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Abstract

Using a large sample of private international bond issues, we document a substantial decline in the share of international bonds denominated in major reserve currencies over the last two decades, and an increase in bonds denominated in issuers' home currencies. These secular trends appear to have accelerated notably after the global financial crisis. Observed increases in home currency foreign bond issuance was larger in countries with stable inflation and lower government debt, and in emerging markets that adopted explicit inflation targeting policies. We then present a model that demonstrates how the global financial crisis could have a persistent impact on home currency bond issuance. Firms that issue for the first time in their home currencies during disruptive episodes, such as the crisis, find their relative costs of issuance in home currencies remain lower after conditions return to normal, due to the increased depth of the home currency market. Empirically, we show that countries with more stable inflation and lower government debt were more likely to benefit from the opportunity to switch to home currency foreign bond issuance presented by the crisis.

JEL classification: F34, F36, F65, E52

Keywords: bond, original sin, inflation targeting, debt, crisis, currency

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1 Introduction

It has become conventional wisdom that most countries do not borrow internationally in their own currency, a phenomenon Eichengreen and Hausmann (1999) dubbed "original sin."[1] Indeed, Hausmann and Panizza (2003) point out that 97 percent of debt is issued in the five largest currencies, henceforth "global currencies"—the U.S. Dollar, the euro, the British pound, the yen, and the Swiss franc—yet borrowers in these countries only account for 83 percent of all debt issues. Theory dictates that foreign investors will demand premia on debt denominated in high-risk countries' currencies because of the additional currency devaluation risk these assets carry. As a result, many borrowers in these countries choose to denominate international debt in one of these global currencies. This poses a problem for borrowers, however, as foreign currency issues subject borrowers to currency mismatch, resulting in balance sheet effects under exchange rate shocks.[2] They may also limit the expansionary policy options of monetary authorities, as countercyclical depreciation actions increase default risk for sovereign and private borrowers facing currency mismatches (Eichengreen et al., 2007).

Since the late 1990s, academics and policymakers have debated whether original sin results from poor policies and institutions or from structural features of international capital markets (Hausmann and Panizza, 2010). Several developments have helped mitigate original sin through both channels. Inflation stabilization, often achieved through recently-adopted inflation targeting policies, has garnered several previously-suspect countries new credibility, as regimes with formal inflation targets have not only proven to be durable,[3] but also have exhibited less exchange rate volatility, and fewer sudden stops (Rose, 2007). Technological advancements may have also have decreased the transaction and information costs of issuing in smaller currencies, reducing pressure for assets to be issued only in global "reserve" currencies.

At the same time, the attractiveness of issuing in global currencies currencies has changed as

[1] Eichengreen and Hausmann (1999) also use this term to describe the related fact that most countries also do not borrow *domestically* in their own currency at extended maturities. The focus of most subsequent work on original sin and this paper, however, concerns the international dimension of original sin.

[2] For the importance of balance sheet effects see, for example, Krugman (1999), Schneider and Tornell (2004), and Calvo et al. (2008).

[3] Only Finland and Spain have abandoned inflation targets, doing so to join the European Monetary Union.

international financial markets have evolved. Hale and Spiegel (2012) suggest that the advent of the European Monetary Union brought about a decline of the dollar's dominance in international bond markets by establishing a second global currency; the introduction of the Euro not only mechanically increased the number of countries able to borrow internationally in their own currency, but also reduced the marked advantages of issuing in dollars.

Going forward, many anticipate the end of a dollar-dominated global monetary system. Before the crisis, based on factors such as home market size, available liquidity, and rates of return, Chinn and Frankel (2008) predicted that the euro could surpass the U.S. dollar as the dominant global reserve currency by 2015. Certainly the relative size of U.S. output in the global economy has steadily declined, but it has also been argued that the scale and network advantages pushing the global system towards a single reserve currency have been exaggerated.

A related issue is whether the international financial system is moving away from reserve-currency dominance. Eichengreen and Flandreau (2012) examine the ascent of the dollar as the preeminent global currency, and argue that it was desirable policies, not scale economies, that gave rise to the dollar. Eichengreen and Flandreau (2009) cite the fact that the dollar and the British sterling shared the reserve currency role as relatively equal partners in the 1920s and 1930s as evidence against the inevitability of a single reserve currency. Eichengreen (2012) envisions a multi-polar world a decade hence, with global transactions denominated in the dollar, the euro and the Renminbi. Dobson and Masson (2008) are likewise optimistic about a regional, if not global, role for the Renminbi. This stance has merit, but remains controversial as some argue that the dollar's inertial advantages are likely to maintain its preeminence as the sole global currency for some time to come (Goldberg, 2010). As evidenced by the severe dollar funding needs of foreign banks during the global financial crisis, the dollar was still *the* reserve currency as recently as 2008-2009. Arguably, the rising role of the euro was also put into question by a protracted debt crisis in the euro area.

These changes motivate a reexamination of the incidence of original sin. Among more recent literature, Hausmann and Panizza (2010) update their earlier work (Hausmann and Panizza, 2003) with developing country data through 2008, finding a small reduction in the incidence of original sin which was limited to a few countries. Burger and Warnock (2012) and Burger et al. (2014)

document a strong trend of increasing U.S. investment in local currency private and public bonds of emerging markets. Du and Schreger (2013) demonstrate that the increase in foreign holding of local currency debt issued by emerging markets was not unique to U.S. investors. They also show, however, that it was primarily due to increased foreign participation in domestic sovereign bond markets. In fact, they do not observe a substantial increase in foreign holdings of local currency corporate debt of emerging market borrowers.

We revisit the incidence of original sin with data for a large sample of OECD and non-OECD countries through 2013, presenting evidence that countries' abilities to borrow internationally in their own currency has significantly increased over the last 15 years, and particularly since 2008. Furthermore, we posit that borrowers from many countries have, in fact, been "baptized" from original sin, and now enjoy the ability to issue debt internationally in their home currencies. We present a model to inform a discussion of the determinants of original sin and "baptism," highlighting the role of the global financial crisis. While most of the literature to date concentrates on half of the borrower's tradeoff—costs and benefits of issuing in home currencies—we also emphasize the other half—changes in the costs of issuing in a global currency—to explain the decline of original sin. Our paper contributes to the discussion of global reserve currency dominance, as our data indicates a decline in the role of global currencies in the international bond market.

Using micro-level data from Dealogic's DCM Analytics (a.k.a. Bondware), we analyze the currency denomination of 110,246 international bond issues by firms from 49 countries between 1990 and 2013. We document a secular decline in the use of the top five global currencies since the launch of the euro in 1999, as well as an overall reduction in the concentration of currency denominations, primarily at the expense of the British pound, Japanese yen, and Swiss franc. Dividing our sample into (1) global currency countries, (2) non-global currency OECD countries, and (3) non-OECD countries, we observe an increase in the ratio of deals denominated in firms' home currencies in all three groups beginning in 1999, and substantially accelerating in 2008.

We formalize these observations with regression analysis of the determinants of home currency bond issuance. We find that larger issues are more likely to be in global currencies, and that issues from non-global currency countries (both OECD and non-OECD) are more likely to be denominated

in firms' home currency if their countries have higher rule of law scores. Examining within-country variation, we find evidence that the adoption of formal inflation targeting regimes increases the probability of home currency issuance for non-OECD countries, while recent high inflation episodes reduce the probability of issuing in home currencies for OECD countries.[4] Furthermore, we find evidence that recent episodes of high inflation and high ratios of government debt to GDP are jointly associated with lower probabilities of issuing in home currencies for all non-global currency countries. We also find that firms from non-global currency countries that have previously issued in their home currency, which we refer to as being "seasoned" in home currency issuance, are more likely to do so again.

