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External Debt and International Trade: Another Mismatch

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External Debt and International Trade: Another Mismatch

Abstract

Currency mismatch makes a debtor country suffer from domestic depreciation by magnifying the burden of its external debt. Since external debt can be paid back by exporting more than importing, a crucial channel for inducing recovery is net export. It is not warranted, however, that domestic depreciation will boost net export correspondingly if the currency compositions differ substantially between debt and trade. This paper examines the association between the debt revaluation and trade competitiveness gain effects of exchange rate fluctuations for middle and low income countries. Empirical results suggest that currency-compositional discord between debt and trade has significant welfare implications.

JEL-Code: F340, F310.

Keywords: currency mismatch, effective exchange rate, external debt, original sin, net export.

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1. Introduction

International borrowing and lending are, in theory, beneficial for all parties. When inter-temporal trade is immune to market segmentation by political borders, it can achieve more efficient resource allocation than otherwise. The complication introduced in reality, however, is that the world consists asymmetrically of diverse countries with various currencies. To realize the benefit, borrowers and lenders separated by national borders must first concur on which currency their contracts will be denominated in.

When debt is denominated in currencies with high devaluation risk, investors will demand premium on it. Not surprisingly, international debt tends to be denominated in currencies with prominent credibility and thick markets, represented most notably by US dollar (USD). Consequently many countries, especially less developed ones, borrow abroad typically in foreign currencies, the phenomenon referred to as original sin. Since their assets are more likely denominated in domestic currencies, there will be currency mismatch between the two sides of the balance sheets. Original sin and currency mismatch have drawn much attention in academic and policy circles as important factors contributing to recurrent financial crises around the globe.¹

For emerging economies, currency mismatch is a double-edged sword (Ranciere, Tornell, and Vamvakidis, 2010a). While it can reduce borrowing constraints to boost economic growth, it will also increase vulnerability to exchange variability. In lack of foreign currency assets that provide buffer, a debtor country suffers severely from depreciation of the domestic currency as it magnifies the burden of its external debt

¹ See, for instance, Hausmann and Panizza (2003), Goldstein and Turner (2004), Eichengreen, Hausmann, and Panizza (2007), and Ranciere, Tornell, and Vamvakidis (2010a).

liabilities.² Under such circumstances, a key channel left for debt-laden countries to inducing recovery is international trade. Since external debt can be paid back by exporting more than importing, it is vital to boost net export for alleviating the problem.³

In general, domestic depreciation makes a country's export more competitive and import more expensive, boosting its net export. Nevertheless, it is unwarranted that domestic depreciation will boost net export in a corresponding fashion to the debt revaluation if the currency composition differs substantially between external debt and international trade. This currency-compositional discord between external debt and international trade, which we refer to as “another mismatch”, is the theme of this paper.

An example might help depict the issue. Consider Mexico and Liberia. These countries have their external debts denominated mostly in USD in about equal proportions. By the decade average, about seventy-six percent of the long-term public and publically guaranteed (PPG) external debt of Mexico is denominated in USD. The corresponding share for Liberia is quite similar and seventy-four percent.⁴ In contrast, the shares of the US as their export destination (import origin) differ strikingly – approximately eighty-two (fifty-two) percent for Mexico and only ten (one) percent for Liberia. Thus, depreciation in the same magnitude of Mexican peso and Liberian dollar against USD, while increasing the external debt burden of the two countries similarly, is

² Hereafter, “depreciation” is used to refer to a decline in a currency value regardless of whether it occurs as a market adjustment of a floating rate or devaluation of a fixed rate by authority.

³ In general, foreign exchange reserves are the primary buffer assets for the external PPG debt. However, as the notion of currency mismatch indicates, less developed countries typically do not possess sufficient reserves to cover their external debt. Under the circumstances, net export assumes an important role to partially offset the debt revaluation effects of domestic depreciation. In the empirical exercise in section 4, we incorporate the reserves to GDP ratio to ensure robustness of the results.

⁴ The figures are the averages for 2003-2012.

likely to have rather different effects on their international trade. An extent of domestic depreciation that may significantly vitalize Mexican net export will not be as nearly igniting for Liberian net export.

When the currency compositions are accordant between debt and trade, the effects of domestic depreciation in terms of rising debt burden are more likely to be offset, at least partly, by a subsequent increase in net export. In a sense, it may be deemed an alleviation mechanism that can be built in by having “right” currency compositions to denominate a country’s external debt. We thus hypothesize that the debt-trade currency compositional mismatch can have important welfare ramifications for borrowing countries.

In this study we first investigate the recent trends in currency denominations of external debt of the middle-income countries (MICs) and the low-income countries (LICs). Then, using the data on the debt-denominating currency compositions and the nominal exchange rates, we construct the debt-weighted effective exchange rate (DEER) indices to examine their association with the trade-weighted real effective exchange rate (TREER) series. The DEER-TREER correlation depicts how the two effects arising from domestic depreciation interact; the revaluation effect on external debt and the cost competitiveness gain effect in trade. Further, by the means of growth regressions, we test if the variation in the extents of the debt-trade currency discord significantly determines the cross-country differences in the growth performances.

To anticipate, our chief findings are as follows. For the long-term PPG debt of the MICs and LICs, we find little evidence of alleviation of original sin over the past three decades. Overall, their external debt continues to be characterized by the striking and even increasing predominance of USD as the currency of denomination. We find

substantial cross-country variation in the association between the DEER and TREER indices, which turns out to have significant implications. Our growth regression estimates suggest that for countries with substantial debt-trade currency-compositional discord, marginal increase in nominal exchange rate variability exerts significantly negative effects on growth. The sign of the effect, however, is reversed as the extent of the debt-trade mismatch declines to stay below a certain threshold. In other words, nominal exchange rate variability can exert either a negative or positive effect on a country's economic growth depending on how harmonious the currency compositions are between debt and trade. With the novel findings, this study contributes to the literature on currency exposure from a unique angle.

The remainder of this paper is organized as follows. Section 2 describes the data and examines the trends in currency compositions of external debt of the MICs and the LICs. Section 3 constructs the DEER indices to quantify the extents of their co-movements with the TREER series as our measures of mismatch. Section 4 examines the implications of the debt-trade mismatch via estimating growth regressions. Finally, section 5 provides concluding remarks.

2. Currency composition of the external debt

2.a Data and preliminaries

We adopt the World Bank's International Debt Statistics (IDS) as our primary data source. Supplementary data are extracted also from the Bank's World Development Indicator Database, and the International Monetary Fund's International Financial Statistics and Direction of Trade Statistics. The baseline sample period is 1980-2012 with occasional curtailment for countries with limited data availability.

The IDS provides the information on currency denomination of external debts but not assets. Therefore, we do not observe currency mismatch in the usual sense.⁵ What we focus on instead is the currency compositional discord between external debt and trade and its implications under nominal exchange rate fluctuations.

