Original Sin Dissipation and Currency Exposures in Emerging Markets*

Bada Han†

May, 2021

Abstract

In this paper, I construct a dataset, which measures the external liability composition of emerging market economies in different instruments and currencies. Thus, the dataset shows, with reasonable precision, the original sin dissipation in emerging markets since the mid-2000s and accordingly currency exposures of the entities in emerging markets. The new data imply emerging markets have much lower currency exposures than in the past as their positions in foreign currency have improved at both the aggregate and the sectoral levels. The sources of external financing in emerging markets have shifted from foreign currency debts to FDIs, portfolio equity investments, and local currency debts, while the countries have accumulated foreign currency assets. Also, at the sectoral level, only nonfinancial corporate sectors in emerging markets have significant net foreign currency debts. On the other hand, another important empirical regularity is the high correlation between external liabilities of equities and local currency debts and the depth of capital markets—stock and bond markets. This suggests that the original sin dissipation is related to the capital market development in emerging market economies.

Keywords: Original Sin, Currency Exposures, Local Currency Debts
JEL Classification: E32, F36, F41, F62, G15

*I am extremely grateful to my advisor Joshua Aizenman, and my dissertation committee Caroline Betts, Romain Ranciere and Wenhao Li. I also thank Dr. Dalgic for providing his dataset. All errors are my own. The views expressed herein are those of the authors, and do not necessarily reflect the official views of Bank of Korea.

†International Department, Bank of Korea, badahan@bok.or.kr

1 Introduction

Until the mid-2010s, it had been widely believed that Emerging Market Economies (EMEs) cannot borrow abroad in their currency, local currency, as foreign investors are not willing to hold local currency-denominated assets.[1] The seminal paper by Eichengreen and Hausmann (1999) formalized the idea, the famous "Original Sin Hypothesis," saying most countries are not able to borrow abroad in their domestic currency. Accordingly, the reliance of EMEs on foreign currency borrowings has been pointed out as a source of the fragility of those economies, and potential risk from foreign currency debts has been extensively studied in the literature. However, a few recent articles such as Arslanalp and Tsuda (2014) and Du and Schreger (2016 a,b) documented that the ability of EMEs to borrow in their local currency has significantly improved: the original sin has been "dissipated." This paper contributes to the literature by illustrating the original sin dissipation in EMEs since the mid-2000s. In this paper, by deploying different sources, I construct a dataset, which shows the currency composition of external assets and liabilities in EMEs at both the aggregate and the sectoral levels. While I discuss much detail in the data, I focus on the two aspects: 1) the amounts of local currency external liabilities in EMEs and accordingly 2) currency exposures in EMEs.

The information on the currency composition of external assets and liabilities is not readily available yet, and there is no single complete and credible dataset. However, central banks or statistical authorities in many EMEs begin including the currency composition information in their own International Investment Position (IIP) or external debt data. Those data are in public in different forms or close to the outside of the institutions. I hand-collected the different data from sixteen EMEs,[2] while understanding institutional details in different EMEs. The level of information varies among the EMEs, and I make a reasonable guess in cases that available information in the data is not sufficient enough. In addition, while going through the data of each country, I learned the local currency debts can be approximated in a certain way, if necessary. In most of the EMEs, the local currency debts excluding local currency FDI debts, are the sum of domestic debt securities purchased by foreign investors and "related" local currency deposits held by the foreign investors. In fact, most of the domestic debt securities held by foreign investors are local currency-denominated sovereign bonds, and most short-term deposits held by foreign investors are local currency-denominated deposits in many countries.[3] Then using the sovereign debt dataset by Arslanalp and Tsuda (2014) and different national sources, I construct the local currency debts of four more EMEs.[4] By combining this information with IIP data from IMF, I can identify the currency composition of different categories in IIP data at both the aggregate and the sectoral levels.

[1] Throughout this paper, I use nonresidents and foreign investors interchangeably. Of course, the two definitions differ in a certain context; for example, off-shore foreign currency debts. However, the dataset in this paper follows the traditions concept in the International Investment Positions. I corrected the amounts of foreign currency debts based on the nationality criteria, if necessary.

[2] Barzil, Chile, Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Philippine, Poland, Russia, South Africa, Thailand and Turkey

[3] More precisely, the local currency deposits of foreign investors are related to the portfolio investments in local currency denominated security markets. I will discuss in detail later.

[4] Argentina, Columbia, Peru, and Romania

The currency composition of external liabilities and assets is still not sufficient to capture currency exposures at the sectoral level. As it has been discussed in the dollarization literature, entities in emerging markets lend and borrow in foreign currency among themselves. Using the dollarization data constructed by Dalgic, I can approximate both foreign currency lending and borrowing among different sectors in EMEs, and therefore I can reasonably estimate net foreign currency debts, i.e., currency exposures of the different sectors — central bank, government, household, financial corporate sector, and nonfinancial corporate sector — in each of the EMEs.

The first major finding from the data is the decline of currency exposures in EMEs. The decline of the currency exposures is clear at the aggregate level in the sample EMEs: almost all the EMEs in the sample have improved their aggregate foreign currency positions, measured by the ratio of net foreign currency debt to GDP.[5] In 2001, the average net foreign currency debt to GDP ratio across the twenty countries was around 7%, but the same ratio is around -22% in 2019: the negative net foreign currency debts and hence the positive net foreign currency assets. In short, the EMEs were net short in foreign currency in 2001, but now the countries are net long in foreign currency. The improvement becomes much more clear and stronger once I include portfolio equity assets in the foreign currency assets as the portfolio equity assets of the EMEs are mostly denominated in foreign currency. The improvement is attributable to both the decline of foreign currency debts and the accumulation of foreign currency assets, but more to the foreign currency asset accumulation. The increase in the foreign currency assets was mainly driven by international reserve accumulation by central banks in the 2000s, but, in the 2010s, it is attributable more to foreign currency asset accumulation by private sectors in the EMEs.

The improvement in the foreign currency position is also observable at the sectoral level. For the sample period of 2010-2018, I identify the net foreign currency debts of the five different sectors I listed above; households, government, central bank, financial corporate sector, and nonfinancial corporate sector. The first observation from the data is the public sectors in the EMEs, as the agglomeration of government and central bank, has large net long positions in foreign currency. Central banks have accumulated tremendous amounts of international reserves, while many governments have rapidly decreased foreign currency bond issuance as discussed in the local currency sovereign debt literature. The most noteworthy result is the "balanced" foreign currency positions in the financial sectors in most of the EMEs. The financial intermediaries have significant amounts of foreign currency debts, but those financial intermediaries also hold corresponding amounts of foreign currency assets, foreign currency loans to domestic companies, or foreign currency bonds issued in international markets. In contrast, nonfinancial corporate sectors in the EMEs have sizable net foreign currency debts. As of 2018, the average of net foreign currency debts of the nonfinancial corporate sector to GDP across the EMEs is around 15% and the ratio is above 30% of GDP in some EMEs such as Bulgaria or Turkey. This is in line with recent papers such as Chui et al. (2016). However, unlike the preceding papers, I

[5]Throughout this paper, foreign currency denotes a hard currency, which is used in international transactions, such as US dollar, Euro, Japanese Yen or Swiss Franc. It is well known that almost all foreign currency debts in EMEs are denominated in US dollar, except for Eastern European countries where much of the foreign currency debts are denominated in Euro. Most of the portfolio investments or loans in foreign currency in EMES are also mostly hard currency denominated as documented in Bénétrix et al. (2020).

abstain from concluding that nonfinancial corporations in EMEs have serious currency exposures. First, nonfinancial corporate sectors in EMEs have low leverage ratios as documented in Beltran et al. (2017). In many EMEs, the average nonfinancial corporate debt to equity ratio is less than 1 and thus the net foreign currency debt to the capital ratios as of 2018 suggest modest currency exposures of the nonfinancial corporate sectors in many of the EMEs. The average net foreign currency debt to the capital ratio is around 0.25, which is far lower than the levels at the dawn of the East Asian Crisis in 1997. Second, many nonfinancial corporations in the EMEs are obviously exporters and local currency depreciation boosts the profitability of the exporters because the revenues from exports, computed in local currency, will increase if the exporting goods are foreign currency-denominated, as suggested in the Dominant Currency Pricing (DCP) hypothesis.

Another important goal in this paper is to trace out the original sin dissipation of the EMEs so that we can have a hint on the underlying reasons for the important changes. I document and discuss detailed patterns of the original sin dissipation in different EMEs: when an EME began borrowing abroad in their local currency equity and debt and how the local currency borrowings have evolved in the EMEs. The most important finding regarding the original sin dissipation is the relationship between the capital market developments in the EMEs and the original sin dissipation. I find that the external borrowings of local currency equities and bonds are strongly correlated with domestic capital market developments. The correlation between the foreign nonresident investors' local currency equity holdings to GDP ratio and the stock market capitalization to GDP ratio is 0.82, and the correlation between the nonresident portfolio investors' local currency bond holdings to GDP ratio and the public bond market capitalization to GDP ratio is 0.61. Such high correlations are clear in both cross-country comparison and time series data of the individual country. Furthermore, none of the other variables of economic fundamentals, such as measures of institutional quality, GDP per capita, or financial openness index, show such high correlations with external borrowings of local currency equities and bonds.

A complete explanation of the correlations is beyond the scope of this paper, but one compelling explanation is as follows. The original sin has been dissipated over the last two decades, but the hypothesis is still valid in that almost all EMEs cannot issue local currency loans or bonds in international markets even these days. The most of external borrowings of local currency equity and debt are the foreign portfolio flows into the local currency-denominated stock and bond markets in EMEs. Then a straightforward explanation is that investors from advanced economies were willing to hold equities and bonds in EMEs since the early-2000s, but there were just not enough stocks and bonds to be sold to the investors. As the capital markets in EMEs, the stock and bond markets, have grown, more equities and bonds have become available for the investors to purchase.

Related Literature First and foremost, this paper belongs to a strand of literature that studied currency exposures in EMEs. After the sudden stops in the 1990s, Mexico peso crisis in 1994 and the East Asian crisis in 1997, several papers such as Eichengreen et al (2003), Goldstein and Turner (2004), and Eichengreen and Hausmann (2005) tried to identify the currency mismatches

in EMEs and discussed the potential risk from foreign currency external debts in the EMEs. The seminal works by Lane and Milesi-Ferretti (2001, 2007a) constructed the national balance sheet data and traced out the evolution of the structures of external assets and liabilities of different countries in the world. Based on the progress in Lane and Milesi-Ferretti (2001, 2007a), Lane and Shambaugh (2010) constructed a database of international currency exposures for a large panel of countries, and documented that EMEs had reduced their currency exposures from the 1990s to the mid-2000s. Bénétrix et al. (2015) and Bénétrix et al. (2020) extended and enhanced the dataset in Lane and Shambaugh (2010). Those papers also documented the decline of currency exposures in EMEs. In a similar fashion, Bénétrix et al. (2015) and Hale and Juvenal (2020) estimated the valuation effects of exchange rate movements, local currency depreciation against US dollar or Euro, in EMEs, during the Global Financial Crisis and the early stage of COVID-19 crisis respectively. Similar to the preceding papers, they concluded that the valuation effects were not devastating to EMEs, at least on the aggregate level. The dataset constructed in this paper complements the dataset developed in the papers mentioned. While the recent dataset in Bénétrix et al. (2020) covers a longer period for a larger set of countries, this paper provides more detailed and possibly more accurate information for a shorter period of a smaller number of countries. Unlike the Bénétrix et al. (2020) that used synthetic data, the dataset in this paper is mostly based on the actual data from central banks, treasuries, or statistical authorities in the EMEs. More importantly, the dataset in this paper provides an estimate of currency exposures at the sectoral level, in particular the exposures of the financial and nonfinancial corporate sectors, which are absent in the Bénétrix et al. (2020). On the other hand, this paper echoes the findings from the preceding papers. EMEs have reduced their currency exposures and the level of risk from foreign currency debts is incomparably lower than what it was in the 1990s or the early 2000s.

Another strand of literature studied potential risk from foreign currency debts, missed in the aggregate level data. A few papers after the Global Financial Crisis focused on the possibility that the conventional residence classification misses important aspects of currency exposures in EMEs. Several papers by the authors at BIS (McCauely et al., 2015; Chui et al., 2016) pointed out that corporations in EMEs began borrowing through their funding vehicles established in foreign countries, which they called "off-shore" borrowing, and this is missed in the conventional residency-based statistics. Some articles in the literature studied potential risk from domestic borrowing and lending in foreign currency, the prevalent phenomenon in some EMEs that the literature named as "dollarization." The influential early paper Levy-Yeyati (2006) analyzed destabilizing effects of dollarization in EMEs and a more recent paper by Bocola and Lorenzoni (2020) built a stylized small open economy model where dollarization of domestic deposits, due to insurance motivation, amplifies the negative impacts of local currency depreciation on the economy. Several recent papers, Dalgic (2020), Christiano et al. (2020), and Montamat (2020), suggest an opposite view. Those papers view the dollarization as a result of risk-hedging of entities in EMEs, and provided suggestive evidence along with a theoretical model consistent with the evidence. This paper accommodates all the empirical findings into the dataset in this paper. I construct different measures of currency exposures with dollarization of domestic

borrowing and the off-shore borrowing. I found no evidence that the consideration of those foreign currency borrowing can alter the trend in EMEs for the last two decades: the currency exposures have decreased although we consider the dollarization or off-shore borrowings. The off-shore foreign currency debts raise the currency exposures of certain EMEs, for example, Brazil or Russia, but the decline of the currency exposures are even stronger in those countries.