To better understand the circumstances under which firms' propensities to systematically issue a larger ratio of international debt in their home currencies might increase, alleviating the incidence of origin sin, we propose a simple model. We assume that firms have heterogeneous abilities to issue in their home currency, and pay country-specific premia on issues denominated in their country's currency relative to cost of issuing in a global currency. Our central assumptions are, first, that firms unseasoned in issuing debt in their home currency pay an additional premium the first time they issue debt in their home currency; second, that country-specific premia depend not only upon conditions in the country itself, but also global economic conditions; third, that transaction costs of issuing in a given currency fall with increased overall issuance in that currency. We assume that country-specific premia decrease in the event of a global crisis, due to either uncertainty in or shortages of global currencies, or because of yield chasing by global investors. The model shows that in the event of such crisis, a temporary shock to the relative cost of home currency debt issuance may induce some firms to issue in their home currency for the first time. This increase in the share of firms "seasoned" in home currency issuance permanently reduces future domestic currency issuance costs. This implies that the post-crisis equilibrium differs from the pre-crisis equilibrium, even as macroeconomic fundamentals return to normal. Because home currency premia are country-specific, the impact of the crisis on firms' susceptibility to original sin will differ across countries.

[4]These results are consistent with the findings of Burger and Warnock (2006) in a cross-country analysis of total, international and domestic, local currency debt as of 2001.

To bring the model to the data, we examine the characteristics of non-global currency countries that experienced a substantive increase in the share of deals issued in home currency after the crisis. Consistent with our panel regressions, we find that countries with lower pre-crisis ratios of government debt to GDP — particularly those that also enjoyed low inflation histories – were more likely to be "baptized" from original sin by the crisis. Countries that were seasoned in home currency international bond issuance were also more likely to experience an increase in the share of home currency issuance. Finally, countries with more volatile pre-crisis exchange rates appear to have been more likely to take advantage of the temporary disruption and near-zero interest rates in global financial centers to issue more in home currency.

It is important to point out that our empirical analysis is intentionally limited to international bonds issued by private sector firms. There are two main reason why we focus on international bonds only: first, as the Russian 1998 crisis showed, foreign participation in local bond markets can be very volatile, while bonds issued in international markets provide a more stable foreign investment; second, the data available on international bond issuance is much more consistent across countries and therefore allows for a more systematic analysis. Excluding sovereign bonds from our analysis allows us to avoid the endogeneity problem that arises from the fact that the governments may influence inflation rate and debt levels simultaneously with their choices of sovereign debt currency compositions.

The paper proceeds as follows. Section 2 describes our data. Section 3 offers a broad analysis of the data as well as cross-country and within-country analysis. In section 4 we present our model and its empirical application. Section 5 concludes.

2 Data Description

Our empirical analysis is based on micro-level data from Dealogic's DCM Analytics (a.k.a Bondware), which covers most new issues on the international bond market (Hale and Spiegel, 2012). We limit our analysis to issues placed by private companies in foreign markets—those explicitly labeled by Dealogic as "international issues," that is, explicitly marketed to foreign investor. Some of these bonds may have explicit restriction that forbid their trading in domestic markets. Dealogic's deal-

level data provides the name and nationality of the issuer,[5] the deal amount, and currency. With this information we classify deals as denominated either in home or foreign currency, and borrowers as either seasoned or unseasoned in home currency issuance. In total, our sample contains 110,246 issues from borrowers in 49 different countries between 1990 and 2013.[6]

Throughout much of the analysis we split the sample into (1) global currency countries, (2) non-global currency OECD countries, and (3) non-OECD countries.[7] We sometimes refer to these groups as GC5, OECD ex. GC5, and non-OECD, respectively. Global currency countries include the U.S., the U.K, Japan, Switzerland, Germany prior to 1999, and the Eurozone beginning in 1999.[8] We distinguish this group because their currencies have traditionally dominated international trade invoicing and asset issuance (Eichengreen et al., 2007). Appendix table A.1 lists the countries in our sample by group. Appendix Table A.2 displays the number of deals and amounts borrowed by each group for each year in our sample.

We match this bond-level data with country-level data from various sources. Gross government debt, GDP, and inflation data come from the IMF's World Economic Outlook database. Exchange rate data come from the IMF's International Financial Statistics (IFS) database. We characterize countries as either inflation targeters, or non-inflation targeters according to Rose (2007) and Roger (2009), assuming continuance since the time of their classification.[9] Rule of law index comes from the World Bank's Worldwide Governance Indicators. S&P sovereign ratings come from S&P. Appendix Table A.3 presents summary statistics for each of the variables that we use in our analysis.

[5]We use "issuer nationality of operations" to identify deal nationality. This implies that bonds issued through offshore financial centers do not get assigned the nationality of the offshore center, but rather the country of residence of the issuer.

[6]The 49 countries selected are those that had sufficient number of bonds issued in any given year for meaningful analysis.

[7]This reflects the composition of the OECD as of 1990 and does not change over the panel.

[8]Countries are added to this group as they join the EMU.

[9]Rose (2007) points out that the U.S., EMU, and Japan have pursued credible stable inflation policies, rendering them implicit inflation targeters. As such, we classify these regimes as inflation targeters. Since we split our sample into country groups, this does not affect the definition of the variable for non-global currency countries.

3 Home currency issuance across countries and over time

Our discussion can be motivated by four informative figures. Figure 1 plots the ratio of international debt denominated in global currencies by number of deals and total amount. By either measure, a decrease in the share of debt issued in these currencies since 1999 is evident. Moreover, the concentration of firms' currency choices has steadily declined over time, as illustrated by a Herfindahl index displayed in Figure 2.

This raises the question: In what currency are firms issuing their debt if not global currencies? In Figure 3, we examine the prevalence of several currencies across three major time periods in our sample: pre-euro (1990-1998), euro pre-crisis (1999-2007), and post-crisis (2010-2013).[10] In the pre-euro period, the top 5 global currencies clearly dominate international debt issuance.[11]

Comparing the three panels in Figure 3 we observe that the introduction of the euro prompts a substantial increase in the share of debt issued in the euro, primarily at the expense of the yen, but also the U.S dollar and Swiss franc, as discussed in Hale and Spiegel (2012). We also observe a decrease in the use of the British pound, yen, and Swiss franc, and an increase in other currencies, most notably the Australian dollar (AUD), the Norwegian Krone (NOK), and the Swedish Krona (SEK) in the post-crisis years. Possibly, most of the increase in the issuance in non-global currencies can be explained by firms issuing in their own currencies. Dividing our sample as discussed in section 2, we show the share of home currency bond issuance by country group in Figure 4. A "euro effect" beginning in 1999 (at which point we reclassify EMU members as GC5) is apparent. However, we also observe an increase in the share of home currency issues by firms in GC5 countries beginning in 2004, as well as a notable acceleration in home currency issuance by other OECD countries and non-OECD countries beginning in 2007 and 2009, respectively.[12]

Table 1 presents time-series regressions that formalize these results. The share of home currency issuance by OECD ex. GC5 countries declines upon the introduction of the euro when initial EMU

[10] We omit 2008-2009 to avoid potential oddities in the data that could be driven by crisis-specific circumstances.

[11] In the figure, to-be eurozone countries that issue in to-be euro area currencies are classified as euro for purposes of comparison.

[12] We ignore the temporary spikes in 2001 and 2008 for non-OECD borrowers. These could be driven by the fact that these were years of high risk aversion, likely making the set of borrowers able to access markets quite different.

member countries move into the GC5 group. The results also show an increase in home issuance for all three sub-samples in years during and after the global financial crisis. This increase is shown to be substantive and statistically significant for the OECD non-global-currency countries, but not for the non-OECD countries.

3.1 Cross-country comparisons

What determines whether firms in a given country can or cannot issue in their home currency? A priori, we might expect larger countries to have scale advantages. Quality of contract enforcement, which is encapsulated in the rule of law index, is likely to affect a country's overall creditworthiness and therefore might also be important. At the deal level, the size of the placement could matter. Specifically, we might expect larger placements to be issued in global currencies. There are two reasons for this: First, one needs a sufficiently deep market to successfully place a large issue; second, larger issues are likely to be from larger firms, which may be more adept at hedging their own positions, and are also more likely to be exporters (Melitz, 2003). Such firms have global currency revenue streams that makes borrowing in global currencies more attractive. Thus, we expect that larger issues are more likely to be denominated in home currency for global currency countries, but less likely to be denominated in home currency for non-global currency countries.

