)	16.1 (12.3)	7.72 (10.5)
Long-term debt	85.1 (8.90)	65.69 (61.8)	80.8 (12.5)	35.8 (23.7)
Private nonguaranteed debt	3.44 (8.51)	1.84 (4.58)	12.7 (14.9)	5.40 (8.48)
Public and publicly guaranteed debt	81.7 (12.8)	63.8 (61.9)	68.1 (20.1)	30.5 (23.6)
Official creditors	72.5 (20.1)	56.8 (56.0)	42.2 (24.8)	17.8 (15.0)
Private creditors	9.19 (12.3)	7.04 (12.9)	25.9 (18.1)	12.6 (15.1)
Use of IMF credits	5.77 (5.82)	3.06 (4.47)	3.15 (4.69)	1.34 (2.01)
Observations/ N° Countries	1450/43		1067/25	

vantage to be costly in observations. Furthermore, working with 5-years averaged data focus —more— on long run effects and therefore occult short-run effects like valuation effects. Second, the use of annual data is further motivated by the so-called Nickell's bias (1981) inherent to dynamic fixed effects model with a small time dimension (relative to the individual dimension). As we rely on annual data, the time dimension of the analysis (from 1980 to 2015) is sufficiently important so that the bias resulting from the use of basic panel data estimators is very weak, if not non-existent.[22] Finally, working with annual data eliminates the need to use average data of misalignments which can generate misleading time series and in turn leads to implausible results.

The list of countries as well as the details regarding the data (definitions, measurements, and sources) are respectively provided in Tables A.1 and A.2 in Appendix A.

4. Results

4.1. Estimating equilibrium exchange rates and assessing currency misalignments

We rely on the Cross-sectionally augmented Pooled Mean Group procedure (CPMG; see Pesaran, 2006; Binder and Offermanns, 2007; De V. Cavalcanti et al., 2015) to estimate the long-run relationship between the REER and the fundamentals. This latter procedure presents very appealing features. Among others, it provides consistent estimates of a long run relationship in presence of cross-sectional dependencies. Indeed, the CPMG procedure augments the Pooled Mean Group procedure (PMG; see Pesaran et al., 1999) with cross-sectional averages of the variables therefore accounting for unobservable common factors. Furthermore, the CPMG procedure, compared to other long run estimation procedures (e.g. Dynamic OLS, Fully-Modified OLS), takes better account of the potential heterogeneity between the countries as it allows short run dynamics heterogeneity for each member of the panel.[23] The CPMG procedure appears therefore as the best procedure to adequately capture not only the interdependences between the countries, but also each country particularities (e.g. resilience to shocks). However, as a condition for the efficiency of the CPMG estimator is the homogeneity of the long run parameters across countries, we also rely on the Cross-sectionally augmented Mean Group estimator (CMG) and test the long run slope homogeneity.[24] Table 2 presents the

[22]See Judson and Owen (1999) and Bun and Kiviet (2006).

[23]The short run dynamics heterogeneity is particularly important as it takes into account the countries' different short-run reactions to shocks (namely terms of trade shocks). Further note that all the mentioned procedures impose long run slope homogeneity but in the case of the CPMG procedure, this latter can be tested —Hausman-test type.

[24]The CMG procedure provides consistent estimates of the averages of long run coefficients, although they are inefficient if homogeneity is present. Under long run slope homogeneity, the CPMG estimates are consistent and efficient (De V. Cavalcanti et al., 2105). Furthermore, even if CPMG estimator can deal with both I(0) and I(1) variables, we performed second generation unit root and cointegration tests

CPMG and CMG estimates as well as the Hausman test statistic examining the panel heterogeneity.[25]

As can be seen, an increase in the productivity differential and an increase in the net foreign assets position lead to an appreciation of the equilibrium exchange rate. However, government consumption and the terms of trade are negatively signed, reflecting of a positive wealth effect that generate higher demand for non-traded goods and therefore necessitate a depreciation to restore the balance. According to the Hausman test, the long-run homogeneity restriction is not rejected for individual parameters and jointly in all regressions. We therefore focus on the CPMG estimates to calculate the equilibrium real exchange rates ($reer^{*}_{i,t}$) which correspond to the fitted value of $reer_{i,t}$ (see equation (1)). Currency misalignments are then obtained doing the difference between the observed real effective exchange rate and its equilibrium level, as indicated by equation (2).[26]

4.2. Currency misalignments and growth: the competitiveness and the FCD debt channels

4.2.1. Baseline results

To ensure that our results are robust, we run our different growth specifications by using system generalized method of moments (SGMM) —developed by Blundell and Bond (1998), in addition to the fixed effects (FE) estimator.[27] We also considered three estimation samples to carefully address the issue of heterogeneity. Results of the baseline regressions are reported in Table 3. While they differ in magnitude, they are qualitatively the same, regardless the estimation method.

(see Appendix B). Also note that the CPMG, by including leads and lags, deals with potential endogeneity issues related to the exchange rate data.

[25]While we only present in Table 2 results based on the whole sample, it is worthwhile noting that we carefully addressed the issue of heterogeneity in our panel by considering three estimation samples: (i) all countries, (ii) developing countries, and (iii) emerging economies. Results derived using the two sub-samples are consistent with those from the whole sample. Tables are not reported here to save space but are available upon requests.

[26]Figure D.1 in Appendix D displays the evolution of calculated currency misalignments.

[27]While GMM estimator is often used to deal with endogeneity issues owing from the inclusion of the lagged dependent variable as explanatory variable, we here relied on the GMM procedure mainly because it is well suited to deal with the other sources of endogeneity, i.e. generated regressors and reverse causality. Indeed, as aforementioned the structure of our panel (N and T) makes it difficult to take position regarding the superiority/appropriateness of FE estimator or SGMM estimator regarding the Nickell's (1981) bias. For the more skeptical, the SGMM estimator would provide robust estimates and would thus be appropriate. Furthermore, while the CPMG presents very appealing characteristics, it does not suit well with the analysis as we are not interested in long run relationships but rather short run effects like competitiveness and valuations effects.

Table 2 — Estimation of the long-run relationship

Dependent variable:	Δ.reer			
Estimation method:	CPMG		CMG	
	Coef.	Z	Coef.	Z
Long-run dynamic				
$rprod$	0.142***	3.91	0.313	1.35
nfa	0.132***	7.10	0.693***	4.08
tot	-0.127***	-2.74	0.175	0.65
gov	-1.000***	-4.16	0.055	0.03
$L.\overline{reer}$	1.031***	12.05	0.844***	3.54
$\overline{rprod}$	0.391**	2.24	-0.599	-0.86
$\overline{nfa}$	0.160***	2.87	-0.094	-0.57
$\overline{tot}$	-0.284	-0.85	-0.062	-0.06
$\overline{gov}$	-10.78***	-4.72	3.754	0.54
Short-run dynamic				
$ec.$	-0.145***	-6.74	-0.577***	-7.49
$\Delta rprod$	0.221	1.61	0.282*	1.87
Δnfa	0.189***	5.49	-0.129***	-2.72
Δtot	-0.102*	-1.64	0.053*	0.58
Δgov	1.306***	3.37	0.434	1.25
$\Delta\overline{reer}$	0.204*	1.93	0.729***	3.76
$\Delta\overline{rprod}$	-0.344*	-1.76	-0.352	-1.50
$\Delta\overline{nfa}$	-0.044	-1.51	-0.026	-0.17
$\Delta\overline{tot}$	-0.029	-0.17	0.546	1.44
$\Delta\overline{gov}$	-1.478	-1.45	-0.069	-0.03
$Constant$	0.659***	6.32	3.809***	2.85
Specification test				
Joint Hausman test[a]	5.97			
$[\chi^2(9)]$	[p-value = 0.7431]			

Notes: Symbols ***, **, and * denote significance at 1%, 5%, and at 10%. "Δ" (resp. "L.") is the difference operator (resp. the lag operator); "$ec.$" is the error correction term. The bars over the variables indicate the cross-sectional averages of these variables.
a: Null of long-run homogeneity

Looking first at the results derived considering the whole sample, it appears that currency misalignments, both undervaluations and overvaluations, negatively impact economic growth. Indeed, the coefficients associated to undervaluations and overvaluations are mostly significant and respectively positive and negative, supporting that growth is adversely affected by misalignments, regardless of their signs. These findings are in line with those of Schröder (2013) and support the WC view. They thus provide some *prima facie* evidence against the "traditional" export-led growth literature. Note however that, looking at the estimated coefficients, overvaluations tend to be more harmful than undervaluations. This point is reinforced when looking at the SGMM estimates based on the development level samples. Indeed, the effect associated to undervaluation is no longer significant. This perfectly illustrates the ambiguous effect exerted by currency misalignments on economic growth and especially undervaluations: while undervaluations might have positive effects, these latter are inhibited or offset by other negative effects.

Echoing these first observations, it is accordingly difficult to clearly establish for the whole sample the existence of the competitiveness channel with a positive effect (resp. negative effect) of undervaluations (resp. overvaluations) on exports. Indeed, only EMEs seem to benefit from undervaluations. This result is consistent with the findings of Elbadawi et al. (2009) which stressed that diversification and sophistication condition the positive effect of undervaluations.

Looking now at the FCD debt channel, it can be seen that valuation effects are indeed at stake. In fact, the interaction terms are significant and negative for undervaluations, reflecting a "negative" valuation effect: the negative impact exerted by the level of the FCD debt on economic growth tends to increase when the currency is undervalued. DCs, given the statistical significance of the coefficients, tend to be particularly exposed to such effects. Conversely, overvaluations tend to reduce the negative effect of the FCD debt on economic growth. However, the statistical significance of the coefficient is relatively weak. This latter is even not significant for EMEs.[28] Hence, valuation effects seem to be more prominent in the undervaluations' regime than in the overvaluations' one. As before, this holds particularly for the DCs group.

Regarding our set of control variables, we first note that the effect of the FCD debt on economic growth is negative and significant, which is in accordance with the literature (see among others, Cordella et al., 2005; Patillo et al., 2011). We also note that the *initial GDP per capita* coefficient is generally negative and significant, meaning that the conditional convergence hypothesis is verified. *Investment*, through its positive impact on capital accumulation, increases growth. The coefficients are positive and highly significant, regardless the estimation method. *Life expectancy* (following the FE estimates) and *foreign direct investment* (in the EMEs' case) also appear to be positively correlated with economic growth. Conversely, any increase in the *government consumption* (in the DCs' case) tends to hamper economic growth. The demographic variables (i.e. *population growth rate* and *age dependency ratio*) do not appear significant.[29] The picture is

[28]A possible explanation for this could be that of two antagonistic effects: overvaluations might indeed reduce the negative effect of the debt, but, at the same time, they could significantly reduce exports earnings which in turn worse the burden of servicing external debt. As a result, the debt increases (the loss in competitiveness leads to a recurring indebtedness to finance the economy and to service debt). In the absence of statistical significance for our coefficients, one may conclude that the competitiveness/income effect outweighs the valuation effect. In addition to these effects, one can also posit —as discussed above— that exchange rate appreciation, by easing financial conditions, leads to an increase in external debt thanks namely to higher banks' leverage (see Bruno and Shin, 2015).

[29]By the way, note that the fact that some growth determinants are not significant — contrary to the

Table 3 — Growth regressions, the FCD debt channel

Dependent var.:	GDP per capita growth rate (Δy)					
Sample	All countries		DCs		EMEs	
	FE	SGMM	FE	SGMM	FE	SGMM
	(3.1)	(3.2)	(3.3)	(3.4)	(3.5)	(3.6)
Variables of interest						
Under	0.012**	0.012***	0.012**	0.009	0.051*	0.029
	(0.005)	(0.004)	(0.005)	(0.008)	(0.025)	(0.045)
Over	-0.025***	-0.059***	-0.031***	-0.057***	-0.015	-0.088**
	(0.008)	(0.016)	(0.008)	(0.019)	(0.022)	(0.034)
Exports	0.033*	0.145***	0.058***	0.178***	-0.010	0.044
	(0.019)	(0.030)	(0.020)	(0.039)	(0.019)	(0.048)
Debt	-0.043***	-0.053***	-0.047***	-0.046**	-0.058***	-0.067**
	(0.008)	(0.013)	(0.009)	(0.019)	(0.013)	(0.027)
$Under * Exports$	0.012	0.024	-0.004	0.019	0.123*	0.140*
	(0.019)	(0.025)	(0.023)	(0.019)	(0.066)	(0.078)
$Over * Exports$	-0.017**	-0.024*	-0.015	-0.037*	0.044	0.100
	(0.007)	(0.013)	(0.009)	(0.018)	(0.058)	(0.081)
$Under * Debt$	-0.011***	-0.018***	-0.011***	-0.016**	-0.101**	-0.128*
	(0.002)	(0.004)	(0.002)	(0.006)	(0.041)	(0.065)
$Over * Debt$	0.012**	0.031*	0.014**	0.036*	0.010	0.085
	(0.006)	(0.015)	(0.007)	(0.018)	(0.035)	(0.059)
Growth determinants						
l.y	-0.031***	-0.019***	-0.039***	-0.017	-0.029***	-0.024**
	(0.007)	(0.006)	(0.011)	(0.013)	(0.007)	(0.008)
Invest.	0.117***	0.203***	0.095***	0.168***	0.202***	0.328***
	(0.022)	(0.040)	(0.027)	(0.051)	(0.043)	(0.074)
Pop.	-0.130	-0.221	-0.059	0.166	-0.384	-0.368
	(0.208)	(0.614)	(0.203)	(1.748)	(0.273)	(0.378)
Life	0.230**	-0.017	0.239**	0.507	1.059**	-1.212
	(0.091)	(0.517)	(0.112)	(2.259)	(0.380)	(1.188)
Age.dep	0.007*	-0.005	0.0001	-0.007**	0.032	-0.005
	(0.004)	(0.003)	(0.006)	(0.003)	(0.029)	(0.005)
FDI	-0.009	-0.011	-0.044	-0.070	0.192**	0.441***
	(0.043)	(0.056)	(0.045)	(0.055)	(0.093)	(0.122)
Gov.	-0.069**	-0.142**	-0.102***	-0.226***	-0.060	-0.079
	(0.029)	(0.065)	(0.032)	(0.076)	(0.043)	(0.074)
MEPV	0.001	0.002	0.005	0.008	0.002	-0.004
	(0.001)	(0.003)	(0.004)	(0.008)	(0.001)	(0.004)
HIPC	-0.022***	-0.011	-0.015**	-0.008	(omitted)	(omitted)
	(0.005)	(0.007)	(0.006)	(0.009)		
Crisis	-0.015***	-0.016***	-0.005	-0.009	-0.021***	-0.019***
	(0.004)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)
Constant	0.177***	0.140**	0.257***	0.127	0.047	0.180**
	(0.054)	(0.055)	(0.086)	(0.129)	(0.125)	(0.083)
R-sq.	0.194		0.192		0.400	
Obs./Countries	2119/68	2119/68	1295/43	1295/43	824/25	824/25
$\beta_{Und.} - \beta_{Over} = 0$	0.004	0.000	0.001	0.006	0.142	0.032
AR(2) test		0.269		0.688		0.415
Hansen test		0.743		0.980		1.000