This paper is also related to a growing literature about local currency-denominated sovereign debts in EMEs. Unlike the Original Sin hypothesis, many EMEs have been able to issue local currency sovereign bonds and sell the bonds to foreign investors since the early-2000s, and the literature has explored what are the empirical characteristics of local currency sovereign bonds and what derives these features. Usually, the papers in the literature assumed the limited commitment of the EME governments and studied how the incentive problem derives empirical facts observed in the data. Noteworthy papers are Du and Schreger (2016a,b), Du et al. (2016), Engel and Park (2018), Ottonello and Perez (2018), and Alfaro and Kanczuk (2018). In these papers, governments in EMEs are incentivized to inflate away the local currency debts to reduce ex-ante payments to foreign investors, but costs of inflating away debts such as the existence of currency mismatches in domestic corporate sectors or exogenous costs of inflation work as a discipline device. This paper contributes to the literature by providing up-to-date information on the local currency debts along with related institutional details. Further, unlike preceding papers that looked at only external debts of EMEs, this paper tries to understand the states in "whole balance sheets of EMEs" including equity external liabilities and external assets. Besides the overall picture of IIPs of the EMEs, another important and interesting empirical finding uncovered in this paper is that the size of the domestic capital market seems to determine how much an EME can borrow abroad in equities or LC debts: EMEs with larger stock markets can sell more equities to foreign investors, and similarly larger bond markets make it possible for an EME to sell more local currency bonds to foreign investors.

Layout The rest of the paper is organized as follows. Section 2 illustrates how I constructed the dataset using different sources. Section 3 describes the evolution of external assets and liabilities of EMEs since the early 2000s. In particular, I introduce different measures of currency exposures and show how the exposures have been reduced. Section 4 describes how EMEs have increasingly borrowed abroad in equity and local currency debt, hence the original sin dissipation. I found several patterns observed in the data. Section 5 concludes.

2 Data

In this section, I illustrate how I constructed the dataset. First, I list the sources I used for different countries and explain how I combined the different data. Then I describe the construction of the aggregate level data and the sectoral level data.

2.1 Sources and Strategy

To construct the dataset, I choose twenty major EMEs including almost all sizable developing economies.[6] My strategy is to correct the International Investment Position (IIP) data from International Monetary Fund (IMF), using other sources that I hand-collected. The IIP dataset from IMF provides much information about external assets and liabilities at the country and the sectoral levels. What is missing in the rich dataset is the currency composition information. To fill in the gap, I used the data from the central banks or government agencies in the EMEs and the sovereign debt data from Arslanalp and Tsuda (2014). Below, I explain the steps in detail.

The IIP dataset from IMF shows the composition of external assets and liabilities of each of the countries in the dataset. It classifies the assets and liabilities into FDI, portfolio equity and debts, derivatives, and other instruments, which are mostly composed of loans and deposits. Furthermore, the IIP data show the assets and liabilities of different instruments for each of the five different sectors; central bank, general government, deposit-taking financial corporations, other financial corporations and others, which are mostly nonfinancial corporations. What is missing in the IIP dataset is the currency denomination, and thus I make the following simplification.

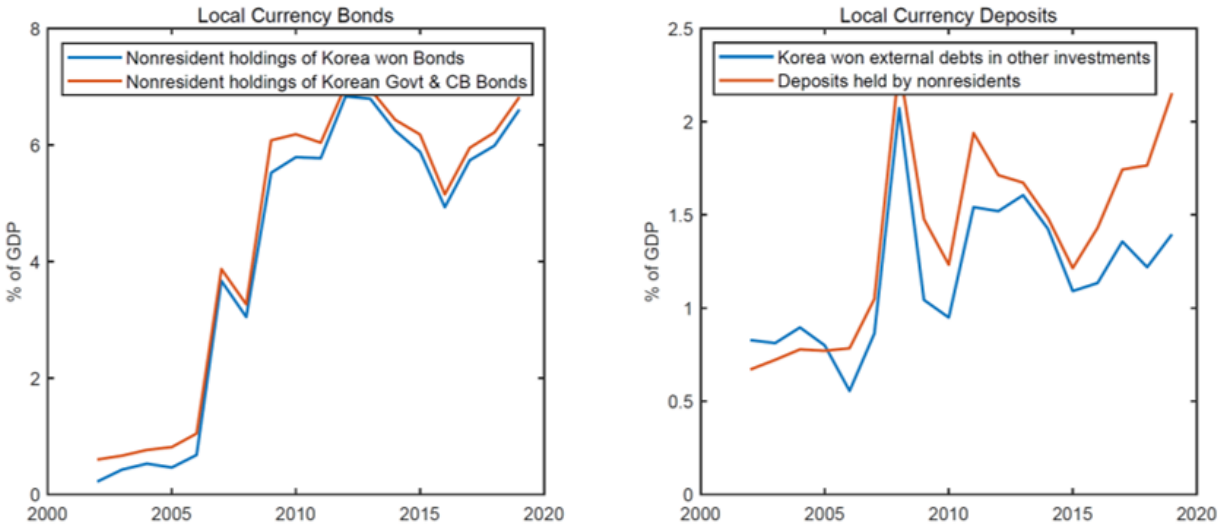
Throughout this paper, I classify all assets and liabilities into two different currencies, local (domestic) currency and foreign currency. In principle, external assets and liabilities can be denominated in any foreign currency, but, in reality, US dollar-denominated instruments take account of more than 70% of the external assets and liabilities and other international key currencies such Euro, Japanese yen or Swiss franc take account of most of the remaining. Furthermore, a few recent articles document the fall of Euro as a key currency and the share of US dollar in cross-border financial transactions has risen since the Global Financial Crisis.[7] In practice, in countries I can identify more detailed currency denomination information, e.g., Korea and few East European countries, US dollar takes account of most of the foreign currency-denominated external assets and liabilities. The exception is the East European countries, but the share of US dollar is still higher than 50% even in those countries. In addition, local currencies depreciate (appreciate) against all the key currencies US dollar, Euro, or Japanese yen — during almost all negative (positive) domestic or global events. That is, more detailed identification of the foreign currency denomination shall be of course useful, but not critical for the assessment of valuation effects due to exchange rate movements.

In addition, I assume all the external assets, regardless of whether it is equity, bond, or loan, are denominated in foreign currency. Because the local currencies of the EMEs in the sample are not international currencies, it is just hard for residents in the EMEs to find their own local currency assets in international markets. In fact, domestic local currency-denominated assets account for less than 2% of the total external assets in Korea, where I can identify Korean won-denominated external assets. In the Korean data, throughout the sample period 2001-2019, more than 80% of the total external assets of portfolio equity are denominated in US dollar, Euro, Japanese yen, and Swiss franc. The share of the four key currencies is higher than 95% for the

[6] Argentina, Brazil, Bulgaria, Chile, Colombia, Czech Republic, Hungary, India, Indonesia, Korea, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, South Africa, Thailand and Turkey

[7] See Bénétrix et al. (2020) and Maggiori et al. (2020)

Figure 1: Local External Debts in Korea



debt claims of Korea, excluding Bank of Korea international reserve, on nonresidents.

Then I only need to identify local currency equities and debts and compute the amounts of foreign currency equities (in the liability side) and debts by extracting the local equities and debts from the IIP data. For the local currency equities and debts, I use the data from central banks, treasuries, and statistical authorities in the EMEs, and the sovereign debt data from Arslanalp and Tsuda (2014). Quarterly External Debt Statistics (QEDS) from World Bank provides the currency composition of external debts of many EMEs. However, the dataset provides currency compositions for only the aggregate external debts, and I need to disentangle FDI debts from the aggregate; FDI debts are mostly intercompany lending (or transactions) and therefore it is often meaningless to separately identify local currency debts and foreign currency debts. Furthermore, the imprecision or inconsistency across the countries in the dataset seems to be nonnegligible. Therefore, I try to use data from the central banks or government agencies in the EMEs as long as it is available.

2.2 Aggregate Level Data

The dataset in this paper is constructed based on the IIP data. Thus, it is ideal to have a country-level data in which the classification is consistent with the IIP data. Central banks of Korea and Russia (Bank of Korea and Bank of Russia) provide their data almost consistent with IIP. Those data are in public. The central bank of Poland (National Bank of Poland) provided me with their data which is not in public, but almost consistent with the IIP data. The currency composition section in the IIP data naturally provides sufficiently rich information for the debt claims and liabilities, but the complementary section is filled in only for Hungary, except for Russia and Poland.

Other central banks or statistical authorities in EMEs provide relevant information in different formats. Central banks of some EMEs such as Indonesia or South Africa publish periodicals

where the amounts of total local currency external debts, along with some classification of the local currency debts, are documented. Central banks in other EMEs such as Chile or Turkey provide the data of domestically issued debt securities held by nonresidents. For the remaining EMEs in the sample, available information is different among the EMEs. I summarize the information available in the appendix. To exploit the information to construct the dataset within the classification of the IIP, I used the following stylized facts about the local currency-denominated external liabilities.

1. Most of the equity liabilities in the category of portfolio investment in the IIP are domestically issued equities, which are almost all local currency-denominated.

2. Most of the local currency debts, except for FDI debts, are domestically issued local currency-denominated debt securities (bonds) in the category of portfolio investment in the IIP.

3. Most of the local currency-denominated bonds held by nonresidents are the central government bonds, and central bank bonds in Asian EMEs, Korea, Malaysia, and Thailand.

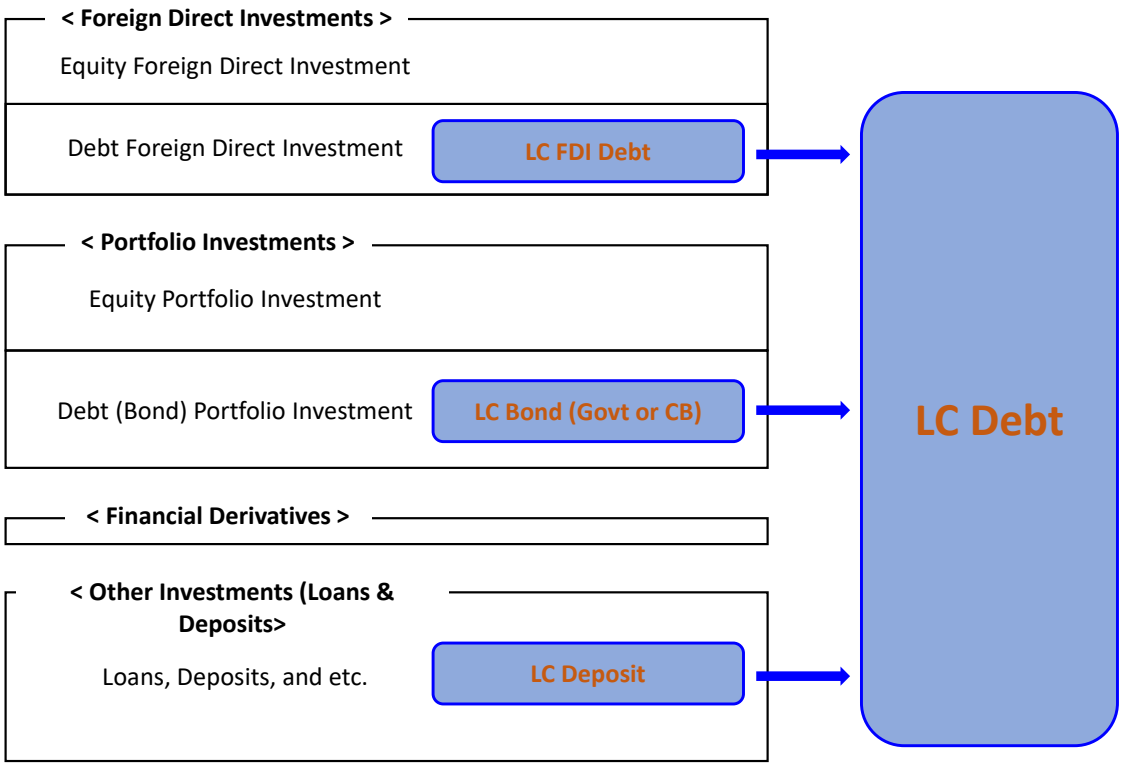
4. Most of the local currency external debts, except for local currency bonds and FDI debts, are the local currency deposits possessed by nonresidents.

Hence, the local currency debts are classified into FDI debt, portfolio investment debt securities or other debt instruments in other investments in the classification of the IIP. The debt securities in the category of portfolio investment are the bonds issued by central governments or central banks. The local currency debts in the category of other investments in the IIP are mostly local currency deposits. This is evident in figure 1 where I plot the data of Korea.

To understand the facts, note that most of the local currency external debts in EMEs, except for FDI debts whose context is much different from other local currency debts, are local currency bonds issued by governments or central banks. That is, foreign investors, who are likely to be residents in advanced economies, are willing to purchase local currency equities and bonds. The local currency bond purchase of the foreign investors in the bond markets in EMEs are centered on the sovereign bonds or central bank bonds whose risk and characteristics are similar to sovereign bonds. On the other hand, corporations and governments in EMEs are still not able to borrow abroad in local currency debt; they cannot raise local currency loans or issue local currency bonds in international (foreign) markets. In this sense, the precise description of the original sin dissipation is the participation of international investors in local currency capital markets in EMEs. The local currency equities and bonds are not exclusively issued to foreign investors, but the foreign investors participate in the capital markets in EMEs to purchase local currency equities and bonds.

Local currency deposits held by foreign investors are related to the local currency equity and bond portfolio investments. Foreign investors in the capital markets in EMEs may want to dispose of their local currency assets and quit the market. Notice that the foreign investors in EMEs are exposed to exchange rate risk as their assets are denominated in local currency, not their home currency, key currencies like US dollar. Thus, the foreign investors who just

Figure 2: International Investment Position and Local Currency Debt



sold their local currency assets may not want to convert their local currency cashes to foreign currency right away, depending on the conditions in foreign exchange markets in the EME. Then the foreign investors may deposit their local currency cashes in EMEs until they will convert it to foreign currency, if it is possible or not too much cumbersome.[8] In some EMEs, for example, India, where a substantial number of citizens work abroad, local currency deposits are held by the citizens as the citizens are classified as nonresidents.

Figure 2 shows how the local currency debts can be allocated according to the classification in the IIP. Using the identity, we can separate FDI local currency debts from the total local currency debts. Some central banks announce the total amounts of local currency debts along with domestic debt securities and deposits held by nonresidents. Hence, I can reasonably approximate the total local currency external debts, except for FDI debts, by adding the local currency bonds and deposits. As a result, I can classify the local currency debts according to the categories in the IIP, if the total amounts of local currency debts are known. If the total local currency debt information is not available, then I can, with reasonable precision, estimate the amounts of local currency debts excluding FDI debts. Moreover, this simple identification strategy is particularly useful for some EMEs where central banks or other authorities do not publish relevant statistics.