We test these conjectures, estimating deal-level pooled probit regressions of the probability of home currency issuance for each of our country groups. The results are reported in Table 2. We find that issues from larger countries are more likely to be denominated in home currency, but the effect is only significant for the full sample. We also find that a higher rule of law index is associated with a higher probability of home currency issuance for non-OECD countries. Rule of law is negatively associated with home currency issuance for global currency countries, but this is likely a spurious effect, based on small variations in the data since countries in this group all have high rule of law scores.[13] Consistent with our conjecture, larger issues are significantly more likely to be denominated in home currency for global currency countries and significantly less likely to be denominated in home currency for non-global currency countries.

[13]The overall effect is likewise negative since the GC5 sub-sample makes up the majority of the full sample in terms of the number of bond issues and therefore the number of observations.

3.2 Within-country dynamics

To study factors that determine over-time changes in home currency foreign bond issuance we estimate the same probit model of the probability of a bond being issued in a firm's home currency as before, but with country fixed effects. We continue to include year fixed effects to control for common trends. Throughout, we cluster standard errors on country-year, the level at which most of our covariates vary.

We draw upon the original sin and inflation targeting literature in specifying a within-country model. For reasons discussed previously, we include issue size. We also include a binary variable indicating whether or not the firm has previously issued debt in its home currency. As we expect sovereign inflation rates and fiscal solvency to be important to the investor weighing currency risk, we also include a variable indicating a history of high inflation in the issuer's country. We define this as having had at least one year in the previous 10 where the average inflation rate exceeded 10 percent. We also include the debt-to-GDP ratio of the issuer's country.

We are specifically interested in the effects of inflation targeting regimes. Evidence suggests that the benefits of inflation targeting and its effects on inflation and output stability hinge largely on the type of economy in question. Ball and Sheridan (2005) demonstrate in a sample of 20 OECD countries that the adoption of inflation targets had no measurable impact on economic performances. However, Goncalves and Salles (2008) do find that in a sample of 36 emerging market economies those that had adopted inflation targets experienced greater declines in both inflation and output volatility. These qualitative results were confirmed using treatment effects methods in Lin and Ye (2007) and Lin and Ye (2009) respectively. Given this evidence, we might expect inflation targeting to more strongly influence the currency denomination decisions of issuers from non-OECD countries.

Table 3 presents our benchmark results. As in our previous regressions, we find that larger issues are more likely to be denominated in their home currency for borrowers in GC5 countries, and less likely to be denominated in their home currency for borrowers in non-GC5 countries, although the effect is insignificant for OECD ex. GC5 countries. This is consistent with our assertion that the market depth matters, and indirectly supports the assumption we make in the model below

that increasing market depth reduces home issuance cost. Furthermore, being a seasoned home currency issuer increases the likelihood of home currency issuance for non-GC5 issuers, supporting our modeling assumption that home currency issuance costs are higher for unseasoned firms. As expected, we find that inflation target policies are an important determinant of home currency issuance for firms from non-OECD countries, but not for the OECD ex. GC5 countries. Although the inflation targeting variable comes in negative for GC5 countries, we are not overly concerned, since we include country fixed effects and this variable exhibits very limited over-time variation in this particular subsample, and thus the estimated effect is likely driven by a few influential observations.[14] Meanwhile, we find that for GC5 and other OECD countries, a history of high inflation decreases the probability of firms issuing in their home currency. Although this variable has a (wrong) positive sign for non-OECD countries, the effect is small relative to the effect of inflation targeting. We conclude from these results that the adoption of a formal inflation targeting regime is more important for non-OECD countries, while the inflation history matters more than the formal monetary regime for the OECD countries.

We do not find any significant effects for the debt-to-GDP ratio. However, it might be important to consider the joint effect of inflation history and debt-to-GDP ratios, since investors may fear the possibility of default through inflation policies. Thus, we also report the results of regressions that include an interaction term that identifies the joint effect of having a history of high inflation and a country's debt-to-GDP in Table 4. In this alternative specification, the effects of deal amount, being a seasoned home currency issuer, and inflation targeting remain unchanged. The coefficient for inflation history should now be interpreted as the effect of high inflation for countries with no debt. While the direct effect of debt-to-GDP ratios remain insignificant, for non-GC5 countries with high inflation histories an increase in debt-to-GDP ratio lowers the probability of issuing in the home currency. For OECD countries in our sample the debt-to-GDP ratio threshold after which the effect of high inflation becomes negative and statistically significant is 35 percent; for non-OECD countries it is 63 percent.[15]

[14] In the sample, only the U.K. before 1992 and Switzerland before 1999 do not have inflation targets, representing less than 1% of the subsample. As discussed in section 2, we classify the U.S., the Euro area, and Japan as inflation targeters, even though they have not adopted explicit policies.

[15] Reported figures are for significance at 10 percent confidence level. At 5 percent confidence level the threshold ratios are 37 and 71 percent, respectively.

4 Determinants of transition to home currency issuance

In this section, we draw on our parametric results above to introduce a theoretical model whose predictions match some of our earlier stylized facts about global trends in home currency issuance. Our model characterizes the determinants of an individual debt issuer's choice of currency denomination, illuminating the circumstances under which firms might choose to issue a larger portion of their debt in their home currency.

Our model's assumptions draw on two qualitative results from our parametric exercises above, namely that a firm's relative cost of home-country issuance is likely to be diminishing in overall home country issuance volumes, and that firms with experience in home country currency issuance will face lower transactions costs in issuing their own currencies again. Our results illustrate that the global financial crisis, by temporarily increasing the relative cost of issuance in global currencies, could have had a permanent positive effect on the global share of firms that choose to issue in home currency.

We then apply the model to cross-country data to explain observed differences across countries in the degree to which they transitioned away from original sin in the aftermath of the crisis.

4.1 The model

We frame the model in terms of a representative firm from an economy which is atomistic in terms of world financial conditions. There are 3 periods, $t = 0, 1$ and 2. Each firm issues one dollar in one-period debt in periods 0 and 1 to finance an investment. Firm decisions concern whether to issue in home currency, d, or a foreign "hard" currency f. Each firm, i, enters period 0 exogenously designated as either seasoned or unseasoned in issuing in their home currency, as a result of past behavior, which we do not model. Investments pay off a fixed amount Y in periods 1 and 2, and any profits earned are immediately paid out as dividends.[16]

There are $2\,\bar{\varepsilon}$ atomistic firms in the country. Firms therefore issue a total volume of $2\,\bar{\varepsilon}$ in debt in each period. As firm income is invariant with respect to their financing choice, decisions are

[16] That is, in the same period that profits are earned.

solely based on minimizing financing costs, with our analysis focusing on the currency denomination decision of a representative firm.

We assume that four factors influence a firm's choice of currency:

1. There exist economies of scale in total issuance in the home currency. Let V_t represent the total volume of issues in the home currency at time t.

2. Firms differ in their ability to issue in the foreign currency. We model this by assuming that in each period each firm receives an idiosyncratic shock, ε, which measures its disadvantage in issuing in the foreign currency. We assume that these shocks are i.i.d., and distributed on support $[-\overline{\varepsilon}, \overline{\varepsilon}]$ with mean 0 and density $f(\varepsilon)$. These shocks could proxy for the denominations of firms' export revenues, foreign currency stock trading, or relative hedging ability.

3. Firms unseasoned in issuing in their home currency pay a premium, u, the first time they issue in their home currency.

4. Firms pay a country-specific premium, ω_t, on issues denominated in their home currency. ω_t is a function of policies and macroeconomic conditions in the home country, as well as global economic conditions, as it measures the relative premium on issuance in home currency compared to issuing in foreign currency. We assume that ω_t are likewise i.i.d, and distributed on support $[\underline{\omega}, \overline{\omega}]$, with mean $\tau > 0$ and density $g(\omega)$.

Given our assumptions, a firm that chooses to issue in its home currency for the first time, i.e. one that is "unseasoned" in issuing in that currency, pays interest rate

$$r_t^{h,u} = 1 + u + \omega_t + \sigma(V_t) \tag{1}$$

in each period, where the world interest rate is exogenous and set equal to 1 without loss of generality, and $\sigma(V_t)$ represents the additional cost of issuing in the home currency due to scale diseconomies, which depend on the volume of transactions in that currency, V_t. For simplicity, we assume that we are in a range of positive scale economies at the market level by setting $\sigma(\cdot) \geq 0$,

and $\sigma'(\cdot) \leq 0$. In each period, a firm seasoned in home currency issuance pays

$$r_t^{h,s} = 1 + \omega_t + \sigma(V_t). \tag{2}$$

Alternatively, if a firm issues in the foreign currency, the interest rate that it pays in each period must satisfy

$$r_t^f = 1 + \varepsilon. \tag{3}$$

To ensure a sub-game perfect equilibrium, we solve the model backwards, beginning in final period 2. There are no decisions made in period 2. Firms earn their income Y from their period 1 investments, pay their outstanding debt obligations, and distribute profits as dividends. Their debt obligation is equal to $r_2^{h,u}$, $r_2^{h,s}$, or r_2^f, depending on whether their debt was issued in home or foreign currency, respectively.

