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Clamoring for Greenbacks: Explaining the resurgence of the U.S. dollar in international debt

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Abstract

This paper investigates the determinants of currency denomination in international debt. Using data on currency shares for international debt securities for 82 countries from 1995 through 2013, we find that while the *extent* of foreign currency issuance has not changed much since the 1990s, especially for developing countries, the currency *composition* has shifted, especially between the U.S. dollar and the euro. Before the Global Financial Crisis (GFC) of 2008, the share of the U.S. dollar has been on a downward trend while that of the euro had been on a steady rising trend, but since the crisis, the U.S. dollar share rebounded. With these findings, we estimate the determinants for the shares of the U.S. dollar, the euro, and the total of foreign currencies in international debt denomination. Our empirical analysis yields the following findings. First, not only does economic size matter, but also a country's monetary, financial and fiscal stance. Second, countries seem to increase their reliance on the euro first before increasing their issuance of debt in domestic currency. Third, financial opening has a persistent, effective influence on both the extent of foreign currency denomination and the shares of individual major currencies. Lastly, by applying the baseline estimation model only to the data before 2007, we conduct a counterfactual analysis to examine what would have happened to the shares of the major currencies had it not been for the GFC. Our results show that without the occurrence of the GFC, the share of the euro in international debt in 2013 would have been 9 percentage points higher at 24%, while the share of the dollar would have been 13 percentage points lower at 54%. Considering a conservative scenario for the near future, the dollar will likely continue dominating the denomination of international debt. In 2020 the share of the dollar in international debt could be at 63% while the share of the euro could be 18%.

***Keywords*:** International debt, Currency composition, Financial openness, Emerging economies
***JEL Classification*:** F02, F34, F41, G15

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1. Introduction

Throughout the post-World War II period, the United States has been playing a dominant role in the international monetary system. Its currency the U.S. dollar is clearly the most dominant international money, more than sufficing all three accounts in the traditional definition of international currency: store of value, medium of exchange, and unit of account in both public and private sectors (Kenen, 1983).

Roughly half of international trade in goods and services and a large proportion of foreign exchange trade (87% out of 200%, Triennial Report 2013) are being conducted with the U.S. dollar as the currency of denomination.[1] More than 65% of internationally-issued debt is denominated in the U.S. dollar. Foreign reserves are held predominantly in the U.S. dollar, accounting for about 60-65% of foreign reserves of central banks in the world. In each type of transactions, the comparable shares of the Euro, the second largest international currency, are about less than half of those of the U.S. dollar. The shares of other currencies are even much smaller. No other currency provides as massive, deep, and liquid financial markets as the U.S. dollar does.

For the last decade or so, the U.S. dollar-centric international monetary system has been facing several challenges. For one, the global financial crisis of 2008 revealed that the current dollar-centric system only feeds profligacy of the issuer of the United States. The high level of dominance of the U.S. dollar in international financial markets contributes to making fiscal discipline less bounding. Many economists argue that such prerogatives of obtaining lower-cost external finance may have led the country to experience the housing bubble in the mid-2000s and its consequential bust, affecting many other economies in the world and thereby keeping the world economy prone for bubble-bust cycles and financial crisis.

Second, while the Euro has been the second most widely used international currency since its creation, the current debt crisis in the Euro area has put the stability and credibility, or even viability, of the currency into question. Once it was argued that the current could challenge the U.S. dollar (such as in Chinn and Frankel, 2007) as the world's dominant currency, the Euro is now so far from being a threat to the U.S. dollar dominancy. However, given the potential instability of the world economy in the U.S. dollar-centric system, merits of a multi-currency

[1] Since each transaction of foreign exchange involves two currencies, the sum of shares in exchange turn over for individual currencies totals 200%

system have been much discussed. Eichengreen (2010) argues that a multi-currency international monetary system, based on the U.S. dollar, the Euro, and the Chinese renminbi (RMB), would make the world economy more stable because it requires for the issuers of the key currencies to check and discipline their fiscal conditions. From that view, the weakening credibility of the Euro may contribute to more instability of the world economy.

Third, the current international monetary system does not represent well the rise of China and other major developing countries as economic powers, all of which are highly frustrated with the current underrepresentation in international economic organizations such as the World Bank and the International Monetary Fund. In recent years, as one of the attempts to change the current system, China has demanded for its currency renminbi (RMB) to be included in the basket for the Special Drawing Rights (SDR) along with the U.S. dollar, the Euro, the Japanese Yen, and the British Sterling, hoping to have the RMB recognized as a vehicle currency. For China, challenging the current international money framework essentially means to what extent China can increase the use of its currency in international markets.

These challenges indicate that topic of international currency is quite important at this point. This paper focuses on one aspect of the issue of international currencies. We will focus on the following questions: How dominant is the U.S. dollar as a currency of denomination for international debt securities? What kind of factors would affect the shares of currencies used for denomination in international debt? Is there any effect of the GFC on the shares of the U.S. dollar and the Euro, or the extent of total foreign currencies in denomination for international debt issuance? This study attempts to answer these questions, hoping to provide insightful information. Hence, this paper should provide useful information for both academic and policy making circles to discuss the issues relevant to international currencies and to whether and how to reform the current dollar-centric international monetary system.

The rest of the paper is organized in the following way. In Section 2, we present summary statistics of the shares of major currencies in outstanding international debt. In Section 3, we conduct an estimation analysis to investigate the determinants of the shares of the U.S. dollar and the Euro, and that of foreign currencies in total in international debt. Using the estimation results, we will conduct a counterfactual analysis on how the shares of the U.S. dollar and the Euro would have changed if it had not been for the Global Financial Crisis (GFC). We

will also make forecasts on the currency shares for the years after 2013. In Section 6, we will make concluding remarks.

2. Stylized Facts of Foreign Currency Shares in International Debt

In this study, we focus on the development of the shares of foreign major currencies, namely, the U.S. dollar, the Euro, and the total of foreign currencies, used for international debt denomination. Here, international debt refers to securities issued in the markets outside the issuer country. In the literature, many researchers have focused on the implications or determinants of international domestic debt such as Mehl and Raynaud (2005), Panizza (2008), and Reinhart and Rogoff (2011) among others.[2] However, the tendency for the empirical literature to focus on international debt is mainly due to data availability.

We use a dataset on the shares of foreign currencies in the denomination of international debt compiled by the Bank for International Settlements (BIS). Debt in this dataset refers to the sum of debt issued by the government sector, financial institutions, and non-financial instittions. Our dataset is the one recently updated with a different methodology from a previous one. Past literature, such as Hausmann and Panizza (2003, 2010), Claenssens et al. (2007), Panizza (2008) and Dell'Ebra, Hausmann and Panizza (2013), uses data based on the previous methodology which are no longer supported by the BIS. Gruic and Wooldridge (2012) describe all the changes made in the new BIS methodology of identifying international debt securities, which is consistent with the methodology recommended by the latest *Handbook on Securities Statistics* (HSS) from the IMF.[3]

The biggest change from the previous methodology related to our study is that while the previous version of the dataset defines domestic debt securities as ones denominated in domestic currency only, which is mostly reflective of the markets reality, the type of denomination currency in the current definition is no longer one of the criteria for identifying domestic or

[2] Domestic debt is issued under home legal jurisdiction, and it can be denominated in domestic and foreign currencies and held by both foreign and domestic residents, though a predominant portion of domestic debt is denominated in local currency and held by domestic residents (Reinhart and Rogoff, 2011).

[3] Two main changes should be noted in the new BIS methodology. First, the data on international debt securities is now compiled focusing on the primary market of the debt securities of concern. Hence, the data no longer pertains to the targeted investor base. Second, the BIS is now making greater use of debt securities data reported by each central bank. This change makes both central banks and the BIS collect statistics according to the classifications in the HSS. As argued by Gruic and Wooldridge (2012), the implication of this revision is not negligible; the BIS's estimate of the outstanding stock of international debt securities by 16% as of 2000 and 27% as of September 2012.

international debt securities (Gruic and Wooldridge, 2012). In the new methodology, identification is rather based on the location of the markets for the debt of concern, which is more in line with theoretical aspects of debt identification.

Besides data availability, we believe that using the data of the currency shares in international debt securities is appropriate for our study because international debt markets are more market-driven than domestic debt markets. In the domestic debt markets, government interventions and regulations could influence pricing and market formation. It is not uncommon for government authorities to try to force financial institutions to accept a certain amount or types of government debt securities. The international debt securities markets should also be market driven in terms of the choice of currencies for debt denomination.

Our dataset is also innovative in the sense that it deals with the individual shares of currencies in international debt denomination. Traditionally, the 'original sin' literature has tended to focus on the aggregate share of total foreign currencies in debt denomination, but the BIS dataset we use also allows us to capture the shares of individual currencies. That should allow our empirical study to investigate the subtlety of determinations of currency choice for debt denomination.

We must note that, due to the lack of ideal data, we use the data on the *outstanding* volumes, instead of issuance volumes, of international debt denominated in different currencies. Considering not only that outstanding volumes of international debt in different currencies are highly correlated with the volumes of international debt issuance, but also that the choice of currency denomination should not change too drastically in a short time period, this should not pose any problems.

Using this dataset, we now discuss how the choice of currency for international debt denomination has changed over time and differs among countries or regions.

As we can see in Figure 1, not only has the total volume of debt issuance been growing rapidly since the early 2000s, so has the volume of international debt. However, Figures 2 (a) and (b) illustrate that the rapid rise in the share of international debt has been concentrated among the advanced economies; the volume of international debt of advanced economies is much higher than that of developing countries.[4] Obviously, advanced economies' financial markets are generally much more open and deeper, and their governing institutions and legal

[4] Be noted that the scale is different between Figures 2 (a) and (b).

systems are highly developed, all of which leads to a higher level of financial development and a greater degree of accessibility to international financial markets (Chinn and Ito, 2006). Since the millennium, developing countries have been experiencing a rapid rise of domestic debt securities despite a retrenchment in 2008, and the issuance of international debt securities has been rising rather slowly but steadily.

A number of studies such as Calvo and Reinhart (2002), Eichengreen et al. (2002), Jeanne (2002), Ize and Levy-Yeyati (2003), and Chang and Velasco (2006) among other authors, have argued that issuing debt in foreign currencies could make a country face a higher extent of vulnerability to external shocks because of currency mismatch and lack the ability to monetize the debt as well as ensure tax base. At the same time, countries face a high hurdle to issue debt in their own domestic currencies. Especially developing countries often face the difficulty in issuing debt in domestic currency and the consequential high external vulnerability, which comprises part of the so-called "original sin" of these economies.[5]

In fact, when issuing debt internationally, many countries, whether developing or developed, would issue debt overwhelmingly in major hard currencies. Figure 3 illustrates the volume of international debt securities issued in 'top four currencies,' namely, the U.S. dollar, the Euro, the British pound, and the Japanese yen. The share of 'top four currencies' in the total outstanding international debt has been steadily over 90% throughout the sample period.

Thus, the high degree of reliance on foreign currencies for international debt issuance has been an issue that has had received much attention especially among developing countries. It has long been argued that economies with high reliance on foreign-currency-denominated debt are more vulnerable to external shocks. Figure 4 shows that such aspect of 'original sin' continues to be the case for developing countries, though it does appear to be less so for advanced economies.

In recent years, it has been anecdotally argued that the degree of reliance on foreign-currency-denominated debt has fallen among developing countries, and therefore that countries are less vulnerable to currency mismatches and more capable of implementing counter-cyclical policies. From Figure 4, we observe a decline of the degree of reliance on foreign currency-denominated debt for developed countries. However, our data show no such a trend for developing countries. In fact, the decline in the share of foreign-currency-denominated

[5] Besides the inability to issue debt in the domestic currency, "Original sin" also refers to the difficulty among developing countries to issue debt with longer maturities and the difficulty in selling their domestic to foreign investors. This paper focuses on the high degree of dependency on issuing debt in the home country's currency.

international debt has been quite modest in the last two decades; the share was about 100% in 1995, but it only declined to about 93% by 2013. This finding is consistent with what Hausmann and Panizza (2010) find, who argue that "the recent decline of currency mismatches and the consequent ability to conduct countercyclical macroeconomic policies is due to lower net debt (abstinence) and not to redemption from original sin."[6] The argument of dwindling original sin is more of an anecdote.

Figure 5 adds another interesting angle to the analysis. Despite the relatively stable share of foreign currencies in international debt denomination, there are more movements in the shares of individual currencies. The dollar, once having the share of about 70% in the beginning of the sample period, continues to lose its share down to slightly below 60% by 2007. However, the share has since been in a rising trend, coming back to about 70%. The Euro share has an almost mirror image of the U.S. dollar share. Starting around a meager 15%, the share kept rising to above 30% by the late 2000s. Given that the U.S. dollar is expected to be on a long-run depreciation trend, that has led to meager or even negative real rates of return for dollar denominated assets held by emerging market economies, the declining trend of the U.S. dollar share and the rising share of the Euro as an alternative investment destination before the crisis, are quite reasonable. However, the comeback of the U.S. dollar and the falling Euro shares after 2007 can be explained by the Global Financial Crisis of 2008, the following Euro debt crisis, or both. In other words, we argue that the resurgence of the U.S. dollar share must reflect the high demand for the U.S. dollar as a safe haven and the declining demand for the Euro due to uncertainty about its stability or even viability. Compared to the pre-global financial crisis, in terms of nominal and real effective exchange rates, the U.S. dollar appreciated by 14.8% and 11.7%, respectively, by March 2009, reflecting a surge in demand for the U.S. dollar as a safe haven. Although the Euro also appreciated during the same period by 2.5% and 2.4% in real and nominal terms, respectively, by August 2010, it depreciated by 7.5% and 8.9% and by August 2012, it depreciated by 11.9% and 14.6%, all reflecting the Euro debt crisis that broke out in 2010. In the empirical section, we will further expand this argument.

Figure 6 (a) makes it clear that the U.S. dollar retains a dominant role as the vehicle currency. Conceptually, the U.S. dollar share in international debt denomination could be proportional to the share of the US as a destination of countries' exports if the U.S. dollar

[6] The decline of net debt is largely due to a rise in the volumes of foreign reserves held by developing countries.

denomination were merely driven by the extent of trade links with the United States. In other words, if the U.S. dollar did not play a dominant role as the vehicle currency, a scatter diagram could show the share of the U.S. dollar denomination and the share of exports to the U.S. of total exports scattering around the 45 degree line. However, Figure 6 (a) illustrates that most of the countries are distributed much above the 45 degree line, indicating that countries denominate their international debt in the U.S. dollar more than their trading linkages with the U.S. would predict.