In the IDS database, the currency composition of external debt is available only for the PPG debt. While this may seem to limit the scope of our analyses severely, the share of the PPG debt in the total debt turns out quite high for both the MICs and LICs. As Panel A of Table 1 indicates, on average more than seventy percent of all debt stock for the MICs is the PPG debt. For the LICs, the PPG debt share is even higher at around eighty-four percent. Replacing the debt stock with the debt service will not alter the picture significantly. The average PPG share remains at seventy percent for the MICs while it rises to ninety-six percent for the LICs. Therefore, the PPG debt serves us as a reasonable proxy for the total external debt of those countries.⁶

Panel B of Table 1 summarizes the currency composition of the PPG debt stock. The average shares are noted for the USD, Euro, Japanese yen (JPY), British pound (GBP), and Swiss franc (CHF). The sample period is 1980-2012 except for Euro to which 2001-2012 applies for the obvious reason. The shares of Deutsch mark (DM) and French franc (FF) are also provided for the period of 1980-2000.

⁵ For the definition of currency mismatch, see Eichengreen, Hausmann, and Panizza (2007) among others. Due to the data constraints, we consider the currency denomination of the external debt without netting out the value of the foreign asset. Thus, our investigations are more closely related to original sin than currency mismatch.

⁶ The PPG debt is a reasonable, although not perfect, measure for the purpose of this paper due also to the following. The distinction between public and private sectors in less developed economies tends to be obscure in that their export and import sectors are often run by public or quasi-public agents such as state enterprises (Claessens 1992). Correspondingly the PPG debt includes not only sovereign debt but also debt by government-backed (quasi-)private enterprises.

For both the MICs and the LICs, USD is by far the most dominant currency with the average share of about fifty percent. Euro, the next on the list, is only about sixteen percent and eight percent for the MICs and the LICs, respectively. Thus, the dominance of the USD is outstanding. When combined, the aforementioned major currencies take up more than eighty percent and close to seventy percent of the external debt of the MICs and the LICs, respectively. These numbers unambiguously manifest the prevalence of original sin across the MICs and the LICs.

Since the currency compositional shares can shift over time, we provide time series plots of the country average shares in Figure 1. For both the MICs and LICs, the graphs indicate that the USD is not just dominant but it also exhibits a long-term increasing trend. By the 2012 figures, the shares of the USD well exceed fifty percent and approach sixty percent.

2.b Trends in the currency composition

Do the borrowing countries show a significant trend of diversification or concentration in the currency denomination of their debt over time?⁷ Are certain currencies gaining or losing importance in the debt denomination for whom? To answer these questions, we fit a linear trend to the time series of the compositional shares of the major currencies by

$$\frac{PPG_{j,t}}{PPG_t} = \alpha_j + \beta_j t + \varepsilon_{j,t}. \quad (1)$$

For a given country, $PPG_{j,t}$ is the currency j -denominated PPG external debt in year t .

PPG_t is the total PPG debt of the country in the same year.

⁷ It is noted that the currency compositions can shift not only for new issues but also the existing debt stock via currency conversion options in rescheduling negotiations.

Panel C of Table 1 presents the numbers of countries for which the denoted currencies exhibit a significant upward or downward trend (noted with + and -, respectively) in their shares. It is evident that USD is becoming even more dominant over time for both the MICs and the LICs since the number of countries with a significant upward trend exceeds by far that with a downward trend. Specifically, the balance is forty-nine positives versus seventeen negatives for the MICs, and twenty-one versus two for the LICs. In contrast, there are more countries that reduced the share of Euro than those that increased due presumably to the recent debt crises. For JPY, there are more MICs with an increasing trend than those with a decreasing one. On the other hand, the number of LICs with a downward JPY trend exceeds that with an upward one.

It is evident from the table that GBP and CHF have been losing their ground as a currency of external debt denomination. For both currencies, the number of the MICs exhibiting a downward trend far exceeds that with an upward trend. Also, while no LICs show an upward trend in their shares, twenty-five and sixteen LICs have a significant downward trend in the shares of GBP and CHF, respectively.

Finally, the entries for the other currencies than the major ones provide little signs of dissolving original sin. Overall, the external debt of the MICs and the LICs continues to be characterized by the striking dominance of USD and, to a lesser degree, a few other major currencies. Furthermore, in general the dominance of USD is increasing over time.

2.c Regional stratification

It is conceivable that geographical distributions of the debtor countries and the countries of popular denominating currencies generate region-dependent non-homogeneous trends in the currency composition. To examine the possibility,

Tables 2.A and 2.B provide the information on the external debt by regionally-stratified sub-samples.⁸ In general, the major denominating currencies show strong presence in the regions of geographical proximity and strong historical ties. For instance, USD has the highest share of sixty-seven percent in Latin America & Caribbean. Furthermore, twenty-one out of twenty-four countries in the region have shown an increasing trend in the USD share. Similarly, the share of JPY is higher in East Asia & Pacific than other regions. Euro shows eminent presence in Europe & Central Asia and Middle East & North Africa although it also has a surprisingly high share in South Asia.

Despite the aforementioned regional specificity, however, we observe universal dominance of USD. Even in East Asia & Pacific, the share of USD is more than twice that of JPY. By the same token, it dominates Euro in Europe & Central Asia as well as Middle East & North Africa. These observations stress that excessive reliance on USD-denominated debt is a global phenomenon, rather than a regional one.

As an alternative way to summarize the data, Figure 2 plots for each region the average share by currency as time series. With a possible exception of Middle East and North Africa (Figure 2.E) where Euro was almost catching up with USD before the crisis, the predominance of USD seems unshakable. The trends in the average shares of Euro on the other hand differ widely by region. Aside from Middle East and North Africa, the currency has steadily increased its share since its birth in Europe and Central Asia and South Asia (Figures 2.B and 2.C). In South Asia the rise in Euro's share is observed concurrently with a decline in the shares of USD and JPY.

Taken altogether, our findings on the currency compositions of the PPG debt thus far makes an interesting contrast to, for instance, those on private bond issuance

⁸ The regional categories are as defined by the World Bank.

reported by Hale, Jones, and Spiegel (2014). These authors find a substantial decline in the share of international bonds denominated in the major currencies and an increase in bonds denominated in issuer's home currencies over the last two decades. Nonetheless, aside from the difference of public versus private issuances, we note two additional sources of differences in the findings. Their country sample consists mainly of advanced economies including the ones of the major currencies. Also, they consider the new issuances whereas we do the stock.

3. Fluctuations of exchange rates and debt burden

3.a *The debt-weighted effective exchange rates*

Depreciation of a domestic currency can have various consequences depending on which currencies it depreciates against. A major concern for many MICs and LICs is the extent to which the depreciation increases the burden of their external debt. To capture the extent of the debt revaluation effect, it would be useful to construct an index that measures the overall value of a debtor's currency against the currencies in which its external debt is denominated.

