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Essays in International Macroeconomics

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Declaration

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Summary

This thesis comprises three essays. The first essay (Chapter 2) analyzes the shock absorption role of external positions by looking at the relation between external stock imbalances and their currency of denomination. The second essay (Chapter 3) focuses on the re-routing activities of non-financial corporations (NFCs) through their foreign affiliates by looking at the relationship between NFCs' offshore issuance and their within-company loans. The third essay (Chapter 4) studies the status of the euro and the US dollar as international currencies and connects them with currency movements by looking at international financial integration and its equity and debt components.

Chapter 2 presents a comprehensive analysis of the shock absorption role of external positions using the currency exposures dataset by Bénétrix et al. (2020). While the literature has frequently studied how the net international investment position and its currency composition determine the direction and scale of valuation effects, we focus on their amplitude. This is of central importance for global financial stability, given the large and increasing scale of external balance sheets. To that end, we propose an indicator showing the extent to which external positions absorb or amplify exchange rate shocks.

Analysing a set of 50 countries over the period 1990-2017, we find the external shock absorption role to be present for advanced economies, while this was initially not the case for emerging markets economies (EMEs). In recent years, however, EMEs' external positions increasingly showed a shock absorption capacity.

Our regression-based analysis reveals that the level of economic and financial development is associated with a greater capacity to absorb exchange rate shocks.

Chapter 3 analyses the re-routing activity of offshore affiliates and its link with the economic environment by looking at the co-movement of offshore debt issuance and within-company loans. The size of external borrowing of non-financial corporations (NFCs) through overseas affiliates is continuously increasing post-global financial crisis (GFC). In addition, offshore bond issuance has become more important than onshore bond issuance as a transmission channel of global liquidity because of its strong link with the global financial cycle and fluctuation in the US dollar. Therefore, offshore issuance of NFCs has become central for assessing the risk profile of debt issuance. However, the risk profile of offshore debt is likely to be very different depending on whether the issuing affiliate uses proceeds for operations in the country of residence or channels funds to the parent company.

This chapter documents three stylized facts. First, re-routing external debt by foreign affiliates to their parents is prevalent in advanced, emerging, and developing countries. Second, institutional development, access to the international capital market, and carry trade motivation shape the striking heterogeneity in re-routing activities. Third, the quality of the legal environment, the deepness of the investor base, and capital controls on international lending, amongst others, are key factors in explaining the share of offshore in total issuance.

Chapter 4 analyzes the status of the euro and US dollar as international currencies by looking at the euro and US dollar composition of international financial integration (IFI) indicators. The literature has studied the role of the euro and USD in international investment positions (IIP) components individually and relates them to the availability of safe assets or liquidity. This chapter focuses on the euro and dollar breakdown of IFI as well as its equity and debt components and associates it with being a relatively safe currency. This is of central importance not only for global financial stability and transmission of monetary policies but also for the privileges arising from being the owner of the prevailing currency.

This chapter presents a newly compiled and updated dataset for the euro and US dollar composition of IIP for 39 countries from 2001 to 2021.

We find that while the euro share expanded rapidly until 2007, it declined after the global financial crisis (GFC) and has been overtaken since 2014 as a result of a decrease in the euro share debt component and a comparatively faster increase in the USD share of the equity component. In addition, there is no prospect for substantial change in the euro's distant secondary role after the dollar due to its limited role in emerging economies. Analyses of the link between exchange rate and valuation-adjusted currency shares in IFI reveal that the relative strength of the currency matters for the share of this currency in external assets and liabilities. Still, it matters, to a lesser extent, for the equity compared to the debt component. Furthermore, the complementarity between the currency share in trade and finance is prevalent.

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To my family

Chapter 1

General introduction

Heterogeneity of external imbalances, and its functional categories in relation to the currency of denomination and geography, has become one of the main dimensions to look at for financial wealth re-distribution, financial vulnerabilities, and international transmission of monetary policies in light of the continuously increasing size and complexity of cross-border financial positions.

Countries can experience valuation gains or losses in their external positions because of the mechanical effect of exchange rate fluctuation on the value of external assets and liabilities. Large capital gains for one country could mean large and potentially destabilising losses to others. It is therefore vital to dampen the amplitude of large financial wealth redistributions for a stable global financial system. Furthermore, the geography of the borrowings, how it is recorded in statistics, and how the proceeds are used do matter for the systemic risk and financial stabilities of countries of residence and countries of nationality.

The first step to answer many important questions in international macroeconomics and finance is to understand the properties and allocation of economies' cross-border financial positions. The aim of this thesis is to provide a better understanding of a range of topics, including currency exposure of external positions and the capacity to absorb shocks, hidden wealth and financial stability

risks arising from concentration in tax havens and offshore financial centers, and the role of the euro and the dollar in the global financial market.

This thesis consists of three essays. Chapter 2 analyzes the shock absorption role of external positions by looking at the relation between external stock imbalances and their currency of denomination. Chapter 3 focuses on the re-routing activities of non-financial corporations (NFCs) through their foreign affiliates by looking at the relationship between NFCs' offshore issuance and their within-company loans. Chapter 4 studies the status of the euro and the US dollar as international currencies and links it to currency movements by looking at international financial integration and its equity and debt components.

Chapter 2 focuses on the relation between net positions and the currency of denomination to assess the extent to which they reduce or amplify the effects of exchange rate movements on the value of external assets and liabilities. Previous research showed that currency mismatches and large imbalances can produce large valuation changes that may stabilise or destabilise an economy. An example of the former would be the case of a country exhibiting a home currency depreciation during a recession but benefiting from positive valuation effects due to a long foreign-currency position (Lane and Milesi-Ferretti, 2001; Tille, 2003; Lane and Milesi-Ferretti, 2007; Gourinchas and Rey, 2007; Lane and Milesi-Ferretti, 2009; Lane and Milesi-Ferretti, 2018). Examples of destabilising roles are related to the kind of mechanism implicitly assumed in the original sin literature (Eichengreen and Hausmann, 1999; Eichengreen, Hausmann, and Panizza, 2003; Eichengreen and Hausmann, 2010; Eichengreen, Hausmann, and Panizza, 2023). A currency depreciation combined with short foreign currency positions can generate large valuation losses at the wrong time. We depart from this literature in the sense that we do not study if valuation effects contribute to reducing or enhancing external imbalances (the stabilising/destabilising role). We focus instead on the properties of external positions that reduce the amplitude of exchange rate-related valuation effects.

Chapter 3 focuses on the link between offshore issuances and within-company loans and conducts an in-depth study on which aspects of the economic environment stimulate the development of this link. There is a substantial body of literature showing that external corporate borrowing through international financial centres can be a source of broader financial instability because of the exposures to global financial conditions and vulnerability to exchange rate movements. They show that offshore bond issuance has become more important than onshore bond issuance, which refers to the debt issued from the country of headquarters, as a transmission channel of global liquidy with its strong link with the global financial cycle and fluctuation in the US dollar; especially in the aftermath of the GFC (Kim and Shin, 2021; Aldasoro, Hardy, and Tarashev, 2021). However, the risk profile of offshore debt is likely to be very different depending on whether the foreign affiliates of NFCs act as a surrogate intermediary by channeling funds to their parents (Gruić, Upper, and Villar, 2014; Gruic, Wooldridge, et al., 2015). This essay is the first to empirically analyze the link between the offshore issuance of NFCs and their within-company loans, serving as a proxy for re-routed external debt. Furthermore, there are studies showing the prevalence of a vastly different picture of global capital allocation between nationality-based and residency-based data. While residency-based statistics associate securities with the location of their immediate issuer, nationality-based statistics associate securities with the country of the issuer's ultimate parent. This difference emerges from the issuances of offshore affiliates in international financial centers (Coppola et al., 2021). This study also fills a gap in the literature by investigating the drivers of this difference, i.e., offshore issuance.

Chapter 4 analyzes the international role of the euro and dollar by looking at the financial integration indicator proposed by Lane and Milesi-Ferretti (2003) and its components by investment types. We compile an extended dataset for the euro and US dollar composition of IIP between 2001 and 2021. Previous research documented the role of the euro and US dollar in corporate and sovereign bond positions, bank loans, global foreign exchange trading volume or international

trade invoicing (Maggiori, Neiman, and Schreger, 2020; Maggiori, Neiman, and Schreger, 2019; Ilzetzki, Reinhart, and Rogoff, 2020). In contrast, this chapter provides a broader framework for the role of the euro and USD as global currencies by including all the components of external positions, except for foreign exchange reserves (portfolio equity, foreign direct investment, portfolio debt, and other investment), rather than looking at only one dimension of international finance. It further enhances our understanding of the IFI measure by including the currency dimension, which was not part of the literature that investigates the evolution of cross-border positions in relation to GDP (Lane and Milesi-Ferretti, 2003; Lane and Milesi-Ferretti, 2007; Lane and Milesi-Ferretti, 2018; Milesi-Ferretti, 2022). Lastly, it contributes to the literature by both looking at equity- and debt-based components separately and presenting a detailed descriptive analysis of the relation between the euro and the US dollar share in the currency-induced valuation-adjusted IFI measures and the exchange rate.

Chapter 2

The shock absorbing role of cross-border investments: net positions versus currency composition[1]

2.1 Introduction

What is it needed for an economy's external financial position to act as a shock absorber? Is it enough to run small external imbalances? What is the role of its currency composition, geography, and sectoral breakdown? Are external financial positions safer now than before the Global Financial Crisis? What are the main macro-financial and institutional factors associated with the amplitude and volatility of valuation effects?

These are key questions at the centre of the global financial stability debate that the empirical literature has mainly addressed in two ways. One is to focus on net and gross external positions from a flow or stock perspective. The other is

[1] This is a joint work with my supervisor Agustín Bénétrix and Martin Schmitz. This paper was published in Open Economies Review, 2023.

to study the contribution to financial stability of specific dimensions of external positions, such as the currency and sectoral composition or its geography.

There is a large body of literature taking the first approach. This includes papers like Frankel and Rose (1996), Eichengreen, Rose, and Wyplosz (1996), Kaminsky, Lizondo, and Reinhart (1998) and Kaminsky and Reinhart (1999) on early warning systems.[2] It also includes works on sudden stops in financial flows, where net foreign liabilities serve as a metric to proxy financial vulnerabilities. Other papers like Catão and Milesi-Ferretti (2014) show that debtor positions are strongly related with crisis risk, while studies such as Reinhart and Reinhart (2009) focus on capital flow bonanzas and how these relate with global variables.

For the second group of papers, the currency composition of external positions has taken a central role. Research in this field looks at the mechanical effects of exchange rate fluctuations on the value of external assets and liabilities. A well-known branch of this research is the "original sin" literature initiated by Eichengreen and Hausmann (1999), Eichengreen, Hausmann, and Panizza (2003), Hausmann and Panizza (2003), Burger and Warnock (2007), Eichengreen and Hausmann (2010) and Eichengreen, Hausmann, and Panizza (2023), among others.

Motivated by the destabilising role of negative valuation effects, this literature studies the reasons why some countries are unable to borrow internationally in domestic currency. Key factors include poor institutions, policies and weak economic fundamentals.[3] Combining gross stocks and currency of denomination, Cubeddu, Hannan, Rabanal, et al. (2021) show that gross external debt and its

[2]These studies identify the macroeconomic variables that help predict currency crises and document the size of the current account deficit as one of the leading indicators of external crises. Phillips et al. (2013), Cubeddu et al. (2019) and Turrini and Zeugner (2019) also consider (cumulative) current account balances together with benchmark levels and their relation with the stability of external imbalances. This is usually studied in conjunction with cyclical factors, macroeconomic fundamentals, and policy variables. In these studies, current account models build on the extensive literature on the macroeconomic determinants of saving and investment decisions (Debelle and Faruqee, 1996; Chinn and Prasad, 2003; Lee et al., 2008; Coutinho, Turrini, and Zeugner, 2018)

[3]More recently, Du and Schreger (2016) document an increase in the domestic currency borrowing of sovereigns in the last decade by using the dataset of 14 emerging markets.

foreign currency share have a direct impact on the crisis probability of emerging and developing economies.

Beyond the potentially stabilising or destabilising roles resulting from large exchange rate changes, valuation effects can be key for the sustainability of external imbalances. A clear example is the US, exhibiting cumulative current account deficits larger than its net liability position. This is explained by positive valuation effects on its external position associated with its composition and currency of denomination (Lane and Milesi-Ferretti, 2001; Tille, 2003; Lane and Milesi-Ferretti, 2007; Gourinchas and Rey, 2007; Lane and Milesi-Ferretti, 2009; Lane and Milesi-Ferretti, 2018).

Our paper links with this last group of studies. It focuses on the combined role of external stock imbalances, their currency of denomination and how they comove with each other. Our contribution relies on data developments initiated by Lane and Shambaugh (2010a), and is motivated by the stylised fact uncovered by Bénétrix, Lane, and Shambaugh (2015) documenting an *improvement* in the cross-country distribution of foreign-currency exposures. This contributed to limiting the negative impact of valuation effects following the outbreak of the Global Financial Crisis.[4] Using an enhanced version of this data set including 50 countries for the period 1990-2017, Bénétrix et al. (2020) confirm the continued improvement in currency exposures. A decomposition of the key elements driving its dynamics showed that changes in net external positions had a greater role than changes in their currency composition.

Motivated by these findings, we focus on the relation between net positions and currency of denomination to assess the extent to which they reduce or amplify the effects of exchange rate movements on the value of external assets and liabilities. We refer to this as the **shock absorbing role** of external positions. More precisely,

[4]Bénétrix, Lane, and Shambaugh (2015) report that the average valuation loss across all countries in their sample would have been 5.7 percentage points of GDP larger if the currency exposure would have been that of 1996.

we focus on the properties of external positions that reduce the amplitude of exchange rate-related valuation effects. Thus, we take a global financial stability, rather than a country-specific stabilisation perspective.

We find the shock absorption property of external positions to be present in advanced economies. While this was initially not the case for emerging markets, we observe a shift towards shock absorption capacity in recent years.

Our regression-based analysis shows that more developed countries have a higher capacity to absorb exchange rate shocks via the currency mix of their net external positions. This holds both in terms of the general level of economic development and in terms of domestic financial development, in particular within emerging market economies, but also between the advanced and emerging country groups. The underlying mechanism behind enhanced shock absorption capacity is that countries with larger net external funding requirements need to be able to fill the funding needs by issuing more domestic currency liabilities. Before the crisis, external balance sheets were growing and imbalances rising, while domestic currency issuance by EMEs was not very wide-spread.

We report that the capacity to absorb shocks increased over time, which is consistent with the evidence presented in Bénétrix, Lane, and Shambaugh (2015). This is important from a global financial stability perspective as large capital gains for one country could mean large, and potentially destabilising, losses to others. This capacity to dampen the amplitude of large financial wealth redistributions across countries is a desired feature of a stable global financial system. This has become of paramount importance in recent decades as a result of the large and increasing scale of external financial positions.

Our paper is structured as follows. First, we present the conceptual framework to lay the grounds for the proposed shock absorption indicator. Then, we characterise its distribution across countries and time. Then, we provide an analytical

framework to motivate our empirical analysis. This section is followed by a bivariate and multivariate assessment of how our proposed measure relates with conditioning factors. The last section concludes.

2.2 Conceptual framework

Key to our analysis is the amplitude of exchange rate induced valuation effects ($VALXR^{U}_{i,t}$) given by net capital gains on the international investment position of countries as a percentage of their GDP. For our assessment, we follow the definition by Bénétrix, Lane, and Shambaugh (2015)

$$VALXR^{U}_{i,t} = FX^{AGG}_{i,t} * IFI_{i,t} * \%\triangle E^{U}_{i,t}, \tag{2.1}$$

where $IFI_{i,t}$ is the international financial integration indicator proposed by Lane and Milesi-Ferretti (2001), Lane and Milesi-Ferretti (2007), and Lane and Milesi-Ferretti (2018) defined by $IFI_{i,t} = (A + L)/GDP$, with A denoting external assets and L external liabilities. $IFI_{i,t}$ captures the scale of the international investment position which has a direct impact on the the size of the valuation effect. $\%\triangle E^{U}_{i,t}$ records a uniform change in the exchange rate, for instance, a depreciation of the domestic currency vis-à-vis all other foreign currencies. This is captured by the percentage point change in the effective exchange rate index. The latter is traditionally based on weights from bilateral trade (Schmitz et al., 2013) or more appropriately for this exercise on the currency of denomination of external positions, as proposed by Lane and Shambaugh (2010a).

$FX^{AGG}_{i,t}$ is the aggregate foreign currency exposure indicator that we use to develop our shock absorption measure. Our analysis does not focus on the role of $IFI_{i,t}$ which only has a proportional effect on the scale of valuation effects, but does not alter its sign. $IFI_{i,t}$'s properties and determinants have been extensively studied by the literature initiated by Lane and Milesi-Ferretti (2001). We do not focus on $\%\triangle E^{U}_{i,t}$ either. While the exchange rate affects both the direction and

size of the valuation effect, a large body of literature provides evidence on its determinants, levels and dynamics.

Instead, we focus on $FX_{i,t}^{AGG}$ which is key to both the direction and the magnitude of valuation effects and a crucial factor for the assessment of the shock absorption properties of international investment positions. The aggregate foreign-currency exposure indicator is defined as follows

$$FX_{i,t}^{AGG} = w_{Ai,t}^{F} s_{i,t}^{A} - w_{Li,t}^{F} s_{i,t}^{L}, \tag{2.2}$$

where $w_{Ai,t}^{F}$ and $w_{Li,t}^{F}$ are the proportions of assets and liabilities denominated in foreign currency, $s_{i,t}^{A}$ is the relative importance of external assets $A/(A+L)$ while $s_{i,t}^{L}$ captures the relative importance of liabilities $L/(A+L)$.

As discussed in Bénétrix, Lane, and Shambaugh (2015) and Bénétrix et al. (2020), the $FX_{i,t}^{AGG}$ indicator ranges from -1 to +1. The former denotes the extreme case of a country "short foreign currency" with all external liabilities denominated in foreign currency and assets in domestic currency. The latter is the extreme case where all external liabilities are denominated in domestic currency, while all assets are in foreign currency. A home currency depreciation generates negative valuation effects if $FX_{i,t}^{AGG}$ is below zero and positive ones if $FX_{i,t}^{AGG}$ is above zero.

Fundamental to our assessment are two dimensions. First, countries exhibiting the same proportions of assets and liabilities denominated in foreign currency, may still be exposed to exchange rate risk via their overall net external position. If the proportions of assets and liabilities in foreign currency are the same ($w_{Ai,t}^{F} = 0.7$ and $w_{Li,t}^{F} = 0.7$) and the country is a net debtor ($(A_{i,t} - L_{i,t})/(A_{i,t} + L_{i,t}) = -0.5$), then the $FX_{i,t}^{AGG}$ indicator will be negative (-0.35) and a currency depreciation will generate a valuation loss. Second, countries exhibiting a balanced net external position ($s_{i,t}^{A} = s_{i,t}^{L} = 0.5$), but showing differences in the proportions of

assets ($w^F_{Ai,t}$) and liabilities ($w^F_{Li,t}$) denominated in foreign currency, will exhibit different valuation effects for the same exchange rate movement.

In order to isolate these two channels it is possible to reformulate $FX^{AGG}_{i,t}$ as

$$FX^{AGG}_{i,t} = \frac{(A_{i,t} - L_{i,t})}{(A_{i,t} + L_{i,t})} + [w^{DC}_{Li,t}\frac{L_{i,t}}{(A_{i,t} + L_{i,t})} - w^{DC}_{Ai,t}\frac{A_{i,t}}{(A_{i,t} + L_{i,t})}] \tag{2.3}$$

where $w^{DC}_{Ai,t}$ and $w^{DC}_{Li,t}$ are the proportions of external asset and liabilities denominated in *domestic* currency.[5] Expression (2.3) can be re-written as

$$FX^{AGG} = \frac{(A - L)}{(A + L)} + FX^{AGG}_o. \tag{2.4}$$

From here onward, we refer to $\frac{(A-L)}{(A+L)}$ as the "**net position**" and to FX^{AGG}_o as the "**currency mix**". The latter is the net external liability position in domestic currency relative to size of the external balance sheet. FX^{AGG}_o can also be interpreted as the pure currency exposure which is independent of the sign of the aggregate net position (i.e. independent of the country being an external creditor or debtor).

These two terms are at the centre of our shock absorption indicator which studies their interrelation to provide information on the capability of countries to hedge exchange rate risk in their external balance sheet via the currency composition. Assuming that the three terms defined in Equation (2.4) can be considered as random variables, our goal of finding the conditions that reduce $VALXR^U_{i,t}$ fluctuations for given $IFI_{i,t}$ and $\%\triangle E^U_{i,t}$, can be based on the last term of the equation below:

$$var(FX^{AGG}) = var[\frac{(A - L)}{(A + L)}] + var[FX^{AGG}_o] + 2cov[\frac{(A - L)}{(A + L)}, FX^{AGG}_o] \tag{2.5}$$

[5] For further details on this decomposition and interpretation see Lane and Shambaugh (2010b) and Bénétrix, Lane, and Shambaugh (2015).

While fluctuations in net positions and the currency mix affect the direction and magnitude of valuations effect, we zoom in on how the hedging of currency risks of external positions affects valuation effects. To that end we interpret that a country's external position has shock absorption properties via hedging exchange rate risk when the net position and the currency mix co-move negatively. Hence, for the remainder of the paper we state that the external position absorbs shocks when

$$\rho = corr[\frac{(A-L)}{(A+L)}, FX_o^{AGG}] < 0. \tag{2.6}$$

The existing literature centres around the stabilising or destabilising roles of valuation effects by considering aggregate foreign currency exposures, which indicate the direction and size of the change in external imbalances resulting from exchange rate shocks. However, this approach is not useful to study the way in which changes in net positions and currencies contribute to the amplitude of the valuation effect. Having shock absorber properties in external positions is a desired feature to reduce the impact of exchange rate shocks on global imbalances.

The example below illustrates that looking at aggregate net external positions and currency exposures may not be enough. These indicators can mask undesired features of countries' international investment positions associated with how net positions and currency weights evolve and co-move.

Take for instance the US and Chile. Both countries are long foreign currency, with an average 1990-2017 $FX_{i,t}^{AGG}$ indicator of 0.19 and 0.15, respectively. In addition, they have been net debtors throughout the analysed period. Average net positions $(A-L)/(A+L)$ are -0.09 and -0.17 for the US and Chile, respectively. While both countries are similar in terms of their negative external positions and long foreign currency exposure, they differ in their hedging capabilities via the currency mix FX_o^{AGG}.

The US net position and currency mix co-move negatively ($corr = -0.75$). Its external position has a shock absorber role: an **increase** in its net liability position is associated with an **increase** (*decrease*) in the proportion of liabilities denominated in domestic (*foreign*) currency. This reduces the potential scale of aggregate valuation effects associated with US dollar movements. The deterioration in the net foreign asset position is partially hedged by the change in the currency mix. On the other hand, Chile's net positions and currency mix positively co-move ($corr = +0.20$). An **increase** in its net liability position is associated with a **decrease** (*increase*) in the proportion of liabilities denominated in domestic currency (*foreign*) currency. This increases the potential scale and volatility of valuation effects generated by movements of the Chilean Peso. In line with this, valuation effects volatility was much larger for Chile than for the US. Their standard deviation during the 1990-2017 period was 0.54 and 2.51 for the US and Chile, respectively.

2.3 Descriptive evidence

Figure 2.1 illustrates the unconditional correlation between the volatility of exchange rate induced valuation effects (based on its standard deviation) and the correlation between the net position and currency mix (with all variables being computed over the 1990-2017 period). Overall, there is evidence of a positive correlation between the two variables.[6] Hence, a lower (i.e. more negative) correlation between the net position and the currency mix is associated with lower volatility in the valuation effect. This finding supports the conjecture that our indicator takes the role as a shock absorber or amplifier.

However, Figure 2.1 also reveals that there are additional factors at play in explaining valuation effect volatility. For instance, Turkey and the Netherlands

[6]The slope coefficient from a bivariate regression for the complete country sample is statistically significant and equal to 1.42. The slope coefficients for the advanced and emerging country samples are statistically significant and equal to 0.82 and 2.62, respectively, while the R^2s are 0.47 and 0.57 for advanced countries and EMEs, respectively.

show low positive correlations between net positions and the currency mix, while the valuation effect volatility is much higher for Turkey.

Table 2.1 shows the mean, median and interquartile range of the shock absorption indicator (i.e. the correlation coefficient between $(A-L)/(A+L)$ and FX_o^{AGG}) for the advanced and emerging country groups over different time periods: the full period 1990-2017, 1990-1999, 2000-2007, and 2008-2017.[7] Since there are fundamental differences between these two country groups in terms of their institutions, economic policies and international role of the domestic currencies, we present these statistics both for the full sample and separately. We consider the 1990–1999 period as the "pre-euro" period, while 2008 marks the year of the Global Financial Crisis (GFC) and we hence refer to 2000-2007 and 2008-2017 as the pre-crisis and post-crisis periods, respectively. The post-crisis period in particular is crucial because of the heterogeneous retrenchment in international capital flow across type of flows, regions and nationality.[8]

For the full period, advanced countries show negative mean and median correlations between the net position and the currency mix, implying that larger (smaller) net external liabilities are associated with a higher (lower) proportion of domestic currency in liabilities than in assets. This suggests that external positions are able to absorb exchange rate shocks since the currency risk of external positions is hedged via the currency of denomination of assets and liabilities. However, this is not the case for emerging economies (EMEs) which show positive mean and median correlations between $(A-L)/(A+L)$ and FX_o^{AGG}. Larger net external liabilities are hence associated with a lower proportion of domestic currency in liabilities than in assets. Here, the external position exacerbates the

[7]For comparability purposes, we use the Advanced-Emerging country classification from Bénétrix et al. (2020). We also compute Table 2.1 including Korea, Singapore, Hong Kong, Israel (reclassified by the IMF as advanced in 1997) and Czech Republic (reclassified by the IMF as advanced in 2009) in the advanced country group. Table 2.1 based on this classification produces similar results.

[8]The crisis brought a more persistent and sharper decline in capital inflows for countries with large pre-crisis external liabilities, especially for advanced economies (Milesi-Ferretti and Tille, 2011; McQuade and Schmitz, 2017). McCauley et al. (2019) report the central role of European banks in driving the retreat of international lending after 2007.

valuation shocks resulting from exchange rate movements. However, small negative correlations emerge in the interquartile range indicating that net position and currency mix have a negative correlation at least for some EMEs.

Another way of analysing the shock-absorption properties of external positions across countries is by plotting the cumulative distribution of our indicator as reported in Figure 2.2. In line with the evidence previously discussed, almost half of the countries show a negative correlation, while most countries with positive correlations are EMEs.

In terms of differences across time, Table 2.1 shows that in all periods, the mean and median correlations are negative for advanced countries. In the pre-euro period, the interquartile range is wide with correlations from -0.67 at the 25th percentile to 0.18 at 75th percentile. For the pre-crisis period, we observe the highest negative mean (-0.54) and median (-0.75) correlations. Hence, the external position acts consistently as a shock absorber for advanced countries. For EMEs, the mean correlations are negative, but small, in the pre-euro and pre-crisis periods, while the medians are positive. In the post-crisis period however, the weak negative mean correlation becomes stronger, while the median correlation even turns from positive to negative. Hence, the external positions of EMEs show shock absorption properties towards the end of our sample period.

As a complement to the evidence presented in Table 2.1, Figure 2.3 reports the cumulative cross-country distribution during the pre-euro and post-crisis subperiods. At the full distribution level, we observe a significant shift in the role of external imbalances towards shock absorption across time, with a much higher proportion of countries showing negative correlations toward the end of the sample period. On the one hand, Figure 2.3 shows that 54 percent of countries showed negative correlations, with 36 percent of the whole sample exhibiting strongly negative correlations of less than -0.5 in 1990-1999. On the other hand, the period 2008-2017 is characterised by 74 percent of the sample showing shock-absorption properties in their external positions, with 52 percent of countries exhibiting a

negative correlation below -0.5. EMEs where the main driver of this shift: while 12 out of the 29 EMEs covered in our sample had negative correlations in 1990-1999, this number increases to 20 in 2008-2017.[9]

2.3.1 Discussion

The first question resulting from the descriptive evidence is which factors can explain the observed difference between advanced and emerging economies. The correlation between net positions and the currency mix is highly related to the ability to borrow from foreigners in domestic currency. EMEs with negative net external positions are deemed inherently riskier, which reduces their ability to issue liabilities in domestic currency. Country risk is generally related to the levels of economic and financial development, international integration and the quality of policies and institutions.[10]

The theoretical literature emphasises the critical roles of the credibility of policies as well as inflation and real exchange rate fluctuations in determining the currency composition of external balance sheets.[11] In EMEs in particular, the government and the corporate sector face the issue that issuing liabilities in domestic currency is associated with incentive problems. These problems relate to higher cost of debt resulting from investors' demand for a risk premium and governments' tendency to pursue loose economic policies ex-post, leading to higher inflation and thereby decreasing the real value of domestic currency debt. Firms can minimise their default probability only in an environment of credible monetary and fiscal policies. Moreover, there is a strong preference by international

[9]The only EMEs for which the correlations turn from negative to positive are Argentina, Singapore and Tunisia. On the contrary, the correlations change from positive to negative for Turkey, South Africa, Brazil, Mexico, Peru, Sri Lanka, India, Pakistan, Thailand, Russia, and Poland. Only 6 out of 21 advanced countries (Denmark, France, Sweden, Japan, Greece, and New Zealand) had a positive correlation in period 1990-1999, while this number drops to 4 in the period 2008-2017. Advanced countries with positive correlations for this period are Denmark, the Netherlands, Sweden and New Zealand.

[10]One can also make a reverse causality argument borrowed from the "original sin" literature (e.g., Eichengreen and Hausmann, 2010) as countries that cannot issue debt in domestic currency are riskier.

[11](Jeanne, 2003; Engel and Park, 2018; Ottonello and Perez, 2019; Du, Pflueger, and Schreger, 2020)

investors to hold assets in the major international currencies, in particular the US dollar which is the dominant currency in bank funding, corporate borrowing and central bank reserve holdings (Maggiori, Neiman, and Schreger, 2020; Gopinath and Stein, 2021; Laser and Weidner, 2022; Iancu et al., 2023) as well as for invoicing international trade. The large global demand for the US dollar makes borrowing in US dollars cheaper than in local currency.[12]

The second question emerging from the descriptive analysis relates to the reasons for the observed striking changes in the correlation of EMEs when moving from the pre-crisis period to the post-crisis period. Importantly, EMEs have frequently adopted managed exchange rate flexibility, inflation targeting, a prudent management of international reserves and macroprudential policies in the late 1990s and 2000s, which softened the negative impact of the Global Financial Crisis of 2008. After the crisis, the US and the euro area embarked on expansionary monetary policies, while investors searched for yield globally. These developments alleviated the "original sin" and improved emerging countries' borrowing capabilities in both hard and domestic currency (Aizenman et al., 2020; Hale and Juvenal, 2020; Hale, Jones, and Spiegel, 2020). Furthermore, as pointed out by Ottonello and Perez (2019), there is a degree of cyclicality in the currency composition of external debt, implying that the share of debt denominated in local currency is higher during economic booms. Consistent with this theory, the post-crisis period saw economic growth and disinflation in emerging economies, while the share of debt denominated in local currency increased, both for governments and private sector borrowers.

2.4 Analytical framework

Exchange rate fluctuations are key determinants for valuation effects associated with cross-border financial positions and international risk sharing patterns. This

[12]Moreover, EMEs tend to accumulate foreign exchange reserves as a protection against external shocks (Alfaro and Kanczuk, 2019), in particular in US dollars because of precautionary motives and exchange rate management considerations.

is a central takeaway in Lane and Shambaugh (2010b) from which we borrow their analytical framework to motivate our empirical analysis.

To that end, we reproduce their adaptation of Davis, Nalewaik, and Willen (2001)'s small open economy model to motivate our choice of explanatory variables. A key assumption of this two-period endowment model is that the first period endowment is fixed and the second period endowment is stochastic. This is well aligned with textbook models to study international risk sharing.

More precisely, the process determining the endowment in the second period is given by

$$y_2 = \bar{y} + \beta_y S + \epsilon, \tag{2.7}$$

where S is the rate of depreciation in the second period, β_y is the regression coefficient of y_2 on S and ϵ is the stochastic shock. As assumed in Davis, Nalewaik, and Willen (2001), there are two assets available in this economy and consumption takes place in period 2 only. The first asset (D) is denominated in domestic currency while the second (F) is denominated in foreign currency. The gross return of the domestic currency asset is fixed ($R_D = \bar{R}$) while the domestic currency return of the asset denominated in foreign currency is equal to

$$R_F = \alpha_F + \beta_F S + \nu. \tag{2.8}$$

β_F is the regression coefficient of R_F on S and ν is the orthogonal shock.

This simple framework is useful to derive the foreign-currency denominated equilibrium holdings of asset F as a function of the regression coefficients β_y and β_F in equation (2.7) and (2.8), respectively.

Since consumption takes place in period 2 only, the representative agent maximises the following utility function

$$U(c_2) = \beta \left(\frac{-1}{A} \right) E \left[e^{-Ac_2} \right], \tag{2.9}$$

where β is the subjective discount factor, A is the coefficient of absolute risk aversion and c_2 is given by

$$c_2 = y_2 + (\omega_D R_D + \omega_F R_F). \tag{2.10}$$

ω_D and ω_F are the domestic currency denominated and foreign currency denominated portfolio allocations. Since the second period output y_2 and the return in the foreign currency denominated are jointly normally distributed, the optimality condition can also be written as

$$ACov(c_2, R_F) = E(R_F) - R_D = RP, \tag{2.11}$$

where RP stands for the risk premium. Thus, the optimal portfolio allocation implies that the equilibrium consumption in the second period can then be written as

$$c_2 = \alpha + \beta_c R_F + \psi, \tag{2.12}$$

where $\beta_c = \frac{RP}{AV(R_F)}$ is the representative agent's desired exposure to the foreign currency denominated asset and $V(R_F)$ is the variance of the return on the foreign-currency asset. An implication of equation (2.12) is that when the foreign currency asset offers a risk premium the representative agent will want some positive exposure to that asset. If the risk premium is zero, the representative agent will prefer a consumption profile with no currency risk. Equation (2.7) above indicates that the agent's endowed exposure to the foreign currency asset is β_y.

Thus, the optimal portfolio allocation to the foreign asset is

$$\omega_F = \beta_c - \beta_y, \tag{2.13}$$

where

$$\omega_F = \frac{RP}{AV(R_F)} - \frac{Cov(y_2, S)}{V(S)} \tag{2.14}$$

This means that the optimal foreign-currency position in the portfolio depends positively on the risk premium offered by the foreign currency denominated asset and the volatility of the exchange rate and negatively on the degree of risk aversion, the foreign-currency asset return volatility and the covariance between output in the second period and the exchange rate. The latter means that when the covariance between output and exchange rate is negative (e.g. a depreciating currency when output is low), the optimal portfolio share for the foreign currency denominated asset is positive, regardless of whether the risk premium is zero or not. If the covariance between the exchange rate and output is positive, the representative agent can be short in the foreign currency denominated asset even if its risk premium is positive.

According to equation (2.14), the foreign currency position should be a function of the covariance between output and the exchange rate as well as the volatility of the exchange rate. Moreover, to explicitly differentiate the role of real and nominal exchange rate, volatility of inflation should be accounted for.

2.5 Empirical analysis

2.5.1 Bivariate evidence

In this section, we assess the extent to which the shock absorption role is associated with a set of macroeconomic variables, in particular to macroeconomic risks, economic development, financial integration and the quality of policies and institutions. As a first step we inspect visually the unconditional correlations between

the shock absorption measure and relevant macroeconomic variables.[13]

Following the previous analytical framework, we assess the role of macroeconomic risks by focusing on GDP volatility, the covariance between the exchange rate and GDP, the volatility of inflation, and the exchange rate over the non-overlapping periods 1990-1999, 2000-2007 and 2008-2017. Volatility is measured by the coefficient of variation.[14] Moreover, we include GDP per capita as a proxy for the level of economic development.[15] To measure financial integration, the financial institutions index (FIX) and the IFI indicator are employed. FIX, calculated by Sahay et al. (2015), summarises how developed financial institutions are in terms of size, access to markets and efficiency.[16] Rule of law (RL) and regulatory quality (RQ), compiled by Kraay, Kaufmann, and Mastruzzi (2010), are used as indicators for the quality of policies and institutions. While RL captures perceptions of the extent of confidence in the rules of the society, the quality of contract enforcement and property rights, RQ captures the ability of governments to formulate and implement sound policies and regulations. RL and RQ are computed by taking the mean over each period.

Figure 2.4 illustrates the correlation between the absorption role of external positions (i.e. the correlation between the net position and the currency mix) and the risk block indicators. Figure 2.4a shows a positive – although insignificant – correlation (0.05) between shock absorption and GDP volatility with an insignificant coefficient of 0.16 from the bivariate regression. Figure 2.4b illustrates a positive correlation between shock absorption and covariance of GDP and exchange rate, with a significant slope coefficient of 0.72 from a bivariate regression.[17] Figure 2.4c presents the correlation between inflation volatility and shock absorption.

[13] Table A.2 provides a list of the sources for all variables used in the analysis.

[14] Exchange rate volatility is based on the monthly nominal effective exchange rate.

[15] GDP per capita is computed by taking the logarithm of the ratio between the sum of GDP and the sum of the population for each period.

[16] Unlike indicators such as the ratio of private credit to GDP or stock market capitalization to GDP, FIX takes into account the complex multidimensional nature of financial development. IFI is computed by taking the log of the ratio of the sum of external assets and liabilities to the sum of GDP for each period.

[17] When Turkey and Brazil are omitted from the sample as outliers, the significance of the coefficient increases.

We observe a positive correlation with a statistically significant slope coefficient (resulting from a bivariate regression) of 0.18.[18] In Figure 2.4d we find a positive correlation between the shock absorption indicator and NEER volatility, with a slope from a bivariate regression of 1.11. Hence, destabilising shock absorption is associated with high exchange rate volatility.

Figure 2.5 shows the unconditional correlation between the absorption indicator and GDP per capita. Since the correlation between these two indicators is negative (the slope term of bi-variate regression is -0.16 and statistically significant), a higher level of economic development is associated with an increased shock absorption role. Figure 2.6a illustrates that the correlation between the shock absorption indicator and the financial institutions index (FIX) is negative (with a statistically significant coefficient of -1.03). Hence, higher domestic financial development level is associated with a shock absorber role of external positions. We also find a statistically significant negative correlation (-0.18) for the IFI indicator, implying that the shock absorption role of external positions is increasing with international financial integration (Figure 2.6b).

Finally, for institutional quality Figure 2.7 shows a negative correlation between the shock absorption indicator and RL and RQ with statistically significant slope coefficients of -0.19 and -0.21, respectively. A greater capacity for shock absorption is hence associated with higher institutional quality.

All in all, the evidence from a simple correlation analysis suggests that the shock absorption capacity of external positions is higher for economically and financially developed countries, for those more financially integrated with the rest of the world, with a higher level of institutional quality and lower exchange rate volatility.

[18] When omitting Brazil, Japan, Peru, Poland and Russia as outliers with excessive inflation volatility, we lose significance, but the coefficient turns negative (-0.07). Japan's relatively high volatility results from a low mean (0.45) rather than a high standard deviation (1.19) for the period 1990-2017.

2.5.2 Regression models

Next we analyse the role of risk characteristics, the development level, financial integration and institutional factors for the shock absorption indicator in a cross-country regression setting.[19] We run regressions of the form

$$C_i = \alpha + \beta R_i + \gamma D_i + \delta F_i + \theta I_i + \varepsilon$$

where the dependent variable is the correlation between the net external position $(A - L)/(A + L)$ and the currency mix FX_o^{AGG} for the periods between 1990 and 1999, 2000 and 2007, and 2008 and 2017. R_i is the risk block matrix, including GDP volatility, the covariance between GDP and exchange rate, inflation volatility, and exchange rate volatility. D_i is the development block, including GDP per capita. F_i is the financial integration block, including the financial institutions index and international financial integration. I_i is the institutions block, including the rule of law indicator.[20]

We follow a two-step approach. First, we analyse the full sample using data pooled over the full time period and the key subperiods presented before. Second, we perform separate regressions for the advanced and emerging country groups.

In Table 2.2, higher GDP volatility is associated with a greater capacity for shock absorption. When GDP volatility is larger, the shock absorption indicator is more negative. This relation emerges when data for the full 1990-2017 period are included. However, it varies across sub-periods, with the pre-crisis period (2000-2007) explaining the bulk of this relation, while the pre-euro (1990-1999) and the post-crisis (2008-2017) periods show negative but insignificant coefficients.

[19] The analysis of the determinants of the shock absorption indicator encounters an endogeneity issue, and we are examining a correlation rather than establishing a causal link.

[20] Since RL and RQ are highly correlated governance indicators, we include only RL, which proves to be more significant than RQ.

A second measure in the risk block is the covariance between GDP and exchange rate and it is statistically insignificant for the full and sub-periods. A third dimension capturing macroeconomic risk is inflation volatility. While this variable is insignificant for the full time period, a very interesting pattern emerges in the sub-period analysis. During the pre-crisis period 2000-2007, higher inflation volatility is associated with a shock amplifier role for external positions, while this relation becomes negative from 2008 onward. Inflation volatility is hence negatively linked with the absorption measure indicating that in the latter years of the sample countries with a higher inflation risk had external positions with better shock absorbing capacity. The final measure in the risk block is nominal exchange rate volatility for which do not find a statistically significant relation, neither in the full nor in the different sub-periods.

We find a negative and statistically significant coefficient for the level of economic development (as proxied by GDP per capita). This suggests that more developed economies exhibit structures in their cross-border positions that mitigate the effect of exchange rate shocks via valuation effects. Column (1) of Table 2.2 shows that this is the case for the full period, while column (2), (3) and (4) reveal that this relation is mostly driven by the 2000-2007 sub-period.

With regard to the role of financial development and financial integration, we find that the former is positively associated with enhanced shock absorption capacity over the full period, driven mostly by the latter part of the sample. On the other hand, more financial integration seems to have contributed to a destabilisation role of external positions in the pre-crisis period when international balance sheets were building up rapidly.

Finally, we consider the institutions block, which is proxied by the rule of law indicator. The positive coefficient for the full time period yields a counterintuitive result, which contrasts with the evidence presented in the bi-variate scatter plots, as it suggest that higher institutional quality is associated with a destabilisation

role of external positions.[21]

Next, we investigate the country group dimension as reported in Tables 2.3, 2.4 and 2.5. There is only weak evidence of our variables having a statistically significant impact for advanced economies which could be due to the small sample size and relatively high homogeneity across the country sample. For the full period, we find that higher GDP and inflation volatility are associated with a larger shock absorbing role of external positions. This is also found for exchange rate volatility, but only in the post-crisis period. Again, rule of law shows a marginally significant counter-intuitive coefficient.

For emerging market economies (Table 2.4) we first observe – as for advanced economies – that higher GDP volatility is associated with a larger shock absorbing role of external positions, which is driven by the time period until the outbreak of the crisis. Second, higher inflation volatility is a shock amplifier for external positions since the pre-crisis period. This may suggest that advanced economies' external balance sheets have become more capable of absorbing larger swings in the exchange rate in the latter part of the sample. Third, GDP per capita is significant during the 2000-2007 period with the expected negative sign (i.e. more developed economies have external balance sheets with a higher shock absorbing capacity). Forth, domestic financial development is statistically significant from 2008 onward and conducive to absorbing exchange rate shocks. Fifth, rule of law effect is only significant in the full period and during the early part of the sample, again with a positive coefficient.

As a final exercise, we compare the country groups in Table 2.5 by including a country dummy for emerging countries and reporting its coefficient together with those for the interactions with all conditioning factors. For the full period, the only statistically relevant difference is for inflation volatility. Advanced

[21] The inclusion of GDP per capita changes the rule of law coefficient from negative to positive as rule of law and GDP per capita are strongly correlated.

economies with higher inflation volatility are associated with a stronger shock absorption capacity of the external position than emerging economies. As regards the sub-periods, we find that the link with GDP volatility is different for EME as higher GDP volatility is associated with more absorption capacity in 1990-1999. The final period yields interesting differences too. Emerging economies with higher GDP volatility are associated with a stronger shock absorption capacity of the external position than advanced economies. In addition, for advanced economies, exchange rate volatility is strongly associated with more shock absorption via external positions while for EMEs it relates with a destabilising role. This is also the case for inflation volatility as relative to advanced economies, it is associated with a destabilising role in the full and latest period for EMEs.