In period 1 firms make their currency denomination decisions. By equations (1), (2), and (3), an unseasoned firm i will prefer to issue in its home currency in period 1 if

$$\varepsilon_i \geq u + \omega_1 + \sigma(V_1), \tag{4}$$

while a seasoned firm j will prefer to issue in its home currency if

$$\varepsilon_j \geq \omega_1 + \sigma(V_1). \tag{5}$$

To ensure positive issuance in home currency by seasoned firms when $V_1 = 0$ we require $\bar{\varepsilon} \geq \omega_1 + \sigma(0)$. We adopt this parameter restriction, along with the assumption that there is a positive number of seasoned firms entering period 1 to ensure an interior solution in the number of firms choosing to issue in their home currency.[17]

[17]These assumptions match our sample, which contains both seasoned and unseasoned firms and positive issuance in home currency for most countries in most years.

Let θ_1^u represent the share of unseasoned firms that issue in home currency in period 1. By (4)

$$\theta_1^u = 1 - F[u + \omega_1 + \sigma(V_1)], \tag{6}$$

where $F(\bullet)$ is the cumulative density of realizations of ε that lie below $\bullet$. Similarly, let θ_1^s represent the share of seasoned firms that issue in home currency in period 1. by (5)

$$\theta_1^s = 1 - F[\omega_1 + \sigma(V_1)]. \tag{7}$$

Let S_1 represent the share of firms that enter period 1 seasoned in home currency issuance either because they issued in their home currency in period 0 or because they entered period 0 already seasoned. Total period 1 issuance in home currency satisfies

$$V_1 = 2\,\bar{\varepsilon}(S_1\theta_1^s + (1 - S_1)\theta_1^u). \tag{8}$$

To solve the model analytically, we impose functional forms for the economies of scale function as well as a distribution for ε. For simplicity, we follow Hale and Spiegel (2012) and assume that the scale economy function satisfies $\sigma(V_t) = \alpha - \beta\,V_t$, where α and β are exogenous parameters, which satisfy the characteristics assumed above, and that the ε are distributed uniformly along the interval $[-\bar{\varepsilon}, \bar{\varepsilon}]$ with mean 0. Given these assumptions, equations (6) and (7) become

$$\theta_1^u = \frac{\bar{\varepsilon} - u - \omega_1 - \alpha + \beta\,V_1}{2\bar{\varepsilon}} \tag{9}$$

and

$$\theta_1^s = \frac{\bar{\varepsilon} - \omega_1 - \alpha + \beta\,V_1}{2\bar{\varepsilon}}. \tag{10}$$

Solving, we obtain

$$V_1 = \frac{(\bar{\varepsilon} - \omega_1 - \alpha) - (1 - S_1)u}{1 - \beta}. \tag{11}$$

We require $\beta < 1$ so that V_1 is positive and finite.

Given this restriction, it can be seen by inspection of (11) that second-period home currency issuance is increasing in S_1, the share of first-period seasoned firms. The intuition is straightforward: Firms that enter period 1 as seasoned have reduced costs of home currency issuance going forward, so a greater share of seasoned firms find it cost effective to issue in home currency than unseasoned firms.

Because of the scale economies in the model, there are strategic complementarities between the currency denomination decisions of firms. In particular, a low home currency equilibrium is possible where no firms issue in home currency. The resulting small scale of operations leaves no issuance in home currency the optimal decision for an individual firm. However, we focus on the "good equilibrium" of the model, in the sense that each firm behaves as if all firms with realizations of ε above their relevant thresholds choose to issue in their home currency, resulting in a total volume of lending in home currency that validates this decision for the individual firm.

Given the country shock ω_1, define ε^{u*} as the realization of ε that leaves unseasoned firms indifferent between issuing in home and foreign currency. By equations (4) and (11), ε^{u*} satisfies

$$\varepsilon^{u*}|\omega_1 = \frac{(\omega_1 + \alpha) - \beta\bar{\varepsilon} + (1 - \beta S_1)u}{1 - \beta}, \tag{12}$$

which is linear in ω_1. Unseasoned firms with realizations of $\varepsilon < \varepsilon^{u*}$ will issue in foreign currency, while the rest will issue in home currency.

Similarly, define ε^{s*} as the realization of ε that leaves unseasoned firms indifferent between issuing in home and foreign currency. By equations (5) and (11), ε^{s*} satisfies

$$\varepsilon^{s*}|\omega_1 = \frac{(\omega_1 + \alpha) - \beta\bar{\varepsilon} + \beta(1 - S_1)u}{1 - \beta}. \tag{13}$$

Seasoned firms with realizations of $\varepsilon < \varepsilon^{s*}$ will issue in foreign currency, while the rest will issue in home currency.

By (12) and (13), $(\varepsilon_1^{u*}|\omega_1) > (\varepsilon_1^{s*}|\omega_1)$, i.e. a greater share of unseasoned firms will issue in the foreign currency. In particular, firms with realizations of ε in the range $\varepsilon_1^{u*}|\omega_1 > \varepsilon > \varepsilon_1^{s*}|\omega_1$ will

issue in home currency if they are seasoned and in foreign currency if they are unseasoned. All firms with realizations of ε above this range will issue in home currency, while all firms with realizations of ε below this range will issue in foreign currency.

The implications for period 1 issuance costs are incorporated in period 0 issuance decisions. The period 0 expected cost of issuance for a firm that is unseasoned in period 1, $E(c_1^u)$, satisfies

$$E(c_1^u) = 1 + \int_{\underline{\omega}}^{\bar{\omega}} \left[\int_{-\bar{\varepsilon}}^{\varepsilon^{u*}|\omega_1} \varepsilon \mathrm{d}f(\varepsilon) + \frac{(\omega_1 + \alpha) - \beta\bar{\varepsilon} + (1 - \beta S_1)u}{1 - \beta} \int_{\varepsilon^{u*}|\omega_1}^{\bar{\varepsilon}} \mathrm{d}f(\varepsilon) \right] \mathrm{d}g(\omega), \tag{14}$$

while the expected cost of issuance for a seasoned firm, $E(c_1^s)$, satisfies

$$E(c_1^s) = 1 + \int_{\underline{\omega}}^{\bar{\omega}} \left[\int_{-\bar{\varepsilon}}^{\varepsilon^{s*}|\omega_1} \varepsilon \mathrm{d}f(\varepsilon) + \frac{(\omega_1 + \alpha) - \beta\bar{\varepsilon} + \beta(1 - S_1)u}{1 - \beta} \int_{\varepsilon^{s*}|\omega_1}^{\bar{\varepsilon}} \mathrm{d}f(\varepsilon) \right] \mathrm{d}g(\omega). \tag{15}$$

The expected savings on first period issuance costs from entering that period seasoned in domestic currency issuance satisfies

$$E(c_1^u - c_1^s) = \int_{\underline{\omega}}^{\bar{\omega}} \left[\int_{\varepsilon^{s*}|\omega_1}^{\varepsilon^{u*}|\omega_1} \left(\varepsilon - \frac{(\omega_1 + \alpha) - \beta\bar{\varepsilon} + \beta(1 - S_1)u}{1 - \beta} \right) \mathrm{d}f(\varepsilon) + (1 - \beta u) \int_{\varepsilon^{u*}|\omega_1}^{\bar{\varepsilon}} \mathrm{d}f(\varepsilon) \right] \mathrm{d}g(\omega) > 0. \tag{16}$$

Recall that ε and ω_1 are distributed uniform with means 0 and $\tau > 0$, respectively. $E(c_1^u - c_1^s)$ then simplifies to

$$E(c_1^u - c_1^s) = \frac{(1 - \beta u)[\bar{\varepsilon} - \tau - \alpha + \beta S_1 u] - u(1 - u)}{(1 - \beta)2\bar{\varepsilon}}. \tag{17}$$

Let S_0 be the share of firms that enter period 0 seasoned in home currency issuance, per our assumptions. S_1 satisfies

$$S_1 = S_0 + (1 - S_0)\theta_0^u. \tag{18}$$

$E(c_1^u - c_1^s)$ is then linear in θ_0^u

$$E(c_1^u - c_1^s) = \frac{(1-\beta u)[\bar{\varepsilon} - \tau - \alpha + \beta u S_0] - u(1-u) + (1-\beta u)(1-S_0)\theta_0^u}{(1-\beta)2\bar{\varepsilon}}. \tag{19}$$

We next turn to the period 0 issuance decision. In period 0, firms face similar cost schedules, subject to the period 0 realization of the aggregate shock, ω_0. However, they must additionally consider the value of entering period 1 seasoned in home currency issuance. We again consider the issuance decisions of seasoned and unseasoned firms separately. We also assume that investors discount earnings at the world interest rate of 0 for simplicity.