Using data on the currency composition of the PPG debt and the bilateral nominal exchange rates, we construct the DEER index

$$DEER_{i,t} = \prod_j \left(\frac{S_{i,j,t}}{S_{i,j,2010}} \right)^{\gamma_{i,j,t}} \quad (2)$$

for which $\gamma_{i,j,t}$ is the share of currency j for country i 's external PPG debt in year t ,

$S_{i,j,t}$ is the bilateral nominal exchange rate between i 's currency and currency $j \in \{\text{USD, Euro, JPY, GBP, CHF, others}\}$. To make the index consistent with the real

effective exchange rate series we use in the next sub-section, the bilateral nominal exchange rate is measured in the number of currency j per i 's currency (i.e. the number of foreign currency per domestic currency) and is indexed to its 2010 value.⁹

One data issue to note is how to treat the debt denominated in other currencies than the major currencies. More specifically, the IDS database contains composition categories labeled “All other currencies” and “Multiple currencies” without further specifications on which currencies they actually are. Constrained by the data limitations, we make a simplifying assumption that the debt in other categories than the major currencies is denominated in a debtor's own currency. This assumption will make the constructed DEER index look more stable, if any, than actual. We keep this in mind when interpreting the empirical results. Nonetheless, given the dominance of the major currencies in the debt denomination documented in the previous section, we believe that fluctuations against the major currencies will draw the essential picture.

3.b Debt revaluation and cost competitiveness gain in trade

It is not only the value of foreign-currency-denominated debt that is affected when a debtor's exchange rate fluctuates. If a domestic currency depreciates against the currencies of a debtor's trading partners, then it can also translate into cost competitiveness gain in international trade.¹⁰ Consequently, it should help the indebted country invigorate its economy and pay back part of its external debt. The extent of the cost competitiveness gain effect depends on the currency compositions of debt and trade which can vary substantially by country. Therefore, implications of domestic depreciation should be also diverse across countries accumulating external debt. The

⁹ An increase in the debt-weighted exchange rate index indicates domestic appreciation as for the trade-weighted real effective exchange rate indices.

¹⁰ The relative inflation is assumed to be stable so that it will not offset the exchange rate movements at least in the short-run.

point is not sufficiently addressed in the previous literature on currency mismatch and original sin.

In this sub-section, we examine the association between the aforementioned two effects arising from exchange rate changes: the debt revaluation effect and the cost competitiveness gain effect. We do so by estimating the correlations between the DEER and TREER series. The novelty of this measure is that it succinctly reflects how the two distinct effects of exchange rate fluctuations interplay for a borrowing country.¹¹ The feature is absent from the extant indices of currency mismatch that rely on the total value of external liabilities in relation to that of export and other assets at a given point in time.¹²

Unfortunately, the real effective exchange rate series are available only for a subset of the sample countries. Consequently, there are only fifty countries, the MICs and the LICs combined, for which we have both the DEER and TREER indices. As a supplementary indicator we consider the ratio of total debt stock (DSTC) to exports of goods, services and primary income. In addition, we estimate correlations between the DEERs and the bilateral nominal USD exchange rates (USD_X) to use as a reference. To avoid spurious correlations, we use the first differences of logged data for all series.

Table 3 summarizes the correlations between the DEER and other series. Panel A presents the descriptive statistics when using all available observations. As a benchmark reference, we first report the correlation between the DEER and the USD_X. The DEER-USD_X correlation is notably high at 0.84 on average, confirming the dominance

¹¹ The actual trade of a debtor country can be shaped in part by factors outside its own trade network. In this sense, the measure we propose does not exclude the third country effects since the TREER is based on the actual trade. The point should be borne in mind when interpreting the empirical results.

¹² For instance, see Eichengreen, Hausmann, and Panizza (2007), Goldstein and Turner (2004) and Ranciere, Tornell, and Vamvakidis (2010b).

of the USD as a debt-denominating currency. Almost all countries in the sample exhibit a positive DEER-USDX correlation.¹³

The average correlation between the DEER and the TREER is 0.55. The positive correlation implies that exchange rate changes that increase the domestic currency value of the external debt also tend to improve cost competitiveness in trade albeit not in a one-for-one fashion. Nonetheless, the DEER-TREER correlation appears substantially lower than the DEER-USDX correlation.¹⁴ The finding implies that the heavy concentration on USD in debt denomination drives a wedge between the extents of debt revaluation and trade competitiveness gain as the debtor's exchange rate fluctuates. Further, we notice that the DEER-TREER correlation is more variable than the DEER-USDX one. The minimum (-0.50) and the maximum (0.89) are recorded by Ukraine and Nigeria, respectively.

The positive DEER-TREER correlations suggest that domestic depreciation increases the burden of the external debt on the one hand while improving the cost competitiveness in international trade on the other hand. What would be the balance between the two effects? The bottom row of the panel reports the DEER correlations with the debt stock as a percentage of exports of goods, services and primary income. A fall in the value of the DEER means domestic depreciation. While it can translate into both revaluation of the external debt and growth in the exports, the ratio between the

¹³ The only country that exhibits a negative correlation is Azerbaijan. On the other extreme, Kosovo shows a correlation of unity implying that all of their PPG debt is denominated in the USD.

¹⁴ The result is not an artifact of different sample sizes. As shown in Panel B of Table 3, using the identical samples does not alter the conclusion.

debt stock and exports can rise or fall to generate a negative or positive DEER-DSTC correlation.¹⁵

As displayed in the bottom row of Panel A, the DEER-DSTC correlation varies substantially by country ranging from -0.68 (Ethiopia) to 0.92 (Myanmar) with the mean near zero. The distributional balance between positive and negative correlations also reveals non-unanimity of the countries. Specifically, sixty-eight and fifty countries exhibit positive and negative correlations, respectively. The chief message is, again, countries are diverse in their experiences of the debt revaluation and cost competitiveness gain effects under exchange rates fluctuations.

While we have used all available observations so far, the differences in the samples make it difficult to compare the entries across rows in Panel A of Table 3. We thus re-calculate the statistics using a common sample consisting only of countries and years for which all necessary data are available. This reduces the sample size to forty-five. The common sample results are summarized in panel B. They turn out quite comparable to those in panel A, requiring no significant alteration to our conclusions.

Figure 3 presents the DEER-TREER correlation estimates by sub-samples to visualize possible heterogeneity. As displayed, the LICs tends to have a higher correlation, and hence more accordant currency compositions, than the MICs. When classified by region, Europe and Central Asia and Sub-Saharan Africa, respectively, have the lowest and highest correlations. Their difference is statistically significant.¹⁶

¹⁵ Note that it is the ratio of debt to exports rather than net exports that the available data allow us to observe.

¹⁶ The sub-sample averages are tested for equality. We additionally investigated if the DEER-TREER correlations differ by exchange rate regimes using the three-way classification scheme of Levi-Yeyati and Sturzenegger (2005). The cross-regime differences in average correlations are found statistically insignificant.