Notes: ***, **, and * denote the levels of statistical significance at 1, 5, and 10%. Robust standard errors are reported in parentheses: robust clustered (resp. Windmeijer correction) standard errors for FE (resp. for two-step SGMM). For the S.GMM estimations, we consider $MEPV$ and $HIPC$ as exogenous and the rest as endogenous. For the "AR(2) test" and "Hansen test", we report the p.values. In line "$\beta_{Und.} - \beta_{Over} = 0$" we test the significance of the difference between the under- and overvaluation coefficients; we report the *p*.values.

also the same regarding *MEPV*.

All in all, the analysis reveals that currency misalignments affect growth through not only the competitiveness channel but also through the FCD debt channel thanks to valuation effects. These effects appear to be important in DCs while dampen/inexistent in the EMEs group. The above analysis on the effects of currency misalignments on the FCD debt, all in a growth equation framework, is however an indirect approach to highlight the existence of valuation effects on the FCD debt —but a necessary one to highlight the existence of the FCD debt channel. Indeed, coefficients derived from the latter are those of interaction terms and as such can be somewhat difficult to interpret. As an alternative to the above approach, we now go upstream in the currency misalignments - FCD debt - economic growth relationship by investigating the direct effect of currency misalignments on the FCD debt. More specifically, we now directly regress the FCD debt on currency misalignments (both under- and overvaluations in absolute values) so that coefficients can be more easily interpretable. Results are reported in Table 4.

As can be seen, regarding our two variables of interest (i.e. $Under$ and $Over$), only $Under$ appears to be significant —except in the EMEs' case. This latter is associated with positive coefficients thus confirming our previous results: the FCD debt tends to increase when the currency is undervalued. Overvaluations however do not seem to reduce the FCD debt. As stated above, this could be attributed to the relative importance of the competitiveness/income effect over the valuation effect or to the fact that by easing the financial conditions, overvaluations are also associated to an increase in the external debt (the risk-taking channel). Regarding the control variables, the real GDP per capita growth and the HIPC initiative dummy appear to be important determinants of the FCD debt. Indeed, both appear —rightly— with negative and significant coefficients. Trade surplus and debt forgiveness also considerably impact debt. However, the socio-political context ($MEPV$) does not appear to influence debt while crisis periods are associated with higher debt.

Results in Table 4 thus confirm our previous conclusions from Table 3. The effect of currency misalignments on economic growth is also conveyed in DCs by valuation effects on the stocks of the FCD debt.

Bayesian analysis results— is due to the standard errors corrections applied here.

Table 4 — The effects of currency misalignments on debt

Dependent var.:	$\Delta Debt$					
Estimation proc.	FE			SGMM		
Sample	All countries	DCs	EMEs	All countries	DCs	EMEs
	(4.1)	(4.2)	(4.3)	(4.4)	(4.5)	(4.6)
$l.Debt$	0.824***	0.808***	0.882***	0.868***	0.855***	0.975***
	(0.009)	(0.011)	(0.032)	(0.047)	(0.042)	(0.026)
$Under$	0.048***	0.071***	-0.026	0.065***	0.069**	-0.019
	(0.014)	(0.019)	(0.024)	(0.023)	(0.030)	(0.082)
$Over$	-0.006	-0.008	-0.031	0.153	0.144	0.056
	(0.016)	(0.020)	(0.031)	(0.128)	(0.135)	(0.038)
$HIPC$	-0.075***	-0.063***	(omitted)	-0.041**	-0.052***	(omitted)
	(0.013)	(0.018)		(0.016)	(0.019)	
$GDP\ growth$	-0.579***	-0.507***	-0.759***	-0.634***	-0.623***	-0.860***
	(0.066)	(0.091)	(0.162)	(0.132)	(0.201)	(0.211)
$MEPV$	-3E-04	-0.009	0.003	-0.002	-0.008	0.007*
	(0.006)	(0.013)	(0.003)	(0.004)	(0.009)	(0.004)
$Trade\ balance$	-0.260***	-0.332***	-0.103	-0.237***	-0.247***	-0.046
	(0.041)	(0.055)	(0.061)	(0.075)	(0.076)	(0.069)
$Debt$	-0.874***	-0.865***	-0.950***	-0.668**	-0.650***	-0.935
$forgiveness$	(0.065)	(0.083)	(0.291)	(0.265)	(0.228)	(0.999)
$Crisis$	0.089***	0.122***	0.032***	0.090***	0.124***	0.027**
	(0.009)	(0.016)	(0.009)	(0.017)	(0.026)	(0.013)
$Constant$	0.094***	0.124***	0.061***	0.049***	0.069***	0.011
	(0.019)	(0.031)	(0.011)	(0.011)	(0.019)	(0.011)
R-sq.	0.890	0.894	0.908			
Obs./ Countries	2207/68	1360/43	847/25	2207/68	1360/43	847/25
AR(2) test				0.765	0.868	0.901
Hansen test				0.151	0.962	0.945

Notes: ***, **, and * denote the levels of statistical significance at 1, 5, and 10%. Robust standard errors are reported in parentheses: robust clustered (resp. Windmeijer correction) standard errors for FE (resp. for two-step SGMM). For the S.GMM estimations, we consider $MEPV$ and $HIPC$ as exogenous and the rest as endogenous. For the "AR(2) test" and "Hansen test", we report the p.values.

4.2.2. Explaining the differences between DCs and EMEs

In order to explain the above results, we plotted in Figure 2 the distribution of the estimated currency misalignments and that of our measure of FCD debt for both DCs and EMEs. As can be seen, the divergences in the results may come from the different patterns in the data. Indeed, a noticeable difference between the two groups is related to the dynamics of currency misalignments. While the distribution of currency misalignments in EMEs appear to be centered, that of the DCs group is negatively skewed and much more spread. DCs have thus experienced more important currency misalignments compared to the EMEs.

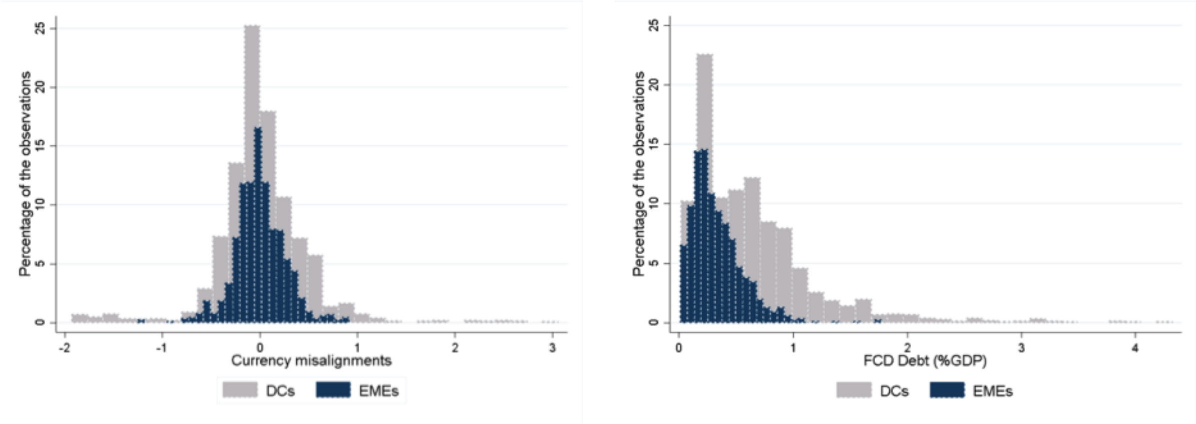

Figure 2 — Distributions of the currency misalignments / PPG Debt

Table 5 — Descriptive statistics

		Mis	Under	Over	Debt
	Obs.	1468	793	675	1468
DCs	Mean	-5.6%	-39.8%	34.5%	66.9%
	(St. Dev.)	(0.719)	(0.756)	(0.397)	(0.651)
	Obs.	871	458	413	871
EMEs	Mean	-0.4%	-18.5%	19.7%	33.3%
	(St. Dev.)	(0.259)	(0.173)	(0.177)	(0.227)
*Diff.**	*Z*	-0.052	-0.212	0.147	0.336
	(Prob.)	(0.011)	(0.000)	(0.000)	(0.000)

Note: In the line ⌊*Diff.*⌋, we test the equality of means between the two samples using the two-sample Wilcoxon rank-sum (Mann-Whitney) test. Variance and normality tests have driven this choice.
* : null of means equality

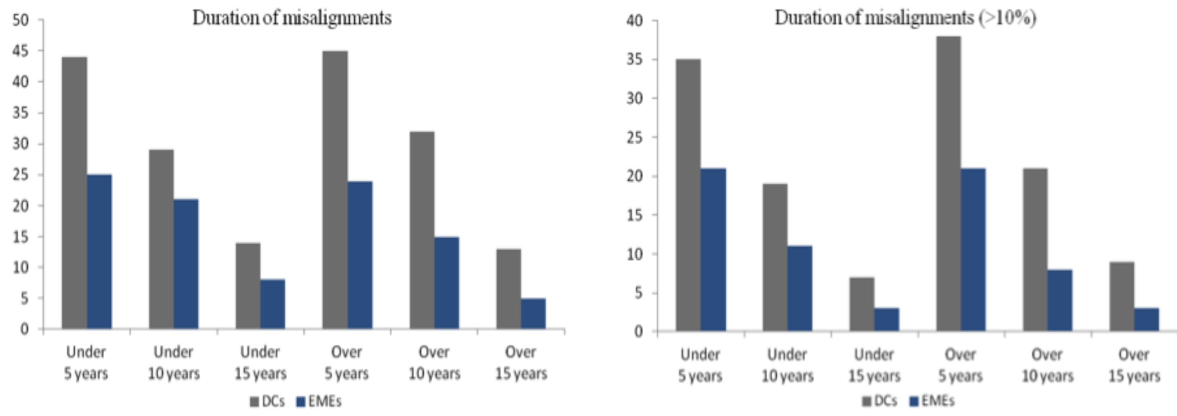

Figure 3 — Duration of misalignments

Notes: we represented the number of countries with undervaluations (resp. overvaluations) lasting at least x years. The considered misalignments differ between the two charts: the left chart considers the calculated misalignments while the right chart considers misalignments higher or equal to 10%.

Table 5 by providing further indications on this allows taking full account of the extent of currency misalignments in DCs and EMEs. While in DCs the average undervaluation is equal to -39.8%, it is -18.5% in EMEs; the average overvaluations in DCs and EMEs are respectively of 34.5% and 19.7%. As shown by the test, the differences between the two groups are not negligible and might, due to the existence of nonlinearities in the misalignments-growth nexus, contribute to explain the difference in the results regarding the effects of both undervaluations and overvaluations. Another interesting fact is captured in Figure 3: the duration of currency misalignments is also more important in DCs. These latter have therefore, in average, suffered longer from the costs related to the departures from the equilibrium levels.

The differences regarding the FCD debt are also of interest. As shown in Table 5 and in the right chart of Figure 2, the level of FCD debt in EMEs is in average half of that of DCs.

However, combining all the above observations on the levels of both currency misalignments and FCD debt in DCs and EMEs may only explain partially the "absence" of valuation effects on the FCD debt in EMEs. Indeed, given the levels of currency misalignments, their duration, and particularly the level of debt in EMEs, it could be argued that the valuation effects are relatively weak and therefore difficult to highlight. This would, however, be a "back door" in that we would neglect/omit the importance of the exchange rate management (or exchange rate regime). Indeed, the exchange rate policy plays a central role in the diffusion of valuation effects. It operates, as aforementioned, at two interlinked levels: (*i*) the composition of the FCD debt and, (*ii*) the dynamics of the exchange rate. While the exchange rate regime is reflected in the exchange rate dynamics, itself reflected in the currency misalignments, the issue of the currency composition of the FCD debt and its coherence with the exchange rate regime requires more effort. As an attempt, we reported in Table 6 the different currencies' average shares in the FCD debt and the average correlation between the domestic currencies and these currencies. To avoid a double-counting between the debt stocks denominated in French Franc and Deutsche Mark on the one hand, and the stock denominated in euro on the other, we consider two periods delimited by the introduction of the euro. As can be seen, both DCs and EMEs have the greatest share of their FCD debt denominated in US dollar. However, DCs (most specifically the domestic currencies) display very low correlation with the US dollar in period 1 (0.056) and even a weaker one in period 2 (0.027). In contrast, the average correlation between the domestic currencies and the US dollar in EMEs is 0.675 in period 1 and 0.457 in period 2.

