Capital Flows and Leverage

Şebnem Kalemli-Özcan\textsuperscript{1,2,3} and Jun Hee Kwak\textsuperscript{1}

\textsuperscript{1}Department of Economics, University of Maryland, College Park, Maryland 20742, USA; email: kalemli@umd.edu, jhkwak@umd.edu
\textsuperscript{2}National Bureau of Economic Research, Cambridge, Massachusetts 02138, USA
\textsuperscript{3}Center for Economic and Policy Research, Washington, DC 20099, USA

\textbf{Keywords}

Capital Flows, Leverage, Intermediation, Banking Flows, Corporate Debt

\textbf{Abstract}

This paper surveys the literature on capital flows and leverage. We summarize results from the existing papers and document new facts. The empirical literature takes both a macro and a micro approach. The macro approach focuses on aggregate data both over time and in the cross-section of countries and documents a positive correlation between total capital flows, build-ups in terms of external and domestic debt-to-GDP, and financial crises. The micro approach uses granular data and focuses on leverage at the firm- and bank-level and associates this leverage with country-level capital flows and related exchange rate movements. We document new facts from a hybrid approach that focuses on the relationship between sector-level capital flows and sectoral leverage. We highlight the interconnections between different approaches and argue that harmonization of the macro and micro approaches can yield a more complete understanding of the effect of capital flows on country-, sector- and firm/bank-level leverage associated with credit booms and busts.
1. INTRODUCTION

International capital flows have nontrivial consequences for macro and micro economic outcomes. There is a large empirical literature that studies both the determinants and effects of capital flows. This literature utilizes cross-country and time-series panel data, making use of both “between” country and “within” country variation. The former source of variation compares countries to each other, averaging the data over decades and focusing on the long-run causes and effects of capital flows, while the latter source of variation keeps average differences across countries fixed, using country-fixed effects, and uses yearly or even quarterly changes in variables for identification. In general, this literature recognizes that the most important determinant of capital flows is the institutional quality of countries in the long run.

When yearly or quarterly variation is used, macroeconomic policies turn out to be more important than institutional quality as the latter changes slowly over time. The consensus view is that countries with higher levels of institutional quality have lower levels of risk of expropriation, are more productive, and have consistent macroeconomic policies. Hence, foreign investors can get a higher return from investing in these countries which have lower probabilities of default. This literature also finds that strong fundamentals in terms of GDP growth attract capital flows. External factors, such as the US interest rates, oil prices, and global financial conditions, are also important determinants of capital flows, especially in the short run. Connecting the effects of fundamentals and external factors, Kalemli-Özcan (2019) shows that capital flows in and out of countries with higher levels of default risk are more sensitive to changes in the US interest rates. On the effects of capital flows, the literature tends to find a strong association between capital flows, GDP volatility and financial crises. In terms of growth benefits, only certain forms of capital flows such as foreign direct investment (FDI) seems to bring growth to host countries.

This literature mostly focuses on net capital flows, that is the current account. Recently, Forbes & Warnock (2012) and Fratzscher (2012) studied total gross flows and show the importance of global risk factors for gross capital flows for the period after 1995. Obstfeld & Taylor (2005) argue that gross flows provide risk sharing and should not be considered from the perspective of efficient allocations of capital that are associated with current account deficits and surpluses. In general, current account deficits are associated with large gross inflows too, especially for emerging markets. Several papers argue that credit booms and

---


2 Kalemli-Özcan and Kwak
capital inflows go hand in hand leading to debt build-ups and high leverage in the receiving economies. This process in general ends with a financial crisis and a long de-leveraging process. Even without capital flows, as shown by Jordà et al. (2013), credit growth is important to understand financial crises.

For open economies, a credit boom can be financed by capital flows that can manifest itself as higher leverage in the banking sector or the corporate and government sectors. Gourinchas & Obstfeld (2012), using data from advanced and emerging markets during 1973–2010, show that the most important determinants of financial crises are an increase in leverage, credit growth and a sharp appreciation of the currency. Similarly, Borio & Disyatat (2011) show evidence on the relationship between leverage in the banking sector, cross border capital flows and the exchange rate. The recent work by Bruno & Shin (2015a,b) provides a model and supporting evidence that can connect these findings. Their work links global banks’ leverage to global push factors that are related to capital flows. Their argument is that when global financial conditions are easy (due to expansionary monetary policy in the US, for example), then global banks’ leverage goes up due to a relaxation in their value-at-risk constraint and this process is associated with an increase in cross-border banking flows. An alternative model by Gabaix & Maggiori (2015) focuses on the risk-bearing capacity of global financial intermediaries.