Overall, we find evidence that more developed countries have a higher capacity to absorb exchange rate shocks via the currency mix of their net external positions. This holds both in terms of the general level of economic development and in terms of domestic financial development, in particular within emerging market economies, but also between the advanced and emerging country groups. The underlying mechanism behind enhanced shock absorption capacity is that countries with larger net external funding requirements need to be able to fill the funding needs by issuing more domestic currency liabilities. Before the crisis external balance sheets were growing and imbalances rising, while domestic currency issuance by EMEs was not very wide-spread.

2.5.3 Robustness checks

In order to check the validity of the main results in Tables 2.2 to 2.5, we conduct a number of robustness tests.

Our default standard errors are robust. However, we also run the main specifications using conventional standard errors which does not change the confidence levels considerably. Only the coefficients of the risk block variables for advanced

countries (Table 2.3) become statistically insignificant if we use conventional standard errors.

To test the robustness of our specifications to potential variable omission, we add to the regressions two variables separately. First, we add the Chicago Board Options Volatility Index (VIX). This variable is a proxy for global risk aversion in which lower values indicate greater tolerance for risk-taking. By including the VIX, we take into account the global market risk and investment sentiment. This variable is calculated by taking its mean for the non-overlapping windows of sub-periods. The VIX is a time-varying variable common across countries. Therefore, we include it only in the regressions that cover all three sub-periods (i.e. in the first columns of Tables 2.2, 2.3 and 2.4). We do not find a statistically relevant link between the absorption role of external position and VIX. Moreover, we add an EMU membership dummy variable, which takes the value 1 if the country is a member of the European Monetary Union, and 0 otherwise. Although exchange rate volatility captures the movements in the exchange rates from an ex-post perspective, it might not be enough to capture expectations on exchange rate movements from an ex-ante perspective. Since all EMU members are advanced countries, we only include this variable in the regressions for the full sample and in those for advanced countries. However, the EU membership dummy remain insignificant in these estimations.

Robustness is also checked with respect to alternative indicator for exchange rate volatility. We consider the domestic currency per US dollar exchange rate as an alternative to the NEER for exchange rate volatility measurement across all specifications from Tables 2.2 to 2.5.[22] As in the case of NEER volatility, we do not find a statistically significant relation, neither in full nor in the different sub-periods. The results do not change for the different county groups.[23]

[22]For the US, domestic currency per Deutsche Mark and euro is used for the pre-euro and euro periods, respectively.

[23]We include Chin-Ito capital openness index (Chinn and Ito, 2006) within the financial integration block as an additional control variable. However, we do not find a statistically significant relation, neither in the full nor in the different sub-periods.

In our main results, the relationship between the shock absorption and an index of rule of law compiled by Kraay, Kaufmann, and Mastruzzi (2010) is not robust to the inclusion of other variables such as GDP per capita. Thus, we also experiment by using an index of creditor rights assembled by Djankov, McLiesh, and Shleifer (2007) which is more directly related to credit market imperfections. This yields similar results with positive coefficients for the full sample and advanced country group, although the sample size is more limited, covering only 1990-2002. However, it is only significant for the advanced country sample. This is not surprising, given the fact that indices of institutional quality are strongly correlated with the level of development.

We also check the sensitivity of our estimates by excluding the outliers in terms of inflation volatility. We drop Japan, Peru, Poland, Russia and Brazil from the sample, but do not observe any significant changes in the full period (1990-2017). However, for the regressions in the period 1990-1999, both inflation volatility and exchange rate volatility turn from insignificant to significant for the full country sample as well as for the emerging country sample. While higher inflation volatility is linked to a stabilisation role for external positions, exchange rate volatility is linked to a destabilisation role for external positions during 1990-1999, once we exclude the outliers.

2.6 Conclusions

This paper offers a number of contributions by studying how external imbalances and their currency mix determine the amplitude of valuation effects. More specifically, we put the focus on how net external positions are hedged against exchange rate shocks via their currency composition. We study how this property evolved over time across country groups, as well as how it is linked with key macro-financial factors.

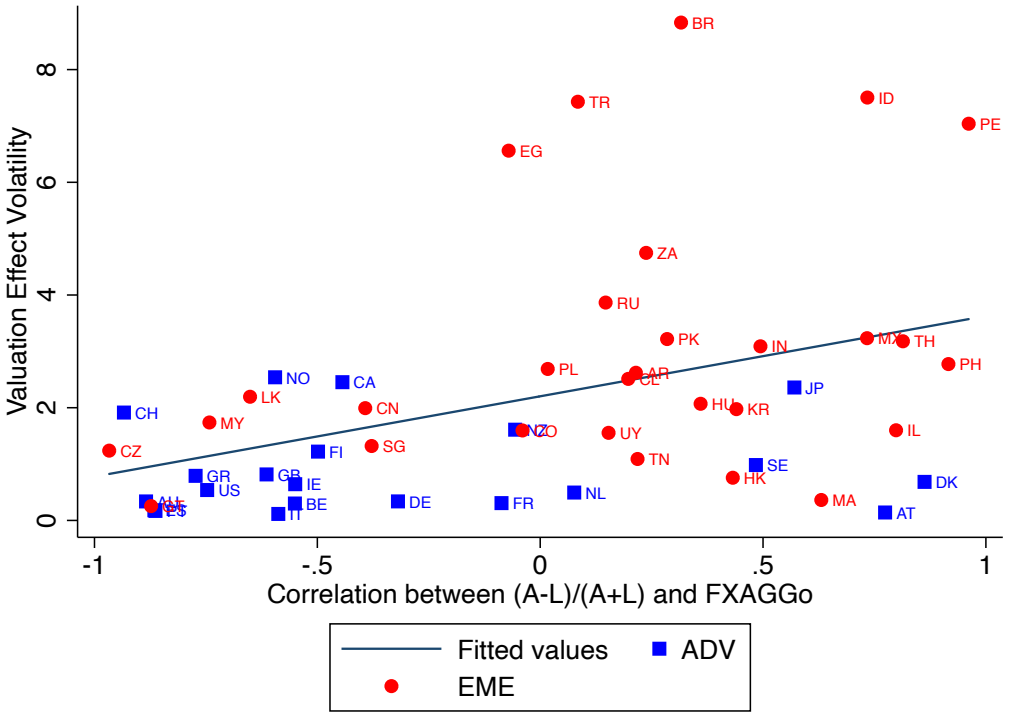
We document that advanced economies exhibited shock absorption properties in

their external positions throughout the full 1990-2017 period. The currency structure of their external positions contributed to reducing the amplitude of valuation effects. By contrast, emerging market economies showed external positions that contributed to increasing the amplitude of valuation effects. However, this pattern changed since the Global Financial Crisis with most EME countries clearly exhibiting shock absorption properties since.

Our regression-based assessment shows that more developed countries have a higher capacity to absorb exchange rate shocks via the currency mix of their net external positions. This holds both in terms of the general level of economic development and in terms of domestic financial development, in particular within emerging market economies, but also between the advanced and emerging country groups. The underlying mechanism behind enhanced shock absorption capacity is that countries with larger net external funding requirements need to be able to fill the funding needs by issuing more domestic currency liabilities. Before the crisis external balance sheets were growing and imbalances rising, while domestic currency issuance by EMEs was not very wide-spread.

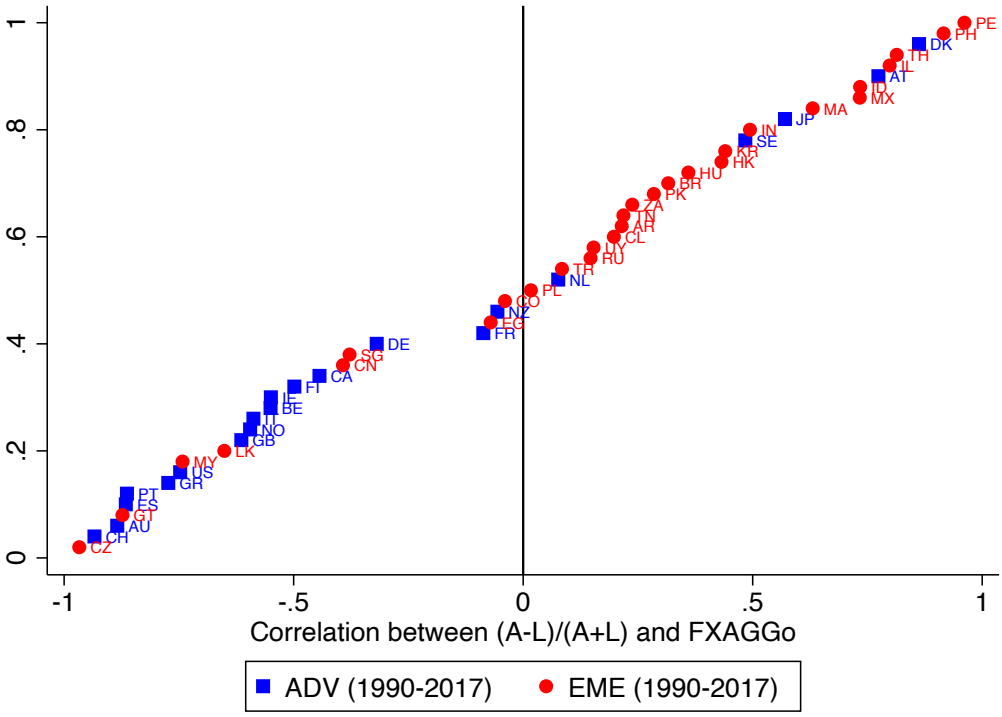
While related research has mainly focused on large net debtor positions and the direction of valuation effects, our paper is the first to systematically include the currency composition into a cross-country framework to study the way in which it affects the amplitude of valuation effects. In light of the continuously increasing size and complexity of cross border financial positions, such studies have become central for the assessment of global financial stability.

Figure 2.1: Exchange rate shock absorption



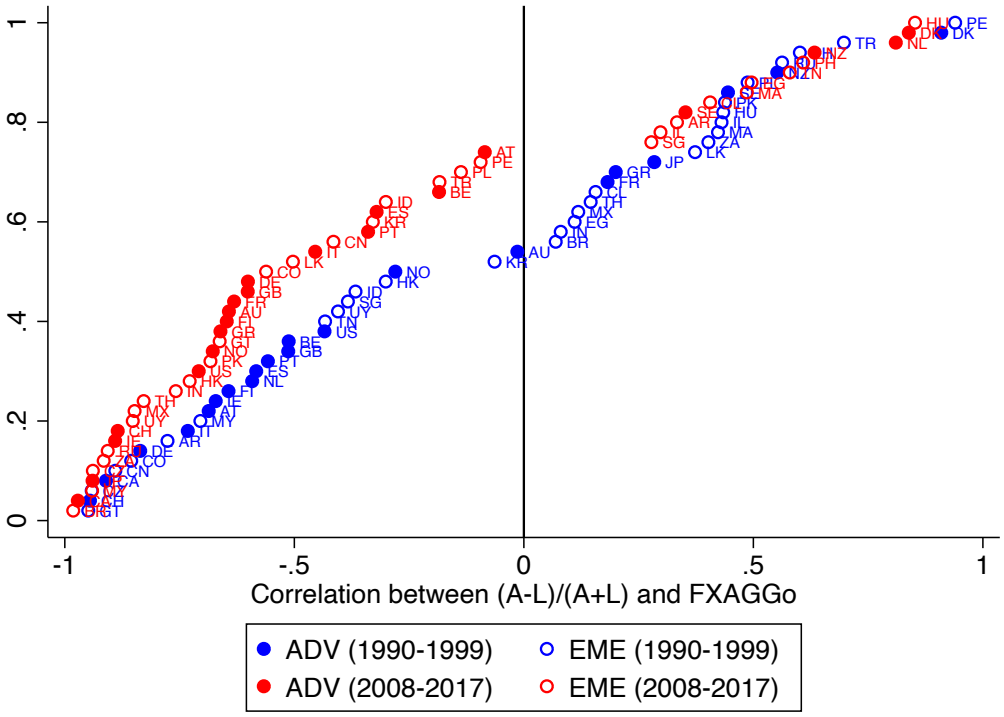
Note: Valuation effect volatility is the standard deviation of the exchange rate induced valuation effects based on data for 1990-2017. Valuation effect data is obtained from Bénétrix et al. (2020). It indicates the net capital gain on the existing holdings of foreign assets and liabilities associated with exchange rate movements. This is defined by $VALXR^{U}_{i,t} = FX^{AGG}_{i,t} * \%\triangle E^{U}_{i,t}$, where $FX^{AGG}_{i,t}$ is aggregate foreign currency exposure and $\%\triangle E^{U}_{i,t}$ is the percentage change in the uniform exchange rate. For the presentation purposes, we prefer to exclude $IFI_{i,t-1}$ (total size of the external balance sheet scaled by GDP) which affects the scale of valuation effects but does not change its sign. The correlation between $(A-L)/(A+L)$ and FX^{AGG}_{0} based on data for 1990-2017. The correlation between these is 0.40.

Figure 2.2: Long term dynamics: Correlation between the net foreign asset and foreign currency mix, 1990-2017



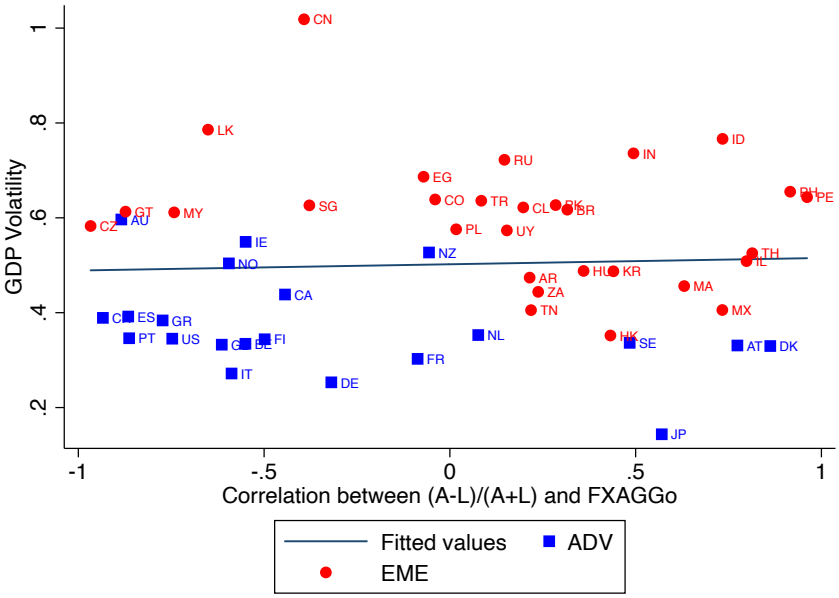
Note: Cumulative distribution for the correlation between $(A-L)/(A+L)$ and FX_o^{AGG}. Correlation is measured on the horizontal axis and ranges between -1 and 1. The vertical axis measures the cumulative distribution, or the proportion of countries, below each correlation value in the horizontal axis.

Figure 2.3: Long term dynamics: Correlation between the net foreign asset and foreign currency mix, 1990-1999 vs 2008-2017

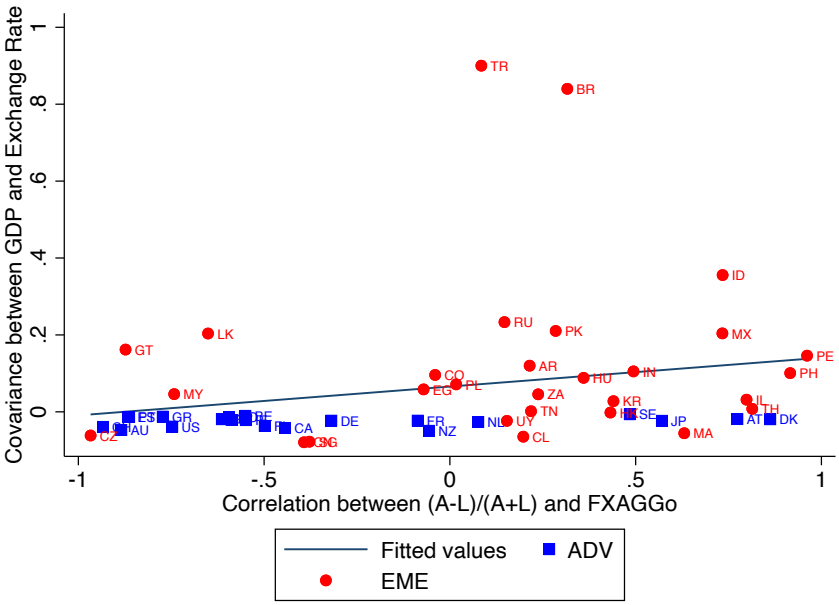


Note: Cumulative distribution for the correlation between $\frac{(A-L)}{(A+L)}$ and FX_o^{AGG}. Correlation is measured on the horizontal axis and ranges between -1 and 1. The vertical axis measures the cumulative distribution, or the proportion of countries, below each correlation value in the horizontal axis.

Figure 2.4: Risk Block

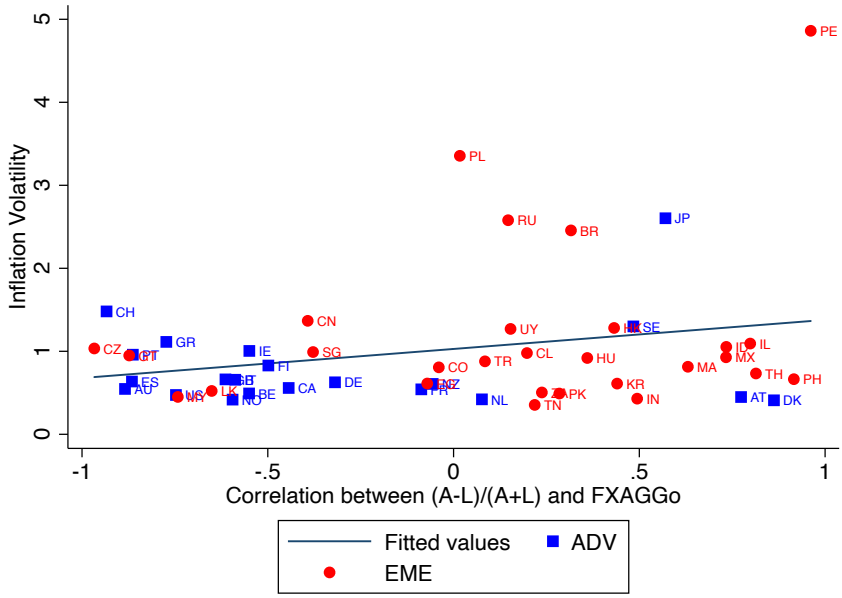


(a)

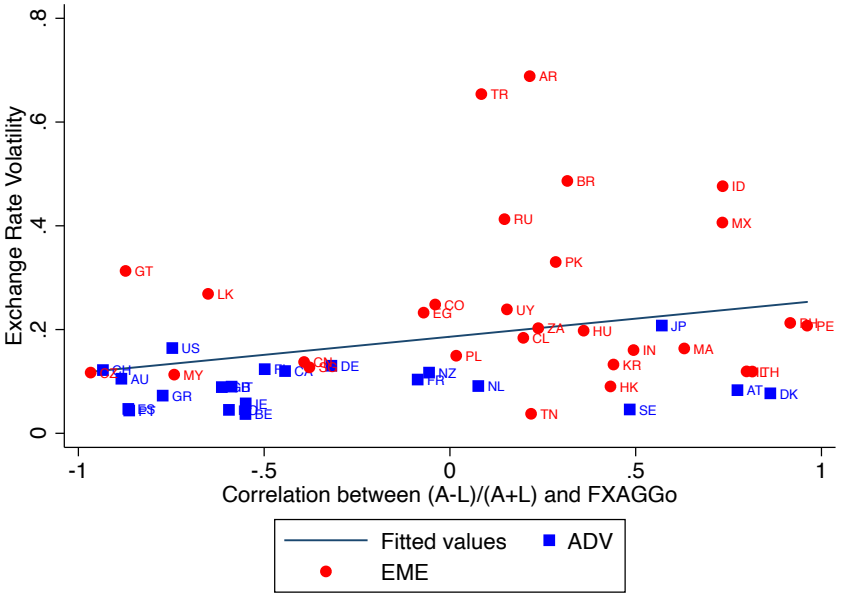


(b)

Figure 2.4: Risk Block



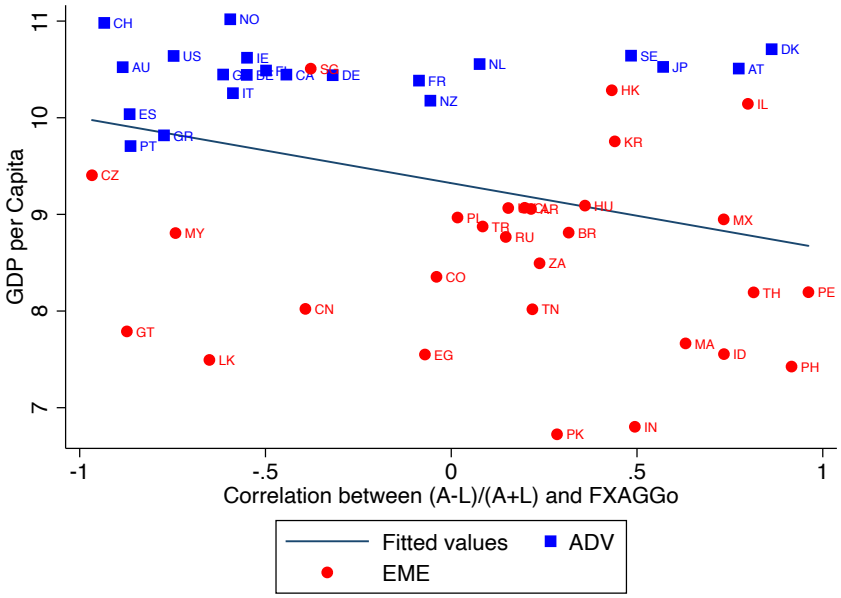
(c)



(d)

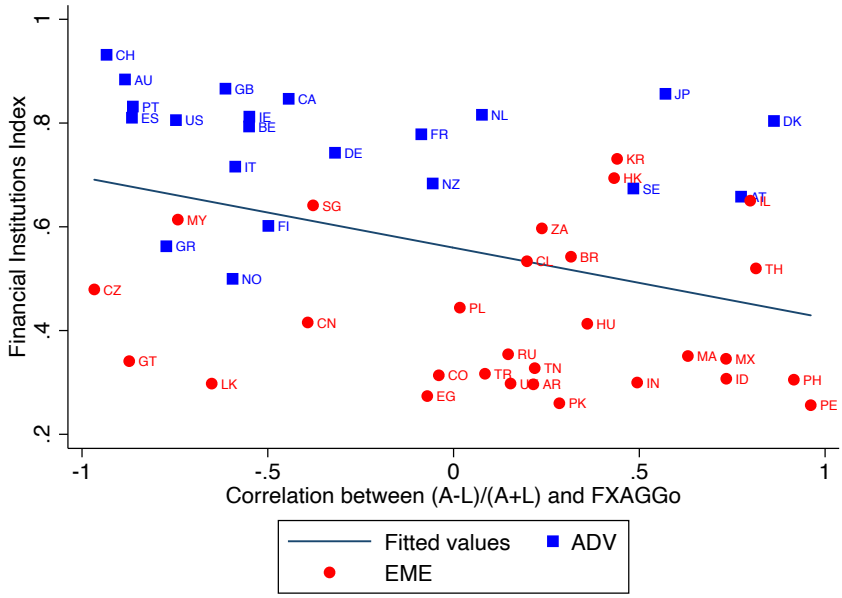
Note: The risk block composes of GDP volatility, covariance between GDP and exchange rate, inflation volatility, and exchange rate volatility. Volatility is measured by the coefficient of variation which the ratio of the standard deviation to mean. Risk block is computed by using data for 1990-2017. The correlation between $(A-L)/(A+L)$ and FX_o^{AGG} based on data for 1990-2017.

Figure 2.5: Development Block

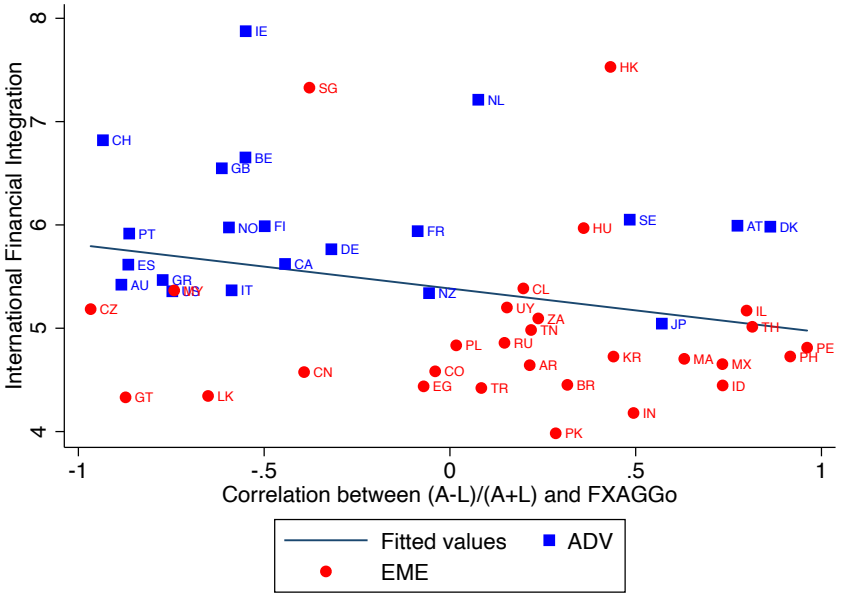


Note: The development block is GDP per capita. It is measured by sum of GDP to sum of population in log level. It is computed by using data for 1990-2017. The correlation between $(A-L)/(A+L)$ and FX_o^{AGG} based on data for 1990-2017.

Figure 2.6: Financial Integration Block



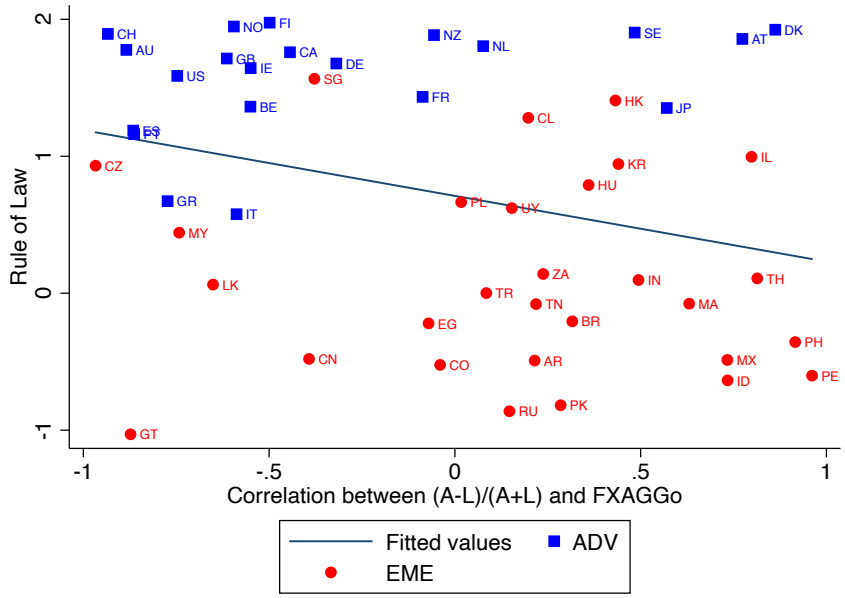
(a)



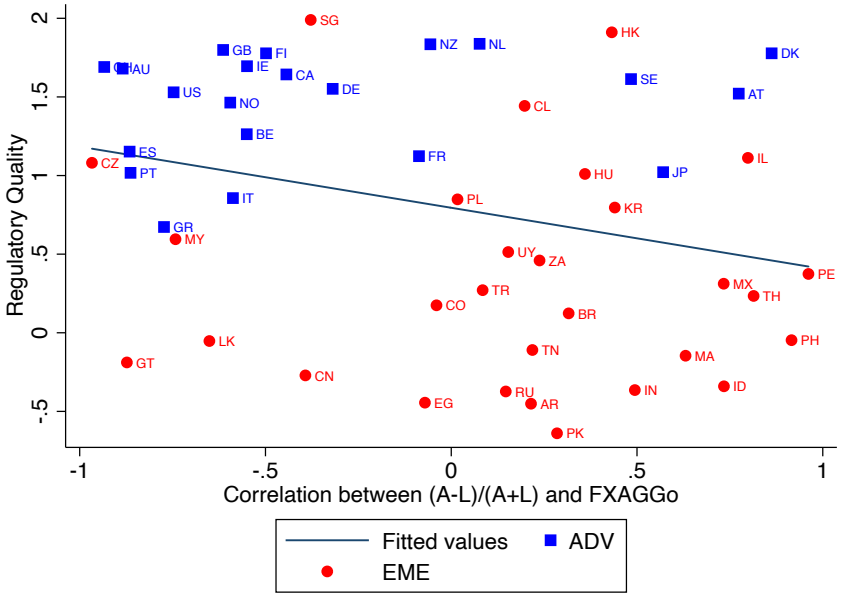
(b)

Note: The financial block is composed of financial institutions index (FIX) and international financial integration (IFI). FIX is computed as the mean of FIX for the full period, 1990-2017. IFI is computed as the ratio of the sum of external assets and liabilities to the sum of GDP in log level using data for 1990-2017. The correlation between $(A-L)/(A+L)$ and FX_o^{AGG} based on data for 1990-2017.

Figure 2.7: Institutions Block



(a)



(b)

Note: The institutions block is rule of law and regulatory quality. They are measured as mean of RL and RQ, obtained from World Bank Governance Indicators, for the full period, 1990-2017. The correlation between $(A-L)/(A+L)$ and FX_o^{AGG} based on data for 1990-2017.

Table 2.1: FXAGG decomposition, correlations 1990-2017, 1990-1999, 2000-2007, 2008-2017

			All Period		1990-1999		2000-2007		2008-2017	
			FXAGGo		FXAGGo		FXAGGo		FXAGGo	
			All countries							
(A-L)/(A+L)	mean	median	-0.03	0.05	-0.14	-0.17	-0.24	-0.47	-0.32	-0.53
	p25th	p75th	-0.59	0.44	-0.64	0.40	-0.84	0.28	-0.76	0.28
			Advanced							
(A-L)/(A+L)	mean	median	-0.31	-0.55	-0.30	-0.51	-0.54	-0.75	-0.36	-0.60
	p25th	p75th	-0.75	-0.06	-0.67	0.18	-0.91	-0.46	-0.68	-0.18
			Emerging and Developing							
(A-L)/(A+L)	mean	median	0.17	0.22	-0.02	0.11	-0.01	0.15	-0.28	-0.41
	p25th	p75th	-0.04	0.49	-0.40	0.43	-0.57	0.48	-0.83	0.30

Note: This table presents the mean, median, 25th and 75th percentile of the cross-country correlation coefficient between $\frac{(A-L)}{(A+L)}$ and FX_o^{AGG}. Correlation coefficients are computed based on the full time span and sub-periods in our data set: 1990-2017, 1990-1999, 2000-2007, and 2008-2017.

Table 2.2: Determinants of the correlation between $\frac{(A-L)}{(A+L)}$ and FX_o^{AGG}

	(1)	(2)	(3)	(4)
	1990-2017	1990-99	2000-07	2008-17
vol(GDP)	-1.24***	-1.63	-2.93***	-1.47
	(0.46)	(1.15)	(0.64)	(1.63)
cov(GDP, NEER)	0.74	0.71	-9.59	4.90
	(0.60)	(0.78)	(5.77)	(7.95)
vol(π)	-0.02	0.05	0.31***	-0.05*
	(0.03)	(0.20)	(0.09)	(0.03)
vol(NEER)	0.24	0.39	-0.11	0.20
	(0.35)	(0.48)	(1.49)	(1.66)
GDPpc	-0.18***	-0.13	-0.42***	-0.09
	(0.07)	(0.12)	(0.09)	(0.20)
FIX	-1.31***	-1.07	-0.86	-1.47*
	(0.39)	(0.67)	(0.71)	(0.85)
IFI	0.12	-0.01	0.29**	0.10
	(0.08)	(0.13)	(0.12)	(0.17)
RL	0.25***	0.27	0.17	0.26
	(0.08)	(0.18)	(0.15)	(0.21)
Constant	1.59***	1.62**	3.15***	0.95
	(0.49)	(0.70)	(0.71)	(1.53)
Observations	150	50	50	50
R-squared	0.226	0.221	0.455	0.214

Note: Pooled regressions based on data for all country sample. Column 2, 3, and 4 represent regressions for all country sample and for sub-periods, respectively 1990-1999, 2000-2007, and 2008-2017. Robust standard errors in parentheses. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$. Vol(GDP) is the ratio of the standard deviation to mean of year-on-year GDP. cov(GDP, NEER) is the covariance between GDP and nominal effective exchange rate in log level. Vol(π) is the standard deviation to mean of year-on-year CPI inflation. Vol(NEER) is the standard deviation to mean of month-on-month nominal effective exchange rate. All measures of volatilities are computed considering the non-overlapping window, including the beginning and the end of the period. GDPpc is sum of GDP to sum of population in log levels. FIX is the mean of IMF financial institutions index. IFI is de-facto international financial integration proposed by Lane Milesi-Ferretti (2001). IFI which is the ratio of the sum of total external assets and liabilities to the sum of GDP in log level. RL is the mean of World Bank Governance Indicators rule of law estimates.

Table 2.3: Determinants of the correlation between $\frac{(A-L)}{(A+L)}$ and FX_o^{AGG}: Advanced countries

	(1)	(2)	(3)	(4)
	1990-2017	1990-99	2000-07	2008-17
vol(GDP)	-2.09**	3.33	-1.81	4.96
	(1.03)	(3.76)	(4.57)	(2.82)
cov(GDP, NEER)	-13.12	-2.28	-15.16	-94.27
	(13.75)	(41.81)	(58.64)	(71.52)
vol(π)	-0.05*	0.23	-0.17	-0.07
	(0.03)	(0.74)	(0.48)	(0.05)
vol(NEER)	-0.81	-1.28	-3.45	-20.41***
	(3.32)	(7.31)	(19.97)	(5.51)
GDPpc	-0.18	0.26	-0.21	-0.30
	(0.19)	(0.76)	(0.63)	(0.62)
FIX	-0.84	-0.16	-0.46	-0.19
	(0.56)	(1.74)	(1.37)	(1.40)
IFI	0.14	-0.42	0.27	0.08
	(0.15)	(0.48)	(0.48)	(0.38)
RL	0.32*	0.08	0.61	0.47
	(0.19)	(0.57)	(0.48)	(0.38)
Constant	1.17	-1.20	-0.03	2.06
	(1.69)	(6.42)	(5.71)	(5.75)
Observations	63	21	21	21
R-squared	0.147	0.171	0.227	0.491

Note: Pooled regressions based on data for advanced country sample. Column 2, 3, and 4 represent regressions for advanced country sample and for sub-periods, respectively 1990-1999, 2000-2007, and 2008-2017. Robust standard errors in parentheses. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$. Vol(GDP) is the ratio of the standard deviation to mean of year-on-year GDP. cov(GDP, NEER) is the covariance between GDP and nominal effective exchange rate in log level. Vol(π) is the standard deviation to mean of year-on-year CPI inflation. Vol(NEER) is the standard deviation to mean of month-on-month nominal effective exchange rate. All measures of volatilities are computed considering the non-overlapping window, including the beginning and the end of the period. GDPpc is sum of GDP to sum of population in log levels. FIX is the mean of IMF financial institutions index. IFI is de-facto international financial integration proposed by Lane Milesi-Ferretti (2001). IFI which is the ratio of the sum of total external assets and liabilities to the sum of GDP in log level. RL is the mean of World Bank Governance Indicators rule of law estimates.

Table 2.4: Determinants of the correlation between $\frac{(A-L)}{(A+L)}$ and FX_o^{AGG}: Emerging countries

	(1)	(2)	(3)	(4)
	1990-2017	1990-99	2000-07	2008-17
vol(GDP)	-1.44**	-3.73***	-2.93***	-2.25
	(0.65)	(1.19)	(0.75)	(2.11)
cov(GDP, NEER)	0.95	1.00	-10.47	-3.67
	(0.69)	(0.97)	(7.17)	(9.21)
vol(π)	0.14	0.08	0.33**	0.79*
	(0.09)	(0.24)	(0.13)	(0.44)
vol(NEER)	-0.05	0.28	-0.50	2.31
	(0.42)	(0.57)	(1.83)	(2.11)
GDPpc	-0.14	-0.12	-0.39**	-0.07
	(0.09)	(0.15)	(0.14)	(0.24)
FIX	-1.65**	-1.23	-0.97	-2.54**
	(0.70)	(1.01)	(1.57)	(1.20)
IFI	0.12	0.09	0.29	0.15
	(0.11)	(0.15)	(0.18)	(0.23)
RL	0.26**	0.35*	0.10	0.28
	(0.11)	(0.20)	(0.20)	(0.30)
Constant	1.38**	1.63**	2.97***	0.57
	(0.53)	(0.71)	(0.78)	(1.69)
Observations	87	29	29	29
R-squared	0.247	0.390	0.478	0.325

Note: Pooled regressions based on data for emerging country sample. Column 2, 3, and 4 represent regressions for emerging country sample and for sub-periods, respectively 1990-1999, 2000-2007, and 2008-2017. Robust standard errors in parentheses. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$. Vol(GDP) is the ratio of the standard deviation to mean of year-on-year GDP. cov(GDP, NEER) is the covariance between GDP and nominal effective exchange rate in log level. Vol(π) is the standard deviation to mean of year-on-year CPI inflation. Vol(NEER) is the standard deviation to mean of month-on-month nominal effective exchange rate. All measures of volatilities are computed considering the non-overlapping window, including the beginning and the end of the period. GDPpc is sum of GDP to sum of population in log levels. FIX is the mean of IMF financial institutions index. IFI is de-facto international financial integration proposed by Lane Milesi-Ferretti (2001). IFI which is the ratio of the sum of total external assets and liabilities to the sum of GDP in log level. RL is the mean of World Bank Governance Indicators rule of law estimates.

Table 2.5: Determinants of the correlation between $\frac{(A-L)}{(A+L)}$ and FX_o^{AGG}

	(1)	(2)	(3)	(4)
	1990-2017	1990-99	2000-07	2008-17
vol(GDP)	-2.09**	3.33	-1.81	4.96*
	(1.02)	(3.55)	(4.32)	(2.67)
cov(GDP, NEER)	-13.12	-2.28	-15.16	-94.27
	(13.57)	(39.51)	(55.41)	(67.58)
vol(π)	-0.05*	0.23	-0.17	-0.07
	(0.03)	(0.70)	(0.46)	(0.04)
vol(NEER)	-0.81	-1.28	-3.45	-20.41***
	(3.28)	(6.91)	(18.87)	(5.20)
GDPpc	-0.18	0.26	-0.21	-0.30
	(0.18)	(0.71)	(0.60)	(0.59)
FIX	-0.84	-0.16	-0.46	-0.19
	(0.55)	(1.64)	(1.29)	(1.32)
IFI	0.14	-0.42	0.27	0.08
	(0.15)	(0.45)	(0.45)	(0.36)
RL	0.32*	0.08	0.61	0.47
	(0.19)	(0.54)	(0.45)	(0.36)
EME	0.22	2.83	3.00	-1.49
	(1.75)	(6.11)	(5.46)	(5.71)

Table 2.5: Determinants of the correlation between $\frac{(A-L)}{(A+L)}$ and FX_o^{AGG} (Continued)

	(1) 1990-2017	(2) 1990-99	(3) 2000-07	(4) 2008-17
vol(GDP)*EME	0.65	-7.06*	-1.12	-7.21**
	(1.21)	(3.76)	(4.39)	(3.45)
cov(NEER,GDP)*EME	14.07	3.28	4.69	90.60
	(13.58)	(39.52)	(55.91)	(68.25)
vol(π) $*$ EME	0.19*	-0.14	0.49	0.86*
	(0.10)	(0.75)	(0.48)	(0.46)
vol(NEER)*EME	0.75	1.57	2.95	22.72***
	(3.30)	(6.94)	(18.97)	(5.65)
GDPpc*EME	0.05	-0.37	-0.18	0.23
	(0.20)	(0.73)	(0.62)	(0.64)
FIX*EME	-0.81	-1.07	-0.51	-2.36
	(0.90)	(1.95)	(2.08)	(1.82)
IFI*EME	-0.01	0.50	0.01	0.07
	(0.18)	(0.48)	(0.49)	(0.44)
RL*EME	-0.06	0.27	-0.51	-0.19
	(0.21)	(0.57)	(0.50)	(0.48)
Constant	1.17	-1.20	-0.03	2.06
	(1.67)	(6.06)	(5.40)	(5.44)
Observations	150	50	50	50
R-squared	0.258	0.347	0.492	0.394

Note: Pooled regressions based on data for all country sample. Column 2, 3, and 4 represent regressions for sub-periods, respectively 1990-1999, 2000-2007, and 2008-2017. Regressions based on data for 1990-1999. Robust standard errors in parentheses. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$. EME is a dummy variable for emerging economies which takes value 1 if the country is an emerging country, and 0 otherwise

Chapter 3

Offshore debt issuance, within-company loans and measured FDI: determinants and implications

3.1 Introduction

In the aftermath of the global financial crisis (GFC), the issuance of international bonds grew faster than bank lending, and its relationship with global financial conditions strengthened (Shin, 2014; Avdjiev et al., 2020). At the same time, non-financial firms have increased their external borrowing significantly through the issuance of debt securities, with a significant part of the issuance taking place offshore through overseas affiliates of corporates. When foreign affiliates of NFCs issue bonds offshore, they could use those funds for either acquiring foreign assets or transferring them to the parent's nationality country as within-company loans (re-routing external debt). The latter case can be defined as re-routed external debt and viewed as portfolio flows masked as FDI. While FDI is generally viewed as a stable and good form of capital, this belief may be misleading for the within-company loans arising from offshore issuance, which can be withdrawn

on short notice (CGFS, 2009). Although these re-routed proceeds of issuance may contribute to growth in the economy of the parent's residence by reallocating financial resources, an increase in the indebtedness and the misperception about its stability might increase the systemic risk and financial instability of countries where parent companies are domiciliated.

How do NFCs use the proceeds of issuance? Are funds raised by offshore affiliates on-lent to the parent company? What aspects of the economic environment stimulate the re-lending business in NFCs' offshore subsidiaries abroad? Why are debt securities issued via offshore affiliates? These are key questions at the centre of this study.

There is a substantial body of literature showing that external corporate borrowing through international financial centres can be a source of broader financial instability because of the exposure to global financial conditions and vulnerability to exchange rate movements. They show that offshore bond issuance has become more important than onshore bond issuance, which refers to the debt issued from the country of headquarters, as a transmission channel of global liquidy with its strong link with the global financial cycle and fluctuation in the US dollar, especially the aftermath of GFC (Kim and Shin, 2021; Aldasoro, Hardy, and Tarashev, 2021). However, the risk profile of offshore debt is likely to be very different depending on whether the foreign affiliates of NFCs act as a surrogate intermediary by channeling funds to their parents (Gruić, Upper, and Villar, 2014; Gruic, Wooldridge, et al., 2015). Therefore, we focus on the link between offshore issuances and within-company loans and conduct an in-depth study on what aspects of the economic environment stimulate the development of this link.

This paper is the first to empirically analyze the link between the offshore issuance of NFCs and their within-company loans considered as portfolio flows masked as FDI.