[8]The local currency deposits are observed and grow with the portfolio investments in most of the EMEs. However, relative volume of the local currency deposits in the Latin American EMEs, considering the foreign local currency equity and bond portfolio investments, is low compared with the Asian EMEs or East European EMEs. This may be because the statistics in the Latin American countries omit the local currency deposits of foreign investors. Or some institutional features in the area make it difficult for foreign investors to hold the deposits.

Sovereign debt dataset in Arslanalp and Tsuda (2014)[9] show the amounts of local currency bonds held by foreign investors for a number of EMEs. Moreover, QEDS shows the amounts of nonresident deposits. As a result, I can approximate the amounts of local currency external debts, even for the EMEs with no national sources.

It is important to separate out FDI debts from the local currency debts as the FDI debts are mere inter-company "transactions." Regardless of the local currency denomination, there are no valuation effects from the debt, due to exchange rate movements.[10] The increase in FDI debts after the Global Financial Crisis may reflect the behaviors of global corporations to avoid taxes or manage risk following the direct investments in EMEs. But, it is unclear how it is related to the original sin dissipation as the debts are not actual debts from advanced economies to EMEs. Of course, I do not argue that FDIs are the "green lights." As discussed in Ostry et al. (2010), FDI direct investments can contribute to large outflows and destabilize EMEs.[11] But, it is reasonable to assume that the FDI flows are more stable than the capital flows of other forms and furthermore, there are no valuation effects in the FDI debts, inter-company lending. Henceforth, the local currency debts indicate the local currency debt excluding FDI local currency debts.

Discussion of nationality versus residence Some readers may question the validity of the approach in this paper, using the statistics based on the classification of residence. Several recent articles written by authors at BIS pointed out that the traditional classification of external assets and liabilities based on the residence of the entity may miss some important dimensions of currency exposures in EMEs. To briefly describe their arguments, they showed that, after the Global Financial Crisis, some multi-national companies in EMEs have raised foreign currency debts using their branches located in foreign countries, usually financial centres such as Luxembourg or Hongkong. The branches in the financial centres are often found to raise the foreign currency borrowings, and in this sense, Chui et al (2016) called the branches "funding vehicles." In practice, the foreign currency debts belong to the mother companies in the EMEs. However, those debts are missed in the statistics that classify external debts based on the residence of debt issuers. Several papers (McCauley et al., 2015; Chui et al., 2016; Kuruc et al. 2017) documented the risk of underestimating foreign currency debts in EMEs in residency-based statistics. The authors of the papers insist that the foreign currency debts based on "nationality" better capture true currency exposures in EMEs. The claims of the authors have been well accepted in

[9] The dataset is regularly updated by the authors. The version I used is updated on October 30th, 2020

[10] That could be different for reverse direct investments. For example, if a globally working Russian company issue foreign currency bonds using their funding vehicle unit in Europe and channels back the money to the mother company, then it will be included in the category debt FDI reverse investments. If Russian ruble depreciates against the foreign currency, the cost of serving the foreign currency debts will actually increase. This issue arises because the economic characteristic of the FDI debts are much closer to foreign currency debts in the category of portfolio debt securities in the classification of the IIP. However, such missed foreign currency debts might be captured in nationality based debt statistics by BIS. Below, I discuss it and show how to capture the missed foreign currency debts.

[11] A different interpretation of the events reported in the paper is that the FDI debt outflows are actually the outflows driven by a form of carry trades. As I will discuss later in this paper, branches of global banks are often actively engaged in carry trades and they borrow in foreign currency from their headquarters to engage in carry trades in emerging markets. Then, the FDI debt flows are closer to local currency bond portfolio investments in terms of economic characteristic.

the literature and BIS developed the dataset providing the foreign currency debts in both the residency-based statistics and the nationality-based statistics.

It it true that the nationality-based statistics show missed currency exposure in the residency-based statistics. In a similar idea, the measures of currency exposures in this paper discard the FDI debt claims and liabilities. The problem is that the dataset in this paper is constructed based on the IIP, which is residency-based. Since the dataset from BIS does not include asset sides, there is no way for me to convert the residency-based data into nationality-based data. Instead, I conduct a simple robustness check. As I stated, BIS debt securities dataset provides the amounts of the debts in the two different classifications; residency-based and nationality-based. By adding the difference between the two different statistics to my dataset based on the IIP, I can reflect possible increases or decreases of foreign currency debts. As a robustness check, I correct my residency-based data as follows, to modify it into nationality-based data.

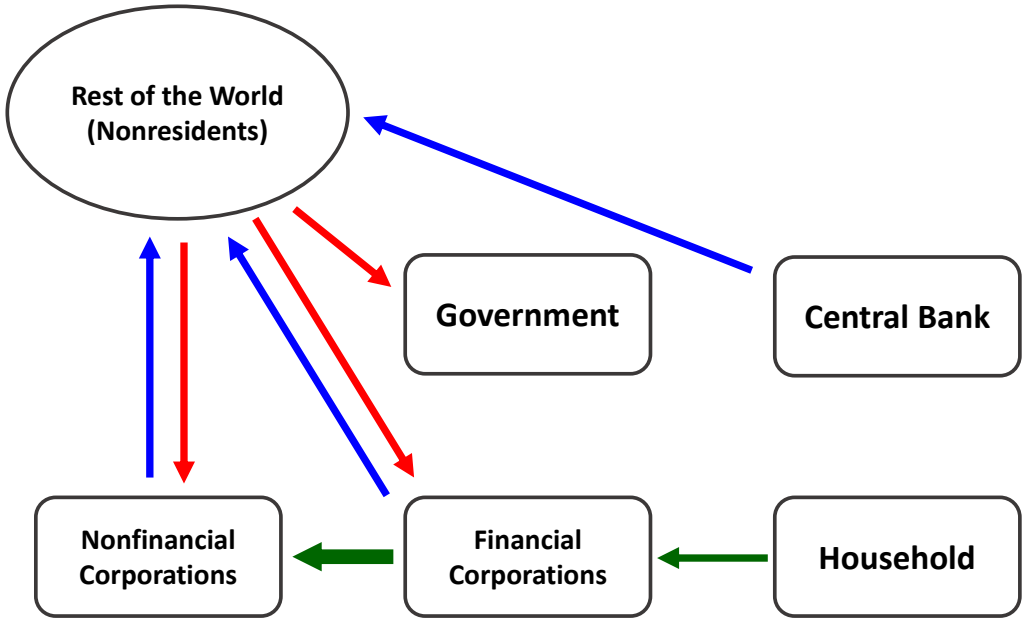
$$FC\ Debt^{N}_{i,t} = FC\ Debt^{R}_{i,t} + \left(BIS\ Debt\ Securities^{N}_{i,t} - BIS\ Debt\ Securities^{R}_{i,t}\right)$$

where "FC" is an abbreviation of foreign currency, and N and R denote the nationality-based and the residency-based respectively. BIS debt securities data show the amounts of debt securities issued in international markets for different countries and sectors, and the different entities are classified according to nationality or residency.[12] Therefore, $FC\ Debt^{R}_{i,t}$ denotes the EME foreign currency debt data in this paper, based on the IIP data and national sources. By adding the difference between the two classifications in the BIS data, I can check how much foreign currency debt can increase once I revise mine to the nationality-based one. Again, I emphasize that this is not a precise way to resolve the discrepancy between the residency and nationality, but rather it is a simple robustness check.

The contribution from BIS of course helps us better capture the nationality-based foreign currency debts in EMEs, but the data from BIS may overestimate the foreign currency debts. Once we reclassify the external debts of EMEs according to nationality rather than residency, we not only have to add up the off-shore borrowings to the external debts, but we also have to deduct the substantial borrowings by branches of foreign corporations in EMEs. What significantly matters is borrowings by branches of global banks in EMEs. The debts of the branches, mostly borrowed from international interbank markets, account for substantial parts of foreign currency debts in EMEs, if it is identifiable. The foreign currency debts of global bank branches account for 60% of total foreign currency debts in Korea in 2017, and 27% in Malaysia for the same year. It is almost impossible to trace out how the branches use the borrowings. However, usual behaviors in the branches in Korea are such that those branches convert their foreign currencies to local currencies in foreign exchange markets and then purchase some fixed-income securities: in fact, they are heavily engaged in carry trades. In other words, once we reclassify the borrowings by those branches according to nationality, some of the foreign currency borrowings are more

[12] One issue in this approach is that the two different datasets are not directly comparable to each other. IIP data and other national sources I used are all measured by market values. In contrast, BIS debt securities data are based on the book value, although the data reflect the debt redemption. This difference should create some errors, which might be non-negligible, but not sizable to alter the reported trends in this paper.

Figure 3: Foreign Currency Borrowing and Lending



similar to typical LC debts: portfolio investments in local currency-denominated bonds.[13]

2.3 Sectoral Level Data

Although the aggregate foreign currency positions are in good shape, if some important sectors in the economy, such as banking sectors, have substantial currency exposures, the aggregate positions do not provide precise information about potential risks from currency mismatch. Therefore, it should be useful to examine currency exposures of the different sectors in the EMEs.

To measure currency exposures of the different sectors, I need data on foreign currency lending and borrowing among different sectors in each EME since the data above only includes the transactions between domestic parties and foreign parties (nonresidents). While the precise information between foreign currency transaction among different entities in EMEs is unavailable, the literature on "dollarization"[14] has traced how much of domestic deposits and loans in EMEs are denominated in foreign currencies. Combining the collected data in the literature with mine, I can draw a "blueprint" of currency mismatches of different sectors in EMEs.

Let's think of an economy composed of the household sector, financial corporate sector, nonfinancial corporate sector, and government. It is easy to breakdown the aggregate foreign currency assets and liabilities into the four different sectors. Then, the missed foreign currency assets and liabilities (debts) of the four sectors in the aggregate level data are the foreign currency deposits of households and nonfinancial corporations in the domestic financial corporate sector and the lending from the financial corporations to the households and nonfinancial corporations. This is depicted in figure 3 above. The financial assets and liabilities with nonresidents (solid line

[13]For the analysis of the foreign bank branches in Korea, see Shin and Shin (2012).
[14]See Levy-Yeyati (2006), Dalgic (2020), Bocola and Lorenzoni (2020), and Christiano et al. (2020)

in the figure) are captured in the IIP data and national sources, but domestic foreign currency borrowings and lending among the different sectors (green line) are not captured.

The dataset in Christiano et al. (2020) filled in the missing parts. Dr. Dalgic, one of the authors in the paper, thankfully provided his data, and the data includes foreign currency-denominated domestic deposits and domestic loans in EMEs. Furthermore, the data separately shows foreign currency loans from domestic financial corporations to households and nonfinancial corporations for some EMEs. What is missing in the data is who the depositors are; the depositors can be either households or nonfinancial corporations, but I cannot see the share of each group in the foreign currency deposits. However, in the dollarization literature, it has been assumed that most foreign currency deposits belong to households since households are incentivized to hold foreign currency deposits to insure themselves from sudden local currency depreciation.[15] Hence, I simply assume that all the foreign currency deposits belong to households. Certainly, it must underestimate the foreign currency assets of nonfinancial corporations in EMEs, net foreign currency debts of the nonfinancial corporations. However, the goal here is to have a rough blueprint, not to have precise information about the sectoral currency exposures in EMEs.

With the dollarization data, under the simplification, I can construct a dataset in which all the foreign currency debt flows in figure 3 are identified.

3 Currency Exposures in EMEs

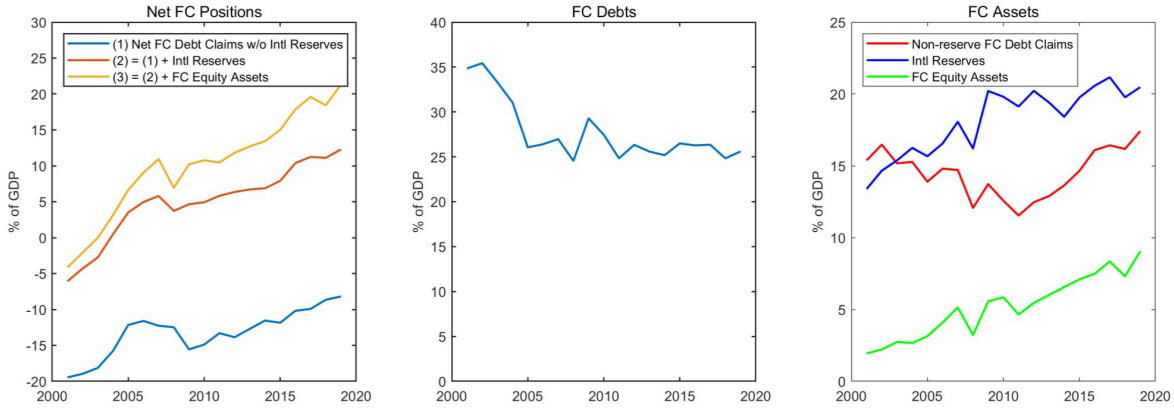
This section describes an important observed pattern in the constructed dataset; the decline of currency exposures in EMEs. First, I introduce the findings at the aggregate level. The aggregate level data clearly shows that EMEs have reduced their currency exposures, which corresponds to a few preceding papers since Lane and Shambaugh (2010). Then, I introduce measured sectoral level currency exposures. It turns out that only nonfinancial corporate sectors in the EMEs, among the five different sectors, have significant amounts of net foreign currency debts although the results of course vary along with countries. This also corresponds to a several articles in the 2010s, which casted concerns about the rising foreign currency debts of corporations in EMEs. Although precise assessments of the risk of the nonfinancial corporate foreign currency debts are beyond the scope of this paper, I view the nonfinancal corporate foreign currency debts from a different angle: states of the EMEs where only nonfinancial corporate sectors have short positions in foreign currency indicate that foreign currency positions in EMEs have improved even at the sectoral level.

3.1 Aggregate Level Currency Exposures

Figure 4 shows the evolution of the average net foreign currency assets in the twenty EMEs, along with foreign currency debts and assets. The left panel in the figure shows the evolution of net foreign currency assets of different definitions. I used the three different definitions of foreign currency assets, so the different definitions of net foreign currency assets. The line at the bottom shows the net foreign currency debt claims, excluding international reserves by central banks.