In order to understand the relationship between capital flows and leverage, we have to understand the effects of global push factors on capital flows. As shown by Rey (2013), a global financial cycle (GFC) – that involves synchronized surges and retrenchments in gross capital flows; and booms and busts in risky asset prices and leverage – is an important phenomenon to understand in terms of its effects on domestic credit creation and leverage. GFC has a strong common component that comoves with VIX. VIX is related to monetary policy in the US and global changes in risk aversion and uncertainty (Bekaert et al. (2013); Miranda-Agrippino & Rey (2019); and Bruno & Shin (2015b)). In association with these findings, many researchers show that VIX has an important role in pushing capital flows especially into emerging markets (See Forbes & Warnock (2012), Cerutti et al. (2019a), Fratzscher et al. (2016), Miranda-Agrippino & Rey (2019), Cerutti et al. (2019b), and di Giovanni et al. (2019)). However, this literature also underlines the importance of the cyclicality in the relationship between VIX and capital flows (See Avdjiev et al. (2018), Avdjiev et al. (2019), and di Giovanni et al. (2019)). Kalemli-Özcan (2019) shows that changes in US monetary policy affect capital flows in and out of emerging markets more than the advanced economies since capital flows of emerging markets are more risk-sensitive, and US policy affects the risk sentiments of global investors.

The theory work by Bruno & Shin (2015a) argues that global banks’ US dollar lending increases during the boom phase of the GFC due to abundant liquidity in US dollar funding markets. An appreciating exchange rate as a result of capital inflows then allows banks and firms with currency mismatch on their balance sheet to take on more leverage in terms of increasing the share of foreign currency debt (e.g., Bruno & Shin 2015b). The model by Coimbra & Rey (2019) points to the importance of bank heterogeneity in leverage in such a mechanism, whereas the models by Bruno & Shin (2015a,b) consider the aggregate leverage of the banking sector. Kalemli-Özcan et al. (2018) show that firms increase their

---

2VIX is a forward-looking volatility index of the Chicago Board Options Exchange. It measures the market’s expectation of 30-day volatility and is constructed using the implied volatilities of a wide range of S&P 500 index options.
leverage with exchange rate appreciations and decrease it with depreciations. As shown by Kalemli-Özcan (2019), this relationship is stronger in countries with higher foreign currency debt, while this relationship disappears in countries with a lower level of foreign currency debt. Fluctuations in VIX affect firm leverage in all countries, regardless of the extent of foreign currency debt.

The model of Coimbra & Rey (2019) shows that financial cycles are due to heterogeneous intermediaries in which credit growth is driven in part by lower funding costs especially for the more leveraged intermediaries. Coimbra & Rey (2018) test the implication of their model using bank-level data from several countries and show that the negative relationship between funding costs and credit growth is stronger when the banking system is skewed where there are larger banks with high leverage. Avdjiev et al. (2019), using confidential bank-level data from several countries, show that the heterogeneity in cross-border liabilities of domestic banks is the key to the transmission of global financial conditions. di Giovanni et al. (2019), using detailed bank-firm-loan-level data from Turkey, show that lower funding costs for banks pass through as lower borrowing costs for corporates, leading to a credit boom. This process is mainly driven by large banks with access to international funding markets.

In the next section, we summarize findings from the literature, that uses macro and micro data in detail. Section 3 documents new facts from a hybrid approach that focuses on sector-level capital inflows and leverage. Section 4 states the conclusions of the survey.

2. LITERATURE

2.1. MACRO APPROACH: COUNTRIES

Figure 1 shows the importance of VIX as a global push factor in determining total capital inflows both into advanced and emerging market economies. This figure is reproduced from Avdjiev et al. (2018) and uses a sample of 25 advanced and 35 emerging market economies. Given our focus on leverage, we use debt flows. VIX is plotted on an inverted scale.