Figure 6 (b), a comparable figure to Figure 6 (a), shows a different picture. Clearly, unlike the case of the U.S. dollar, many countries are scattered around the 45 degree line. That means that the degree of reliance on the Euro for debt denomination is more of a reflection of their trading linkages with the Euro area. The Euro should be much less viewed as the vehicle currency; it is rather driven by trade behavior of the countries.

In sum, we have seen that in contrast to the oft-discussed, anecdotal claim that many countries have reduced their reliance on foreign-currency denominated debt, the degree of reliance on foreign-currency-denominated debt does not show any downward trend. Rather, it has been stable in recent years as Hausmann and Panizza (2010) also find. The shares of major currencies used for debt denomination, especially the U.S. dollar and the Euro, have been changing in recent years, however. The finding that the demand for the U.S. dollar as a debt denomination currency is disproportionally high compared to the share of the United States as an export destination, suggests that the U.S. dollar is being viewed as the vehicle currency. Such a role of the currency explains the resurgence in the U.S. dollar share since the breakout of the GFC.

3. Investigation on the Determinants of 'Original Sin' and Currency Shares in International Debt: Estimation Model

3.1 Estimation Model

We now investigate the determinants of the shares of the U.S. dollar, the Euro, and total foreign currencies for international debt issuance. Given these variables of interest are by construction bounded between zero and one, we employ the Tobit model as has also been done in past literature. The panel structure of the dataset suggests we should account for potential unobservable country effects. However, unobserved country effects would bias standard Tobit

models. Hence, to address this potential bias we use a random-effects Tobit model as the following specification:

$$y_{it}^{C} = \beta_1^{C} + \beta_2 X_{it}^{C} + \beta_3^{C} D_{it} + u_i^{C} + v_{it}^{C}. \qquad (1)$$

$$\text{with } y_{it}^{C} = \begin{cases} 1 & \text{if } y*_{it}^{C} > 1 \\ y*_{it}^{C} & \text{if } 0 \le y*_{it}^{C} \le 1 \\ 0 & \text{if } y*_{it}^{C} < 0 \end{cases}$$

where y_{it}^{C} refers to the share of either dollar-denominated debt, Euro-denominated debt, or total foreign currency-denominated debt for country *i* in year *t* with *C* refering to the U.S. dollar, the Euro, or the sum of total foreign currencies. $y*_{it}^{C}$ denotes the share of *C* before getting censored. We repeat this estimation for three different dependent variables. Again, we do not include U.S. dollar denominated debt issued by the U.S. in the share of the U.S. dollar use. Furthermore, we do not include any of the Euro countries in the estimations for the dollar and the Euro shares.[7] To keep our estimations comparable we also exclude the Euro countries from our regressions of the share of foreign currency.

As potential determinants of the currency shares, we test a number of explanatory variables. In X_{it}^{C}, we include the size of economy *i* which we measure with total GDP in nominal US dollars, the growth rate of real output (in local currency) averaged over five years before year *t*, domestic saving as a share of GDP, inflation volatility, financial development, and a variable for 'fiscal space,' or gross public debt measured as a proportion of tax revenues. X_{it}^{C} also includes $ShareTrade_{it}^{C}$, the share of country *i*'s exports to the U.S. or the Euro area in its total exports when *C* is either the U.S. dollar or the Euro, respectively. $ShareTrade_{it}^{C}$ also refers to country *i*'s exports share in total world exports when we run the estimation for the share of total foreign-currency denominated debt.

[7] The reasons for not including the Euro countries are twofold. First, the introduction of the Euro in 1999 complicates the analysis especially regarding whether we should treat the Deutsche Mark or other 'legacy currencies' in the same way as the Euro. Second, in this BIS dataset, the treatment of Euro-denominated debt can be misleading for the Euro member countries. For example, debt securities issued by a Euro member country in another Euro country is considered to be "international debt" although both countries in this case are Euro member countries. To maintain consistency, we exclude the Euro member countries from both the dollar and the Euro share estimations.

Vector D_{it}^{C} includes the dummies pertaining to currency arrangements, such as pegs to the U.S. dollar or the Euro, and also to whether or not country *i* participates in the Euro Union (EU_i).The dummy for the EU membership is assigned for the entire sample period regardless of the year of entry to the union, i.e., time-invariant.[8] In the estimations for the U.S. dollar share and total foreign currency share, we also include the dummy for the Euro membership. That is, the dummy takes the value of one for the original 12 Euro countries in 1999 and on, and also for the other Euro countries when they join the currency union. Furthermore, we include the regional dummies for Asia and Latin America, two areas which seem to have geographically distinct preferences for the U.S. dollar in international debt issuance.

Finally, u_i^C are unobserved country effects which are i.i.d. $N(0,\sigma^2_u)$ and v_{it}^C are panel level effects (independent of u_i^C) which are i.i.d. $N(0,\sigma^2_v)$. The estimation model also includes time fixed effects to control for global common shocks.

For the data on currency shares in international debt denomination, we use the BIS data on currency composition of international bonds for 70 developing and 12 developed economies from 1995 through 2013. The number of countries and years included in the regressions may be smaller depending on the data availability of explanatory variables. Most of the data for the explanatory variables are extracted from the World Bank's *World Development Indicator*, the IMF's *International Financial Statistics*, the *World Economy Outlook Database*, and the IMF's *Direction of Trade Database*. See Appendix 1 for more details on data descriptions and sources. Appendix 2 lists all countries included in our study.

3.2 Theoretical Predictions

Now, let us briefly discuss the theoretical rationales for testing the variables and what we should expect for the estimates of the variables.

GDP (in log): The larger an economy is, the more bargaining power it might have when negotiating the terms for the debt. Also, such an economy may have ample economic resources and potentials to pay off its debt. Hence, a large economy can be more likely to be able to issue

[8] This is due to stylized facts that the currency denomination behavior would differ for EU member countries even before they actually become the members, partly because of the existence of precursor organization such as the European Community and also of geographical reasons for other countries that did not participate in the precursor organizations (such as former communist states).

its debt in its own currency, i.e., less reliant on major foreign currencies, thereby suggesting negative estimates for such size effect.

Output Growth Trend: Like the size effect, higher output growth potentials can mean a higher level of potential or prospect to repay its debt, which may allow an economy with higher growth potentials to issue international debt in its own currency. To test this, we include a variable for growth potentials, which is the five-year average annual real GDP growth. The expected sign of this variable is negative for both the degree of foreign reliance and the shares of major currencies.

Domestic Saving: An economy with potential investment opportunities and room for further financial development should be able to rely less on hard currencies for debt issuance. We use gross domestic savings as a ratio to GDP as a proxy for potential investment opportunities or financial development, and expect the sign for its estimate to be negative.

Inflation Volatility: An unstable macroeconomic environment would make investors shy away from holding the currency of the country subject to such uncertainty. Higher inflation volatility usually represents an unstable macroeconomic environment.[9] Hence, a country with volatile inflation tends to rely less on its home currency as a currency and more on the U.S. dollar for debt denomination. Hence, its estimate should take a positive sign for foreign reliance and the U.S. dollar share, and to lesser extent the Euro too. We calculate the five year average annual standard deviations of the year-on-year monthly rate of inflation as a measure of inflation volatility.

Fiscal Space: The more indebted a country is, the more expensive it can become to issue its debt in its own local currency. Such a country would face higher expected inflation and currency depreciation pressure. Therefore, from the perspective of international investors, they would prefer if the country issues its debt in major currencies so that they would not have to deal with discounted repayment values. While that means fiscal sustainability is an important factor, 'fiscal space,' or public debt measured as a proportion of tax revenue the government could obtain, would be more important to capture the country's ability of the government to repay the debt. Hence, we use a measure akin to the measure of fiscal space in Aizenman and Jinjarak (2011) by dividing the general government gross debt by the five-year average of tax revenues.

[9] In fact, the high use of Deutsche Mark for both trade invoicing and international debt issuance before the advent of the Euro is often attributed to the stability of the currency, backed by Germany's stable monetary policy.

Financial Development: A currency for which large, liquid, and deep markets exist should face lower transaction costs, and therefore should make debt denominated in the home currency more appealing. To examine the impact of financial development on the choice of currency denomination, we test private credit creation (as a share of GDP: *PCGDP*).[10] We expect a negative estimate for the coefficient in the estimations for the share of the U.S. dollar or total foreign currencies while that for the Euro is ambiguous.

Dummy for dollar- or Euro-peg: If a country pegs its currency to another anchor currency such as the U.S. dollar or the Euro, it should surely tend to make it easier to issue international debt in the anchor currency, thereby also raising the tendency of general reliance on foreign currencies.[11] The dummy for dollar- or Euro-peg should capture such an effect.

Dummy for EU States: We assign the value of one to the countries that participate in the Euro Union regardless of the year of entry to the union, i.e., time-invariant. The estimate on this dummy should be negative for the U.S. dollar estimation and positive for the Euro estimations.

Ratio of Exports to the U.S. or the Euro Area in Total Exports, or Exports share in Total World Exports: If a country has a large volume of exports to an issuer of an international currency (i.e., the U.S. or the Euro area), export proceeds should make it easier to repay its debt in that currency. Hence, we should expect a positive estimate for the variable for the share of exports to the U.S. or the Euro area in world exports in the estimations on the shares of the U.S. dollar or the Euro, respectively. For the estimation of the share of total foreign currencies, we use the share of a sample country's exports in total world exports .

British Legal Origin: La Porta et al. (1997, 1998) have found that the national legal origin (whether English, French, German, or Scandinavian) strongly affects the legal and regulatory environment in financial transactions and explains cross-country differences in financial development. They and many others have shown that countries with British (Common-law) legal origin tend to develop financial markets more friendly toward creditors and more particularly bond markets. Hence, we include the dummy for the countries with British Common-law legal origin. Because of the legal environment friendlier toward creditors, such countries tend to be able to issue debt in their own currencies, suggesting a negative correlation with the share of foreign currencies for debt denomination.

[10] *PCGDP* is extracted from the World Bank's Financial Structure Database (first introduced by Beck, et al., 2000).
[11] For the pre-Euro period, the dummy is assigned for countries pegging their currencies to the Deutsche Mark.

Quality of Institutions: Similarly, countries that have more developed or high-quality institutions or legal systems can provide protective environments for property owners and therefore find it easier to issue international debt in their own domestic currencies. To capture the level of quality of institutions, we include a measure of legal/institutional development, which is the first principal component of law and order, bureaucracy quality, and corruption, all variables from the ICRG database. Higher values of these variables indicate better conditions.

(De Jure) Financial Openness: There is no question that full-convertibility of a currency is a necessary, if not sufficient, condition for that currency to become an international currency. The currency of a country with more open financial markets could provide more usability and investment opportunities for international investors. Hence, the more open the capital account is for the issuer country of a currency, the more likely it is for the country to be able to issue its debt in that currency. Therefore, the impact of financial openness on the degree of foreign reliance for international debt issuance as well as the share of the U.S. dollar should be negative, though its impact on the share of the Euro can be ambiguous.

For the measure of capital account openness, we use the Chinn-Ito index of capital account openness (Chinn and Ito, 2006, 2008, and updates). *KAOPEN* is based on information regarding regulatory restrictions on cross-border capital transactions reported in the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER)*. Specifically, *KAOPEN* is the first standardized principal component of the variables that indicate the presence of multiple exchange rates, restrictions on current account transactions, on capital account transactions, and the requirement of the surrender of export proceeds (see Chinn and Ito, 2006 and 2008).

With these theoretical predictions in hand, we now test the effects of the above variables on the shares of the U.S. dollar, the Euro, and total foreign currencies.

4 Empirical Findings

4.1 Findings from the Baseline Model

Table 1 reports the results from the estimation on the determinants of the U.S. dollar share in international debt denomination.[12] Several points need to be noted. First of all, the

[12] All specifications control for all the dummies explained above. Additionally, we also include year dummies a constant term, but we do not report their estimates in the tables to conserve space.

economic size and, to a lesser extent, the trend growth matter. The larger an economy is or the faster its potential growth is, the less likely it is to have its international debt denominated in the U.S. dollar, though the estimate of potential growth is not significant. These results are reasonable considering that a bigger, or a faster-growing, economy may become more able to issue its debt in its own domestic currency.

The variable for domestic saving, a proxy for potential investment opportunities, and the one for financial development have significantly negative estimates. That indicates that an economy with more financial potentials or existent developed financial markets tends to have less international debt denominated in the U.S. dollar, possibly suggesting more issuance of debt in domestic currency.

Not surprisingly, the more trade a country has with the United States, the more tendency it has to denominate its international debt in the U.S. dollar. The estimate for inflation volatility is significantly positive, though it is not robust when we include the financial openness variable. This result suggests that a country with more unstable macroeconomic conditions tends to rely more on the U.S. dollar, reflecting the lack of credibility in its domestic macroeconomic policies and currency.

One other interesting point to note is that the effect of having more open financial markets toward international investors is found to be a negative contributor to the U.S. dollar share. This means that a currency of a more open financial markets could denominate its international debt more in its domestic currency because it could provide more usability and investment opportunities for international investors in that currency. Or, it may more likely denominate in other foreign currencies than the U.S. dollar since more open financial markets could provide a wider variety of financial instruments that include debt denominated in non-dollar denominated ones.[13]

EU member countries tend to have lower U.S. dollar shares in their international debt denomination by 49-54 percentage points. However, interestingly, neither fiscal space – the relative size of gross debt to revenue size in trend – nor institutional quality matters for the U.S. dollar share.

[13] Ito and Chinn (2014) find that greater financial openness leads a country to invoice its exports less in its home currency.

Even when we restrict our sample to include only developing countries (columns (5) through (8) in Table 1), the estimation results are overall intact, except for the variables for output growth potentials and the share of exports to the United States. Both the magnitude and statistical significance of the growth potential variable rises, though it is still insignificant when financial openness enters the estimation model. The lack of statistical significance for the share of exports to the U.S. is consistent with what we found in Figure 6. That is, the motive to denominate international debt in the U.S. dollar is not necessarily driven by the degree of trade ties with the U.S. – developing countries must have more incentives to denominate their international debt in the U.S. dollar to ensure accessibility to international financial markets.

Table 2 reports the estimation results for the Euro share in international debt denomination, so does Table 3 for the share of total foreign currencies. Let us focus on identifying differences in these tables from the U.S. dollar share estimation results.

