Global Banks' Leverage, Gross Capital Flows, and Current Account Imbalances

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Abstract: This paper develops a tractable multi-country model of the international banking system where global banks interact with local banks. In the model, consistent with the data, when the leverage of global banks goes up, countries experience both higher gross capital inflows and outflows, and global imbalances increase. I show that the net external position of a country against global banks —its assets on global banks minus its liabilities towards global banks— plays a key role in explaining its macroeconomic response to a change in global financial conditions. The main predictions of the model are borne out in a large panel of advanced and emerging market economies. In particular, countries with higher net external liabilities against global banks tend to experience a larger drop in investment and a larger improvement in their current account balance following a deleveraging by global banks.

Keywords: Global Banks' Leverage, Capital Flows, Current Account, Investment

JEL Codes: F32, F33, F34, E44, C23

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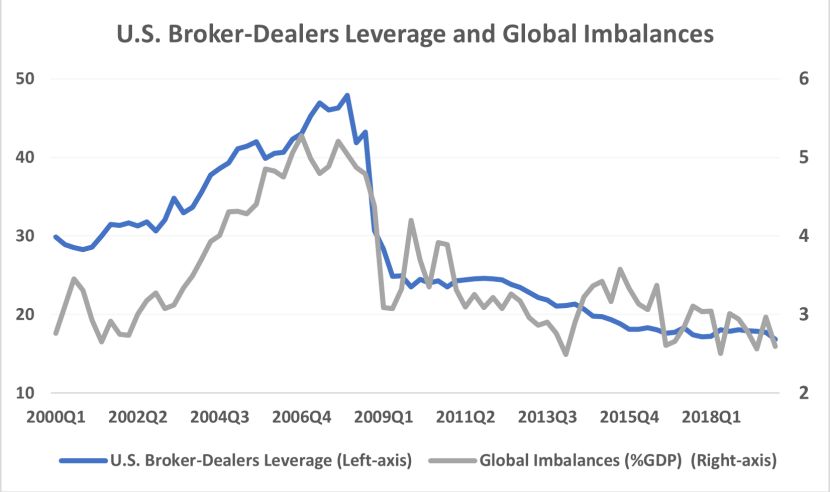
1 Introduction

Global banks are central to the international financial architecture. Over the past 20 years, they have on average intermediated approximately $25 trillion of cross-border capital flows annually (about 45% of global GDP), playing a key role in facilitating international risk sharing (Gabaix and Maggiori (2015), Miranda-Agrippino and Rey (2020)). At the same time, they propagate shocks across borders. Since the global financial crisis, there has been a renewed attention on the global factors that drive financial conditions worldwide. Rey (2013) has shown that there is a strong global co-movement in asset prices, gross capital flows, credit and risk premia, a phenomenon coined the global financial cycle (GFC). There is evidence that this global financial cycle is closely tied to a global leverage cycle, and in particular to the leverage of U.S. broker dealers (Bruno and Shin (2015), Cerutti et al. (2017), Cesa-Bianchi et al. (2018)).

While it has been extensively documented that the global financial cycle systematically drives risky asset prices and gross capital flows[1], its differentiated impact across countries, and in particular on net capital flows, i.e. the current account balance, is little explored. Figure 1 shows that the leverage of global financial intermediaries is highly correlated with global imbalances—defined as the sum of the absolute value of current account balances across countries, normalized by world nominal GDP. This suggests that changes in the leverage of global financial intermediaries may have implications not only for gross flows, but also for net flows. In this paper, I analyze systematic changes in the current account, i.e. net flows, across countries in response to changes in the leverage of global financial intermediaries. To my knowledge, I am the first to explore this impact, and its decomposition between savings and investment, across all countries, without distinguishing between advanced and emerging market economies.

[1] Cerutti et al. (2019) provide a more nuanced view on the importance of the global financial cycle in driving gross capital flows.

Figure 1 Global Banks' Leverage and Global Imbalances



Note. This chart shows the U.S. Broker-Dealer sector leverage (left axis) and global imbalances (right axis) over the period 2000Q1-2019Q4. The U.S. Broker-Dealer sector leverage is computed as assets over equity. Global imbalances are computed as the quarterly sum of the absolute value of current account balances across countries, normalized by world nominal GDP. Source: Flows of Funds, IMF BOP, author's calculations.

The objective of this paper is to shed light on the role of the international banking system and the factors explaining the different macroeconomic sensitivities across countries to a change in global financial conditions. More specifically, I intend to answer the following questions. First, why do countries differ in their macroeconomic response to a change in global financial conditions? In particular, I study the empirical response of the current account, i.e. net flows, and its decomposition between savings and investment, to a change in the leverage of global financial intermediaries. I complement this analysis by also looking at the response of risky asset prices, the real exchange rate and real GDP growth. Second, what role plays the global banking structure in explaining those differences? I show, theoretically and empirically, that heterogeneity in the exposure to global financial intermediaries, measured as a country's net external positions against global banks, both across countries and over time, is key to explaining different macroeconomic sensitivities to changes in global financial conditions.