It is clear that VIX and capital (debt) flows move together. Notice the importance of private debt inflows in driving the dynamics of the relationship between total debt inflows and VIX. The decline in total debt inflows is smaller than the decline in private debt inflows when VIX is high. This means that public debt inflows move in the opposite way of private inflows and help to smooth out the decline in total inflows, especially in the emerging markets.

This figure is informative since it indicates that leverage of different sectors might change differentially over time as a response to global and country shocks, and it may not be straightforward to detect the relationship between leverage and total capital flows in the aggregate data.

The global factor VIX is clearly important, but we should consider the role of external factors together with the countries’ own fundamentals. Avdjiev et al. (2018) construct a new data set for gross capital flows during 1996–2014 for a large set of countries at a quarterly frequency, decomposing debt inflows and outflows by borrower and lender type: banks, corporates, and sovereigns. They run regressions of both total capital inflows and capital inflows by sector on VIX and countries’ own GDP growth. These regressions show that banking flows are important for the comovement of capital inflows and outflows. These regressions also show that capital inflows move procyclically with the GDP growth, in which this procyclicality is driven by both banking inflows and corporate inflows. This means
that, when countries grow fast, their banking sectors and corporate sectors borrow more externally and that foreign investors leave these sectors during recessions. These results hold for both advanced countries and emerging markets.

2.2. MICRO APPROACH: FIRMS AND BANKS

Several papers in the literature focus on bank- and firm-level data and try to connect leverage at this granular level to capital flows. It is important to have an understanding of the stylized facts on bank and firm leverage that can be generalized to more than one country before establishing the connection to capital flows.

Kalemli-Özcan et al. (2012) show that bank leverage is heterogeneous across banks and varies a great deal over time. The leverage at the firm-level, although still heterogeneous in the cross-section of firms, does not move as much over time as the bank-level leverage. These authors show that there was an increase in leverage for “investment banks” prior to the 2008–2009 crisis not only in the US but also in other countries. They also show a procyclical leverage ratio for “investment banks” in other countries as shown by Adrian & Shin (2008) for the US investment banks. In addition, Kalemli-Özcan et al. (2012) show that procyclical leverage is not about being an “investment bank” but rather leverage is procyclical for large commercial banks in many countries. Although there have been theoretical papers that aim at understanding the endogenous leverage process (Farhi & Tirole (2012); Fostel & Geanakoplos (2008); Brunnermeier & Pedersen (2009)), the literature lacked evidence on the leverage of firms and banks based on internationally comparable data. The exception is the seminal work of Rajan & Zingales (1995) who focus on the comparison of firm-level leverage across G7 countries using data on listed firms.

Kalemli-Özcan et al. (2012) utilize the most comprehensive and comparable firm-level and bank-level world-wide data set; namely, ORBIS from Bureau van Dijk Electronic Publishing (BvD) for the years 2000–2010 which covers listed, private, large, and small non-financial firms, financial firms, and banks. It is important to use micro data because aggregate country-level data may mask micro-level patterns. Adrian & Shin (2008, 2009, 2010) and He et al. (2010) investigate US commercial banks and investment banks mainly using aggregate sectoral Flow of Funds data from the Federal Reserve. Such sectoral data may be driven by the largest banks and it is important to know how typical investment and commercial banks behave. In fact, the key finding that large banks are more leveraged from Kalemli-Özcan et al. (2012) supports models such as Coimbra & Rey (2019) that is mentioned in the introduction.

2.2.1. FUNDING COST CHANNEL. What about the relationship of leverage of large banks to capital flows? There are papers that have emphasized the role of financial intermediaries in channeling capital flows into leverage in both financial and non-financial private sectors. Cetorelli & Goldberg (2012) use bank-level data to study the role of global banks in transmitting capital flows related liquidity conditions across borders. Using Mexican loan-level data, Morais et al. (2018) find that, during easy global liquidity conditions, the supply of credit of foreign banks to Mexican firms increases. This transaction would register as a capital flow in the balance of payments from a foreign country to the Mexican banking sector. Bräuning & Ivashina (2019) show that, during easy monetary conditions in the US, cross-border syndicated bank loans increase.