4. Implications of the debt-trade “mismatch”

4.a Augmented growth regression specifications

In view of the results in the preceding sections, we are now poised to raise an essential question: Does the extent of the currency-compositional discord between external debt and international trade have significant welfare implications as hypothesized in the introduction section? We answer the question by estimating growth regressions to test if the extent of the debt-trade mismatch exerts a significant effect on a country’s growth performance.

Specifically, we estimate the following cross-country regression equation

$$\Delta Y_i = \alpha + \gamma' X_i + \phi_1 VOL_i + \phi_2 COR_i + \phi_3 (VOL_i \times COR_i) + \varepsilon_i, \quad (3)$$

for which ΔY_i is the average growth rate of *per capita* real GDP of country i . X_i is a vector of standard growth regression variables we include as controls. They are the initial level of GDP *per capita* (in logarithm), investment, government consumption, population growth rate, secondary education school enrollment rate, trade openness (i.e. total trade to GDP), and debt stock.¹⁷ Investment, government consumption, and debt stock are measured in relative terms to GDP. With an exception of the initial level of GDP *per capita*, the control variables are measured in their sample average terms.

The regressors of our primary interests are those with ϕ coefficients. Namely, VOL_i is the exchange rate volatility measured by variances of the first differences of logged nominal effective exchange rates. COR_i is the DEER-TREER correlation. A larger

¹⁷ Investment is measured by gross fixed capital formation. For the choice of controls, see Barro (1991), Durlauf and Quah (1999), Levy Yeyati and Panizza (2011), and Panizza and Presbitero (2014) among many others.

value of COR_i indicates a closer co-movement driven by more accordant currency compositions, and hence, a smaller extent of the debt-trade mismatch.

We emphasize that the interaction term, $VOL_i \times COR_i$, in (3) is indispensable since the growth effect of the debt-trade mismatch should depend on how much i 's nominal exchange rate actually changes. For instance, when a country's exchange rate stays perfectly still, there will be no revaluation effect on its external debt.¹⁸ Only to the extent that a country's nominal exchange rate actually fluctuates, its external debt valuation also changes. Only then it becomes meaningful to consider how much of the debt revaluation effect will be compensated by the cost competitiveness gain effect arising also from the exchange rate fluctuations. Omitting the interaction term from (3) will result in a specification that restricts the extent of the debt-trade mismatch to affect all countries in an identical manner regardless of the extent of exchange rate variability, and vice versa.

It is worth noting that in (3) the effect of the DEER-TREER correlations on growth is measured by $\phi_2 + \phi_3 VOL_i$. We stress that ϕ_2 does not represent the marginal effect of the DEER-TREER correlations on growth. Instead, it measures the effect of the DEER-TREER correlations when there is no nominal exchange rate variability. Since nominal effective exchange rates fluctuate even for countries with a successful fixed exchange rate regime, VOL_i takes a positive value for all countries.

4.b Empirical results

Table 4 summarizes the estimates of (3) and its variants. We begin with a bare-bone specification that includes only the conventional growth regression variables. The

¹⁸ Consequently, currency mismatch is not even an issue.

estimates are provided in Column 1 of the table. The signs of the coefficient estimates are in accordance with the expectations based on the literature. The effect of the initial income level is significantly negative, implying convergence. The investment ratio exerts a highly significant positive effect, while government consumption does a negative one with only moderate significance. Though statistically insignificant, the population growth and school enrollment rates obtain negative and positive coefficients, respectively, in line with the conventional theoretical predictions and the existing evidence. The effect of the trade openness variable also turns out insignificant. The debt to GDP ratio has a significantly negative effect on growth, which is consistent with the findings of some recent studies (Reinhart and Rogoff, 2010 and 2011).¹⁹

In column 2 and 3, we report the estimates when incrementally including VOL_t and COR_t without allowing their interaction. These constrained estimates suggest that exchange rate volatility by itself does not exert a significant effect on growth. A similar observation is made on the effect of COR_t . The adjusted r-squared estimates indicate deterioration of the model's explanatory power relative to the bare-bone specification.

In contrast, the unconstrained specification estimates of (3) reported in column 4 reveal some significant effects. The exchange rate volatility variable obtains a significant negative coefficient, whereas the interaction term $VOL_t \times COR_t$ attains a significant positive effect. Further, the adjusted r-squared estimates attest noticeable improvement in terms of explanatory power.

¹⁹ Panizza and Presbitero (2014) points out for a sample of OECD countries that the negative debt-growth correlation may be driven by a third factor and not a product of a direct causal effect. See also Kourtellis, Stengos, and Tan (2013) for related evidence.

As already noted, the coefficient estimate on VOL_i (i.e. $\hat{\phi}_1$) does *not* represent the marginal effect of exchange rate volatility on economic growth. Instead it gauges the exchange rate volatility effect when COR_i is zero. Since $\hat{\phi}_3$, the coefficient on the interaction term, is significantly positive, as the value of COR_i increases (i.e. as the extent of debt-trade mismatch diminishes) the negative effect of exchange rate volatility will be reduced in magnitude. In fact, the combined effect, $\hat{\phi}_1 + \hat{\phi}_3 COR_i$, turns positive once COR_i exceeds a certain threshold. That is, nominal effective exchange rate volatility can exert either growth-hindering or growth-enhancing effects, depending on the level of the debt-trade currency-compositional discord.²⁰

In order for the combined effect of exchange rate volatility to be positive for growth, the DEER-TREER correlation has to exceed 0.65. This threshold value slightly exceeds the median value (0.63). More specifically, of the 45 countries in the sample, 21 possess the DEER-TREER correlation values greater than 0.65.²¹ For these countries, the DEER-TREER correlation is substantial (i.e. the debt-trade currency-compositional mismatch is small) enough for marginal increase in exchange rate variability to have an overall stimulating effect on growth. On the other hand, the

²⁰ In considering the effects of capital account liberalization, Henry (2007) argues that purely cross-sectional growth regressions are problematic since they cannot identify temporary shifts in growth rates. In our regressions, exchange rate fluctuations can occur repeatedly unlike the one-shot permanent liberalization of capital account in Henry (2007). Thus, even though each shock may have only temporary effects, recurrent shocks can lead to differences in average growth rates.

²¹ Specifically, the 21 countries are Cameroon, Colombia, Costa Rica, Cote d'Ivoire, Dominica, Gabon, Georgia, Grenada, Macedonia, Malaysia, Moldova, Nicaragua, Nigeria, Philippines, Romania, South Africa and Venezuela (17 MICs); and Central Africa Republic, Gambia, Malawi, and Togo (4 LICs).

majority of the countries experience a downward pressure on growth when their exchange rates become more volatile.