Unlike the U.S. dollar share estimation results, economic growth potentials have a persistently positive impact on the share of the Euro in international debt denomination, which is also true for developing economies. In the estimation on the shares of total foreign currencies, the estimated coefficients take negative values persistently for both the full and developing countries samples, but they are never significant (Table 3). From the weakly negative coefficients of economic growth potentials in the U.S. dollar share estimation and persistently insignificant coefficients in the total foreign currency share estimation, we can conclude that a country with higher economic growth potentials tends to have more international debt denominated in the Euro, most possibly switching from denomination in the U.S. dollar, because high economic growth prospects allow countries to diversify its debt portfolio. However, it does not necessarily mean that such economies can afford to switch to domestic currency debt issuance.

The significantly positive estimate on the effect of financial development in the Euro share estimation for the full sample is consistent with this story. Previously, we found that a country with more developed financial markets tends to denominate its international debt *less* in the U.S. dollar. Now, we find that such a country tends to issue more Euro-denominated international debt. Table 3, however, reports that no impact of financial development for the level of dependency of total foreign currencies.

Such an impact of financial development is more pronounced by financial openness. A country with more open financial markets will have a higher Euro share in its international debt denomination while tending to reduce dollar denomination while the estimate on financial openness in the total foreign currencies share is significantly negative. These findings mean that a country with greater financial openness would not only reduce dollar-reliance and increase Euro-reliance, but also *increase* issuance of international debt denominated in its own domestic currency, signifying the importance of pursuing financial liberalization to reduce the extent of foreign currency dependence in its reliance on foreign currencies for debt issuance.[14] Additionally, and more importantly, this generalization applies to developing countries, which was not the case with financial development.

Unlike the case with the U.S. dollar share, however, inflation volatility does not affect the share of the Euro or the one of total foreign currencies. One possibility is that for countries with more volatile inflation – which may as well represent overall macroeconomic instability, the U.S. dollar is the only vehicle currency that allows them to issue international debt.

Naturally, having greater volumes of trade with the Euro economies leads to a higher amount of debt denominated in the Euro. Compared to the U.S. dollar share estimation, the magnitude of the trade volume variable is generally higher, suggesting that changes in the Euro share is more responsive to the intensity level of trade with the Euro area. That is consistent with our view that the demand for dollar denomination is not merely driven by trade factors pertaining to the U.S. economy or trade. In the estimation among developing countries, however, trade factors do not appear to matter.

When we focus on the effect of institutional development, interestingly, its impact is significantly negative in both the full and the developing countries' samples for both the Euro share and total foreign currency share estimations. While the estimation results for the share of total foreign currencies also find significantly negative coefficients for institutional development, its impact was never significant in the U.S. dollar share estimations. These findings can be interpreted as that developing institutions and legal systems would help countries to issue more debt internationally in their own currencies.

To increase the share of domestic currency-denominated debt, 'fiscal space' is also important, our estimations suggest. Table 3 shows that the variable for the reciprocal of fiscal

[14] This result is also consistent with Ito and Chinn's (2014) result on currency choice for trade invoicing.

space, measured by the volume of gross debt as a ratio to tax revenues, has significantly positive estimates, suggesting that the more fiscal space, or the better fiscal conditions, a country has, it tends to have more international debt denominated in its own currency.

To assess the magnitude of the results, we construct Tables 4-6 that show the predicted effects of each of the selected explanatory variables when the variable of concern increases its value by one standard deviation (column (1)).[15] The predicted effects are reported in terms of the number of standard deviations of the dependent variable (column (2)).[16] For example, in Panel (a) of Table 4, we can see that a one standard deviation increase in domestic saving would reduce the share of the U.S. dollar in debt denomination by 5.13 percentage points which is 0.15 standard deviations of the dependent variable.

According to Table 4, smaller domestic saving as a proxy for potential investment opportunities, less open capital accounts, and higher shares of exports to the U.S. in total exports would lead to higher shares of the U.S. dollar in international debt. For developing countries particularly, domestic saving matters the most, followed by financial openness, fiscal space, and inflation volatility.

For the share of the Euro in international debt, greater financial development or financial openness and high output growth matter, while greater financial openness, more investment potentials, and output growth would all contribute to higher Euro shares.

The largest contribution to the share of total foreign currency denomination comes from (the lack of) fiscal space and financial openness, but for developing countries, fiscal space and shares of exports in world exports matter more than other significant variables. These are the variables traditionally pointed as big contributors in the literature such as Eichengreen et al. (2002), Hausmann and Panizza (2003), Claessens et al. (2007).

In sum, our results provide the following four implications. First, while economic size matter does somewhat matter for the choice of currencies for international debt denomination – larger economies tend to issue their debt less in the U.S. dollar and more in their domestic currencies, monetary, financial and fiscal conditions do affect the currency composition of international debt. Generally, countries with more developed or open financial markets as well as

[15] The estimates in the tables are based on the estimation results of model (4) for the full sample and (8) for the developing countries subsample in Tables 1 through 3.

[16] Asterisks by the variable names correspond to the asterisks for statistical significance reported in the corresponding columns of Tables 1 through 3.

those with more fiscal space tend to reduce dollar-denominated debt denominate their debt in their own currencies. Second, countries with high economic prospects, greater financial development, and more investment opportunities tend to increase the extent of reliance on the Euro first while some of these factors lead to lower dollar-denomination. Such effect suggests that these factors appear to lead first to a wider variety of currency choices for debt issuance before leading to more opportunities of issuing debt in their domestic currencies.

4.2 Robustness Checks

Give the sum of the shares of the U.S. dollar, the Euro, and the other currencies in international debt sum to one, we suspect that the error terms of the estimation models for the U.S. dollar and the Euro shares could be correlated. In other words, positive disturbances in one currency could be associated with negative disturbances on average across the other currency. It is worth noting that since our data is not balanced or complete, such correlation does not have to be the case in a strict sense. However, we test the possibility that the error terms across the two (the dollar share and the Euro share) or three (plus the share of total foreign currencies) estimations are correlated with each other by employing the seemingly unrelated regression (SUR) estimation.

Table 7 reports the results of the SUR estimation for the U.S. dollar and the Euro share in columns (1) and (2). We can see that most of the signs of the estimates are consistent with our theoretical predictions and with the estimates from Tables 1-2. Two of those results that require discussions are the following. Regarding the equation for the share of the U.S. dollar, fiscal space now appears with a positive and significant contribution which means that the better fiscal conditions a country has, it tends to have less international debt denominated in dollars. Regarding the share of the Euro, the economic size now appears with a positive and significant sign. This effect can be interpreted consistently with the previous story of more diversified portfolios a larger country may be able to afford while switching away from dollar denomination.

Next, we turn our attention to the effect of financial crises. Any financial crisis can put the credibility of the currency of the crisis country into question, which would discourage the use of that currency when issuing international debt. In fact, if a financial crisis involves expectations for future depreciation or devaluation, that would shy away investors from buying debt

denominated in the currency of the country at risk. Furthermore, it is expected that a country facing a financial crisis will denominate their international debt in a currency that is free from future sharp depreciations and thus the U.S. dollar or the Euro emerge as more stable options. Hence, we include the dummy for currency and debt crisis individually and jointly in each specification for the share of the U.S. dollar, the share of the Euro and the total share of foreign currency in international debt. We use the crisis dummies from Aizenman and Ito (2013) to identify the types of the crises.[17]

Tables 8 and 9 report the results of adding the crisis dummies based on specification (4) for the full sample and specification (8) for developing countries from Tables 1 through 3. The estimation results from tables 8 and 9 indicate that countries that experience a debt crisis tend to shy away from their own currency toward the U.S. dollar or the Euro for debt denomination. The effect of a debt crisis seems to be stronger when denominating debt in the Euro, which could be interpreted as an opportunity to switch from other currency to the Euro. These effects are detected with the full sample and among developing countries. However, the effect of currency crisis on the U.S. dollar or the Euro share turns out to be insignificant. The main results from the previous section for Tables 1 and 2 still hold in Tables 8 and 9.

We conduct some additional robustness checks, though we only discuss the summary of the results to conserve space. First, we examine the impact of the interest rate of the sample countries as differentials vis-à-vis that of the major currency issuers. One could argue that the above analysis focused on the determinants of currency choice for debt denomination from the demand side perspectives. However, supply side factors could also play an important role. Especially in the aftermath of the GFC, all the issuers of the major currencies, the U.S. Federal Reserve, the Bank of England, the Bank of Japan, and later the European Central Bank, implemented unconventional monetary policies, such as the zero interest rate policy and quantitative easing, to jumpstart their economies. These aggressive unconventional monetary policies are meant to lower the cost of borrowing funds. That also means that it must have become easier in these advanced economies to issue debt in their own currencies. The rise in the dollar share that occurred in the immediate aftermath of the GFC we saw in Figure 5 may be due

[17] To identify currency crisis, Aizenman and Ito (2013) use the exchange market pressure index using the exchange rate against the currency of the base country (i.e., the country a country follows most closely in determining its monetary policy. See Aizenman, et al. (2009) for details). For the debt crisis dummy, Aizenman and Ito (2013) augment the dataset by Reinhart and Rogoff (2009) with other papers including the World Bank's Global Development Finance (2012). See Aizenman and Ito's (2013) Appendix for more details.

to the lower cost to issue dollar-denominated debt. Hence, we examine if the lower cost of borrowing has had any impact on the shares of the dollar, the Euro, and foreign currencies in total. For that, we include interest rate differentials with respect to that of the major currency issuers' as an additional regressor in our baseline model. In the dollar share regression, we include the interest rate differentials with respect to the U.S. 3-month Treasury bill rate. For the Euro share regression, we use the ECB policy interest rate as the reference rate for the interest rate differentials. For the regression on the total share of foreign currencies, we use as the reference rate the GDP-weighted average of the U.S. 3-month Treasury bill interest rate, the ECB 3-month interest rate, Japan's financing bill rate, and the U.K. Treasury bill interest rate.

The signs and significance of the estimates from our baseline model remain unchanged. For all of the three currency share regressions, the interest rate differential variable has a negative sign as expected, but the point estimate is never significant. These findings confirm that the cost of borrowing does not affect the decision of the dollar or euro in international debt denomination despite relatively wider variations in the shares of the dollar and the Euro that occurred when the central banks of advanced economies, especially the Federal Reserve, implemented aggressive unconventional monetary policies.

Second, we investigate the effect of "dollar zone weight" as another possible source of omitted variable bias. The "dollar zone weight" refers to the extent to which countries attempt to stabilize the movement of their own currencies against the dollar. In other words, the variable represents the degree of pegging to the dollar. McCauley and Chan (2014) show that the "dollar zone weights" are positively correlated with the shares of the dollar in official foreign reserves holding.[18] We include in our baseline estimation the 'dollar zone weight' measure from McCauley and Chan (2014) who based the estimation method by Haldane and Hall (1991) and Frankel and Wei (1996).[19] In the dollar share estimation, we expect the sign of the estimate for the dollar zone weight variable to be positive, and we expect the negative estimate for the Euro share estimation. For the total foreign currency share estimation, the expected sign of the estimate is ambiguous.[20] Since the McCauley and Chan's data are available only for 39

[18] Holding a large portion of international reserves in dollar-denominated assets would be less risky in terms of domestic currency if the domestic currency value varies less against the dollar (compared to other major currencies).
[19] Variants of the methodology include Kawai and Akiyama (1998) and Bénassy-Quéré et al (2006). We thank McCauley for pointing out this possibility and also McCauley and Chan for sharing the data with us.
[20] We remove the dummy for pegging to the dollar since this variable is redundant with the dollar zone weight variable.

countries in 2004 through 2013, the number of observations in the estimation reduces significantly, which can possibly affect the estimation results.

In the U.S. dollar share regression, we find a significantly positive effect of the dollar zone weight variable, but only when the (reciprocal) degree of fiscal space is not included in the estimation. When it is included, not only does the dollar zone weight variable become insignificant, but it enters with a significantly negative sign, an opposite effect to what theory suggests. In the case of the Euro share regression, we find a persistently negative and significant effect of the dollar zone weight variable in the full sample, but not in the subsample of developing countries. This finding suggests that the countries with a higher dollar weight rely less on the Euro as the currency of international debt denomination. For the total share of foreign currency, the estimated coefficients for the dollar zone weight are generally positive but not statistically significant. We must note two caveats. The reduction of the sample size by more than 60% affects the signs and the significance of some of the estimates compared to the baseline model. Also, some of the explanatory variables may be correlated with the dollar zone weight measure, which may lead to flipping signs of the estimates.

Last, we test if exchange rates contribute to the choice of debt denomination currency. If a currency value has been, or is expected to be, on a one-sided trend, such as the Chinese RMB that was once expected only to appreciate, that would encourage the issuance of debt in that particular currency since possible capital gains would make it look appealing to hold the debt denominated in the currency. Conversely, the appreciation trend of the home currency may help lower the shares of major currencies such as the U.S. dollar and the Euro in debt denomination. At least, the trend of exchange rate movement may matter for the choice of currency for debt issuance. To investigate this, we include in the currency share regressions the five-year moving average of the rate of depreciation of the nominal exchange rate. For the dollar or Euro share regression, we use the nominal exchange rate against the dollar or the Euro, respectively. For the share of total foreign currencies, we use the nominal effective exchange rate from the IMF's *International Financial Statistics*.

While the signs and significance of the estimates of the explanatory variables from our baseline model remain intact, the exchange rate trend variable is never found statistically significant for both the dollar share and the Euro share regressions. However, in the total foreign currencies share regression, we find a significantly negative coefficient for the exchange rate

trend, including the estimations for the subsample of developing countries. That implies that a developing country with its currency expected to appreciate tends to issue its international debt *less* in foreign currencies, i.e., more in domestic currency.[21] This result is consistent with our priors.

5 Extended Analyses

5.1 A Counterfactual Analysis: What Would Have Happened to the Euro If It Were Not for the Global Financial Crisis

We previously illustrated that the global financial crisis of 2008 may have caused structural changes in currency choice for debt denomination for both developed and emerging market economies; had it not been for the GFC in 2008, the trends of the declining dollar share and the rising Euro share could have continued. Chinn and Frankel (2007) predicted such trends in terms of the shares of the two currencies in foreign reserve holdings. In one of their scenario predictions, the share of the Euro in foreign reserves holdings is expected to catch up with that of the U.S. dollar by 2020, thereafter making the Euro the largest reserves currency with a market share of a little over 80%, followed only by the U.S. dollar which would come down to less than 20%. While this prediction is based on a most optimistic scenario (such as the U.K. adopting the Euro as its currency), their exercise represents pre-GFC trends for the two currencies. In retrospect, the onset of the GFC (or the following Euro debt crisis) may have contributed significantly to altering such predictions.