Using confidential loan-level data on the universe of loans combined with firm-
bank-level data from Turkey, di Giovanni et al. (2019) and Baskaya et al. (2017) show a direct link between banking inflows, bank leverage, corporate leverage, and a credit boom; they show that increased capital inflows into Turkey lead to a leveraged corporate sector and a credit boom via bank intermediation of these capital inflows. There are certain banks creating this type of procyclicality though. These are the banks that have a higher level of non-core liabilities. A high level of non-core liability ratio means more access to international funding since most of the non-core liabilities are non-domestic-deposit and externally funded. Baskaya et al. (2017) show that banks’ non-core liabilities move in tandem with banking sector inflows.

The key intuition behind these patterns is the pass-through of cost of funds. Large banks, who fund themselves cheaply in international markets, pass through this cheap cost of funding as a lower cost of borrowing to corporates. Figure 2 below, reproduced from di Giovanni et al. (2019), shows the relationship between Turkish firms’ borrowing costs and VIX, in which this relationship gets stronger during low VIX periods that are associated with Quantitative Easing (QE) policies of the US Federal Reserve. The figure plots the “time effects” on loan rates (nominal and real) in the sense that the authors plot the average interest rate on the average loan after purging that loan’s interest rate out of its determinants such as loan amount, maturity, risk, currency and so forth. The aim is to solely focus on the time pattern of borrowing costs at a very granular level and see if this time pattern is associated with the global push factor, VIX. They find that it is the case.

Some papers link firm-level leverage to capital flows and other aggregate outcomes. The work by Gopinath et al. (2017) links corporate leverage and credit growth to capital flows and to misallocation of this capital that leads to a decline in aggregate productivity. They show that countries in Southern Europe experienced low productivity growth alongside declining real interest rates during 1999–2008 due to capital inflows from Northern Europe. They argue that capital inflows from North to South Europe led to the misallocation of this capital across firms, which gave rise to lower aggregate productivity. They show that firms with larger and higher net worth got more capital, although they may not be productive. They develop a model with size-dependent financial frictions that is consistent with firm leverage being a function of firm size in the data. They provide evidence consistent with their model from six European countries.

Kalemli-Özcan et al. (2018) also focus on firm-level leverage, but they link it to declining aggregate investment in Europe in the aftermath of the 2008–2009 crisis. They show that declining firm-level and aggregate investment can be explained by higher firm-level leverage, increased debt service associated with this leverage, and having a relationship with a weak bank that led to a decrease in credit supply. Banks’ role is linked to capital flows since Northern European banks expand their credit supply to Southern European banks, while these banks are exposed to Southern European governments’ debt. This deadly embrace created a doom loop between firms, banks, and sovereigns across Europe that is funded by capital flows, as shown by these authors.

2.2.2. BALANCE SHEET CHANNEL. One dimension of the bank- and firm-level leverage is borrowing/lending in local versus foreign currency. As argued in the introduction, the model by Bruno & Shin (2015a) explicitly predicts higher leverage for banks and firms when there is currency mismatch on their balance sheets as a result of the movements in the exchange rate, which is linked to capital flows.
Kalemli-Özcan et al. (2018) directly test Bruno & Shin (2015a) model using firm-level data. Using firm-level data from private and public firms in ten Asian emerging markets during 2002–2015, these authors show that firms with higher foreign currency debt, before the exchange rate appreciates, increased their leverage more after appreciations. Kalemli-Özcan et al. (2016) show that these balance sheet currency mismatch effects can be detrimental on the downside, when the credit boom turns into a bust and there is liquidity shortage during the bust, which is almost always the case with few exceptions. Using firm-level data from six Latin American countries, they show that if currency crises are accompanied by banking crises, domestic exporters holding unhedged foreign currency debt decrease investment, while foreign exporters with better access to credit increase investment despite their unhedged foreign currency debt. There is no such effect if the crisis is a pure currency crisis.

3. NEW FACTS FROM A HYBRID APPROACH: SECTORS

In this section, we will undertake an exercise that is a hybrid between micro and macro approaches. This approach establishes a direct link between capital inflows into the banking sector and the leverage in the corporate sector. We will use the data from Avdjiev et al. (2018). Note that the previous literature cannot undertake such an exercise for a large set of countries over a long period since capital flows data by sector is very limited at the quarterly frequency. Avdjiev et al. (2018) build a new sector-level capital flow dataset that expands the existing datasets significantly in terms of country and time coverage. See Avdjiev et al. (2018) for details.