To check robustness of the results, we additionally estimate a specification that controls for the amount of foreign exchange reserves in relative terms to GDP. As discussed in the introduction section, the reserves can play an important role as buffer assets. Thus, it may also affect the growth performances. The estimates reported in column 5, however, indicate no significant changes to our findings. The reserve variable is insignificant while the effects on the key regressors remain virtually intact, suggesting robustness of our chief results.

5. Conclusions

For emerging and less developed economies, borrowing abroad typically means borrowing in foreign currencies. The prevalence of heavy reliance on foreign currency-denominated debt makes the borrowing countries more vulnerable to the debt revaluation effect of domestic depreciation. While it has been recognized as a significant factor behind recurrent crises, the empirical evidence we find in this study shows no indication that the predominance of USD as a debt denomination currency is subsiding. In fact, we find that USD is becoming even more dominant than ever as a choice of denominating currency for external debt among many MICs and LICs.

Even though many countries need to borrow abroad in foreign currencies, there is more than just one foreign currency to denominate the debt. When the currency compositions of external debt and international trade are made accordant enough, domestic depreciation that increases the burden of the external debt also leads to cost competitiveness gain for international trade. Thus, the debt revaluation effect is more

likely to be offset, at least partially, by a subsequent rise in net export. It is in a sense a self-alleviation mechanism that can be built in by having “right” compositions of currencies to denominate a country’s external debt.

The correspondence between the currency compositions of external debt and international trade can have important ramifications for economic performances of debtor countries. Indeed, our growth regression results attest that countries with more accordant debt-trade currency compositions tend to have growth advantages over those otherwise. In other words, of the countries with original sin and currency mismatch, there are ones that suffer from “another mismatch” and those do not. The issue is not if to borrow in foreign currencies, but who borrows in which foreign currencies and trades with whom. Thus, the ramifications of the seemingly excessive USD-debt, for instance, are not the same across countries. In sum, not all original sin is equally sinful.

Needless to say, borrowers cannot unilaterally and freely select the currencies in which their debt will be denominated. Nonetheless, it should be also lenders’ interest to avoid debt crises and detrimental economic consequences. In this sense, the findings of this study suggest that it is worth reconsidering the currency denomination strategies of the external debt of the MICs and LICs. Countries with significant debt-trade currency compositional mismatch bear implicit cost in terms of growth that might be avoided by revising the currency compositions of their external debt denomination. The cost is implicit in that the significant growth suppressing effect of another mismatch has not been explicitly recognized in the previous literature.

Of course, it is not costless to alter the currency composition of the external debt. Caballero and Krishnamurthy (2003), for instance, finds that the financial underdevelopment in emerging markets make agents undervalue insuring against

domestic depreciation. A crucial consequence is that they choose, rather than to be forced, to use excessive dollar debt. If so, domestic financial development needs to precede re-balancing of the currency compositions of the external debt. In general, the extents of financial development can be a factor that influences the relationship between the choice of currency compositions of debt and economic performances.

Also, the real cost of the debt-trade currency compositional mismatch needs to be evaluated by netting out its benefit. By having USD as the currency of debt denomination, borrowers are likely to have a better access to external capital. Thus, the balance between the accessibility and the risk needs to be taken into account.

Finally, while the analytical focus of this paper is set specifically on the debt-trade mismatch, it would be also interesting to examine if the growth effects we find extends to a broader measure of currency exposure such as the one proposed by Lane and Shambaugh (2009). These issues are saved for future research.

Data Appendix

Sources

The data used in this study are obtained from the following sources:

International Debt Statistics, World Bank.

World Development Indicators, World Bank.

International Financial Statistics, International Monetary Fund.

Direction of Trade Statistics, International Monetary Fund.

Sample period

The primary sample period is 1980-2012. Depending on the availability of the data, some countries have shorter samples.

Euro: exchange rate 1999-2012; currency composition 2001-2012.

Deutsch mark and French franc: exchange rate 1980-1998; currency composition 1980-2000. The exchange rates for 1999 and 2000 are set to 1 euro = 1.95583 DM and 1 euro= 6.55957 FF.

Sample countries

Our sample consists of all middle and low income countries in the WDI for which the data on the external debt currency composition are available. The MIC and LIC samples respectively consist of ninety-one and thirty-three countries listed below. For the analyses in sections 3 and 4, the numbers of countries in the samples are further reduced due to limited data availability.

Middle income countries (91 countries) : Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Belarus, Belize*, Bhutan, Bolivia*, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria*, Cabo Verde, Cameroon*, China*, Colombia*, Republic of Congo, Costa Rica*, Cote d'Ivoire*, Djibouti, Dominica*, Dominican Republic*, Ecuador, Egypt, El Salvador, Fiji*, Gabon*, Georgia*, Ghana*, Grenada*, Guatemala, Guyana*, Honduras, Hungary*, India, Indonesia, Iran*, Jamaica, Jordan, Kazakhstan, Kosovo, Kyrgyz Republic, Lao PDR, Lebanon, Lesotho*, Macedonia*, Malaysia*, Maldives, Mauritania, Mauritius, Mexico*, Moldova*, Mongolia, Montenegro, Morocco*, Nicaragua*, Nigeria*, Pakistan*, Panama, Papua New Guinea*, Paraguay*, Peru, Philippines*, Romania*, Samoa, Sao Tome and Principe, Senegal, Serbia, Seychelles, Solomon Islands, South Africa*, Sri Lanka, St. Lucia*, St. Vincent and the Grenadines*, Sudan, Swaziland, Syrian Arab Republic, Thailand, Tonga, Tunisia*,

Turkey, Turkmenistan, Ukraine*, Uzbekistan, Vanuatu, Venezuela*, Vietnam, Yemen, Zambia

Low income countries (33 countries): Afghanistan, Bangladesh, Benin, Burkina Faso, Burundi*, Cambodia, Central African Republic*, Chad, Comoros, Democratic Republic of Congo*, Eritrea, Ethiopia, Gambia*, Guinea, Guinea-Bissau, Haiti, Kenya, Liberia, Madagascar, Malawi*, Mali, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sierra Leone*, Somalia, Tajikistan, Tanzania, Togo*, Uganda*, Zimbabwe.

“*” indicates the countries for which the data availability allows us to calculate the DEER-REER correlations. These 45 countries constitute the sample for the growth regressions in section 4.