Table 6 — FCD debt weights and currency correlations

	DEM	FRF	EUR	JPY	GBP	CHF	USD
DCs							
Period 1							
Weight	0.043	0.187	—	0.051	0.045	0.021	0.654
(St. Dev.)	(0.053)	(0.163)	—	(0.060)	(0.047)	(0.035)	(0.178)
Corr.	-0.102	0.337	—	-0.163	0.170	-0.083	0.056
(St. Dev.)	(0.261)	(0.250)	—	(0.156)	(0.157)	(0.172)	(0.243)
Period 2							
Weight	—	—	0.182	0.023	0.008	0.014	0.773
(St. Dev.)	—	—	(0.144)	(0.046)	(0.013)	(0.034)	(0.156)
Corr.	—	—	-0.101	-0.012	0.201	-0.323	0.027
(St. Dev.)	—	—	(0.635)	(0.122)	(0.299)	(0.628)	(0.440)
EMEs							
Period 1							
Weight	0.077	0.076	—	0.139	0.034	0.011	0.663
(St. Dev.)	(0.040)	(0.065)	—	(0.108)	(0.025)	(0.011)	(0.132)
Corr.	-0.662	0.305	—	-0.823	0.725	-0.653	0.675
(St. Dev.)	(0.197)	(0.311)	—	(0.117)	(0.151)	(0.152)	(0.243)
Period 2							
Weight	—	—	0.159	0.112	0.007	0.002	0.720
(St. Dev.)	—	—	(0.191)	(0.118)	(0.010)	(0.004)	(0.224)
Corr.	—	—	-0.358	0.043	0.128	-0.432	0.457
(St. Dev.)	—	—	(0.453)	(0.265)	(0.391)	(0.549)	(0.469)

Notes: "*Weights*" indicates the average weight (share) of the *x*-currency denominated debt; "*Corr.*" indicates the average correlation between the changes in the domestic currency and those of currency *x*. "*St. Dev.*" stands for the standard deviation. Period 1 ends with the introduction of the euro (EUR). All the currencies are expressed relative to the Special Drawing Rights (SDR).

Table 7 — Correlation between the currencies

		DEM	FRF	EUR	JPY	GBP	CHF	USD
DEM	Period 1	1.000						
FRF	Period 1	0.824	1.000					
EUR	Period 2			1.000				
JPY	Period 1	0.162	0.063	—	1.000			
	Period 2			0.214	1.000			
GBP	Period 1	0.210	0.467	—	0.030	1.000		
	Period 2			-0.413	-0.667	1.000		
CHF	Period 1	0.760	0.509	—	0.294	0.141	1.000	
	Period 2			-0.267	0.519	-0.227	1.000	
USD	Period 1	-0.808	-0.794	—	-0.504	-0.5773	-0.680	1.000
	Period 2			-0.059	-0.039	-0.3224	-0.407	1.000

Furthermore, as reported in Table 7, the US dollar displays negative correlations with the other currencies composing the FCD debt. Hence, the valuation effects due to the changes in the US dollar cannot be balanced by those owing from the other currency variations. As they display more important correlation with the US dollar, EMEs, in contrast to DCs, are less subject to valuation effects as they are mainly related to the changes in the US dollar. All in all, it seems that the explanation for the absence of valuation effects in EMEs is not only an active management of the exchange rate —which result in tapered misalignments, but also a coherence between the structure/composition of the FCD debt and the exchange rate policy.

5. Further results

As any empirical analysis, the above results might be dependent on many factors such as the data we used or the methodological approach we relied on. In this section, we conduct a number of additional analyses —or robustness checks— in order to confirm or infirm these latter. We mainly address three issues: (*i*) the debt measure, (*ii*) the stability of the estimates, and (*iii*) a third channel effect.

All in all, these additional analyses support the previous conclusions on the existence of the FCD debt channel.[30]

5.1. Another debt measure

Among issues that might have plagued our analysis, that of the debt measure could be one of the most important. So far, we relied on the public and publicly guaranteed (PPG) external debt stocks augmented by the IMF credits. As can be seen in Figure 4, the PPG debt, while representing a considerable part of the total external debt in DCs (80% in average), dramatically decreased in EMEs since the end of the 1980s. This decrease in the PPG debt in EMEs was however accompanied/compensated by an increase in the private non-guaranteed (PNG) debt; debt for which the currency composition is unknown.

This implies a difficult choice regarding the debt measure. On the one hand, the PPG debt represents only a share (a bit more than half at the end of period) of the external debt in EMEs but the currency composition is known; on the other hand, the total external debt might include not only foreign currency-denominated debt but also domestic currency-denominated debt and neither the share of these two latter nor the currency composition are known. By relying previously on the PPG debt and the IMF credits, we have potentially underestimated the "actual" FCD debt but did not make any assumptions about its currency composition. We now explore the second alternative

[30] We also addressed other issues related to the currency misalignments measure: (*i*) outliers via trimming/winzorisation and (*ii*) Atheoretical Permanent Equilibrium Exchange Rate (APEER) based currency misalignments for alternative measures. The results —not reported here but available upon requests— do not reverse the previous conclusions.

by using the entire external debt stock. Hence, we implicitly assume that the currency composition of this latter is identical to that of our previous debt measure, i.e. mainly denominated in US dollar as EMEs and DCs can usually not borrow abroad in their own currency (Eichengreen et al., 2005). Results of the analyses using the entire external debt stocks are reported in Tables 8 and 9. As it can be seen, the results are consistent with those obtained so far: the use of the entire external debt stock does not alter the results.

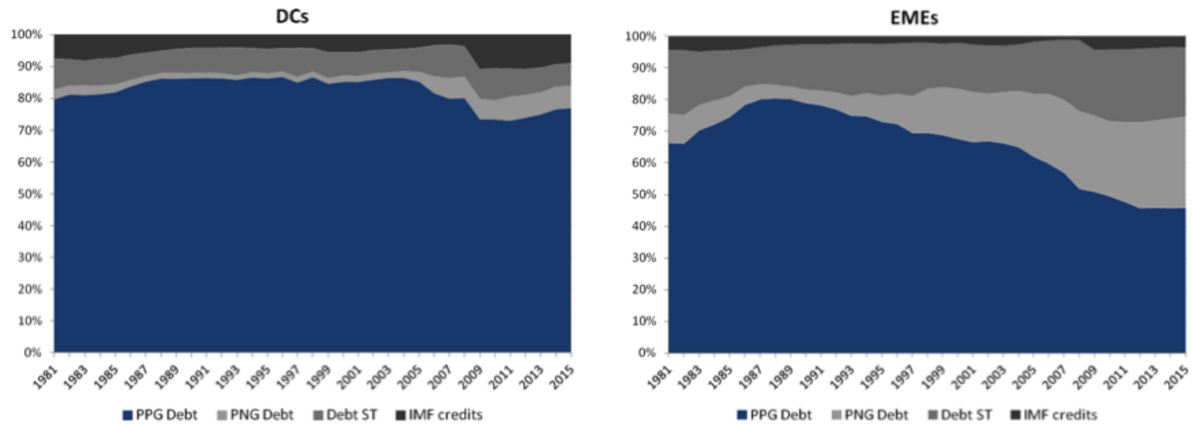

Figure 4 — Evolution of the external debt components

5.2. Stability of the estimates (structural breaks)

The focus of this section is on assessing the stability of the model parameters —especially the stability of the coefficients on the variables of interest— over the sample period.

Indeed, as can be seen in Figure D.1 in Appendix D, most of the currency misalignment graphs exhibit important breaks (mostly due to sudden depreciation/devaluation episodes or crises). Since currency misalignment is the key variable of the analysis, taking into account such breaks is important in order to not bias the results. As it is often the case, we included dummy variables and time fixed-effects to account for these breaks. We now investigate to what extent this strategy insulated the results.

As a first approach to detect breaks and particularly structural breaks, we plotted in Figure 5 the residuals from the estimations based on the whole sample (both panel fixed-effects and system GMM procedures). As can be seen, both graphs are not in resonance with the existence of "structural breaks" —in the sense of common breaks— within the panel.[31]

[31]The plots of the residuals from the estimations on development sub-samples lead to the same conclusion.

Table 8 —The FCD debt channel (an alternative debt measure)

Dependent var.:	GDP per capita growth rate (Δy)					
Sample	All countries		DCs		EMEs	
	FE	SGMM	FE	SGMM	FE	SGMM
	(8.1)	(8.2)	(8.3)	(8.4)	(8.5)	(8.6)
Variables of interest						
Under	0.010*	0.013***	0.010*	0.012	0.042	0.015
	(0.005)	(0.004)	(0.005)	(0.008)	(0.025)	(0.038)
Over	-0.021**	-0.056***	-0.027***	-0.051***	-0.002	-0.088**
	(0.008)	(0.017)	(0.008)	(0.017)	(0.023)	(0.033)
Exports	0.036*	0.137***	0.059***	0.186***	-0.007	0.028
	(0.019)	(0.030)	(0.020)	(0.040)	(0.021)	(0.037)
Debt	-0.0318***	-0.048***	-0.037***	-0.041***	-0.034**	-0.061**
	(0.007)	(0.011)	(0.008)	(0.012)	(0.014)	(0.025)
$Under * Exports$	0.019	0.027	0.002	0.013	0.138**	0.148*
	(0.019)	(0.023)	(0.025)	(0.023)	(0.063)	(0.077)
$Over * Exports$	-0.015**	-0.023*	-0.013	-0.029*	0.042	0.096
	(0.007)	(0.012)	(0.010)	(0.016)	(0.056)	(0.079)
$Under * Debt$	-0.009***	-0.019***	-0.010***	-0.017***	-0.073	-0.089
	(0.002)	(0.004)	(0.0026)	(0.005)	(0.044)	(0.071)
$Over * Debt$	0.007	0.028*	0.010	0.025	-0.013	0.092
	(0.005)	(0.015)	(0.007)	(0.019)	(0.037)	(0.065)
Growth determinants						
I.y	-0.028***	-0.019***	-0.037***	-0.021*	-0.027***	-0.019**
	(0.007)	(0.006)	(0.011)	(0.011)	(0.006)	(0.007)
Invest.	0.116***	0.200***	0.091***	0.148***	0.221***	0.314***
	(0.022)	(0.042)	(0.026)	(0.046)	(0.038)	(0.059)
Pop.	-0.123	-0.541	-0.039	-0.057	-0.486*	-0.296
	(0.216)	(0.587)	(0.208)	(1.884)	(0.256)	(0.493)
Life	0.211**	0.319	0.218*	0.376	1.004***	-0.668
	(0.092)	(0.568)	(0.111)	(1.813)	(0.356)	(1.052)
Age.dep	0.007*	-0.006**	0.0015	-0.007**	0.029	-0.009**
	(0.004)	(0.003)	(0.006)	(0.003)	(0.027)	(0.004)
FDI	0.004	-0.013	-0.035	-0.045	0.232**	0.421***
	(0.043)	(0.054)	(0.043)	(0.057)	(0.084)	(0.097)
Gov.	-0.070**	-0.147**	-0.097***	-0.207**	-0.080*	-0.146***
	(0.029)	(0.064)	(0.030)	(0.078)	(0.040)	(0.052)
MEPV	5E-04	0.002	0.004	0.006	0.002	-0.005
	(0.001)	(0.003)	(0.004)	(0.007)	(0.001)	(0.004)
HIPC	-0.019***	-0.012**	-0.012*	-0.004	(omitted)	(omitted)
	(0.005)	(0.006)	(0.006)	(0.007)		
Crisis	-0.015***	-0.015***	-0.005	-0.009	-0.020***	-0.017***
	(0.004)	(0.005)	(0.006)	(0.006)	(0.005)	(0.005)
Constant	0.147***	0.159***	0.229***	0.161	0.042	0.183**
	(0.051)	(0.056)	(0.084)	(0.103)	(0.118)	(0.068)
R-sq.	0.188		0.186		0.400	
Obs./Countries	2119/68	2119/68	1295/43	1295/43	824/25	824/25
$\beta_{Und.} - \beta_{Over} = 0$	0.017	0.000	0.004	0.004	0.334	0.028
AR(2) test		0.246		0.663		0.415
Hansen test		0.740		0.990		1.000

Notes: ***, **, and * denote the levels of statistical significance at 1, 5, and 10%. Robust standard errors are reported in parentheses: robust clustered (resp. Windmeijer correction) standard errors for FE (resp. for two-step SGMM). For the S.GMM estimations, we consider *MEPV* and *HIPC* as exogenous and the rest as endogenous. For the "AR(2) test" and "Hansen test", we report the p.values. In line "$\beta_{Und.} - \beta_{Over} = 0$" we test the significance of the difference between the under- and overvaluation coefficients; we report the *p*.values.