[15] See Christiano et al. (2020)

Figure 4: Changes in Net Foreign Currency Positions



Note: 1) Simple average of the 20 EMEs

Then I added international reserves by central banks, and equity portfolio investments, which I assumed it is foreign currency-denominated. These are the lines in the middle and at the top. Regardless of how I define the foreign currency asset, it is clear that currency exposures in EMEs have declined.[16]

For illustrative purpose, I first describe the pattern before the Global Financial Crisis and then explain the observed patterns after the crisis. After illustrating the average of the twenty EMEs, I will briefly describe the different evolution across the EMEs.

From 2001 to 2007, the beginning of the Global Financial Crisis, significant improvement in the net foreign currency positions are clear and the improvements are mostly due to the decreases in foreign currency debts and the international reserve accumulation by central banks. The decreases in the foreign currency debts are attributed to improvements in current accounts of the countries and also to large FDI and equity portfolio capital inflows during the periods, as documented in Lane and Milesi-Ferretti (2007a); the inflows of FDI and equity portfolio investments substituted for foreign currency debt inflows. The international reserve accumulation during the periods accounts for most of the increases in foreign currency assets. While the literature has not formed a consensus about whether (or how much) the international reserve accumulation leads to a higher net foreign asset position,[17] a few recent influential studies (e.g.,

[16] As many EMEs have become net long in foreign currency, in some sense, the EMEs face the foreign currency depreciation risk. In this paper, currency exposures are the exposures to local currency depreciation as it is often assumed in discussions of EMEs.

[17] Several early studies of international reserve accumulation in the early 2000s (e.g., Rodrik, 2006; and Alfaro and Kanczuk, 2009) doubt casts on role of reserve accumulation against sudden stops. Other studies following the papers (Aizenman and Lee, 2007; and Jeanne and RanciÃšre, 2011) suggested theoretical models where international reserve accumulation does a role of preventing sudden stops. After the Global Financial Crisis, there have been different empirical studies of the effects of international reserve accumulation on the financial and economic stability of EMEs during the crisis. While different studies reported different results, a few influential studies such as Bussiére et al. (2015) showed that the countries with more reserves before the crisis weather the crisis better than other countries. Papers in different strands of the literature have built quantitative models to understand the role of international reserves against sudden stops or sovereign default crises (e.g., Bianchi et al., 2018; Shousha, 2019; Arce et al. 2020; and Samano, 2020). The literature oveall agrees that the reserve accumulation is an effective tool against sudden stops or sovereign default crisis, but different papers are still seeking exact mechanisms o how the reserve accumulation has an effect or has been chosed over other policy tools,

Gabaix and Maggiori, 2015; Fanelli and Straub, 2020) suggest that reserve accumulation, i.e., foreign exchange market intervention, improves the net foreign asset position.

The net foreign currency assets of the EMEs have kept increasing after the Global Financial Crisis, but the pace has been slower than before the crisis. A noteworthy difference from the pre-Global Financial Crisis is that the improvement is mostly attributed to the foreign currency asset accumulation by private sectors. The levels of foreign currency debts and international reserves of the EMEs have been stable since 2011, but the foreign currency debt claims and portfolio equity assets, mostly held by private sectors in EMEs, have notably risen.[18] This is important in the sense that 1) the increase of the foreign currency asset accumulation of private sectors in EMEs have not received much attention and therefore it has not been extensively studied, and 2) the capacity of private entities to protect themselves against the exchange rate risk should be more desirable than reliance on the international reserves of central banks. It is well-known that central banks are often hesitant to deplete their international reserves during sudden stops, possibly due to concerns about the moral hazard or heightened uncertainty.[19] Having private corporations and individuals hedge their own exchange rate risk is an important improvement regardless of the improvement in the aggregate positions.

Figure 4 and the discussions above are all about the average of the twenty different EMEs. Of course, there is a great heterogeneity along with countries and regions. Table 1 shows the different evolution in the EMEs. Table 1 confirms that the patterns observed in the average are not driven by a small number of countries. Most of the countries were "net short" in foreign currency in 2001, but now are "net long" in foreign currency. The improvement in the net foreign currency positions is sizable, except for Romania and Turkey. The net foreign currency debt of Romania was less than 5% of GDP even in 2001. Turkey seems to be the only EME in the sample, which corresponds to the old stereotype of EMEs, large amounts of net foreign currency debts over 30% of GDP. Note that, in the table, I did not include portfolio equity assets, which have significantly increased since the early 2010s and are mostly foreign currency-denominated liquid assets.[20] Once I include the equities in the foreign currency assets, the improvements in the foreign currency positions are even more dramatic. Only Turkey remains as a net borrower in foreign currency and twelve EMEs are net long in foreign currency, even without central bank international reserves if I count the foreign currency equity assets. The portfolio equity assets in 2019 are particularly sizable in Chile, Korea, and South Africa.

In table 1, I also included the modified foreign currency debts, the nationality-based foreign currency debt, computed by the way that I described above. The difference between the residency-based and the nationality-based was negligible in 2001, but the difference between the two different classifications is not negligible any more in some EMEs in 2019. Foreign currency debts in Brazil, Malaysia, Russia, and South Africa in 2019 considerably increase when computed in the nationality-based classification. The increments are 5 - 10% of GDP. However, even

e.g., capital controls.

[18]The foreign currency debt claims and portfolio equity assets include the assets of sovereign wealth funds and public pension funds, who shall be included in the public sectors rather than private sectors. However, exclusion of the state-owned financial institutions hardly convert the trends.

[19]See Aizenman and Sun (2012) and Shousha (2019)

[20]In contrast, most of the portfolio equity liabilities are mostly local currency-denominated.

Table 1: Foreign Currency Positions of EMEs

	FC Debt Claims[2)]		FC Debt Liab.[3)]		Net FC Position[4)]	
	2001	2019	2001	2019	2001	2019
Argentina	36.8 (5.0)	70.5 (10.1)	35.7 <34.6>	43.4 <43.0>	1.1 (-3.9)	27.1 (17.1)
Brazil	9.8 (6.4)	23.6 (19.4)	37.6 <38.3>	17.5 <25.9>	-27.7 (-34.1)	6.0 (-13.4)
Bulgaria	63.8 (25.2)	77.7 (41.1)	71.5 <71.5>	40.5 <40.5>	-7.7 (-32.9)	37.2 (-3.9)
Chile	38.4 (20.3)	38.1 (14.4)	46.2 <42.9>	44.4 <42.7>	-7.8 (-28.1)	-6.2 (-20.6)
Columbia	27.6 (10.2)	37.5 (16.3)	39.9 <40.1>	37.1 <38.0>	-12.3 (-22.5)	0.4 (-15.9)
Czech Rep.	57.7 (21.3)	85.5 (59.8)	17.4 <16.3>	30.8 <30.4>	40.4 (19.0)	54.7 (-5.1)
Hungary	37.9 (20.1)	45.9 (19.8)	38.1 <37.9>	36.0 <36.3>	-0.2 (-20.3)	10.0 (-9.8)
India	14.2 (11.2)	18.0 (16.1)	17.8 <18.4>	12.0 <13.7>	-3.6 (-14.8)	6.0 (-10.1)
Indonesia	24.8 (16.1)	24.8 (11.5)	77.5 <81.4>	24.4 <25.5>	-52.7 (-68.8)	0.4 (-11.1)
Korea	28.3 (18.8)	53.5 (24.8)	19.3 <19.7>	18.3 <18.7>	9.0 (-9.7)	35.2 (10.4)
Malaysia	49.7 (29.5)	56.9 (28.4)	47.5 <48.6>	35.3 <40.2>	2.2 (-27.3)	21.6 (-6.8)
Mexico	14.1 (5.9)	26.8 (14.5)	20.8 <21.6>	29.3 <29.1>	-6.7 (-12.6)	-2.5 (-17.0)
Peru	23.1 (17.3)	35.8 (29.6)	53.5 <53.3>	27.4 <24.3>	-30.4 (-47.7)	8.4 (-21.2)
Philippines	35.5 (19.9)	36.0 (23.3)	67.6 <69.3>	21.9 <22.7>	-32.0 (-51.9)	14.1 (-9.3)
Poland	25.3 (13.9)	32.4 (21.7)	22.5 <25.4>	28.0 <28.3>	2.7 (-11.2)	4.5 (-17.2)
Romania	26.4 (12.0)	)28.5 (16.8)	29.8 <29.1>	29.3 <30.4>	-3.3 (-15.4)	-0.8 (-17.6)
Russia	67.0 (11.1)	58.2 (32.6)	38.9 <39.4>	13.9 <18.7>	28.1 (16.9)	44.3 (11.8)
South Africa	15.0 (6.1)	29.7 (15.7)	18.9 <21.8>	28.2 <39.2>	-3.9 (-10.1)	1.6 (-14.1)
Thailand	42.8 (27.5)	65.7 (41.3)	49.5 <50.3>	20.8 <22.5>	-6.7 (-34.2)	44.9 (3.6)
Turkey	23.2 (9.9)	26.3 (13.9)	51.7 <52.6>	50.4 <49.6>	-28.4 (-38.3)	-24.1 (-38.0)

Note: 1) All the numbers are are % of GDP. 2) Numbers in parentheses are central bank official reserves to GDP ratios.) Numbers in < > are the nationality-based foreign currency debt liabilities using BIS data. 4) Numbers in parenthesis are private sectors net position (excluding official reserves).

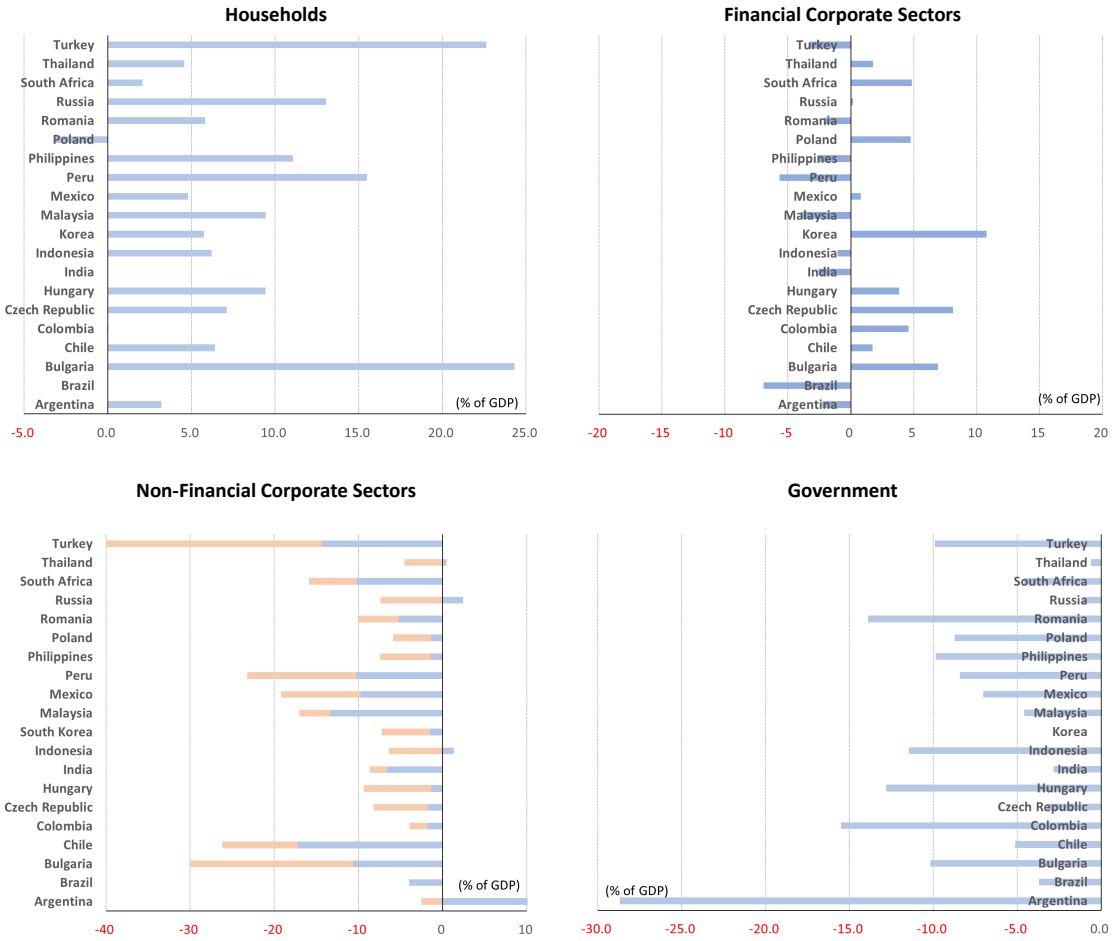
after adding the foreign currency debts, we can still see the improvement in the four EMEs. In Brazil, Malaysia, and Russia, the increased net foreign currency assets in the residence-based classification are around 20% of GDP, which are far larger than the increments. In South Africa, the foreign currency asset accumulation of the country over the last decade has been done mostly through the portfolio equities, and once I calculate the foreign currency assets of South Africa, including the portfolio equities, the improvement in the foreign currency position is clear.

3.2 Sectoral Level Currency Exposures

The constructed foreign currency exposures of the five sectors in EMEs clearly show who is short or long in foreign currency in EMEs. As shown in figure 5, households and central banks in EMEs have positive net foreign currency assets (net long in foreign currency). Financial corporate sectors have balanced foreign currency assets and debts (square position in foreign currency), but nonfinancial corporate sectors have sizable net foreign currency debts (net short in foreign currency). Governments in some of the sample EMEs have nonnegligible foreign currency debts, but it is still much lower than the historical averages. The most important feature uncovered from the sector level data is that the currency mismatches in EMEs, measured in the levels of net foreign currency debts, are centered on nonfinancial corporations.

As expected, households and central banks are net long in foreign currency as the households and the central banks hold foreign currency deposits and international reserves respectively.