Domestic banks play an important role in channeling funds offered by foreign lenders into domestic nonbanks. Figure 3 presents an example of how domestic banks intermediate funds and how the balance sheets of the domestic bank and those of counterparties are adjusted. If foreign lenders grant loans to a domestic bank, the domestic bank’s external liabilities increase. If the domestic bank’s external assets do not change, its external leverage (defined as external liabilities to external assets ratio) increases, and this implies that its domestic assets should increase so that the balance sheet identity holds. The increase in the bank’s domestic assets means that the domestic bank grants loans to the domestic non-banking sector (non-financial firms and households), and in turn, the domestic non-banking sector’s debt increases.

First, we show empirical evidence that domestic banks’ external leverage has increased since 2000 in emerging market economies (EMEs). Figure 4 panel (b) shows that bank debt inflows are positively correlated with bank external leverage (that is external liabilities to assets ratio) in EMEs. This finding indicates that domestic banks’ external assets do not change much and hence their domestic assets should increase. As a result, the banking sector in EMEs mainly uses funds abroad in making loans to the domestic sector instead of acquiring assets held by the external sector. The same figure panel (a) shows that this is not the case in advanced economies (AEs).

Second, in EMEs, domestic banks grant more loans to the domestic non-banking sector when they have more external funds obtained abroad as shown in Figure 5 panel (b), and as before, this is not the case for AEs as shown in panel (a). This is a new and important finding which points towards a hidden financial stability risk: for emerging markets, capital flows

---

3Figure 8 in the appendix illustrates that rising external leverage in EMEs is driven by increasing external liabilities.
into the banking sector can substantially increase the domestic vulnerabilities. However, as shown in Figure 9 in the appendix, capital flows into the corporate sector do not increase the corporate sector’s external leverage, suggesting that corporates that borrow directly in international markets are special multinationals which also increase their external assets at the same time. These sector-level results are also consistent with the firm-bank-level results in di Giovanni et al. (2019).

Next, to further support our results, we show firm-level evidence on the effects of bank inflows on firm leverage. In Table 1, we regress firm-level leverage on sectoral inflows using ORBIS database that covers 43 countries. We run regressions for different country groups as follows:

\[
\text{Leverage}_{i,c,t} = \beta_1 \text{BankInflows}_{c,t} + \beta_2 \text{CorporateInflows}_{c,t} + \beta_3 \text{PublicInflows}_{c,t} + \gamma_i + \delta_c + \epsilon_{i,c,t}
\]

Leverage is measured as financial debt (loans and debt instruments) to total assets ratio for each firm \(i\) in a given country \(c\) and year \(t\); \(\gamma_i\) and \(\delta_c\) are firm and country fixed effects, respectively. It is noteworthy that financial-debt-to-assets ratio is usually considered to be a better measure of vulnerability of firms than other leverage measures.4

We find that the financial-debt-to-assets ratio is positively correlated with bank inflows in (i) EMEs, (ii) countries with high foreign currency (FX) debt share, and (iii) managed floats. These results suggest that domestic banks channel funds obtained abroad into domestic firms in these country groups and that these firms are more vulnerable to capital inflows as they build up leverage significantly via the domestic bank lending channel. The table shows that there is no significant positive effect of capital flows into the corporate sector and the government sector on firm leverage. If anything, more capital flows into the corporate sector decrease firm leverage in countries with free floats.

Finally, we investigate the currency decomposition of domestic banks’ liabilities and assets to assess the vulnerability of these banks’ balance sheets to exchange rate shocks. Given that domestic banks play a pivotal role in channeling funds between foreign lenders and the domestic non-banking sector, currency mismatch in these domestic intermediary balance sheets poses a great risk to the financial system of a country. In Figure 6, we calculate the share of foreign currency liabilities as the sum of the liabilities in foreign currency across countries divided by that of total liabilities. We also calculate the share of foreign currency assets in the same fashion. Foreign currency shares in both liabilities and assets have gradually declined over time, but they look fairly stable. In fact, from these figures, it does not seem that there is a currency mismatch issue for banks’ balance sheets in AEs and EMEs. It goes the other way around in that assets in foreign currency exceed liabilities in foreign currency.