Table 9 — The effects of misalignments on debt (an alternative measure)

Dependent var.:	ΔDebt					
Estimation proc.	FE			SGMM		
Sample	All countries	DCs	EMEs	All countries	DCs	EMEs
	(9.1)	(9.2)	(9.3)	(9.4)	(9.5)	(9.6)
l.Debt	0.805***	0.783***	0.877***	0.861***	0.861***	0.863***
	(0.011)	(0.014)	(0.027)	(0.060)	(0.063)	(0.050)
Under	0.211***	0.262***	-0.066*	0.107**	0.123**	-0.122
	(0.021)	(0.027)	(0.034)	(0.053)	(0.059)	(0.120)
Over	0.061**	0.071**	-0.010	0.415	0.418	0.036
	(0.024)	(0.031)	(0.038)	(0.423)	(0.427)	(0.059)
HIPC	-0.088***	-0.072**	(omitted)	-0.015	-0.021	(omitted)
	(0.019)	(0.028)		(0.029)	(0.028)	
GDP growth	-0.636***	-0.534***	-0.866***	-0.639***	-0.520***	-0.890***
	(0.101)	(0.139)	(0.231)	(0.195)	(0.183)	(0.216)
MEPV	-3E-04	-0.007	0.003	-8E-05	-0.021	0.004
	(0.009)	(0.019)	(0.004)	(0.005)	(0.019)	(0.007)
Trade balance	-0.337***	-0.457***	-0.244***	-0.271***	-0.269**	-0.253**
	(0.063)	(0.084)	(0.081)	(0.096)	(0.120)	(0.093)
Debt forgiveness	-1.090***	-1.096***	-1.549***	-0.944***	-0.909***	-1.729**
	(0.099)	(0.126)	(0.379)	(0.114)	(0.120)	(0.737)
Crisis	0.093***	0.118***	0.054***	0.072***	0.088***	0.061***
	(0.015)	(0.025)	(0.014)	(0.019)	(0.031)	(0.017)
Constant	0.133***	0.165***	0.070***	0.043**	0.055*	0.053
	(0.030)	(0.048)	(0.018)	(0.020)	(0.028)	(0.032)
R-sq.	0.823	0.832	0.832			
Obs./ Countries	2209/68	1362/43	847/25	2209/68	1362/43	847/25
AR(2) test				0.275	0.269	0.574
Hansen test				0.268	0.956	1.000

Notes: ***, **, and * denote the levels of statistical significance at 1, 5, and 10%. Robust standard errors are reported in parentheses: robust clustered (resp. Windmeijer correction) standard errors for FE (resp. for two-step SGMM). For the S.GMM estimations, we consider *MEPV* and *HIPC* as exogenous and the rest as endogenous. For the "AR(2) test" and "Hansen test", we report the *p*.values.

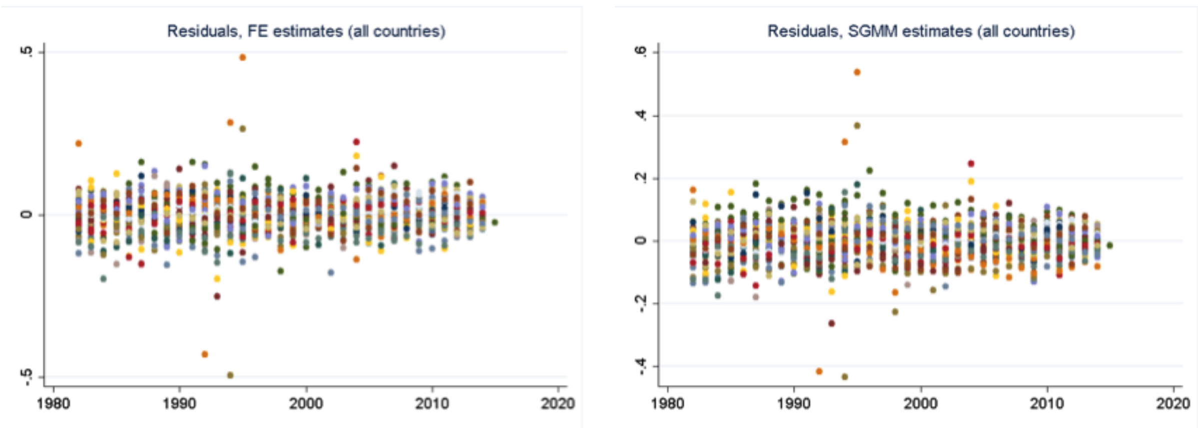

Figure 5 —Plot of the residuals (by estimation procedure)

We now investigate the sensitivity of the coefficients associated to our variables of interest. To do so, two approaches are possible: (*i*) rolling window estimations, (*ii*) recursive estimations. Given our relative short time dimension, we here choose to rely on the recursive estimations approach to assess the stability of the estimates over the sample period. If the model is stable over time, the recursive parameter estimates should stabilize at some level as the time window increases. However, if a model parameter does not appear to stabilize as the time window increases or if a sharp break appears before and/or after a point in time, this parameter is considered as unstable. To save space —and since it constitutes the purpose of the paper, we only report in Figure 6 coefficients associated to the FCD debt channel (i.e. $Under * Debt$ and $Over * Debt$). As can be seen, the coefficients appear to be relatively stable over time as they do not display any breaks. Hence, a posteriori, the estimates do not seem to suffer from the breaks in the currency misalignments.[32]

5.3. The redistributive channel

So far, our empirical approach focused on two transmission channels of the growth effects associated to exchange rate changes. In this section, we introduce a third channel highlighted by Diaz-Alejandro (1963) and investigate whether the previous results still hold when we take into account —or control for— this channel. Indeed, Diaz-Alejandro (1963), addressing the issue of the impacts of devaluations, highlighted that devaluations may lead to growth contractions because of the existence of a redistributive effect owing from the expenditure switching: by raising the price of the foreign good in domestic currency, a devaluation will result in an increase of the real income of "capitalists" and a decrease in the real income of workers.[33] Hence, devaluation entails an income transfer from low-saving agents (typically "wage earners") who consume traded goods to high-saving agents (typically "capitalists"). The interest for controlling for this third channel is therefore twofold as it draws a connection between exchange rate adjustments and the dynamics of growth. We do so using a proxy: the share of wages in the economy —or simply put the labour share.[34] The results are reported in Table 10. For brevity, we only report the estimates regarding the variables of interest.

[32] It is worthwhile noting that the strategy adopted here to test for the parameters stability is due to the absence of parameter stability/structural break tests in panel data (for unknown break date). In addition to the above tests, we also implemented CUSUM and CUSUM of squares tests for each country. These latter confirm the stability of the model.

[33] The foreign good is a single Hicksian composite good since it is assumed that the terms of trade are set exogenously (exportables and importables can thus be lumped). The agents' taxonomy used is from Diaz-Alejandro (1963).

[34] Note that we only address this issue here —and not in the baseline analysis— because of the lack of data regarding the proxy. See Table A.2 in Appendix A for the definition.

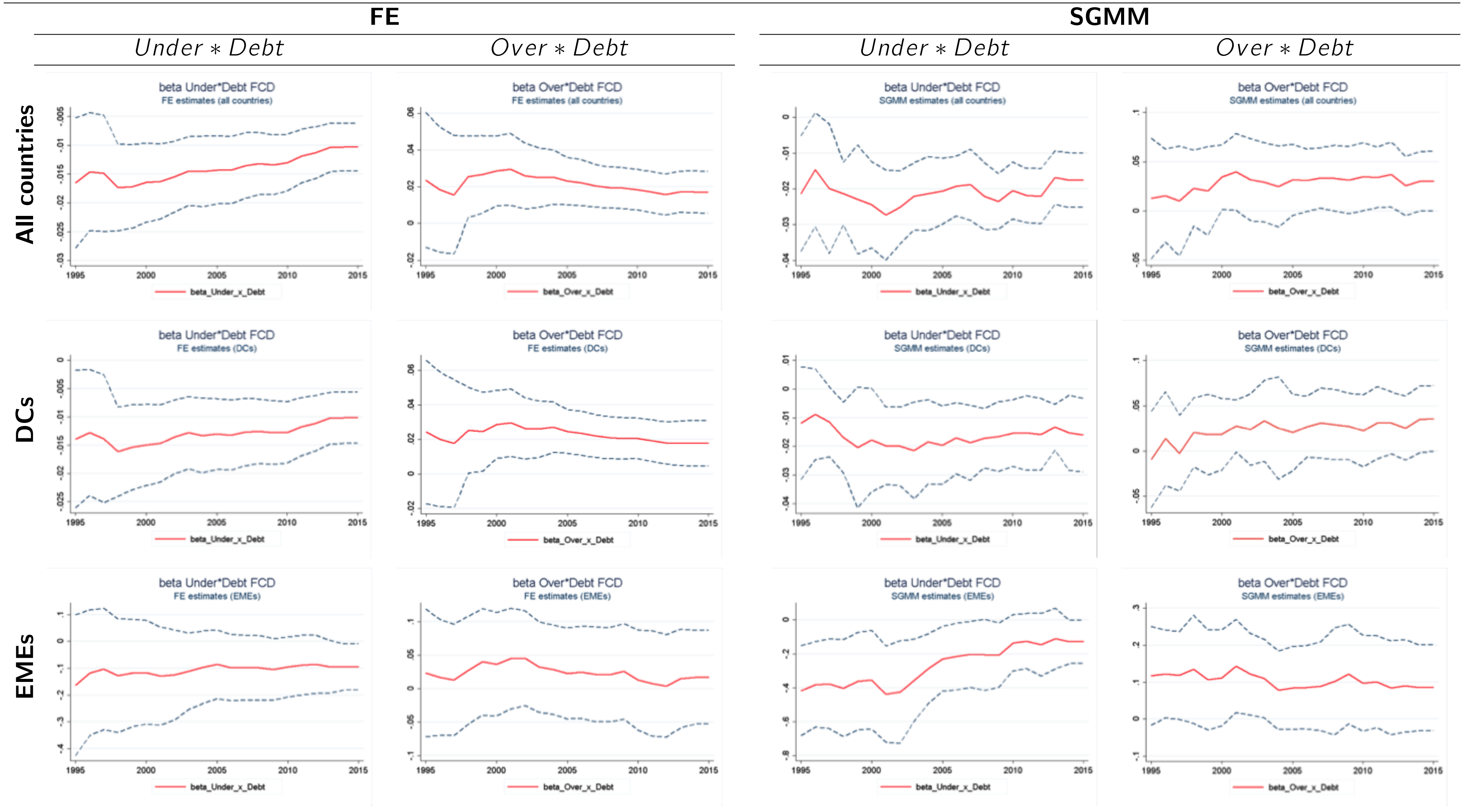

Figure 6 — Stability of the estimates (Under*Debt and Over*Debt)

Notes: the solid line represents the coefficient and the dashed lines the 95% confidence interval. The initial time window ranges from 1980 to 1995.

Table 10 — The FCD debt channel: controlling for the redistributive effect

Dependent var.:	GDP per capita growth rate (Δy)											
	FE						SGMM					
Sample	All	All	DCs	DCs	EMEs	EMEs	All	All	DCs	DCs	EMEs	EMEs
	(10.1)	(10.2)	(10.3)	(10.4)	(10.5)	(10.6)	(10.7)	(10.8)	(10.9)	(10.10)	(10.11)	(10.12)
Variables of interest												
Under	0.017	0.017	-0.002	-0.003	0.068***	0.067***	0.006**	0.006**	0.007*	0.007*	0.067***	0.065***
	(0.012)	(0.012)	(0.008)	(0.008)	(0.022)	(0.023)	(0.002)	(0.002)	(0.004)	(0.004)	(0.019)	(0.018)
Over	-0.046*	-0.047*	-0.075***	-0.075***	-0.040	-0.043	-0.030	-0.033	-0.063*	-0.064*	-0.008	-0.010
	(0.025)	(0.026)	(0.024)	(0.024)	(0.029)	(0.027)	(0.033)	(0.032)	(0.033)	(0.033)	(0.022)	(0.020)
Exports	0.029	0.028	0.087**	0.086**	-0.013	-0.016	0.084**	0.083**	0.099**	0.100**	0.014	0.013
	(0.028)	(0.028)	(0.040)	(0.042)	(0.024)	(0.024)	(0.035)	(0.035)	(0.042)	(0.042)	(0.015)	(0.015)
Debt	-0.042***	-0.041***	-0.034***	-0.033***	-0.067***	-0.065***	-0.032**	-0.031**	-0.039***	-0.039***	-0.054***	-0.052***
	(0.008)	(0.008)	(0.010)	(0.010)	(0.016)	(0.016)	(0.012)	(0.012)	(0.011)	(0.011)	(0.012)	(0.012)
Under ∗ Exports	0.028	0.024	0.011	0.011	0.200**	0.170*	0.022	0.020	0.023	0.023	0.277***	0.248***
	(0.029)	(0.029)	(0.028)	(0.029)	(0.085)	(0.085)	(0.031)	(0.031)	(0.032)	(0.033)	(0.084)	(0.085)
Over ∗ Exports	0.031	0.024	0.008	0.006	0.126*	0.087	0.024	0.019	0.006	0.005	0.087	0.046
	(0.048)	(0.046)	(0.050)	(0.049)	(0.064)	(0.069)	(0.047)	(0.045)	(0.042)	(0.041)	(0.067)	(0.077)
Under ∗ Debt	-0.015***	-0.014***	-0.013***	-0.012***	-0.125	-0.111	-0.011***	-0.011**	-0.015***	-0.014***	-0.210***	-0.198***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.095)	(0.092)	(0.004)	(0.004)	(0.004)	(0.004)	(0.072)	(0.069)
Over ∗ Debt	0.025**	0.024**	0.021	0.021	0.029	0.028	0.009	0.010	0.018	0.018	0.019	0.020
	(0.010)	(0.010)	(0.013)	(0.013)	(0.045)	(0.042)	(0.014)	(0.014)	(0.019)	(0.019)	(0.029)	(0.028)
Labor share	-0.004	-0.002	0.135	0.135	-0.033**	-0.031**	0.006	0.003	-0.136	-0.140	-0.023	-0.023
	(0.009)	(0.009)	(0.161)	(0.160)	(0.015)	(0.014)	(0.051)	(0.051)	(0.188)	(0.180)	(0.015)	(0.016)
Redistributive		-0.342**		-0.155		-0.316*		-0.324		-0.114		-0.322
		(0.160)		(0.284)		(0.176)		(0.205)		(0.369)		(0.212)

Notes: "a" indicates the AR(3) test (instruments accordingly start with the third lags). See Table 3 for the other details.