Another part of the literature focuses on bilateral portfolio investment based

on nationality versus residency (Coppola et al., 2021; Pellegrino, Spolaore, and Wacziarg, 2021; Galstyan, Maqui, and McQuade, 2021). Most international financial statistics are reported on a residency basis. On the one hand, residency-based statistics associate securities with the location of their immediate issuer. On the other hand, nationality-based statistics associate securities with the country of the issuer's ultimate parent. It means the residence-based issuance measure does not capture the issuance when offshore affiliates issue bonds in international financial centers. In this case, it offers a highly distorted financial linkage across countries. Despite the prevalence of a vastly different picture of global capital allocation between nationality-based and residency-based data, there is a gap in the literature for investigating the drivers of this difference, i.e., offshore issuance. Therefore, this paper also aims to fill this gap using empirical analysis.

Empirical analyses show that re-routed external debt in advanced, emerging, and developing countries is a non-trivial phenomena and highlight the importance of monitoring the sources of, and question the stability of, FDI. The measures of institutional development, access to the international capital market and carry trade motivation shape the striking heterogeneity in re-routing activities across the country pairs. Better legal environments and institutions, higher stock market capitalization, corporate bond issuance volume, international financial integration, and capital account openness of the countries where the parent resides relative to countries where their affiliates reside cool down the re-routing activities of NFCs. In addition, because of the financial return motivation, higher borrowing costs in the residence of the parent relative to the location of the affiliate amplify the re-routing activities of NFCs.

Analyses for drivers of the weight of offshore issuance relative to onshore issuance reveal the quality of the legal environment, the deepness of the investor base, and capital controls on international lending, amongst others, are key factors in explaining the share of offshore in total issuance. Countries with less institutional and financial development and international financial integration tend

to have a higher share of offshore issuance in total debt issuance. In addition, more capital openness and stable inflation in the country where the offshore affiliate resides encourage issuance there. For emerging and developing countries, better hedging market development in the domestic market discourages offshore issuance by providing hedging options on foreign currency obligations. Moreover, issuing offshore allows advanced and emerging countries to access market with more stable exchange rates, which decrease exchange rate risk.

Our findings provide key policy implications. For countries where parent companies are domiciliated, policymakers may want to trace the within-company borrowing behaviors of NFCs. In the meantime, they might want to enhance the legal environment for international investors and reconsider the capital control policies to cool down re-routing activities by NFCs. As international financial integration continues, governments need to recognize the importance of this phenomena when designing policies for capital flow.

This paper is structured as follows. Section 3.2 introduces the key patterns of NFCs' offshore debt issuance and how they can be used. Section 3.3 provides the analytical framework of the international capital market and explores the drivers of the re-routed external debt from the affiliates. Section 3.4 specifies the methodology and describes the variables. Section 3.5 presents empirical results. Section 3.6 provides implications, followed by a discussion and conclusion.

3.2 Key patterns

To understand the concept of NFC's offshore debt issuance via their subsidiaries in foreign countries, we draw an example from Coppola et al. (2021). China's energy company, China Petroleum & Chemical Corporation, established a financing subsidiary in the British Virgin Islands called Sinopec Group Overseas Dev. 2015 Ltd. In 2017, foreign investors bought 8.4 billion USD of bonds this company issued. While it is recorded as a corporate bond investment in the British Virgin Islands according to residency-based statistics, according to nationality-based

statistics, it is recorded as a corporate bond investment in China.

Figure 3.1a illustrates an increasing trend of NFCs' debt securities issuance through their offshore affiliates for both advanced economies and emerging and developing economies. While offshore issuance of advanced economies' NFCs starts to increase in the early period, we observe the drastic increase in offshore issuance of EMEs' NFCs after the GFC as a foreshadowing of the second phase of global liquidity. Shin (2014) divides global liquidity into two phases. Although global banking and acceleration of banking sector capital flow are at the core of the first phase, roughly between 2003 and 2008, the bond market, especially the one for emerging market debt securities at the centre of the second phase of global liquidity.

When we divide EMEs in terms of their geography, it is possible to observe that the NFC of Asian EMEs constitutes a large amount of offshore issuance. Since there is a big gap between the amount issued by Asian EMEs NFCs and other EMEs NFCs, Figure 3.1b is beneficial to zoom in on patterns in other EMEs, and it is possible to observe a post-GFC increasing trend in those groups as well. Figure 3.2 shows the offshore issuance shares of countries in their groups. Germany and US stand out among the advanced economies with their offshore issuance share in their group. Among the emerging developing economies, China, Brazil, Russia, and South Africa are the countries that have the largest share in their geographies, Asia Pacific, Latin America, Europe, and Africa, respectively.

On the other hand, Figure 3.3 represents shares of countries hosting offshore issuance of different country groups' NFC. While the Netherlands, Luxembourg, Cayman Island, United Kingdom, and the US are the most popular offshore locations for advanced economies, Cayman Island, British Virgin Island, the Netherlands, Hong Kong, and Luxembourg are prominent locations for emerging and developing economies. Under the same figure, shares of countries that are hosting the offshore issuance of different geographical groups of EMEs are also available.

Foreign affiliates of NFCs could use funds that are obtained by issuing bonds offshore in two alternative ways. They can either use them to acquire foreign assets, which means money stays outside, or transfer the proceeds to the country where their parents reside. Figure 3.4 illustrates the three possible channels foreign affiliates might exploit to re-lend the bond issuance proceeds to its parent country. It could lend directly to its headquarters (within-company flows), extend credit to unrelated companies (between-company flows), or make a cross-border deposit in a bank (corporate deposit flows) (Gruic, Wooldridge, et al., 2015; Avdjiev, Chui, and Shin, 2014).

This paper focuses on the within-company loan channel for transferring the proceed from a foreign subsidiary to its parent. International debt securities issued by foreign affiliates and repatriated by the parent are recorded as debt liabilities of the parent to their affiliates under FDI (TFFS, 2013) and raise questions about the traditional view of FDI. FDI is mainly known as a stable form of investment. Although this general belief might reflect the truth for the case of greenfield investment and foreign acquisitions, it might not be the case for within-company loans, which could turn out to be hot money and withdrawn at short notice (Avdjiev, Chui, and Shin, 2014; CGFS, 2009)

3.3 Offshore issuance and capital structure

Drivers of offshore debt issuance via the foreign subsidiaries by NFC and channeled proceeds via the within-company loan are highly related to the determinants of capital structure and thus linked with several theories.[1]

Static trade-off theory – Debt issuance increases or decreases depending on its benefits or cost, which are determined by tax rates, asset types, business risk, profitability, and bankruptcy code. This theory is also highly related to the currency

[1] (Booth et al., 2001; Allayannis, Brown, and Klapper, 2003; Mizen et al., 2012)

denomination of debt. The direct cost of borrowing differs across markets because of the different levels of interest rates between the local and foreign borrowing markets. Interest rate differentials should be positively related to the use of foreign currency debt.

Agency cost theory – This type of cost originated from asymmetric information. Managers and investors have different sets of information, and the latter must take costly monitoring activities. Conflict of interest between inside and outside investors determines the optimal capital structure.

When the purpose of the manager is the investment for growth, the aim of shareholders and management coincide, and equity is valuable for investment opportunities. However, without strong investment purposes, agency costs emerge because of managerial discretion. Although debt limits the costs of managerial discretion, if the firm is highly debt-financed, it might create costs of forgone opportunities and contractual provisions.

Peking order theory – One of the most accepted explanations for firm financing behavior is pecking order which suggests that firms prefer to use internally obtained funds first, then external debt, and finally, external equity (Myers, 1984; Myers and Majluf, 1984). Asymmetric information, transaction costs, and interest rates make external funds more expensive than internal funds. Therefore, to finance their operations, non-financial firms normally use internal sources first, and when they are inadequate, they look for outside funds.

Market depth hypothesis – If the local (currency) market is not deep and sufficient enough for the demands of borrowers, then firms that have access to foreign (currency) markets would reach out to foreign (currency) lending.

Risk management theory – Corporates might be incentivized to adjust their capital structure according to their earnings to hedge foreign currency exposure. On the one hand, if the corporate has high foreign earnings, then borrowing in foreign

currency is a buffer against exchange rate fluctuation. In other words, foreign-denominated debt can be a natural hedge of foreign revenues. On the other hand, if a corporation does not have foreign earnings, it is likely to hedge the currency exposure by using currency derivatives. Many foreign currency bond issuers simultaneously enter into currency swaps when they undertake foreign currency borrowing. In this way, while they can pay the domestic currency swap rate, they can receive the foreign currency swap rate. In other words, a foreign currency bond issuer creates a synthetic domestic currency bond (Munro and Wooldridge, 2010; Habib and Joy, 2010).

3.3.1 Analytical framework

We set up an analytical framework for the functioning of the internal capital market following Goldbach et al. (2021) that analysis the borrowings of multinationals' affiliates from their parents by setting up a model. On the one hand, tax-efficient capital structure theories explain how multinational corporations use internal debt to let the affiliates reside in the countries with the lowest tax rates lend to other affiliates. On the other hand, Goldbach et al. (2021) provides a framework explaining why affiliates also borrow from their parent companies located in a high-tax country. However, multinationals' foreign affiliates can also provide within-company loans to their parents by issuing debt securities in the country where they reside. This cannot be explained by existing theories in the literature. A novelty of our framework is that we look at the borrowing of a parent from its affiliate and include the rerouted external debt from subsidiaries into the model.

Non-financial parent corporate is in country i, and its affiliate is in country j. We assume that there is only one parent and one affiliate. The parent company owns technology $\theta \in [\underline{\theta}, \bar{\theta}]$ that increases productivity. It has fixed assets K_i which is financed by equity E_i, external debt from third party D_i^E, debt from the affiliates $D_{i,j}^I$, rerouted external debt from the affiliates $D_{i,j}^{RE}$ The balance sheet of the company i is $K_i = E_i + D_i^E + D_{i,j}^I + D_{i,j}^{RE}$.

Using external and internal debt entails different types of costs and benefits. Internal debt should be considered as tax-favored equity. On the one hand, as it is discussed in the previous subsection, while external debt decreases the information asymmetries between the managers and shareholders, too much debt financing increases bankruptcy risk or creates a debt-overhang situation. On the other hand, internal debt affects neither information asymmetries nor bankruptcy costs. Unlike external debt, there is no outside enforcement in the case of failure to pay back internal loans. However, internal debt also carries costs that are related to various tax-engineering expenses, such as the cost of audits, lawyers, and accountants to avoid regulations like thin capitalization rules and/or controlled foreign company rules (Schindler and Schjelderup, 2016; Gertner, Scharfstein, and Stein, 1994).

In line with the optimal capital structure literature, we assume that the cost functions for internal and external debt are separate and they are convex in debt to asset ratios.[2] The cost of internal debt is

$$C^I(b^I_{i,j}) = \frac{\eta}{2}(b^I_{i,j})^2 K_i(\theta) \tag{3.1}$$

where $b^I_{i,j} = \frac{D^I_{i,j}}{K_i(\theta)}$ indicates the internal debt from affiliate j to asset ratio in parent i, and η is a positive constant.

Apart from profit shifting to the parent company, subsidiaries can issue bonds in the country they reside in and reroute funds to the parent company. Both external debt from third parties and rerouted external debt from the related affiliates together constitute the total external debt. We assume a cost function for total external debt (external debt and rerouted external subsidiary debt)

$$C^E(b^E_i, b^{RE}_{i,j}) = [\frac{\mu}{2}(b^E_i + b^{RE}_{i,j})^2 + \frac{\delta^E_i}{2}(b^E_i)^2 + \frac{\delta^{RE}_j}{2}(b^{RE}_{i,j})^2]K_i(\theta) \tag{3.2}$$

[2]See, e.g., Fuest and Hemmelgarn (2005), Huizinga, Laeven, and Nicodeme (2008), Schindler and Schjelderup (2016), and Goldbach et al. (2021) for similar assumptions

where $b_i^E = \frac{D_i^E}{K_i(\theta)}$ and $b_{i,j}^{RE} = \frac{D_{i,j}^{RE}}{K_i(\theta)}$ represent the external and rerouted external debt to asset ratios in parent i, respectively and μ is a positive constant. The first term in the function represents the agency costs. Additionally, the parent and the affiliates may face different transaction costs of accessing the external capital market, which are represented by δ_i^E and δ_j^{RE}, respectively. Such costs depend negatively on the quality of the legal and institutional environment, development of the domestic capital market, and accessibility to the international capital market in the countries where the parent and affiliate are located.

Economic and taxable profit in parent i, π_i^e and π_i^t, respectively are as the following

$$\pi_i^e = f(\theta K_i(\theta)) - r_i.K_i(\theta) - \tilde{r}_{i,j}.b_{i,j}^{RE}.K_i(\theta) - C^I(b_{i,j}^I) - C^E(b_i^E, b_{i,j}^{RE})$$

$$\pi_i^t = f(\theta K_i(\theta)) - r_i.(D_{i,j}^I + D_i^E + D_{i,j}^{RE}) - \tilde{r}_{i,j}.D_{i,j}^{RE}$$

where r_i is the market interest rate of the country where the parent resides and $\tilde{r}_{i,j}$ is the interest rate differential between the country where the affiliate resides and the country where the parent resides. Parent i's profit after corporate taxation in country i is

$$\pi_i = \pi_i^e - t_i.\pi_i^t \tag{3.3}$$

$$= (1-t_i).f(\theta K_i(\theta)) - r_i.K_i(\theta) - \tilde{r}_{i,j}.b_{i,j}^{RE}.K_i(\theta) + t_i.r.(D_{i,j}^I + D_i^E + D_{i,j}^{RE}) + t_i.\tilde{r}_{i,j}.D_{i,j}^{RE}$$

$$-C^I(b_{i,j}^I) - C^E(b_i^E, b_{i,j}^{RE})$$

After examining the first-order condition for rerouted external debt in the appendix B.1, we derive the optimal debt-to-asset ratio for rerouted external debt

$b_{i,j}^{RE}$ as

$$b_{i,j}^{RE} = [t_i.r_i - \frac{(\delta_i^E + \mu)}{\delta_i^E}.(1 - t_i).\tilde{r}_{i,j}].\frac{1}{[\mu(1 + \frac{\delta_j^{RE}}{\delta_i^E} + \delta_j^{RE}]} \tag{3.4}$$

it is also possible to write the relation between rerouted external debt and external debt: $b_{i,j}^{RE} = \frac{\delta_i^E}{\delta_j^{RE}}.b_i^E - \frac{(1-t_i).\tilde{r}_{i,j}}{\delta_j^{RE}}$. The higher the costs to access the capital market and receive third-party debt in the parent country (δ_i^E), relative to the equivalent costs in the subsidiary's residing country (δ_j^{RE}), the larger is the rerouted subsidiary debt-to-asset ratio. The higher the market interest rate, the direct cost of borrowing, in the subsidiary's residing country relative to the interest rate in the parent country ($\tilde{r}_{i,j}$), the smaller the rerouted debt-to-asset ratio.

3.3.2 Rerouted vs. external debt: key determinants

Parent companies are exposed to different institutional quality, different levels of financial development, access to the international financial market, taxation and risk by depending on using rerouted funds by their subsidiaries or borrowing from third parties in the domestic market.

Institutional Development – A country's institutional environment may be an important determinant of capital market frictions. Issuers who do not have access to solid investor protection, corporate governance rules, and a secure legal environment might then use within-company loans provided by their subsidiaries via bond issuance in offshore locations to offset the negative influence. Worse institutional quality and legal environment make management less accountable to outside investors and increase the moral hazard problem. This deteriorates access to the local and external capital market and augments the reliance on internal funds (Forbes, 2010; Egger et al., 2014; Aldasoro, Hardy, and Tarashev, 2021). Possible indicators that can be used are world governance indicators.

Domestic financial market development – The maturity level of the financial market affects the loan rate and the cost of capital across locations of parent companies and their subsidiaries. Parent companies in countries with less developed financial markets might take advantage of a deeper investor base, particularly for foreign currency borrowing, in the foreign subsidiaries' locations by borrowing the funds internally and hence reduce borrowing costs (Bertaut, Bressler, and Curcuru, 2019; Aldasoro, Hardy, and Tarashev, 2021). Financial development, stock market capitalization, and financial intermediary size, the quantity of funds channeled through the banking system to investors in the private sector are the possible variables.

Furthermore, companies located in countries with relatively small bond markets issue bonds in offshore locations where the depth and liquidity of bond markets are high to improve pricing, access to foreign investors, and issue more significant, lower-rated, or longer-maturity bonds (Black and Munro, 2010; Serena and Moreno, 2016). Corporate bond issuance volume and average maturity are additional variables that might be used.

Access to international capital market– Companies in countries that are highly integrated with the international capital market have the ability to issue larger, lower-rated, or longer-maturity bonds, and they have less incentive to borrow internally via their affiliates in other countries (Bertaut, Bressler, and Curcuru, 2019). The total aggregate foreign assets and liabilities ratio to GDP can measure international financial integration.

The extent to which domestic capital markets are open to foreign investment is another critical factor in the offshore bond issuance decision (Caballero, Panizza, and Powell, 2016; Burger, Warnock, and Warnock, 2012; Coppola et al., 2021). Bonds issued by affiliated entities in foreign countries may be less likely to be affected by capital controls than domestic securities. Parent companies may face less restrictive capital controls on inter-company lending, which is classified as direct investment in the balance of payments (BOP) relative to other cross-border

flows (McCauley, Upper, and Villar, 2013; Aldasoro, Hardy, and Tarashev, 2021). Kim and Shin (2021) find that the circumvention of capital controls may be one of the factors explaining the stronger role of offshore issuance during the post-crisis period.

Taxation– High-tax countries incentivize companies to finance investments with debt because interest payments are tax-deductible, while the costs associated with equity financing are often not. Some multinational corporations take advantage of the tax benefits associated with debt financing by lending money internally from subsidiary entities in low-tax countries to entities in high-tax countries. Tax savings in high-tax countries typically exceed the increased tax paid in low-tax countries, decreasing worldwide tax liability. Only the affiliate facing the lowest tax rate should lend, and all others borrow internally to exploit the tax advantage of interest deductions. However, differences in local institutional quality and financial institutions may amplify or offset differences in profit tax rates so that internal capital can flow in any direction (Egger et al., 2014).

Risk Level– Parent and host country market factors like exchange rate risk, inflation, and interest rates are essential factors in the choice between the rerouted external debt of affiliates and the external debt of the parent. Exchange rate and inflation uncertainty increase the corporate's business risk, making external borrowing more costly for firms (Aggarwal and Kyaw, 2008; Huizinga, Laeven, and Nicodeme, 2008).

Since most bonds issued offshore are in foreign currency (US dollar), the differentiation in USD borrowing cost of the parent and its subsidiaries might bring different motives to NFCs. One motive for taking on such a carry trade position may be to hedge U.S. dollar receivables. Alternatively, the carry trade position may be motivated by the prospect of financial gain if the domestic currency is expected to strengthen against the dollar. Bruno and Shin (2017) find that foreign bond issuances are driven by carry trade activities in emerging market countries but not in advanced economies. Whatever the motivation, the corporate treasurer

who takes the consolidated balance sheet into account will care about fluctuations in the exchange rate as well as the U.S. dollar borrowing costs (Shin and Zhao, 2013; Shin, 2014).

Furthermore, hedging market development makes access to swaps and derivatives easier. Swap and derivatives make it possible to hedge interest payments on foreign currency obligations for borrowers and foreign currency returns for investors and strengthen the issuance in both foreign and domestic currency bond markets (Mizen et al., 2021). In the case of an immature derivative market, corporate might face foreign exchange risk. Therefore, differences between the hedging market development in a country where parents reside and in countries where its subsidiaries reside might be another factor in choosing the location for external borrowing.

Take, for instance, the transition economies like China and Russia. These countries embody most of the unfavorable environments we mentioned above and be a special case regarding the actions of foreign affiliates of a non-financial corporation as a surrogate intermediary by repatriating funds. There are studies verifying the existence of widespread shadow banking (re-lending) activities of non-financial firms in these countries, in which firms borrow in order to lend. This includes papers like Shin and Zhao (2013), Du, Li, and Wang (2017), and Huang, Panizza, and Portes (2018).

Financial repression is the natural outcome of countries changing from a centrally planned economy to a market economy. While state-owned and/or large enterprises have privileged access to formal finance with favorable terms, small privately-owned enterprises face serious obstacles to accessing formal finance. Because of the ownership-identity-based credit market discrimination, NFCs with good access to financial markets issue bonds to raise funds and then re-lend other non-financial firms rather than finance their own investments.

3.4 Methodology

Suppose the foreign subsidiaries issue debt to re-route it to their parents. In that case, it should be reflected in the international investment position of the country where the parent resides as foreign direct investment debt liabilities. Therefore, co-movement between foreign affiliates' lending to resident parents and offshore debt issuance by foreign affiliates can be a proxy of re-routed external debt by foreign affiliates to their parents.

We conduct regressions of within-company loans on offshore issuance to employ this strategy. To address the endogeneity, we include country-time fixed effects, which allow us to control for time-variant factors that are jointly correlated with within-company loans and offshore issuance.[3] In addition, we use time-invariant country pair control variables and a time-variant county pair control variable. Our focus is the sign and statistical significance of the estimated coefficient of offshore issuance. If it is significant and positive, then it suggests the prevalence of re-lending funds to the parent by their affiliates. The sample consists of observations between the years 2009 to 2020.

We run a log-linearized OLS regression of the form

$$ln(IOWDL_{ij,t}) = \alpha_{it} + \alpha_{jt} + \beta ln(OFFSHORE_{ij,t}) + \gamma ln(TRADE_{ij,t}) + \delta ln(C_{ij}) + \epsilon_{ij,t}$$

where the dependent variable is the logarithm of outward debt instruments liabilities position of NFC parent country i in offshore location j at the end of year t. $OFFSHORE_{ij,t}$: amounts outstanding offshore issuance by the country of NFC parent i in offshore location j in the year t.[4] α_{it} and α_{jt} are NFC parent country

[3] Including country-time fixed effects ensures that the estimated offshore effect is not driven by omitted variable bias, since some time and country varying variables like GDP per capita or market capitalization are highly correlated with within-compony loans but may yet exert an independent influence on offshore issuance.

[4] Both IOWDL and OFFSHORE are stock variable.

time fixed effects and offshore location country time fixed effects, respectively. $TRADE_{ijt}$ is sum of imports plus exports between the country of NFC parent i and offshore location j in the year t. C_{ij} are the transaction costs on international financial markets. We assume the specific functional form:

$$C_{ij} = DIST_{ij}^{\theta_1} exp(\theta_2 LANG_{ij} + \theta_3 LEGAL_{ij} + \theta_4 COL_{ij} + \theta_5 TIME_{ij})$$

where $DIST_{ij}$ is the bilateral distance, $LANG_{ij}$, $LEGAL_{ij}$, COL_{ij} are dummies that indicate that both countries share a common language, a common legal system, a colonial relation and $TIME_{ij}$ is the absolute value of time difference between NFC parent country i and offshore location j. Standard errors are clustered by country pairs.

To incorporate country pairs with zero investment and cope with possible heteroskedasticity, we convert the log-linear specification into a Poisson pseudo maximum likelihood regression (PPML) as (Tenreyro and Silva, 2006; Silva and Tenreyro, 2011; Correia, Guimarães, and Zylkin, 2020).

$$IOWDL_{ij,t} = exp[\alpha_{it} + \alpha_{jt} + \beta ln(OFFSHORE_{ij,t}) + \gamma ln(TRADE_{ij,t}) + \delta ln(C_{ij}) + \epsilon_{ij,t}]$$

where the dependent variable is the outward debt instruments liabilities position of NFC parent i in offshore location j at the end of year t.

In addition, we include interaction terms between offshore issuance and the key independent variables in PPML regression separately and investigate whether these variables strengthen or weaken the re-routing activities. To explore the factors shaping heterogeneous re-routing of external debt by foreign subsidiaries across parents' countries, we run PPML regression of the form

$$IOWDL_{ij,t} = exp[\alpha_{it} + \alpha_{jt} + \beta ln(OFFSHORE_{ij,t}) + \gamma ln(TRADE_{ij,t}) + \delta ln(C_{ij}) +$$

$$\eta ln(OFFSHORE_{ij,t}) * Z_{ij,t} + \mu Z_{ij,t} + \epsilon_{ij,t}]$$

where

$$Z_{ij,t} \in \{WGI_{ij,t}, FD_{ij,t}, STOCK_{ij,t}, CREDIT_{ij,t}, BOND_{ij,t}, MATURITY_{ij,t}, IFI_{ij,t},$$

$$KAOPEN_{ij,t}, KACONTROL_{ij,t}, CORPTAX_{ij,t}, SHARPE_{ij,t}, DERIV_{ij,t}\}$$

is the interaction terms we include in the model separately. These indicators are the difference between the national factors in the residence countries of parents and residence countries of the parent's foreign subsidiaries. Interaction terms are the first principle component of the world governance indicator (WGI) for institutional quality, financial development index (FD), stock market capitalization (STOCK), domestic credit to the private sector (CREDIT), corporate bond issuance volume (BOND), and corporate bond average maturity (MATURITY) for domestic financial market development, international financial integration (IFI), Chin-Ito capital openness index (KAOPEN), and capital flow management controls index (KACONTROL) for access to the international capital market, corporate income tax (CORPTAX) for taxation, and finally sharpe ratio (SHARPE), and the size of foreign exchange swaps, derivatives and options market (DERIV) for risk. We also divide countries into sub-samples based on the value of variables of interest to examine whether the correlation between within-company loans and offshore issuance would change across sub-samples.

On the one hand, co-movement between foreign affiliates' lending to parent and offshore debt issuance by foreign affiliates is expected to diminish as the difference between institutional quality, financial market development, and access to the international capital market in NFC parent's residence country and offshore

affiliate's location country increases. In other words, if these variable blocks are better in the parent's country relative to the affiliate's country, the incentive for the issuance of debt by offshore affiliates to channel the funds to the parent should reduce.

On the other hand, we expect the co-movement to strengthen as the difference between the corporate income tax of the parent's residence country and its affiliate's residence country increases and the interest rate difference adjusted by the exchange rate volatility of the parent's residence country rises.

To explore the factors determining the relative weight of offshore issuance, we also formulate a model of debt structure as

$$\frac{OFFSHORE_{ij,t}}{(OFFSHORE + ONSHORE)_{i,t}} = \alpha_i + \tau_t + \beta ln(DIST_{ij}) + \eta I_{ij,t} + \gamma F_{ij,t} +$$

$$\delta A_{ij,t} + \mu T_{ij,t} + \theta R_{ij,t} + \epsilon_{ij,t}$$

where the dependent variable is the ratio of amounts outstanding offshore issued by the country of NFC parent i in offshore location j in the year t to the sum of offshore and onshore issuance by the country of NFC parent i in the year t. $I_{ij,t}$ is the institutional development block including WGI. $F_{ij,t}$ is the domestic financial market development block, including FD, STOCK, CREDIT, BOND, and MATURITY. $A_{ij,t}$ is access to the international capital market block, including IFI and KACONTROL. $T_{ij,t}$ is the taxation block, including CORPTAX. $R_{ij,t}$ is the risk block matrix, including the volatility of inflation (vol(π)), volatility of exchange rate change (vol(ERC)), and DERIV. α_i and τ_t are NFC parent country fixed and time-fixed effects, respectively. Appendix B.2 provides more detail about the variables and the data sources.

3.5 Empirical results

3.5.1 Baseline results

In this section, we estimated the effect of offshore issuance on outward debt instrument liabilities. Table 3.1 presents results of both OLS and PPML regressions of within-company loans on offshore debt issuance.[5] In this specification, we include country of nationality time fixed effect and location country time fixed effect to control time-variant variables that might be correlated with both within company loans and offshore issuance. We also add control for time-invariant country pair control variables and a time-variant county pair control variable. The focus is the sign of the estimated coefficient of offshore issuance.

While Columns (1)-(3) report the results of OLS regression of the log of outward debt instrument liabilities, Columns (4)-(6) report the results of PPML regressions of outward debt instrument liabilities. Column (1) and (4) reports the regression results of all country sample, and the slope coefficients of offshore issuance are positive and statistically significant at the 99% confidence level. Positive co-movement between offshore debt issuance by foreign affiliates and foreign affiliates' lending to resident parents suggests an incentive to channel the funds to their parents by foreign affiliates.

While Columns (2) and (5) report the OLS regression result and PPML regression result, respectively, for the advanced country sample, Columns (3) and (6) report the OLS regression result and PPML regression result, respectively, for the emerging and developing country sample. There is a positive link between within-company loans and offshore issuance for both advanced and emerging and developing countries. The magnitude of the coefficient is higher for the emerging developing country sub-sample relative to the advanced country sub-sample. However, the number of observations for the former is lower than for

[5] After merging CPIS data with the data for offshore issuance, a number of zero values is too low in the sample. Therefore, we do not observe a significant difference between the sample size of OLS and PPML regressions.

the latter because of the data gap in CDIS for emerging and developing countries. The magnitudes of Poisson estimates are generally larger than the corresponding OLS estimates.

All in all, the evidence from gravity-type analysis suggests the prevalence of re-routing external debt by foreign affiliates to their parents. This pattern is present in advanced, emerging, and developing countries.

3.5.2 Country characteristics and re-routed external debt

This section analyzes the heterogeneous re-routed external debt activities. We explore the cross-country variations from five perspectives; institutional development, domestic financial market development, access to the international capital market, taxation, and risk factors.

Column (1) in Table 3.2 presents the estimated coefficient of log offshore issuance and the interaction term of offshore issuance with the difference between the first principle component of world governance indicators of the affiliates' nationality country and residence country in the full sample. We observe that although the link between within-company loans and offshore issuance is statistically insignificant in the country pairs with above median scores, it remains significantly positive in the country pairs with below median scores, which suggests that better legal environment and institutions in the issuer's nationality country relative to the location country hinder NFCs from participating in re-routing external debt back to parent companies. Furthermore, the negative and statistically significant estimated interaction term coefficient supports that finding.

To explore whether re-routing behavior is affected by domestic financial market development, we select five different measures, i.e., the financial development index, stock market capitalization, domestic credit to the private sector, corporate bond issuance volume, and corporate bond average maturity, and report the results in Columns (2)-(6) respectively. All the estimated coefficients of offshore issuance in the above and below sub-sample are positive and statistically

significant, apart from the above sub-sample for bond issuance volume. However, the magnitudes of the estimated coefficients are higher in the below-median sub-sample relative to the above-median sub-sample, which suggests that lower domestic financial market development in parents' countries relative to their affiliates' countries strengthens the incentive to channel the funds to the parent. Although we observe that pattern in all five measures, only the findings for stock market capitalization and corporate bond issuance volume are supported by the estimated coefficient of the interaction term, which is negative and statistically significant.

Considering better access to financial resources in the market where the parent resides should relax the financial constraint of companies, we use measures of financial integration and openness, i.e., international financial integration, Chinn-Ito index, and Schindler's KA index. Column (1) in Table 3.3 shows that the estimated coefficient of the interaction term between offshore issuance and international financial integration is significantly negative. In addition, while the estimated coefficient of the offshore issuance is significantly negative for the above sub-samples, it is significantly positive for the below sub-sample. All these findings suggest that greater international financial integration reduces the intensity of engagement in re-routing external debt activities.

In Columns (2) and (3) in Table 3.3, the Chin-Ito index, where a higher score means greater financial openness, and Schindler's KA index, where a higher value suggests greater restrictions, are used, respectively. Column (2) presents that if the difference between the Chin-Ito index of affiliate's nationality and residence countries is above the median, the estimated coefficient of offshore issuance is significant and negative. If it is below the median, the estimated coefficient is significantly positive. Furthermore, the coefficient of the interaction term between offshore issuance and the Chin-Ito index difference is significantly negative. Column (3) shows that while the estimated coefficient of Schindler's KA index difference is significantly positive for the above sample, it is insignificant and

positive for the below median sample. The significantly positive coefficient of the interaction term also supports this finding. Two patterns emerge from Columns (2)-(3), suggesting that higher openness in the country of parent relative to the country of subsidiary decreases the prevalence of re-routing external debt activities.

Column (4) in Table 3.3 reports that the estimated coefficients of offshore issuance are significantly positive both in above and below the median of the difference between statutory corporate income tax rates of the national and offshore country; the magnitude of the above median sub-sample is relatively higher. However, the estimated coefficient of the interaction term between offshore issuance and corporate income taxes is insignificant. Considering the possible carry trade motivation of NFCs, we use the Sharpe ratio, interest rate differences adjusted for exchange rate volatility in Column (5). Both the coefficients of above and below median sub-samples are positive, but only the former is statistically significant. The estimated coefficient of the interaction term between offshore issuance and the Sharpe ratio is significantly positive. These results suggest that higher interest rates adjusted for exchange rate volatility (search for yield) in a nationality country relative to the location country strengthen the incentive to channel the funds to the parent. In Column (6), we use the difference between the hedging market development of the affiliates' nationality country and residence country. Both the estimated coefficients of offshore issuance in the above and below median sub-sample are significantly positive, and there is no substantial difference between the magnitudes. In addition, the estimated coefficient of the interaction term is statistically insignificant.

Overall, we find evidence that better institutional development and access to international capital market in terms of both financial integration and capital account openness in the residence of the parent relative to the location of affiliates deter NFCs' rerouting external debt via within-company loans. However, higher borrowing cost in countries where parents reside relative to countries where their

affiliates reside incentives re-routing activities because of the financial return motivation.

3.5.3 Debt structure

In this section, we address the debt structure with reference to the ratio of offshore issuance to the total external debt by nationality of issuers, i.e., the sum of offshore and onshore issuance. Table 3.4 - 3.7 report estimated OLS regression results using data for all countries, advanced counties, emerging and developing countries, and emerging countries samples, respectively.

Overall, in all specifications, as a proxy of information asymmetry, the geographic distance between the country where the parent resides and the location country where their affiliates reside (DIST) has a significantly negative coefficient. Furthermore, coefficients of difference between the corporate income tax of the issuer's national and location country (CORPTAX) are also significantly negative. It is also economically significant because interest payments are tax-deductible, and it is expected to have a positive link between external debt issuance and the countries' corporate income tax.

Because of the high correlation of world governance indicators (WGI) with the measures for domestic financial market development and measures for financial integration and openness, in Column (1) in Tables 3.4-3.7, we include only WGI, corporate income tax (CORPTAX), and risk block. An increase in WGI reduces the ratio of offshore issuance to total external issuance for the entire sample and sub-samples, which is consistent with the theory.

Again because of the high correlations across the measures of domestic financial market development and international financial integration (IFI), each of the measures is included in separate regressions alongside the corporate bond average maturity (MATURITY), capital flow management controls (KACONTROL),

corporate income tax, and risk block. Column (2) in Table 3.4-3.7 reports significantly negative estimated coefficients of the financial development index difference between country of parent and country of affiliate (FD), which suggest that better financial development in the market where parents reside than in the market where affiliates reside has a negative influence on the ratio of offshore. On the one hand, when we replace FD with the domestic credit to the private sector (CREDIT) and the corporate bond issuance volume (BOND) in Column (3) and (5), respectively, the results do not change. On the other hand, when we replace FD with the stock market capitalization in Column (4), except for the advanced country sample, although the coefficient is negative, it is not significant.

Considering the high correlation of international financial integration with WGI, FD, and CREDIT, IFI is included in Columns (4) and (5) for entire sample and sub-samples. Overall, higher financial integration of the nationality country relative to the location country negatively links with the offshore ratio. In addition, because of the high correlation between WGI and KACONTROL, apart from Column (1), KACONTROL is included in all specifications. The coefficient of KACONTROL is positive and significant in Columns (2)-(4) for all countries, (2) and (3) for advanced countries, and (2)-(4) for emerging and developing countries. These findings suggest a higher capital control in the affiliate's national country relative to the residence country positively associated with the offshore issuance ratio.

For the risk block, the estimated coefficient of the inflation volatility (volπ) in Columns (3) and (5) in Table 3.4 and 3.5 are significantly positive, which means a higher difference between the volatility in the affiliate's nationality and residence countries is positively associated with the offshore issuance ratio for entire sample and advance countries. In Table 3.6 and 3.7 for emerging and developing countries, we observe the same result only for the specification in Column (5). Table 3.5 and 3.7 show the importance of volatility in exchange rate change

(vol(ERC)) in the weight of offshore issuance for advanced countries and emerging countries, respectively. Positive and significant coefficients confirm that the higher volatility in exchange rate change in a national country relative to the location country increases the offshore issuance weight. Furthermore, the importance of hedging market development is apparent for emerging and developing countries in Tables 3.6 and 3.7. Better hedging market development in offshore locations relative to the national country (DERIV) increases the offshore issuance ratio.

In summary, we find that more secure environment in foreign jurisdiction, reaching deeper investor base in offshore location, less restrictive capital controls on within-company loans, and lower risk level in the residence of foreign affiliates motivate NFCs to increase their offshore issuance relative to their onshore issuance.

3.6 Implications

When firms straddle borders and access international capital markets by using their offshore issuance, they can mimic the behavior of financial institutions by re-lending funds to other non-financial firms, banks, or non-bank financial intermediaries in the headquarter country.

Figure 3.5 illustrates the case where corporate that have issued debt offshore in foreign currency and accumulated liquid financial assets in domestic currency in the form of claims on domestic banks. In this case, even though it doesn't appear in the official external debt statistics, the company faces a currency mismatch and is affected by currency fluctuations. Even if there is no currency mismatch, since the indebtedness and the claims of the firms are associated with global financial conditions, the domestic market is potentially affected by the transmission of global liquidity (Chung et al., 2015).

An increase in debt issuance offshore might raise the leverage on corporate balance sheets. In the event of slowing growth and tightening profit margins, corporates might be challenged by the management of debt levels. Apart from an increase in the size of indebtedness, the compositions of assets and liabilities also change. If there is low volatility, corporates could have carry trade incentives and take advantage of interest rate differentials adjusted for exchange rate volatility by borrowing overseas and depositing the proceeds in the local market. An increase in bond market financing, especially in foreign currencies, makes companies' balance sheets more pro-cyclical. In the case of shifts in risk appetite, firms might face difficulties in rolling over their outstanding debt. Because of the corporate deposits in banks and other financial institutions, local institutions' liabilities may also be subject to sudden withdrawals by corporates. From the currency perspective, escalated levels of foreign currency borrowing could deteriorate debt sustainability. If the foreign currency liabilities are not financially hedged or matched by foreign currency receivables, depreciation in the local currency inflates the local currency value of foreign currency liabilities relative to domestic currency assets (Chui, Fender, and Sushko, 2014; Turner, 2014)

Some studies investigate offshore debt issuance as a source of wider financial instability. On the one hand, Kim and Shin (2021) study whether debt issued offshore is the channel transmitting US financial conditions to emerging market economies. They find that offshore bond issuance has a strong positive response to impulse in the US aggregate credit variable after 2010. In addition, offshore bond issuance has become more important than onshore bond issuance as a transmission channel of global liquidity during the post-crisis period. Aldasoro, Hardy, and Tarashev (2021) investigate the link between offshore debt issuance by NFCs and global financial conditions. They find that for emerging market economies, offshore issuance has a strong positive link with the global financial cycle and a strong negative link with the US dollar nominal effective exchange rate. Furthermore, these links are more pronounced for offshore issuance denominated in US dollars.

3.7 Conclusions

This paper provides several contributions by studying how NFCs use the proceeds of offshore debt issuance. More specifically, we focus on the channel where foreign affiliates re-route the bond issuance proceeds to their parent NFC. We study the factors shaping the heterogeneity of re-routed external debt activities. Furthermore, we also conduct an in-depth study on factors driving the weight of offshore issuance relative to onshore issuance.

Gravity-type regression results show there is an incentive to channel the funds to the parent for advanced as well as emerging and developing countries with positive co-movement between offshore debt issuance by foreign affiliates and foreign affiliates' lending to resident parents. We document factors linked with heterogeneous re-routing external debt activities across country pairs using five blocks: institutional development, domestic financial market development, access to the international capital market, taxation, and risk level. While better legal environment and institutions, higher stock market capitalization, corporate bond issuance volume, international financial integration, and capital account openness in nationality country relative to the residence country of foreign affiliates weakens the incentive to channel the funds to the parent, a higher Sharpe ratio as a proxy of carry trade motivation strengthens the incentive.

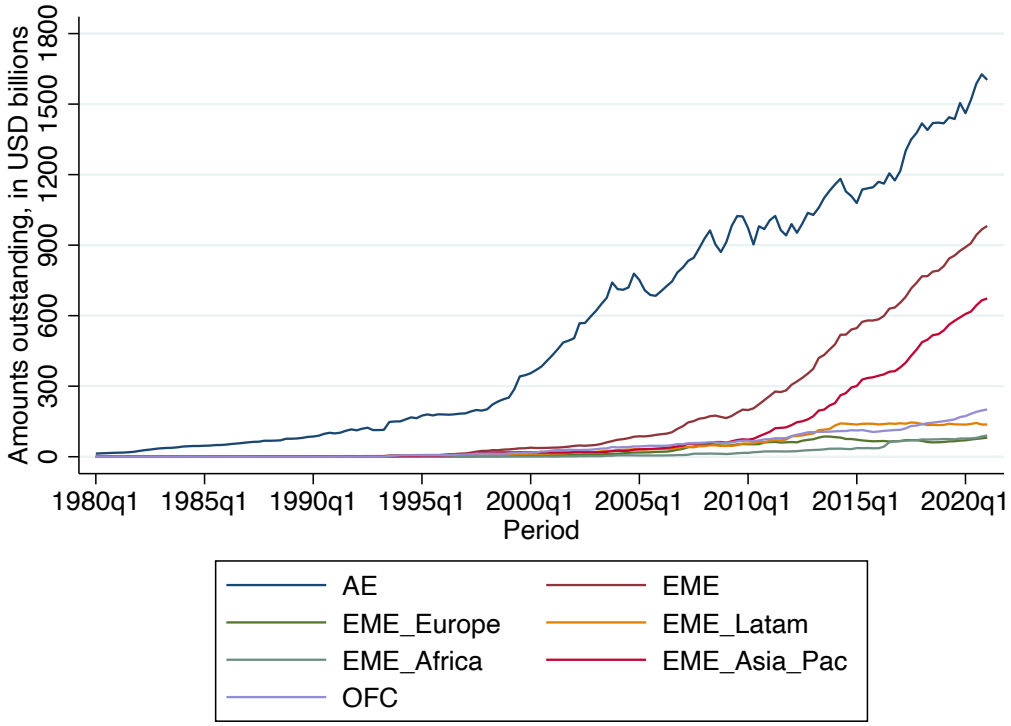
Furthermore, we assess OLS regressions for the weight of offshore issuance in total international debt issuance by nationality of NFC parent. On the one hand, the higher difference between the values of national and residence countries of affiliates for world governance indicators, financial development index, credit to the private sector, corporate bond issuance volume, international financial integration for all county groups, and hedging market development for emerging and developing countries are negatively linked with the offshore issuance share. On the other hand, greater values of nationality country relative to residence countries of foreign affiliates for capital flow management control, volatility in the

inflation rate for all country groups, and volatility in exchange rate change for advanced and emerging countries are positively linked with the offshore issuance share.