Let $v_0^{u,h}$ represent the value in period 0 to an unseasoned firm that issues in the home currency. $v_0^{u,h}$ satisfies

$$v_0^{u,h} = 2Y - (1 + u + \omega_0 + \alpha - \beta V_0) - E(c_1^s). \tag{20}$$

Similarly, let $v_0^{s,h}$ represent the period 0 value of a seasoned firm with realization ε that issues in the home currency. $v_0^{s,h}$ satisfies

$$v_0^{s,h} = 2Y - (1 + \omega_0 + \alpha - \beta V_0) - E(c_1^s). \tag{21}$$

Let $v_0^{u,f}|\varepsilon_i$ represent the value to an unseasoned firm i that issues in the foreign currency—and therefore remains unseasoned in home currency. $v_0^{u,f}|\varepsilon_i$ satisfies

$$v_0^{u,f}|\varepsilon_i = 2Y - (1 + \varepsilon_i) - E(c_1^u). \tag{22}$$

Finally, let $v_0^{s,f}|\varepsilon_i$ represent the value to a seasoned firm i that issues in the foreign currency. That firm remains seasoned in home currency issuance. Its value function satisfies

$$v_0^{s,f}|\varepsilon_i = 2Y - (1 + \varepsilon_i) - E(c_1^s). \tag{23}$$

Define $\varepsilon^{u*}|\omega_0$ as the value of ε conditional on the realization of ω_0 that leaves an unseasoned firm

indifferent between issuing in domestic and foreign currency. By (20) and (22), $\varepsilon^{u*}|\omega_0$ satisfies

$$\varepsilon^{u*}|\omega_0 = (u + \omega_0 + \alpha - \beta\, V_0) - E(c_1^u - c_1^s). \tag{24}$$

Similarly, define $\varepsilon^{s*}|\omega_0$ as the value of ε conditional on the realization of ω_0 that leaves a seasoned firm indifferent between issuing in domestic and foreign currency. By (21) and (23), $\varepsilon^{s*}|\omega_0$ satisfies

$$\varepsilon^{s*}|\omega_0 = (\omega_0 + \alpha - \beta\, V_0). \tag{25}$$

The share of unseasoned firms that issue in home currency in period 0 then satisfies

$$\theta_0^u = \frac{\bar{\varepsilon} - (u + \omega_0 + \alpha - \beta\, V_0) + E(c_1^u - c_1^s)}{2\bar{\varepsilon}}, \tag{26}$$

while the share of seasoned firms that issue in home currency in period 0 satisfies

$$\theta_0^s = \frac{\bar{\varepsilon} - (\omega_0 + \alpha - \beta\, V_0)}{2\bar{\varepsilon}}. \tag{27}$$

Total period 0 issuance in home currency satisfies

$$V_0 = 2\,\bar{\varepsilon}(S_0\theta_0^s + (1 - S_0)\theta_0^u). \tag{28}$$

Equations (19), (26), (27), and (28) then give us a system of four equation in four unknowns: $E(c_1^u - c_1^s)$, θ_0^u, θ_0^s, and V_0. Solving for V_0 yields

$$\begin{aligned} V_0 = \frac{1}{(1-\beta)[(1-\beta S_0)2\bar{\varepsilon} - (1-S_0)\beta]}\, &[S_0[\bar{\varepsilon} - (\omega_0 + \alpha)](1-\beta)2\bar{\varepsilon} \\ &+(1-S_0)\{(1-\beta)[\bar{\varepsilon} - (u + \omega_0 + \alpha)] + (1-\beta u)(\bar{\varepsilon} - \tau - \alpha + \beta u S_0) - u(1-u)\}] \end{aligned} \tag{29}$$

where the denominator must be positive for stability. This solution leads to the following proposition.

Proposition 1 *A one-period negative shock to ω_0 raises period 0 and expected period 1 issuance*

in the home currency.

Differentiating (32) with respect to ω_0 yields

$$\frac{\partial V_0}{\partial \omega_0} = -\frac{S_0 2\bar{\varepsilon} + (1 - S_0)}{(1 - \beta S_0)2\bar{\varepsilon} - (1 - S_0)\beta} < 0. \tag{30}$$

A negative shock to ω_0 therefore raises V_0, the volume of period 0 issuance in domestic currency. Moreover, by (19), (26), and (27), this increase in V_0 raises the share of both seasoned and unseasoned firms that choose to issue in the home currency in period 1 given any realization of ω_1. Thus, a temporary shock to the relative cost of issuing in home currency has a persistent effect on the share of firms choosing to issue in home currency in subsequent periods. Due to the strategic complementarities, this effect goes beyond a simple one-time increase in the share of seasoned firms.

4.2 Impact of the global financial crisis

We relate ω_t to countries' macroeconomic and monetary policies, considering them exogenous to firm issuance decisions, as in our model. Extending our model to a multi-country global economy, countries with better policies, and hence lower ω_t on average, will be more likely to be influenced by a temporary decline in ω_t conditional on global economic circumstances. The implication is that, given a temporary decline in the relative cost of home currency issuance, well-suited countries will experience a greater increase in the share of firms issuing in domestic currency than countries with worse policies. We now test this hypothesis empirically.

The model shows that a temporary decline in the relative cost of home currency issuance could lead to a larger increase in the ratio of debt denominated in home currency for well-suited countries. During the financial crisis in 2008, the relative cost of issuing in one's own currency likely declined, as markets experienced a dollar shortage initially, and later, the stability of the euro came into question.[18] Moreover, zero or near-zero policy rates in the U.S., U.K., and the euro area resulted in yield-chasing by institutional investors and therefore increased demand for assets in alternative currencies. As a result, we might expect that the crisis offered firms in well-suited countries a

[18] Du and Schreger (2013) show that local currency spreads on emerging markets' sovereign bonds declined relative to foreign currency spreads during the crisis.

greater increase in the ability to issue foreign debt in their own currency.

As illustrated in Figure 5, some countries experienced a substantial increase in the share of home currency issuance after the crisis, while others did not. We attempt to understand what factors determined whether or not a given country experienced an increase in the share of debt denominated in their home currency. In order to do so, we estimate the probability of an increase in the average share of home currency issuance between 2002-2006 and 2009-2013 among non-GC5 countries, using a cross-country probit model. In all regressions we control for the degree to which GDP growth declined during the crisis period, 2007-2009. The results are reported in Table 5.

Individually, we find that rule of law does not influence the outcome, but a closely correlated sovereign risk measure (S&P sovereign credit rating, with higher risk numbers assigned to worse ratings) does: the higher the sovereign risk, the less likely a country increased the ratio of home currency denominated debt after the crisis. Higher exchange rate volatility is also associated with a higher probability of home currency bond issuance share increase after the crisis, which makes sense from the issuer's point of view—the higher the volatility of the exchange rate, the higher the issuer's incentive and willingness to pay in for matching currency composition of its balance sheet. Consistent with our model, we find that countries that had a history of home currency issuance were more likely to increase their share after the crisis. As in our previous regressions, we also find that the joint effect of high debt-to-GDP ratios and high inflation history negatively affect the probability of an increase in home currency issuance.