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Table 1. Currency composition of PPG external debt

	Middle-income countries	Low-income countries
Number of countries	91	33
<i>A. Share of PPG debt (%)</i>		
Debt stock	70.22	83.62
Debt service	70.24	95.93
<i>B. Currency composition (%)</i>		
US dollar	50.14	49.05
Euro	16.15	8.22
Deutsch mark	3.49	1.64
French franc	5.26	5.52
Japanese yen	6.76	4.49
British pound	2.07	1.94
Swiss franc	0.95	0.93
Major currencies	81.35	68.17
Others	9.78	17.21
<i>C. Trends by currency</i>		
US dollar	+49, -17	+21, -2
Euro	+22, -33	+4, -12
Japanese yen	+36, -20	+6, -8
British pound	+2, -56	+0, -25
Swiss franc	+5, -45	+0, -16
Others	+31, -43	+12, -13

Notes: In panel A, the average shares of public and publicly guaranteed debt stock (service) in total debt stock (service) are reported. The sample period is 1980-2012. In panel B, “Major currencies” refers to the total shares of US dollar, Euro, Japanese yen, British pound, and Swiss franc. For 1980-2000, Euro is replaced by German mark and French franc. “Others” indicates the shares of all other currencies than those in “Major currencies”. The sample period is 1980-2012 except for Euro (2001-2012), Deutsch mark (1980-2000), and French franc (1980-2000). In panel C, the entries with “+ (-)” sign denote the numbers of countries exhibiting a positive (negative) trend in the share of the corresponding currency in the first column. Trends are estimated by (1) in the main text.

Table 2.A Currency composition of PPG external debt by region

	East Asia & Pacific	Europe & Central Asia	South Asia
Number of countries	16	21	8
<i>A. Share of PPG debt (%)</i>			
Debt stock	72.90	55.57	85.10
Debt service	69.15	52.91	78.71
<i>B. Currency composition (%)</i>			
US Dollar	40.71	54.99	47.12
Euro	5.17	25.43	6.55
Deutsch mark	2.80	5.23	2.11
French franc	2.99	0.82	0.96
Japanese yen	16.56	6.88	10.17
British pound	1.72	0.19	2.16
Swiss franc	0.46	1.60	0.15
Major currencies	74.77	91.02	67.54
Others	11.53	3.19	12.09
<i>C. Trends by currency</i>			
US Dollar	+10, -2	+6, -6	+3, -1
Euro	+0, -6	+10, -6	+1, -3
Japanese yen	+6, -4	+9, -2	+5, -1
British pound	+0, -11	+2, -6	+0, -7
Swiss franc	+1, -8	+1, -8	+0, -3
Others	+5, -6	+10, -9	+1, -6

Notes: The entries are for the countries that belong to the regional categories denoted at the top. See also the notes to Table 1.

Table 2.B Currency composition of PPG external debt by region

	Latin America & Caribbean	Middle East & North Africa	Sub-Saharan Africa
Number of countries	24	10	45
<i>A. Share of PPG debt (%)</i>			
Debt stock	73.06	77.23	80.21
Debt service	71.96	80.97	74.24
<i>B. Currency composition (%)</i>			
US Dollar	67.18	43.52	43.35
Euro	5.70	28.80	14.38
Deutsch mark	1.95	3.76	2.58
French franc	2.03	10.77	9.40
Japanese yen	3.58	7.33	2.52
British pound	2.98	0.93	2.73
Swiss franc	0.23	0.66	1.42
Major currencies	89.28	79.49	68.15
Others	4.74	16.15	18.53
<i>C. Trends by currency</i>			
US Dollar	+21, -1	+3, -7	+27, -2
Euro	+2, -12	+5, -2	+8, -16
Japanese yen	+5, -9	+6, -1	+11, -11
British pound	+0, -18	+0, -5	+0, -34
Swiss franc	+0, -13	+1, -6	+2, -23
Others	+2, -17	+5, -3	+20, -15

Notes: See the notes to Table 2.A.

Table 3. Correlations between debt-weighted effective exchange rate and other indices

	Sample size	Positive	Negative	Mean	Std. dev.	Minimum	Maximum
<i>A. Maximum sample</i>							
(DEER, USDX)	111	110	1	0.84	0.19	-0.37	1.00
(DEER, REER)	50	48	2	0.55	0.30	-0.50	0.89
(DEER, DSTC)	118	68	50	0.02	0.28	-0.68	0.92
<i>B. Common sample</i>							
(DEER, USDX)	45	45	0	0.85	0.15	0.30	0.99
(DEER, REER)	45	43	2	0.53	0.31	-0.50	0.89
(DEER, DSTC)	45	22	23	-0.02	0.26	-0.53	0.59

Notes: The entries indicate correlations among the followings: debt-weighted effective exchange rates (DEER), trade-weighted real effective exchange rates (TREER), bilateral USD rates (USDX), and external debt stocks (DSTC) as percent of exports of goods, services and primary income. The correlations are based on the first difference of logged series. Panel A contains the statistics based on all available observations. In panel B, the correlations are calculated using the identical country and year samples.

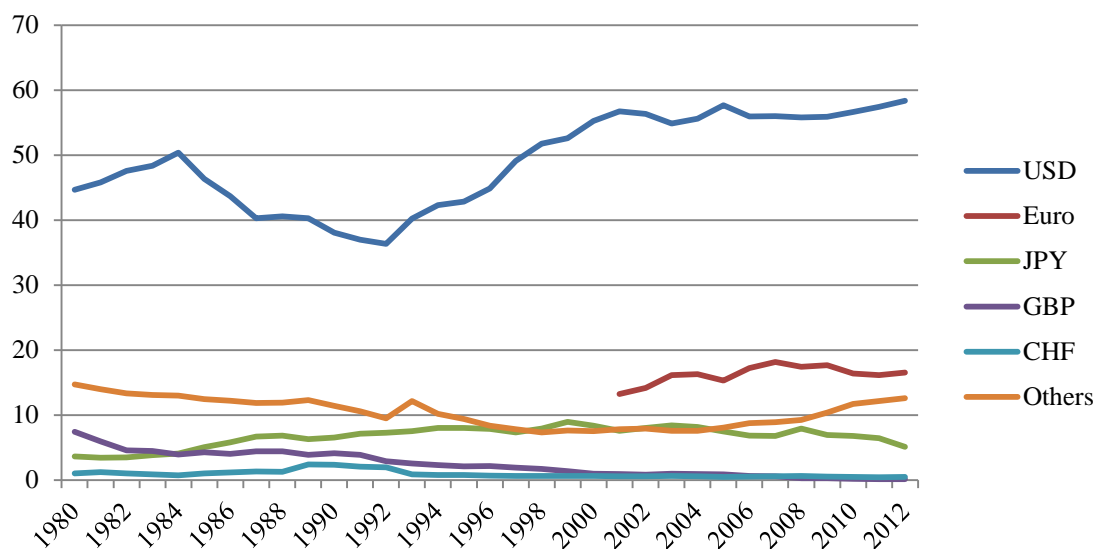
Table 4. Growth regression estimates

	1	2	3	4	5
Initial GDP	-.857* (.336)	-.906* (.348)	-.960* (.369)	-1.032** (.355)	-.962** (.322)
Investment	.205** (.065)	.201** (.064)	.198** (.062)	.179** (.063)	.171** (.055)
Government cons.	-.114 [†] (.064)	-.117 [†] (.065)	-.109 [†] (.063)	-.123* (.056)	-.119* (.055)
Population growth	-.181 (.313)	-.190 (.317)	-.207 (.325)	-.086 (.343)	-.093 (.353)
School enrollment	.016 (.013)	.015 (.013)	.019 (.014)	.024 (.015)	.023 (.015)
Trade openness	-.003 (.007)	-.001 (.007)	-.001 (.007)	-.001 (.007)	-.001 (.008)
Debt stock/GDP	-1.184* (.508)	-1.547* (.621)	-1.534* (.625)	-1.559* (.568)	-1.301* (.571)
VOL		.097 (.225)	.097 (.202)	-1.852* (.695)	-1.854* (.712)
COR			.677 (.877)	-.517 (1.035)	-.564 (1.055)
VOL×COR				2.848** (.985)	2.817** (1.004)
Reserves/GDP					.003 (.006)
Adjusted R ²	.527	.520	.521	.562	.557
n	45	45	45	45	45