Figure 5: Sector Level Currency Mismatches



Note: 1) All data is as of the 2018. 2) Net foreign currency debts: foreign currency debt instrument assets minus foreign currency debts, and hence negative numbers are positive net debts. 3) In the figure of Non-Financial Corporate Sectors, the orange bars indicate domestic foreign currency loans and the blue bars indicate net foreign currency debts from financial contracts with only non-residents. 4) The data of foreign currency deposits and loans are missing in my data, and therefore I let the foreign currency deposits and loans in Brazil be zero.

Governments in the EMEs have net foreign currency debts varying from nearly zero to around 15% of GDP,[21] except for Argentina whose foreign currency government external debt to GDP ratio jumped in 2018 due to large Argentine peso depreciation following the sovereign debt crisis. While the foreign currency debts will be burdensome for the governments when the local currencies depreciate, but the level of the foreign currency debts are much lower than in the 1990s or the early 2000s when the governments could not sell local currency government bonds to foreign investors.[22] Accurate assessment of the underlying risk of foreign currency debts of the EMEs is beyond the scope of this paper, but it is evident that the governments now face lower exchange rate risk than in the 1990s or the early 2000s.

Below, I focus on the discussion of financial and nonfinancial corporate sectors.

[21] Positive net foreign currency positions of general governments in Chile and Korea are mainly due to government-owned financial institutions, in particular sovereign wealth funds.

[22] For the currency composition of government debts in EMEs and relevant information such as the debt holders, see Arslanalp and Tsuda (2014). Other relevant papers are Du and Schreger (2016) and Ottonello and Perez (2019)

Financial Corporate Sectors The net foreign currency debts of the financial corporate sectors in the figure 1, measured as the ratios of GDP, look relatively small. The financial corporate sectors borrow in foreign currency from both foreign parties and domestic households, but they also lend in foreign currency and invest in foreign currency assets. As a result, the foreign currency assets of the financial corporate sectors, even without equity assets, are sizable enough to protect them from the exchange rate risk. In other words, the risk from foreign currency debts is hedged by their own foreign currency debt claims.

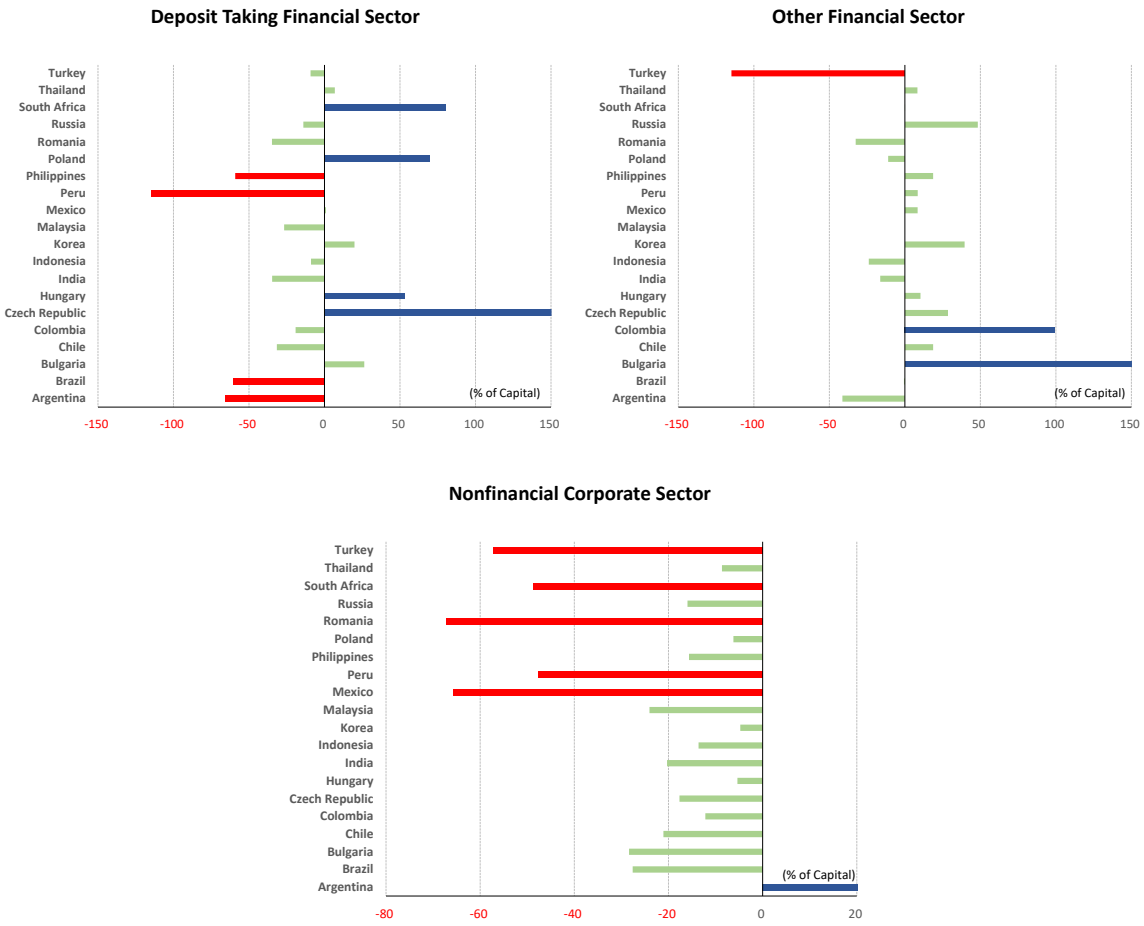
However, the GDP ratio might not be an ideal measure of the currency exposure of the financial corporate sectors. While I can take different measures, I take the net foreign currency debt to the capital (equity) ratios. How much the exchange rate risk matters for a financial institution would be determined by the factors, 1) share of the net foreign currency debt in the total asset and 2) the leverage (total asset to the capital ratio). The net foreign currency debt to the capital ratios summarize the two factors. Also, I divide the financial corporate sectors into two different groups; deposit-taking financial corporations (banks) and other financial corporations including insurance companies, mutual funds and pension funds.

Figure 6 shows the net foreign currency debt to capital ratios for the two groups of financial corporations in EMEs in 2018.[23] The compute the net foreign currency debt to the capital ratios show a little different picture from figure 5. Although the net foreign currency debt to the GDP ratios are low, the net foreign currency debt to the capital ratios significantly vary along with countries because the sizes of the banking sectors and other financial sectors are very much different among the EMEs.

The net short foreign currency position to the capital ratios are above 30% for some EMEs; Argentina, Brazil, Chile, India, Peru, Philippines, and Romania, and above 50% for a smaller set of EMEs; Argentina, Brazil, Peru and Philippines. In Peru, the short position to the capital ratio is higher than 100%. The sectoral level backs to only 2010 and thus it is hard to find its historical benchmark. However, this ratios are still lower than foreign currency debt to the capital (net worth) ratios used as target moments in many recent quantitative studies. The net foreign currency positions to the capital ratios are often over 100% in many quantitative studies, but only Peru in the sample EMEs has such high currency exposures in the banking sectors. Also, the ratios are note enough to generate the falls in bank capitals as large as typically observed in a banking crisis. Baron and Xiong (2017) studied the history of banking crises and defined a banking crisis as an event where the bank capitals fall by more than 30%. During a currency crisis, e.g., East Asian crisis, local currency depreciated by 70-80%. If the depreciation is 75%, we need net foreign currency debts to be more than 40% of the capital. The net foreign currency debt to the capital ratios are over 40% only in Argentina, Brazil, Peru nad Philippines.

[23] I used financial development dataset by World Bank. The dataset provides the bank capital to GDP ratios for the EMEs. One issue is that there might be discrepancy between the coverage of the deposit taking financial corporations in the IIP and the coverage of banks in the world bank data. However, errors due to the different definitions of the banks must be small in practice, considering the dominance deposit taking banks in financial system in most of countries in the world. The World Bank dataset also shows the total assets of insurance companies, mutual funds and pension funds. Two issues I have are I do not have any information of leverage ratios of the financial sectors and have no clue of how the different sectors are interconnected. For the convenience, I just summed the assets of the three financial sectors, and then I assumed that the leverage ratio is 5 as such non-banking financial corporations take lower leverage ratios as they take higher risk in their investments.

Figure 6: Net Foreign Currency Position to Capital Ratios



Another noteworthy observation is that other financial corporations, financial corporations other than deposit-taking banks, tend to have long positions (or larger long positions) compared with the deposit-taking financial corporations. If I add the portfolio equities to the foreign currency assets, the foreign currency net long positions of the financial corporations will be even larger. In Chile, Colombia, Peru, Philippines, and Russia, deposit-taking financial corporations are net short in foreign currency, but other financial corporations are net long in foreign currency. In those EMEs, local currency deprecation will cause opposite valuation effects to the two different groups of financial sectors. In EMEs like Chile, the net long positions of nonbanking financial corporations must help the Chilean economy when the banks are forced to deleverage due to loss from her own net short positions in foreign currency. Depending on the institutional details, insurance companies or mutual funds with stronger balance sheets may replace the sluggish intermediation by the banks or support the banks by providing more funds to the interbank markets. Another realistic scenario is that the banks may own the insurance companies or mutual funds. In such a case, the banks directly benefit from her subsidiaries so that the banks can cover the losses from the foreign currency debts.

Nonfinancial Corporate Sectors Similarly with the financial sectors, I computed the net foreign currency position to the capital ratios for the nonfinancial corporate sectors in the EMEs. I estimated the capitals of the nonfinancial corporate sectors, using the corporate debt database in Mbaye et al. (2018) and the average corporate leverages in Beltran et al. (2017).[24] Figure 6 shows the computed net foreign currency position to the capital ratios. Despite the sizable foreign currency debts of the nonfinancial corporations, the net foreign currency short positions are below 30% of the capital in most of the countries. This is due to the leverage ratios of nonfinancial corporations that tend to be low in most of the countries in the world. Then, as discussed in Christiano et al. (2020), the nonfinancial corporations better absorb negative valuation effects from the foreign currency debts and it is illustrated in the relatively low ratios in figure 6.

More importantly, much of the revenues of the nonfinancial corporations in the EMEs are in fact foreign currency-denominated. Many of the corporations are exporters and the current consensus about the export pricing in the literature is the "Dominant Currency Pricing (DCP)" hypothesis. According to the DCP hypothesis, most of the tradable goods are de facto denominated in the key currency, US dollar. Then, certain shares of the revenues of exporters in EMEs are foreign currency-denominated, and the revenues from exports computed in local currency increase in the local currency depreciation against the foreign currency. In contrast, much of the costs, for example, wages, must be local currency-denominated.[25] Given the foreign currency denomination in exports, as one can easily see, the local currency depreciation actually raises the mark-up on the exporting goods, which eventually boosts the profitability of the exporters. In other words, domestic local currency depreciation benefits many of the nonfinancial corporations in EMEs, net exporters. In a companion paper Han (2021), I build a small open economy model to formalize the idea. Auclert et al. (2021) separately developed a similar idea in their paper.

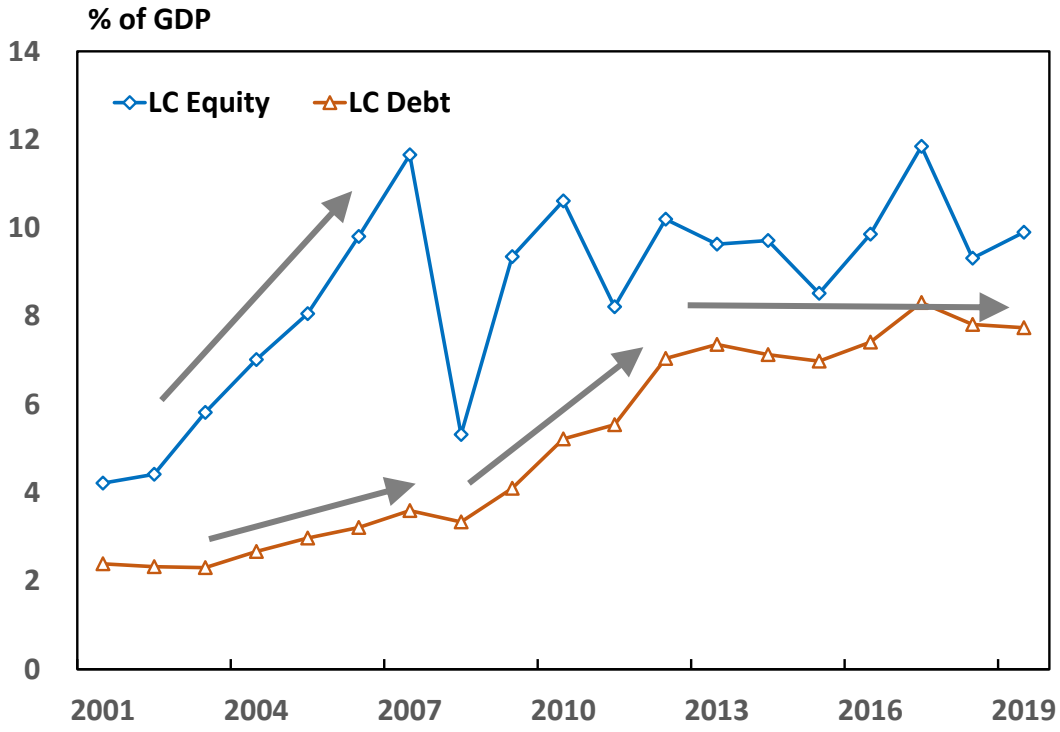
To sum up, despite the net foreign currency debts of nonfinancial corporations in the EMEs, how risky the foreign currency debts are is unclear. The nonfinancial corporations have low leverages than financial corporations and they can generate foreign currency revenues by themselves. More importantly, under the DCP hypothesis, the local currency depreciation itself is likely to raise the profitability of exporters in EMEs.