We also report the results with all of these variables included in the same specification, with rule of law and sovereign risk included separately as these variables are highly correlated. All of the effects—except for sovereign risk—remain in the full specifications. In none of the regressions do we find a significant effect of inflation targeting, suggesting that having low inflation mattered to international capital markets, but the adoption of formal monetary regimes did not.

The above results are robust to changes in specification and are not driven by any specific countries.[19]

[19]We re-estimated these regressions excluding China, Sweden, and Singapore from our sample and our results were not affected.

5 Conclusion

In this paper, we demonstrate a reduction in the incidence of original sin in a large sample of individual foreign bond issuances, and point to macroeconomic characteristics that are particularly important in allowing countries' firms to overcome it and begin issuing foreign bonds denominated in their home currencies. We find that a combination of recent high inflation history and high government debt is the most significant deterrent to increases in home currency foreign bond issuance. These macroeconomic characteristics are consistent with the reason highlighted in the literature for the existence of the original sin phenomenon, namely the ability of the countries to effectively default on home currency debt through higher inflation. Both OECD and developing countries that were able to reduce their government debt and avoid having high inflation episodes in 10 years, were more likely to increase home currency foreign bond issuance during our sample period.

We also hypothesize that the global financial crisis of 2008-2009 offered well-suited countries a "baptism" of sorts, setting the stage for a new equilibrium state in the global economy in which a broader set of countries are able to issue debt internationally in their own currency. We provide a model that formalizes this story as well as empirical analysis that confirms the model's main predictions. We find that those countries that were able to take advantage of the temporary disruption and near-zero interest rates in global financial markets were the ones with a combination of low government debt and a history of stable inflation.

We also find that throughout our sample adopting formal inflation targeting regimes helped developing countries increase their home currency foreign bond issuance, although the adoption of inflation targeting itself did not matter for the discrete changes observed following the global financial crisis for developed economies. For these countries, it appears that having a history of de facto stable inflation was more important in the eyes of international investors than the de jure means through which low inflation was achieved.

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Figure 1: Ratio of bonds issued in top 5 global currencies: CHF, EUR, GBP, JPY, and USD.

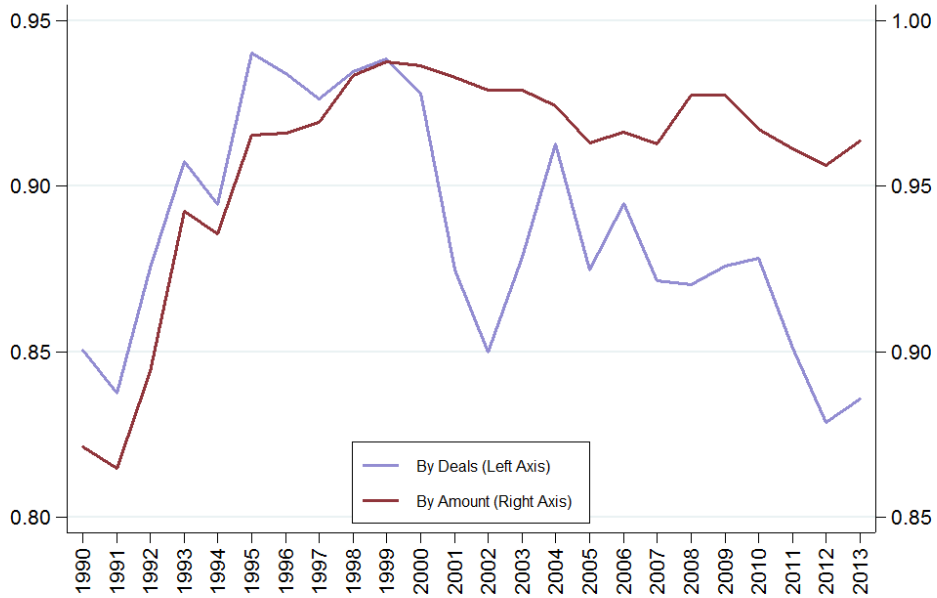


Figure 2: Herfindahl currency concentration of the international bond market.

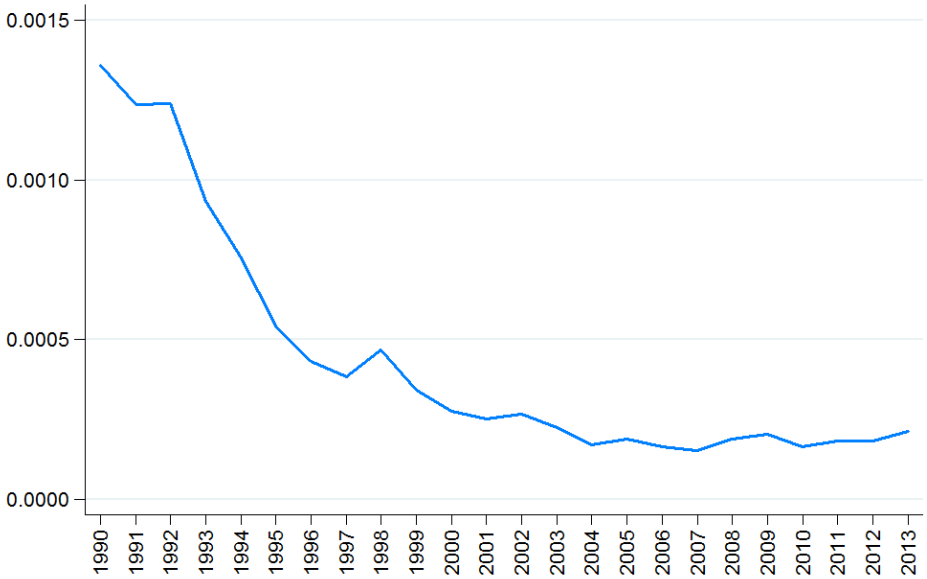
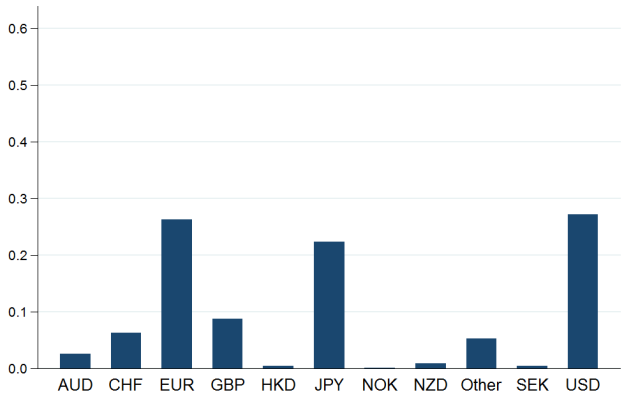
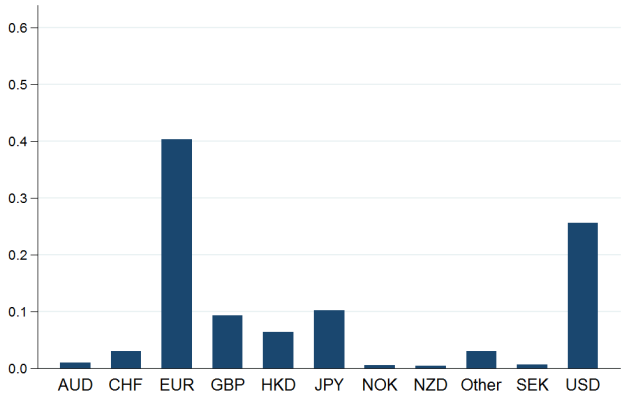


Figure 3: Currency choices of international borrowers as a ratio of the total number of deals.

1990-1998



1999-2007



2010-2013

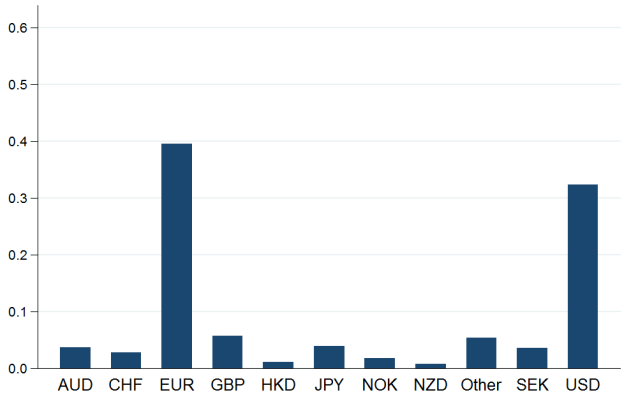


Figure 4: Ratio of bonds issued in home currency by country group.