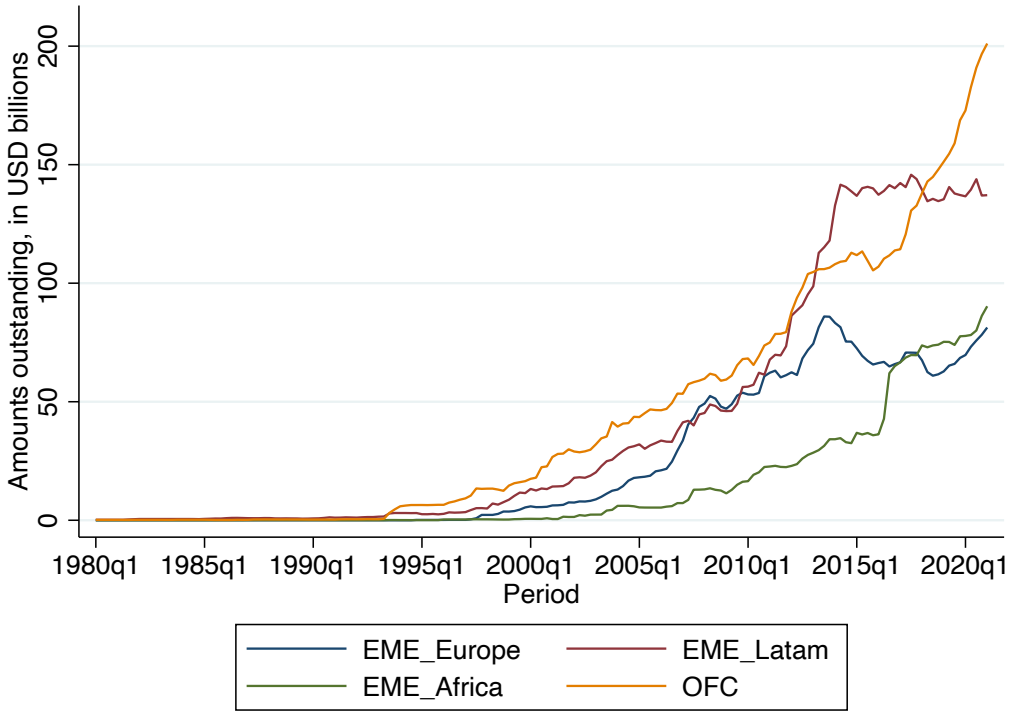
While related research has documented the effect of offshore debt issuances on financial instability via the transmission of global liquidity and US financial conditions, this paper is the first to empirically analyze the link between the offshore issuance of NFCs and their within-company loans considered as portfolio flows masked as FDI. The results of this study highlight the importance of questioning the general view of FDI regarding its stability and monitoring its sources. This study also emphasizes the importance of institutional features and regulations, financial integration, and carry trade motivation in re-routing proceeds of external debts by offshore affiliates to their parent NFCs. Moreover, this in-debt study on the factors determining the relative weight of offshore relative to onshore issuance highlights institutional quality and security of the legal environment, the deepness of the investor base, capital controls on international lending and financial integration, and risk level of countries at the core of the global financial system on the relative incidence of offshore financing. In light of the continuously increasing size of external borrowing of NFCs through overseas affiliates, such studies have become central for assessing the risk profile of debt issuance and its link with the economic environment.

The prevalence of the re-routed external debt might be a double-edged sword. On the one hand, it could promote the growth of the domestic market where the parent company is located by reallocating financial resources to parent companies. On the other hand, it may increase systemic risk and financial instability. Our findings provide some policy implications. The government can support the movement to a more mature financial system, integration into the global financial system, and legal institution-building to cool down the re-routed external borrowing by NFCs.

Figure 3.1: Offshore Issuance

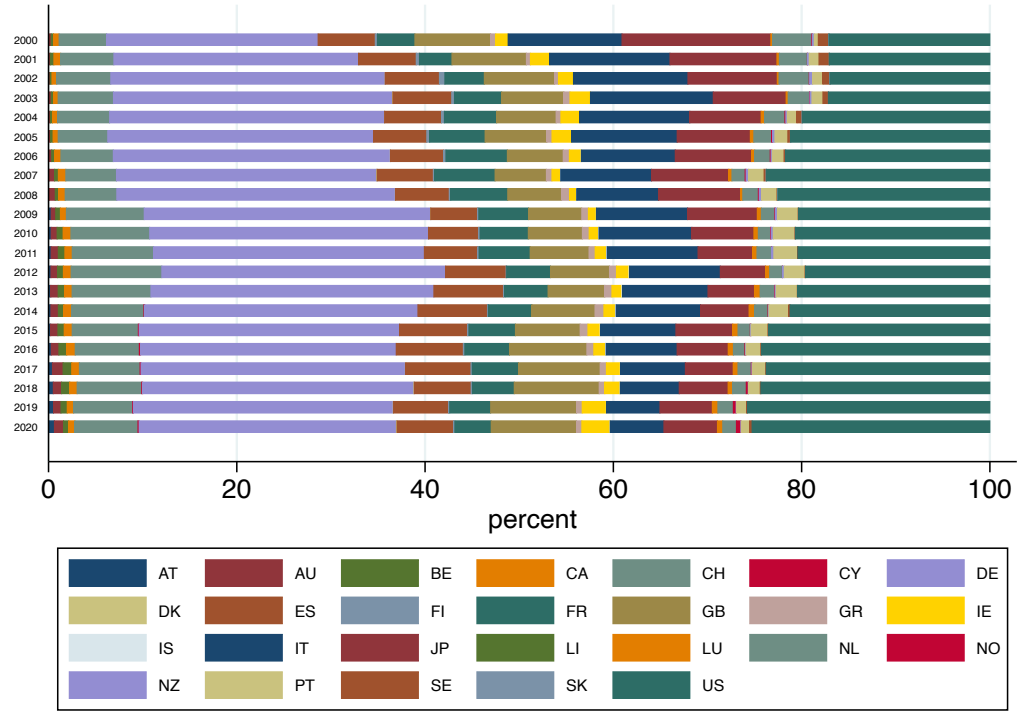


(a)

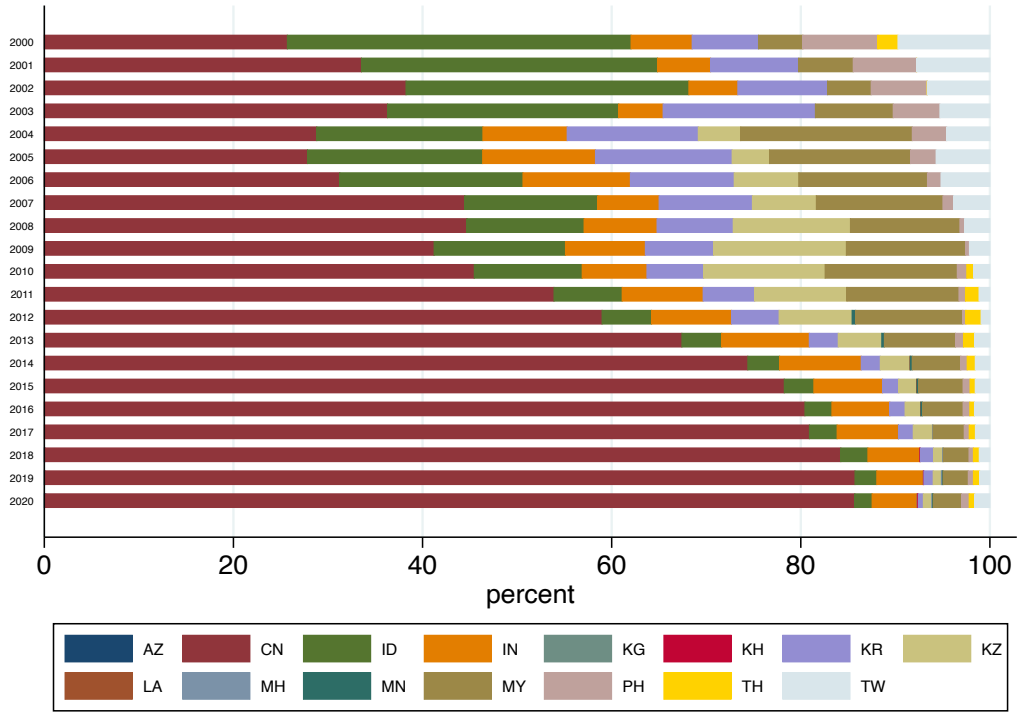


(b)

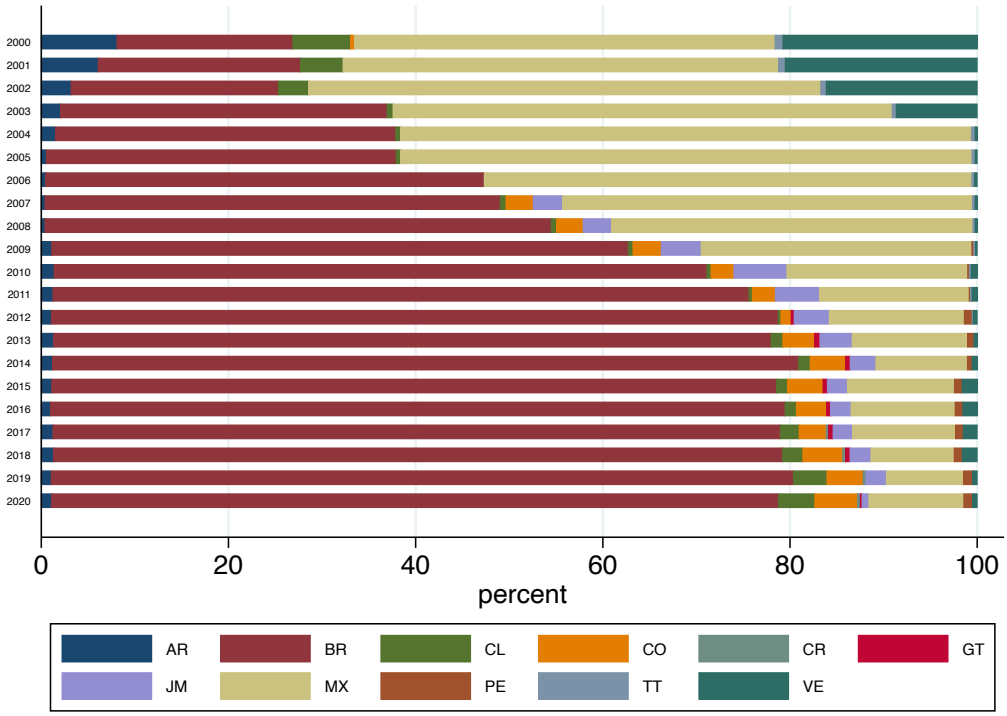
Figure 3.2: Country shares



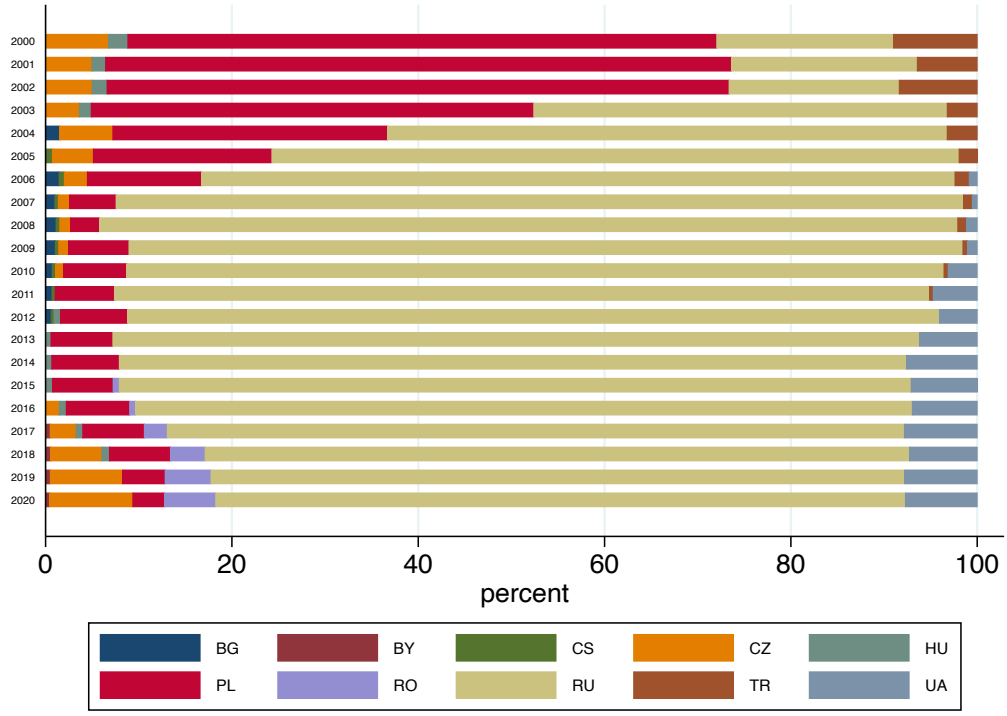
(a) Advanced economies



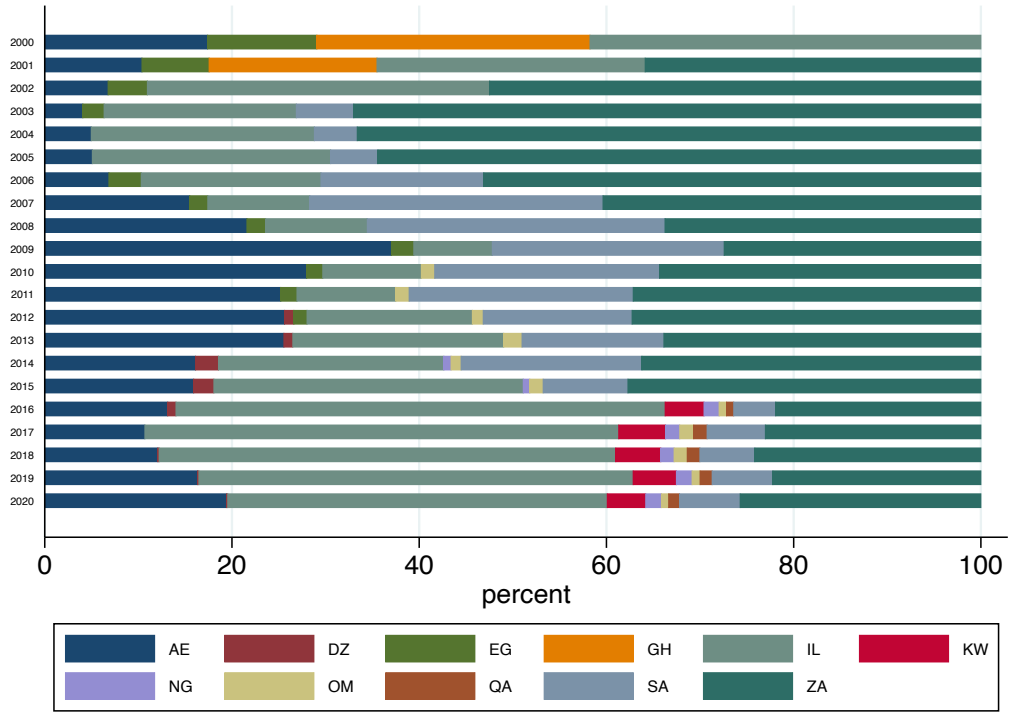
(b) Emerging Asia/Pacific



(c) Emerging Latin America

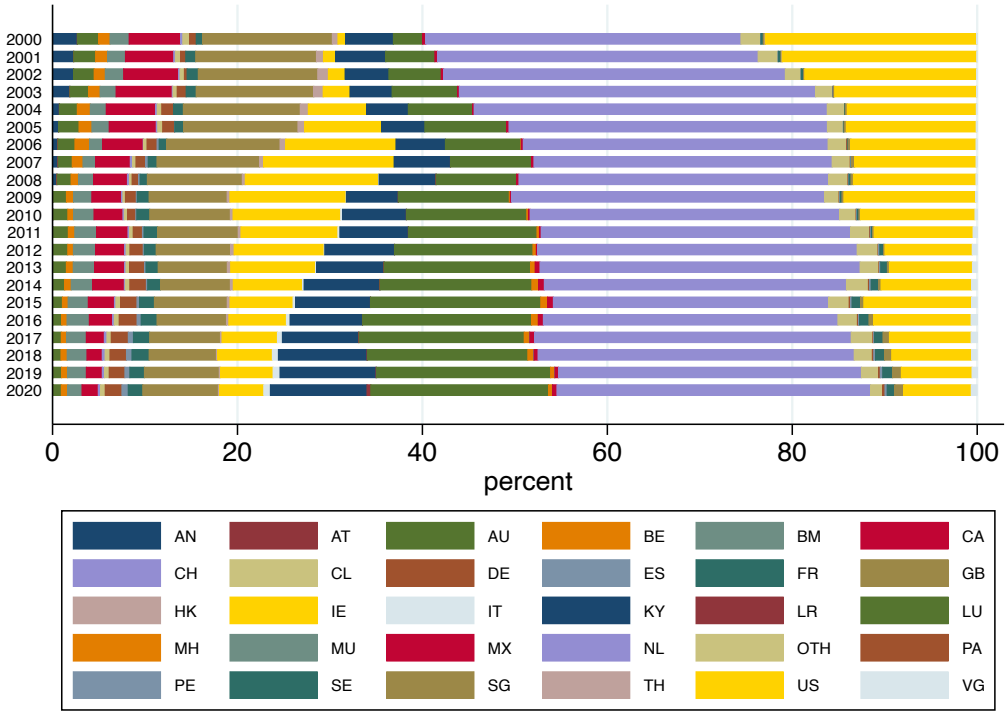


(d) Emerging Europe

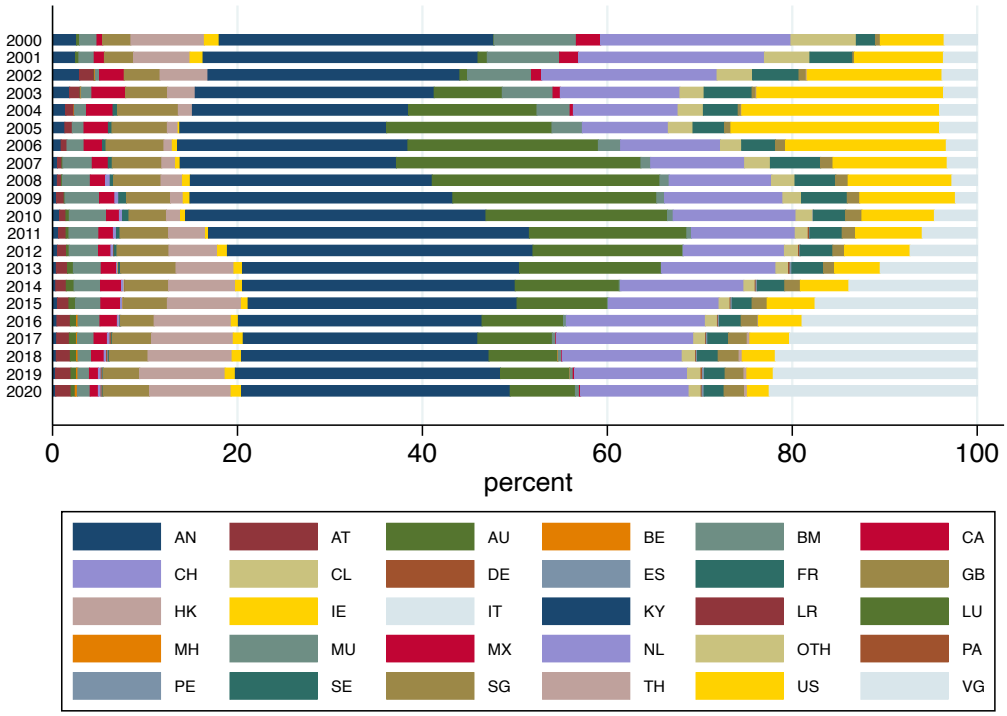


(e) Emerging Africa

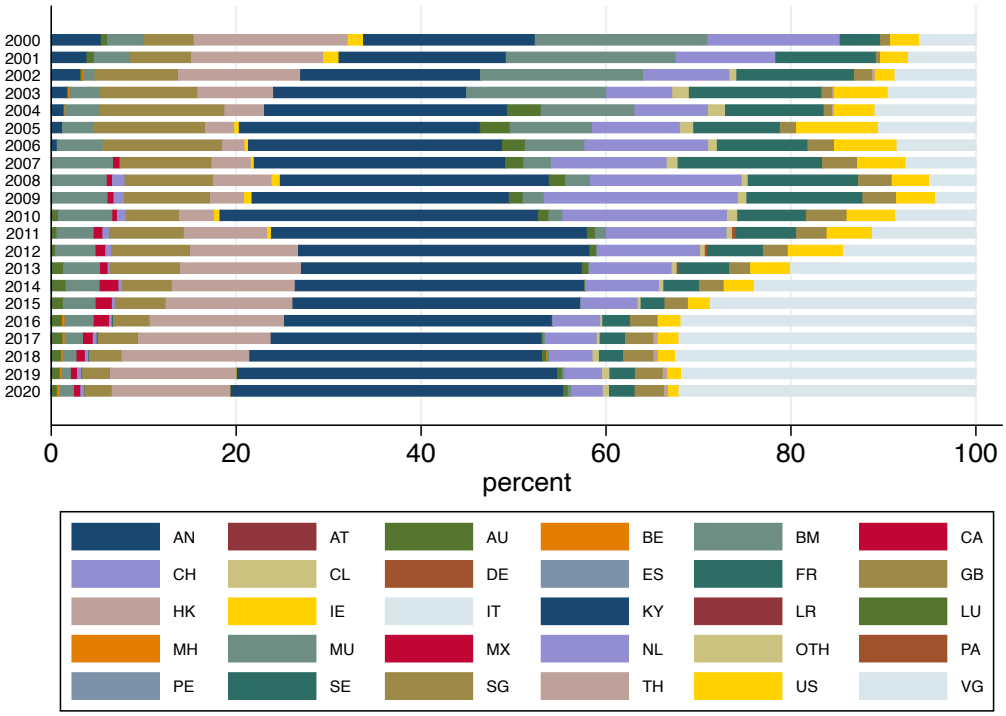
Figure 3.3: Offshore locations' share



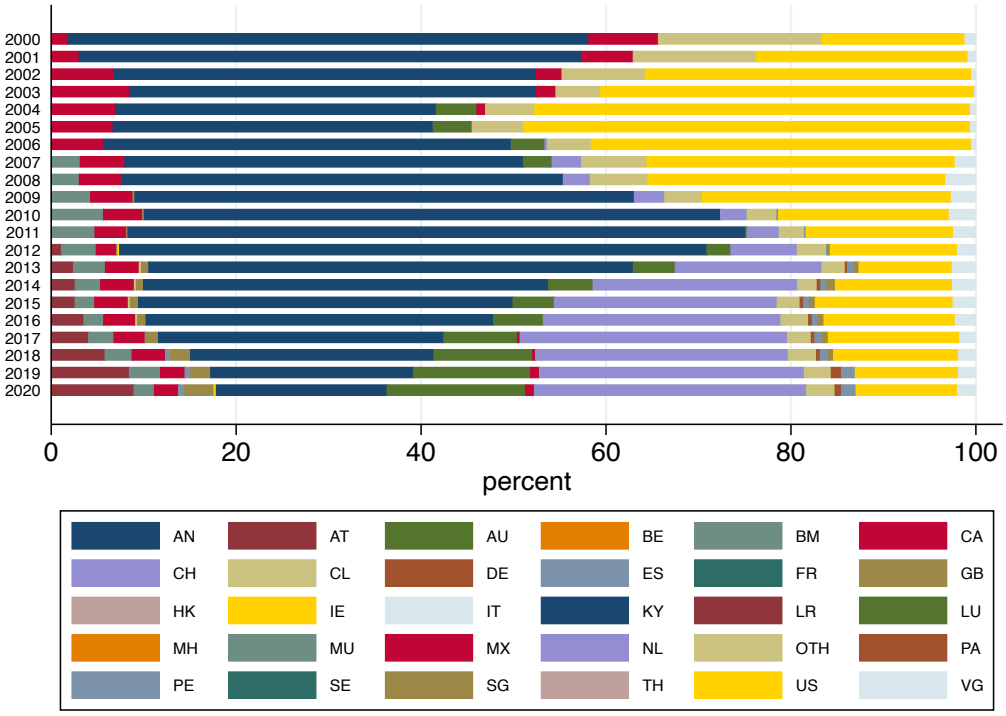
(a) Advanced economies



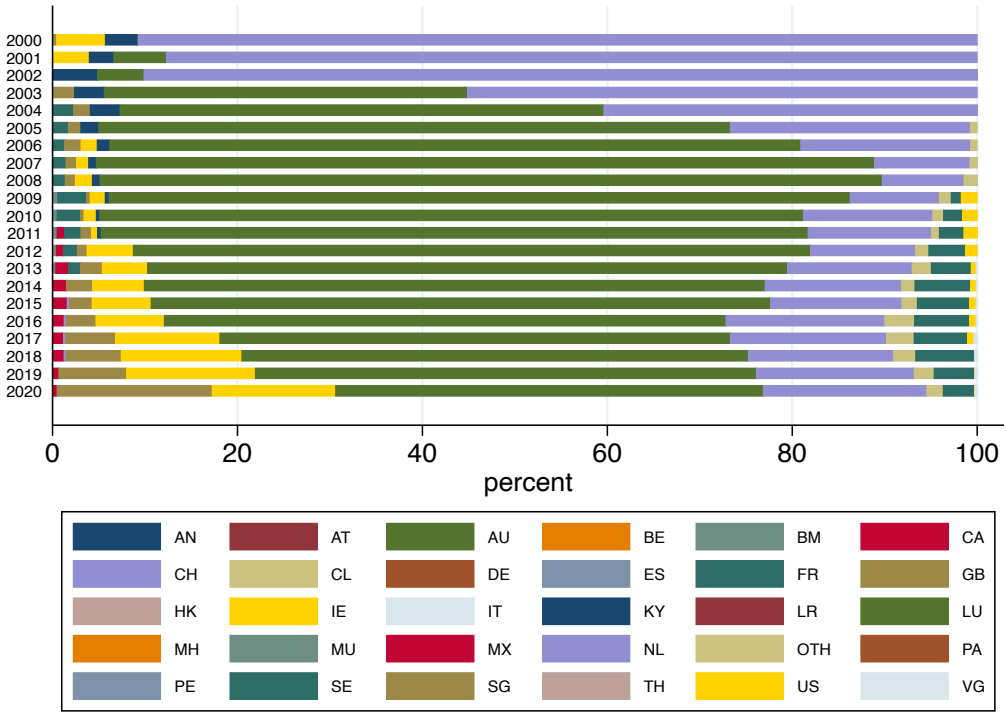
(b) Emerging market and developing economies



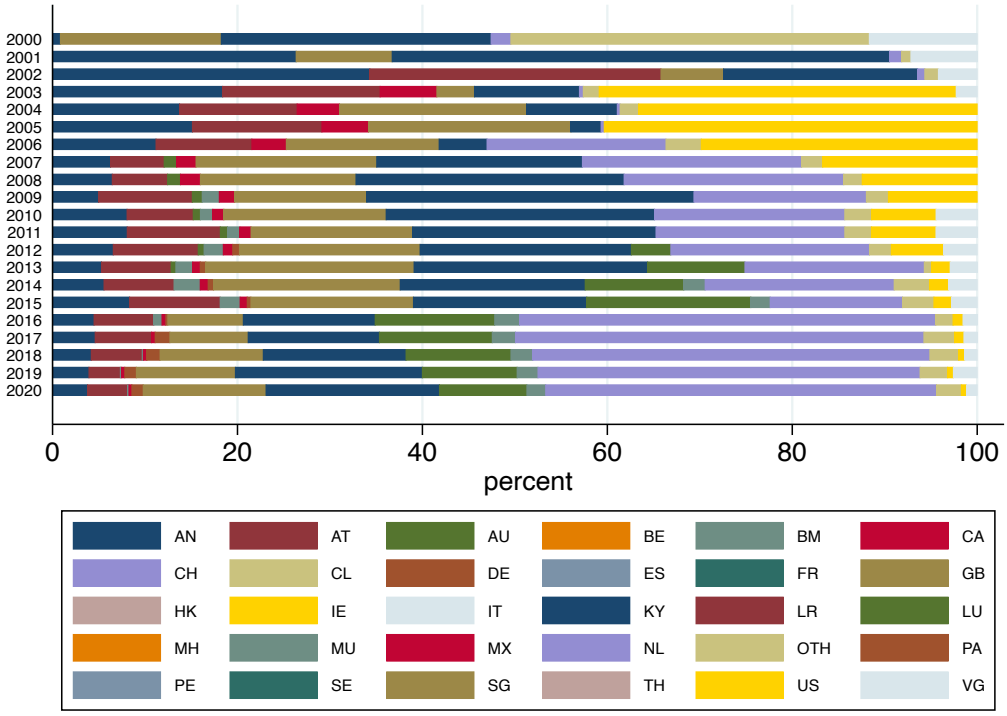
(c) Emerging Asia and Pacific



(d) Emerging Latin America

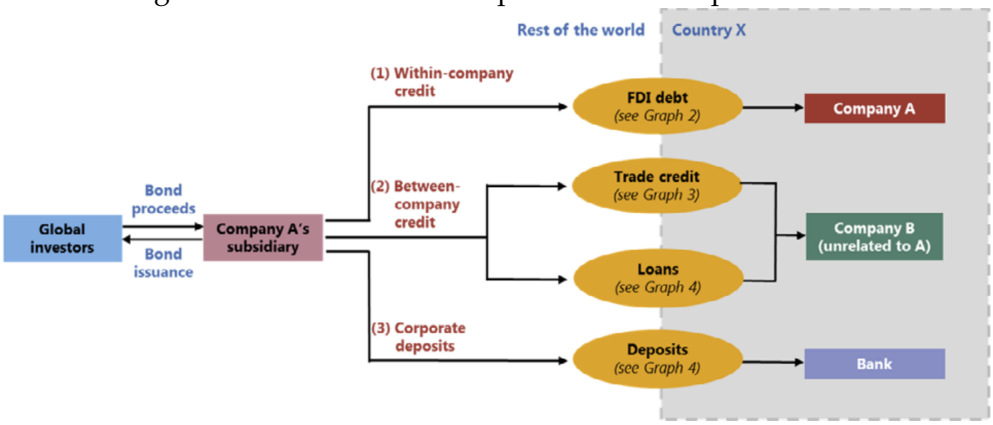


(e) Emerging Europe



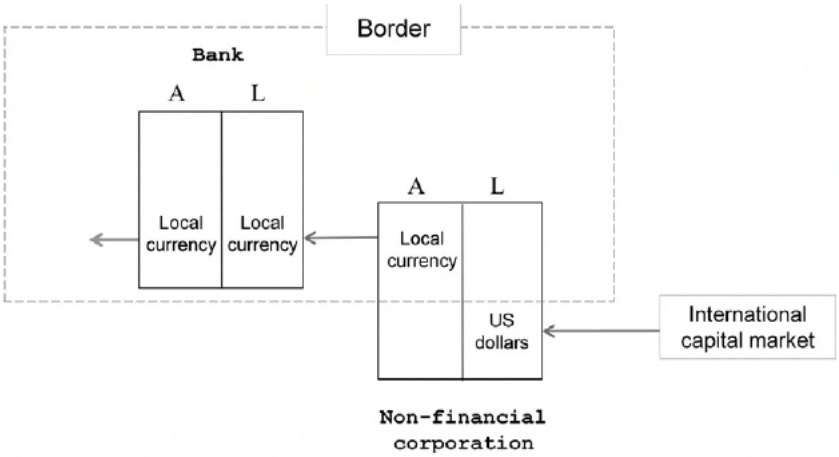
(f) Emerging Africa

Figure 3.4: Non-financial corporations and capital flows



Source: Avdjiev, Chui, and Shin (2014).

Figure 3.5: Transmission of Global Liquidity through Offshore Debt Issuance



Source: Chung et al. (2015)).

Table 3.1: The correlation between within-company loans and offshore issuance

	OLS			PPML		
IOWDL	All	Advanced	EmeDev	All	Advanced	EmeDev
	(1)	(2)	(3)	(4)	(5)	(6)
Offshore	0.263***	0.207***	0.446**	0.341***	0.283***	0.961***
	(0.059)	(0.058)	(0.197)	(0.056)	(0.061)	(0.042)
Nationality × Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Location× Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Countrol Variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1,712	1,332	201	1,929	1,423	273
R-squared	0.801	0.841	0.907	0.735	0.731	0.883

Note: This table reports the coefficient of key variable in the OLS and PPML regressions. The dependent variable is the log of the outward debt instruments liabilities (IOWDL) in Column (1)-(3) and IOWDL in Column (3)-(6). The key independent variable is the log of amounts outstanding offshore issuance (OFFSHORE). Columns (1) and (4) represent the estimated coefficients of OFFSHORE for all country sample. Columns (2) and (5) represent the estimated coefficients of OFFSHORE for the advanced country sample. Columns (3) and (6) represent the estimated coefficients of OFFSHORE for emerging and developing country sample. Country of nationally time fixed effect and location country fixed effects are included in all regressions. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$.

Table 3.2: The effects of national factors on re-routing activities.

	WGI	FD	STOCK	CREDIT	BOND	MATURITY
	(1)	(2)	(3)	(4)	(5)	(6)
Above median	-0.064	0.289***	0.169**	0.236***	0.060	0.369***
subsample	(0.059)	(0.078)	(0.078)	(0.076)	(0.063)	(0.055)
Below median	0.562***	0.399***	0.580***	0.456***	0.545***	0.431***
subsample	(0.058)	(0.102)	(0.082)	(0.107)	(0.076)	(0.054)
Full sample	0.237***	0.329***	0.368***	0.345***	0.404***	0.349***
	(0.057)	(0.058)	(0.053)	(0.059)	(0.066)	(0.055)
Full sample	-0.116***	0.008	-0.108***	-0.085	-0.159***	-0.002
interaction term	(0.029)	(0.284)	(0.031)	(0.071)	(0.046)	(0.002)

Note: This table reports the coefficient of key variable in the PPML regressions. The dependent variable is the outward debt instruments liabilities (IOWDL). The key independent variable is the log of amounts outstanding offshore issuance (OFFSHORE). Rows 1–3 present the estimated coefficients of OFFSHORE in the corresponding samples, and row 4 presents the estimated coefficients of the interaction terms of each factor with OFFSHORE. Rows 1 and 2 in Columns (1)–(6) all represent the above-median sub-samples and the below-median sub-samples based on the value of each determinant. Country of nationally time fixed effect and location country fixed effects are included in all regressions. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$.

Table 3.3: The effects of national factors on re-routing activities.

	IFI	KAOPEN	KACONTROL	CORPTAX	SHARPE	DERIV
	(1)	(2)	(3)	(4)	(5)	(6)
Above median	-0.168***	-0.562***	0.428***	0.455***	0.547***	0.245***
subsample	(0.056)	(0.126)	(0.067)	(0.077)	(0.067)	(0.086)
Below median	0.575***	0.804***	0.151	0.319***	0.015	0.385***
subsample	(0.052)	(0.099)	(0.094)	(0.070)	(0.058)	(0.097)
Full sample	0.208***	0.313***	0.246***	0.343***	0.350***	0.326***
	(0.062)	(0.068)	(0.065)	(0.055)	(0.069)	(0.057)
Full sample	-0.092***	-0.183***	0.784***	-0.003	0.064***	-0.003
interaction term	(0.025)	(0.067)	(0.225)	(0.004)	(0.022)	(0.018)

Note: This table reports the coefficient of key variable in the PPML regressions. The dependent variable is the outward debt instruments liabilities (IOWDL). The key independent variable is the log of amounts outstanding offshore issuance (OFFSHORE). Rows 1–3 present the estimated coefficients of OFFSHORE in the corresponding samples, and row 4 presents the estimated coefficients of the interaction terms of each factor with OFFSHORE. Rows 1 and 2 in Columns (1)–(6) all represent the above-median sub-samples and the below-median sub-samples based on the value of each determinant. Country of nationally time fixed effect and location country fixed effects are included in all regressions. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$.

Table 3.4: Debt structure

$OFFSHORE_{SH}$	(1)	(2)	(3)	(4)	(5)
DIST	-0.352***	-0.312***	-0.366***	-0.312***	-0.283***
	(0.086)	(0.097)	(0.101)	(0.103)	(0.105)
WGI	-0.239***				
	(0.041)				
FD		-1.387***			
		(0.270)			
STOCK				-0.068	
				(0.049)	
CREDIT			-0.228***		
			(0.063)		
BOND			-0.185***		-0.065**
			(0.036)		(0.032)
MATURITY	-0.003	-0.004**	-0.003*	-0.002	-0.002
	(0.002)	(0.002)	(0.002)	(0.001)	(0.002)
IFI				-0.536***	-0.564***
				(0.142)	(0.169)
KACONTROL		0.746***	0.824***	0.237**	0.164
		(0.155)	(0.165)	(0.099)	(0.107)
CORPTAX	-0.021***	-0.013***	-0.013***	-0.031***	-0.034***
	(0.006)	(0.005)	(0.005)	(0.009)	(0.010)
vol(π)	0.001	0.002*	0.002**	-0.004	0.003**
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
vol(ERC)	0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DERIV					-0.107*
					(0.059)
Constant	3.461***	3.097***	3.551***	3.089***	2.885***
	(0.771)	(0.872)	(0.915)	(0.926)	(0.936)
Observations	27,783	22,910	21,519	16,858	18,376
R-squared	0.038	0.039	0.041	0.050	0.058

Note: This table reports the OLS regressions based on data for all country sample. The dependent variable is the ratio of amounts outstanding offshore issuance (OFFSHORE) to the sum of offshore and onshore issuance. DIST is the log of distance. WGI is the first principle component of World Governance Indicators. FD is the financial development index. STOCK is the log of stock market capitalization to GDP. CREDIT is the log of domestic credit to the private sector to GDP. BOND is the log of corporate bond issuance volume to GDP. MATURITY is corporate bond average maturity. IFI is international financial integration, the total external assets and liabilities ratio to GDP at the log level. KACONTROL is capital flow management controls. CORPTAX is the corporate income tax. vol(π) is the standard deviation to the mean of month-to-month inflation. vol(ERC) is the standard deviation to the mean of the month-to-month exchange rate change. All measures of volatilities are computed considering the non-overlapping window. DERIV is the size of foreign exchange swaps, derivatives, and options markets. All time-varying independent variables are the differences between issuer nationality and offshore location. Country of national fixed effects and time-fixed effects are included in all regressions. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$.

Table 3.5: Debt structure, Advanced countries

$OFFSHORE_{SH}$	(1)	(2)	(3)	(4)	(5)
DIST	-0.383***	-0.299**	-0.361***	-0.291*	-0.209*
	(0.114)	(0.133)	(0.139)	(0.158)	(0.118)
WGI	-0.203***				
	(0.058)				
FD		-1.256***			
		(0.434)			
STOCK				0.000	
				(0.086)	
CREDIT			-0.229**		
			(0.106)		
BOND			-0.179***		-0.028
			(0.057)		(0.031)
MATURITY	-0.002	-0.003*	-0.003	-0.004	-0.002
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
IFI				-0.734**	-0.670**
				(0.311)	(0.303)
KACONTROL		0.675***	0.734***	0.074	0.022
		(0.232)	(0.253)	(0.149)	(0.136)
CORPTAX	-0.023***	-0.016**	-0.017**	-0.044**	-0.040**
	(0.009)	(0.008)	(0.008)	(0.019)	(0.017)
vol(π)	0.001	0.001	0.002**	-0.004	0.002*
	(0.001)	(0.001)	(0.001)	(0.003)	(0.001)
vol(ERC)	0.000**	0.000***	0.000**	0.000**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DERIV					-0.073
					(0.097)
Constant	3.886***	3.156***	3.645***	3.436**	2.650**
	(1.048)	(1.216)	(1.286)	(1.486)	(1.104)
Observations	13,170	10,222	9,343	6,278	8,532
R-squared	0.045	0.042	0.045	0.065	0.065

Note: This table reports the OLS regressions based on data for the advanced country sample. The dependent variable is the ratio of amounts outstanding offshore issuance (OFFSHORE) to the sum of offshore and onshore issuance. DIST is the log of distance. WGI is the first principle component of World Governance Indicators. FD is the financial development index. STOCK is the log of stock market capitalization to GDP. CREDIT is the log of domestic credit to the private sector to GDP. BOND is the log of corporate bond issuance volume to GDP. MATURITY is corporate bond average maturity. IFI is international financial integration, the total external assets and liabilities ratio to GDP at the log level. KACONTROL is capital flow management controls. CORPTAX is the corporate income tax. vol(π) is the standard deviation to the mean of month-to-month inflation. vol(ERC) is the standard deviation to the mean of the month-to-month exchange rate change. All measures of volatilities are computed considering the non-overlapping window. DERIV is the size of foreign exchange swaps, derivatives, and options markets. All time-varying independent variables are the differences between issuer nationality and offshore location. Country of national fixed effects and time-fixed effects are included in all regressions. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$.

Table 3.6: Debt structure, Emerging and developing countries

$OFFSHORE_{SH}$	(1)	(2)	(3)	(4)	(5)
DIST	-0.349***	-0.359**	-0.397***	-0.277***	-0.396**
	(0.122)	(0.140)	(0.145)	(0.105)	(0.178)
WGI	-0.279***				
	(0.062)				
FD		-1.602***			
		(0.384)			
STOCK				-0.094	
				(0.068)	
CREDIT			-0.262***		
			(0.090)		
BOND			-0.195***		-0.089
			(0.051)		(0.057)
MATURITY	-0.004	-0.004	-0.003	-0.001	-0.000
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
IFI				-0.463***	-0.530***
				(0.148)	(0.198)
KACONTROL		0.836***	0.928***	0.333**	0.330*
		(0.213)	(0.224)	(0.141)	(0.185)
CORPTAX	-0.020***	-0.012*	-0.012*	-0.026***	-0.032***
	(0.007)	(0.007)	(0.006)	(0.010)	(0.012)
vol(π)	0.003	0.003	0.003	-0.003	0.007*
	(0.002)	(0.002)	(0.002)	(0.004)	(0.004)
vol(ERC)	0.000	0.000	0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DERIV					-0.148*
					(0.080)
Constant	3.136***	3.275***	3.651***	2.468***	3.382**
	(1.073)	(1.253)	(1.302)	(0.928)	(1.586)
Observations	13,653	11,812	11,325	9,829	9,070
R-squared	0.034	0.037	0.039	0.041	0.055

Note: This table reports the OLS regressions based on data for emerging and developing country sample. The dependent variable is the ratio of amounts outstanding offshore issuance (OFFSHORE) to the sum of offshore and onshore issuance. DIST is the log of distance. WGI is the first principle component of World Governance Indicators. FD is the financial development index. STOCK is the log of stock market capitalization to GDP. CREDIT is the log of domestic credit to the private sector to GDP. BOND is the log of corporate bond issuance volume to GDP. MATURITY is corporate bond average maturity. IFI is international financial integration, the total external assets and liabilities ratio to GDP at the log level. KACONTROL is capital flow management controls. CORPTAX is the corporate income tax. vol(π) is the standard deviation to the mean of month-to-month inflation. vol(ERC) is the standard deviation to the mean of the month-to-month exchange rate change. All measures of volatilities are computed considering the non-overlapping window. DERIV is the size of foreign exchange swaps, derivatives, and options markets. All time-varying independent variables are the differences between issuer nationality and offshore location. Country of national fixed effects and time-fixed effects are included in all regressions. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$.

Table 3.7: Debt structure, Emerging countries

$OFFSHORE_{SH}$	(1)	(2)	(3)	(4)	(5)
DIST	-0.419**	-0.445**	-0.489**	-0.344**	-0.500**
	(0.164)	(0.190)	(0.197)	(0.142)	(0.225)
WGI	-0.330***				
	(0.080)				
FD		-2.074***			
		(0.513)			
STOCK				-0.125	
				(0.091)	
CREDIT			-0.311***		
			(0.118)		
BOND			-0.254***		-0.111
			(0.070)		(0.068)
MATURITY	-0.002	-0.001	-0.000	-0.002	0.001
	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)
IFI				-0.533***	-0.532**
				(0.192)	(0.224)
KACONTROL		0.967***	1.090***	0.473**	0.399*
		(0.262)	(0.278)	(0.193)	(0.219)
CORPTAX	-0.022**	-0.013	-0.013*	-0.030**	-0.033**
	(0.009)	(0.009)	(0.008)	(0.013)	(0.014)
vol(π)	0.005	0.006	0.006	-0.007	0.008*
	(0.004)	(0.004)	(0.004)	(0.008)	(0.005)
vol(ERC)	0.000**	0.000***	0.000***	0.000***	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DERIV					-0.183*
					(0.093)
Constant	3.690**	4.008**	4.431**	3.066**	4.276**
	(1.439)	(1.695)	(1.759)	(1.260)	(2.002)
Observations	10,062	8,679	8,289	7,197	7,648
R-squared	0.037	0.041	0.043	0.045	0.058

Note: This table reports the OLS regressions based on data for the emerging country sample. The dependent variable is the ratio of amounts outstanding offshore issuance (OFFSHORE) to the sum of offshore and onshore issuance. DIST is the log of distance. WGI is the first principle component of World Governance Indicators. FD is the financial development index. STOCK is the log of stock market capitalization to GDP. CREDIT is the log of domestic credit to the private sector to GDP. BOND is the log of corporate bond issuance volume to GDP. MATURITY is corporate bond average maturity. IFI is international financial integration, the ratio of total external assets and liabilities to GDP at the log level. KACONTROL is capital flow management controls. CORPTAX is the corporate income tax. vol(π) is the standard deviation to the mean of month-to-month inflation. vol(ERC) is the standard deviation to the mean of the month-to-month exchange rate change. All measures of volatilities are computed considering the non-overlapping window. DERIV is the size of foreign exchange swaps, derivatives, and options markets. All time-varying independent variables are the differences between issuer nationality and offshore location. Country of national fixed effects and time fixed effects are included in all regressions. ***, **, and * denote, respectively $p<0.01$, $p<0.05$, $p<0.1$.