Because of the facts and findings from the recent consensus in the trade literature, foreign currency debts of nonfinancial corporate sectors in EMEs are probably not great threats to the financial stability of those countries. Furthermore, it is clear that the nonfinancial corporations are the sectors least fragile to local currency depreciation and in some sense, the foreign currency net short positions of the nonfinancial corporations seem to be efficient. Therefore, considering that governments and financial corporations also took large net short positions in foreign currency in the past, current states in EMEs where only nonfinancal corporate sectors are net short in foreign currency show the improvement of EMEs in terms of the sectoral level foreign currency

[24]The corporate debts in Mbaye et al. (2018) significantly vary along with countries and the level of corporate debts are quite low; even lower than 20% of GDP in Argentina and Romania. This reflects the large informal sectors in EMEs; corporations borrow informally or rely on net worth

[25]Those exporter must import intermediate goods to produce the exporting goods. However, considering considerable shares of imports are consumption goods, exports from the corporations must be more than the intermediate goods import.

Figure 7: Local Currency External Liabilities



Note: 1) Simple average of the twenty EMEs 2) Both the local currency equity liabilities and local currency debt liabilities exclude FDI equities and debts.

positions.

4 Original Sin Dissipation

In this section, I illustrate how the original sin has been dissipated since the early 2000s in different EMEs. I focus on when and which EMEs began borrowing abroad in local currency equities and debts, and how the local currency borrowings have increased. In particular, I try to find economic fundamentals which are highly correlated with the local currency borrowings. For example, EMEs with low and stable inflation could have borrowed abroad more than other EMEs? or higher financial openness makes some EMEs able to borrow abroad more in their own local currency? It turns out that the most tightly correlated variable with the local currency borrowings is the capital market depth, stock market and bond market capitalization to GDP ratios.

Key trends in the original sin dissipation EMEs began receiving portfolio equity investments into their stock markets from the 1990s, as documented in Lane and Milesi-Ferretti (2001, 2007a). However, in the very early 2000s, the amounts of equity portfolio investments were still less than 5% of GDP in most of the EMEs. The local currency external debts in the very early 2000s were even more scarce than the local currency equities.

The local currency equities and debts held by nonresidents (mostly foreign investors) have steadily increased from 2000 to 2007, just before the Global Financial Crisis, but the inflows into local currency equity and bond markets were particularly large in 2006 and 2007. Amounts of the equities held by foreign portfolio investors rapidly increased during the two years. The increases were in part due to the global stock market booms at that time, but also due to large purchases of the stocks by foreign investors. The large inflows into the bond markets in some EMEs at that time are also observable. Actually, 2006 and 2007, the two years was the time when local currency bonds in EMEs began being sold to investors from advanced economies. It is not clearly observable in the average as many EMEs were still not able to attract foreign investors into their local currency bond markets, but the bond inflows were large in Brazil, Korea and Malaysia.

During the Global Financial Crisis in 2008, there were obviously large outflows from EMEs, which significantly decreased the local currency equity liabilities and local currency debts. However, from 2010 until the early-2010s, the external liabilities of local currency equity and debt in the EMEs had rapidly increased. Both the local equity and local currency debt had increased, but the increases in the local currency debts were larger in terms of growth rate. In particular, international investors began purchasing local currency bonds in the EMEs that they had not been significantly holding in the 2000s; India, Indonesia, Peru, Romania, and Thailand.

The large inflows into stock and bond markets in the EMEs were probably fueled by the near-zero interest rates and quantitative easing in major economies such as US or Eurozone. During the late-2010s when Fed was gradually normalizing its policy, the overall growth of the external liabilities of local currency equities and debts in the EMEs became sluggish. However, there were no considerable outflows from the stock and bond markets in the EMEs: although Fed raised its policy rate and rolled back the quantitative easing, there was no notable regress in the original sin dissipation. Depending on the economic and political conditions (e.g., Brazil) or the amounts of inflows in the late and mid-2010s (e.g., Hungary and South Africa), there were moderate amounts of outflows in the bond markets, but there were more capital inflows into local currency bond markets in other EMEs during the same periods; e.g., Chile, India, and Indonesia.

Finally, I summarize the key trends in the original sin dissipation as follows

1. In 2005-07, there was a beginning of the original sin dissipation: large inflows into local currency stock markets in many of the EMEs and meaningful inflows into local currency bond markets in a few EMEs

2. In 2010-12, there was a surge of capital inflows into the local currency stock and bond markets, although amounts of the inflows and relative weights between the local currency equity inflows and local currency bond inflows vary among the EMEs.

3. In 2016-19, amid the monetary policy normalization by Fed, there was a slowdown of the inflows, but there were no large outflows from the stock and bond markets, equivalently no significant regress in the original sin dissipation

Original sin dissipation and capital market developments An important question related to the findings illustrated so far in this paper is "What is behind the original sin dissipation?" Several preceding papers have touched on this question. Chang and Wei (2020) argued that countries with better institutional quality can attract more equity investments into the countries. Ottonello and Perez (2019) suggested that better management of domestic inflation, such as inflation targeting, might be behind the surge of local currency sovereign debts. Du et al. (2016) provided empirical and theoretical results of similar insights.

I suggest a different view on the original sin dissipation. However, I do not formalize my idea. I simply examine different economic fundamental variables and pick up the variable that is most correlated with the local currency borrowings since the early-2000s in different EMEs. Then, I discuss my empirical findings and suggest an interpretation to the results, but the interpretation should not be understood as a formal claim.

I computed correlations between different economic fundamental variables and the local currency borrowings. I examined different variables, level of inflation, inflation volatility, GDP per capita, institutional quality index, financial openness, and trade openness. Among the different variables, the most correlated variable with the local currency borrowing is the development of capital markets, the stock and bond markets.[26] That is, an EME with larger stock markets relative to the size of the economy, EME of a higher stock market capitalization to GDP ratio, seems to borrow abroad more in local currency equity by attracting more foreign investors into the market. Similarly, an EME of higher bond market capitalization to GDP ratio seems to borrow abroad more in local currency debt by attracting more foreign investors into the bond market. Figure 8 below shows the high correlations between the market sizes and the original sin dissipation, local currency borrowings.

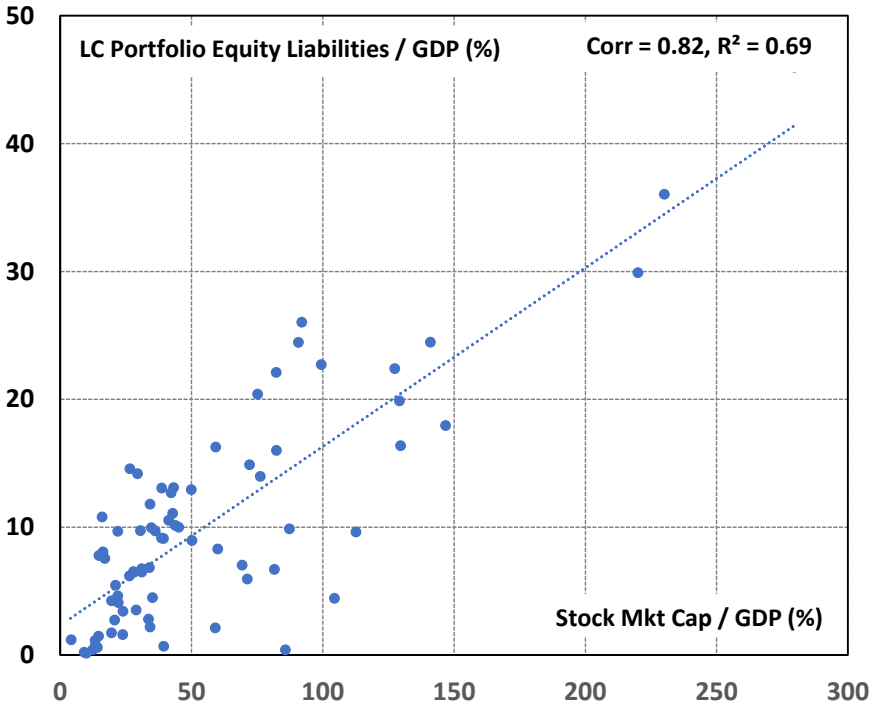
The correlation between the stock market capitalization to GDP and portfolio equity investment to GDP is 0.82 and none of the other variables is even close. Hence, the shares of non-resident portfolio investors in stock markets in the EMEs have been mostly in the range between 0.15-0.25 across the time and the countries. The bond market capitalization is a little hard to find a proper measure. As it is in many advanced economies, much of the corporate bond tradings are probably done in over-the-counter markets in the EMEs. Then, the sizes of the floor bond markets will be much proportional to the sizes of public debt markets. Hence, I used the outstanding public debt-securities to GDP ratios,[27] as a proxy for the bond market capitalization. The correlation for the bond market capitalization is 0.61, which is a little lower than in portfolio equity investments, but much higher than other variables.

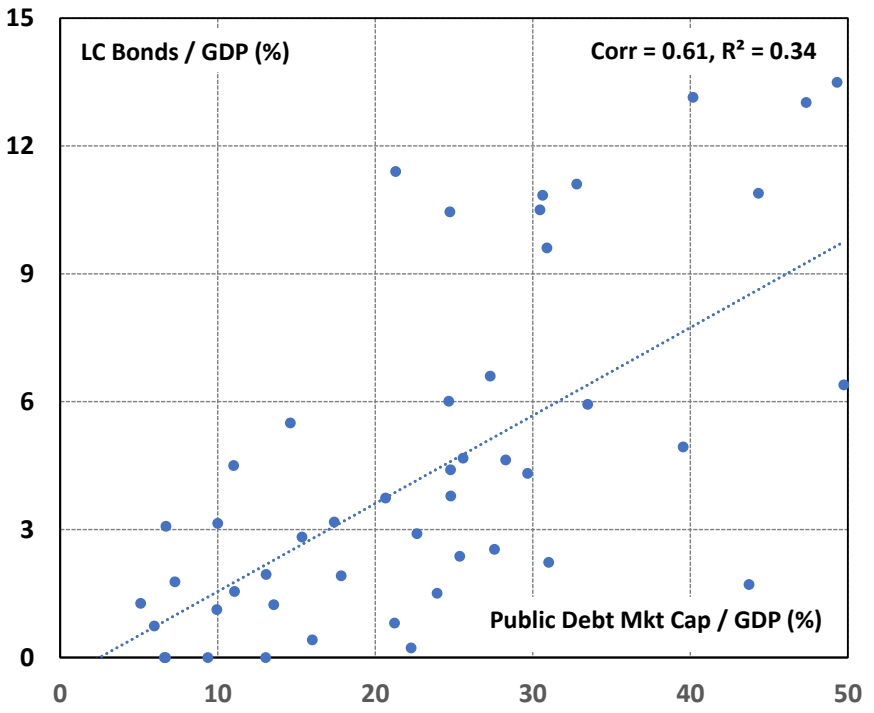
Again, these are mere correlations and I do not try to draw a firm causality from the observed correlations. I just suggest a plausible interpretation of the correlations. As I described, it is in the early 2000s that EMEs began attracting substantial portfolio investments into their domestic stock and bond markets where the securities are traded in local currency. Around the early 2000s, there were several important changes. Some EMEs that had suffered from sudden stops in the 1990s, for example, Korea and Indonesia, opened their capital markets from the

[26] Here, the development mere refers the size of the market capitalizations

[27] I used Arslanalp and Tsuda (2014) and added outstanding amounts of central bank debt securities, if necessary.

Figure 8: Capital Markets and Local Currency Borrowing





Note: Each bin is 5 years avearge of each of the 20 EMEs. Hence, the window is either of 2001-05, 2006-10, 2011-15, or 2016-19 for equity and 2004-09, 20010-14, or 2015-19 for bond

early-2000s. A few Latin American countries ended hyperinflation in the mid or late-1990s and adopted inflation targeting, which has stabilized the inflation in those countries. Furthermore, progress in information technology in the early-2000s, wider use of the internet in developing countries, makes it easy for international investors to enter and exit the stock and bond markets in EMEs. Note that international investors' portfolio investments in local currency equity and bond markets are the participation of the investors in the local markets.[28] To quickly change positions depending on the surrounding conditions, the investors need to enter and exit the markets whenever they want. To make all the process in the investments electronic should be crucial for the investors to be able to quickly dispose of their positions in the local markets.

All the changes together incentivized international investors to invest in stock and bond markets in EMEs. However, in the early-2000s, there were not enough local currency stocks and bonds in EMEs for the investors to buy. When the stock and bond markets were really small and therefore the liquidity in the markets was really limited, the local markets could not accommodate many enough international investors. The share of international investors in domestic capital markets cannot increase indefinitely and might have some limits. As the stock and bond markets in EMEs have grown over time, more stocks and bonds in local markets have become available for the investors and the ability of the markets to accommodate international investors has improved. Then, more international investors naturally join the local markets to enjoy higher expected returns in the markets.[29]

Put differently, the changes around the early-2000s I listed above could be substantial enough to attract international investors into the local currency stock and bond markets. However, there were just not enough stocks and bonds in EMEs for the investors to purchase. As more and more stocks and bonds in the local markets in EMEs have become available, the international investors have been willing to hold more local currency stocks and bonds in EMEs. In a companion paper Han (2021), I formalize the idea in a simple model, although it is not the main research agenda in the paper.

5 Concluding Remarks

This paper provides another source for a researcher to see the evolution of currency exposures and the composition of external liabilities in EMEs. The information of the external liabilities in local currency is mainly available through the national sources that I hand-collected. I combined the different sources using my understanding of institutional details of the local currency equities

[28]Hence, the local currency equities and bonds in EMEs are mostly not issued in foreign markets and not exclusively to international investors. Rather, the securities are issued in domestic capital markets, and the international investors "come" to the markets to buy the local currency-denominated securities so that the international investors are another type of investors in the domestic capital markets along with domestic investors. Thus, the issuers of the equities and bonds do not have controls over the buyers: rather, the shares of international investors are determined by the investors, not by the domestic issuers. Such obvious institutional features are often overlooked, but it is important to build a correct model.

[29]The positive linear relationship between the market growth and foreign investment in local currency bond investment is not as clear as the portfolio investment in local currency equities. Possibly, this reflects the another aspect of the bond market development other than the depth of the markets. For example, the existence of the bonds of different maturities should matter for attracting more international investors into the domestic local currency bond markets.

and debts in different EMEs. Furthermore, I also added the dollarization data to my data so that I can reasonably approximate the currency exposures at the sectoral level. Throughout the data construction in this paper, I relied on the actual data from different central banks and other authorities in the EMEs. Although the information from the different sources is not so complete, the use of actual data from the national sources greatly improves the precision of the dataset.