Against this backdrop, we now conduct a counterfactual analysis so as to examine how the shares of the U.S. dollar and the Euro in international debt denomination would have evolved if the GFC had not occurred. If the impact of the crisis period is significant, the counterfactual predictions based on the pre-crisis data should not only differ from the actual development of the shares, but also reflect the pre-crisis trend of declining dollar shares and rising Euro shares similarly to Chinn and Frankel (2007).

For this scenario analysis, we first estimate each of the shares of the U.S. dollar, the Euro, and foreign currencies in total in international debt denomination by using the data up to 2007.[22] Once we get the estimates, we make out-of-sample predictions for the post-crisis years using the

[21] A rise in the nominal effective exchange rate variable indicates currency *appreciation*.

[22] We use the estimation model that includes all the explanatory variables, comparable to model (4) for the full sample and (8) for the developing countries subsample in Tables 1 through 3.

actual data from 2008-2013. Intuitively, the out-of-sample predictions should reflect the pre-GFC trend if the crisis (or crises) acted as a structural break.[23]

Before showing our out-of-sample predictions, we must note that when we test the coefficient stability over the crisis period, we significantly reject the stability of the estimates. That is, we test the null hypothesis that the estimates from the estimation with the full sample period's data are the same as those from the estimation with the data up to 2007, we significantly reject the null hypothesis for the full sample and the subsamples of developed and developing countries for all three types of currency share estimations.[24]

Figure 7 presents the country group averages of the out-of-sample forecasts of the shares of the U.S. dollar and the Euro for the full sample and the subsample of developing countries.[25] For comparison, we also show the predictions using the data up to 2013 (i.e., in-sample predictions) in graph 7 (c). The observed shares of the U.S. dollar and the Euro are shown in blue and grey, respectively, both in solid lines. The out-of-sample predictions (based on the data up to 2007) are shown with dotted lines for both currency shares.

The out-of-sample predictions look consistent with our priors. The predicted shares of the U.S. dollar using the pre-crisis estimates are much lower than the actual shares of currency, so as are those of the Euro in the years after 2007. As of 2013, the share of the U.S. dollar denomination in international debt could have been around 54.0% if the pre-crisis had continued, lower than the observed share of 67%. Even the basic model that uses the data up to 2013 predicts the U.S. dollar share of 59%, still under-predicting the observed share and suggesting how the rise in the U.S. dollar share was unexpectedly high. The share of the Euro could have been around 24%, higher than the in-sample prediction of 18% and the observed 15%. Again, these results suggest that the Euro share could have been higher had it not been for the Global Financial Crisis.

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[23] More strictly speaking, to show the impact of the crisis, we should use the ex ante (e.g., forecasted or surveyed) data as of 2007 for the explanatory variables in the 2008-2013 predictions so that the out-of-sample could be more free of the impact of the crisis. However, it is not feasible to obtain such ex ante data for all of the explanatory variables. Hence, our out-of-sample, counterfactual predictions are rather conservative in terms of showing the trends of the currency shares in the non-crisis situations.

[24] We also find that, among other possible structural break years such as the years of 2007, 2010, 2011, and 2012, the year of 2007 or 2008 (the former for the full sample and the latter for the subsample of developing countries) is found to be the most significant structural break. The results of the coefficient stability tests are available from the authors upon request.

[25] We make out-of-sample predictions first, then average the predictions for the country group of concern.

Among developing countries, a rather flatten hump share for the Euro and a flat U shape for the U.S. dollar represent the developments of the two currencies' shares for debt denomination. The dollar share almost goes back to 80%, around the same level in the late 1990s, after declining to less than 70% in 2007. The Euro share hits the peak around 20% in 2006, but thereafter declines to around 10%. Had there not been the crisis, however, the U.S. dollar share could have continued to fall to 61% whereas the Euro share stays around 21%. These results suggest that the crisis seems to have helped the return of the dominant role of the U.S. dollar in international debt denomination.

We repeat the same exercise for the share of total foreign currency denomination. In Figures 8 (a) and (b) illustrate the observed share series along with the out-of-sample predictions for the full and the developing countries samples whereas Figure 9 (c) illustrates the in-sample prediction for the full sample. The figures show that the average shares of foreign currency-denominated debt would have moderately declined if the crisis had not occurred (whether in- or out-of-sample predictions). By 2013, the share of foreign-currency denominated debt in the no-crisis situation would have been smaller by about 4% for the entire sample. Given that the shares had been stably high in early years of the sample, the differences between the observed and predicted shares with this magnitude are not unsubstantial.

Interestingly, most of the difference between the observed share series and the out-of-sample predictions appears to be driven by the developing country group, suggesting that the impact of the crisis on the extent of foreign currency shares in debt denomination is larger for developing countries. Again, these results are not only consistent with our priors but also suggestive that the 'redemption from original sin' could have happened if the crisis had not occurred.

5.2 Counterfactual Predictions of Individual Countries

We just looked at an aggregate picture of how the dollar or Euro share would have looked if it had not been for the GFC in 2008. Let us now look at counterfactual predictions for several individual countries.

Figure 8 presents the counterfactual, out-of-sample predictions of four countries: Japan, Denmark, Mexico, and Thailand. In each panel of the figures, blue and gray solid lines show the observed shares of the U.S. dollar and the Euro, respectively, while the dotted lines with triangle

and x nodes refer to out-of-sample predictions for the U.S. dollar and the Euro shares, respectively. The predictions for individual countries could present more variations and deviations from the aggregate country group averages we previously observed. Especially, the predictions for developed economies can differ more from the predictions because developing countries comprise a larger portion of the entire sample.

Overall, among the four individual economies, we can see that the out-of-sample predictions appear consistent with what we observed in the aggregate pictures in Figure 7. The pre-crisis estimation suggests that the U.S. dollar share would have continued to decline, though much more moderately for Mexico and Thailand than Japan or Denmark, while the observed dollar shares turned out to be much higher than the out-of-sample predictions in the cases of Japan and Denmark. The generalization we found for the Euro share also applies here. For all of the four economies, the observed Euro shares are lower than the pre-crisis predictions. Again, the deviations from the predictions are much larger for Japan and Denmark.

While Japan and Denmark both show rapid rises in the dollar-denominated debt in the post-crisis period and part of the rises can be explained by the flight to quality for the dollar and the flight from the Euro as the GFC happened in 2008, followed by the Euro debt crisis after 2010. Japan's case appears to be quite unique with its wide variation in the dollar share. In the last few years, financial news agencies have been reporting that Japanese firms have been active in issuing dollar-denominated debt. One of the reasons for that is because, compared to European and American financial institutions, Japanese financial institutions, which had focused on recovering from their own banking crisis in the late 1990s, were unaffected by the GFC. While many of financial and nonfinancial firms in Europe and the U.S. were significantly damaged by the GFC, Japanese counterparts became quite active in merger and acquisitions after 2010 or so. Furthermore, the dollar-yen exchange rate had been so volatile that issuing debt in the U.S. dollar could help Japanese financial and nonfinancial institutions avoid exchange rate risk. Hence, issuing dollar-denominated increased while Japanese firms attempted to fill the void after the retrenchment of European or American firms in the international markets.

Mexico and Thailand represent the tendency among developing countries in terms of their continuous reliance on dollar-denominated debt, though Mexico has issued more dollar-denominated debt than the model predicts and Thailand issued less. Overall, as we have already observed, the extent of dollar-reliance has not change so drastically for developing

countries, while the Euro has not penetrated as a debt denomination currency as much as the model predicts. That may be explained by the inertia. For developing countries, which tend to lack sophisticated financial instruments or markets, switching denomination currencies for international debt can be more costly than developed economies.

5.3 Prospects of Foreign Currency-denominated International Debt

Now, let us analyze a last question: where are the major currencies heading in the near future in terms of their shares in international debt denomination? To answer this question, we implement out-of-sample prediction for 2014 through 2020.

For the out-of-sample predictions, we will use forecasts for the explanatory variables when forecasts are available, such as the variables from the IMF's *World Economic Outlook* (as of October 2014). For the other variables, we need to make assumptions about the explanatory variables. We summarize the assumptions we make for the forecasting exercise in Appendix 3. In some cases, variables are assumed to be the same as the average of their last five years of the sample period (i.e., 2009-2013). In some other cases forecasts are derived from an AR(1) process prediction for 2014 through 2020. See Appendix 3 for more details on the assumptions we make for the out-of-predictions.

In Figure 10, we have two types of out-of-sample predictions. One is the predictions based on the estimates using the data up to 2013 and the other is those based on the estimates and data up to 2007.

In Panel (a), we can see that the predicted share of the dollar may moderately decline from 2014 through 2020 while the predicted share of the Euro appears stable. If we base our predictions on the model using the full sample period, the predicted share for the U.S. dollar will be about 63%, but if we use the predictions of the pre-crisis model, the dollar share could be as low as 51%. The Euro share would be about 18% in the baseline model predictions for most of the 2014-2020 period while the pre-crisis model predicts it to be about 26%.

We can make similar observations for developing countries. The baseline model predicts the dollar share to be 70% by 2020 though the pre-crisis model predicts it to be 59%, 11% point difference between the two types of out-of-sample predictions. The Euro share would have been 25% without the GFC while it would be 12% based on the baseline model. This exercise also

indicates that the impact of the GFC on the dollar and the Euro shares continues to be significant in the foreseeable future.

6 Concluding Remarks

In this study, we have characterized the recent trends in the shares of foreign currencies, particularly the U.S. dollar, the Euro, and total foreign currencies, in international debt denomination in the last two decades, and empirically investigated the determinants of the shares. Using the estimation results, we have also conducted counterfactual analyses, focusing on how the developments of the currency shares in international debt denomination would have changed if the GFC had not occurred. In these analyses, we have obtained several interesting results.

First of all, we find that the extent of fall in the degree of reliance on foreign currencies for debt issuance, or one aspect of 'original sin' particularly for developing countries, has been quite modest. This finding is consistent with Hausmann and Panizza (2010). However, the shares of the U.S. dollar and the Euro in international debt denomination have been changing more substantially in the last two decades.

Before the GFC of 2008, the share of the U.S. dollar had been on a downward trend while that of the Euro on a steady rising trend. After the crisis, however, the U.S. dollar share rebounded and the Euro share fell, reflecting investors' flight to safety and liquidity both of which can be provided by the vehicle currency, the U.S. dollar.

In fact, while the use of the Euro is more or less proportional to the share of the Euro economies in the total export destination, the use of the U.S. dollar for debt denomination is disproportionally higher than the share of the U.S. as an export destination suggests.

Our estimation results show that larger economies tend to denominate their international debt less likely in foreign currencies or the U.S. dollar. Faster economic growth would also lead a country to have a smaller share of dollar denominated international debt, but it would lead, though less significantly, to more denomination in the Euro or foreign currencies in total. Not surprisingly, a greater volume of trade with the U.S. or the Euro area leads a country to denominate its debt more in the U.S. dollar or the Euro, respectively.

A country with more financial potentials, which we proxy with domestic saving (as a share of GDP), or a country with more developed financial markets tends to have less international debt denominated in the U.S. dollar. However, we also find evidence that more

financial potentials would lead to more Euro denomination. Greater financial openness would lead to less denomination in the U.S. dollar or foreign currencies in general, but it would also lead to more debt denominated in the Euro. These findings suggest that financial liberalization or development could lead to less reliance on the U.S. dollar but that would also provide countries with more currency choices for denomination including the Euro or the domestic currency. Interestingly, if a country possesses greater 'fiscal space,' i.e., more government revenues relative to the size of gross debt, such a country would tend to denominate debt less in foreign currencies in general. This result suggests that a country with better fiscal conditions can afford to issue debt more in its own domestic currency in the international financial markets.

When we also make out-of-sample predictions for the post-GFC period using the data up to 2007, we see that had the trend of the share of U.S. dollar denomination in international debt continued after 2008, the currency share would have been lower, around 54%, rather than the actual share of 67% as of 2013. The share of the Euro would have been around 24% instead of the actual 15% and the share of total foreign currencies would have been 90% instead of 94%. These findings indicate that the outbreak of the GFC had increased the demand for the U.S. dollar as a safe haven and significantly affect the determination of currency choice for international debt issuance. These findings suggest that the U.S. dollar is, and will most likely continue to be, the currency that can provide a safe haven in the current international monetary system (Prasad, 2013).

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Appendix 1: Data Description

GDP – GDP of each country is converted to U.S. dollars before being expressed in natural log. The data are extracted from the IMF's *World Economic Outlook* Database (October 2014).

Real GDP Growth Trend – The five-year (*t*–4 through *t*) average of the growth rate of real GDP (in local currency) is used. The original data are from the IMF's *World Economic Outlook* Database (October 2014).

Domestic Savings – Gross domestic savings. They are included as shares of nominal GDP. The data are extracted from the IMF's *World Economic Outlook* Database (October 2014).

Inflation Volatility –The five year average annual standard deviations of the monthly, year-to-year rate of inflation. The original data are retrieved from the IMF *International Financial Statistics*.

Fiscal space –It is the log difference between general government gross debt and the five-year average of tax revenues. Both variables are retrieved from the IMF's *World Economic Outlook* Database (October 2014). A lower value of this variable indicates more fiscal space.

Financial development – It is total private credit as a share of GDP. The original data are from the World Bank's *World Development Indicators*.

Trade with the U.S./the Euro area/the World – The proportion of exports with their destination of the U.S., the Euro area, or the world in total exports. The data are from the IMF *Direction of Trade* database.

British Legal Origin – The value of one is assigned to countries whose legal systems have British origin. The original data are from the World Bank's *World Development Indicators.*

Quality of Institutions – It is the first principal component of law and order (*LO*), bureaucracy quality (*BQ*), and corruption (*C*), all variables from the ICRG database. Higher values of these variables indicate better conditions.

Financial Openness (KAOPEN) – KAOPEN is the first principal component of the original variables pertaining to regulatory controls over current or capital account transactions, the existence of multiple exchange rates, and the requirements of surrendering export proceeds based on Chinn and Ito (2006, 2008). The dataset is available at http://web.pdx.edu/~ito/ .