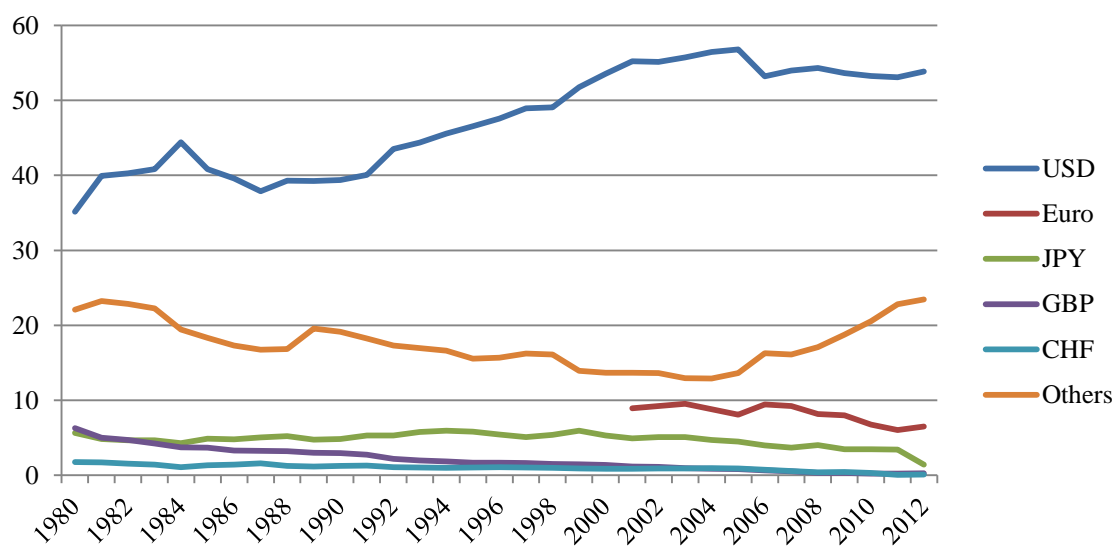
Notes: The entries summarize the estimates of the cross-country growth regression (3) in the main text and some variant specifications. The sample size is 45 for all estimates. Heteroskedastic-robust standard errors are provided in the parentheses. VOL is the variances of the nominal effective exchange rates. COR is the correlation between debt-weighted effective exchange rates and trade-weighted real effective exchange rates. First differences of the logged data used for all exchange rates.

Figure 1. Average PPG share by denominating currency (%)

A. Middle income countries



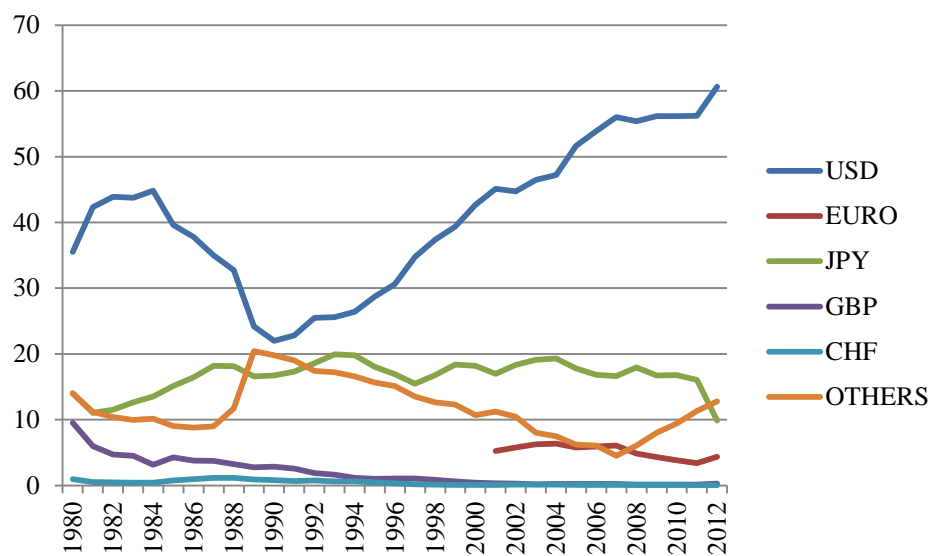
B. Low income countries



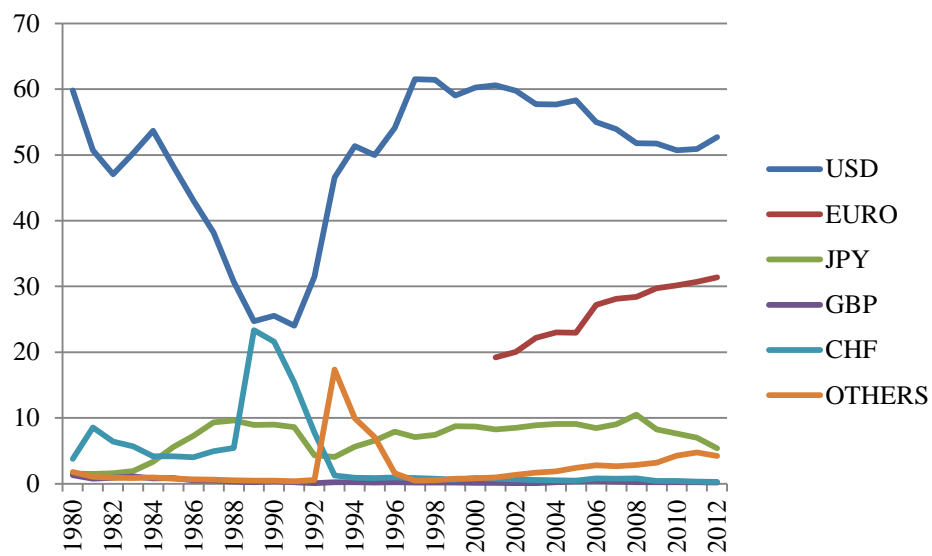
Notes: The figures depict the cross-country averages of the percentage shares of the PPG debt by currency of denomination.