As can be seen, the lack of data on the labour share considerably affects the structure of the panel(s). Nonetheless, our previous conclusions remain overall unchanged. Focusing on the redistributive effect, it can be seen that we adopted two strategies to take it into account. In the first (see the odd columns of Table 10), we simply include the labour share as a control variable; in the second (even columns), we augment the previous model by including Redistributive which is an interaction term between the labour share and a dummy variable for currency crises (constructed using data from Laeven and Valencia, 2012). In a nutshell, the third channel proves to be significant in EMEs (FE estimates).[35]

All in all, controlling for the redistributive effect does not alter our previous conclusions.

5.4. Causality

As a final check, we now perform causality tests to comfort the results which —often— involve causality relationships between the variables. Results displayed in Table 11 are those obtained from the test proposed by Dumitrescu and Hurlin (2012). For brevity, we do not present the technical details but simply note that the test is based on the null hypothesis of Homogenous Non Causality (HNC), i.e. there is no causal relationship for all the cross-units of the panel. Under the alternative, there is a causal relationship for at least for one cross-unit.

Overall, the results comfort the presupposed relationships between the variables. Indeed, a causal relationship is first established between the currency misalignments and economic growth. More interestingly, a causal relationship is also underlined between the currency misalignments and the debt thus supporting the existence of valuation effects due to currency misalignments and hence the existence of a FCD debt channel. This latter channel is again confirmed in the third test (from $Mis * Debt$ to Growth).

[35] This result seems consistent with the semi-industrialized domestic economy assumption in Diaz-Alejandro (1963).

Table 11 — Causality test results

		K=1	K=2	K=3
	$\bar{W}$	3.173	4.322	5.439
$Mis \rightarrow Growth$	$\bar{Z}$	12.001***	9.070***	7.777***
	$\tilde{Z}$	10.257***	7.217***	5.663***
	$\bar{W}$	1.181	2.647	4.975
$Growth \rightarrow Mis$	$\bar{Z}$	0.999	2.527**	6.299***
	$\tilde{Z}$	0.534	1.625	4.451***
	$\bar{W}$	5.828	6.407	7.548
$Mis \rightarrow Debt$	$\bar{Z}$	26.225***	16.926***	14.263****
	$\tilde{Z}$	22.833***	13.940***	10.993***
	$\bar{W}$	2.353	3.472	4.625
$Debt \rightarrow Mis$	$\bar{Z}$	7.347***	5.652***	5.095***
	$\tilde{Z}$	6.150***	4.305***	3.4764***
	$\bar{W}$	4.857	5.357	6.992
$Mis * Debt \rightarrow Growth$	$\bar{Z}$	20.774***	12.784***	12.412***
	$\tilde{Z}$	18.019***	10.404***	9.481***
	$\bar{W}$	2.884	3.106	4.661
$Growth \rightarrow Mis * Debt$	$\bar{Z}$	10.147***	4.211***	5.165***
	$\tilde{Z}$	8.628***	3.078***	3.539***

Notes: $X \rightarrow Y$ indicates that we test the causality from X to Y. "K" indicates the lag order. ***, **, and * indicate rejection of the null at 1%, 5%, and 10%. The "$\bar{W}$" statistic corresponds to the cross sectional average of the N standard individual Wald statistics of Granger non causality tests; the "$\tilde{Z}$" statistic corresponds to the standardized statistic (for fixed T sample).

6. Conclusion

The aim of this paper was to investigate, for a sample of developing and emerging countries, the existence of a foreign currency-denominated debt channel through which currency misalignments can impact economic growth. By so doing, we contributed to the ongoing debate on the effects of currency misalignments on economic growth, by considering this indirect transmission channel in addition to the direct competitiveness channel.

We provide evidence that misalignments have a significant and prominent indirect effect on GDP growth through valuation effects, suggesting the existence of an additional transmission channel related to the existence of a foreign currency-denominated debt. In particular, through this channel, misalignments affect economic growth in the opposite direction to that of the traditional competitiveness channel. This channel appears to be particularly important for DCs. However, EMEs, thanks to an active management of their exchange rate and a coherence between their debt composition and their exchange rate regime, limit the effects related to currency misalignments. Our results thus also highlight the role of exchange rate policies in shaping the effects of misalignments on these valuation effects.

Our results have then important policy implications. First, if they are large, the misalignments of the real exchange rates are something to worry about especially in developing countries. This is because growth in these countries is affected through different transmission channels. Indeed, in accordance with some studies, we evidenced that both undervaluations and undervaluations hamper growth. In fact, while the case of overvaluation is more consensual, the negative impact of undervaluations can be linked to the fact that they do not deliver the expected competitiveness gains and hence do not boost growth. Furthermore, valuation effects and inflation tensions add other layers. For EMEs, there is more leeway but the interconnection between the competitiveness and the FCD debt channels are very important and conclusions should probably be drawn on a case-by-case basis. More generally, while reducing currency misalignments require both sound policies and a favourable external environment —which adds randomness— but falls in a medium/long term perspective, mitigating the adverse effects of currency misalignments is a shorter horizon issue. This is especially true for the FCD debt channel for which a key element to insulate economies from its effects is the coherence between the currency composition of the debt and the exchange rate regime. In this regard, EMEs display higher correlations with the (major) currency(ies) of indebtedness than DCs. This observation points to two issues in DCs: that of the exchange rate flexibility degree —and therefore that of the exchange rate regime and its sustainability which is definitely a political issue in some DCs— and that of their financing conditions.

References

Aguirre, A., Calderón, C., 2005. Real exchange rate misalignments and economic performance. Central Bank of Chile Working Paper 315.

Bénassy-Quéré, A., Béreau, S., Mignon, V., 2010. On the Complementarity of Equilibrium Exchange-Rate Approaches. *Review of International Economics* 18(4): 618-632.

Béreau, S., Lopez-Villavicencio, A., Mignon, V., 2012. Currency Misalignments and Growth: a New Look Using Nonlinear Panel Data Methods. *Applied Economics* 44 (27), 3011-3053.

Berg, A., Miao, Y., 2010. The Real Exchange Rate and Growth Revisited: The Washington Consensus Strikes Back?. IMF Working Papers 10/58, International Monetary Fund.

Bernanke, B., Gertler, M., 1989. Agency costs, net worth, and business fluctuations. *American Economic Review* 79: 14-31.

Bernanke, B., Gertler, M., Gilchrist, S., 1999. The financial accelerator in a quantitative business cycle framework, *Handbook of Macroeconomics* Volume 1, Part C, 1341–1393.

Binder, M., Offermanns, C.J., 2007. International investment positions and exchange rate dynamics: a dynamic panel analysis. Discussion Paper Series 1: Economic Studies 23, Deutsche Bundesbank, Research Centre.

Blanchard O., Milesi-Ferretti G-M., 2011. (Why) Should Current Account Balances Be Reduced? IMF Staff Discussion Notes 11/03, International Monetary Fund.

Bleaney, M., Ozkan F. G., 2011. The structure of public debt and the choice of exchange rate regime. *The Canadian Journal of Economics* 44: 325-339.

Blundell, R., Bond, S., 1998. Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics* 87: 115–143.

Bruno V., Shin, H.S., 2015a. Capital flows and the risk-taking channel of monetary policy. *Journal of Monetary Economics* 71: 119–32.

Bruno V., Shin, H.S., 2015b. Cross-border banking and global liquidity. *Review of Economic Studies* 82(2): 535–64.

Bun, M.J.G., Kiviet, J.F., 2006. The effects of dynamic feedbacks on LS and MM estimator accuracy in panel data models. *Journal of Econometrics* 132: 409-444.

Calvo, G., Reinhart, C., 2001. Reflections on Dollarization. MPRA Paper 8206, University Library of Munich, Germany.

Calvo, G., Reinhart, C., 2002. Fear of Floating. *Quarterly Journal of Economics* 117: 379-408.

Cavallo, D., Cottani, J., Kahn, M.S., 1990. Real exchange rate behaviour and economic performance in LDCs. *Economic Development and Cultural Change* 40: 523-544.

Céspedes, L.F., 2005. Financial frictions and real devaluations. Working Paper 318, Banco Central de Chile.

Céspedes, L.F., Chang, R., Velasco, A., 2004. Balance Sheets and Exchange Rate Policy. *American Economic Review* 94: 1183-1193.

Choi, I., 2002. Combination Unit Root Tests for Cross-Sectionally Correlated Panels. Mimeo, Hong Kong University of Science and Technology.

Clark, P., MacDonald, R., 1998. Exchange rates and economic fundamentals: a methodological comparison of BEERs and FEERs. IMF working paper 98/00.

Collins, S.M., Razin, O., 1997. Real exchange rate misalignments and growth. NBER Working Paper 6174.

Cordella, T., Ricci, A.L., Ruiz-Arranz, M., 2005. Debt Overhang or Debt Irrelevance? Revisiting the Debt-Growth Link. IMF working paper 05/223.

Coudert, V., Couharde, C., 2009. Currency Misalignments and Exchange Rate Regimes in Emerging and Developing Countries. *Review of International Economics* 17: 121-136.

Couharde, C., Delatte, A-L., Grekou, C., Mignon, V., Morvillier, F., 2017. EQCHANGE: A World Database on Actual and Equilibrium Effective Exchange Rates. *International Economics* 30: 1-25.

Couharde, C., Sallenave, A., 2013. How do currency misalignments' threshold affect economic growth? *Journal of Macroeconomics* 36: 106-120.

De V. Cavalcanti, T., Mohaddes, K., Raissi, M., 2012. Commodity Price Volatility and the Sources of Growth. IMF working paper 12/12, International Monetary Fund.

Dumitrescu, E.I., Hurlin, C., 2012. Testing for Granger non-causality in heterogeneous panels. *Economic Modelling* 29: 1450-1460.

Dubas, J.M., 2009. The Importance of the Exchange Rate Regime in Limiting Misalignment. *World Development* 37: 1612-1622.

Driver, R., Westaway, P.F., 2004. Concepts of equilibrium exchange rates. Bank of England working paper n° 248.

Edwards, S., 1987. Exchange Rate Misalignment in Developing Countries. UCLA Economics Working Papers 442, UCLA Department of Economics.

Edwards, S., 1988. Real and monetary determinants of real exchange rate behavior: Theory and evidence from developing countries. *Journal of Development Economics* 29: 311-341.

Edwards, S., 1994. Real and monetary determinants of real exchange rate behavior: theory and evidence from developing countries, in J. Williamson (ed), *Estimating equilibrium exchange rates*, Institute for International Economics, Washington D.C., 1994, 61-91.

Edwards, S., Savastano, M.A., 2000. Exchange Rates in Emerging Economies: What Do We Know? What Do We Need to Know? In: Krueger, A.O. (Ed.), *Economic Policy Reform: The Second Stage*. University of Chicago Press, Chicago, IL, pp. 453-510.

Eichengreen, B., Hausmann, R., 1999. Exchange rates and financial fragility. Proceedings, Federal Reserve Bank of Kansas City, 329-368.

Eichengreen, B., Hausmann, R., Panizza, U., 2005. The Pain of Original Sin. In: Barry Eichengreen and Ricardo Hausmann (eds.), *Debt Denomination and Financial Instability in Emerging-Market Economies*, Chicago: University of Chicago Press.

Elbadawi, I., 1994. Estimating Long-Run Equilibrium Real Exchange Rates. In J. Williamson (ed.), *Estimating Equilibrium Exchange Rates*, Washington, D.C.: Institute for International Economics.

Elbadawi, I., Soto, R., 2008. Theory and empirics of real exchange rates in developing countries. Documentos de trabajo 324, Instituto de Economica, Pontificia Universidad Católica de Chile.

Elbadawi, I., Kaltani, L., Soto, R., 2009. Aid, Real Exchange Rate Misalignment and Economic Performance in Sub-Saharan Africa. Documentos de Trabajo 368, Instituto de Economia. Pontificia Universidad Católica de Chile.

Fernàndez, C., Ley, E., Steel, M., 2001a. Model Uncertainty in Cross-Country Growth Regressions. *Journal of Applied Econometrics* 16: 563-76.

Fernàndez, C., Ley, E., Steel, M., 2001b. Benchmark Priors for Bayesian Model Averaging. *Journal of Econometrics* 100: 381-427.

Frankel, J., 2005. Contractionary currency crashes in developing countries. IMF Staff Papers 52, 149-192.

Gala, P., 2008. Real exchange rate levels and economic development: theoretical analysis and econometric evidence. *Cambridge Journal of Economics* 32(2): 273-288.

Galindo, A., Panizza, U., Schiantarelli, F., 2003. Currency Depreciations: Do They Boost or Do They Bust? Mimeo, Inter-American Development Bank.

Ghura, D., Grennes, T. J., 1991. The impact of Real exchange Rate Misalignment and instability on Macroeconomic Performance in Sub-Saharan Africa. Working Paper 91-4, International Agricultural Trade Research Consortium.

Gluzmann, P., Levy-Yeyati, E., Sturzenegger, F., 2011. Exchange rate undervaluation and economic growth: Diaz Alejandro (1965) revisited. Mimeo.