Appendix 2: Country Classification

Country include in the empirical analysis

Albania	Georgia	Norway	United States
Australia	Ghana	Oman	Uruguay
Azerbaijan	Guatemala	Pakistan	Venezuela, RB
Bahamas, The	Hong Kong SAR	Panama	Vietnam
Bahrain	Hungary	Paraguay	
Barbados	Iceland	Peru	
Belarus	Indonesia	Philippines	
Belize	Iran, Islamic Rep.	Poland	
Bolivia	Israel	Qatar	
Brazil	Jamaica	Russian Federation	
Bulgaria	Japan	Saudi Arabia	
Canada	Jordan	Senegal	
China	Kazakhstan	Singapore	
Colombia	Korea, Rep.	South Africa	
Congo, Rep.	Kuwait	Sri Lanka	
Costa Rica	Latvia	St. Lucia	
Cote d'Ivoire	Liberia	Suriname	
Croatia	Lithuania	Sweden	
Czech Republic	Macedonia, FYR	Switzerland	
Denmark	Malaysia	Thailand	
Dominican Republic	Mauritania	Trinidad and Tobago	
Ecuador	Mexico	Tunisia	
Egypt, Arab Rep.	Moldova	Turkey	
El Salvador	Morocco	Ukraine	
Fiji	New Zealand	United Arab Emirates	
Gabon	Nigeria	United Kingdom	

Note: The countries included are divided into developing and developed following the classification used by the IMF's World Economic Outlook

Appendix 3: Assumptions of Out-of-sample Forecasting Exercise

Variables	**Assumptions**
GDP	IMF's *World Economic Outlook* (October 2014) forecasts
Real GDP growth trend	IMF's *World Economic Outlook* (October 2014) forecasts
Domestic saving	IMF's *World Economic Outlook* (October 2014) forecasts
Inflation volatility	IMF's *World Economic Outlook* (October 2014) forecasts
Fiscal space (reciprocal)	IMF's *World Economic Outlook* (October 2014) forecasts
Financial development	AR(1) one-step-ahead forecasts
Trade with the U.S./the Euro area/the World	Average value of 2009-2013
Quality of institutions	Average value of 2009-2013
Financial openness	AR(1) one-step-ahead forecasts

Table 1: Determinants of the U.S. Dollar Share in International Debt, 1995-2013

	FULL SAMPLE				DEVELOPING COUNTRIES			
Dep. Var.: % of Dollar	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(GDP)	-6.891***	-6.124***	-8.052***	-7.244***	-6.453***	-6.067***	-8.014***	-7.944***
	(1.242)	(1.269)	(1.331)	(1.311)	(1.523)	(1.551)	(1.683)	(1.660)
Real GDP growth trend	-0.619**	-0.460	-0.136	0.012	-1.005***	-0.786**	-0.534	-0.239
	(0.307)	(0.296)	(0.334)	(0.317)	(0.365)	(0.349)	(0.409)	(0.383)
Domestic savings (% of GDP)	-0.451***	-0.501***	-0.312**	-0.343***	-0.671***	-0.740***	-0.545***	-0.616***
	(0.126)	(0.126)	(0.126)	(0.124)	(0.151)	(0.149)	(0.154)	(0.148)
Inflation volatility	0.448**	0.505***	0.149	0.200	0.430*	0.511**	0.204	0.286
	(0.200)	(0.191)	(0.203)	(0.191)	(0.223)	(0.211)	(0.227)	(0.208)
Fiscal space (reciprocal)	1.140	1.392	2.367	2.648	1.308	2.080	3.295	4.001*
	(1.833)	(1.776)	(1.929)	(1.839)	(2.387)	(2.292)	(2.587)	(2.430)
Financial development	-0.072***	-0.065***	-0.057**	-0.049**	-0.175***	-0.135***	-0.118**	-0.046
	(0.023)	(0.022)	(0.022)	(0.021)	(0.050)	(0.049)	(0.054)	(0.053)
Exports to the U.S.(% of total exp.)	0.217**	0.179*	0.327***	0.268***	0.142	0.097	0.211*	0.125
	(0.097)	(0.095)	(0.100)	(0.096)	(0.115)	(0.111)	(0.121)	(0.115)
EU dummy	-53.174***	-55.243***	-47.894***	-50.267***	-67.194***	-70.403***	-65.630***	-69.373***
	(9.408)	(9.200)	(9.550)	(9.276)	(10.985)	(10.309)	(11.416)	(10.987)
Quality of institutions		0.261		-0.545		-1.697		-2.758
		(1.715)		(1.647)		(2.142)		(2.031)
Financial openness			-18.167***	-18.903***			-17.242***	-19.980***
			(4.039)	(3.830)			(5.509)	(5.229)
σ_u^2	25.368***	24.543***	25.185***	24.260***	25.049***	23.063***	25.375***	24.195***
σ_v^2	12.490***	11.918***	11.614***	10.884***	13.477***	12.727***	12.576***	11.483***
ρ	0.80	0.81	0.82	0.83	0.78	0.77	0.80	0.82
LR test σ_u^2=0	821***	791***	772***	763***	490***	447***	439***	408***
Number of observations	943	889	809	762	722	668	609	562
Number of countries	77	70	74	67	67	60	64	57

Notes: * p<0.1; ** p<0.05; *** p<0.01. Robust standard errors are presented below the corresponding coefficient. All specifications control for geographical regions, currencies pegged to the U.S. dollar or the Euro, Euro membership (time variant), and for the introduction of the Euro as a currency. Additionally, year dummies and a constant term are also included though they are not reported to conserve space. The EU dummy is time invariant. See Data Appendix for the definitions and constructions of the data. $\sigma_u^2$and σ_v^2 are the panel-level and overall variance components respectively, while ρ is the percent contribution to the total variance of the panel-level variance component. The null hypothesis of the LR test is that the standard Tobit model is better suited than the random-effect Tobit.

Table 2: Determinants of the Euro Share in International Debt, 1995-2013

	FULL SAMPLE				DEVELOPING COUNTRIES			
Dep. Var.: % of Euro	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(GDP)	-1.486	-2.146*	-0.347	-0.901	-1.418	-2.365	1.132	0.289
	(1.270)	(1.246)	(1.348)	(1.351)	(1.720)	(1.710)	(1.811)	(1.826)
Real GDP growth trend	1.380***	1.437***	0.691**	0.695**	1.866***	1.882***	0.868**	0.810**
	(0.306)	(0.300)	(0.304)	(0.303)	(0.402)	(0.393)	(0.392)	(0.386)
Domestic savings (% of GDP)	0.039	-0.002	-0.023	-0.011	0.203	0.196	0.135	0.190
	(0.145)	(0.145)	(0.147)	(0.149)	(0.191)	(0.193)	(0.189)	(0.192)
Inflation volatility	-0.120	-0.185	0.046	-0.021	-0.301	-0.364	-0.253	-0.323
	(0.223)	(0.218)	(0.204)	(0.203)	(0.268)	(0.262)	(0.234)	(0.230)
Fiscal space (reciprocal)	-0.058	0.634	0.564	0.773	-1.610	-0.410	-3.932	-3.500
	(1.867)	(1.815)	(1.795)	(1.783)	(2.917)	(2.883)	(2.768)	(2.765)
Financial development	0.097***	0.086***	0.085***	0.079***	0.081	0.067	-0.045	-0.058
	(0.021)	(0.020)	(0.019)	(0.019)	(0.050)	(0.048)	(0.050)	(0.049)
Exports to the Euro Area	0.449***	0.349***	0.228*	0.205	0.348**	0.240	-0.046	-0.078
(% of total exp.)	(0.129)	(0.126)	(0.128)	(0.128)	(0.174)	(0.171)	(0.166)	(0.165)
EU dummy	16.778**	19.783***	10.565	12.389	33.586***	35.723***	31.225***	32.104***
	(7.038)	(6.812)	(8.172)	(8.177)	(9.767)	(9.799)	(11.250)	(11.558)
Quality of institutions		-6.142***		-3.342**		-7.779***		-5.271**
		(1.471)		(1.376)		(2.370)		(2.054)
Financial openness			20.719***	19.404***			27.998***	27.208***
			(2.943)	(2.954)			(4.699)	(4.619)
σ_u^2	21.196***	19.759***	25.304***	24.423***	22.718***	21.819***	27.061***	26.980***
σ_v^2	10.894***	10.624***	9.384***	9.280***	12.190***	11.763***	9.887***	9.611***
ρ	0.79	0.78	0.88	0.87	0.78	0.77	0.88	0.89
LR test σ_u^2=0	671***	622***	793***	733***	390***	366***	484***	462***
Number of observations	747	732	670	658	449	434	393	381
Number of countries	64	62	62	60	44	42	42	40

Notes: * p<0.1; ** p<0.05; *** p<0.01. Robust standard errors are presented below the corresponding coefficient. All specifications control for geographical regions, currencies pegged to the U.S. dollar or the Euro, Euro membership (time variant), and for the introduction of the Euro as a currency. Additionally, year dummies and a constant term are also included though they are not reported to conserve space. The EU dummy is time invariant. See Data Appendix for the definitions and constructions of the data. $\sigma_u^2$and σ_v^2 are the panel-level and overall variance components respectively, while ρ is the percent contribution to the total variance of the panel-level variance component. The null hypothesis of the LR test is that the standard Tobit model is better suited than the random-effect Tobit.

Table 3: Determinants of the Share of Foreign-Currency Denominated International Debt, 1995-2013

	FULL SAMPLE				DEVELOPING COUNTRIES			
Dep. Var.: % of Foreign-Currency	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log(GDP)	-2.084***	-2.128***	-2.344***	-2.463***	-1.428***	-1.465***	-1.654***	-1.813***
	(0.337)	(0.370)	(0.357)	(0.386)	(0.340)	(0.380)	(0.368)	(0.415)
Real GDP growth trend	-0.111	-0.120	-0.117	-0.125	-0.079	-0.081	-0.062	-0.056
	(0.088)	(0.092)	(0.093)	(0.097)	(0.083)	(0.088)	(0.093)	(0.099)
Domestic savings (% of GDP)	-0.019	-0.030	-0.008	-0.017	-0.004	-0.015	-0.002	-0.011
	(0.031)	(0.033)	(0.030)	(0.032)	(0.029)	(0.031)	(0.029)	(0.031)
Inflation volatility	0.013	0.010	0.001	-0.005	-0.006	-0.008	0.001	-0.003
	(0.054)	(0.056)	(0.052)	(0.054)	(0.050)	(0.052)	(0.051)	(0.053)
Fiscal space (reciprocal)	1.475***	1.599***	2.106***	2.295***	0.225	0.361	0.851	1.074*
	(0.510)	(0.533)	(0.521)	(0.545)	(0.503)	(0.531)	(0.538)	(0.573)
Financial development	0.001	0.000	-0.002	-0.003	-0.006	-0.005	-0.003	-0.001
	(0.008)	(0.008)	(0.008)	(0.008)	(0.013)	(0.013)	(0.013)	(0.014)
Share of Exports (% of world exp.)	-3.394***	-3.252***	-2.186***	-2.020***	-3.921***	-3.779***	-2.236***	-2.121***
	(0.439)	(0.454)	(0.459)	(0.473)	(0.418)	(0.432)	(0.449)	(0.464)
EU dummy	0.125	-0.157	1.915	1.902	1.485	0.994	2.651	2.444
	(2.048)	(2.128)	(2.107)	(2.206)	(2.165)	(2.262)	(2.144)	(2.290)
Quality of institutions		-1.486**		-1.900***		-2.266***		-2.196***
		(0.622)		(0.580)		(0.600)		(0.588)
Financial openness			-3.731***	-4.150***			-2.796**	-3.257***
			(1.103)	(1.155)			(1.167)	(1.245)
σ_u^2	5.396***	5.534***	5.465***	5.643***	4.885***	5.021***	4.719***	4.961***
σ_v^2	4.652***	4.763***	4.107***	4.181***	4.224***	4.332***	3.968***	4.049***
ρ	0.57	0.57	0.64	0.65	0.57	0.57	0.59	0.60
LR test σ_u^2=0	484***	447***	493***	472***	399***	357***	328***	303***
Number of observations	1,029	973	888	841	808	752	688	641
Number of countries	82	75	80	73	72	65	70	63

Notes: * p<0.1; ** p<0.05; *** p<0.01. Robust standard errors are presented below the corresponding coefficient. All specifications control for geographical regions, currencies pegged to the U.S. dollar or the Euro, Euro membership (time variant), and for the introduction of the Euro as a currency. Additionally, year dummies and a constant term are also included though they are not reported to conserve space. The dummy variable for British legal origin is also included but not reported. The EU dummy is time invariant. See Data Appendix for the definitions and constructions of the data. $\sigma_u^2$and σ_v^2 are the panel-level and overall variance components respectively, while ρ is the percent contribution to the total variance of the panel-level variance component. The null hypothesis of the LR test is that the standard Tobit model is better suited than the random-effect Tobit.

Table 4: Predicted Impact on the U.S. Dollar Share in Outstanding International Debt, 1995-2013

(a) Full Sample

	(1) Predicted Effect of 1 SD (%)	(2) In SDs of Dep. Variable
Log (GDP)***	-0.14	0.00
Real GDP growth	0.25	0.01
Dom. Savings/GDP***	-5.13	-0.15
Inflation Volatility	2.00	0.06
Fiscal Space	1.54	0.04
Financial Development*	-2.00	-0.06
Exports to U.S. (% of total)***	6.04	0.17
Quality of Institutions	-0.75	-0.02
Financial Openness***	-4.17	-0.12
	** p<0.1; ** p<0.05; *** p<0.01*	
Predicted value† (%)	*53.6*	
Actual value in 2013 (%)	*67.4*	
SD of Dep. Variable	*34.7*	

† = Prediction based on average values 1995-2013

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. The estimates in the tables are based on the estimation results of model (4) for the full sample and (8) for the developing countries subsample in Table 1.

(b) Developing Countries

	(1) Predicted Effect of 1 SD (%)	(2) In SDs of Dep. Variable
Log (GDP)***	-0.15	-0.01
Real GDP growth	-1.21	-0.04
Dom. Savings/GDP***	-11.21	-0.39
Inflation Volatility	3.42	0.12
Fiscal Space*	4.16	0.14
Financial Development	-1.51	-0.05
Exports to U.S. (% of total)	2.55	0.09
Quality of Institutions	-1.38	-0.05
Financial Openness***	-6.42	-0.22
	** p<0.1; ** p<0.05; *** p<0.01*	
Predicted value† (%)	*65.6*	
Actual value in 2013 (%)	*74.3*	
SD of Dep. Variable	*28.9*	

† = Prediction based on average values 1995-2013

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. The estimates in the tables are based on the estimation results of model (4) for the full sample and (8) for the developing countries subsample in Table 1.