Chapter 4

Breaking down international financial integration: US dollar vs euro

4.1 Introduction

The US dollar- and euro-dominated international monetary system is important regarding the sensitivity to exchange rate fluctuations, which potentially bring large financial wealth re-distributions via balance sheet effects, the transmission of monetary policies of the Federal Reserve or the European Central Bank (ECB) to other economies, and global financial stability. For instance, a dollar depreciation can make dollar borrowers more creditworthy and ease the credit supply to them, as happened in 2008 and 2020 when the Fed found reason within its domestic mandate to extend dollar credit abroad freely. Furthermore, the US dollar and the euro have large domain and essential roles in bank funding, corporate borrowing, government borrowing, Central Bank reserve holdings, foreign exchange markets, and international trade due to their primary and secondary place as international currencies (McCauley, 2020; McCauley, McGuire, and Sushko, 2015; Bénétrix, Lane, and Shambaugh, 2015).

There are additional benefits for countries owning the international currency,

such as lower cost of borrowing for the county's household or firms, more reliable access to finance because of a more liquid and integrated financial market, reduced exposure to legal actions taken by third country jurisdictions, less vulnerability to an exchange rate shock, and lower cost and risk of trading in the domestic currency. The status of the international currencies, therefore, also does matter for the owner of these currencies. For instance, promoting the euro's international role is one of the strategies of the European Union, and the global role of the euro is monitored by the ECB (European Central Bank, 2022; European Comission, 2021).

Which forces drive international currency use? How do the domain and economics of global dollar markets evolve? Why does the euro have a secondary role in the current monetary order, and how will the structure of the international monetary system evolve? These have been the key questions in the literature, and they have been far-reaching in the last decade with developments like Russia's war in Ukraine, an increase in, at times crippling, economic and financial sanctions, the rise of China, the renminbi and growing US-Chinese tensions, and developments in digital finance such as digital currencies provided by central banks or cryptocurrencies.

This paper introduces a new and extended dataset for the euro and US dollar composition of international investment positions (IIP) for 39 countries from 2001 through 2021, which brings us closer to answering these questions. It documents the status of the Euro and the US dollar as international currencies by analyzing key patterns of the international financial integration (IFI) indicator denominated in euro and US dollar. This is done comparatively for advanced and emerging market economies as well as for their debt and equity components. Investigating these separately is important due to their different risk implications and relations with other financial metrics and economic actors.

The paper speaks to three distinct bodies of literature. The first group discusses the US dollar's dominance across different aspects of international currency use

compared to the Euro in a distant second place. While Maggiori, Neiman, and Schreger (2020) document the evolution of the euro and US dollar shares of corporate and sovereign bond positions, Maggiori, Neiman, and Schreger (2019) focus on the currency used in bank loans, international trade invoicing, and in global foreign exchange trading volume. Furthermore, Ilzetzki, Reinhart, and Rogoff (2020) documents the dollar and euro as anchor currencies and explores safe assets as possible reasons for the euro's second place. These studies present the underperformance of the euro relative to USD in different aspects of international currency use and the rise of USD share and fall of the euro share after the global financial crisis (GFC). In addition, they relate these findings with different factors like the availability of safe assets, structural weaknesses in the euro area, the euro crisis, and maintaining liquidity.

The second group, such as Lane and Shambaugh (2010a), Bénétrix, Lane, and Shambaugh (2015) and Bénétrix et al. (2020), shows the evolution of international currency exposure and quantifies the valuation effect arising from exchange rate fluctuations on the value of external assets and liabilities. Furthermore, as one of the building blocks of the valuation effect, Bénétrix et al. (2020) analyze the main trends of IFI denominated in USD and euro for 50 countries compiling data for the currency composition of IIP until 2017.

The final group focuses on the central role of international financial integration. Lane and Milesi-Ferretti (2003), Lane and Milesi-Ferretti (2007), Lane and Milesi-Ferretti (2018), and Milesi-Ferretti (2022) study the evolution of cross-border positions in relation to GDP and its compositions by relating them with the major macroeconomic and financial developments. For instance, Lane and Milesi-Ferretti (2018) analyze the profile of cross-border financial positions since the onset of the crisis for the following sub-periods: the GFC, the euro crisis of 2010-2012, the boom in the capital flows to emerging market economies in the aftermath of the crisis and the taper tantrum during which emerging market flows were volatile.

This paper combines these different bodies and analyzes the international role of the euro and dollar by looking at the financial integration indicator proposed by Lane and Milesi-Ferretti (2003) and its components by investment types. We compile an extended dataset for the euro and US dollar composition of IIP between 2001 and 2021. The paper provides a broader framework for the role of the euro and USD as global currencies by including all the components of external positions, except for foreign exchange reserves (portfolio equity, foreign direct investment, portfolio debt, and other investment), rather than looking at only one dimension of international finance like in the first body of the literature. Furthermore, it contributes to Bénétrix et al. (2020) by looking at equity- and debt-based components separately and showing the link between the exchange rate and the role of the euro and USD in IFI measures. Finally, it enhances our understanding of the IFI measure by including the currency dimension, which was not part of the third body of the literature. Finally,

There are several key findings. First, for the euro and US dollar-denominated IFI, we find that while the euro-denominated IFI expanded rapidly until 2007, it declined after the GFC and has been overtaken by the US dollar since 2014. Global investors might see the dollar as a safer currency relative to the euro because of its relatively better performance in the peak time of crisis and appreciation afterward. This is the outcome of a decrease in the share of the euro in the debt component and a steeper increase in the share of USD relative to the share of the euro in the aftermath of the GFC. Furthermore, there is an unambiguous US dollar dominance in cross-border holdings across all the measures throughout the whole sample period when we exclude the US and euro area countries from the sample, pointing out the concentration of the euro in euro area countries. In addition, there is a disproportionate dominance of the US dollar in all measures (IFI, debt-based, and equity-based) for emerging market economies, referring to the limited role of the euro as a globally prevailing currency. In addition, despite the last decade's developments, there has not been a change in the status of the euro and the US dollar in finance.

This paper further contributes to the literature by presenting a detailed descriptive analysis of the relation between the euro and the US dollar share in the currency-induced valuation-adjusted IFI measures and the exchange rate. We find a strong positive correlation between the strength of the currency in the previous year and the share of the currency in different financial integration measures in the current year. The finding shows that the relative strength of the currency towards another currency motivates both investors to hold their assets in that currency and borrowers to issue in that currency. However, the link is weaker for the equity component, which might be associated with the less effective currency-related frictions for the equity market relative to the debt market.

The paper is structured as follows. Section 4.2 describes the data and its uses. Section 4.3 present the building blocks to compute the euro and USD breakdown of IFI. Section 4.4 introduces the key patterns of euro- and US dollar-denominated IFI and aggregate euro and US dollar shares. Section 4.5 presents the relations of euro and US dollar shares in IFI with the exchange rate. Section 4.6 provides a descriptive analysis of the link between currency denomination in IFI and trade, followed by a conclusion.

4.2 Data

The dataset in this paper builds on the contributions by Lane and Shambaugh (2010a), Bénétrix, Lane, and Shambaugh (2015), and Bénétrix et al. (2020). The first two papers provide estimates of the currency composition of external assets and liabilities for a sample of 117 countries between 1990-2004 and 1990-2012, respectively. The third paper provides data for 50 countries between 1990-2017.

Our dataset provides information for 39 countries for the period 2001 through 2021.[1] Following the approach of Bénétrix et al. (2020), we focus on countries that

[1]The countries included in the sample are Argentina, Australia, Austria, Belgium, Brazil, Canada, Chile, China, Czech Republic, Denmark, Finland, France, Germany, Greece, Hong Kong, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Malaysia, Mexico, Netherlands, Norway, Philippines, Poland, Portugal, Russia, South Africa, Spain, Sweden, Switzerland, Thailand, Turkey, the United Kingdom, and the United States.

are part of the IMF External Balance Assessment and/or External Sector Report. We have fewer country observations because there is no perfect overlap between the Coordinated Portfolio Investment Survey (CPIS) and the Coordinated Direct Investment Survey (CDIS) regarding coverage, and we opted against estimating missing data points via the gravity model. For example, CPIS has no data for Peru after 2017, while CDIS does, whereas CDIS has no data for Singapore and Uruguay whereas CPIS does. While this is not ideal, the data still provide global coverage of about 82 and 90 percent of the average world external assets and liabilities and world GDP, respectively, throughout the period, which is comparable with Bénétrix et al. (2020).[2] We use actual data whenever available for each of the IIP and expand it by using estimated currency weights, which are obtained by the geography dimension. The main data sources for actual data are CPIS (Table 2) and Locational Banking Statistics (LBS) from the Bank of International Settlement (BIS). The synthetic data is calculated using CPIS, CDIS, and BIS International Debt Security Statistics (IDS). Tables C.1 and C.2 in the Appendix C describe the coverage of actual data for each country.

4.2.1 Foreign assets

The asset side of IIP consists of five items: portfolio equity, foreign direct investment (equity and debt), portfolio debt, other investment, and reserve. We exclude reserve assets because of the data limitation.

Data for currency breakdown of portfolio equity come from CPIS (Table 2) and covers 65 countries. Only 31 countries for portfolio equity overlap with our sample in this database. We use the CPIS dataset, which provides the geographical location of portfolio equity asset holding since 2001, to fill in missing data points. We assume that the portfolio equity asset is denominated in the host country's currency following previous research (Bénétrix et al., 2020; Bénétrix, Lane, and

[2]Bénétrix et al. (2020) provides the global coverage of about 85 and 91 percent of the average world external assets and liabilities and world GDP throughout the period, respectively

Shambaugh, 2015; Lane and Shambaugh, 2010a). The CPIS bilateral data contains information on 80 source and 243 host countries and covers the period 2001 through 2021.[3] We omit offshore financial centre (OFC) host countries from the dataset.[4]

We estimate the currency of denomination for FDI equity and debt separately. It is essential to distinguish debt and equity components because there is evidence that these components of FDI have very different currency composition (Bénétrix et al., 2020). CDIS provides the geographical location of direct investment for the equity part. Both inward and outward direct investment positions are available with breakdowns of debt instruments and equity positions. Like with CPIS, CDIS contains the source country, host country, and time information. We use data between 2001 and 2008 from Bénétrix et al. (2020) as CDIS only covers the period 2009-2021. Similar to portfolio equity, we assume that the equity component of FDI is denominated in the currency of the host country. There are 94 reporter countries for FDI equity assets, which provides complete coverage for our sample.[5] We use the currency weights of portfolio debt assets for FDI debt.

CPIS Table 2 is the source of the actual dataset for portfolio debt assets, and it covers 66 countries, of which 32 countries overlap with our sample. We estimate the currency weight by combining the geography of long-term portfolio debt assets positions from CPIS with the currency of denomination of host countries' bonds issued in international markets to extend coverage. The BIS international debt security statistics (IDS) provides data for the currency denomination of host countries' bond issuance for 151 countries. Those are the securities issued in a market other than the local market of the country where the borrower resides (Gruić and Wooldridge, 2012). The BIS compiled this dataset using commercial

[3]We use interpolation to increase the coverage. Interpolation is not a problem for the purposes and methodologies used in this paper.

[4]Removing offshore financial centers is common practice as they tend to have a close to balanced net foreign asset positions.

[5]Before computing the share, we set the negative values to zero in the data and interpolate them. In addition, we drop the Offshore financial centre (OFC) host counties from the dataset.

data sources such as Dealogic, Euroclear, Thomson Reuters, and Xtrakter. Data is available for our entire sample.

We use BIS LBS for the currency denomination of other investments since banking assets constitute the largest part of it. It provides data on bilateral country-level cross-border bank positions, including the currency composition of outstanding assets. There are 31 countries providing information to BIS, which overlap with our country sample. For the remaining countries, we use "mirror data" obtained from reporter countries' data. In other words, we derive the currency composition of the foreign assets of non-reporting countries by using the aggregate currency composition of the foreign banking liabilities of the reporting countries. Using mirror data is appropriate because of both a high correlation between reported and derived LBS weights and the importance of reporter countries (Bénétrix et al., 2020).

4.2.2 Foreign liabilities

The main functional categories of the liability side of international investment positions are portfolio equity, foreign direct investment (equity and debt), portfolio debt, and other investments.

We assume that portfolio equity and FDI equity liabilities are denominated in the currency of the issuer country, i.e., in domestic currency. We use the currency weights of portfolio debt liabilities for FDI debt liabilities. Data on currency denomination of portfolio debt liabilities come from BIS IDS.

Data for other investment liabilities are provided by BIS LBS. The coverage of assets and liabilities are aligned with each other. As in other investment assets, we use "mirror data" obtained from reporter countries' data. We derive the currency composition of the foreign liabilities of non-reporting countries by using the aggregate currency composition of the foreign banking assets of the reporting countries.

4.3 Euro and dollar indicators: "currency IFI"

The dataset contains currency weights for assets and liabilities, including portfolio equity, FDI equity and debt, portfolio debt, and other investments. The core of this paper is to measure international financial integration denominated in the US dollar and euro. We calculate volume-based IFI by using the following formula introduced by Lane and Milesi-Ferretti (2003)

$$IFI_{it} = \frac{(FA_{it} + FL_{it})}{GDP_{it}}$$

where FA and FL refer to the stock of aggregate foreign assets and liabilities, respectively.

For the equity-based measure, we use the following formula

$$IFI_{it}^{equity} = \frac{(PEQA_{it} + FDIA_{it} + PEQL_{it} + FDIL_{it})}{GDP_{it}}$$

where PEQA (L) and FDIA (L) are the stock of portfolio equity and FDI assets (liabilities). For the debt-based measure, we use the following formula

$$IFI_{it}^{debt} = \frac{(PDA_{it} + OTHIA_{it} + PDL_{it} + OTHIL_{it})}{GDP_{it}}$$

where PDA (L) and OTHIA (L) are the stock of portfolio debt and other investment assets (liabilities).

To compute the currency denomination of IFI measures, we follow the techniques in Lane and Shambaugh (2010a) and Bénétrix, Lane, and Shambaugh (2015). This involves a two-step process in which currency weights for different categories of foreign assets and liabilities, except for reserves, are first calculated and then combined with the shares of each category in the international balance sheets using the External Wealth of Nations dataset (Lane and Milesi-Ferretti, 2018; Milesi-Ferretti, 2022).

Currency weights formulae for assets and liabilities are

$$\omega_{ijt}^{A} = \sum_{1}^{N} \lambda_{it}^{Ak} * \omega ijt^{Ak}; \qquad \omega_{ijt}^{L} = \sum_{1}^{N} \lambda_{it}^{Lk} * \omega ijt^{Lk}$$

where ω_{ijt}^{A} (ω_{ijt}^{L}) is the weight for currency j (euro and US dollar) in period t in country i' foreign assets (liabilities). λ_{it}^{Ak} (λ_{it}^{Lk}) is the share of category k (portfolio equity, FDI, portfolio debt, and other investment) in country i's foreign assets (liabilities) in period t. ωijt^{Ak} (ωijt^{Lk}) is the weight for currency j in period t in category k for country i' foreign assets (liabilities).

Measures of aggregate euro and US dollar currency shares at the end of period t can be defined by

$$SHEUR_{it} = \omega_{iEURt}^{A} s_{it}^{A} + \omega_{iEURt}^{L} s_{it}^{L}; \qquad SHUSD_{it} = \omega_{iUSDt}^{A} s_{it}^{A} + \omega_{iUSDt}^{L} s_{it}^{L}$$

where ω_{iEURt}^{A}(ω_{iUSDt}^{A}) and ω_{iEURt}^{L}(ω_{iUSDt}^{L}) are the share of foreign assets denominated in euro (US dollar), and the share of foreign liabilities denominated in euro (US dollar), respectively. $s_{it}^{A} = A_{it}/(A_{it} + L_{it})$ ($s_{it}^{L} = L_{it}/(A_{it} + L_{it})$) is the share of foreign assets (liabilities) in total cross-border holdings. SHEUR (SHUSD) index lies in the range (0, 1), where a value of 0 corresponds to a country that has zero euro (US dollar) denominated foreign assets and liabilities, whereas + 1 corresponds to a country that has only euro (US dollar) denominated foreign assets and foreign liabilities.

In turn, international financial integration denominated in euro, and the US dollar can be written as

$$IFI_{it}^{EUR} = SHEUR_{it} * IFI_{it}; \qquad IFI_{it}^{USD} = SHUSD_{it} * IFI_{it}$$

where $SHEUR_{it}(SHUSD_{it})$ is the share of foreign assets and liabilities denominated in euro (US dollar). We will refer to these as "dollar IFI" and "euro IFI" and more generally "currency IFI" throughout the paper. IFI_{it} is the de-facto IFI in period t in country i.

It is worthy to mention one concern. We only focus on cross-border positions. However, foreign currencies may also be used between residents of the same economy. For instance, a Citibank London holding in London of a security in euro will not be accounted for in these measures. Secondly, we are looking from the residency perspective rather than nationality one. In some cases, a corporation in country A may be also affected by the currency share of a subsidiary in country B. These cannot be addressed with available data. Furthermore, by the nature of the IFI measure, there is duplication. In other words, the asset of one country is the liability of another. From the currency perspective, one country's long euro or USD position means another country's short euro or USD position.

4.4 Key patterns

The evolution of IFI based on cross-border assets and liabilities positions relative to GDP is studied by Lane and Milesi-Ferretti (2003), Lane and Milesi-Ferretti (2007), and Lane and Milesi-Ferretti (2018). Their findings showed that international financial integration expanded rapidly between 1990 to the GFC and came to a halt in the aftermath of the GFC.

More recently, Bénétrix et al. (2020) breaks down the IFI measure by currency for 50 countries and analyzes the trend. They documented three main findings: the rapid expansion of euro-denominated IFI until 2007, quick recovery of the US dollar after a sharp decline in 2008, and continuous dominance of the US dollar in cross-border holdings outside the US and euro. However, their data covers the years 1990-2017, which exclude the recent economic and political developments that constitute the sharpest shocks to the status quo since the collapse of Bretton Woods. First of all, there are sanctions imposed by Western countries on Russia

because of Russia's war in Ukraine.[6] An increase in the frequency of sanctions may lead foreigners to look for alternatives to the dollar. Second, the Chinese economy and its footprint are increasing. For instance, it is the second-biggest exporter and fourth-place foreign investor by value. In addition, the authorities in China actively promote the international use of renminbi. Therefore, renminbi is one of the international currencies that might challenge the dollar. Third, although isolation from the conventional financial system and lack of regulatory actions limit the use of cryptocurrencies and stablecoins, retail of central bank domestic currencies (CBDCs) might enhance the international use of currency because of the lower cost of cross-border transactions relative to transfers via banks and payment companies (Corsetti et al., 2023).

4.4.1 Level dynamics: year on year

In this section, we analyze the main trends in the share of the euro and US dollar in international financial integration over the period 2001-2021 by breaking down IFI into its debt and equity components. Figure 4.1a illustrates the measure of IFI denominated in euro and in US dollar (USD) for all countries in the sample as well as all countries excluding the euro area and the US. In addition, Figure 4.1b and 4.1c report the debt IFI and equity IFI measures separately. While Figure 4.2a, 4.2b and 4.2c show information for advanced economies, Figures 4.3a, 4.3b and 4.3c are the plots for emerging market economies. For all figures, the measure is the sum of external assets and external liabilities scaled by the weighted average of each country group's GDP. This provides a global perspective on the IFI measures.

The figures confirm the distant second position of the euro to the US dollar as the dominant currency, as previously described in Maggiori, Neiman, and Schreger (2019), Ilzetzki, Reinhart, and Rogoff (2020), and Bénétrix et al. (2020), from the international financial integration perspective. Figure 4.1ashows that although euro-denominated holdings expanded rapidly until 2007 from 55.4 to 130 percent

[6] 'Western countries' refer to a political and geostrategic grouping.

of the overall sample GDP, they declined after the global financial crisis, and have been outdistanced by the US dollar since 2014. By late 2021, the euro and dollar IFI accounted for roughly 111.4 and 129.1 percent of the overall sample GDP, respectively. When the US and euro area member states are excluded from the sample, the US dollar is the dominating currency throughout the time period. The widening gap between the US dollar and the euro after the European debt crisis is visible. On the one hand, the euro surged from 33.7 to 56.2 percent of the group GDP between 2001 and 2007 and declined drastically to 39.4 in 2008. However, when you exclude the US and euro area from the sample, the line gets flatter between 2001 and 2007, which is a sign that euro growth in this period is mostly concentrated in the euro area. Towards the end of 2020, it reached about 40.3 percent of the group's GDP. On the other hand, the US dollar increased from 73 to 77.6 percent of the group GDP during 2001-2007 and dropped drastically to 58.8 percent of the group GDP in 2008. Since the GFC, it has been continuously rising and reached 94 percent of the group GDP in 2020. The increasing trend of the USD and stable trend of the euro after the GFC might be the outcome of sharp appreciation in the USD and high liquidity of the USD during the peak of the crisis. There is a drop in both the US dollar and euro-denominated cross-border holdings to 33.6 and 86.8 percent of the group GDP, respectively, in 2021.

The dominance of currency in cross-boarding assets and liabilities is linked to liquidity and safety (Gourinchas, Rey, and Sauzet, 2019; Coppola, Krishnamurthy, and Xu, 2023). The euro has a distant secondary role after the US dollar in the international monetary system, and there is no prospect for substantial change. Several factors might explain this pattern. Supply of safe euro-denominated assets is scarce relative to safe US dollar-denominated assets. For instance, there is a wide gap between sovereign bond supply by the US government and by the combined German and French governments. Moreover, US market capitalization exceeds the combined capitalization of the euro area, China, the United Kingdom, and Japan. The euro area capital market has relatively more regulatory and

informational barriers and is not as integrated as the United States (He, Krishnamurthy, and Milbradt, 2019; Ilzetzki, Reinhart, and Rogoff, 2020). Furthermore, since investors show "zone bias" in the currency composition of their portfolios to reduce the currency risk, the much larger size of the dollar zone relative to the euro area is also an important factor (Ito and McCauley, 2019). A country is part of the currency zone in the cases in which either its currency is pegged to the key currency or has a floating currency that varies less against the key currency (McCauley, 2020). In addition, there is a dramatic rise in dollar-anchored Asian economies' share of global economic activity. A shift away from the euro to the US dollar, especially after the GFC, can be driven by a couple of forces, such as instability in the euro area, sharp appreciation of the US dollar, and shielded liquidity of trade in dollar assets (Maggiori, Neiman, and Schreger, 2019).

Figure 4.1b and 4.1c reveal that euro and US dollar-denominated IFI patterns are mainly driven by the debt rather than equity part. The debt-based IFI measure shows a decreasing trend for the euro after the GFC. While it was 79.7 percent of the overall sample GDP in 2009, it declined and reached 58.5 percent of the overall sample in 2021. In contrast, the trend was moderately but steadily increasing for the US dollar. However, the equity-based measure shows an increasing trend after the GFC for both US dollar and euro denominations. Figure 4.1c shows that the euro- and dollar-denominated equity-based measures were 25.8 and 24.4 percent of the overall sample GDP in 2001 and increased to 51.1 and 24.1 percent of the overall sample GDP by 2009, respectively. Although the euro increased the distance to the US dollar, this pattern has been turned around, and the euro's dominant position in equity-based measure was overtaken by the US dollar in 2021 (59.5 and 61.4 percent of overall sample GDP). All figures demonstrate that the US dollar is the prevailing currency throughout the period for the countries excluding the US and euro area, and the distance between the USD and euro IFI has been growing since the GFC. The use of currency in international finance is concentrated in euro area countries.

Figure 4.2a shows that the euro has been the dominant currency for advanced economies since 2003, but the US dollar gained a predominance over the euro in 2021. However, IFI measure denominated in US dollars has been higher than IFI measure denominated in euro for countries excluding US and euro area countries, and the difference between them has been increasing since 2010. In other words, euro area countries are the main contributors to the euro dominance in cross-border holdings of advanced economies. Euro IFI was at 91.2 percent of the group GDP in 2009 and end up at 87.7 percent of the group GDP in 2021. However, USD IFI surged from 105.3 to 194.9 percent of group GDP for countries excluding the US and euro area countries between 2009 and 2021.

Figure 4.2b indicates that euro-denominated debt-based measures for advanced economies declined after the GFC and stayed at a similar level for the following years. However, the US dollar has been showing an upward trend in the aftermath of the GFC. The widening difference between the US dollar and euro composition of the stocks of portfolio debt and other investment assets and liabilities to GDP is clear for the countries excluding the US and euro area. While it increased for the euro from 35.6 to 90.5 percent of the group GDP during 2001-2007, it drastically dropped to 75.5 percent of the group GDP in 2008 and reached 62.4 percent of the group GDP in 2021. It rose from 72.7 to 105.2 percent of the group GDP for the USD during 2001-2007, dropped severely to 89.4 percent of the group GDP in 2008 but quickly recovered and surged to 136.1 percent of the group GDP by the end of 2021. Moreover, Figure 4.2c shows a drastic and continuous increase in both euro and US dollar-denominated equity-based measures for advanced economies after the GFC. While the euro is the dominant currency for advanced economies' equity measure during the entire period, when we exclude the US and euro area from the country sample, the US dollar becomes the dominant component of portfolio equity and foreign direct investment assets and liabilities.

The US dollar had a disproportionate role in cross-boarding assets and liabilities

of emerging market economies (Figure 4.3a). Although the USD-denominated IFI, 42.8 percent of the group GDP in 2001, decreased until 2011 and ended up at 30.9 percent of the group GDP, it shows an increasing trend by 2020 and reached 45.1 percent of the group GDP. In contrast, the euro-denominated IFI has been low and stable throughout the period. Lane and Milesi-Ferretti, 2003 and Lane and Milesi-Ferretti, 2007 documented the large increase in financial integration from the 1990s to the GFC and a more gradual increase in emerging market economies relative to advanced economies. In the 1990s, the dollar was already established as the number one international currency, and this might lead these economies to go on the dollar in the first place. Since safe assets and liquidity in the US dollar are higher than in the euro, the euro was not in a position to challenge the US dollar's dominance. Figure 4.3b illustrates the downward trend for the US dollar component of debt-based measures until 2011; it is stable for the period after. The dollar component of the debt-based measure declined by 10 percent of the group GDP from 2001-2011. For the equity-based measure, the trend is upward for both euro and US dollar components since the GFC (Figure 4.3c). While the euro-denominated equity-based measure increased from 3.5 in 2008 to 7.3 percent of group GDP by 2020, the dollar-denominated part increased from 6.5 in 2008 to 13.5 percent of group GDP by 2020. Both euro and US dollar-denominated measures dropped in 2021 to 6.3 and 12.4 percent of group GDP, respectively.

In general, there are developments in the last decade that have the potential to shake the status of the US dollar and euro, like the increase in the sanctions by the Western world towards Russia; the rising role of China in economics and finance, and tension between the US and China. For instance, the use of sanctions by the US and allied countries might make other countries contemplate the possibility that they might become subject to sanctions at some point too. In this case, they would search for alternatives to the dollar and to US banking services and China's renminbi, its banking system and its Cross-Border Interbank Payments System (CIPS) could be an alternative. Furthermore, central banks issuing central bank digital currencies (CBDCs) relatively earlier might enhance the

international role of their currencies. Despite all these developments, we don't observe any structural change in the pattern of euro- and US dollar-denominated IFI. Apart from the years 2018 and 2020, the percentage of dollar-denominated assets and liabilities for 39 countries with respect to their group GDP has been stable or increasing since 2014.

4.4.2 Share dynamics: period-based

This section presents the aggregate euro and US dollar shares of international financial integration and debt- and equity-based measures. The focus is on the start and end years of different periods: the pre-crisis (2001-2007), post-crisis (2007-2013), and post-taper tantrum (2013-2021) for advanced and emerging market economies. We can observe country-by-country currency shares across different IFI measures.

Figure 4.4a and 4.4b display the aggregate euro share for IFI in 2001, 2007, 2013, and 2021 for advanced and emerging market economies, respectively. Although there has been no significant increase over the years for countries with low euro shares in their IFI, there is an increase in euro shares for countries with high euro shares in their IFI between 2001 and 2007. While euro area countries have the highest aggregate euro share in their IFI, the group of countries with the lowest aggregate euro share consists of mostly emerging market economies, and their euro shares do not go beyond 40 percent of their IFI.

Furthermore, Figure 4.5a and 4.5b show the aggregate euro shares for debt components of IFI for advanced and emerging market economies, respectively. Figure 4.5a demonstrates that for all advanced economies, there has been an increase in the euro share between 2001 and 2007; for euro area countries, this increase is more drastic. Aggregate euro shares are similar for 2007, 2013, and 2021, however. The distinction between the euro share of countries regarding their country group is observable for debt-based measures, too. The euro share in debt measure is going beyond 40 percent only for the Czech Republic, Hungary, and Poland

among emerging market economies. Even though they are not part of the euro area, they are all geographically closer to the euro area than other emerging market economies, member states of the European Union since 2004, and have strong economic and financial ties with euro area countries. Figure 4.6a and 4.6b illustrate no observable difference in the euro shares in the equity component of IFI over the years, especially for advanced economies. The distinguishable feature is the heterogeneity in the euro share of emerging and advanced countries, which is even more striking than for the debt-based measure. None of the emerging market economies has more than a 30 percent euro share in their equity-based measure.

The aggregate US dollar weight of IFI decreased from 2001 to 2007 (Figure 4.7a and 4.7a). The steady growth of the euro's global use as an international currency from its launch in 1999 until the GFC may decrease the shares of the USD. USD has an important role in the IFI of both emerging markets and advanced economies. The number of emerging market economies having a high USD share in IFI is even more than the number of advanced economies.

Figure 4.8a and 4.8b reveal that for most of the countries, the US dollar shares in their debt measure decreased between 2001 and 2007. Aggregate US dollar weights in debt measure are similar for the years 2007, 2013, and 2021. Excluding European emerging market economies (the Czech Republic, Hungary, and Poland), all emerging market economies have more than 40 percent US dollar shares. The US dollar shares in the equity-based measure are lower than the debt-based measure for emerging market economies. The US dollar share in the equity-based measure shifted towards lower shares between 2001 and 2007 (Figure 4.9a and 4.9b).

Overall, while the euro's use expanded and grew during the pre-crisis period, it is not possible to say the same for other periods. Turmoil in European sovereign debt markets, the sharp appreciation of the dollar relative to the euro, and maintained liquidity of the US dollar during the peak of crises are some of the factors

that might play a role in this (Maggiori, Neiman, and Schreger, 2019). Moreover, the euro has an important role in advanced economies, especially the euro area countries of course. However, low euro shares for emerging market economies indicate that it is far from being the dominant currency globally. The difference between the euro shares for emerging market economies and advanced economies is more striking for the equity component than for the debt component. However, the US dollar has a more global role relative to the euro; it is the dominant currency for both advanced and emerging market economies.

4.5 Currency IFI and exchange rate fluctuations

In this section, we focus on the link between the exchange rate movement (euro to USD and USD to euro) and the share of the currency in different IFI measures (euro and USD shares in IFI, debt-based and equity-based measures). Although previous literature relate the role of the euro or dollar in different dimensions, e.g., anchor currency, trade invoicing, asset denomination, and central bank reserve accumulation with different structural factors like availability of safe assets and liquidity, there is no study looking at the link between the currency breakdown of IFI and currency movement (Ilzetzki, Reinhart, and Rogoff, 2020).

The strength of the currency reflects the currency's status as a safe haven. Having assets denominated in a stronger currency is preferable to avoid currency risk and maintain liquidity. Countries with assets denominated in stronger currency are better positioned to absorb global shocks. Appreciation of the currency of denomination could be deployed to counter an external shock without necessarily risking adverse balance sheet effects arising from the exchange rate-induced valuation effect. In addition, both creditworthiness would increase and access to funding would be easier because of the improvement in balance sheets which improves the liquidity conditions (McCauley, 2020; Bénétrix, Lane, and Shambaugh, 2015). In contrast, the link between the currency denomination of liabilities and the movement in the value of the currency is less clear. The correlation may be

positive because of the synergies or complementarities between the use of the currency across domains and functions. The dominance of the currency on the assets side can create incentives to borrow in the same currency to avoid currency mismatch, knowing that these holdings can assist in periods of currency stress (Corsetti et al., 2023; Gopinath and Stein, 2021; Farhi and Maggiori, 2018). Alternatively, the correlation may be negative because of the exchange rate-induced valuation effect. If the currency in which liabilities are denominated appreciates, the value of liabilities increases.

An increase in the currency's share in assets and liabilities might be dismissed as a figment of the concurrent appreciation of the exchange rate. In other words, appreciation of the euro (US dollar) against the US dollar (euro) can mechanically increase the share of the euro (US dollar) in IFI because of the valuation effect. It is therefore important to exclude the mechanical effect of exchange rate movement on the currency denomination of IFI before looking at correlations.

There are different approaches to exclude the exchange rate-induced valuation effect. For instance, the ECB uses the constant exchange rate instead of the current exchange rate to adjust the share of currencies across various indicators for exchange rate valuation effects (European Central Bank, 2022). In comparison, the BIS approximates the adjusted changes in the amount outstanding between two points in time to eliminate the impact of exchange rate movements. They first convert US dollar-equivalent amounts outstanding into their original currency using end-of-period exchange rates to subsequently calculate the difference in amounts outstanding in the original currency and convert the difference into a US dollar-equivalent change using average period exchange rates (Borio et al., 2023).

In this paper, we exclude the mechanical effect of exchange rate movement by subtracting the valuation effects arising from the movement of euro to the US dollar (the US dollar to euro) from euro (the US dollar) denominated IFI (Lane and Shambaugh, 2010a; Bénétrix, Lane, and Shambaugh, 2015; Bénétrix et al.,

2020). The valuation impact can be expressed as

$$VAL_{it}^{EUR} = SHEUR_{it} * IFI_{it} * \%\Delta EUR/USD_t$$

$$VAL_{it}^{USD} = SHUSD_{it} * IFI_{it} * \%\Delta USD/EUR_t$$

where $SHEUR_{it}(SHUSD_{it})$ is the aggregate financial weight for the currency (euro / US dollar) in period t in country i's total size of the external balance sheet, IFI_{it} equals assets plus liabilities as a percentage of GDP in country i in period t, and $\%\Delta EUR/USD_t(\%\Delta USD/EUR_t)$ is the percentage change in the bilateral exchange rate of euro to US dollar (US dollar to euro) in period t. For instance, suppose that Brazil has a balanced net foreign assets position, i.e.assets equal liabilities. If 20% of its assets are in US dollars and 30% of its liabilities are in US dollars in a given year, then the $SHUSD_{it} = (0.2 * 0.5 + 0.3 * 0.5) = 0.25$. If assets plus liabilities are equivalent to 200% of Brazil's GDP, then 10% appreciation of the dollar against the euro would generate a 5% of GDP valuation gain in the US dollar-denominated IFI.

International financial integration of country i denominated in currency euro or US dollar in period t, while excluding the aggregate impact of currency-based valuation effects raised from exchange rate movement (euro to US dollar and US dollar to euro), can be calculated as follows:

$$IFI_{it}^{EUR} - VAL_{it}^{EUR} = IFI_{it}^{EUR} * (1 - \%\Delta EUR/USD_t)$$

$$IFI_{it}^{USD} - VAL_{it}^{USD} = IFI_{it}^{USD} * (1 - \%\Delta USD/EUR_t)$$

We present the cumulative cross-country distribution of the unconditional correlation between lagged percentage change in the exchange rate (euro to US dollar and US dollar to euro) and valuation-adjusted percentage change in the currency

share of different IFI measures.[7] The exchange rate only varies over time, and we use distributions to enable country-level analyses and to illustrate the link between exchange rate and currency share in IFI country by country. We use unconditional rather than conditional correlations due to the small individual sample sizes.[8] We used the lagged percentage change of the euro to US dollar and US dollar to euro exchange rates. Figures C.1a and C.1b show co-movement of percentage change in euro and USD shares of IFI with the one period before the percentage change in euro to USD and USD to euro exchange rate, respectively. It might be interpreted as the lagged effect of exchange rate movements on the currency of denomination choices in external positions.[9]

Figure 4.10a shows the cumulative cross-country distribution of the correlation between the lagged percentage change in euro to US dollar exchange rate and the percentage change in euro share of different IFI measures during 2001-2021. Correlations of 27 countries, 20 of which are advanced economies and seven are emerging market economies, are statistically significant and positive for the euro share of IFI. The distance between the cumulative distribution of equity-based measure (in green) and debt-based measure (in red) indicates that the proportion of countries with a strong positive correlation is higher for debt measure relative to equity measure. In addition, the number of countries that have statistically significant correlations is higher for the debt measure (32) than for the equity measure (22). Figure 4.10b and 4.10c show the cumulative cross-country distribution of the correlation between the lagged percentage change in euro to US dollar exchange rate and the percentage change in euro share of assets measures and

[7] Data for exchange rates come from the European Central Bank.

[8] Fiscal surplus as a proxy of country fundamentals, the size of the debt, and the size of the currency zone would be some potential indicators to include, however (He, Krishnamurthy, and Milbradt, 2019; Ilzetzki, Reinhart, and Rogoff, 2020).

[9] The correlation between the percentage change in the currency share of IFI and the percentage change in the exchange rate is statistically significant and equal to 0.88 and 0.87 for euro and USD, respectively. Moreover, when we use the euro area real effective exchange rate (REER) and nominal effective exchange rate (NEER) as well as the US REER and NEER, correlation levels are significant and positive at around 0.74.

liability measures separately for the same period. Most countries have statistically significant and positive correlations for asset and liability measures. However, the distance between the cumulative distribution of equity-based measure (in green) and debt-based measure (in red) is only prevalent for the liabilities.

In sum, almost half of the countries show a correlation higher than 0.70 between the percentage change in euro share of IFI and the lagged euro to dollar percent increase, and most countries with strong positive correlations (more than 0.5) are advanced economies. In addition, the link of euro share growth with the exchange rate appreciation or depreciation in the previous year is stronger for the debt relative to the equity measure.

Figure 4.11a shows the cumulative cross-country distribution of correlation between lagged percentage change in US dollar to euro exchange rate and growth of US dollar shares in different IFI measures during 2001-2021. Correlations of 34 countries, 18 of which are advanced economies and 16 are emerging market economies, are statistically significant and positive for the US dollar share of IFI. There is no noteworthy difference between the cumulative distribution of the level of correlations for both the debt and equity measures. In addition, a number of countries with statistically significant correlations for debt-based (32) and equity-based (31) measures are close to each other. Figure 4.11b and 4.11c show the cumulative cross-country distribution of the correlation between the lagged percentage change in US dollar euro exchange rate and the percentage change in US dollar share of assets measures and liability measures separately for the same period. Most countries have statistically significant and positive correlations for asset and liability measures. Although there is no difference between the cumulative cross-country distribution between the debt-based and equity-based measures for assets, we observe a significant distance between equity-based measure (in green) and debt-based measure (in red) for liabilities. In other words, the proportion of the countries with a strong positive correlation is higher for debt liabilities relative to equity liabilities.

The correlation between the growth of the US dollar share in IFI and the percentage increase in the dollar-to-euro exchange rate of the previous year is more than 0.67 for more than half of the countries. Similar to the case of the euro share of IFI measures, most countries with strong positive correlations (more than 0.5) are advanced countries. The distinction between the levels of correlation of growth in US dollar share in debt and equity with the lagged percentage change in USD/EUR is not as observable as for the correlation of growth in euro share of debt and equity with the lagged percentage change in EUR/USD. In sum, the exchange rate movement of USD against the euro is an important indicator for the currency of denomination in external assets and liabilities to GDP, regardless of the investment type. The appreciation of USD value against the euro is linked to the growth in the USD share in IFI with lag. It might be related to the valuation gain and liquidity concerns of investors.

We have so far used the value of the euro relative to the USD and vice versa. We now also compute the same diagrams by using euro area real effective exchange rate (REER) and nominal effective exchange rate (NEER) instead of euro to USD exchange rate to consider the strength of a currency relative to a basket of other currencies.[10] Figure C.2 and C.3 illustrate similar results. The distance between the cumulative distribution of the correlation of growth in euro share of equity-based measure and debt-based measure with the percentage change in euro area REER and NEER is wider. In other words, the sensitivity of the euro share in the debt component of IFI to euro area REER and NEER is higher than the sensitivity of the euro share in the equity component of IFI for a higher number of countries.

We draw separate cumulative distribution curves of correlations for portfolio debt, other investments, portfolio equity, and foreign direct investment to illustrate which components play a bigger role in the distance between the cumulative distribution of correlations for debt-based and equity-based measures (Figure C.4

[10]Results using the United States REER and NEER instead of USD to the euro exchange rate can be found in the Appendix. Data for effective exchange rate indices come from the Bank for International Settlements.

and C.5). There is a big distance between cumulative distributions of the correlation of growth in shares in portfolio debt and in portfolio equity with the percentage change of bilateral exchange rate in the previous year for both the euro and USD. Therefore, the proportion of the countries that have a high correlation is lower for the case of portfolio equity than for portfolio debt.

There is an overall positive and significant correlation between the lagged percentage change in the currency's exchange rate and growth in the currency's share in IFI and its sub-components, debt and equity. An increase in the relative strength of one currency relative to another might motivate the investor to hold their assets in that currency to avoid possible loss of value in their holdings, and the borrowers to issue in that currency to open up more borrowing sources with a lower cost. However, the positive correlation is weaker for the equity component of IFI than the debt component of IFI. This finding is consistent with the literature. Currency movements do matter for investor returns, but it varies depending on investor type. While currency-induced valuation gains or losses reinforce changes in the currency denomination of the external positions for the creditors, capital returns and productivity are additional factors in the owners' case. For instance, take the case of portfolio equity and FDI. On the one hand, depreciation of the currency could be accompanied by an improvement in the trade performance, which boosts the returns on holdings in export-oriented firms. On the other hand, it might be accompanied by a deterioration in the currency return. These two conflicting forces result in the weak correlation between currency movement and its share in equity-based measures (Lane and Shambaugh, 2010a). Furthermore, Coeurdacier and Gourinchas (2016) and Maggiori, Neiman, and Schreger (2020) argue that the currency-related frictions are less effective for equity markets since these are the claims to profits from producing and selling real goods.

4.6 Currency IFI and trade

There are studies modeling the link between currency dominance in international trade and finance. On the one hand, Coppola, Krishnamurthy, and Xu (2023) shows the causal link from currency dominance in finance invoicing to currency dominance in trade. According to their model, if firms finance in the dominant currency, then invoicing their trade in the dominant currency is cost-minimizing. On the other hand, Chahrour and Valchev (2022) and Gopinath and Stein (2021) present the causal link from dominance in trade invoicing to dominance in finance. According to their model, if firms invoice their export in dollars, they become more certain about their next period's dollar revenue, making borrowing in dollars safer. In addition, there is the invoicing-feedback mechanism. An increase in the demand for safe dollar claims reduces the dollar-denominated borrowing cost, which makes dollar invoicing in trade more attractive. Since firms benefit from operating with the same collateral as their trade counterparties, there is also a complementary mechanism among firms.

Gopinath and Stein (2021) plots an empirical chart showing the correlation between the fraction of foreign currency local banking liabilities denominated in US dollars and the share of a country's foreign currency invoiced import denominated in US dollars. In addition, they plot the same chart with sub-categories of banking liabilities, loans, and deposits. Either way, they find a strong association between dollar-invoiced imports and dollar-denominated banking liabilities.