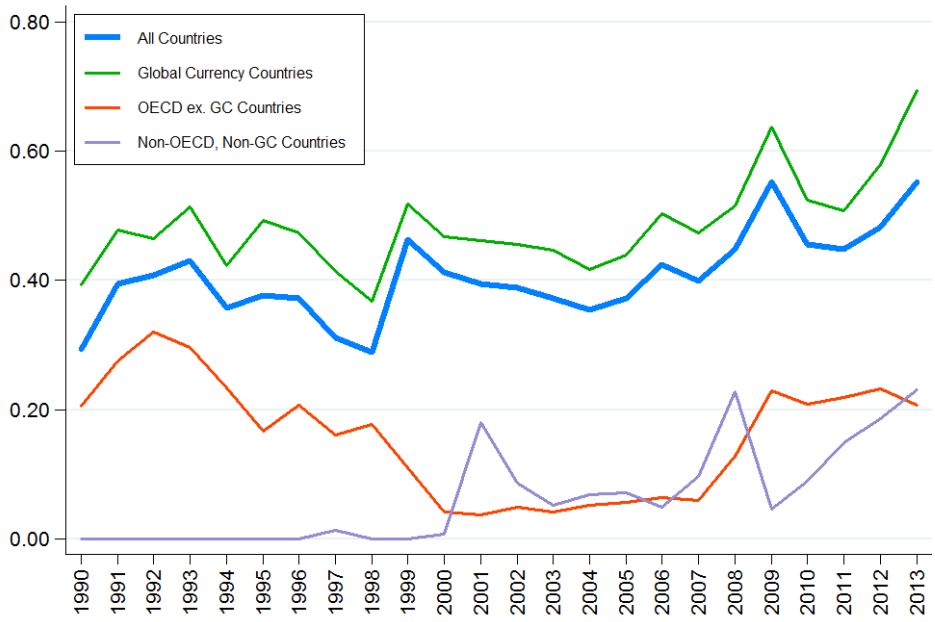


Figure 5: Change in the ratio of bonds issued in home currency between 2002-2006 and 2009-2013.

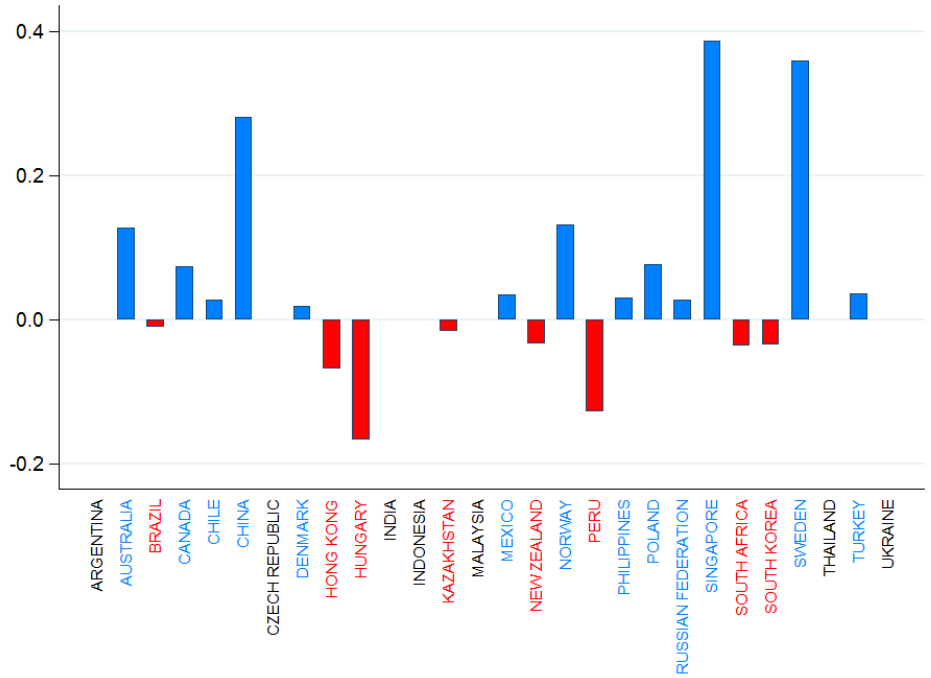


Table 1: Trend Regressions: Share of Home Currency Issuance (OLS Estimation).

	All Countries	Global Cur. Countries	Non-Global Cur., OECD Countries	Non-Global Cur. Non-OECD Countries
Year	-0.00213	0.00121	-0.00215	0.00465
	(0.00524)	(0.00587)	(0.00499)	(0.00380)
1999 Forward	0.0569	0.00659	-0.152***	0.0235
	(0.0478)	(0.0574)	(0.0474)	(0.0458)
2007 Forward	0.0949*	0.0888*	0.143**	0.0473
	(0.0478)	(0.0500)	(0.0548)	(0.0399)
Constant	4.598	-1.968	4.514	-9.262
	(10.45)	(11.71)	(9.961)	(7.577)
N	24	24	24	24
Adj. R^2	0.468	0.392	0.657	0.575

Robust SEs in parentheses.

Table 2: Baseline Regressions: Probability of Home Currency Issuance (Probit Estimation).

	All Countries	Global Cur. Countries	Non-Global Cur., OECD Countries	Non-Global Cur. Non-OECD Countries
Log Real GDP	0.182***	0.0435	0.00287	0.106
	(0.0275)	(0.0303)	(0.0437)	(0.0859)
Deal Amount	0.402***	0.433***	-0.375*	-2.209***
	(0.0571)	(0.0661)	(0.196)	(0.544)
Rule of Law	-0.245***	-1.509***	0.306	0.274***
	(0.0780)	(0.137)	(0.271)	(0.0837)
Constant	-1.367***	1.728***	-1.064*	-6.067***
	(0.264)	(0.347)	(0.585)	(0.566)
N	110246	86223	18916	4772
Pseudo R^2	0.0547	0.0839	0.0700	0.126

All regressions include year fixed effects. Robust SEs clustered on country-year.

Table 3: Within Regressions: Probability of Home Currency Issuance (Probit Estimation).

	All Countries	Global Cur. Countries	Non-Global Cur., OECD Countries	Non-Global Cur. Non-OECD Countries
Deal Amount	0.437***	0.457***	-0.270	-1.954***
	(0.0494)	(0.0583)	(0.220)	(0.482)
Seasoned Dom. Cur. Issuer	0.0135	-0.145**	0.457***	0.675***
	(0.0559)	(0.0614)	(0.0712)	(0.0919)
Inflation Targeter Rose 2007	0.323**	-0.988***	-0.335	4.305***
	(0.136)	(0.266)	(0.211)	(0.495)
Inflation Above 10% Last 10 Years	-0.498***	-0.751***	-0.636***	0.471*
	(0.123)	(0.127)	(0.133)	(0.241)
Gross Govt. Debt / GDP	-0.000133	0.000162	-0.00629	0.00288
	(0.00190)	(0.00206)	(0.00454)	(0.00996)
Constant	-0.0514	1.126***	0.109	-10.08***
	(0.227)	(0.306)	(0.335)	(0.796)
N	109811	86223	18889	4378
Pseudo R^2	0.188	0.154	0.140	0.234

Regressions include country and year FEs. Robust SEs clustered on country-year.

Table 4: Within Regressions: Probability of Home Currency Issuance (Probit Estimation).