Figure 7 panel (b) shows that a 1% increase in the appreciation rate is associated with a 0.84% increase in bank external leverage buildup (and similarly a depreciation will be associated with de-leveraging) across emerging market economies during the pre-crisis period 2000–2007. This cross-country correlation is significant with t-statistic -3.48. However, notice that causality can go the other way around in that more borrowing by

---

4For example, BIS includes debt securities and loans in its main credit indicator (core debt in total credit statistics) but excludes other liabilities such as pension, trade credit, or other accounts receivable/payable.
domestic banks from overseas leads to an appreciation of the domestic currency. We do not find the same pattern during the post-crisis period 2009–2014. Also, we do not find this pattern in advanced economies during pre- and post-crisis periods.

4. CONCLUSION
This paper surveys the literature on capital flows and leverage. We summarize results from the existing papers and document some new facts. The literature takes both a macro and a micro approach. The macro approach focuses on aggregate country-level data over time and in the cross-section and documents a positive correlation between total capital inflows, build-ups in terms of external and domestic debt, and financial crises associated with deleveraging. The micro approach uses granular data, focuses on leverage at the firm- and bank-level and associates this leverage with aggregate country-level capital inflows.

The key messages from these approaches are as follows. At the macro level, boom periods for countries that are associated with domestic credit growth, and hence leverage, are also associated with periods of capital inflows, especially for emerging markets. These occurrences end with financial crises most of the time. At the micro level, firm leverage is not as cyclical as bank leverage, where bank-level leverage moves in-tandem with global push factors, most notably the VIX index, which is a measure of global uncertainty and risk aversion. The connection between bank-level leverage and the cyclicality in this leverage as a function of VIX can be explained by the effect of VIX on capital inflows. When VIX is low, capital flows into the banking sectors of many countries, where bank-level leverage increases. There is important heterogeneity in bank-level leverage though, where not all banks increase their leverage when global liquidity conditions are easy (low VIX), but it is large banks and banks that fund themselves in the international markets, and they end up with higher leverage during such periods. Firm-level leverage is connected to bank-level leverage and capital flows via easy borrowing conditions.

We document some new facts from a hybrid approach that focuses on the relationship between sector-level capital inflows and sectoral leverage. We show that capital flows into the domestic banking sector of a given country are associated with increased leverage in the same country’s corporate sector. This result is strong for emerging markets but weaker for advanced countries.

The bottom line result from this survey is that countries’ own domestic banks are central to the relationship between capital flows and leverage. This is not to say global banks are not important. They are. This is simply because, in open economies that are financially integrated to the rest of the world, domestic banks fund themselves mostly through global banks using the interbank market. However, the realization of the importance of the domestic banking sector in the intermediation process of capital flows has a very important policy implication. Macro-prudential authorities that aim at financial stability should start with their own domestic banking sector in open economies.
DISCLOSURE STATEMENT

The authors are not aware of any affiliations, memberships, funding, or financial holdings that might be perceived as affecting the objectivity of this review.

ACKNOWLEDGMENTS

Şebnem Kalemli-Özcan and Jun Hee Kwak have no financial interest to disclose and want to thank their colleagues for useful comments.

LITERATURE CITED

Calvo GA, Leiderman L, Reinhart CM. 1996. Inflows of Capital to Developing Countries in the 1990s. J. Econ. Persp. 10(2):123–39


Figure 1: Total vs Private Average Debt Inflows (% GDP) and VIX. (a) Advanced Economies. (b) Emerging Market Economies. We calculate debt inflows to GDP ratios as the average over the country group in a given year. Figures constructed using data from Avdjiev et al. (2018).

Figure 2: VIX, US Monetary Policy and Turkish Firms’ Borrowing Costs. Figure adapted with permission from di Giovanni et al. (2019).
Figure 3: Balance Sheets and Capital Inflows