Table 5: Predicted Impact on the Euro Share in Outstanding International Debt, 1995-2013

(a) Full Sample

	(1) Predicted Effect of 1 SD (%)	(2) In SDs of Dep. Variable
Log (GDP)	-0.02	0.00
Real GDP growth**	2.90	0.10
Dom. Savings/GDP	0.12	0.00
Inflation Volatility	0.26	0.01
Fiscal Space	0.35	0.01
Financial Development***	3.54	0.13
Exports to Euro Area* (% of total)	4.32	0.15
Quality of Institutions**	-1.82	-0.07
Financial Openness***	6.85	0.25
	** p<0.1; ** p<0.05; *** p<0.01*	
Predicted value† (%)	*17.8*	
Actual value in 2013 (%)	*14.9*	
SD of Dep. Variable	*27.9*	

† = Prediction based on average values 1995-2013

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. The estimates in the tables are based on the estimation results of model (4) for the full sample and (8) for the developing countries subsample in Table 2.

(b) Developing Countries

	(1) Predicted Effect of 1 SD (%)	(2) In SDs of Dep. Variable
Log (GDP)	0.01	0.00
Real GDP growth**	3.58	0.11
Dom. Savings/GDP	3.42	0.10
Inflation Volatility	-2.53	-0.07
Fiscal Space	-3.06	-0.09
Financial Development	-2.06	-0.06
Exports to Euro Area (% of total)	-1.27	-0.04
Quality of Institutions**	-2.98	-0.09
Financial Openness***	9.81	0.29
	** p<0.1; ** p<0.05; *** p<0.01*	
Predicted value† (%)	*14.7*	
Actual value in 2013 (%)	*9.8*	
SD of Dep. Variable	*33.9*	

† = Prediction based on average values 1995-2013

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. The estimates in the tables are based on the estimation results of model (4) for the full sample and (8) for the developing countries subsample in Table 1.

Table 6: Predicted Impact on the Share of Total Foreign Currencies in Outstanding International Debt, 1995-2013

(a) Full Sample

	(1) Predicted Effect of 1 SD (%)	(2) In SDs of Dep. Variable
Log (GDP)***	-0.07	0.00
Real GDP growth	-0.21	-0.01
Dom. Savings/GDP	-0.98	-0.03
Inflation Volatility	-0.66	-0.02
Fiscal Space***	4.03	0.14
Financial Development	-2.79	-0.09
Share of Exports*** (% of world exp.)	-1.13	-0.04
Quality of Institutions	-0.12	-0.00
Financial Openness***	-6.40	-0.22
	** p<0.1; ** p<0.05; *** p<0.01*	
Predicted value† (%)	*89.5*	
Actual value in 2013 (%)	*93.0*	
SD of Dep. Variable	*29.6*	
† = Prediction based on average values 1995-2013		

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. The estimates in the tables are based on the estimation results of model (4) for the full sample and (8) for the developing countries subsample in Table 3.

(b) Developing Countries

	(1) Predicted Effect of 1 SD (%)	(2) In SDs of Dep. Variable
Log (GDP)***	-0.06	0.00
Real GDP growth	-0.23	-0.01
Dom. Savings/GDP	0.21	0.01
Inflation Volatility	0.16	0.01
Fiscal Space***	1.77	0.08
Financial Development	0.70	0.03
Share of Exports *** (% of world exp.)	-1.73	-0.08
Quality of Institutions***	-1.41	-0.07
Financial Openness***	-1.24	-0.06
	** p<0.1; ** p<0.05; *** p<0.01*	
Predicted value† (%)	*92.1*	
Actual value in 2013 (%)	*96.5*	
SD of Dep. Variable	*21.7*	
† = Prediction based on average values 1995-2013		

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. The estimates in the tables are based on the estimation results of model (4) for the full sample and (8) for the developing countries subsample in Table 3.

Table 7: Determinants of the Currency Shares in International Debt, 1995-2013

Dep. Var.:% of	FULL SAMPLE	
	U.S. dollar (1)	Euro (2)
Log(GDP)	-1.043***	2.825***
	(0.373)	(0.374)
Real GDP growth trend	0.378	-0.140
	(0.304)	(0.312)
Domestic savings (% of GDP)	0.085	0.162**
	(0.077)	(0.080)
Inflation volatility	0.849***	0.007
	(0.238)	(0.246)
Fiscal space (reciprocal)	2.862***	-0.343
	(0.936)	(0.951)
Financial development	-0.091***	0.056***
	(0.013)	(0.013)
Exports to the U.S./ EU/ World (% of total exp.)	0.175***	0.145***
	(0.033)	(0.043)
EU dummy	-24.621***	32.342***
	(1.670)	(1.725)
Quality of institutions	-1.881	-2.784**
	(1.182)	(1.216)
Financial openness	-10.324***	7.268***
	(2.147)	(2.173)
R^2	0.73	0.74
Number of observations	765	765

Notes: * $p<0.1$; ** $p<0.05$; *** $p<0.01$. The table shows the results of the seemingly unrelated regression (SUR). Robust standard errors are presented below the corresponding coefficient. All specifications control for geographical regions, currencies pegged to the U.S. dollar or the Euro, Euro membership (time variant), and for the introduction of the Euro as a currency. Additionally, year dummies and constant terms are also included though they are not reported to conserve space. The EU dummy is time invariant. See Data Appendix for the definitions and constructions of the data.

Table 8: Determinants of the U.S. Dollar Share in International Debt, 1995-2013

	FULL SAMPLE			DEVELOPING COUNTRIES		
Dep. Var.: % of Dollar	(1)	(2)	(3)	(4)	(5)	(6)
Log(GDP)	-7.015***	-5.812***	-5.694***	-7.920***	-6.882***	-6.803***
	(1.320)	(1.336)	(1.334)	(1.675)	(1.737)	(1.728)
Real GDP growth trend	0.004	0.308	0.285	-0.220	0.030	-0.012
	(0.319)	(0.344)	(0.345)	(0.389)	(0.426)	(0.429)
Domestic savings (% of GDP)	-0.250*	-0.414***	-0.387***	-0.517***	-0.718***	-0.692***
	(0.133)	(0.136)	(0.140)	(0.159)	(0.167)	(0.169)
Inflation volatility	0.196	0.265	0.267	0.291	0.380*	0.385*
	(0.192)	(0.198)	(0.199)	(0.210)	(0.219)	(0.220)
Fiscal space (reciprocal)	2.480	2.872	2.993	3.729	5.036*	5.179*
	(1.886)	(2.013)	(2.022)	(2.512)	(2.806)	(2.809)
Financial development	-0.048**	-0.052**	-0.052**	-0.031	-0.030	-0.034
	(0.021)	(0.021)	(0.022)	(0.054)	(0.056)	(0.056)
Exports to the U.S.(% of total exp.)	0.272***	0.328***	0.334***	0.133	0.125	0.132
	(0.097)	(0.106)	(0.106)	(0.116)	(0.136)	(0.135)
EU dummy	-49.640***	-42.250***	-41.134***	-68.812***	-59.915***	-59.038***
	(9.274)	(8.605)	(8.500)	(10.972)	(10.386)	(10.206)
Quality of institutions	-0.927	-0.168	-0.390	-3.255	-2.414	-2.536
	(1.671)	(1.676)	(1.686)	(2.081)	(2.109)	(2.125)
Financial openness	-19.206***	-20.934***	-21.165***	-20.277***	-23.103***	-22.885***
	(3.864)	(3.903)	(3.926)	(5.299)	(5.379)	(5.403)
Currency Crisis	-0.244		-1.096	2.098		1.482
	(2.971)		(3.060)	(3.772)		(3.933)
Debt Crisis		7.635**	7.664**		7.206*	7.247*
		(3.887)	(3.902)		(4.171)	(4.186)
σ_u^2	24.213***	21.473***	21.078***	24.141***	21.614***	21.098***
σ_v^2	10.912***	10.991***	10.997***	11.536***	11.671***	11.689***
ρ	0.83	0.79	0.79	0.81	0.77	0.77
LR test σ_u^2=0	730***	580***	555***	386***	306***	290***
Number of observations	721	697	668	521	497	468
Number of countries	65	62	60	55	52	50

Notes: * p<0.1; ** p<0.05; *** p<0.01. Robust standard errors are presented below the corresponding coefficient. All specifications control for geographical regions, currencies pegged to the U.S. dollar or the Euro, Euro membership (time variant), and for the introduction of the Euro as a currency. Additionally, year dummies and a constant term are also included though they are not reported to conserve space. The EU dummy is time invariant. See Data Appendix for the definitions and constructions of the data. $\sigma_u^2$and σ_v^2 are the panel-level and overall variance components respectively, while ρ is the percent contribution to the total variance of the panel-level variance component. The null hypothesis of the LR test is that the standard Tobit model is better suited than the random-effect Tobit.

Table 9: Determinants of the Euro Share in International Debt, 1995-2013

	FULL SAMPLE			DEVELOPING COUNTRIES		
Dep. Var.: % of Euro	(1)	(2)	(3)	(4)	(5)	(6)
Log(GDP)	-1.232	0.897	0.990	0.023	1.745	1.693
	(1.313)	(1.407)	(1.413)	(1.759)	(1.863)	(1.866)
Real GDP growth trend	0.675**	0.744**	0.697**	0.868**	0.885**	0.879**
	(0.302)	(0.301)	(0.302)	(0.386)	(0.397)	(0.397)
Domestic savings (% of GDP)	-0.038	-0.240	-0.222	0.132	-0.132	-0.127
	(0.147)	(0.151)	(0.151)	(0.190)	(0.200)	(0.200)
Inflation volatility	-0.022	0.127	0.127	-0.319	-0.076	-0.072
	(0.202)	(0.199)	(0.198)	(0.230)	(0.232)	(0.232)
Fiscal space (reciprocal)	1.042	1.845	1.943	-3.523	-1.177	-1.178
	(1.760)	(1.767)	(1.766)	(2.723)	(2.840)	(2.839)
Financial development	0.079***	0.069***	0.068***	-0.048	-0.048	-0.049
	(0.019)	(0.019)	(0.019)	(0.048)	(0.051)	(0.051)
Exports to the Euro Area	0.255**	0.098	0.128	-0.039	-0.327	-0.337
(% of total exp.)	(0.126)	(0.156)	(0.157)	(0.164)	(0.244)	(0.244)
EU dummy	16.932**	15.889*	15.464*	37.398***	36.182***	36.238***
	(7.449)	(8.303)	(8.299)	(10.688)	(12.058)	(12.068)
Quality of institutions	-3.700***	-3.336**	-3.587***	-5.128**	-6.196***	-6.134***
	(1.384)	(1.334)	(1.344)	(2.058)	(1.990)	(1.993)
Financial openness	18.590***	21.126***	20.573***	26.575***	31.545***	31.610***
	(2.955)	(3.011)	(3.026)	(4.601)	(5.194)	(5.193)
Currency Crisis	1.104		1.135	0.522		2.052
	(2.394)		(2.292)	(4.458)		(4.265)
Debt Crisis		23.233***	23.099***		20.487***	20.509***
		(4.886)	(4.877)		(5.202)	(5.199)
σ_u^2	21.475***	23.293***	23.277***	23.739***	25.227***	25.258***
σ_v^2	9.282***	8.887***	8.870***	9.645***	9.159***	9.153***
ρ	0.84	0.87	0.87	0.86	0.88	0.88
LR test σ_u^2=0	649***	672***	673***	396***	396***	396***
Number of observations	651	621	620	375	344	344
Number of countries	59	56	56	39	36	36

Notes: * p<0.1; ** p<0.05; *** p<0.01. Robust standard errors are presented below the corresponding coefficient. All specifications control for geographical regions, currencies pegged to the U.S. dollar or the Euro, Euro membership (time variant), and for the introduction of the Euro as a currency. Additionally, year dummies and a constant term are also included though they are not reported to conserve space. The EU dummy is time invariant. See Data Appendix for the definitions and constructions of the data. $\sigma_u^2$and σ_v^2 are the panel-level and overall variance components respectively, while ρ is the percent contribution to the total variance of the panel-level variance component. The null hypothesis of the LR test is that the standard Tobit model is better suited than the random-effect Tobit.

Figure 1: Domestic vs. International Debt Securities (in $ trillions)

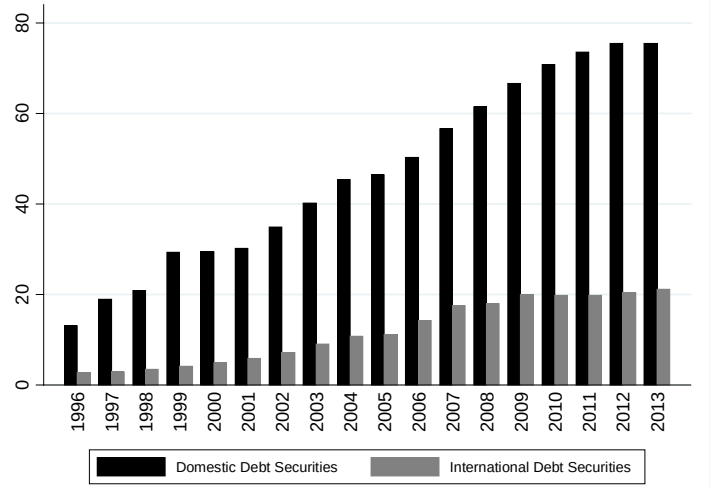
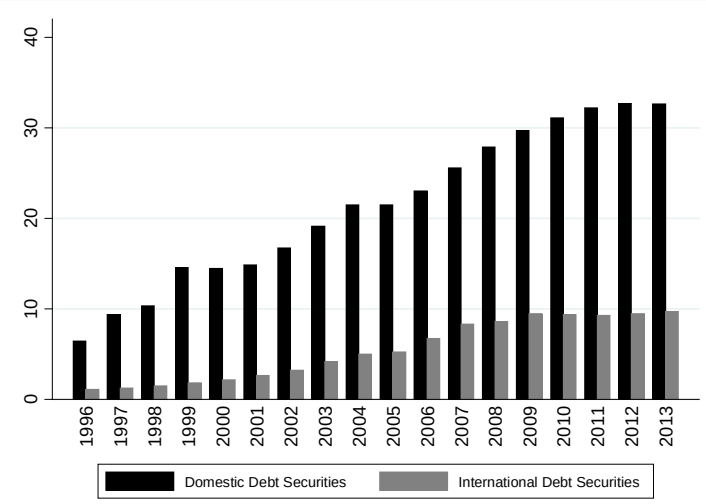


Figure 2: Domestic vs. International Debt Securities (in $ trillions): Developed vs. Developing