In this section, we analyze the correlation of the country's share of trade invoicing denominated in euro and USD with the share of IFI measures denominated in euro and USD for 34 countries for which both data of currency share are available.[11] To do that, we combine my dataset with the invoicing data collected by Boz et al. (2022). Measures of aggregate euro and US dollar currency shares in

[11] Canada, South Africa, Mexico, Hong Kong, and China are not available in the trade invoicing dataset.

trade can be specified by

$$SHEUR_{it}^{TRADE} = \omega_{iEURt}^{EX} s_{it}^{EX} + \omega_{iEURt}^{IM} s_{it}^{IM}; \qquad SHUSD_{it}^{TRADE} = \omega_{iUSDt}^{EX} s_{it}^{EX} + \omega_{iUSDt}^{IM} s_{it}^{IM}$$

where $\omega_{iEURt}^{EX}(\omega_{iUSDt}^{EX})$ and $\omega_{iEURt}^{IM}(\omega_{iUSDt}^{IM})$ are the share of export denominated in euro (US dollar), and the share of import denominated in euro (US dollar), respectively. s_{it}^{EX} (s_{it}^{IM}) is the share of export (import) in the sum of export and import.

Figure 4.12 and 4.13 illustrate positive correlations between the country's share of trade invoicing denominated in a currency and the share of different international financial integration measures (IFI, debt-based and equity-based measure) denominated in the same currency for both the euro and the US dollar. Figure 4.12a shows the statistically significant correlation of 0.84 between the euro share in IFI and the euro share in trade. While Figure 4.12b presents the statistically significant correlation of 0.91 between euro share in debt-based measure and euro share in trade, Figure 4.12c shows the statistically significant correlation of 0.77 between euro share in equity-based measure and euro share in trade. In all subfigures of 4.12, advanced European countries constitute the highest euro shares in both trade and IFI measures. Unsurprisingly, euro area countries have more than 50 percent of IFI and trade in the euro. When we exclude euro area countries, those countries that are geographically closer to the euro area and trade heavily with euro area countries [12] have the highest euro shares in both trade and IFI. However, their euro shares in trade (more than 40 percent) are higher than their euro shares in IFI (less than 40 percent). For the equity-based measure, the euro shares of those countries are even lower (around or less than 20 percent).

Furthermore, there is a significant and positive correlation (0.85) between the US dollar share in IFI and the US dollar share in trade (Figure 4.13a). While the US dollar share in debt-based measure significantly correlates at 0.91 level with the

[12] Denmark, Sweden, Norway, Switzerland, the United Kingdom among advanced economies and Czech Republic, Poland, Hungary, and Turkey among emerging market economies

US dollar share in trade, the correlation between the US dollar share in equity-based measure and trade is 0.6 (Figure 4.13b and 4.13c).[13] We observe that the above-median countries for US dollar share in both IFI and trade are all emerging market economies except Japan.

Overall, these findings remark on the complementarity between the role of a currency in trade and finance. For both the euro and US dollar, the currency share in debt-based measure shows a stronger correlation with the corresponding currency share in trade relative to the currency share in equity-based measure.

4.7 Conclusion

There is US dollar supremacy in the international monetary system, followed by the euro. The usage of these two currencies is important in terms of the transmission of monetary policies and financial stability globally. In addition, it is also essential for the euro area and the US because of the privileges coming with being the owners of the widely used international currencies, like lower cost of finance and lower risk exposure. Therefore, the evolution of euro and USD usage in the monetary system should be continuously monitored, and its link with the other factors should be analyzed.

There are some studies analyzing the euro or USD shares of IIP components individually, e.g., central bank reserves or bond positions and their links with the availability of safe assets or liquidity. Although Bénétrix et al. (2020) look at the main trends in euro and USD IFI, including all components of IIP until 2017, there is no further analysis about sub-components, i.e., equity and debt. In addition, there is no study in the literature relating the currency breakdown of IFI to currency movement.

[13] To check if there is any difference in the relation between US dollar share in IFI and US dollar share in trade and the relation between USD share in debt-based measure and US dollar share in trade, we draw the diagrams by excluding the United State which is an outlier country (Figure C.6a and C.6b). As a result, we obtained significant and positive correlations of 0.87 and 0.66 for IFI and debt-based measures, respectively.

This paper studies how the euro and US dollar in the international monetary order have evolved by focusing on the status of the USD and euro in international financial integration. We compile data for the euro and US dollar composition of portfolio equity, foreign direct investment, portfolio debt, and other investments between 2001 and 2021 for 39 countries. We subsequently analyze how the trends in international financial integration are reflected in the currency breakdown for the euro and US dollar. After presenting a detailed descriptive analysis of shares of the euro and USD in IFI, we separately present the relation of the euro and the US dollar share in IFI measures with the exchange rate and trade.

A descriptive analysis of the euro and US dollar shares of IFI reveals some stylized facts. First, while the euro-denominated IFI expanded rapidly until 2007, it has been overtaken by the US dollar since 2014. Second, the debt-based measure has a decreasing pattern for the euro, whereas the equity-based measure has an increasing trend for both the euro and the US dollar in the aftermath of the GFC. Third, there is an unambiguous US dollar dominance in cross-border holdings across all the measures (IFI, debt-based, and equity-based) throughout the whole sample period when excluding the US and euro area from the sample. Fourth, there is disproportionate dominance of the US dollar in all measures (IFI, debt-based, and equity-based) for emerging market economies. Lastly, there has been no change in the status of the euro and US dollar in finance despite the last decade's developments.

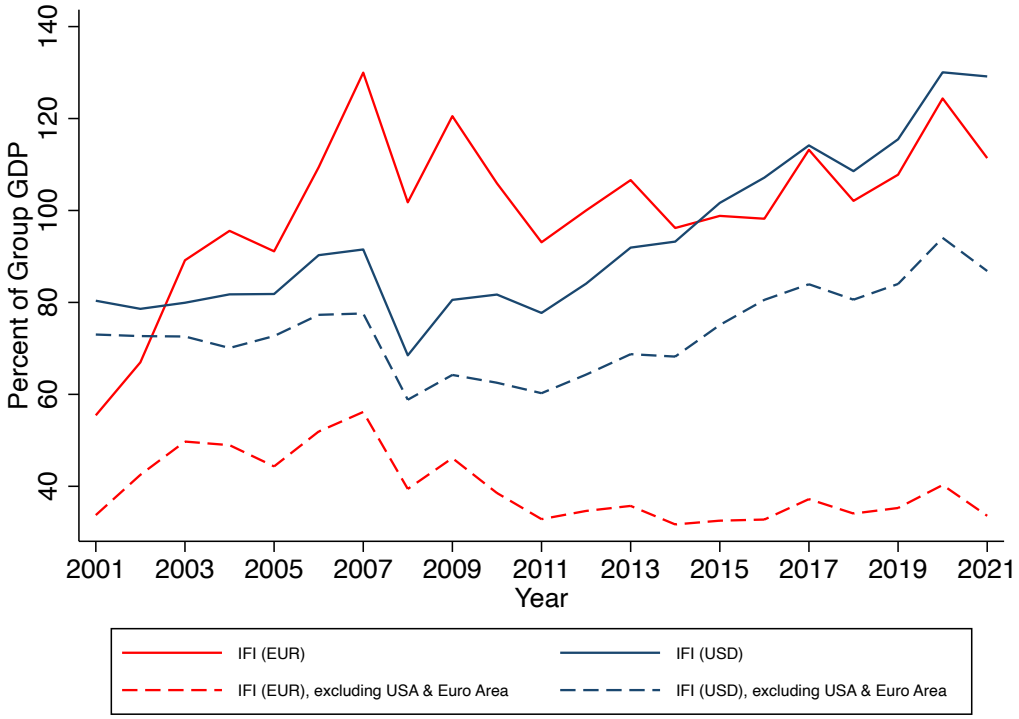
Looking at the distributional dynamics of euro and USD shares of IFI measures shows noteworthy patterns. While the euro's use improved and grew from its launch to GFC, it is not the case for other periods. The European debt crisis, appreciation of the USD to the euro, and relatively higher maintenance of USD liquidity during the peak of GFC are some possible explanations for this observation. Furthermore, the euro has an important role in advanced economies, especially euro area countries. It has a limited role in emerging market economies, unlike USD, and is far from being the dominant currency globally, however.

We also study the relation between the percentage change in the exchange rate and in currency share in IFI. This exercise gives hints about the motivations behind the currencies of choice in external positions since the direction of the relation is less clear for liabilities than for assets. The analysis highlights that most countries have a strong positive correlation between the lagged percentage change of the currency and the percentage change of currency's share in the IFI, debt-based, and equity-based measures. This positive link can be explained by the avoidance of exchange rate-inducing capital loss and currency mismatch. However, the proportion of countries with a strong positive correlation is higher for the debt relative to the equity measure. Put differently, currency-related frictions are associated less with equity relative to the debt market.

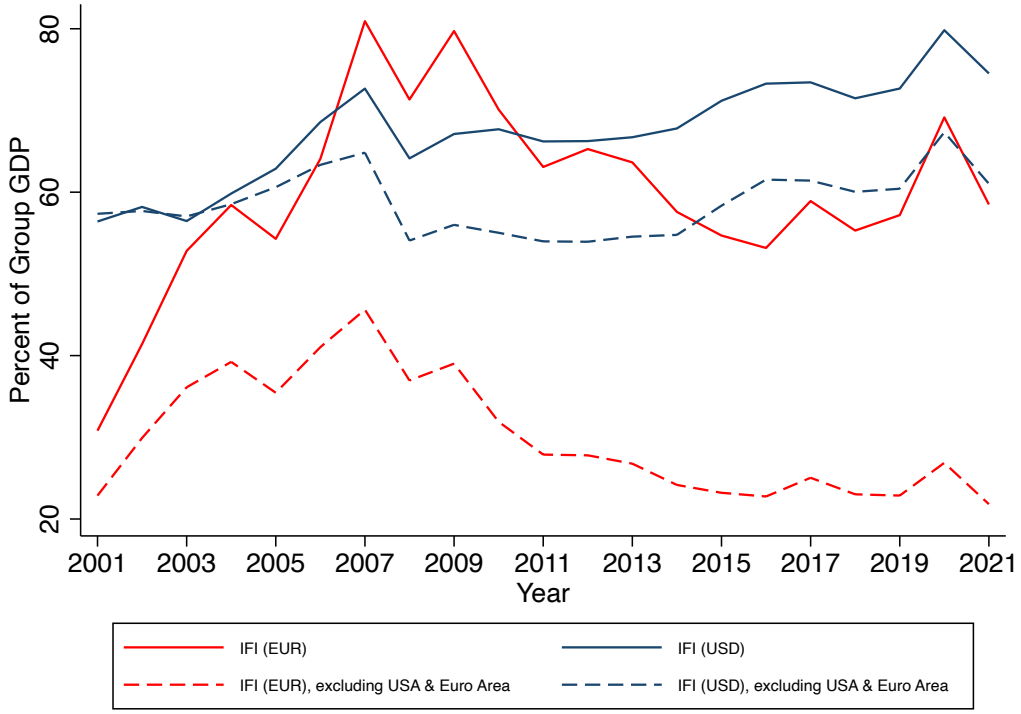
Furthermore, the findings for the relation between the currency of denomination in IFI and trade show the complementarity between these two. However, this relation is stronger for the currency share in trade and debt-based measure relative to the currency share in trade and equity-based measure.

In light of the economic and political development of the last decade, such as strained ties between the United States and China and Russia's war in Ukraine in Europe, the evolvement of the international monetary system is gaining central importance. It is important to understand the implications of the use of one international currency over another for the global economy. This study provides an assessment of the role of the euro and US dollar for the cross-border assets and liabilities covering the years from 2001 to 2021 and its country-by-country link with the exchange rate movement. Future research could apply a cross-country analysis for the determinants of the use of euro and USD or drivers of foreign currency exposure that capture the sensitivity of external balance sheets to currency movements using the data provided by this paper.

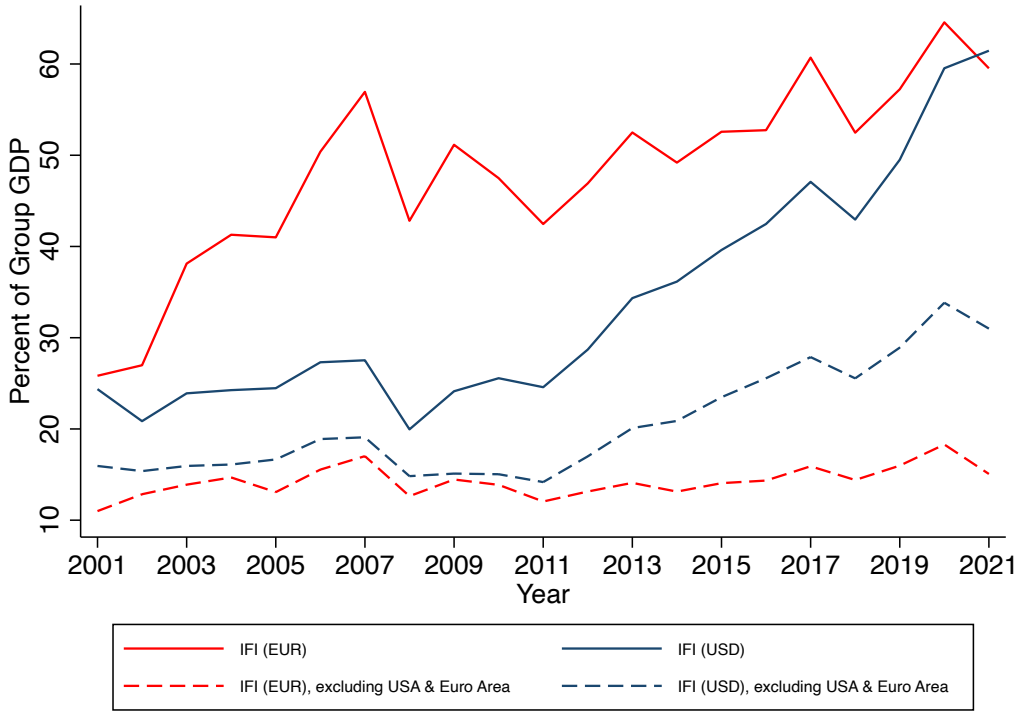
Figure 4.1: International Financial Integration: All Countries



(a) International Financial Integration

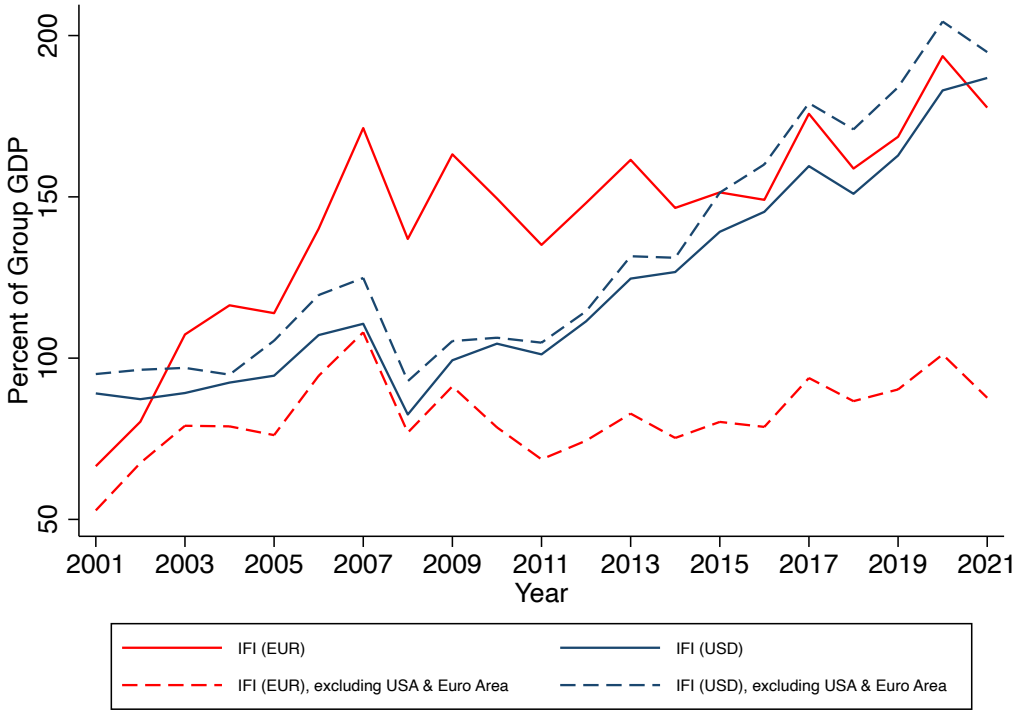


(b) Debt-based measure

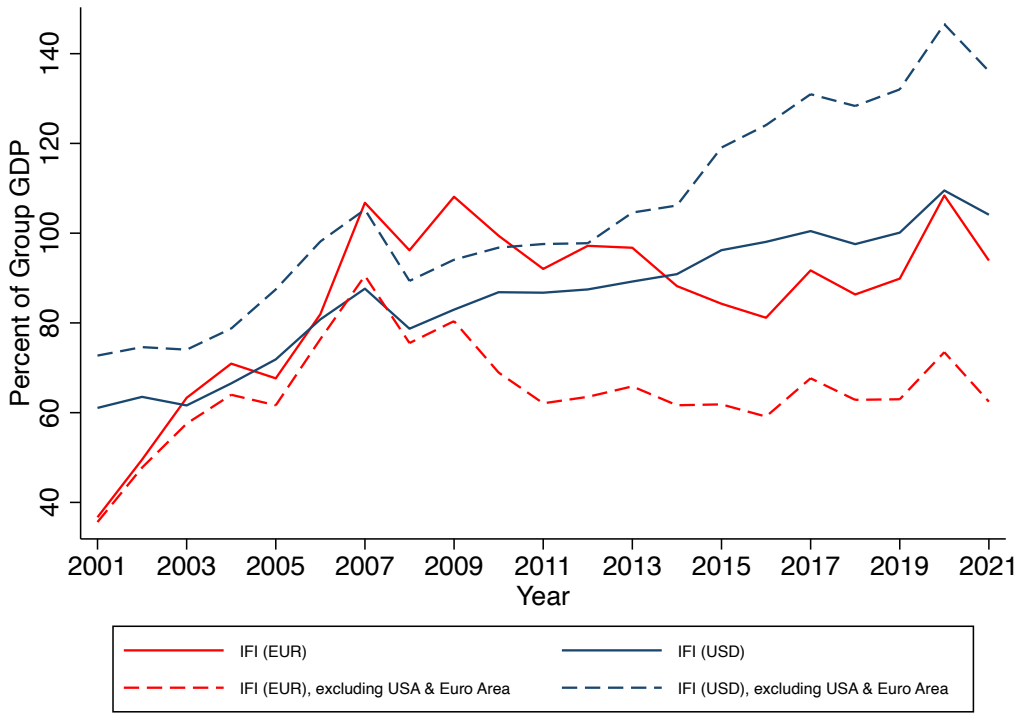


(c) Equity-based measure

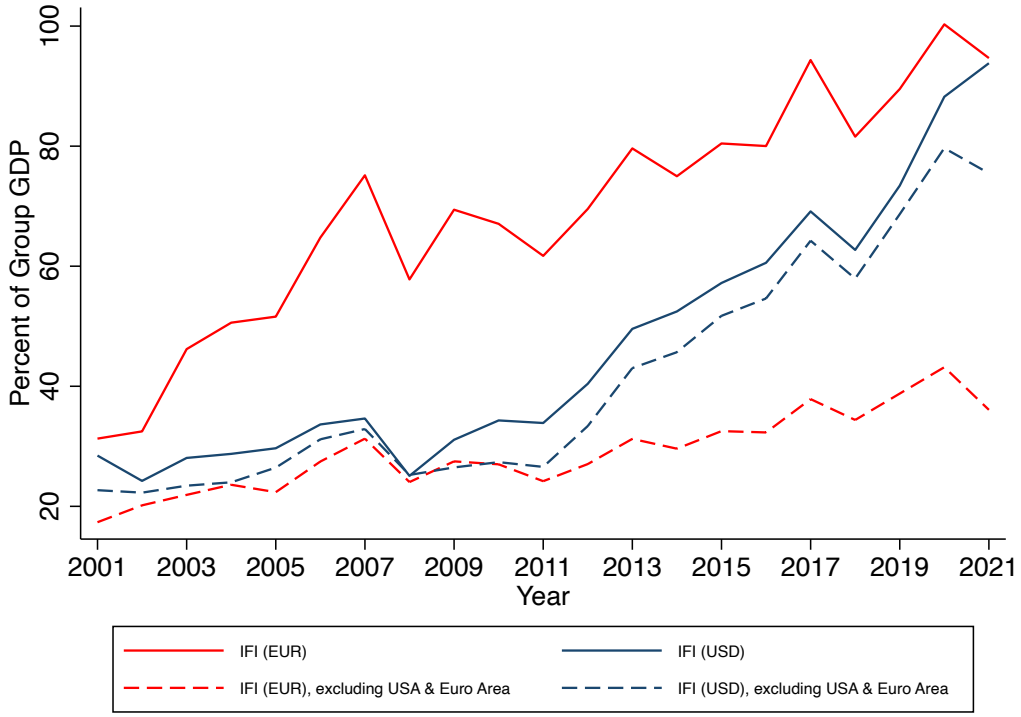
Figure 4.2: International Financial Integration: Advanced Economies



(a) International Financial Integration

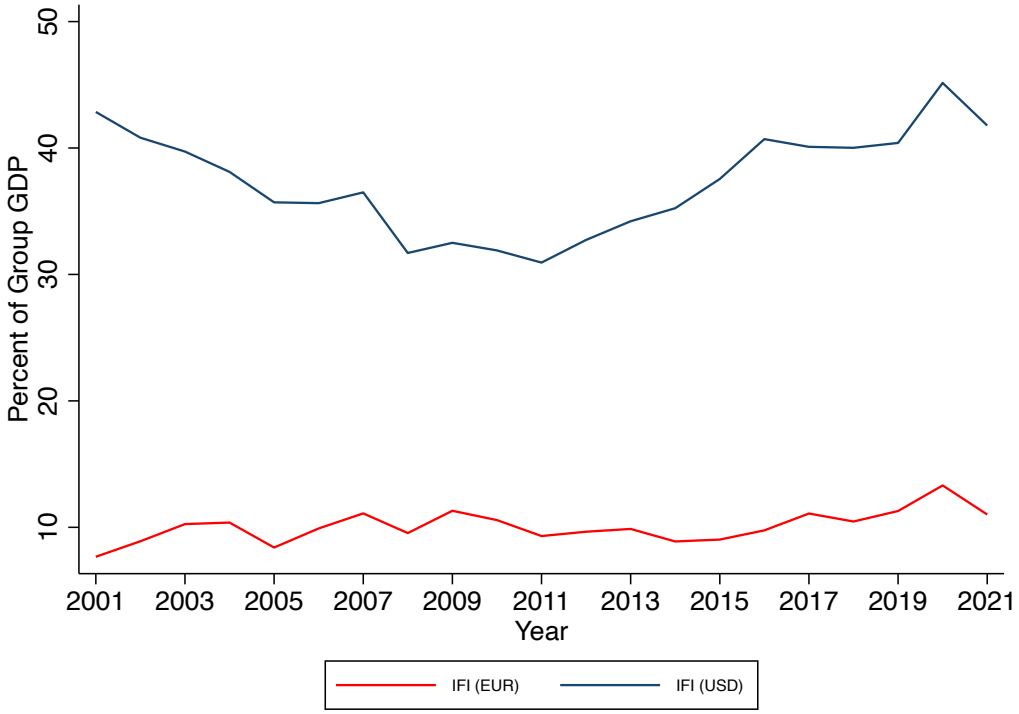


(b) Debt-based measure

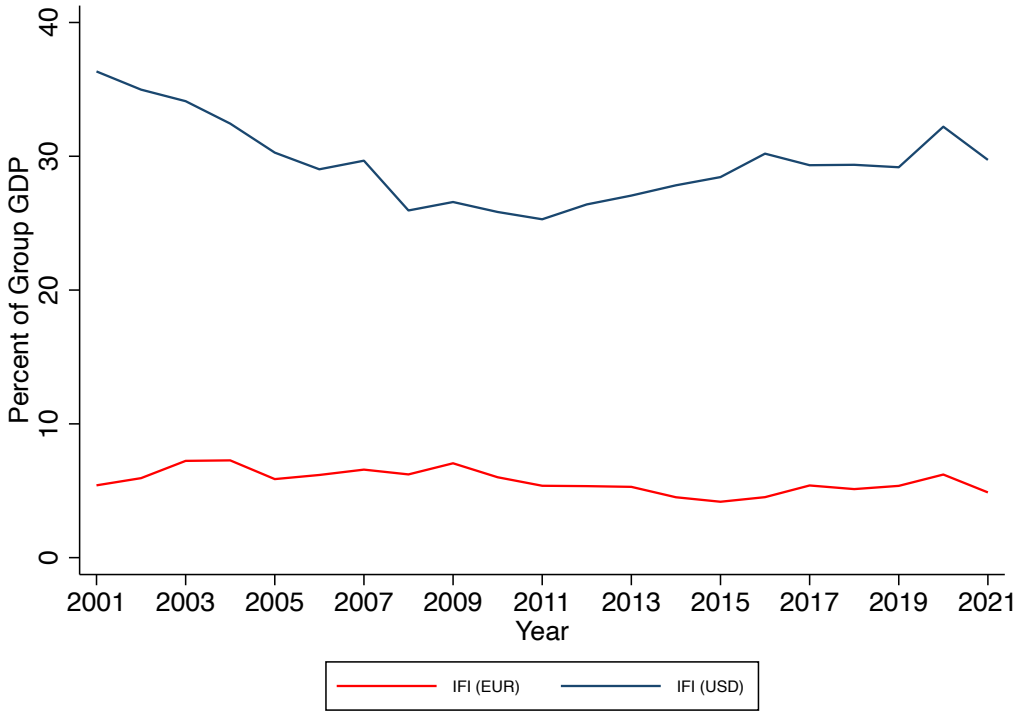


(c) Equity-based measure

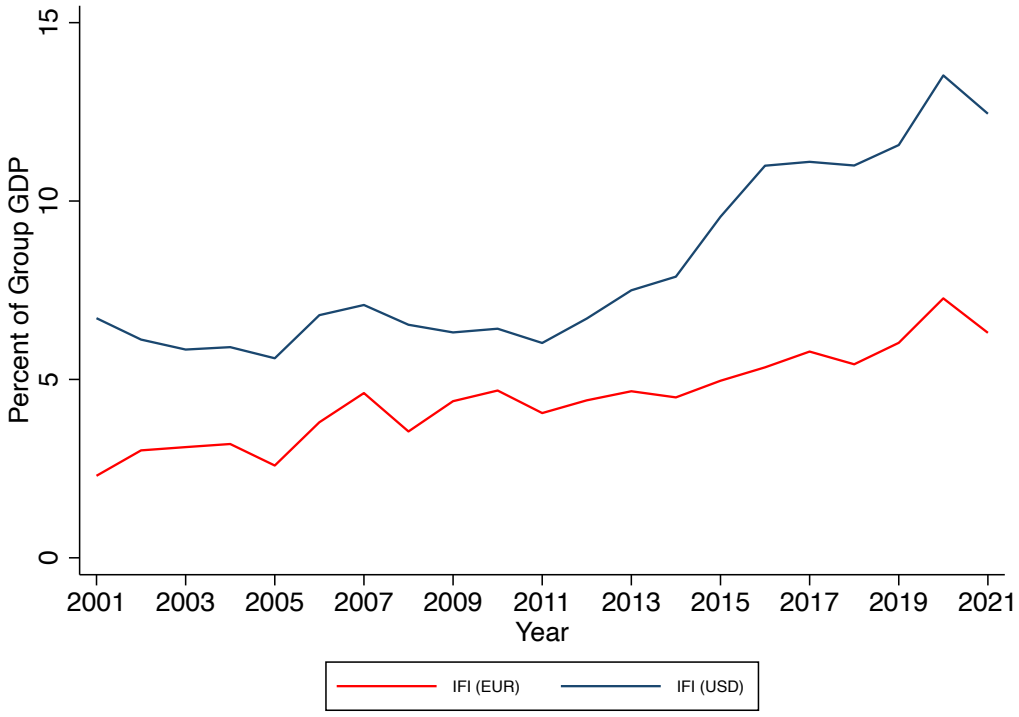
Figure 4.3: International Financial Integration: Emerging Economies