Goldstein, M., Turner, P., 2004. Controlling Currency Mismatches in Emerging Markets. Institute for International Economics, Washington D.C.

Grekou, C., 2015. Revisiting the nexus between currency misalignments and growth in the CFA Zone. *Economic Modelling* 45: 142-154.

Hinkle, L., Montiel, P., 1999. *Exchange Rate Misalignment: Concepts and Measurement for Developing Countries*. Oxford: Oxford University Press.

Hoeting, J.A., Madigan, D., Raftery, A.E., 1997. Bayesian model averaging for linear regression models. *Journal of the American Statistical Association* 92: 179-191.

Hoeting, J.A., Madigan, D., Raftery, A.E., Volinsky, C.T., 1999. Bayesian model averaging: a tutorial. *Statistical Science* 14: 382-401.

Ilzetzki, I., Reinhart, C., Rogoff, K., 2011. The country chronologies and background material to Exchange Rate Arrangements into the 21st Century: Will the Anchor Currency Hold?

IMF, 2006. Methodology for CGER Exchange Rate Assessments. International Monetary Fund, Washington DC. (Retrieved from https://www.imf.org/external/np/pp/eng/2006/110806.pdf)

Judson, R.A., Owen, A.L., 1999. Estimating dynamic panel data models: a guide for macroeconomists. *Economics Letters* 65: 9-15.

Kearsns J., Patel, N., 2016. Does the financial channel of exchange rates offset the trade channel? *BIS Quarterly Review*, December 2016, 95-113.

Laeven, L., Valencia, F., 2012. Systemic Banking Crises Database: An Update, IMF Working Paper 12/163, International Monetary Fund.

Lane, P.R., Milesi-Ferretti, G.M., 2007. The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970-2004, *Journal of International Economics* 73: 223-250.

Levy-Yeyati, E., Sturzenegger, F., 2007. Fear of appreciation. Policy Research Working Paper Series 4387, The World Bank.

Mirestean A., Tsangarides C., 2009. Growth Determinants Revisited, IMF Working Paper No. 268 (Washington: International Monetary Fund).

Moral-Benito, E., 2012. Determinants of Economic Growth: A Bayesian Panel Data Approach. *The Review of Economics and Statistics* 94: 566-579.

Nickell, S., 1981. Biases in Dynamic Models with Fixed Effects. *Econometrica* 49: 1399-1416.

Patillo, C., Poirson, H., Ricci, A.L., 2011. External Debt and Growth. Review of economics and Institutions, 2(3), Article 2. doi: 10.5202/rei.v2i3.45.
(Retrieved from http://www.rei.unipg.it/rei/article/view/45.)

Pesaran, M., 2006. Estimation and Inference in Large Heterogeneous Panels with a Multifactor Error Structure. *Econometrica* 74: 967–1012.

Pesaran, M. H., 2007. A Simple Panel Unit Root Test In The Presence Of Cross-section Dependence. *Journal of Applied Econometrics* 22: 265–312.

Rodrik, D., 2008. The Real Exchange Rate and Economic Growth. *Brookings Papers on Economic Activity* 2: 365-412.

Sala-i-Martin, X., 1997. I Just Ran Two Million Regressions. *American Economic Review* 87(2), 178-183.

Schröder, M., 2013. Should developing countries undervalue their currencies? *Journal of Development Economics* 105: 140–151.

Ul Haque, N., 2002. Developing of Financial Markets in Developing Economies. Address given at the Financial Reform Conference, Colombo, Sri Lanka.

Williamson, J., 1990. What Washington Means by Policy Reform, in "*Latin American Adjustment: How Much Has Happened?*". John Williamson, ed. Washington, Institute for International Economics.

Williamson, J., 1994. Estimates of FEERs, in John Williamson (ed.) Estimating Equilibrium Exchange Rates, Institute for International Economics, Washington, D.C.

Appendices

A. Data

Table A.1 – List of countries

Algeria^E	Congo Dem. Rep.^{H}	Honduras^H	Panama^E
Angola^E	Congo Rep.^{H}	India^E	Paraguay^E
Argentina^E	Costa Rica^E	Jordan^E	Peru^E
Bangladesh	Cote d'Ivoire^H	Kenya	Philippines^E
Benin^H	Dominican Rep.^{E}	Madagascar^H	Rwanda^H
Bolivia^H	Ecuador^E	Malawi^H	Senegal^H
Botswana^E	Egypt^E	Malaysia^E	Sri Lanka^E
Brazil^E	El Salvador^E	Mali^H	Sudan
Burkina Faso^H	Ethiopia^H	Mauritania^H	Swaziland^E
Burundi^H	Fiji^E	Mauritius^E	Tanzania^H
Cabo Verde	Gabon^E	Mexico^E	Thailand^E
Cameroon^H	Gambia^H	Morocco^E	Togo^H
Central African. Rep^H	Ghana^H	Mozambique^H	Tunisia^E
Chad	Guatemala^E	Nicaragua^H	Turkey^E
China^E	Guinea^H	Niger^H	Uganda^H
Colombia^E	Guinea-Bissau^H	Nigeria	Venezuela, RB^E
Comoros^H	Haiti^H	Pakistan^E	Zambia^H

Note: "H" indicates the countries that benefited from the *HIPC* initiative and reached the completion point. "E" indicates that the country is considered as "emerging economies" (emerging here refers to the middle group in the IMF classification).

Table A.2. — Variable definitions and sources

Variable	Definition	Source
Exchange rate fundamentals		
$rprod$	Relative productivity: measured by the ratio of GDP per capita (PPP) in the country and the trade-weighted average GDP per capita PPP of the top 67 partner countries.	Author calculations
nfa	Net Foreign Asset position (%GDP)	Lane & Milesi-Ferretti
tot	Net barter terms of trade index (2000 = 100), expressed in logarithm	WDI
Variables used for the BMA analysis		
Dependent variable		
Δy	GDP per capita growth (annual %)	WDI
Solow determinants & human capital		
$l.y$	Initial real GDP per capita	WDI
$invest$	Total investment (%GDP)	WEO
pop	Total population (expressed in logarithm)	WDI
$life$	Life expectancy at birth (total years), expressed in logarithm	WDI
$age.dep$	Age dependency ratio (% of working-age population)	WDI

(Continued on next page)

Table A.2. — (*Continued*)

Macroeconomic variables		
fdi	Foreign direct investment, net inflows (% of GDP)	UNCTAD
open	Exports plus Imports as share of GDP	WDI
oda	Net official development assistance and official aid received (%GDP)	WDI
gov	General government final consumption expenditure (% of GDP)	WDI
tot	Net barter terms of trade index (2000 = 100), expressed in logarithm	WDI
inflation	Inflation (consumer price), expressed in logarithm	WEO
debt	External debt stocks, public and publicly guaranteed (expressed in logarithm and %GDP)	WDI
debt.serv	Public and publicly guaranteed debt service (% of GDP)	WDI
exports	Exports of goods and services (% of GDP)	WDI
gfcf	Gross fixed capital formation (% of GDP)	WDI
money	Broad money (% of GDP)	WDI
remit.	Personal remittances, received (% of GDP)	WDI
Socio-political indicators		
CL	Civil liberties; measured on a scale from 1 to 7, 7 being the lowest level of freedom.	Freedom House
PR	Political rights; measured on a scale from 1 to 7, 1 being the highest degree of freedom.	Freedom House
Democ	Democracy; measured on a 0-to-1 scale, 1 being the highest level of democracy.	CSP
CIVWAR	Magnitude score of episode(s) of civil warfare involving the state; measured on a scale from 0 to 1, 1 being the highest degree.	CSP
REGCIV	Magnitude scores of all societal (civil or ethnic) Major Episodes of Political Violence; measured on a scale from 0 to 1.	CSP
Other variables		
de facto	*de facto* exchange rate regime classification	IRR
HIPC	Dummy variable for the HIPC initiative: scores 1 from the completion point till the end of the studied period. Coded using informations provided by the IMF, the African Development Bank and the Club de Paris.	

Note: WDI: World development Indicators (World bank)
WEO: World Economic Outlook (International Monetary Fund)
CSP: Center for Systemic Peace
UNCTAD: United Nations Conference on Trade and Development

B. Test results

Table B.1 — Cross-sectional dependence test results

	reer	nfa	rprod	tot	gov
Pesaran (CD)'s test	25.16	46.96	54.10	9.79	6.96
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Notes: The test is based on the null of no cross-sectional dependence and is standard Normal under this null. p.values are given in parentheses.

Table B.2 — Unit root test results

		reer	rprod	nfa	tot	life	pop
CIPS*	level	-2.44	-1.99	-2.09	-2.41	-1.62	-1.26
		(0.21)	(0.13)	(0.04)	(0.29)	(0.99)	(0.99)
	1^{st} diff.	-3.06	-2.94	-3.90	-3.41	-2.57	-2.83
		(0.01)	(0.01)	(0.01)	(0.01)	(0.05)	(0.05)
Choi Pm	level	-0.51	-5.37	-0.07	1.65	7.84	11.31
		(0.69)	(1.00)	(0.52)	(0.05)	(0.00)	(0.00)
	1^{st} diff.	49.77	41.21	60.80	45.06	8.75	8.47
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Choi Z	level	4.31	13.66	1.01	0.78	2.88	-0.57
		(1.00)	(1.00)	(0.84)	(0.78)	(0.99)	(0.28)
	1^{st} diff.	-24.37	-20.33	-28.07	-19.41	-4.08	-3.39
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Choi L*	level	5.04	16.78	0.91	0.69	4.40	0.67
		(1.00)	(1.00)	(0.81)	(0.75)	(1.00)	(0.75)
	1^{st} diff.	-31.58	-25.92	-37.72	-26.18	-4.91	-3.67
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: We allow for individual deterministic trends and constants for all variables except *open* (only individual intercepts). The tests are built on the null of a unit root; *p*.value in parentheses. Appropriate lag orders are determined by running auxiliary ADF test regressions for each of the cross-sectional units. We also refer to the lag order that minimizes the Schwarz criterion. Conclusions are robust to change in model's specification.

Table B.2 — *Continued*

		fdi	invest	gov	debt	gdp	age.dep
CIPS*	level	-2.61	-2.08	-2.30	-2.25	-2.12	-2.34
		(0.03)	(0.05)	(0.52)	(0.63)	(0.10)	(0.01)
	1^{st} diff.	-4.57	-4.41	-4.41	-3.51	-3.89	-2.61
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Choi Pm	level	21.69	21.38	0.14	-2.95	-4.58	14.52
		(0.00)	(0.00)	(0.43)	(0.99)	(1.00)	(0.00)
	1^{st} diff.	61.45	65.49	45.55	-41.80	60.98	18.35
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Choi Z	level	-13.17	-13.22	0.56	4.32	7.48	-3.50
		(0.00)	(0.00)	(0.71)	(1.00)	(1.00)	(0.00)
	1^{st} diff.	-27.46	-29.92	-21.17	-21.56	-28.32	-10.14
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Choi L*	level	-15.19	-15.28	1.01	4.84	7.63	-4.51
		(0.00)	(0.00)	(0.84)	(1.00)	(1.00)	(0.00)
	1^{st} diff.	-37.15	-40.61	-28.08	-27.20	-38.06	-11.43
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note: see above.

Table B.3 — Westerlund cointegration test results

Specification				**reer** **rprod, tot, nfa**				
	With constant				*With constant and trend*			
Statistic	Value	$Z-$value	$p-$value	Robust $p-$value	Value	$Z-$value	$p-$value	Robust $p-$value
G_t	-2.905	-6.195	0.000	0.005	-3.107	-4.516	0.000	0.003
G_a	-9.230	-0.110	0.456	0.005	-10.833	2.504	0.994	0.062
P_t	-16.724	-5.317	0.000	0.070	-16.185	-1.313	0.095	0.087
P_a	-8.685	-3.308	0.001	0.055	-9.765	0.701	0.758	0.451

Note: Optimal lag and lead length determined by Akaike Information Criterion. Width of Bartlett-Kernel set to 3. Null hypothesis of no cointegration. Robust p-values are obtained via bootstrap (400 iterations).

C. Selecting the growth determinants

This Appendix is devoted to the presentation of the Bayesian analysis on which we rely on to select the growth determinants used in the paper. We begin by a brief presentation of the Bayesian Model Averaging (BMA) methodology followed by that of the data and finally conclude with the results.

The Bayesian Model Averaging (BMA) methodology

To deal with the issue of model uncertainty plaguing a number of growth equations —due to the lack of clear theoretical guidance—, we resort to Bayesian Model Averaging techniques. Before going into technical details —although the BMA is briefly presented here[36]—, note that the starting point of the BMA methodology is the finding that there are different possible models, each of them defined by a different combination of regressors, and by a probability of being the "true" model. It proceeds by estimating these different models and constructing a weighted average of all of them.

Considering X potential determinants, one obtains 2^X possible combinations of determinants and thus 2^X potential models M_j with $j = 1, \ldots, 2^X$. Denoting D, the dataset available, and considering θ a function of θ^j parameters to be estimated, the posterior density of the parameters for all the models under consideration is given by:

$$p(\theta|D) = \sum_{j=1}^{2^X} P(M_j|D)\ p(\theta|D, M_j) \qquad \text{(C.1)}$$

Thus, the posterior density of the parameters is defined by the weighted sum of the posterior density of each considered model, with weights being their posterior model probability.