(a) Developed Economies



(b) Developing Countries

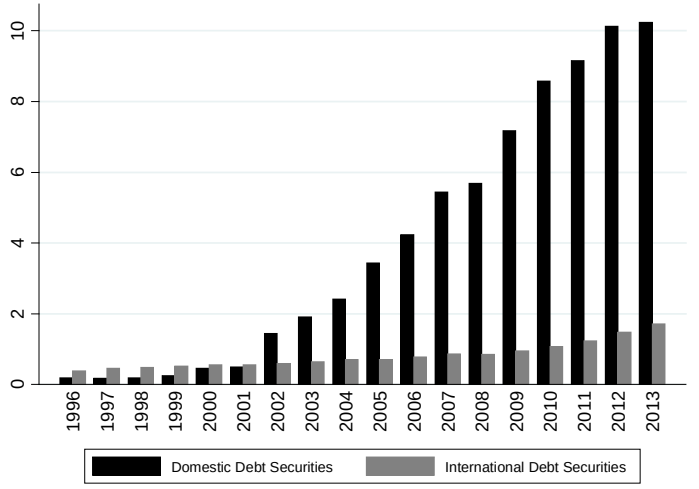
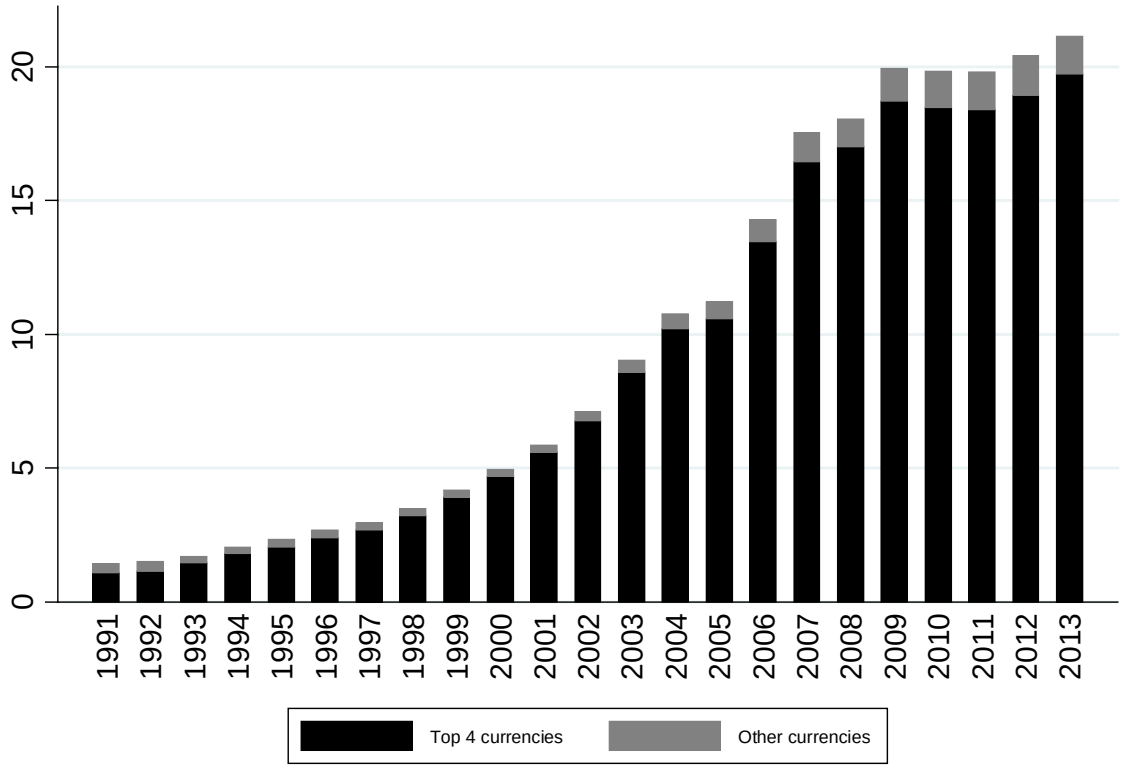


Figure 3: Dominance by the Four Major Currencies ($, €, ¥, £) in International Debt Securities ((in $ trillions)



Note: Top 4 currencies are: Dollar, Euro, Yen, and Pound

Figure 4: Reliance on Foreign-Currency Denomination

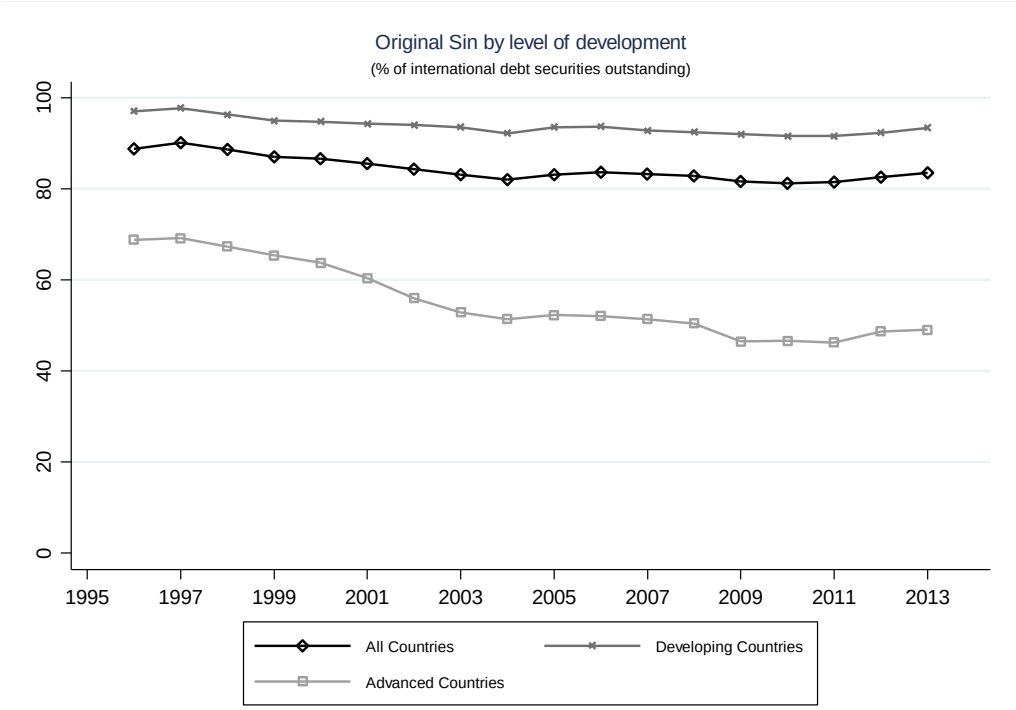


Figure 5: Shares of the Dollar, the Euro, and Foreign Currencies

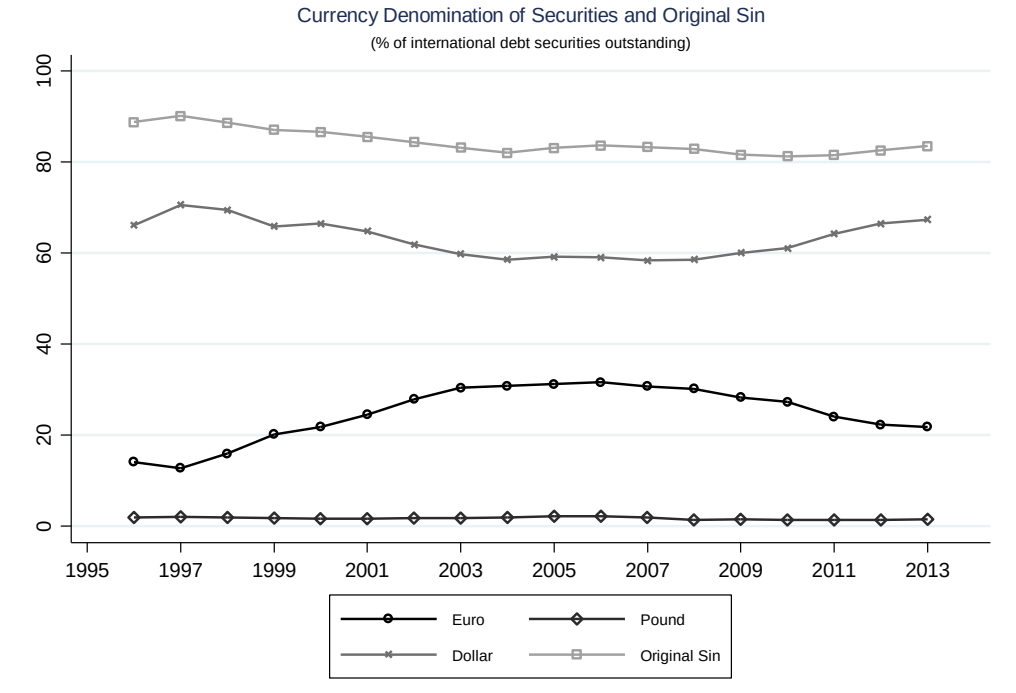
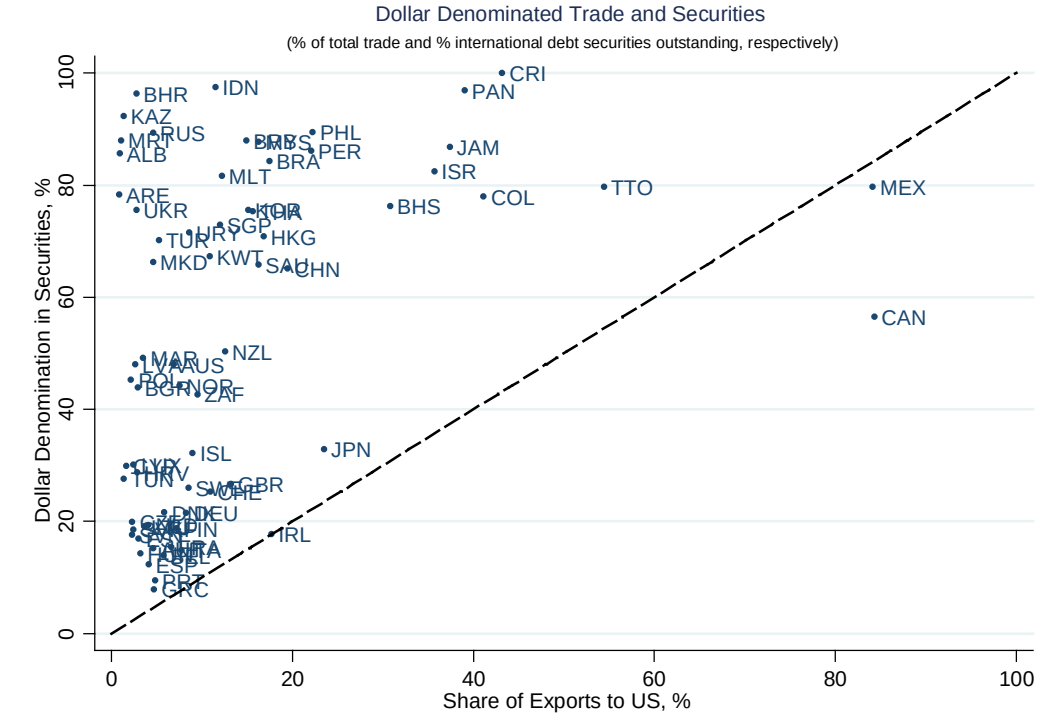


Figure 6: Currency Choice and Trade (1995-2013)

(a) U.S. Dollar



(b) Euro

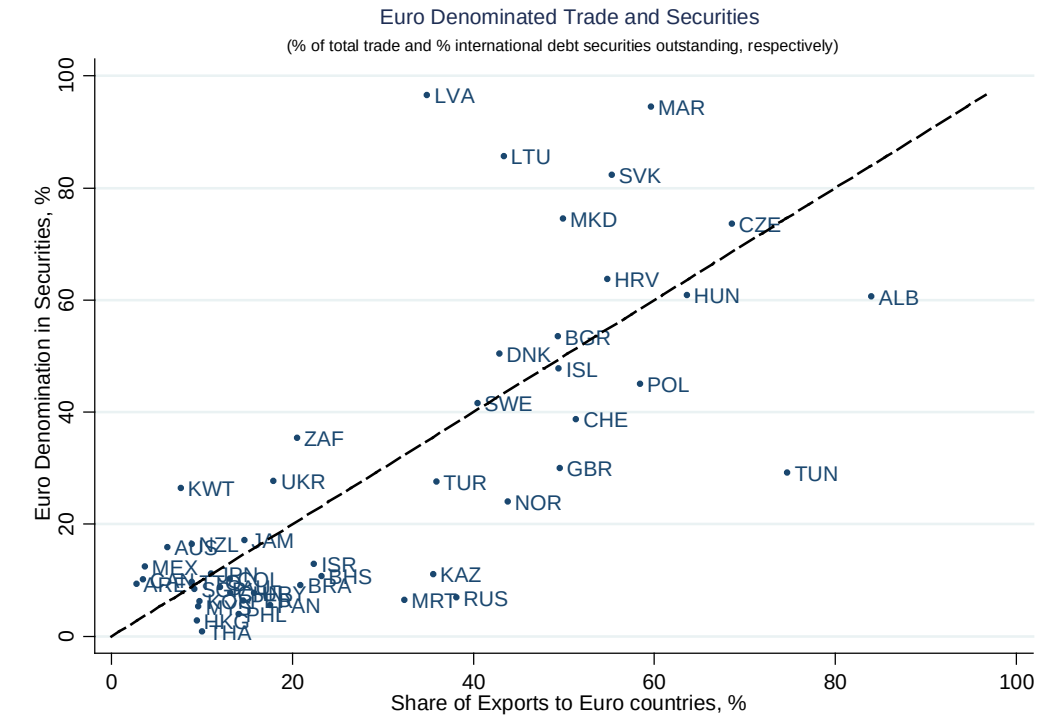
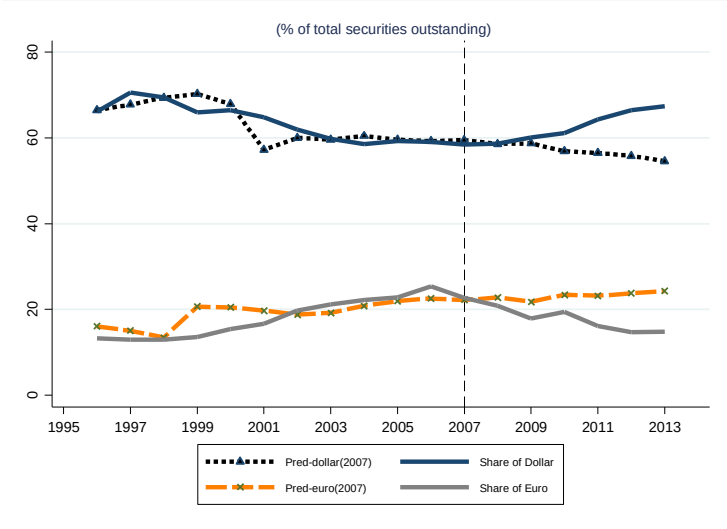
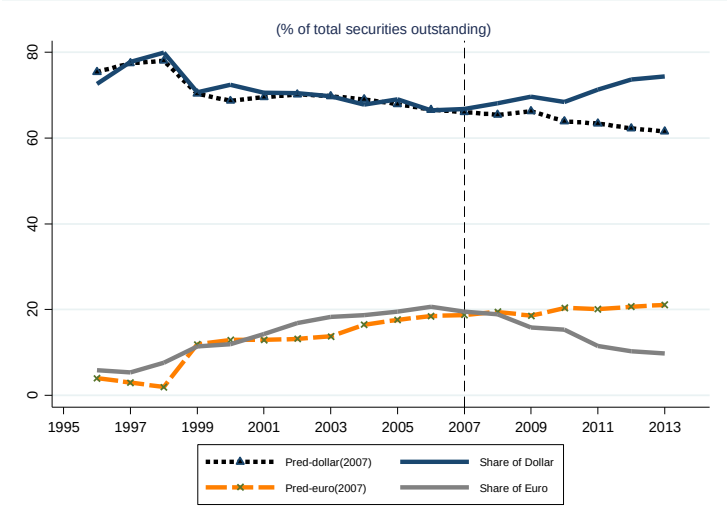