(a) International Financial Integration

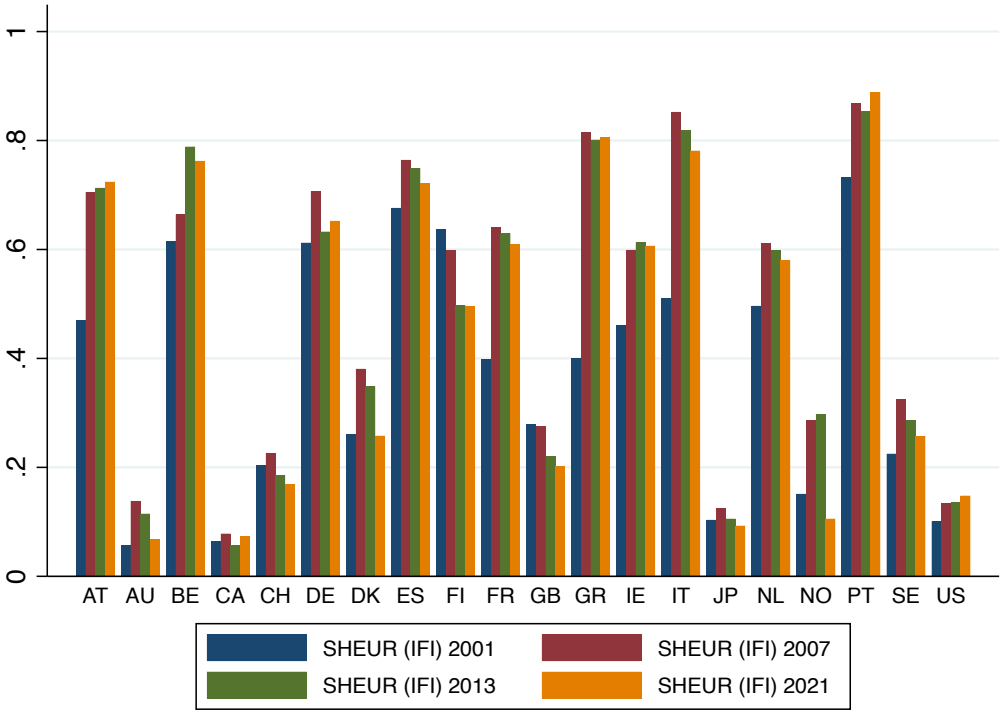


(b) Debt-based measure

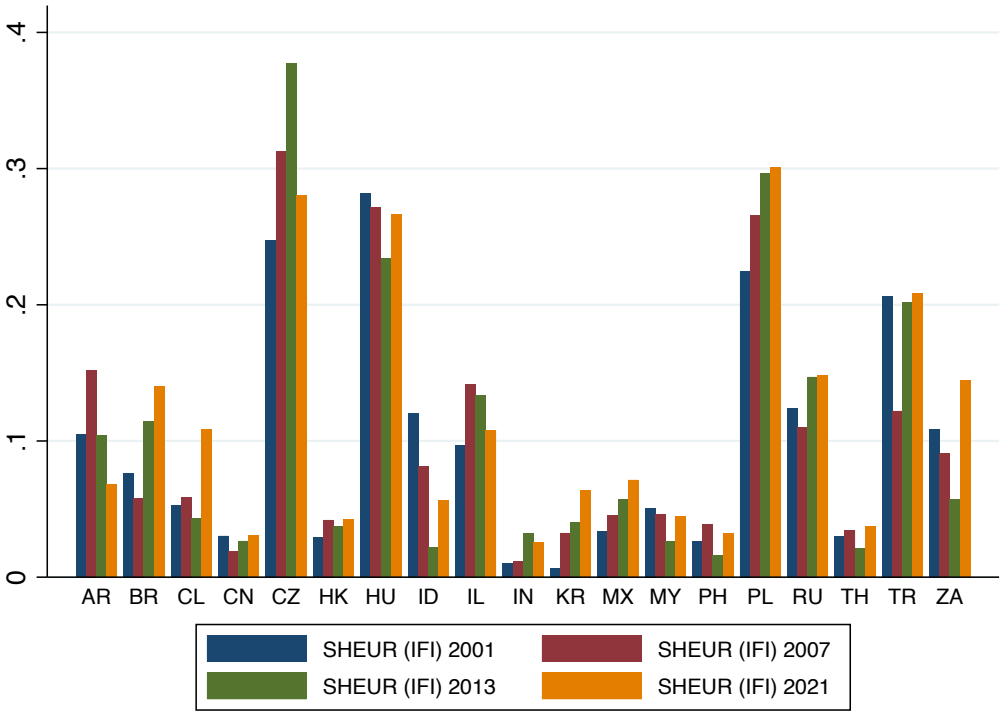


(c) Equity-based measure

Figure 4.4: SHEUR (IFI) long-term dynamics: 2001, 2007, 2013, 2021

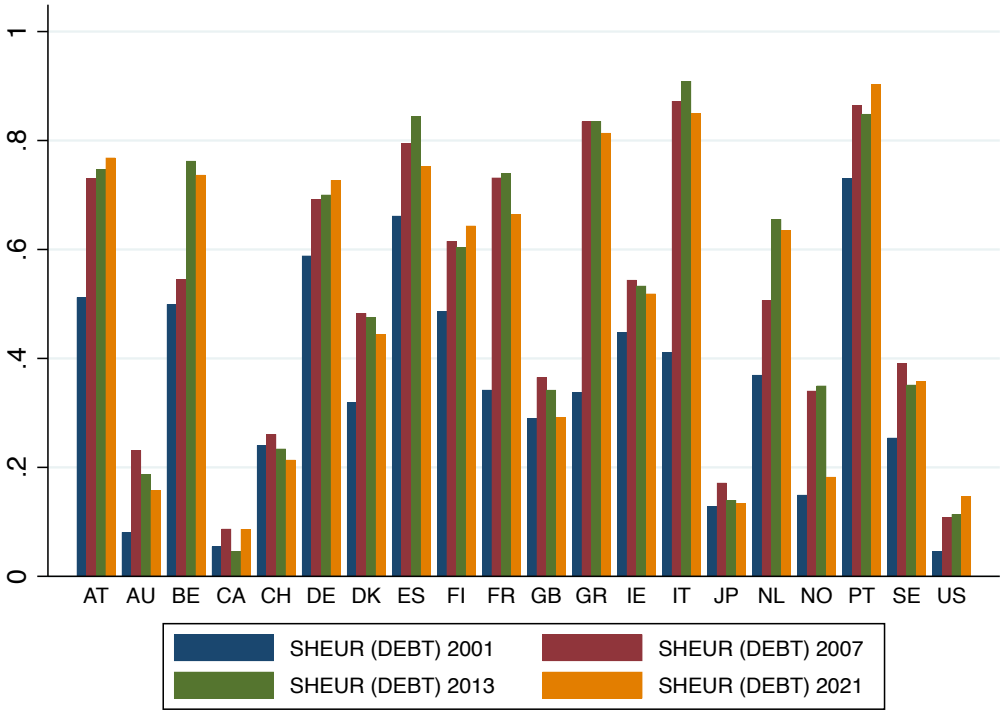


(a) Advanced Economies

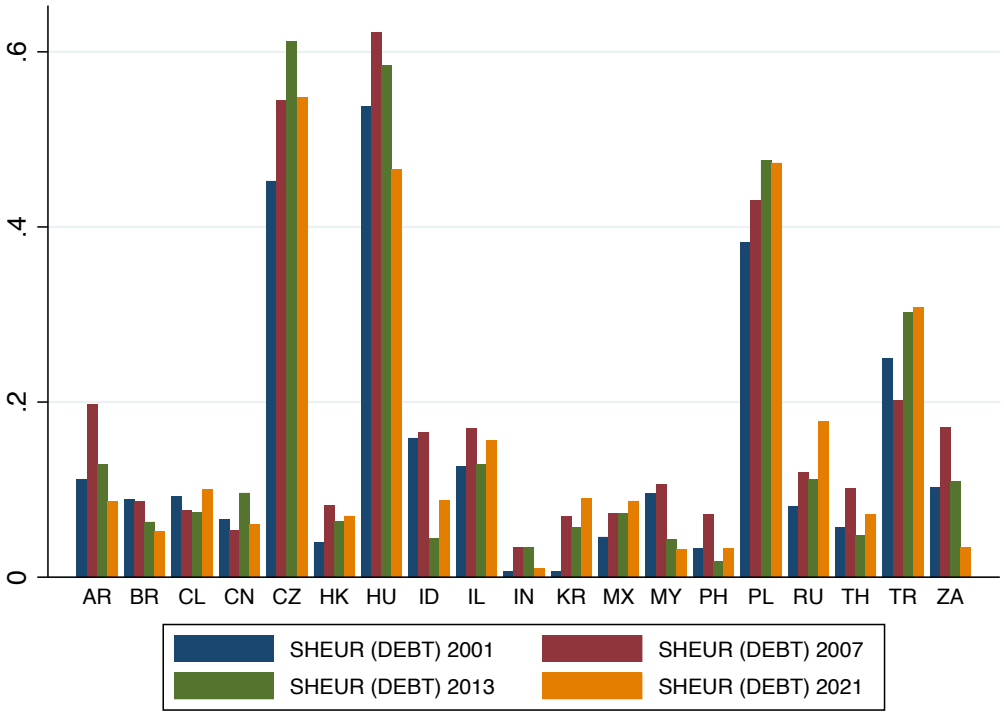


(b) Emerging Market Economies

Figure 4.5: SHEUR (DEBT) long-term dynamics: 2001, 2007, 2013, 2021

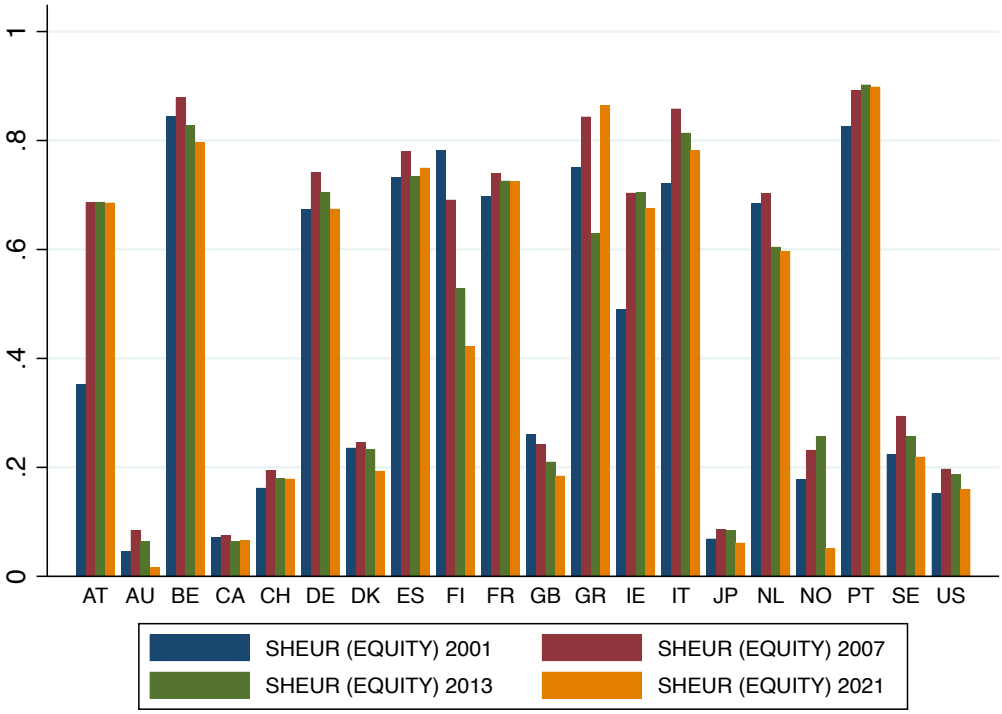


(a) Advanced Economies

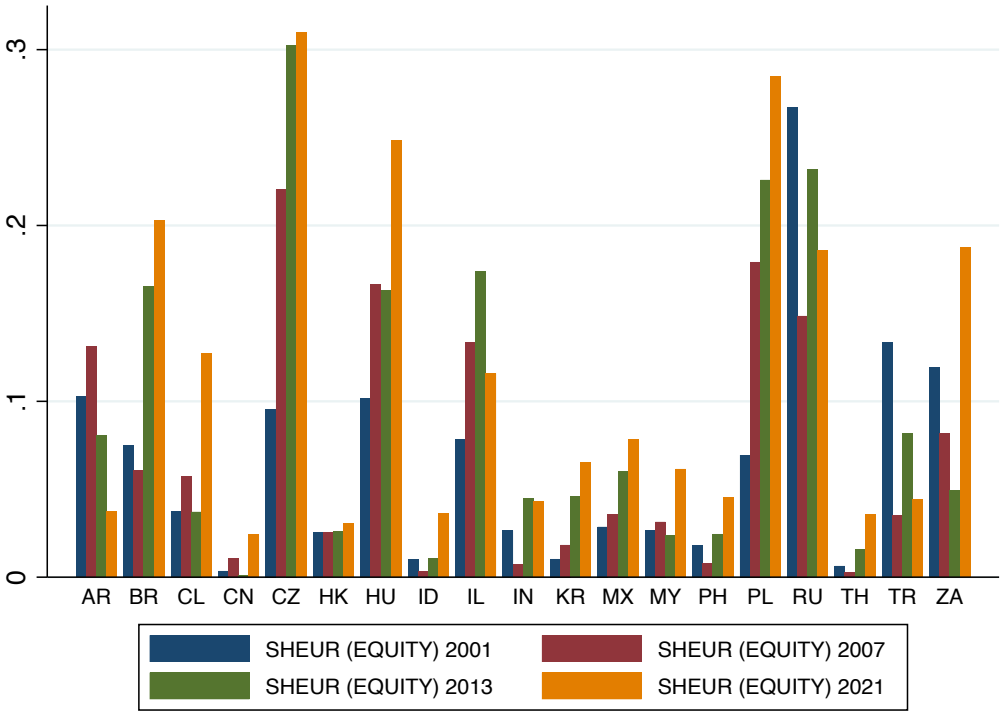


(b) Emerging Market Economies

Figure 4.6: SHEUR (EQUITY) long-term dynamics: 2001, 2007, 2013, 2021

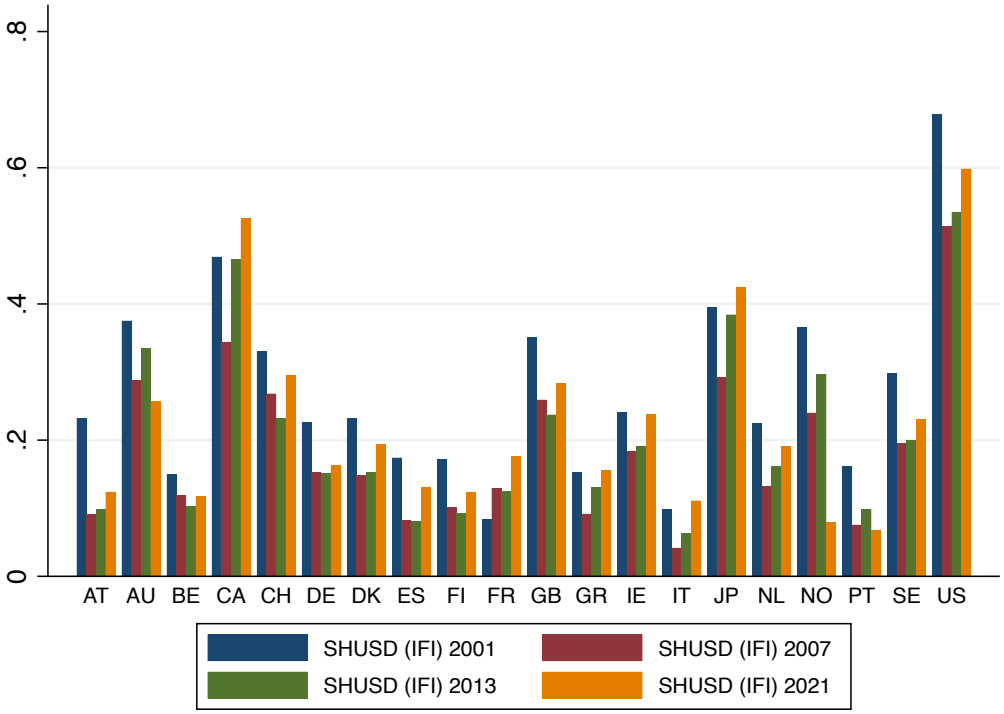


(a) Advanced Economies

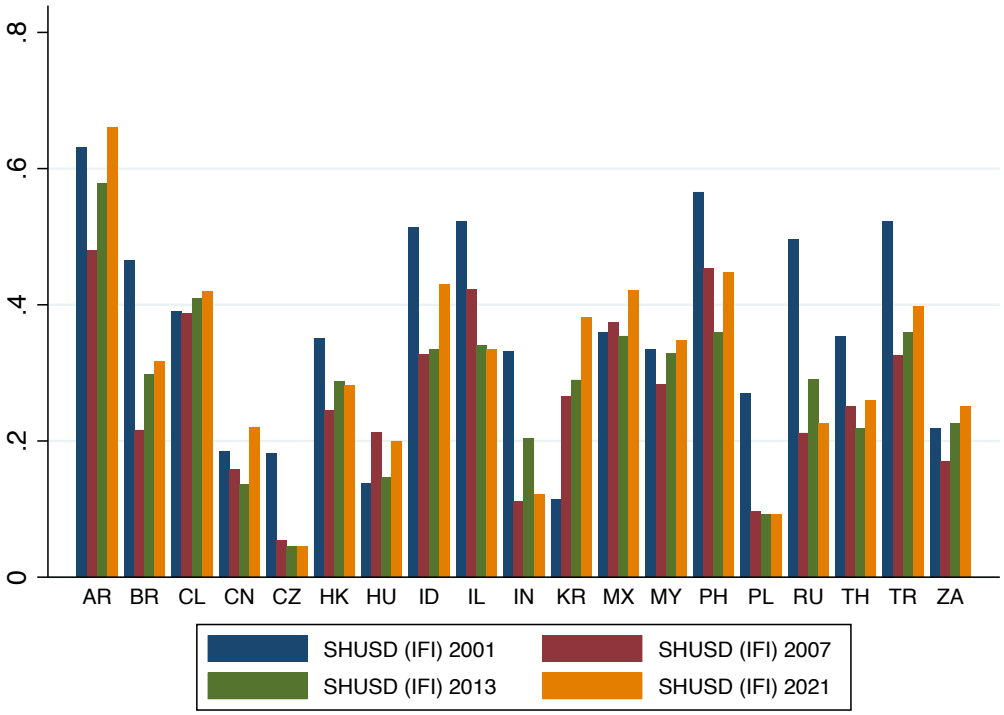


(b) Emerging Market Economies

Figure 4.7: SHUSD (IFI) long-term dynamics: 2001, 2007, 2013, 2021

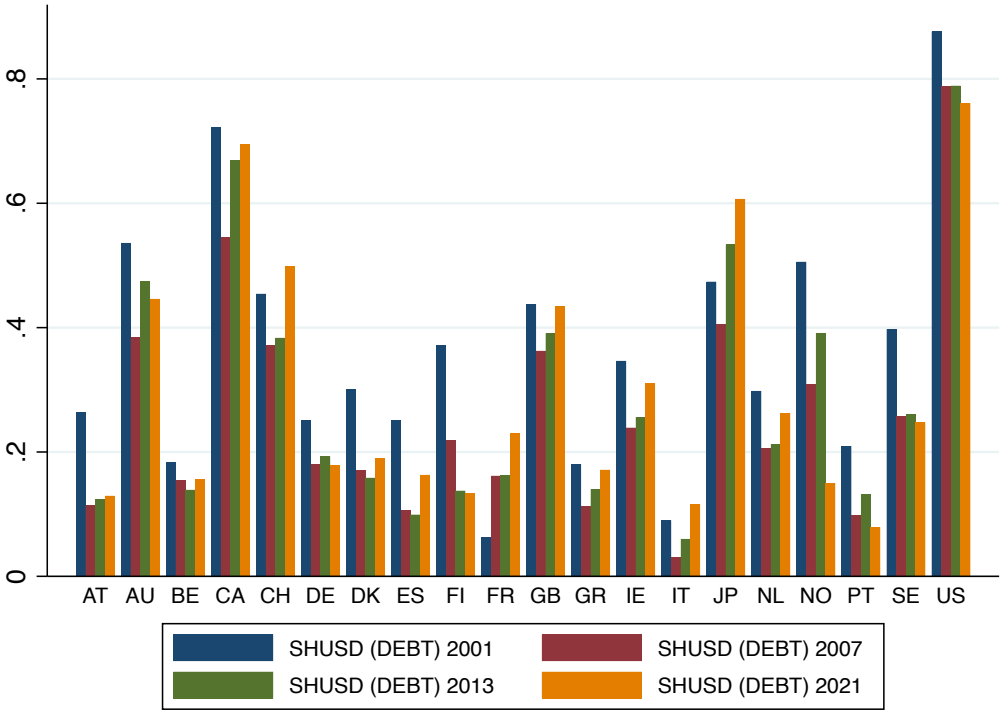


(a) Advanced Economies

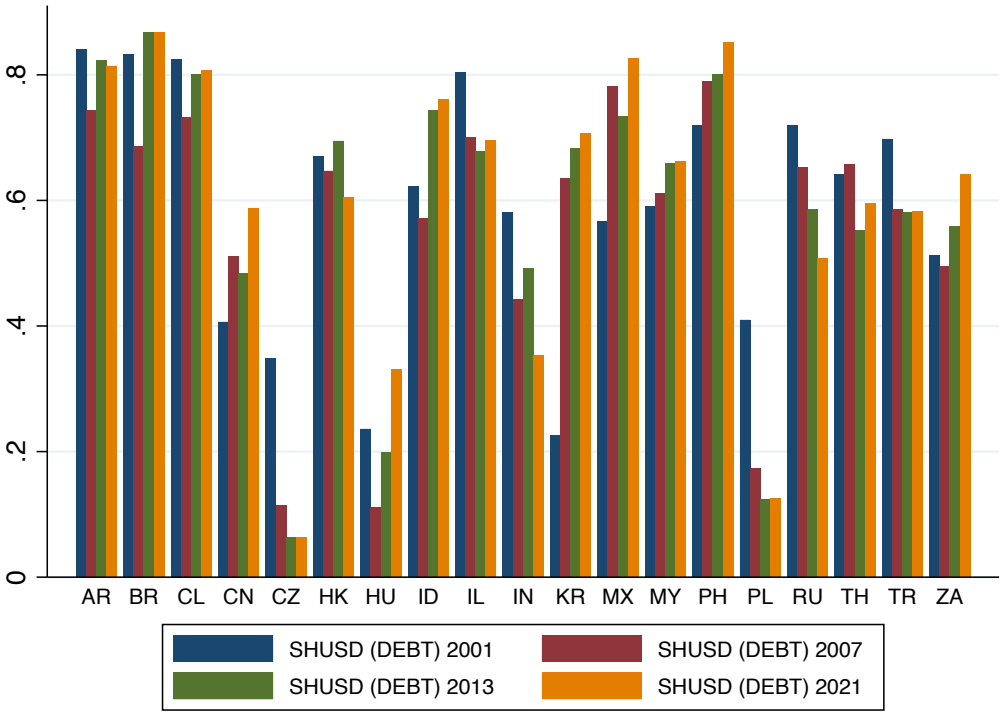


(b) Emerging Market Economies

Figure 4.8: SHUSD (DEBT) long-term dynamics: 2001, 2007, 2013, 2021

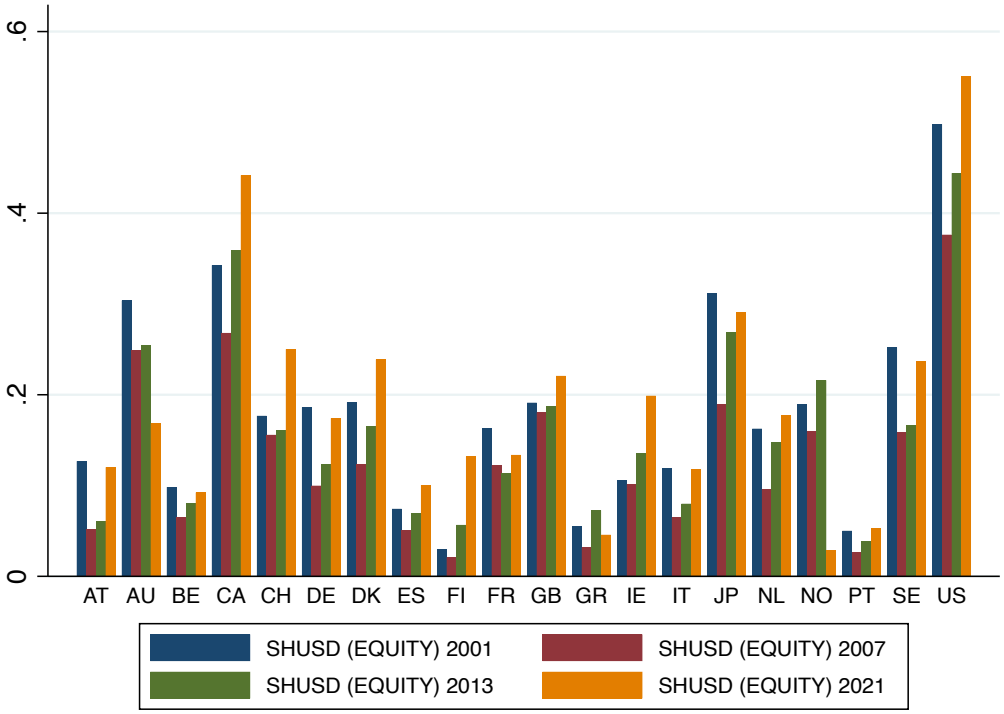


(a) Advanced Economies

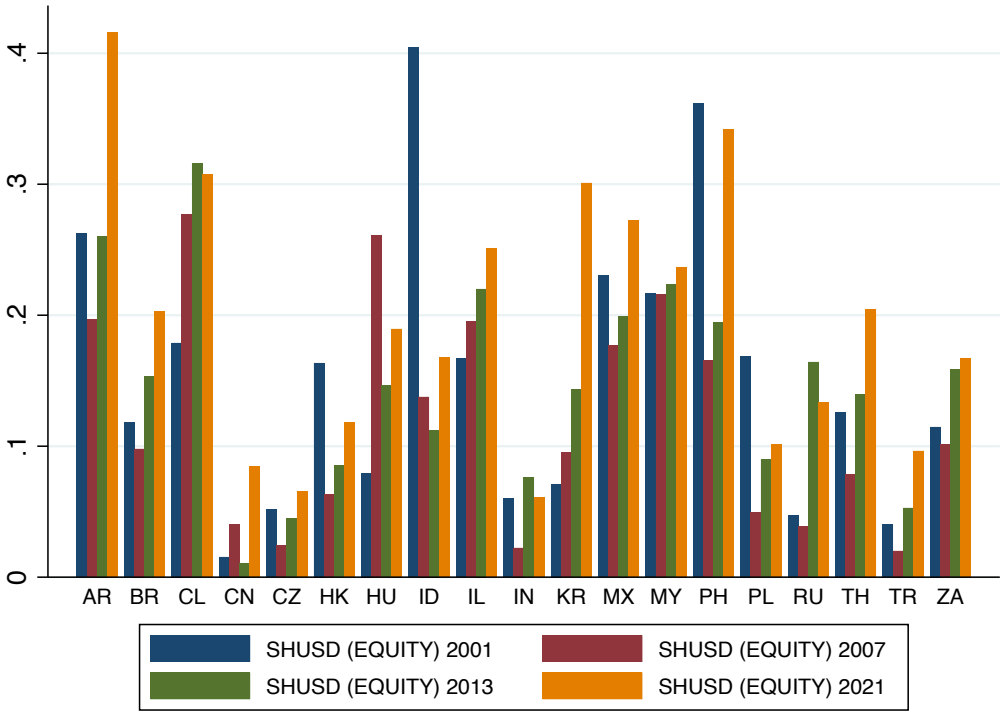


(b) Emerging Market Economies

Figure 4.9: SHUSD (EQUITY) long-term dynamics: 2001, 2007, 2013, 2021

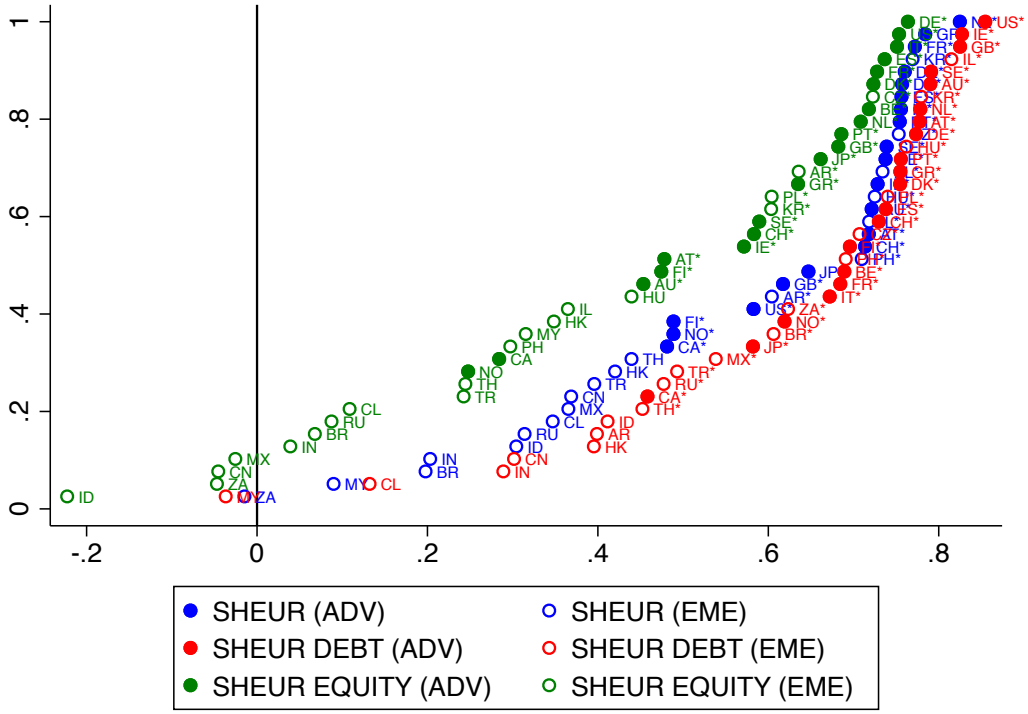


(a) Advanced Economies



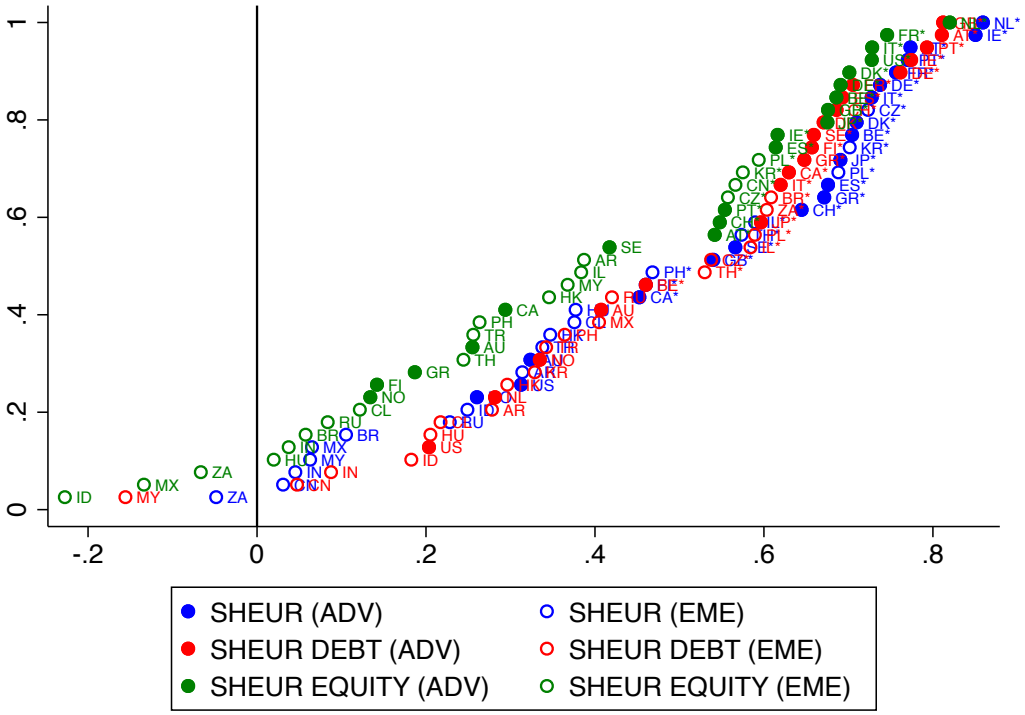
(b) Emerging Market Economies

Figure 4.10: Correlation between percentage change of SHEUR excluding valuation effect and lagged exchange rate

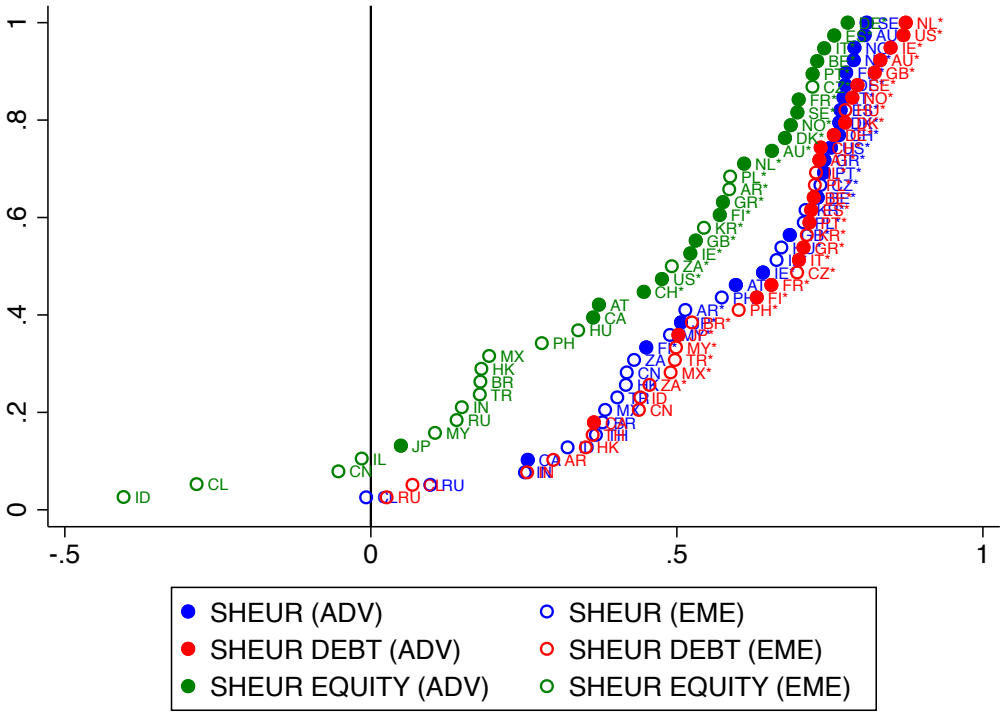


(a) IFI

Note: Cumulative distribution for the correlation between the percentage change in SHEUR, SHEUR Debt, and SHEUR Equity and the percentage change in lagged exchange rate (EUR/USD). Correlation is measured on the horizontal axis and ranges between -1 and 1. The vertical axis measures the cumulative distribution, or the proportion of countries, below each correlation value in the horizontal axis. * denotes p<0.05

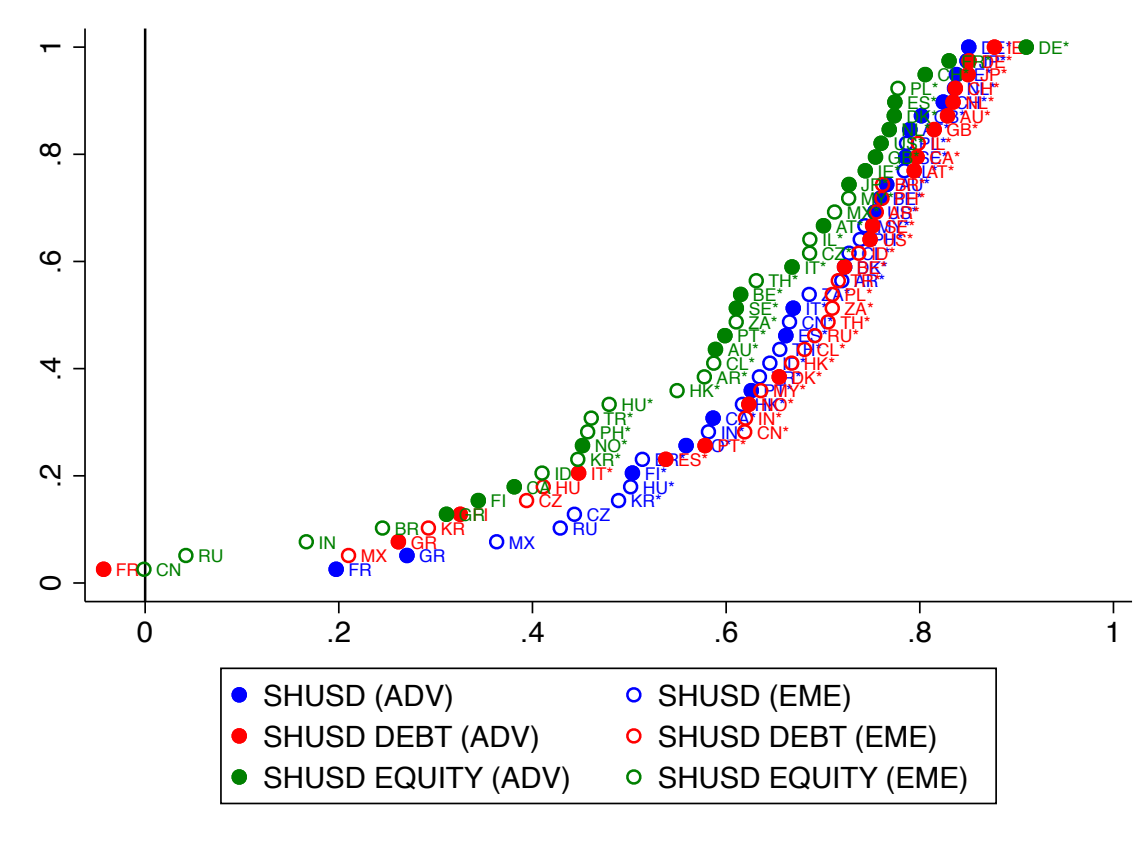


(b) Assets



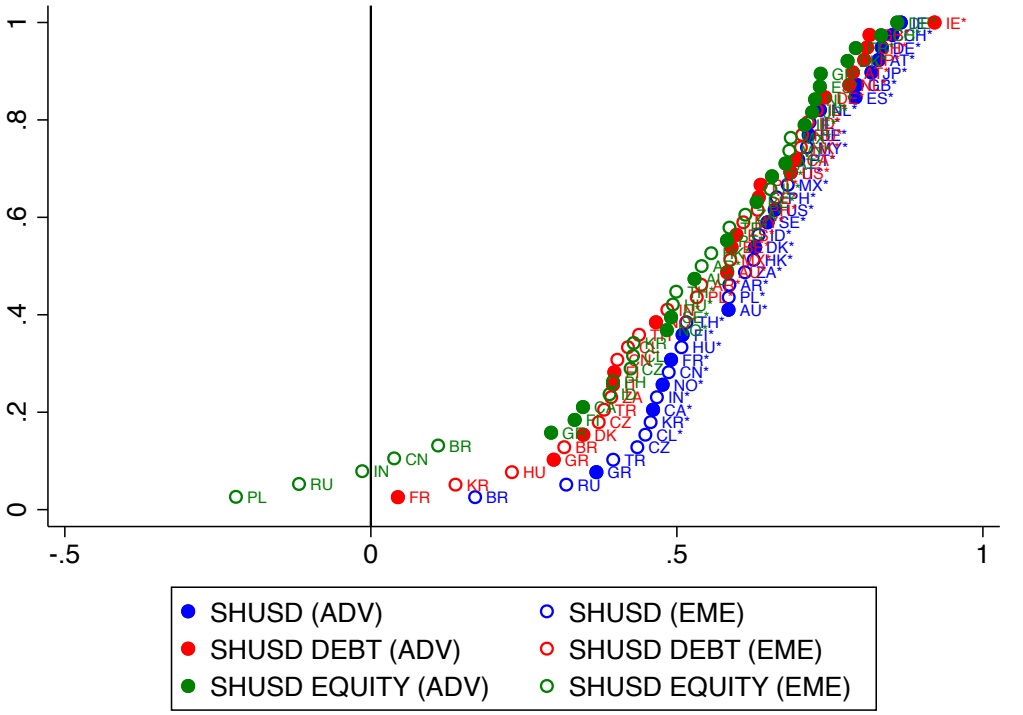
(c) Liabilities

Figure 4.11: Correlation between percentage change of SHUSD excluding valuation effect and lagged exchange rate

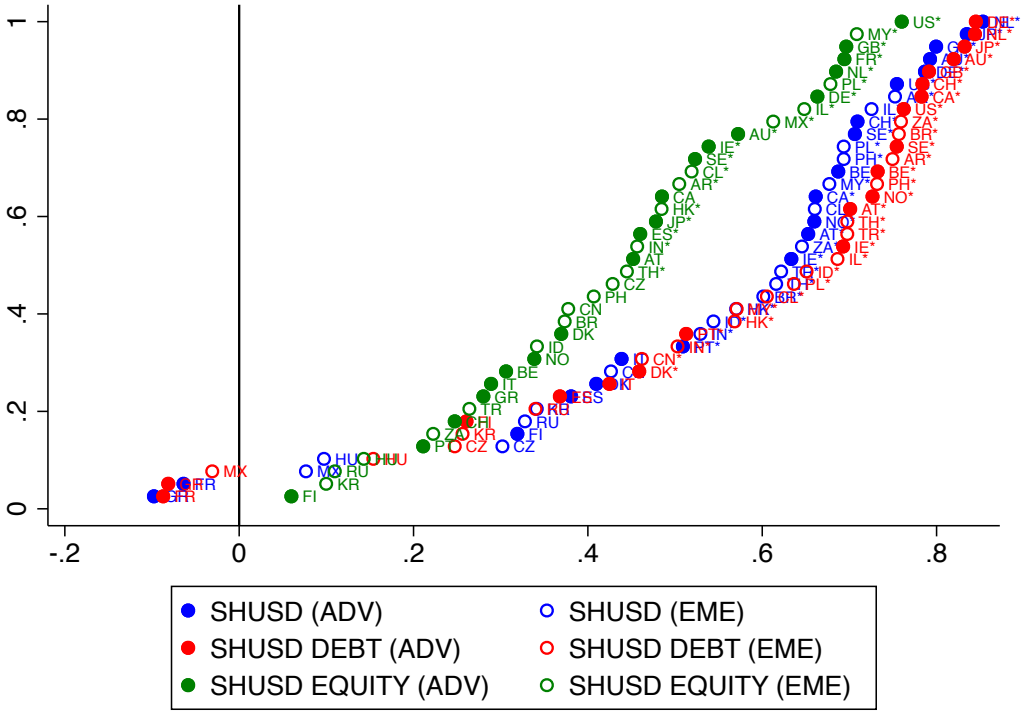


(a) IFI

Note: Cumulative distribution for the correlation between the percentage change in SHUSD, SHUSD Debt, and SHUSD Equity and the percentage change in lagged exchange rate (USD/EUR). Correlation is measured on the horizontal axis and ranges between -1 and 1. The vertical axis measures the cumulative distribution, or the proportion of countries, below each correlation value in the horizontal axis. * denotes p<0.05

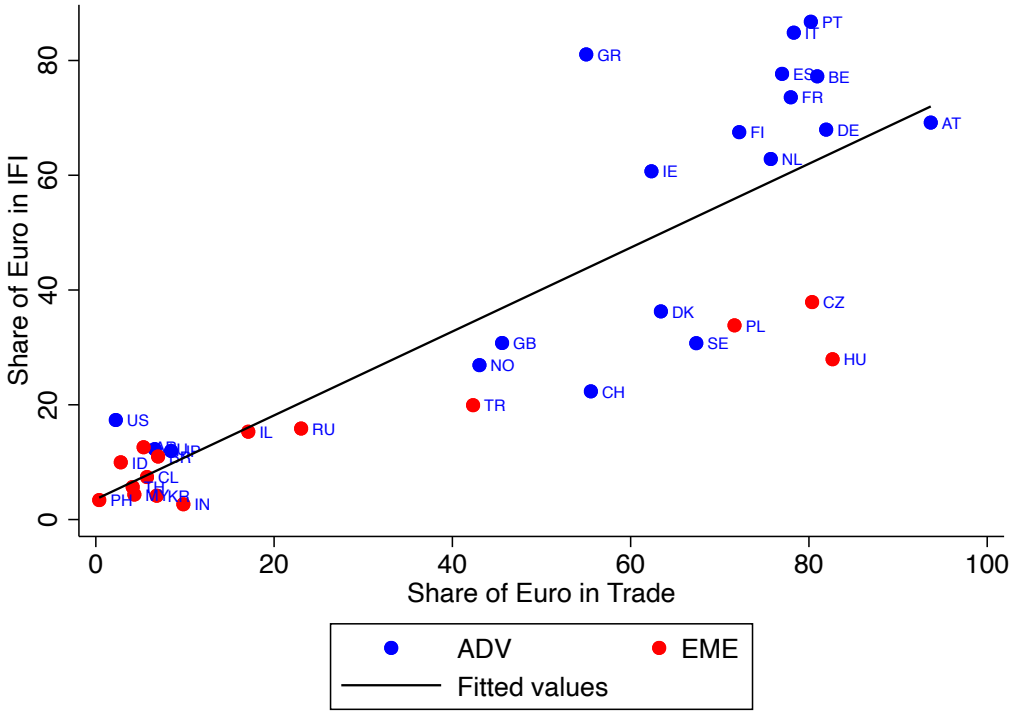


(b) Assets



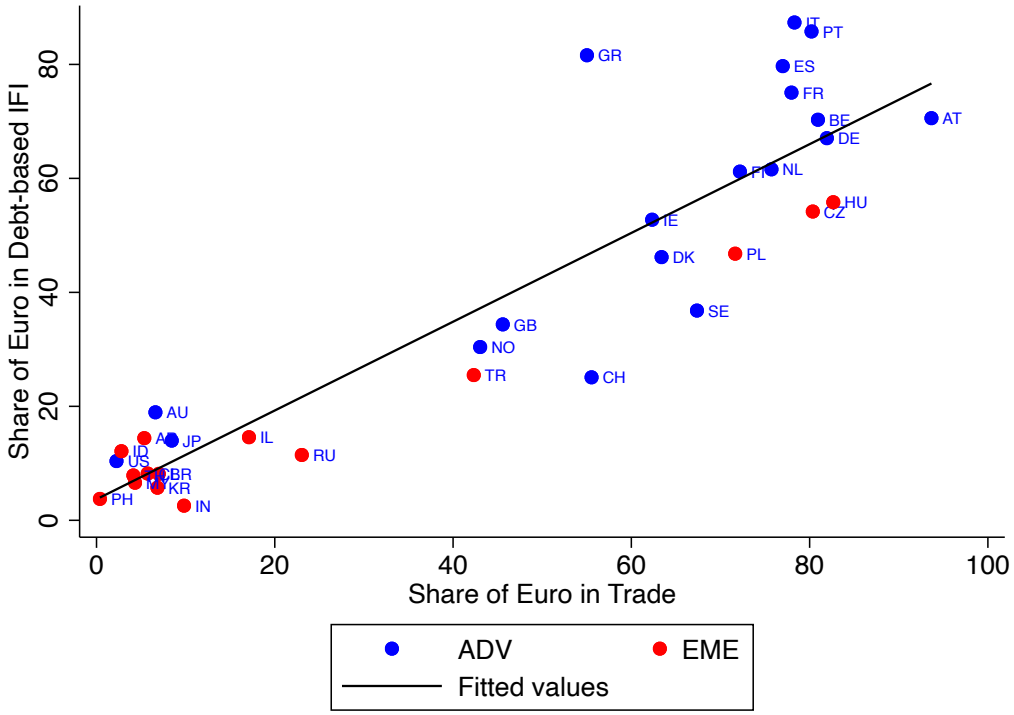
(c) Liabilities

Figure 4.12: Correlation of euro denomination of IFI measures and trade invoicing euro

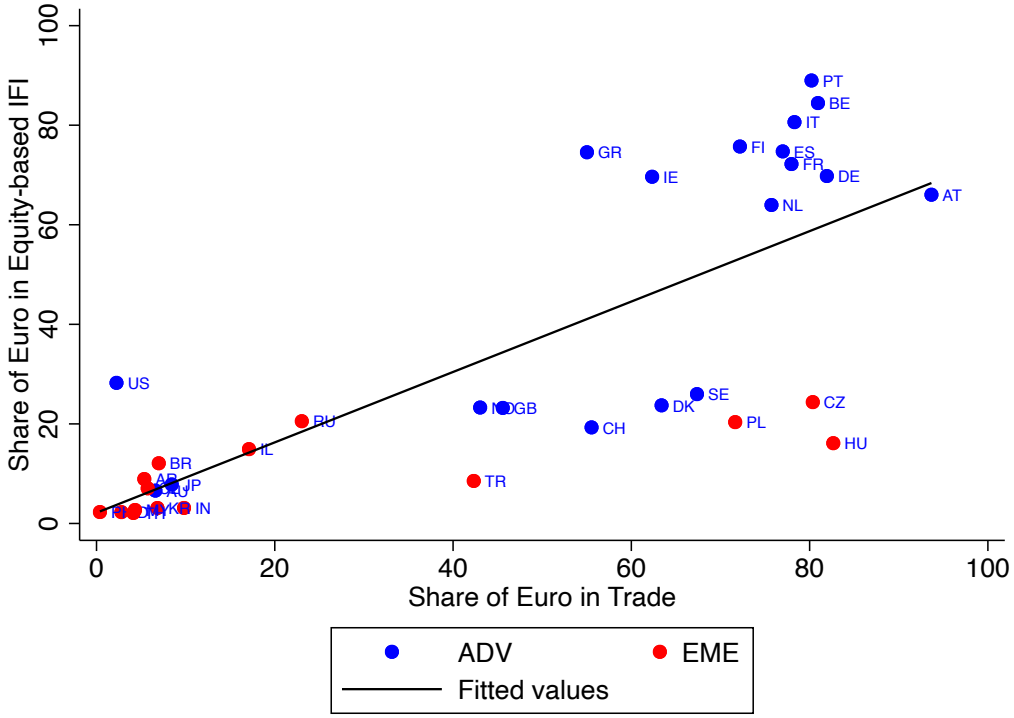


(a) Share of euro in IFI

Note: The horizontal axis display the share of euro in trade, import plus export. The vertical axis display the share of euro in international financial integration measures. Reported values are for the 2001-2019 average

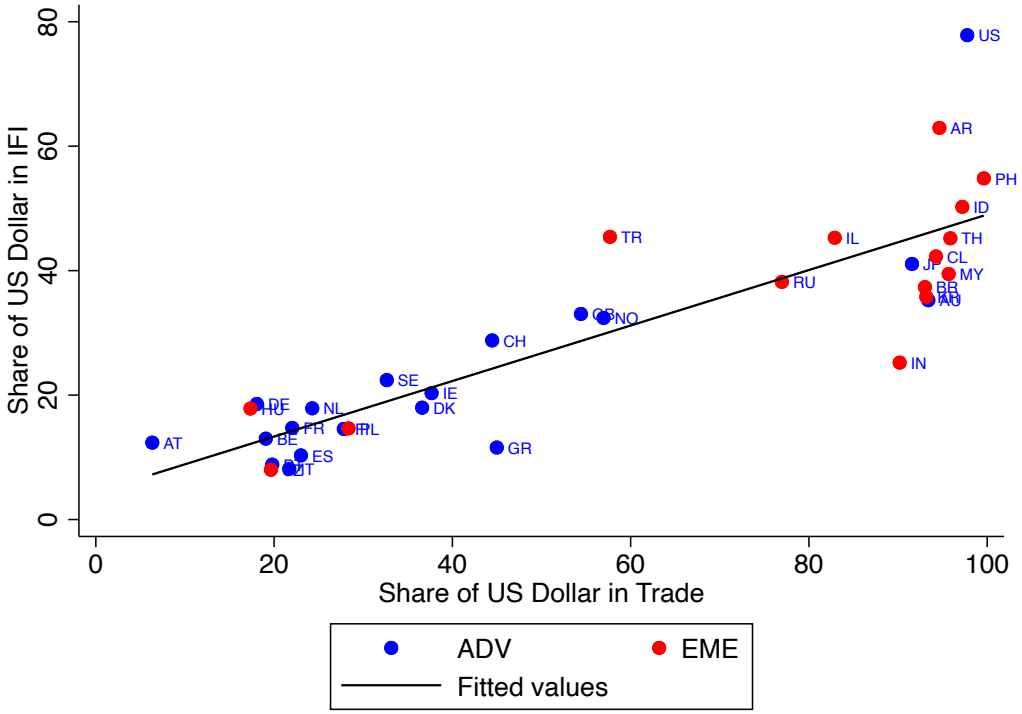


(b) Share of euro in Debt-based measure



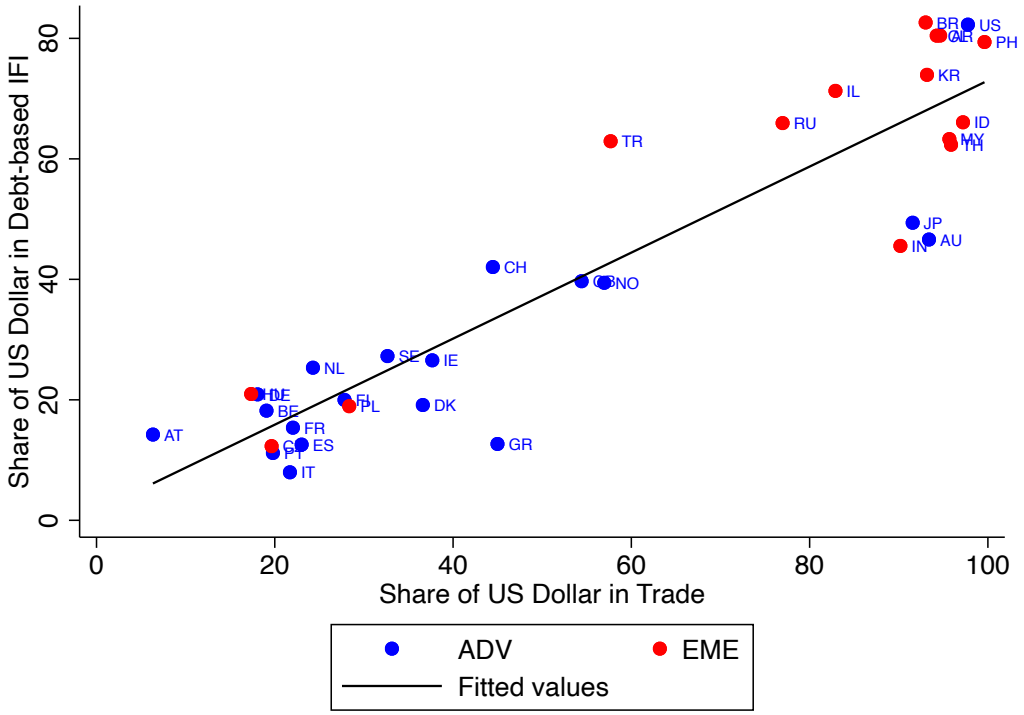
(c) Share of euro in Equity-based measure

Figure 4.13: Correlation of US dollar denomination of IFI measures and trade invoicing US dollar

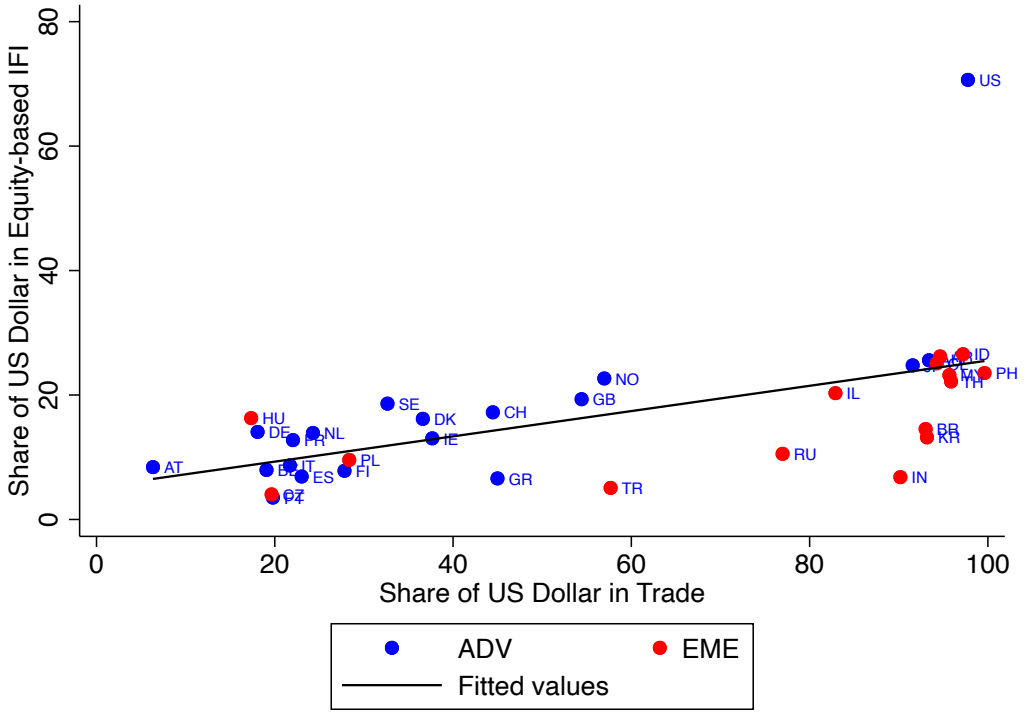


(a) Share of US dollar in IFI

Note: The horizontal axis display the share of US dollar in trade, import plus export. The vertical axis display the share of US dollar in international financial integration measures. Reported values are for the 2001-2019 average



(b) Share of US dollar in Debt-based measure



(c) Share of US dollar in Equity-based measure

Chapter 5

General conclusion

In an era marked by unprecedented globalization and interconnectivity, the dynamics of international finance have grown increasingly intricate and consequential. The global economy's reliance on cross-border financial positions, characterized by diverse currency denominations and geographical disparities, has given rise to economic challenges and opportunities. This thesis presents insights for the multifaceted dimensions of cross-border financial positions by analysing shock absorption properties of external positions (Chapter 2), offshore debt issuance of NFCs (Chapter 3), and the status of the euro and the US dollar in international investment positions (Chapter 4).

Chapter 2 is the first study that systematically includes the currency composition into a cross-country framework to study the way in which it affects the amplitude of valuation effects. We find the shock absorption property of external positions to be present in advanced economies. While this was initially not the case for emerging markets, we observe a shift towards shock absorption capacity in recent years. The regression-based analysis shows that more developed countries have a higher capacity to absorb exchange rate shocks via the currency mix of their net external positions. This holds in terms of both the general level of economic development and domestic financial development; in particular within emerging market economies but also between the advanced and emerging country groups. The underlying mechanism behind enhanced shock absorption capacity is that

countries with larger net external funding requirements need to be able to fill the funding needs by issuing more domestic currency liabilities. External balance sheets were growing and imbalances rising, while domestic currency issuance by EMEs was not particularly widespread before the crisis.

Chapter 3 is the first study that analyzes the link between the offshore issuance of NFCs and their within-company loans considered as portfolio flows masked as FDI and the factors shaping the heterogeneity in this link using gravity-typed regressions. The results show the prevalence of re-lending of funds by foreign affiliates to their parents for advanced as well as emerging and developing countries. In other words, they highlight the importance of questioning the general view of FDI regarding its stability and monitoring its sources. This study also emphasizes that better institutions, higher corporate bond issuance volume, higher international financial integration, greater capital account openness, and lower borrowing cost in nationality country relative to the residence county of foreign affiliates weaken the incentive to channel proceeds of external debt from offshore affiliates to their parent NFCs. Moreover, this paper provides an in-depth study on the factors determining the relative weight of offshore relative to onshore issuance. The analysis highlights that the quality and security of the legal environment, the deepness of the investor base, capital controls on international lending and financial integration, and the risk level of countries are at the core of the global financial system on the relative incidence of offshore financing. More specifically, countries with less institutional and financial development, less financial integration, and high risk levels are more likely to have a higher share of offshore issuance in total issuance.