Figure 4: Bank Debt Inflows and Bank External Leverage in All Currencies. (a) Advanced Economies. (b) Emerging Market Economies. We calculate aggregate debt inflows into the bank sector in a given year as the sum of deflated debt inflows (billions 1996 USD) over the country group in a given year. We calculate external leverage of the bank sector in a given year as the sum of the bank sector’s external liabilities over the country group in a given year divided by the counterpart of external assets. Figures constructed using data from Avdjiev et al. (2018).
Figure 5: Inflows and Bank Credit to the Private Non-financial Sector to GDP ratio. (a) Advanced Economies. (b) Emerging Market Economies. We calculate aggregate debt inflows into the bank sector in a given year as the sum of deflated debt inflows (billions 1996 USD) over the country group in a given year. We use the average of bank credit to the private non-financial sector to GDP ratios over the country group in a given year as the measure of the private non-financial sector’s leverage. Figures constructed using data from Avdjiev et al. (2018) and BIS Credit Statistics.
Figure 6: Foreign Currency Share of Bank External Liabilities and Assets. (a) Advanced Economies. (b) Emerging Market Economies. (c) Advanced Economies Excluding the U.S. We calculate the share of foreign currency liabilities as the sum of the liabilities in foreign currency across countries divided by the sum of total liabilities across countries. The share of foreign currency assets is calculated in the same fashion. Figures constructed using data from BIS Locational Banking Statistics.
Figure 7: Bank External Leverage and Exchange Rate. (a) Advanced Economies (Precrisis). (b) Emerging Market Economies (Precrisis). (c) Advanced Economies (Postcrisis). (d) Emerging Market Economies (Postcrisis). The change in bank external leverage ratio is the difference between bank external-liabilities-to-assets ratio in 2007 and the one in 2000 for the pre-crisis period. The exchange rate is the price of the US dollar in local currency. The change in the log exchange rate is the difference between the log exchange rate in 2007 and the one in 2000. We use 2009–2014 changes for the post-crisis period. We drop country observations if a change in bank external leverage ratio is larger than 3 or smaller than -3 in a given country. Figures constructed using data from IMF International Financial Statistics and Avdjiev et al. (2018).
### Table 1: Firm Leverage Regression

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Financial Debt to Total Assets Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Advanced Economies</td>
</tr>
<tr>
<td></td>
<td>(1)</td>
</tr>
<tr>
<td>Bank Inflows/GDP(c,t)</td>
<td>0.02</td>
</tr>
<tr>
<td></td>
<td>(0.02)</td>
</tr>
<tr>
<td>Corporate Inflows/GDP(c,t)</td>
<td>-0.12</td>
</tr>
<tr>
<td></td>
<td>(0.07)</td>
</tr>
<tr>
<td>Public Inflows/GDP(c,t)</td>
<td>0.04</td>
</tr>
<tr>
<td></td>
<td>(0.04)</td>
</tr>
</tbody>
</table>

| Adjusted $R^2$       | 0.8685             | 0.7583                    | 0.7621       | 0.8829      | 0.7844        | 0.8600     |
| Number of Observations | 22,352            | 631,593                   | 605,705      | 17,078      | 611,365       | 4,163      |
| Number of Countries  | 22                 | 17                        | 15           | 15          | 23            | 6          |
| Country FE           | yes                | yes                       | yes          | yes         | yes           | yes        |
| Firm FE              | yes                | yes                       | yes          | yes         | yes           | yes        |

***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively. Firm-year two-way clustered standard errors are in parentheses. We run the following regression: $Leverage_{i,c,t} = \beta_1 BankInflows_{c,t} + \beta_2 CorporateInflows_{c,t} + \beta_3 PublicInflows_{c,t} + \gamma_i + \delta_c + \epsilon_{i,c,t}$, in which leverage is measured as financial debt (loans and debt instruments which is proxied by items “loans” and “longtermdebt”) to assets ratio or each firm $i$ in a given country $c$ and year $t$. Leverage is winsorized at 1st and 99th percentile. $\gamma_i$ and $\delta_c$ are firm and country fixed effects, respectively. We include country-specific aggregate sectoral debt inflows as explanatory variables. Country’s foreign currency (FX) debt share (obtained from Kalemli-Özcan et al. (2018)) is considered to be high if average FX debt share in the non-financial corporate sector of that country during the sample period is above the median among all countries and low otherwise. Using Ilzetzki et al. (2019)’s exchange regime classification, we classify a country as a managed float if the classification code is 2 or 3 and a free float if the code is 4, 5, or 6.