I focus on the two aspects of the information in the constructed dataset. First, I traced out how currency exposures in the EMEs have evolved since the early 2000s. Like a few preceding and contemporaneous papers (Bénétrix et al., 2015; Bénétrix et al., 2020), I concluded that currency exposures in the EMEs overall have greatly reduced for the last two decades. In the 2000s before the Global Financial Crisis, large FDI and portfolio inflow into the EMEs provided EMEs with sources to save in foreign currency. In the early and mid-2000s, there was a great reduction in the foreign currency debts of the countries and central banks in the EMEs had aggressively increased their international reserve holdings. After the Global Financial Crisis, there were other large portfolio inflows into the EMEs, which were probably fueled by the monetary policy easing in large advanced economies, in particular the US. Unlike the pre-Global Financial Crisis, there was no reduction in foreign currency debts or international reserve accumulation of the central banks, but private sectors in the EMEs, financial and nonfinancial corporations, have accumulated foreign currency assets in both equities and debt clams. As a result, the foreign currency positions in the EMEs have kept improving even in the 2010s, although the speed of the improvements has become slower than in the 2000s.

I also confirm that the EMEs are currently in a good shape in terms of the "distribution" of currency exposures across different sectors. Financial sectors in the EMEs are balanced between foreign currency debts and foreign currency assets. The financial corporations in the EMEs borrow in foreign currency from foreign parties or households, but they also invest abroad in foreign currency or make foreign currency loans to domestic companies. As a result, the financial corporate sectors have net long positions in foreign currency or the amounts of net foreign currency debts are manageable considering the net foreign currency debt to the capital ratios, except for a few EMEs where the banking sectors have relatively high net foreign currency debt to the capital ratios, e.g., Brazil and Peru. The nonfinancial corporate sectors have in general have net foreign currency debts by considerable amounts. But, the currency exposures in the nonfinancial corporate sectors are limited because the leverages in the sectors are usually low and many of the corporations are exporters; some forefront studies in the literature (Han, 2021; Auclert et al, 2021) pointed out that, under the DCP hypothesis, local currency depreciation itself leads to higher mark-up on the exports, thereby raising the profitability of the exporters. The higher profitability will offset the higher cost of serving foreign currency debts of the corporations.

Lastly, I illustrated how the EMEs have increasingly borrowed abroad in local currency equity and debts, i.e., how original sin in the EMEs has been dissipated. I documented several patterns in the dissipation commonly observed across the countries. The most interesting and important empirical regularity regarding the original sin dissipation is the highly positive correlations between the market capitalization to GDP ratios and the external liabilities of local currency equities and bonds. Deep investigations into the correlations are beyond the scope of this paper,

but I provide a plausible interpretation of the correlations. The important changes occurred in the EMEs around 2000, such as capital account liberalization or progress in information technology, probably incentivized international investors to put their money in the local currency stock and bond markets in the EMEs. However, the capital markets in the EMEs didn't have enough depth at that time and thus the inflows into the local markets were limited. However, as the capital markets have grown over time, deepening the markets, the international investors have become willing to invest more in the markets: larger capital markets have attracted more foreign capitals into the local currency stock and bond markets in the EMEs.

References

[1] Aizenman, J. and Sun, Y., 2012. "The financial crisis and sizable international reserves depletion: From âfear of floatingâ to the âfear of losing international reservesâ?," *International Review of Economics Finance*, 24 (C): 250–269.

[2] Arslanalp, S. and Tsuda, T. 2014. "Tracking Global Demand for Emerging Market Sovereign Debt," *IMF Working Paper*, WP/14/39.

[3] Akinci, O. and Queralto, A. 2019. "Balance Sheets, Exchange Rates, and International Monetary Spillovers." *FRB of New York Sta Report,* No. 849.

[4] Aoki, K., G. Beningno, and N. Kiyotaki. 2018. "Monetary and Financial Policies in Emerging Markets." *Manuscript*, *Princeton University.*

[5] Auclert, A., Rognlie, M., Souchier, M., and Straub, L. 2021. "Exchange Rates and Monetary Policy with Heterogeneous Agents: Resurrecting the Real Income Channel." *Manuscript*, *Stanford University.*

[6] Beltran, D., Garud, K., and Rosenblum, A. 2017. "Emerging Market Nonfinancial Corporate Debt: How Concerned Should We Be?," *IFDP Notes. Washington: Board of Governors of the Federal Reserve System*, June 2017, https://doi.org/10.17016/2573-2129.32

[7] Bénétrix, A. S., Lane, P. R., and Shambaugh, J. C. 2015. "International currency exposures, valuation effects and the global financial crisis." *Journal of International Economics*, 96 (S1): S98–S109.

[8] Bénétrix, A. S., D. Gautam, L. Juvenal, and M. Schmitz. 2020. "Cross-border currency exposures: new evidence based on an enhanced and updated dataset," *ECB Working Paper*, No. 2417.

[9] Bocola, Luigi, and Guido Lorenzoni. 2020. "Financial Crises, Dollarization, and Lending of Last Resort in Open Economies." *American Economic Review*, 110 (8): 2524–57.

[10] Bruno, V. and Shin, H. S. 2018. "Currency Depreciation and Emerging Market Corporate Distress." *BIS Working Papers*, No. 753.

[11] Burger, J. D. and Warnock, F. E. 2006. "Local Currency Bond Markets." *NBER Working Paper*, No. 12552.

[12] Bussiére, M., Cheng, G., Chinn, M., and Lisack, N. 2015. "For a Few Dollars More: Reserves and Growth in Time of Crises." *Journal of International Money and Finance*, 52: 127–145.

[13] Calvo. G. 1998. "Capital Flows and Capital-market Crises: the Simple Economics of Sudden Stops." *Journal of Applied Economics*, 1 (1): 33–54.

[14] Calvo, G., Izquierdo, A., and Talvi, E. 2006. "Phoenix Miracles in Emerging Markets: Recovering Without Credit From Systemic Financial Crises." *Inter-American Development Bank Research Department Working Paper*, No. 570.

[15] Chang, M. and Wei, S-J. 2020. "International Equity and Debt Flows to Emerging Market Economies: Composition, Crises, and Controls." *Manuscript, Fudan University*

[16] Christiano, L., Dalgic, H. C., and Nurbekyan, A. 2020. "Financial Dollarization in Emerging Markets: Efficient Risk Sharing or Prescription for Disaster?" *Manuscript, Northwestern University.*

[17] Chui, M. KF, Kuruc, E., and Turner, P. 2016. "A New Dimension to Currency Mismatches in the Emerging Markets: Non-financial Companies." *BIS Working Papers*, No. 550.

[18] Dalgic, H. C., 2020. "Corporate Dollar Debt in Emerging Markets." *Manuscript, University of Mannheim.*

[19] Du, W. and Schreger, J. 2016. "Local Currency Sovereign Risk." *Journal of Finance*, 71 (3): 1027–1070.

[20] Du, W. and Schreger, J. 2016. "Sovereign Risk, Currency Risk, and Corporate Balance Sheets." *Manuscript, Columbia Business School.*

[21] Du, W., Pflueger, C. E., and Schreger, J. 2016. "Sovereign Debt Portfolios, Bond Risks, and the Credibility of Monetary Policy." *NBER Working Paper*, No. 22592.

[22] Eichengreen, B. and Hausmann, R. 1999. "Exchange Rates and Financial Fragility," *NBER Working Paper*, No. 7418

[23] Eichengreen, B., Hausmann, R., and Panizza, U. 2002. "Original Sin: the Pain, the Mystery, and the Road to Redemption." *Inter-American Development Bank Conference Paper*.

[24] Engel, C. and Park, J. J. 2018. "Debauchery and Original Sin: The Currency Composition of Sovereign Debt." *NBER Working Paper*, No. 24671.

[25] Fanelli, S. 2019. "Monetary Policy Capital Controls, and International Portfolios." *Manuscript, Princeton University*

[26] Gopinath, G. and Stein, J. C. 2020. "Banking, Trade, and the Making of a Dominant Currency," *Quarterly Journal of Economics*, qjaa036.

[27] Kuruc, E., Tissot, B., and Turner, P. 2016. "Looking at Aggregate Currency Mismatches and Beyond." BIS (Ed.), Conference on "Uses of Central Balance Sheet Data Offices' information", 45.

[28] Lane, Philip R. and Gian Maria Milesi-Ferretti. 2001. "THE EXTERNAL WEALTH OF NATIONS: Measures of Foreign Assets and Liabilities For Industrial and Developing Countries." *Journal of International Economics*, 55 (2): 263–294.

[29] Lane, Philip R. and Gian Maria Milesi-Ferretti. 2007. "The external wealth of nations mark II: Revised and extended estimates of foreign assets and liabilities, 1970-2004." *Journal of International Economics*, 73 (2): 223–250.

[30] Lane, Philip R. and Jay C. Shambaugh. 2010. “Financial Exchange Rates and International Currency Exposures." *American Economic Review*, 100 (1): 518-40.

[31] Levy-Yeyati, E. 2006. “Financial dollarization: evaluating the consequences.” *Economic Policy*, 21 (45): 62–118.

[32] Maggiori, M., Neiman, B., and Schreger, J. 2020. “International Currencies and Capital Allocation.” *Journal of Political Economy*, 128 (6): 2019–2066.

[33] Mbaye, S., M. Moreno Badia, and K. Chae. 2018. “Global debt database: Methodology and sources.” *IMF Working Paper*, 18/111.

[34] Montamat. G. 2020. “Stubborn Dollarization: Love for the Dollar and Fear of the Peso.” *Manuscript, Harvard University.*

[35] Ottonello, P. and Perez, D., 2019. “The Currency Composition of Sovereign Debt.” *American Economic Journal: Macroeconomics*, 11 (3): 174–208.

[36] Shin, H. S. and Shin, K. 2011. “Procyclicality and Monetary Aggregates.” *NBER Working Paper* No. 16836.

[37] Shousha, S. F. 2017. “International Reserves, Credit Constraints, and Systemic Sudden Stops.” *Board of Governors of the Federal Reserve System International Finance Discussion Papers*, No. 1205.

A Data Appendix

A.1 Local currency debt and equity liability data

- Argentina: Argentine peso denominated bond portfolio investment is from local currency sovereign debt data from Arslanalp and Tsuda (2014). Some local currency debts are observed in QEDS (Quarterly External Debt Statistics) provided by World Bank[30], but in the IIP of Argentina from IMF, external debts of deposit-taking corporations are negligible. Therefore, I assume that the small amount of local currency debts belong to FDI liabilities in the form of debt instrument. No information about the currency denomination of equity portfolio investments in IIP. I simply assume that all equities in the category are local currency denominated.

- Brazil: Central bank of Brazil (BCB) provides IIP data that divides portfolio investments into securities issued in onshore (domestic) and offshore (foreign) markets. Officials at BCB confirmed that all equities and bonds issued in Brazil are almost all Brazil real denominated by regulation. Other local currency debts in the category of other investments in the classification of IIP are identified from the data provided by officials at BCB (directly provided conditional on not sharing with others).

- Bulgaria: Complete information of local currency debts and bonds of Bulgaria is provided from the central bank of Bulgaria (BNB, directly provided conditional on not sharing with others). All equity portfolio investments in IIP are assumed to be local currency denominated.

- Chile: Central bank of Chile (Banco Central de Chile) provides the data on debt securities issued in Chile, but held by nonresidents. Currently, I have no information on the currency denomination of the bonds, but the government bonds in the data well match Arslanalp and Tsuda (2014). In addition, deposits in Chile, held by nonresidents, are available from the external debt data provided by the bank. The summation of the debt securities and the deposits are little short of the total Chile peso denominated external debts, which is also provided by Banco Cental de Chile; the remaining debts are presumably the peso denominated FDI debts. All equity portfolio investments in IIP are assumed to be local currency denominated.

- Colombia: QEDS provides total Colombian peso denominated external debts, but the reported numbers in the data set are much smaller than Columbian peso denominated sovereign bonds in Arslanalp and Tsuda (2014). Like several other EMEs, it is very probable that the numbers in QEDS are under-reported. Hence, I used the data in Arslanalp and Tsuda (2014), and assumed that there is no other Colombian peso denominated external debts as it turns out external debts in the form of deposits are negligible in Colombia. All equity portfolio investments in IIP are assumed to be local currency denominated.

[30]The QEDS is co-managed with BIS and IMF

- Czech Republic: Czech koruna denominated external debt unusually increased since 2014. The increasing pattern corresponds to a sudden increase in nonresidents koruna deposits in Czech Republic.[31] Hence, I reasonably assumed that all external debt in the form of deposits are Czech koruna denominated external debts; the external debts of different instruments are from the cental bank of Czech Republic (Czech National Bank, CZB). Czech koruna denominated sovereign bonds are computed as follows. The Ministry of Finance of the Czech Republic provides government debt data that classify the governments into domestic currency versus foreign currency, and domestic creditors and foreign creditors. I assumed that all foreign currency denominated sovereign external debts belong to foreign creditors. Then the Czech koruna denominated sovereign external debts are total external government debts credited by foreign investors minus the total foreign currency denominated government debts. The summation of the korona denominated deposits held by nonresidents and the korona denominated sovereign bonds reasonably matches the total local currency external debts of Czech Republic in QEDS. All equity portfolio investments in IIP are assumed to be local currency denominated.

- Hungary: Currency compositions section in IIP is filled out in Hungarian data. Hence, I can easily identify local and foreign currency debts in different categories. All the equity portfolio investments in IIP are assumed to be local currency denominated.

- India: Ministry of Finance in India annually publishes a report of external debts including ratios of India rupee denominated debts in both of total and sovereign debts. Since FDI debts in India are almost negligible, I assume that all rupee currency debts in the report are either of investments in rupee denominated bonds or rupee denominated deposits. The same report provides the information on Indian rupee deposits held by nonresidents; NRI deposits except for FCNR. The total rupee denominated external debts are substantially more than the summations of the rupee denominated sovereign bonds and rupee deposits held by non-residents. The remaining rupee denominated external debts are foreign portfolio investments, through FII account, in rupee corporate bonds or special bonds.[32] All equity portfolio investments in IIP are assumed to be local currency denominated.