Figure 7: Predicted Shares of the U.S. Dollar and the Euro

(a) Full Sample – Counterfactual



(b) Developing Countries – Counterfactual



(c) Full Sample with in-sample prediction

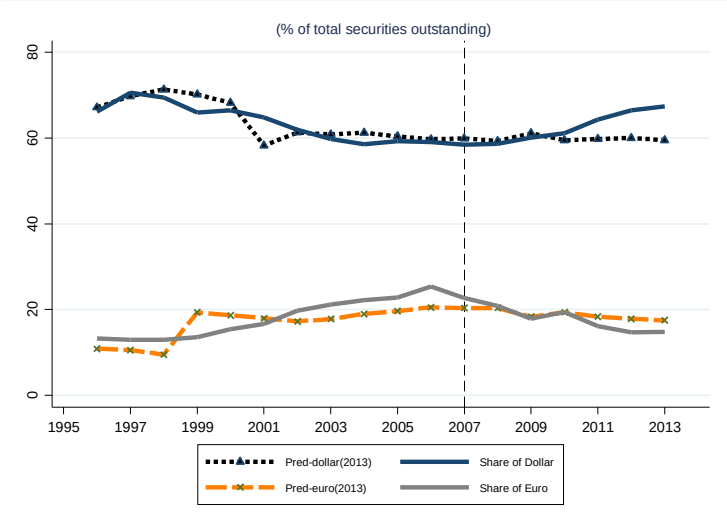
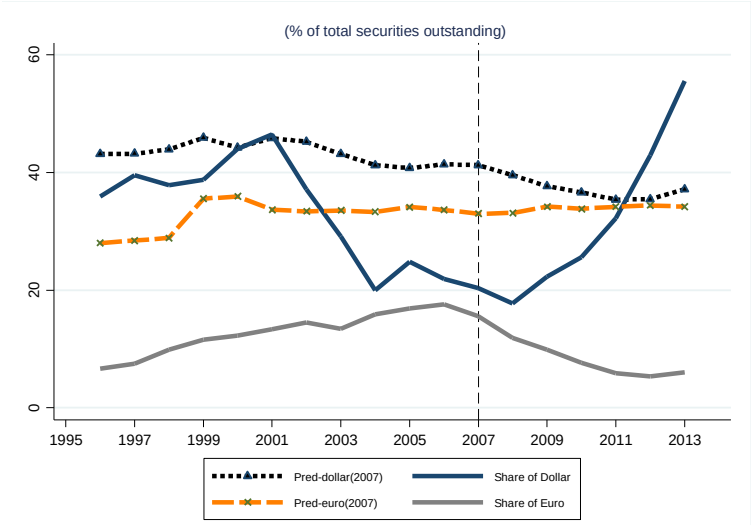
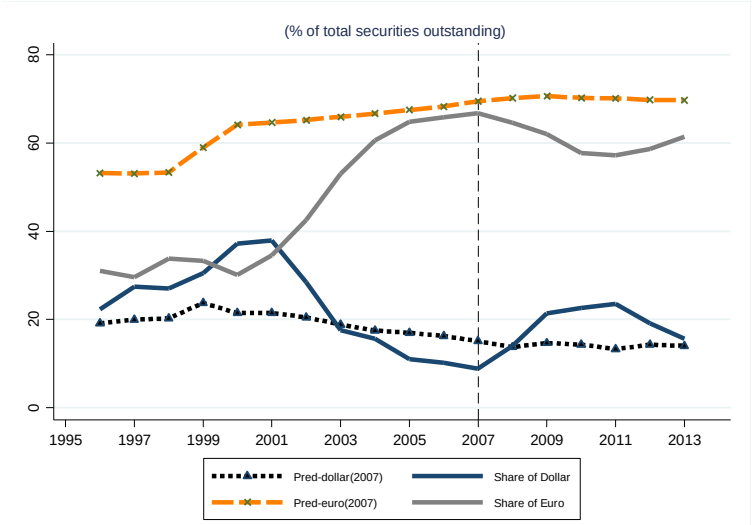


Figure 8: Predicted Shares of the U.S. Dollar and the Euro by country

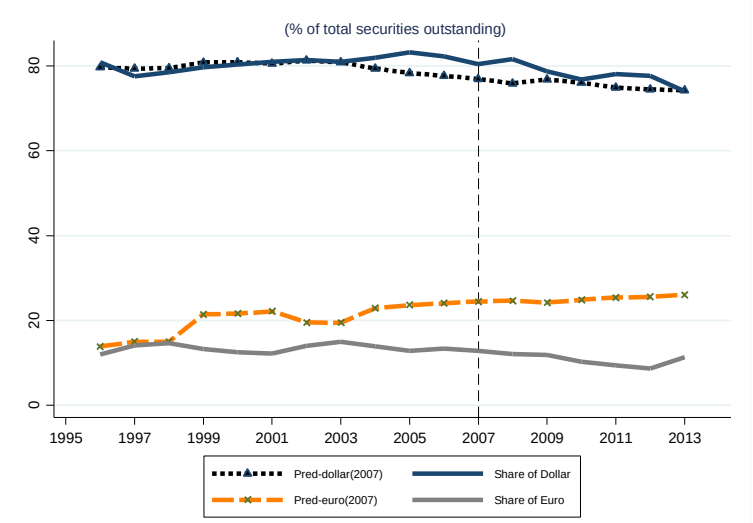
(a) Japan



(b) Denmark



(c) Mexico



(d) Thailand

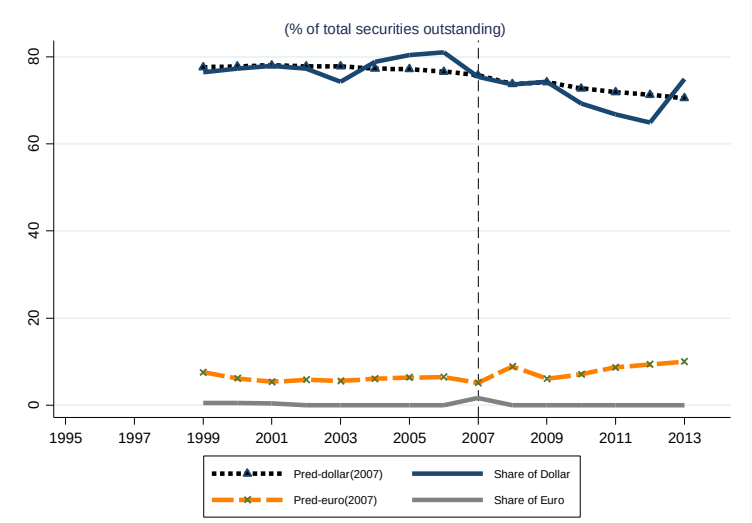
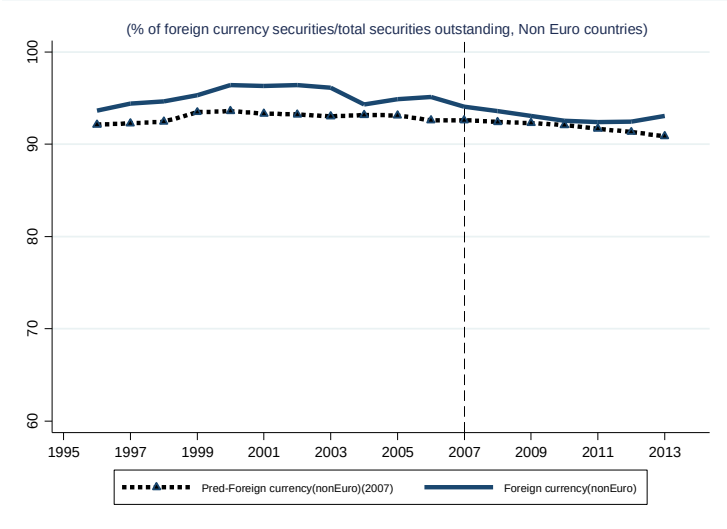
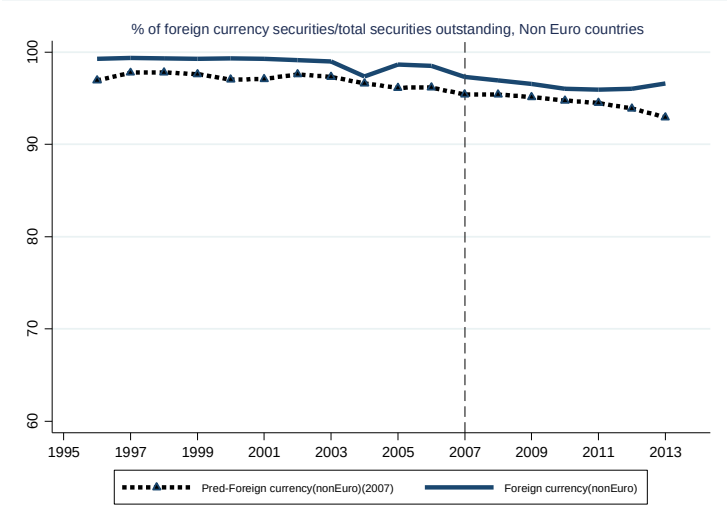


Figure 9: Predicted Shares of Total Foreign Currencies

(a) Full Sample – Counterfactual



(b) Developing Countries – Counterfactual



(c) Full Sample with in-sample prediction

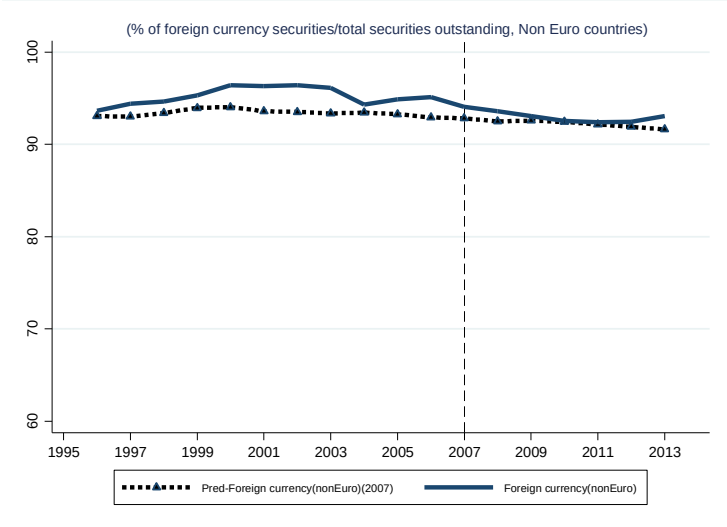
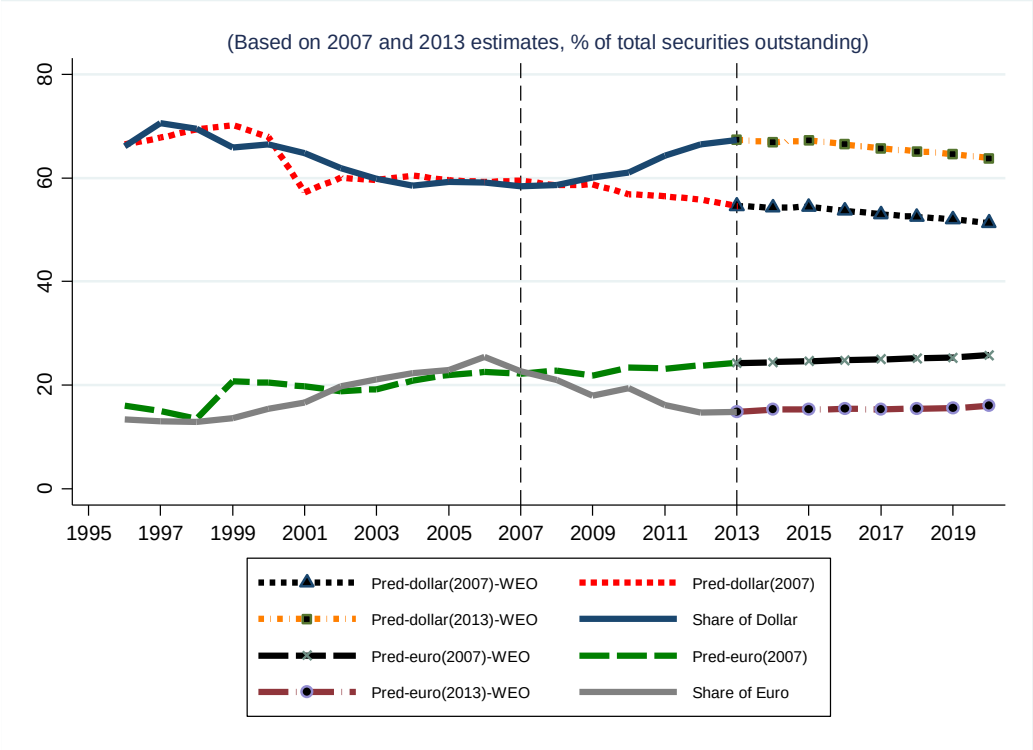


Figure 10: Predicted Shares of the U.S. Dollar and the Euro in 2014-2020

(a) Full Sample



(b) Developing Countries