Given the prior model probability $p(M_j)$, the posterior model probability is calculated using the Bayes theorem as follows:

$$P(M_j|D) = \frac{p(D|M_j)\ p(M_j)}{\sum_{j=1}^{2^X}\ p(D|M_j)\ p(M_j)} \qquad \text{(C.2)}$$

[36]See Hoeting et al. (1997, 1999), Fernàndez et al. (2001) and Moral-Benito (2012) for further details.

where $p(D|M_j) = \int p(D|\theta^j, M_j)\ p(\theta^j|M_j)\ d\theta^j$ is the marginal likelihood of the data given the model M_j; $p(\theta^j|M_j)$ is the prior density of the parameter θ^j under the model M_j, $p(D|\theta^j, M_j)$ is the likelihood and $p(M_j)$ is the prior probability that M_j is the "true" model.

Summing the posterior model probabilities for all the models including a specific regressor (determinant), we derive the *posterior inclusion probability* (PIP), i.e. the probability that this regressor belongs to the "true" model. It is calculated as:

$$p(\theta_h \neq 0|D) = \sum_{\theta_h \neq 0} p(M_j|D) \tag{C.3}$$

We base the inclusion of a variable —in our growth equation— on this statistic. In general, a variable is considered as robust if its posterior inclusion probability is greater or equal to 0.50. We here follow the same strategy. Regarding the BMA methodology, we follow the Fernàndez, Ley and Steel (2001a) (hereafter, FLS) BMA approach as we have no preference for any specific model.[37] We use improper noninformative priors for the parameters that are common to all models, and a g-prior structure for the slope parameters (with two values for the latter, identified as "*Prior 1*" and "*Prior 9*" as discussed in FLS (2001b)). Since the FLS approach as originally proposed is a cross-section analysis, we follow the methodology proposed by Moral-Benito (2012) for its implementation in the panel data context. For brevity, we do not report the details. Note however that in practice we will work with demeaned data.

The data

Since the aim of this section (nor that of the paper) is not to revisit the growth determinants, we surveyed the vast literature on growth analysis with a particular emphasis on studies that use Bayesian techniques and retained 22 different potential determinants. We restrain ourselves to these determinants which have proven to be important/robust growth determinants.

We consider five broad categories of potential determinants of growth. Following the

[37] The FLS methodology assumes equal probabilities for all models, i.e. $p(M_1) = p(M_2) = \ldots = p(M_{2^X}) = 1/2^X$.

neoclassical theory (Solow-Swan model), we retain the following variables: *(i)* investment and *(ii)* gross fixed capital formation to capture the effects of physical capital; *(iii)* life expectancy to proxy the human capital development[38]; and *(iv)* population and *(v)* age dependency ratio to take into account the effect of the population. We also include *(vi)* the initial income per capita (conditional convergence).

The impact of macroeconomic stability/policies is captured by *(i)* inflation, *(ii)* government consumption, *(iii)* debt (external debt stocks, public and publicly guaranteed[39]), *(iv)* debt service, and *(v)* broad money.

The trade regime is taken into account through *(i)* openness, *(ii)* export revenues, and *(iii)* terms of trade.

The socio-political context is proxy by *(i)* civil liberties, *(ii)* political rights, *(iii)* democracy, *(iv)* civil warfare, and *(v)* REGCIV (magnitude scores of all societal (civil or ethnic) major episodes of political violence).

Finally, we include *(i)* the foreign direct investment, *(ii)* the remittances, and *(iii)* the official aid received as measures of the external environment.

All data are annual and cover the period 1980-2012. The definitions, main sources and calculation details of the data are reported in Table A.2.

The results

Table C.1 presents the results of the estimations (the posterior inclusion probabilities) based on a universe of 2^{23} — i.e. 8,388,608 — possible models. For comparison purpose, we also report results obtained using uniform model prior. Since the main analysis of the paper will be done with annual data, we accordingly perform the Bayesian analysis with annual data rather than 5-year averaged data as it is often done. Doing so, we ensure a sample size that allows enough degree of freedom for estimations and purge the estimates from the Nickell (1981) bias.

[38]We do not include school enrollment variables since these variables are not available for all the considered countries.

[39]We use two measures of the debt: the debt to GDP ratio and the debt (in real terms; we use the GDP deflator) expressed in logarithm.

Overall, the BMA analysis identified ten robust determinants with posterior inclusion probability higher than 0.50. Except "Gross fixed capital formation", all the Solow-Swan determinants are identified as robust variables. Furthermore, in most cases, these latter belong to the top 3 ranked models.

Table C.1 — Posterior Inclusion Probabilities

Variable	Posterior Inclusion Probability				
	Model prior				
	Uniform	Fixed		Random	
		Prior 1	*Prior 9*	*Prior 1*	*Prior 9*
Initial GDP level	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]
Age dependency ratio	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]
Broad money	0.050	0.007	0.036	0.021	0.054
Civil liberties	0.026	0.001	0.019	0.010	0.028
Civil warfare (CIVWAR)	0.040	0.002	0.023	0.013	0.038
Debt (ln)	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]
Debt (%GDP)	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]
Debt service	0.317	0.144	0.255	0.199	0.311
Democracy	0.023	0.002	0.021	0.008	0.026
Exports	0.083	0.003	0.046	0.021	0.083
Foreign Direct Investment	**0.989**[1,2,3]	**0.807**[1,2,3]	**0.983**[1,2,3]	**0.963**[1,2,3]	**0.989**[1,2,3]
Government consumption	**0.899**[1,2,3]	0.311[2,3]	**0.877**[1,2,3]	**0.804**[1,2,3]	**0.890**[1,2,3]
Gross fixed capital formation	0.461	0.206[2]	0.473[1]	0.408[1]	0.487[1]
Inflation	0.036	0.001	0.022	0.012	0.037
Investment	**0.679**[2,3]	**0.797**[1,3]	**0.611**[2,3]	**0.633**[2,3]	**0.658**[2,3]
Life expectancy	**0.916**[1,2,3]	0.393[2,3]	**0.896**[1,2,3]	**0.842**[1,2,3]	**0.911**[1,2,3]
Official Dev. Assist. & Aid	0.030	0.002	0.018	0.011	0.031
Openness	0.136	0.011	0.092	0.050	0.137
Political rights	0.068	0.001	0.051	0.029	0.076
Population	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]
REGCIV	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]	**1.000**[1,2,3]
Remittances	0.155	0.058	0.119	0.085	0.153
Terms of trade	0.407[2]	0.085	0.329[3]	0.213[3]	0.387

Note: The dependent variable is the real GDP per capita growth rate. The results are based on 100,000 burn-ins and and 200,000 draws. Simulations made using birth-death MCMC sampler. The number over the posterior inclusion probability —e.g. "1" — indicates that the variable belongs to the nth best model among the top 2000 models.

Regarding macroeconomic policies and the external environment variables, only the "foreign direct investment", the "government consumption" and the two measures of the "debt" enter with sufficiently high probabilities. These variables also belong to the top 3 models. Finally, the last robust variable suggested by the BMA is REGCIV.

Results being robust to priors' choice (see Figure C.1), we retain the 9 different determinants highlighted in Table C.1, i.e. the initial real GDP ($I.y$), the age dependency ratio (*age.dep*), the debt (*debt*), the foreign direct investment (*fdi*), the government consumption (*gov*), the investment (*invest*), the life expectancy (*life*), the population growth rate (*pop*), and *REGCIV*.

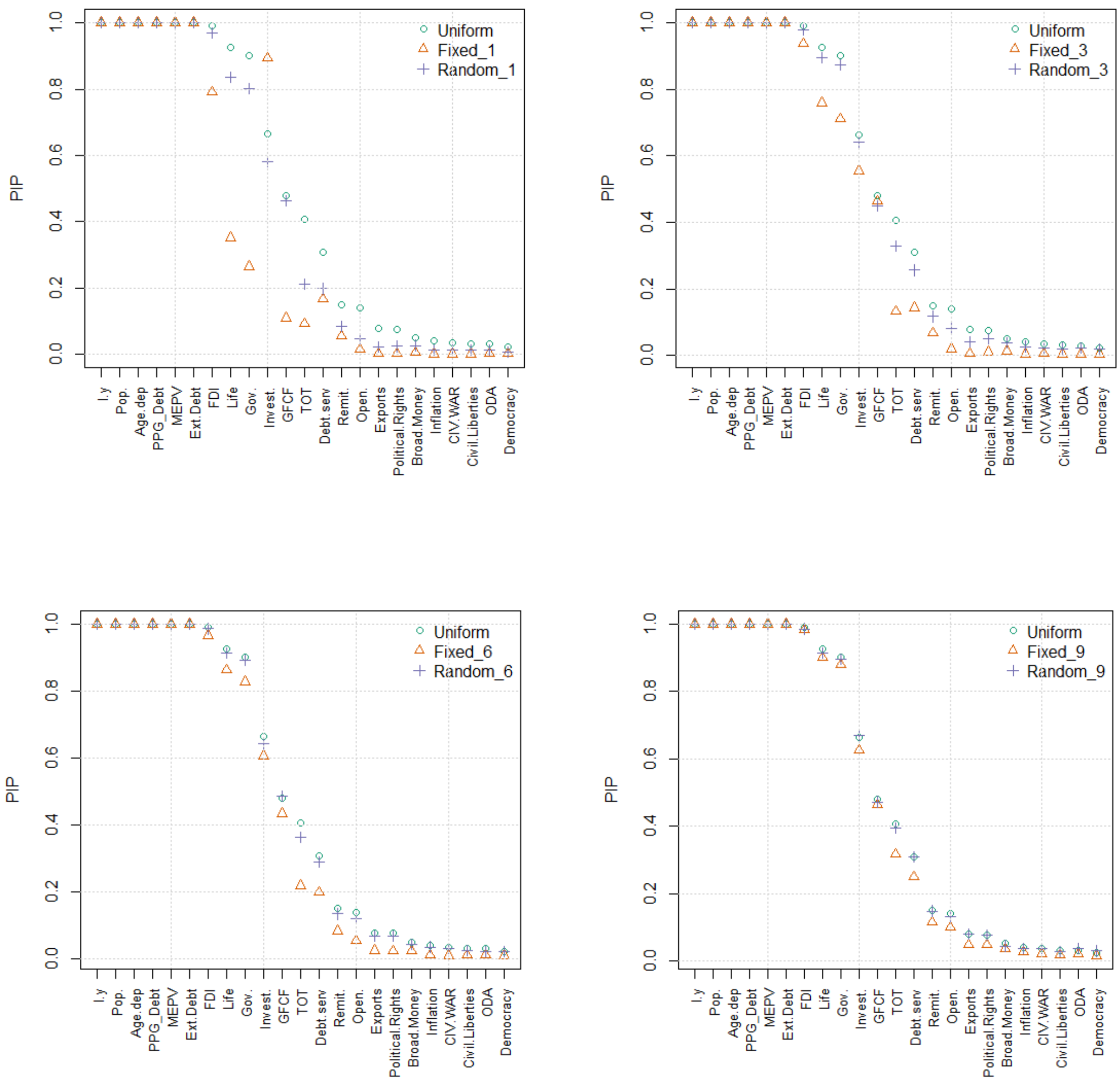

Figure C.1 — PIPs' sensitivity to priors' choice

D. Currency misalignments

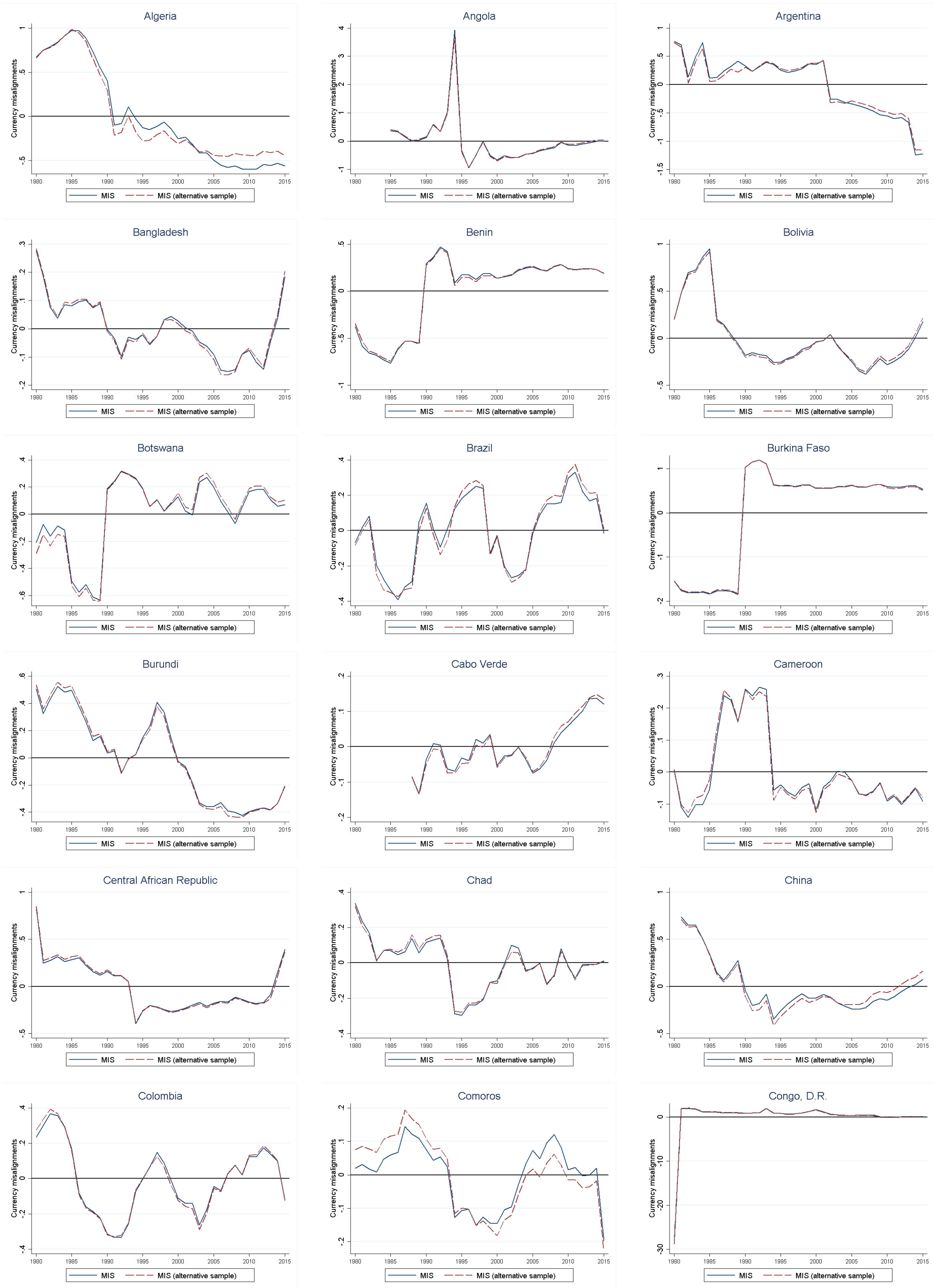

Figure D.1 — Currency misalignments

Notes: A positive (resp. negative) value corresponds to an overvaluation (resp. undervaluation). "MIS (alternative sample)" correspond to the misalignments estimated using the sample based on development level.