	All Countries	Global Cur. Countries	Non-Global Cur., OECD Countries	Non-Global Cur. Non-OECD Countries
Deal Amount	0.437***	0.457***	-0.275	-1.933***
	(0.0493)	(0.0583)	(0.222)	(0.488)
Seasoned Dom. Cur. Issuer	0.0116	-0.145**	0.468***	0.686***
	(0.0558)	(0.0614)	(0.0717)	(0.0932)
Inflation Targeter Rose 2007	0.402***	-1.018***	-0.158	4.139***
	(0.126)	(0.242)	(0.208)	(0.429)
Inflation Above 10% Last 10 Years	0.736*	-0.929	0.386	1.660***
	(0.423)	(0.604)	(0.287)	(0.542)
Gross Govt. Debt / GDP	0.000225	0.000170	-0.00187	0.0198
	(0.00188)	(0.00206)	(0.00403)	(0.0128)
Debt / GDP * High Inflation	-0.0221***	0.00306	-0.0183***	-0.0361***
	(0.00679)	(0.00988)	(0.00500)	(0.0125)
Constant	-0.217	1.161***	-0.283	-10.96***
	(0.213)	(0.284)	(0.328)	(0.869)
N	109811	86223	18889	4378
Pseudo R^2	0.191	0.154	0.146	0.238

Regressions include country and year FEs. Robust SEs clustered on country-year.

Table 5: Country XS Regressions. Probability of increase in the ratio of home currency issuance (Probit Estimation).

Real GDP Crisis Shock	0.112	0.0988	-0.0994	-0.0259	0.0270	0.0903	-0.0831	-0.348	-2.065***	-1.792**
	(0.385)	(0.382)	(0.356)	(0.347)	(0.350)	(0.371)	(0.397)	(0.497)	(0.734)	(0.808)
Rule of Law		0.402								-0.509
	(0.253)								(0.481)	
S&P Risk		-0.132**								-0.00506
		(0.0644)								(0.108)
Exchange Rate Coef. of Var.			23.18*						83.61***	67.90**
			(12.51)						(31.68)	(31.94)
Inflation Targeter Rose 2007			0.249					-1.128	-0.829	
				(0.511)					(0.845)	(0.911)
Dom. Cur. Issues 2002-2006					0.0258*				0.0382**	0.0277**
					(0.0140)				(0.0169)	(0.0131)
Negative Year since Infl.> 10%						-0.0243		0.0691	0.282***	0.291***
						(0.0274)		(0.0604)	(0.0874)	(0.106)
Gross Govt. Debt / GDP							-0.00238	-0.0363*	-0.135***	-0.120***
							(0.0128)	(0.0203)	(0.0427)	(0.0464)
Debt / GDP * Neg. High Infl. Years								-0.00234*	-0.00741***	-0.00683***
								(0.00123)	(0.00199)	(0.00219)
Constant	-0.396	0.724	-0.756	-0.222	-0.335	-0.505	0.0903	1.311	4.710**	4.591*
	(0.536)	(0.576)	(0.599)	(0.580)	(0.487)	(0.673)	(0.822)	(1.289)	(2.001)	(2.595)
N	28	28	28	28	28	28	28	28	28	28
Pseudo R^2	0.0678	0.125	0.0902	0.00686	0.0830	0.0210	0.00143	0.105	0.469	0.449

A Appendix

Table A.1: Countries in the sample by country group.

GC5	Non-GC5 OECD	Non-GC5 Non-OECD
Austria*	Australia	Argentina
Belgium*	Austria*	Brazil
Finland*	Belgium*	Chile
France*	Canada	China
Germany	Denmark	Colombia
Greece*	Finland*	Czech Republic
Ireland*	France*	Hong Kong
Italy*	Greece*	Hungary
Japan	Iceland*	India
Luxembourg*	Ireland*	Indonesia
Netherlands*	Italy*	Kazakhstan
Portugal*	Luxembourg*	Malaysia
Spain*	Netherlands*	Mexico
Switzerland	New Zealand	Peru
United Kingdom	Norway	Philippines
United States	Portugal*	Poland
	Spain*	Romania
	Sweden	Russian Federation
	Turkey	Singapore
		South Africa
		South Korea
		Taiwan
		Thailand
		Ukraine
		Venezuela

*EMU countries move into GC5 during the sample.

Table A.2: Issues and amount by year and country group.

	Number of Issues				Amount (Real USD Bil[1])			
	Total	GC5	Non-GC5 OECD	Non-GC5 Non-OECD	Total	GC5	Non-GC5 OECD	Non-GC5 Non-OECD
1990	943	443	495	5	$69	$47	$22	$0
1991	1,071	638	424	9	100	68	31	0
1992	1,050	671	365	14	108	74	33	1
1993	1,351	857	476	18	147	96	50	1
1994	1,626	1,091	513	22	139	98	39	2
1995	2,213	1,441	730	42	179	116	59	4
1996	2,793	1,831	834	128	272	185	74	13
1997	3,099	1,919	1,036	144	329	218	93	18
1998	2,602	1,588	940	74	372	258	103	12
1999	3,693	3,214	410	69	607	547	51	10
2000	4,555	3,968	462	125	614	559	41	14
2001	4,874	4,048	649	177	737	656	57	24
2002	4,609	3,827	667	115	589	530	43	16
2003	5,530	4,525	814	191	817	723	67	27
2004	7,370	6,101	1,051	218	981	851	94	35
2005	6,783	5,585	931	267	1,028	892	100	36
2006	7,812	6,438	1,003	371	1,481	1,308	126	47
2007	8,331	6,794	1,187	350	1,509	1,315	142	52
2008	6,811	5,585	1,042	184	1,289	1,137	131	21
2009	6,302	5,067	1,040	195	1,413	1,222	155	36
2010	7,682	6,187	1,103	392	1,161	962	136	62
2011	6,804	5,528	807	469	1,102	919	126	58
2012	6,621	4,867	1,045	709	1,203	965	146	93
2013	5,721	4,010	892	819	1,198	971	129	98
Total	110,246	86,223	18,916	5,107	$17,446	$14,718	$2,047	$681

[1]1982-1984 = 100.

Table A.3: Summary Statistics by Country Group.

	N	Mean	Std. Dev.	Min.	Max
Total (49 Countries)					
Home Currency Issue	110246	0.421	0.494	0.000	1.000
Deal Amount (Bil. USD)	110246	0.158	0.368	0.000	21.033
Seasoned Dom. Cur. Issuer	110246	0.735	0.441	0.000	1.000
Inflation Targeter Rose 2007	899	0.614	0.487	0.000	1.000
Inflation Above 10% Last 10 Years	899	0.347	0.476	0.000	1.000
Log Real GDP	899	6.092	1.344	2.306	9.725
Gross Govt. Debt / GDP	899	55.398	33.975	3.890	243.544
Rule of Law	899	0.972	0.910	-1.600	2.000
Global Currency Countries (16 Countries)					
Home Currency Issue	86223	0.499	0.500	0.000	1.000
Deal Amount (Bil. USD)	86223	0.171	0.401	0.000	21.033
Seasoned Dom. Cur. Issuer	86223	0.789	0.408	0.000	1.000
Inflation Targeter Rose 2007	283	0.954	0.210	0.000	1.000
Inflation Above 10% Last 10 Years	283	0.074	0.263	0.000	1.000
Log Real GDP	283	6.862	1.494	3.246	9.725
Gross Govt. Debt / GDP	283	72.836	40.361	6.070	243.544
Rule of Law	283	1.479	0.384	0.350	1.980
OECD ex. GC5 (19 Countries)					
Home Currency Issue	18916	0.150	0.357	0.000	1.000
Deal Amount (Bil. USD)	18916	0.108	0.203	0.000	3.873
Seasoned Dom. Cur. Issuer	18916	0.638	0.480	0.000	1.000
Inflation Targeter Rose 2007	256	0.488	0.501	0.000	1.000
Inflation Above 10% Last 10 Years	256	0.316	0.466	0.000	1.000
Log Real GDP	256	5.698	1.215	2.306	7.706
Gross Govt. Debt / GDP	256	56.627	28.602	7.096	137.755
Rule of Law	256	1.586	0.449	-0.060	2.000
Non-OECD (26 Countries)					
Home Currency Issue	5107	0.121	0.326	0.000	1.000
Deal Amount (Bil. USD)	5107	0.133	0.205	0.000	4.722
Seasoned Dom. Cur. Issuer	5107	0.194	0.395	0.000	1.000
Inflation Targeter Rose 2007	360	0.436	0.497	0.000	1.000
Inflation Above 10% Last 10 Years	360	0.583	0.494	0.000	1.000
Log Real GDP	360	5.766	1.017	3.429	9.098
Gross Govt. Debt / GDP	360	40.815	23.930	3.890	139.447
Rule of Law	360	0.138	0.801	-1.600	1.770