- Indonesia: Central bank of Indonesia (Bank Indonesia, BI) annually publishes the report of external debts of Indonesia, which documents total Indonesian rupiah denominated external debts and sovereign external debts. The summation of the rupiah sovereign external debts and deposits held by nonresidents almost exactly matches the total rupiah external debt. All equity portfolio investments in IIP are assumed to be local currency denominated.

- Korea: Central bank of Korea (Bank of Korea, BOK) provides annual data on currency compositions of external assets and liabilities for all the categories in IIP.

[31] It is 20-30% of GDP and definitely unusual. About the driving force behin such unusual phenomenon, currently I have no clue.

[32] Other parts of external debts in Indian rupee are Rupee Debt: outstanding state credits (both defense and civilian) extended to India by the erstwhile Union of Soviet Socialist Republic (USSR). Hence, Rupee Debt is a legacy from the past and currently the remaining Rupee Debt is negligible.

- Malaysia: Central bank of Malaysia (Bank Negara Malaysia, BNM) provided me with monthly data on external debts in Malaysia showing Malaysia ringgit denominated debt securities held by nonresidents; directly contact officials at BNM. A series of reports from BNM documents the same information at semiannual frequency and the report shows deposits in Malaysia, held by nonresidents. I assumed all the deposits are denominated in ringgit and the summation of the deposits and debt securities reasonably matches the total ringgit external debts of Malaysia, documented in the periodical reports of BNM.[33] All equity portfolio investments in IIP are assumed to be local currency denominated.

- Mexico: Gross External Debt Position (GEDP) data from central bank of Mexico (Banco de Mexico, Banxico) shows all Mexico peso denominated debt securities held by nonresidents. QEDS also provides Mexico peso denominated external debts; the documented numbers are smaller than GEDP data. As a Baxico senior official confirmed to me that GEDP data are correct, I ignore QEDS data and assumed that all Mexico peso-denominated external debts of Mexico are the peso debt securities in GEDP data. The official also confirmed that all equity portfolio investments in IIP are Mexico peso denominated.

- Peru: Peru sol denominated sovereign debt data is from Arslanalp and Tsuda (2014). I cannot find any information of nonresidents deposit in Peru. Becaus of the deficient information, I use the number reported in Du and Schreger (2016): the paper documents that as of 2012, 7% of external debts of corporate sectors in Peru is sol denominated, and using the reported ratio, I assume that 7% of external debts other than Peruvian government external debts are sol denominated. All equity portfolio investments in IIP are assumed to be local currency denominated.

- Philippines: Central bank of the Philippines (Bangko Sentral ng Pilipinas, BSP) provided me with the data on Philippines peso denominated external debts in both government and private sector; directly contacted BSP. Actually, it turns out that peso denominated external debt in private sector is almost zero. The contacted official also confirmed that all the equity portfolio investments in IIP are Philippines peso denominated.

- Poland: Central bank of Poland (National Bank of Poland, NBP) provided me with currency compositions of external assets for all the categories in IIP; directly contacted BNP. All equity portfolio investments in IIP are assumed to be local currency denominated.

- Romania: Romania leu denominated sovereign external debts are from Arslanalp and Tsuda (2014).[34] Deposits held by nonresidents are assumed to be leu denominated. The total leu denomiated external debts are computed as the summation of the leu denomiated government external debts and the deposits held by nonresidents.

- Russia: Central bank of Russia (Bank of Russia, CBR) provided a few different data

[33] For 2012 and 2013, the computed ringgit external debts are little more than the separately reported total ringit external debts.

[34] Leu denominated government external debts are higher than the total leu denominated external debts reported in QEDS.

sets showing currency denominations in external assets and liabilities.[35] Only missing information in the data is the amount of Russia ruble deposits, held by nonresidents. I assumed that ruble denominated external debts of the banking sector in Russia are the ruble denominated deposits as it is in many of the sample EMEs.

- South Africa: South Africa central bank (South African Reserve Bank) publishes a report of external debts every quarter, and the reports document the amount of South Africa rand denominated debt securities held by nonresidents and total rand denominated external debts. Then I added deposits in South Africa, which I can identify from the same periodical.[36] All equity portfolio investments in IIP are assumed to be local currency denominated, and it is confirmed by an official at South Africa Reserve Bank (direct contact).

- Thailand: Central bank of Thailand (Bank of Thailand, BOT) directly provided me with the data of Thailand bhat denominated government external debts, different forms of external debts in bhat and the total Thailand external debt in bhat. Other than the government bonds in bhat, BOT also issues its own bonds in bhat, some of which are purchased by foreign investors. The information is available at BOT website. All equity portfolio investments in IIP are assumed to be local currency denominated, and it is confirmed by an official at BOT (direct contact).

- Turkey: Turkey lira denominated sovereign external debts are from Arslanalp and Tsuda (2014). The data of lira denominated deposits held by nonresidents is provided by the central bank of Turkey (TÃŒrkiye Cumhuriyet Merkez Bankasi, TCMB). All equity portfolio investments in IIP are assumed to be local currency denominated.

A.1.1 Sector Level Foreign Currency Assets and Liabilities

- External assets and liabilities of each sector in foreign currency: IIP data from IMF break down external assets and liabilities into different sectors (financial corporate sector, government, central bank and others[37]) and different types (equity portfolio, bond portfolio, and other debt instruments). From the external liabilities in different categories, I deduct corresponding local currency debt liabilities.

- Foreign currency deposits: Data set by Dr. Dalgic includes foreign currency deposits in the sample EMEs, all the EMEs in the sample except for Brazil. The data only shows the ratio of foreign currency deposits to the total deposits. Therefore, I used the deposit to GDP ratios of CEIC database.

[35] One can download the same data from the CBR website.

[36] One can download same data from South African Reserve Bank online download system. The required codes for rand denominated external debt securities and deposits held by non-residents are KBP5512J and KBP5579J respectively.

[37] The category of others includes both household sector and nonfinancial corporate sector. Since it is unlikely that households hold large amounts of external assets and liabilities without intermediations of banks, which is reported in banking sector liabilities and assets in IIP data, I assumed all the assets and liabilities in the category of "others" belong to nonfinancial corporate sector.

- Foreign currency loan: Same data set provided by Dr. Dalgic includes foreign currency loans between domestic creditors and domestic borrowers for 12 EMEs; Argentina, Bulgaria, Chile, Columbia, Czech Republic, Hungary, Indonesia, Mexico, Poland, Romania, Russia, and Turkey. For the last of 7 EMEs among the 19 EMEs (except for Brazil in the 20 EMEs), I simply assumed that the foreign currency loan is the same as the foreign currency deposit; for the 12 EME that I have information, the amount of foreign currency deposits are almost equivalent to foreign currency loans. As a result, I know the ratios of the foreign currency loans to the total credit to private nonfinancial sectors. The data of total credit from domestic financial sector to nonfinancial sectors is available from World Bank. Then I can easily compute the foreign currency loan to GDP ratios.

- Foreign currency loan to households: The data set of Dr. Dalgic includes the foreign currency loan to household credit ratios for the following EMEs; Argentina, Bulgaria, Colombia, Czech Republic, Hungary, Indonesia, Mexico, Poland, Romania, and Russia. For the remaining EMEs, I assumed that all the domestic foreign currency loans are made to nonfinancial corporates since, among the EMEs that I have information, foreign currency loans to households are negligible except for Poland and Romania. Multiplication of the foreign currency loan to household credit and household debt to GDP ratios give me the household foreign currency loan to GDP ratios. I used household debt data from the CEIC database.

A.2 Additional Tables

Table 2: Sources for the Local Currency Equities and Debts

Country	Sources
Argentina	- No available national source - Arslanalp and Tsuda (2014)
Brazil	- Direct contact (Banco Central do Brasil) - International Investment Position from Banco Central do Brasil
Bulgaria	- Direct contact (Bulgarian National Bank)
Chile	- Central Bank of Chile Statistical Database
Columbia	- No available national source - Arslanalp and Tsuda (2014)
Czech Rep.	- Czech National Bank Statistics - Ministry of Finance of the Czech Republic Statistics
Hungary	- No available national source - Currency composition table in the IMP IIP database
India	- The Ministry of Finance of the India Quarterly External Debt Report
Indonesia	- Bank Indonesia External Dept Report
Korea	- Bank of Korea Statistics Portal Ecos
Malaysia	- Direct contact (Bank Negara Malaysia) - Bank Negara Malaysia Quarterly Bulletin
Mexico	- Banco De Mexico Economic Information System
Peru	- No available national source - Arslanalp and Tsuda (2014)
Philippines	- Direct contact (Bangko Sentral ng Pilipinas) - Arslanalp and Tsuda (2014)
Poland	- Direct contact (Narodowy Bank Polski) - Currency composition table in the IMP IIP database
Romania	- No available national source - Arslanalp and Tsuda (2014)
Russia	- Bank of Russia Statistics
South Africa	- South African Reserve Bank Quarterly Bulletin
Thailand	- Direct contact (Bank of Thailand) - Bank of Thailand Statistics
Turkey	- Central Bank of the Republic of Turkey Statistical Data (EVDS)

Table 3: External Liabilities of EMEs

	2004			2019		
	LCE	LCD	FCD	LCE	LCD	FCD
Argentina	0.01 (0.01)	0.01 (0.01)	0.58 (0.98)	0.00 (0.00)	0.00 (0.00) <0.00>	0.43 (0.99)
Brazil	0.04 (0.10)	0.00 (0.01)	0.30 (0.72)	0.16 (0.36)	0.06 (0.13) <0.06>	0.18 (0.40)
Bulgaria	0.00 (0.00)	0.00 (0.00)	0.55 (0.98)	0.01 (0.02)	0.00 (0.00) <0.00>	0.41 (0.98)
Chile	0.01 (0.02)	0.02 (0.04)	0.38 (0.86)	0.08 (0.14)	0.06 (0.09) <0.04>	0.44 (0.76)
Colombia	0.01 (0.02)	0.00 (0.01)	0.34 (0.98)	0.02 (0.04)	0.07 (0.16) <0.07>	0.37 (0.80)
Czech	0.08 (0.20)	0.10 (0.24)	0.22 (0.56)	0.03 (0.05)	0.29 (0.46) <0.08>	0.31 (0.48)
Hungary	0.16 (0.19)	0.14 (0.17)	0.52 (0.63)	0.12 (0.19)	0.17 (0.26) <0.14>	0.36 (0.55)
India	0.06 (0.26)	0.03 (0.11)	0.15 (0.63)	0.05 (0.21)	0.07 (0.30) <0.04>	0.12 (0.49)
Indonesia	0.06 (0.10)	0.01 (0.01)	0.50 (0.89)	0.10 (0.23)	0.08 (0.19) <0.07>	0.24 (0.58)
Korea	0.16 (0.43)	0.01 (0.04)	0.17 (0.44)	0.29 (0.51)	0.08 (0.14) <0.07>	0.18 (0.32)
Malaysia	0.23 (0.32)	0.03 (0.05)	0.45 (0.63)	0.17 (0.24)	0.17 (0.25) <0.13>	0.35 (0.51)
Mexico	0.10 (0.29)	0.01 (0.03)	0.22 (0.68)	0.12 (0.24)	0.09 (0.18) <0.09>	0.29 (0.58)
Peru	0.06 (0.11)	0.00 (0.00)	0.47 (0.89)	0.09 (0.21)	0.08 (0.17) <0.08>	0.27 (0.61)
Philippines	0.05 (0.07)	0.01 (0.01)	0.59 (0.92)	0.14 (0.37)	0.01 (0.02) <0.01>	0.22 (0.59)
Poland	0.05 (0.11)	0.13 (0.26)	0.30 (0.63)	0.06 (0.12)	0.16 (0.30) <0.12>	0.28 (0.54)
Romania	0.00 (0.00)	0.00 (0.01)	0.34 (0.96)	0.02 (0.05)	0.03 (0.10) <0.03>	0.29 (0.85)
Russia	0.14 (0.30)	0.02 (0.05)	0.30 (0.65)	0.12 (0.38)	0.07 (0.20) <0.06>	0.14 (0.42)
South Africa	0.21 (0.56)	0.05 (0.03)	0.12 (0.31)	0.45 (0.48)	0.20 (0.22) <0.16>	0.28 (0.30)
Thailand	0.15 (0.34)	0.01 (0.03)	0.29 (0.63)	0.21 (0.43)	0.07 (0.15) <0.06>	0.21 (0.43)
Turkey	0.04 (0.09)	0.04 (0.08)	0.35 (0.82)	0.04 (0.07)	0.03 (0.05) <0.02>	0.50 (0.88)
Average	0.07 (0.17)	0.03 (0.06)	0.31 (0.75)	0.10 (0.23)	0.08 (0.18) <0.06>	0.26 (0.58)

Note: 1) All the numbers are the Liabilities to GDP ratios. 2) LCD: Local Currency Debts, LCE: Local Currency Equities. and FCD: Foreign Currency Debts 3) The numbers in ( ) are the ratios of each type of external liabilities to total external liabilities excluding FDIs and financial derivatives 4) The numbers in < > are local currency bond portfolio investments.

Table 4: Correlations with Local Currency External Liabilities

	Stock Mkt. Cap.	Public Debt Mkt Cap.	Avg. Inflation[2)]	Government Effectiveness[3)]	GDP per capita[4)]	Trade Openness	Financial Openness[5)]
LC Equity	0.81	-	-0.19	0.32	0.05	0.24	-0.03
	(0.69)		(0.03)	(0.10)	(0.00)	(0.05)	(0.00)
LC Bond	-	0.61	-0.36	0.44	0.30	0.47	0.22
		(0.37)	(0.02)	(0.17)	(0.09)	(0.22)	(0.03)

Note: 1) The numbers in the parentheses are the R-squared of the univariate regression. 2) Average inflation is the average of the annual inflation for the last 10 years. 3) Government effectiveness index is one of the six categories in the World Bank Governance Indices. 4) GDP per capital is measure by US dollar in 2017 (World Economy Outlook 2020 October, IMF) 5) Financial openness measures are the indices of equity and bond market openness indices in Fernandez et al. (2016).