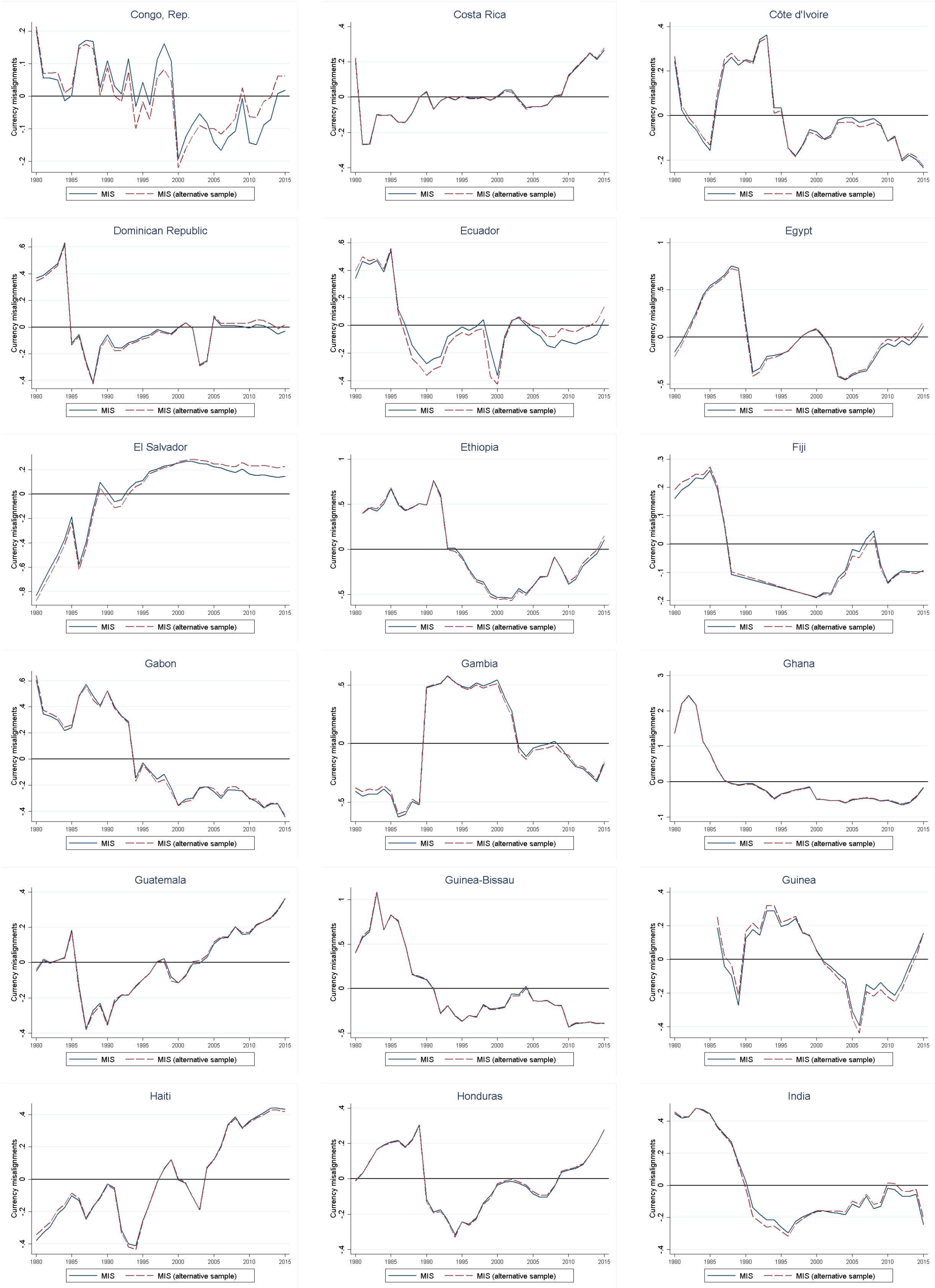

Figure D.1 — *Continued.*

Notes: A positive (resp. negative) value corresponds to an overvaluation (resp. undervaluation). "MIS (alternative sample)" correspond to the misalignments estimated using the sample based on development level.

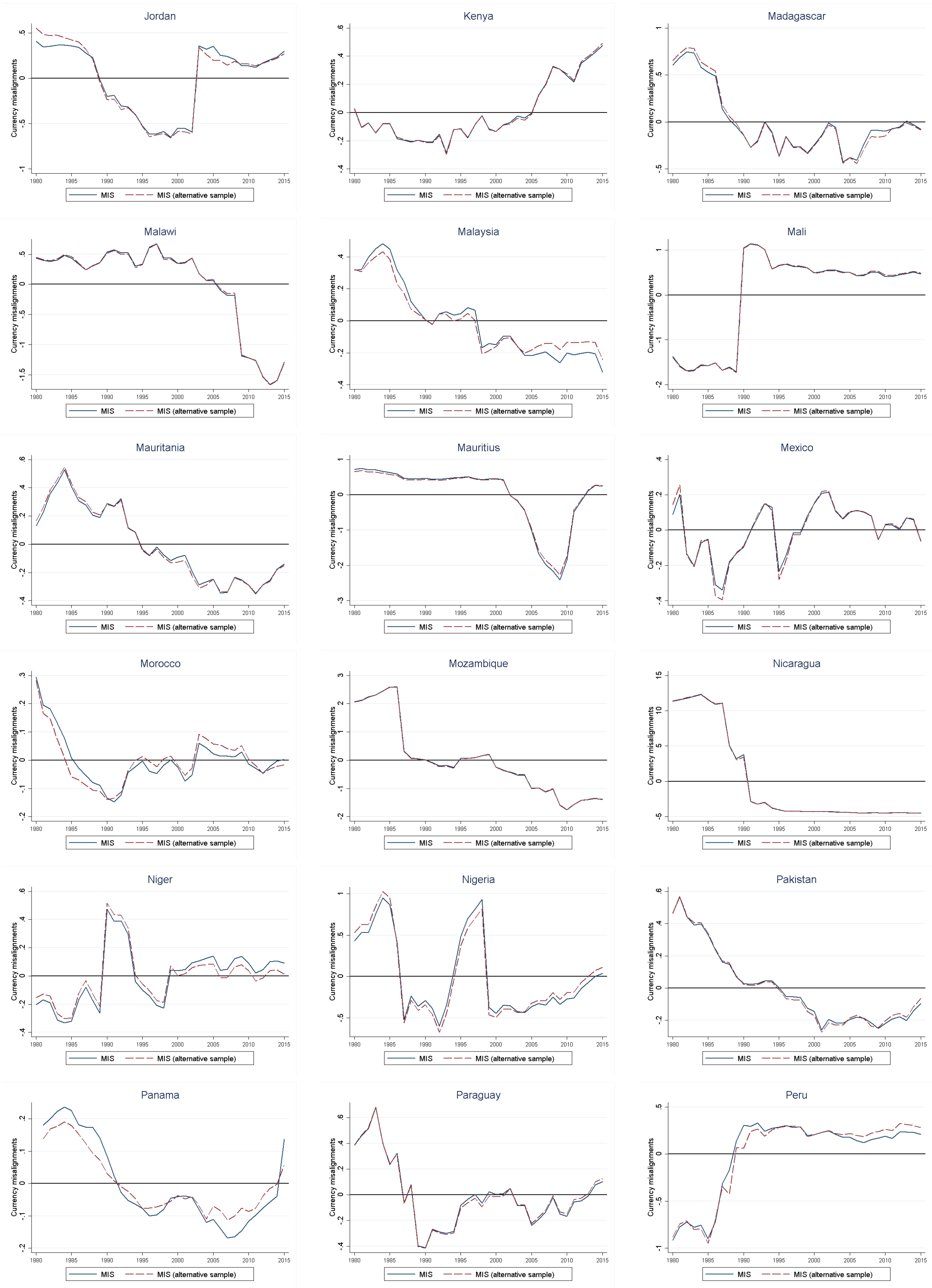

Figure D.1 — *Continued.*

Notes: A positive (resp. negative) value corresponds to an overvaluation (resp. undervaluation). "MIS (alternative sample)" correspond to the misalignments estimated using the sample based on development level.

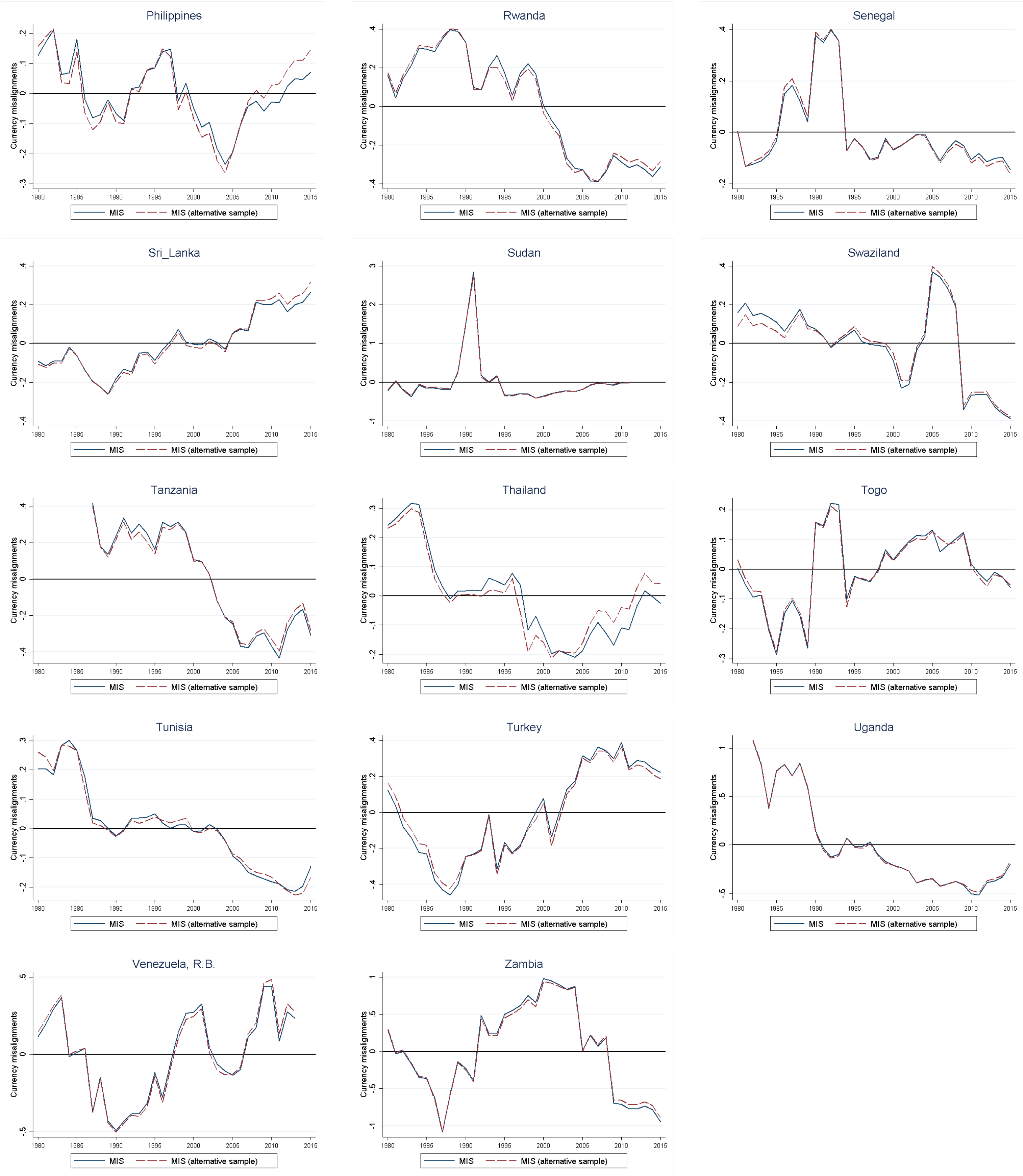

Figure D.1 — *Continued.*

Notes: A positive (resp. negative) value corresponds to an overvaluation (resp. undervaluation). “MIS (alternative sample)” correspond to the misalignments estimated using the sample based on development level.