Figure 2

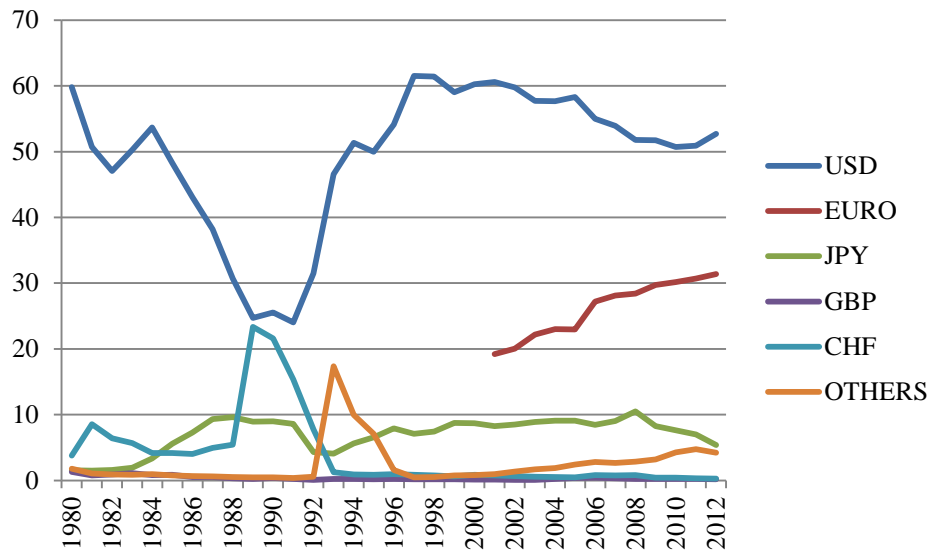
A. East Asia and Pacific



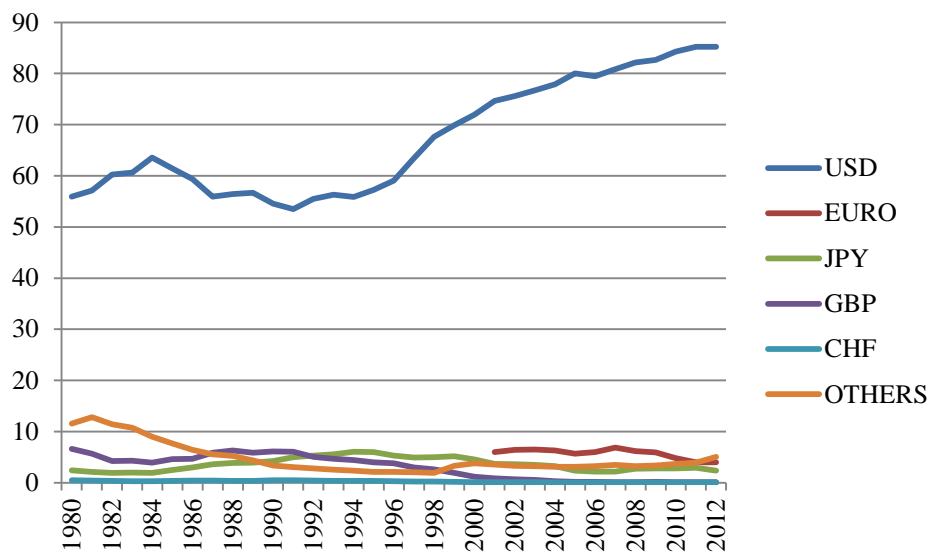
B. Europe and Central Asia



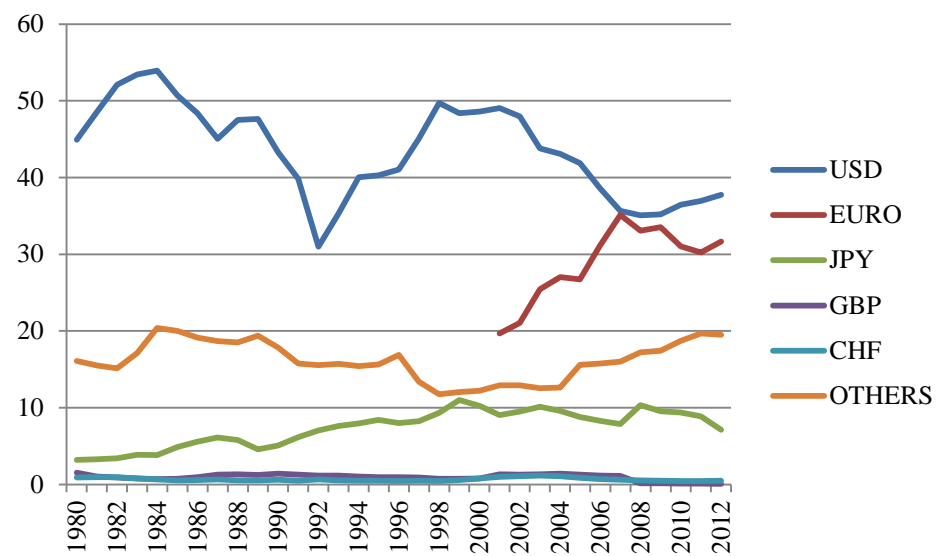
C. South Asia



D. Latin America and Caribbean



E. Middle East and North Africa



F. Sub-Saharan Africa

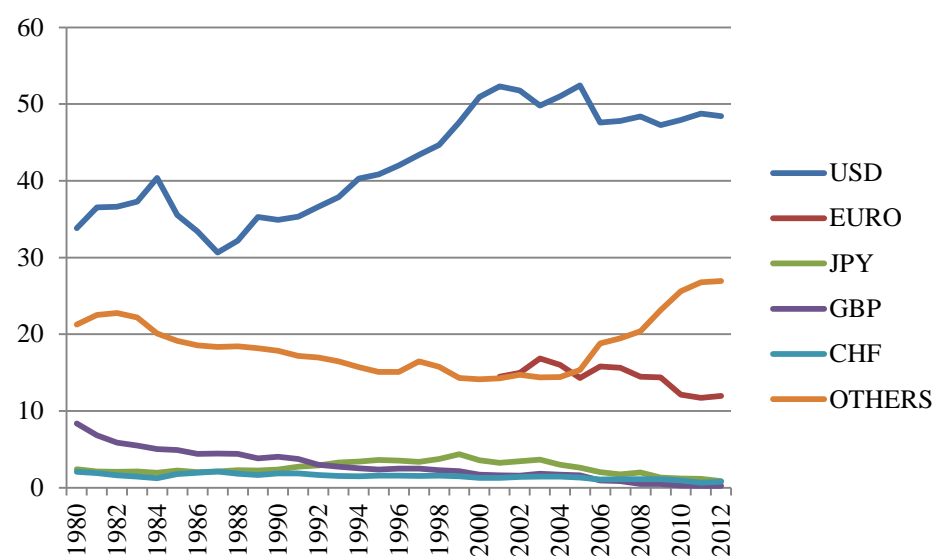


Figure 3 Average DEER-TREER correlations by country groups