### Table 2: BIS Data List

<table>
<thead>
<tr>
<th>Measure (Stocks)</th>
<th>Counterparty Sector</th>
<th>Currency Type</th>
<th>Sample Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cross-border claims of reporting banks</td>
<td>All sectors</td>
<td>All currencies</td>
<td>1996-2014</td>
</tr>
<tr>
<td>All sectors</td>
<td></td>
<td>Foreign currency</td>
<td></td>
</tr>
<tr>
<td>Cross-border liabilities of reporting banks</td>
<td>All sectors</td>
<td>All currencies</td>
<td>1996-2014</td>
</tr>
<tr>
<td>All sectors</td>
<td></td>
<td>Foreign currency</td>
<td></td>
</tr>
</tbody>
</table>

18 Kalemli-Özcan and Kwak
Figure 8: Bank External Liabilities and Assets in All Currencies. (a) Advanced Economies. (b) Emerging Market Economies. We calculate external leverage of the bank sector in a given year as the sum of the bank sector’s external liabilities over the country group in a given year divided by the counterpart of external assets. Figures constructed using data from Avdjiev et al. (2018).

Figure 9: Corporate Debt Inflows and Corporate External Leverage in All Currencies. (a) Advanced Economies. (b) Emerging Market Economies. We calculate aggregate debt inflows into the corporate sector in a given year as the sum of deflated debt inflows (billions 1996 USD) over the country group in a given year. We calculate external leverage of the corporate sector in a given year as the sum of the corporate sector’s external liabilities over the country group in a given year divided by the counterpart of external assets. Figures constructed using data from Avdjiev et al. (2018).
DATA APPENDIX

This section describes the construction of aggregate time-series data. We use the dataset constructed by Avdjiev et al. (2018) (henceforth, AHKS) to obtain external assets and liabilities and external debt inflows, in which all measures break down into sectors (banks, corporates, and public sector), and the public sector consists of the government and the central bank. The counterparty sector and the currency type do not break down in AHKS. AHKS mainly follow the 6th Edition Balance of Payments Manual (BPM6) in constructing data. According to the BPM6, all liabilities and assets are measured at market values when it is possible. However, if it is not possible, nominal values are used. We use the sample period of 1996–2014 mainly due to data availability of the AHKS dataset. We collect all available data across countries and follow the AHKS country classification for choosing advanced and emerging market economies.

In Figure 4, 5, 7, 8, and 9, we plot sectoral inflows, external assets and liabilities, and associated leverage (assets to liabilities ratio) measures, using AHKS database. To obtain aggregate debt inflows into each sector, first, we deflate debt inflows (billions USD) using the US consumer price index in 1996. Second, we calculate aggregate debt inflows into each sector in a given year as the sum of deflated debt inflows (billions 1996 USD) over the country group in a given year. To obtain aggregate external leverage by sector, we use external assets and liabilities. External positions are converted into US dollars by AHKS. We calculate external leverage of each sector in a given year as the sum of each sector’s external liabilities over the country group in a given year divided by the sum of each sector’s external assets over the country group in a given year.

In Figure 5, we use the average of bank credit to the private non-financial sector to GDP ratios over the country group in a given year as the measure of the private non-financial sector’s leverage. Bank credit to GDP ratios are obtained from BIS credit statistics. Bank credit includes credit extended by domestic banks to the private non-financial sector. The financial instruments covered comprise currency and deposits (which are mostly zero in the case of credit to the private non-financial sector), loans, and debt securities. The statistics follow the framework of the System of National Accounts 2008, which mandates that outstanding credit instruments be valued at market values when market prices are observable.

In Figure 6, we measure the foreign currency share of domestic banks’ external liabilities and assets, using BIS locational banking statistics (LBS). We calculate the share of foreign currency liabilities as the sum of the liabilities in foreign currency across countries divided by the sum of total liabilities across countries. The share of foreign currency assets is calculated in the same fashion.

We illustrate how to download banks’ stock measures of assets and liabilities from BIS LBS. Liabilities and assets include all balance sheet positions. Liabilities include interbank loans received, deposits from banks or nonbanks, and holdings of securities. Assets also include interbank deposits, loans, and advances to banks or nonbanks, and holdings of securities. We download data in the item called “A5, Location of reporting banks,” which provides positions of reporting banks located in each country. Table 2 shows the list of downloaded data. By the reporting conventions, claims are market values, while liabilities are nominal values in most cases.