Chapter 4 contributes to the literature by analyzing how the trends in international financial integration as well as in equity and debt components of IFI are reflected in the currency breakdown for the euro and US dollar. We compile data

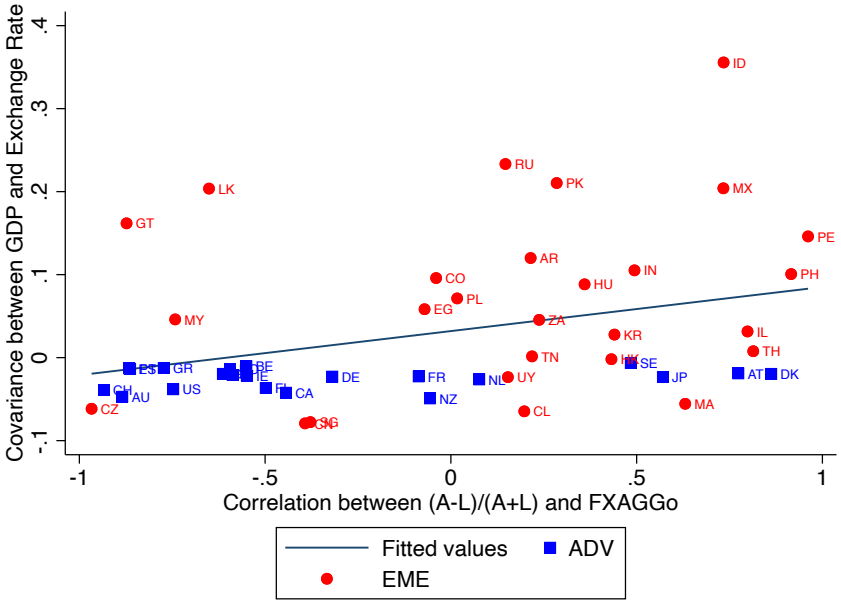
for the euro and US dollar composition of portfolio equity, foreign direct investment, portfolio debt, and other investments between 2001 and 2021 for 39 countries. While the euro's use improved and grew from its launch to the GFC, this is not the case for other periods. The European debt crisis, appreciation of the USD to the euro, and relatively higher maintenance of USD liquidity during the peak of the GFC are some possible explanations for this observation. Furthermore, the euro has an important role in advanced economies, especially euro area countries. It has a limited role in emerging market economies, unlike USD, and is far from being the dominant currency globally. In addition, we present the relation between the currency-induced valuation-adjusted IFI measures and the exchange rate movements separately to observe the role of being a safer currency in the evolvement of the status of the USD and euro in international finance. We find a strong positive correlation for most of the countries. This positive link can be explained by the avoidance of exchange rate-inducing capital loss and currency mismatch. Furthermore, currency-related frictions are associated less with equity relative to the debt market.

More generally, this thesis ventures into the complex realm of cross-border financial positions, dissecting their multifaceted nature and implications. By exploring the interplay between currency denominations, geographical factors, and their role in mitigating or exacerbating financial shocks, we have endeavored to shed light on critical aspects of international macroeconomics and finance. The essays within this thesis provide valuable insights into currency exposure of cross-border financial positions, hidden wealth and financial vulnerabilities arising from offshore financial centers, and the global roles of key currencies: the euro and the US dollar. As we conclude this exploration, we recognize the ever-evolving dynamics of the global financial landscape and the importance of continued research and analysis in the pursuit of a more stable and resilient global financial system.

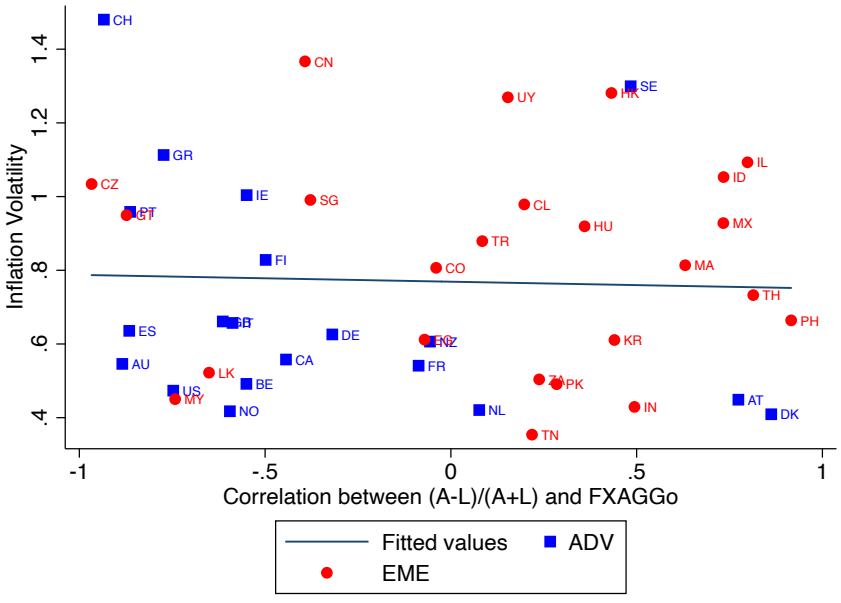
Appendix A

The shock absorbing role of cross-border investments: net positions versus currency composition

Figure A.1: Risk Block excluding outlier countries



(a)



(b)

Note: They show unconditional correlation relations between Inflation volatility and shock absorption, and between covariance of GDP and exchange rate and shock absorption indicator by excluding outlier countries. Inflation volatility as measured by the coefficient of variation which is the ratio of the standard deviation to mean. They are computed by using data for 1990-2017. The correlation between $(A-L)/(A+L)$ and FX_o^{AGG} based on data for 1990-2017.

Table A.1: Sample Economies

Advanced Economies	Emerging Economies
Australia	Argentina
Austria	Brazil
Belgium	Chile
Canada	China,P.R.: Mainland
Denmark	Colombia
Finland	Czech Republic
France	Egypt
Germany	Guatemala
Greece	Hong Kong
Ireland	Hungary
Italy	India
Japan	Indonesia
Netherlands	Israel
New Zealand	Korea
Norway	Malaysia
Portugal	Mexico
Spain	Morocco
Sweden	Pakistan
Switzerland	Peru
United Kingdom	Philippines
United States	Poland
	Russia
	Singapore
	South Africa
	Sri Lanka
	Thailand
	Tunisia
	Turkey
	Uruguay

Table A.2: Data Sources

Indicator	Source
IIP currency composition	Bénétrix et al. (2020)
GDP, GDP per capita	World Bank World Development Indicators
Inflation	IMF International Financial Statistics
The end of period domestic currency per U.S	IMF International Financial Statistics
Merchandise exports and imports in U.S. dollar	IMF Direction of Trade Statistics
Financial Institutions Index	IMF Financial Development Index Database
International Financial Integration	Lane and Milesi-Ferretti (2018)
Rule of Law	World Bank Governance Indicators
Regulatory Quality	World Bank Governance Indicators
Volatility Index	Chicago Board Options Exchange

Appendix B

Offshore debt issuance, within-company loans and measured FDI: determinants and implications

B.1 Deriving the optimal rerouted external debt

To derive the optimal capital structure, the parent corporate maximizes its after-tax profits.

$$max_{D_i^E, D_{i,j}^{RE}, D_{i,j}^I} \Pi_i = (1-t_i).f(\theta K_i(\theta)) - r_i.K_i(\theta) - \tilde{r}_{i,j}.b_{i,j}^{RE}.K_i(\theta)$$

$$+t_i.r_i.(D_{i,j}^I + D_i^E + D_{i,j}^{RE}) + t_i.\tilde{r}_{i,j}.D_{i,j}^{RE}$$

$$-\frac{\eta}{2}.(b_{i,j}^I)^2.K_i(\theta)$$

$$-[\frac{\mu}{2}.(b_i^E + b_{i,j}^{RE})^2 + \frac{\delta_i^E}{2}.(b_i^E)^2 + \frac{\delta_j^{RE}}{2}.(b_{i,j}^{RE})^2].K_i(\theta) \quad \text{(A.1)}$$

where we used Eqs. (1) and (2) in Eq. (3).

The resulting first-order conditions are

$$D_i^E : t_i.r - \mu(b_i^E + b_{i,j}^{RE}) - \delta_i^E b_i^E = 0 \tag{A.2}$$

$$D_{i,j}^{RE} : -\tilde{r}_{i,j} + t_i.r_i + t_i.\tilde{r}_{i,j} - \mu(b_i^E + b_{i,j}^{RE}) - \delta_j^{RE}.b_{i,j}^{RE} = 0 \tag{A.3}$$

$$D_{i,j}^{I} : t_i.r - \eta b_{i,j}^{I} = 0 \tag{A.4}$$

FOC (A.4) can be rewritten as

$$b_{i,j}^{I} = \frac{t_i.r}{\eta} \tag{A.5}$$

Turning to the optimal external and rerouted external debt-to-asset ratios, we subtract FOC (A.3) from FOC (A.2) to establish the relationship

$$\tilde{r}_{i,j} - t_i.\tilde{r}_{i,j} - \delta_i^E b_i^E + \delta_j^{RE} b_{i,j}^{RE} = 0 \Rightarrow b_i^E = \frac{\delta_j^{RE}}{\delta_i^E}.b_{i,j}^{RE} + \frac{(1-t_i).\tilde{r}_{i,j}}{\delta_i^E} \tag{A.6}$$

When we use Eq. (A.6) to replace b_i^E in Eq. (A.3), we obtain

$$b_{i,j}^{RE} = [t_i.r_i - \frac{(\delta_i^E + \mu)}{\delta_i^E}.(1-t_i).\tilde{r}_{i,j}].\frac{1}{[\mu(1 + \frac{\delta_j^{RE}}{\delta_i^E} + \delta_j^{RE}]} \tag{A.7}$$

B.2 Data and variables

NFC's offshore amount outstanding debt issued by affiliates located outside the country of headquarters is provided by Aldasoro, Hardy, and Tarashev (2021).

This dataset includes information on 85 NFC nationalities and 90 offshore locations.[1] The sample period is 1980Q1 -2021Q1.

For within-company loans, we use Outward Debt Instruments Liabilities Positions (IOWDL) from Coordinated Direct Investment Survey (CDIS). This data shows the lending of the resident affiliates in an offshore location to parents in NFCs nationality and provide information on outward direct investment positions cross-classified by the economy of immediate investment. The sample period is 2009 -2020.

CDIS provides detailed data on "inward" and "outward" direct investment positions with the issuer and holder (geography) information. Unlike the Balance of Payments (BOP) and International Investment Position (IIP) datasets, both presented according to the asset/liability principle, Investment Survey is presented according to the directional principle (OECD, 2014; Mesias, 2015; IMF, 2009).

On the one hand, according to the asset/liability principle, both the asset and liability sides include all assets and liabilities of both resident parent companies and of resident affiliates. It includes investment by a direct investor in its direct investment enterprise, reverse investment by a direct investment enterprise in its own immediate or indirect direct investor and investment between resident and nonresident fellow enterprises.

On the other hand, according to the directional principle, to derive the amount of total outward or inward investment of the reporting country, reverse investment (arises when a direct investment enterprise lends funds to its immediate or indirect direct investor) is subtracted. While inward debt instruments liabilities positions show foreign parents' lending to resident affiliates, inward debt instruments assets positions represent resident affiliates' lending to foreign parents, and the difference between them is inward debt instruments positions. While outward debt instruments liabilities positions show foreign affiliates' lending to resident

[1]The number of countries in different country groups, EME, AE, and OFC are 47, 26, and 12, respectively.

parents, outward debt instruments assets positions show resident parents' lending to foreign affiliates, and the difference between them is outward debt instruments positions.

Therefore, direct investment debt instruments liabilities are equivalent to the sum of inward debt instruments liabilities and outward debt instruments liabilities positions. Direct investment instruments assets are equivalent to the sum of inward debt Instruments assets and outward debt instruments assets.

We obtained geographic distance from CEPII's GeoDist dataset (Mayer and Zignago, 2011), and it measures the geodesic distance between any two countries based on a population-weighted average of the distances between individual cities. For the institutional quality, we use the first principle component of control of corruption, government effectiveness, political stability, regulatory quality, the rule of law, and voice and accountability from World Bank World Governance Indicators. For the domestic financial market development, we use the financial development index (FD) from Svirydzenka (2016), stock market capitalization (% of GDP) as the stock market size, domestic credit to the private sector (% of GDP) as a proxy of financial intermediary size, corporate bond issuance volume (% of GDP), and corporate bond average maturity (years) from World Bank Global Financial Development (GFD).

International financial integration, total external assets, and liabilities excluding financial derivatives (% of GDP) (Lane and Milesi-Ferretti, 2018) and Chin-Ito capital account openness index (Chinn and Ito, 2006) are the key variables for international capital market access. Alternatively, we also use the index of capital flow management controls (restrictions) for all asset categories from Fernández et al. (2016).

We use statutory corporate income tax rates from OECD Statistics for the taxation block. Finally, for the risk factors, we take the exchange rate and consumer price index for inflation calculation from IMF International Financial Statistics (IFS).

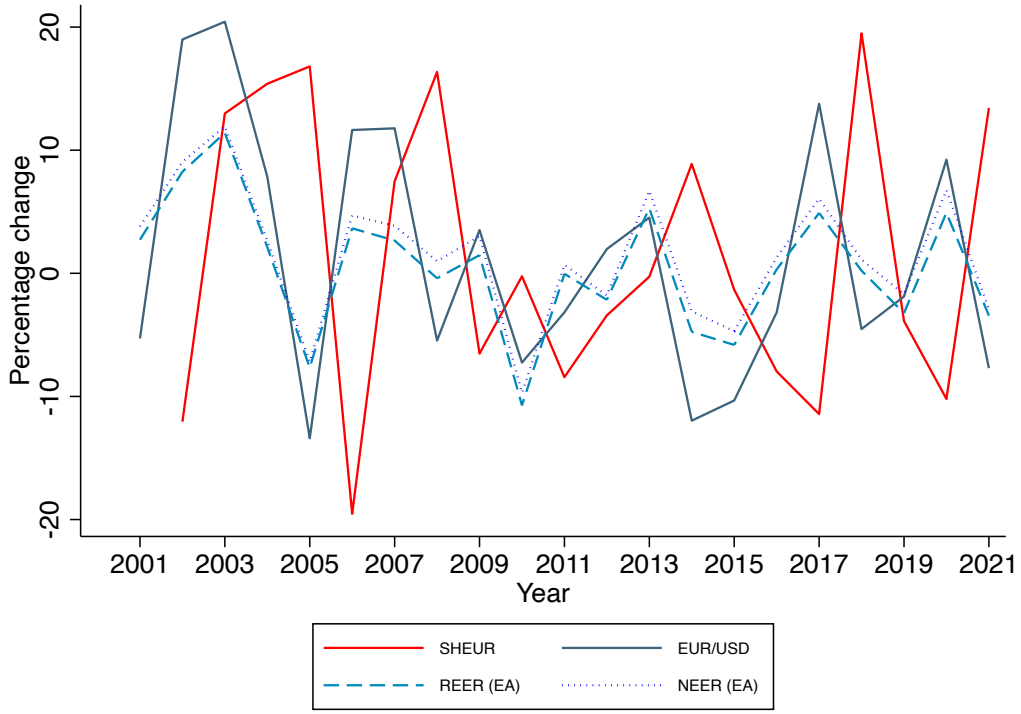
For the calculation of relative borrowing cost, we draw short-term interest from IMF and OECD. Furthermore, for the size of foreign exchange swaps, derivatives, and options markets, we sum up currency swaps, FX swaps, options, outright forwards, and other derivatives based on the daily average turnover in April, by location of the counterparty, currency, and reporting country from the BIS Triennial Survey.[2]

[2]We interpolate the intervening years using a semi-annual survey conducted by the BIS.

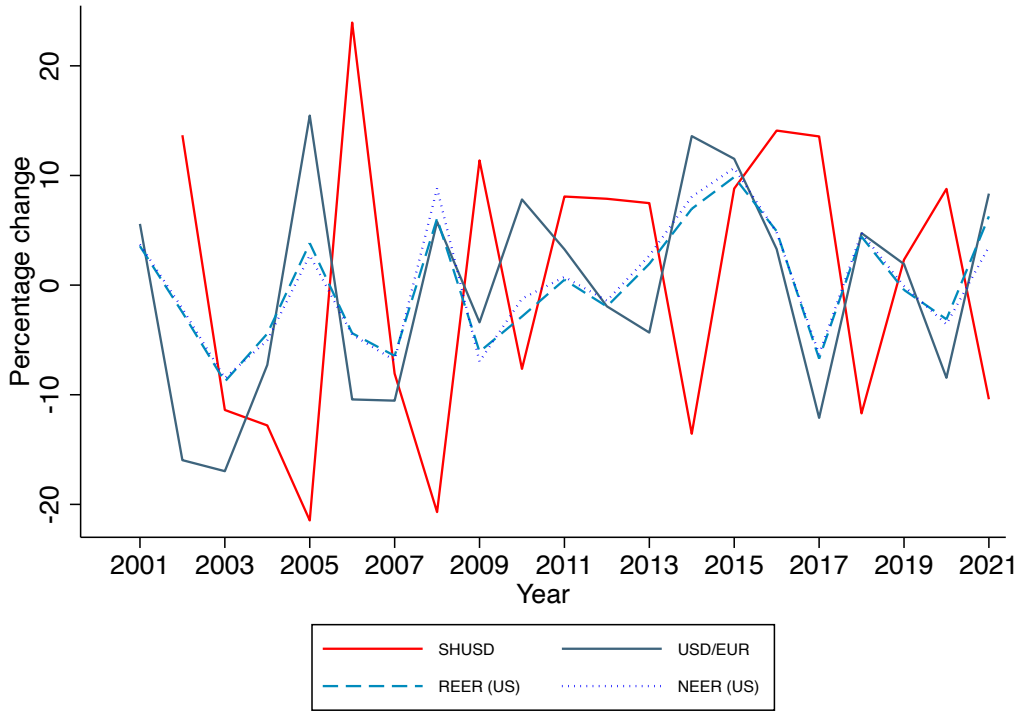
Appendix C

Breaking down international financial integration: US dollar vs euro

Figure C.1: Valuation adjusted percentage change in the currency shares of IFI and percentage change in the exchange rate

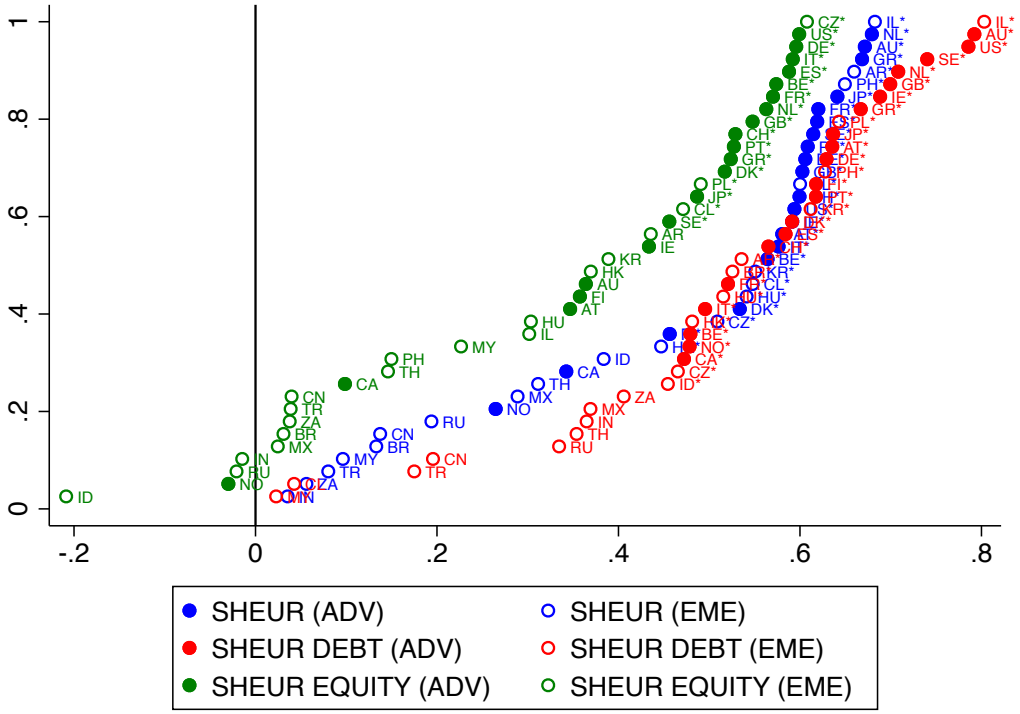


(a) The euro share of IFI and euro exchange rates

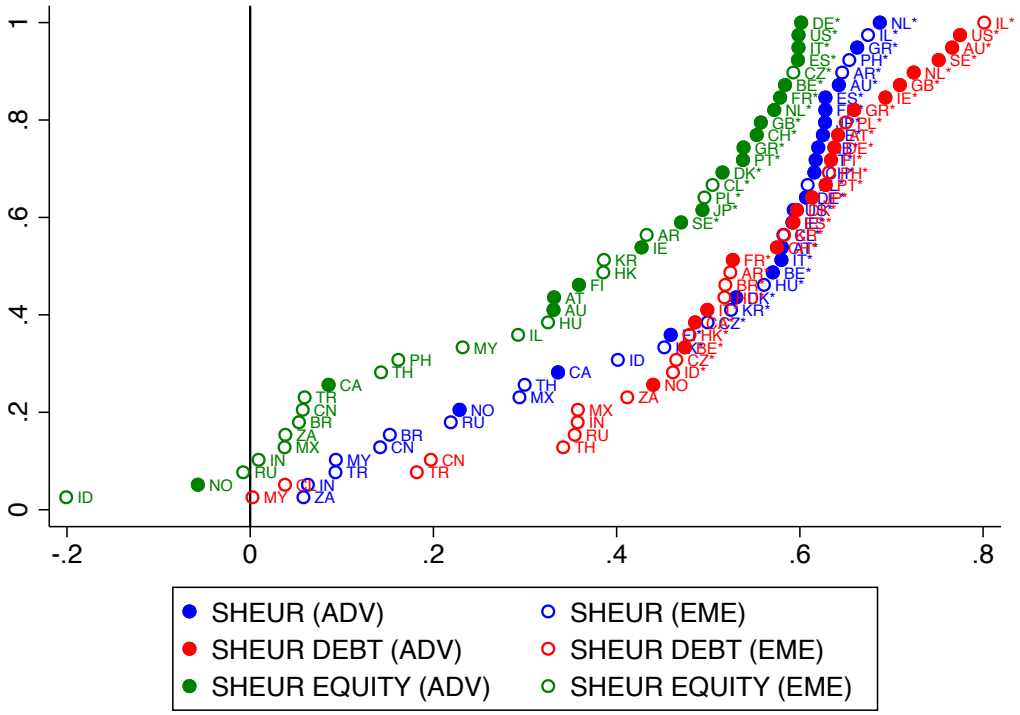


(b) The USD share of IFI and USD exchange rates

Figure C.2: Correlation between percentage change of SHEUR excluding valuation effect and lagged exchange rate

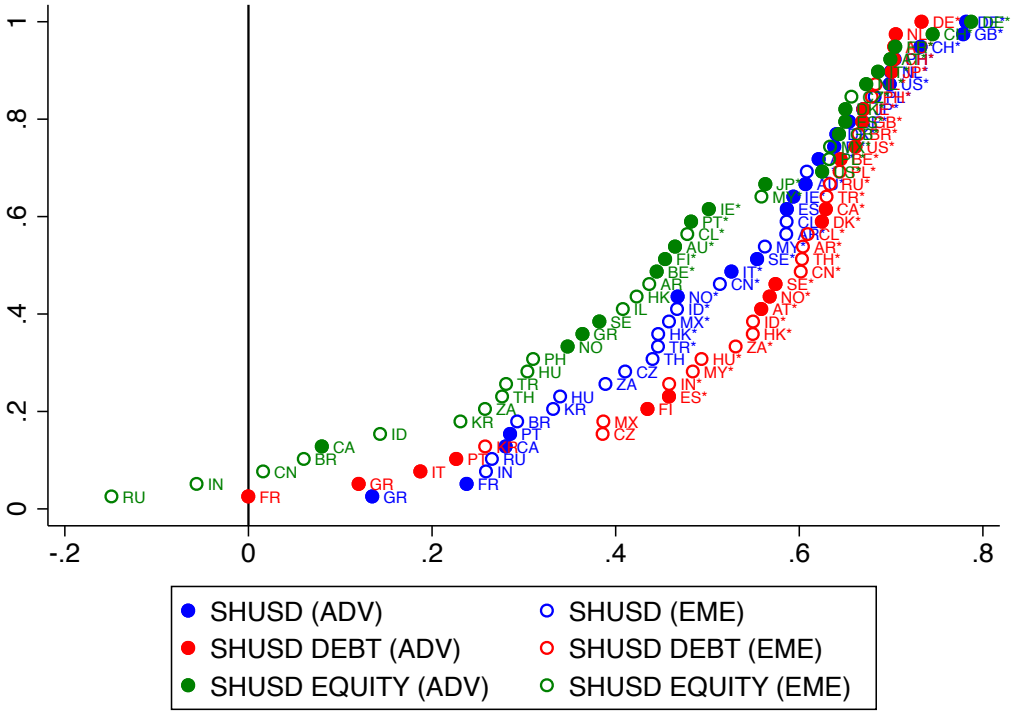


(a) Correlation with lagged euro area REER

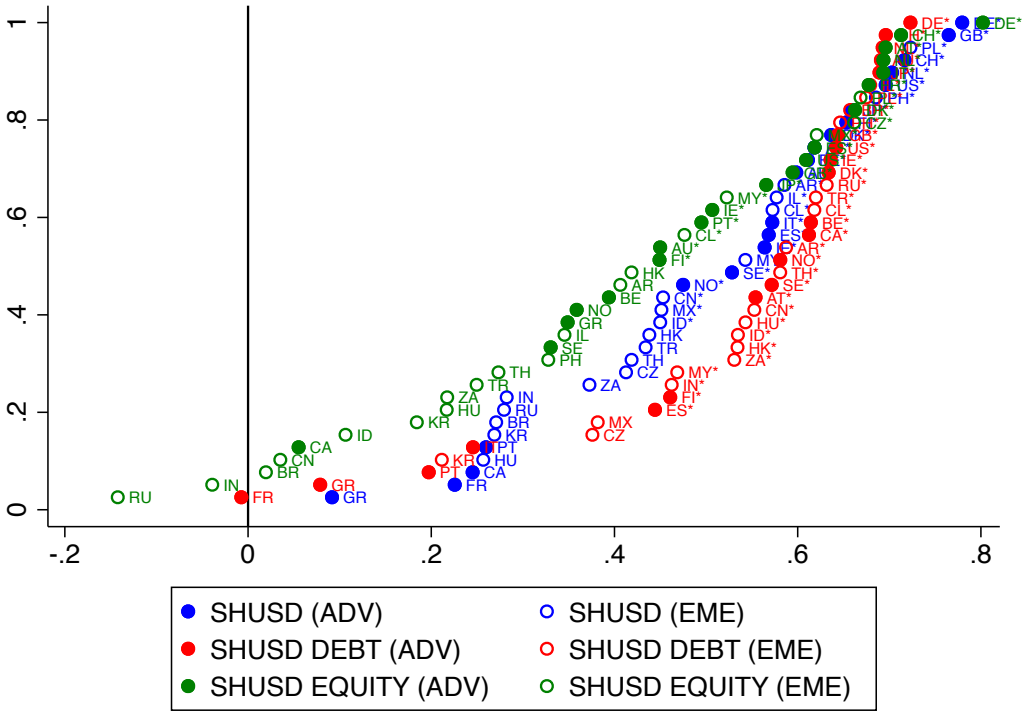


(b) Correlation with lagged euro area NEER

Figure C.3: Correlation between percentage change of SHUSD excluding valuation effect and lagged exchange rate

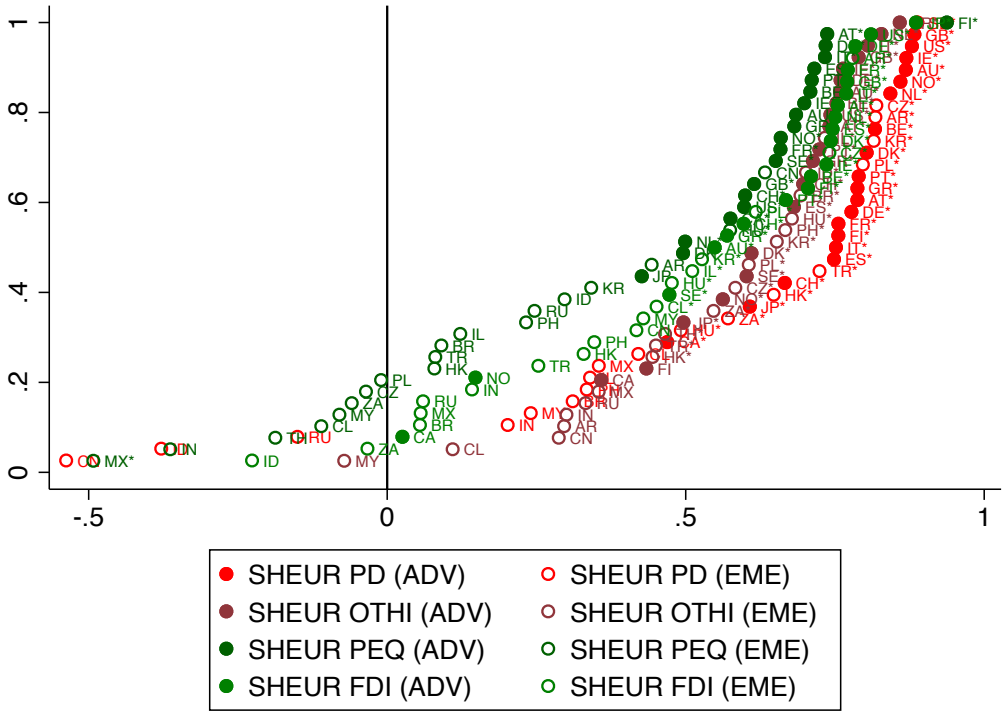


(a) Correlation with lagged United States REER



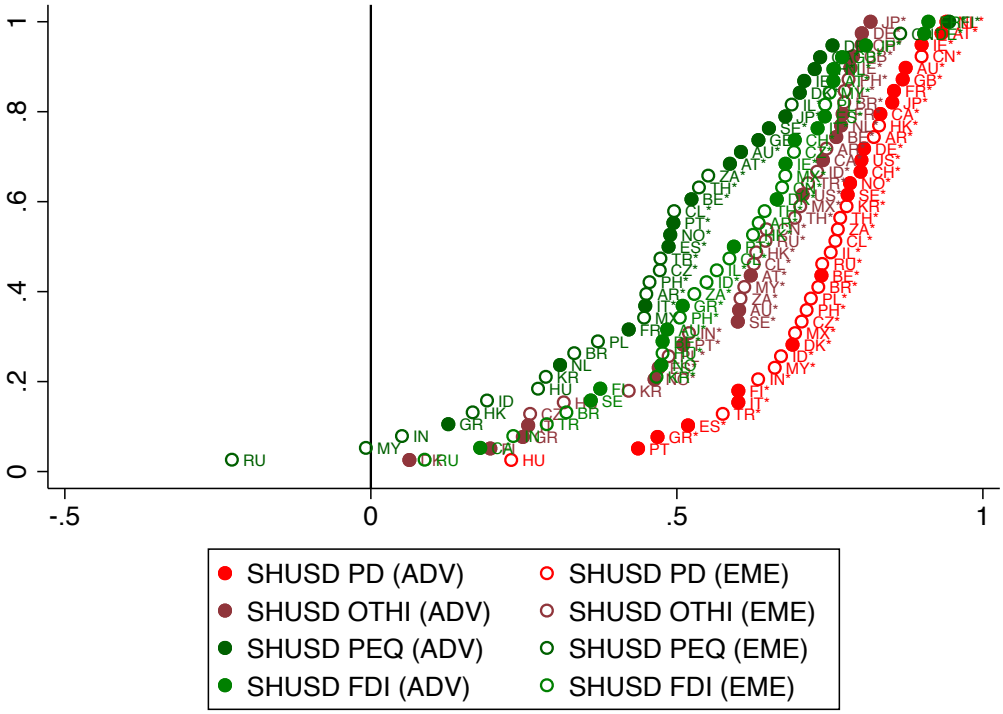
(b) Correlation with lagged United States NEER

Figure C.4: Correlation between percentage change of SHEUR excluding valuation effect and lagged exchange rate



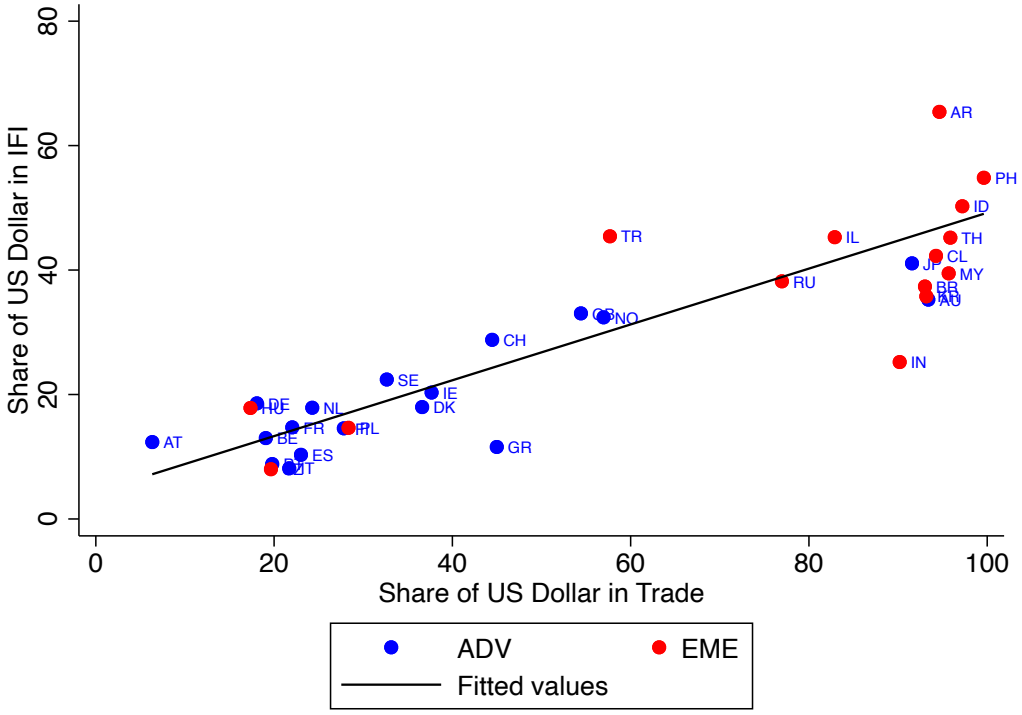
Note: Cumulative distribution for the correlation between the percentage change in euro share in Portfolio Debt, Other Investment, Portfolio Equity and FDI (SHEUR PD, SHEUR OTHI, SHEUR PEQ and SHEUR FDI) and the percentage change in lagged exchange rate (EUR/USD). Correlation is measured on the horizontal axis and ranges between -1 and 1. The vertical axis measures the cumulative distribution, or the proportion of countries, below each correlation value in the horizontal axis. * denotes p<0.05

Figure C.5: Correlation between percentage change of SHUSD excluding valuation effect and lagged exchange rate

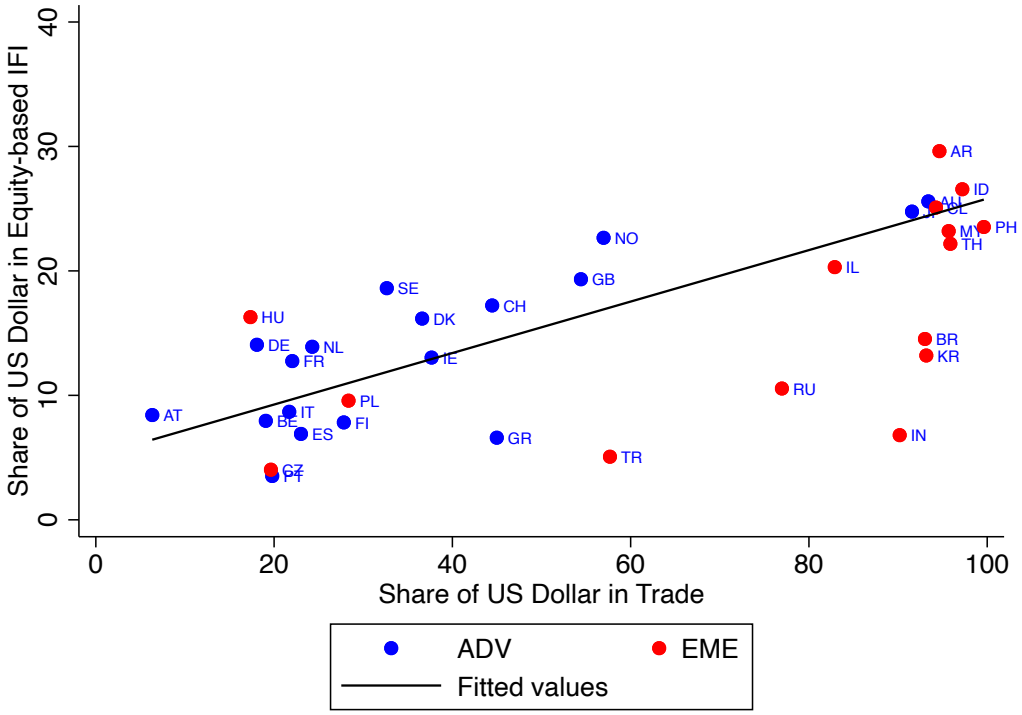


Note: Cumulative distribution for the correlation between the percentage change in US dollar share in Portfolio Debt, Other Investment, Portfolio Equity and FDI (SHUSD PD, SHUSD OTHI, SHUSD PEQ and SHUSD FDI) and the percentage change in lagged exchange rate (USD/EUR). Correlation is measured on the horizontal axis and ranges between -1 and 1. The vertical axis measures the cumulative distribution, or the proportion of countries, below each correlation value in the horizontal axis. * denotes p<0.05

Figure C.6: Correlation of US dollar share in IFI measures and trade invoicing US dollar



(a) Share of US dollar in IFI, excluding the outlier country US



(b) Share of US dollar in Equity measure, excluding the outlier country US

Table C.1: Assets: Actual and Synthetic Data

Country	FDI Equity Assets	Portfolio Equity Assets	Portfolio Debt Assets	Other Investment Assets
Argentina	2009-2021*	2016-2021**	2016-2021**	2001-2021*****
Australia	2009-2021*	2001-2020****	2001-2020****	2001-2021***
Austria	2009-2021*	2001-2021**	2009-2021**	2007-2021***
Belgium	2009-2021*	2013-2021**	2013-2021**	2001-2021***
Brazil	2010-2021*	2013-2021**	2013-2021**	2002-2021***
Canada	2012-2021*	2014-2021**	2020-2021**	2001-2021***
Chile	2012-2021*	2001-2021****	2001-2021****	2002-2021***
China	2018-2021*	2015-2021****	2015-2021****	2015-2021***
Czech Republic	2009-2021*	2014-2021**	2014-2021**	2001-2021*****
Denmark	2009-2021*	2001-2021**	2001-2021**	2001-2021***
Finland	2009-2021*	2016-2021**	2013-2021**	2001-2021***
France	2009-2021*	2001-2021**	2001-2021**	2007-2021***
Germany	2009-2021*	2007-2021**	2007-2021**	2001-2021***
Greece	2009-2021*	2001-2021**	2001-2021**	2003-2021***
Hong Kong SAR	2009-2021*	2018-2021**	2001-2021****	2014-2021***
Hungary	2009-2021*	2001-2021**	2001-2021**	2001-2021*****
India	2010-2021*	2004-2021**	2004-2021**	2001-2021***
Indonesia	2018-2021*	2001-2021**	2001-2021**	2001-2021*****
Ireland	2009-2021*	2001-2021****	2001-2021****	2001-2021***
Israel	2009-2021*	2001-2021**	2001-2021**	2001-2021*****
Italy	2009-2021*	2001-2021**	2001-2021**	2007-2021***
Japan	2009-2021*	2001-2021**	2001-2021**	2001-2021***
Korea	2009-2021*	2001-2021**	2001-2021**	2005-2021***
Malaysia	2009-2021*	2001-2021**	2001-2021**	2001-2021*****
Mexico	2009-2021*	2003-2021**	2003-2021**	2003-2021***
Netherlands	2009-2021*	2009-2021**	2009-2021**	2001-2021***
Norway	2011-2021*	2001-2020****	2001-2020****	2014-2021***
Philippines	2009-2021*	2007-2021**	2007-2021**	2016-2021***
Poland	2009-2021*	2001-2021**	2001-2020**	2001-2021*****
Portugal	2009-2021*	2001-2021**	2001-2021**	2007-2021***
Russia	2009-2021*	2001-2021**	2001-2021**	2015-2021***
South Africa	2009-2021*	2012-2021**	2012-2021**	2009-2021***
Spain	2009-2021*	2001-2021**	2001-2021**	2007-2021***
Sweden	2010-2021*	2001-2020****	2003-2020**	2001-2021***
Switzerland	2009-2021*	2001-2021**	2001-2021**	2001-2021***
Thailand	2009-2021*	2004-2021**	2004-2021**	2001-2021*****
Turkey	2009-2021*	2013-2021**	2013-2021**	2001-2021***
United Kingdom	2009-2021*	2001-2021****	2001-2021****	2001-2021***
United States	2009-2021*	2001-2021****	2003-2021**	2001-2021***

Note: * indicates country is CDIS reporter, ** identifies actual data from CPIS Table 2, *** indicates that the country is a BIS reporter, **** indicates that the country is a CPIS reporter, ***** identifies mirrored data from BIS-LBS

Table C.2: Liabilities: Actual and Synthetic Data

Country	Portfolio Debt Liabilities	Other Investment Liabilities
Argentina	2001-2021*	2001-2021*
Australia	2001-2021*	2001-2021*
Austria	2001-2021*	2007-2021*
Belgium	2001-2021*	2001-2021*
Brazil	2001-2021*	2002-2021*
Canada	2001-2021*	2001-2021*
Chile	2001-2021*	2002-2021*
China	2001-2021*	2015-2021*
Czech Republic	2001-2021*	2001-2021*
Denmark	2001-2021*	2001-2021*
Finland	2001-2021*	2001-2021*
France	2001-2021*	2007-2021*
Germany	2001-2021*	2001-2021*
Greece	2001-2021*	2003-2021*
Hong Kong SAR	2001-2021*	2014-2021*
Hungary	2001-2021*	2001-2021*
India	2001-2021*	2001-2021*
Indonesia	2001-2021*	2001-2021*
Ireland	2001-2021*	2001-2021*
Israel	2001-2021*	2001-2021*
Italy	2001-2021*	2007-2021*
Japan	2001-2021*	2001-2021*
Korea	2001-2021*	2005-2021*
Malaysia	2001-2021*	2001-2021*
Mexico	2001-2021*	2003-2021*
Netherlands	2001-2021*	2001-2021*
Norway	2001-2021*	2014-2021*
Philippines	2001-2021*	2016-2021*
Poland	2001-2021*	2001-2021*
Portugal	2001-2021*	2007-2021*
Russia	2001-2021*	2015-2021*
South Africa	2001-2021*	2009-2021*
Spain	2001-2021*	2007-2021*
Sweden	2001-2021*	2001-2021*
Switzerland	2001-2021*	2001-2021*
Thailand	2001-2021*	2001-2021*
Turkey	2001-2021*	2001-2021*
United Kingdom	2001-2021*	2001-2021*
United States	2001-2021*	2001-2021*

Note: * indicates country is BIS reporter. Portfolio equity liabilities and FDI equity liabilities are assumed to be denominated in the currency of the host country and are therefore excluded from the table

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