This paper makes two contributions. The first contribution is to develop a simple multi-country model of the international banking system where global banks, defined as internationally active banks that lend to foreign entities through cross-border loans, interact with local banks. The model features a multi-country economy comprised of global banks located heterogeneously across countries and, in each country, a continuum of local banks that have uncertain bank-specific project returns. The key ingredient of the model is that there is both cross-country and within-country heterogeneity regarding the returns on local projects. Additionally, local banks interact with global banks by borrowing and lending on the wholesale inter-bank market. The double heterogeneity explains a few empirical facts. In particular, it generates a positive co-movement in gross inflows and outflows, and leads to differences in net external positions across countries. Moreover, it generates differences in the size of external positions across countries that are not only explained by fundamentals—namely a country's average productivity in the model— but also by the heterogeneous presence of global banks across countries. The model generates sharp testable predictions about the direction and size of gross and net capital flows. Put differently, in this model, changes in the leverage of global banks, i.e. in global financial conditions, not only have implications for gross flows, but also for net flows and global imbalances.

The second contribution of the paper is empirical. I test the predictions of the model in the data. The first prediction of the model is that an increase in the leverage of global financial intermediaries leads to relatively higher net inflows, i.e. a higher deterioration of the current account balance, in countries which have higher net external liabilities against global banks. Conversely, countries which have higher net external assets on global banks will experience relatively higher net outflows, i.e a higher improvement of the current account balance, following an increase in the leverage of global financial intermediaries. Put differently, an increase in the leverage of global banks magnifies global imbalances. This prediction leads to a distinction between countries which differs from the traditional distinc-

tion between advanced and emerging market countries. For example, Germany, Switzerland, Bolivia, Peru and Israel are net creditors on global banks, while France, Spain, Lithuania, Turkey and Brazil are net debtor against global banks. The model predicts that the latter group will experience a higher deterioration of their current account balance after an increase in the leverage of global banks. The second prediction of the model is that this differentiated effect on the current account across countries comes from a differentiated impact on investment, not on savings. In a panel study of 43 advanced and emerging market countries, I find that the interaction of global banks' leverage with the country's position against global banks—defined as its assets on global banks minus its liabilities towards global banks, and obtained from the BIS Locational Banking Statistics— is statistically and economically significant in explaining the behavior of the current account across countries and across time in the way predicted by the model. The results are robust to controlling for numerous factors, including the distinction between advanced and emerging market countries. The results are also robust to considering separately the periods before and after the global financial crisis.

To summarize the results, I find both theoretically and empirically that a country's net foreign position against global banks is a determinant of its current account response to a change in global financial conditions. A country with higher net external liabilities against global banks tends to experience a larger improvement in its current account balance following a deleveraging by global banks. This differentiated impact on the current account is explained by the response of investment, not savings. To be specific, a country with higher net external liabilities against global banks tends to experience a larger drop in investment following a deleveraging by global banks. Moreover, a country with higher net external liabilities against global banks tends to experience lower real GDP growth and lower risky asset prices, and a larger depreciation of its real effective exchange rate, following a deleveraging by global banks. Although these facts on output, asset prices and exchange rates are not predictions of the model as it stands, they could be predicted by extensions of the model.

Lastly, I show that the mechanism described in my model can rationalize the observed increase in global imbalances which preceded the global financial crisis, as well as the reversal in global imbalances which followed the crisis.

Literature. This paper is related to multiple strands of the literature. First, this paper is related to the growing empirical literature on the global financial cycle, following the seminal work of Rey (2013). This literature argues that that there is a strong global co-movement in asset prices, gross capital flows, credit and risk premia, a phenomenon coined the global financial cycle (GFC). There is evidence that this global financial cycle is closely tied to a global leverage cycle, and in particular to the leverage of U.S. broker dealers (Bruno and Shin (2015), Cerutti et al. (2017), Cesa-Bianchi et al. (2018)).

My paper also relates to a specific strand of this literature which focuses on the positive correlation between gross capital inflows and outflows (Forbes and Warnock (2012), Broner et al. (2013)). Avdjiev et al. (2017) emphasize that the positive co-movement of total capital inflows and outflows is driven by inflows and outflows vis-a-vis the domestic banking sector. They find that in response to an adverse change in global financial conditions, inflows to domestic banks decline, while domestic banks invest less abroad, decreasing their outflows. While this correlation is extensively documented from an empirical perspective, few models are able to explain this high correlation between gross capital inflows and outflows. Caballero and Simsek (2020) provide a model with fickle local banks and liquidity risk which can explain the positive correlation between banking inflows and outflows, but do not look at the impact of sudden stops on the current account. The model in my paper contributes to the literature by providing a rationale for positively correlated gross inflows and outflows. Additionally, the model has implications not only for gross flows but also for net flows.

Second, this paper also relates to the literature on the relevant role of global banks in the transmission of international shocks. Following the seminal work of Gertler and

Kiyotaki (2010), there has been considerable progress in developing macroeconomic models which include a leveraged banking sector subject to financial frictions. In this class of models, aggregate shocks transmit internationally to periphery countries through global financial intermediaries' net worth. Cao et al. (2021) study the impact of the openness to multinational banks on the depth and duration of recessions. Cetorelli and Goldberg (2012a) and Cetorelli and Goldberg (2012b) conjecture that global banks manage liquidity on a global scale, actively using cross-border internal funding in response to local shocks. Morelli et al. (2022) study the role of global financial intermediaries in international lending. Similar to Bruno and Shin (2015), I develop a model where global wholesale banks interact with local retail banks. Compared to their paper, my analysis provides a rationale for two-way capital flows and a differentiated macroeconomic impact across countries, and in particular on net flows, of a change in global banks' leverage.

Third, this paper also relates to the literature on the determinants of the current account and global imbalances (Milesi-Ferretti and Tille (2014)). Aguiar and Gopinath (2007) find that emerging market business cycles exhibit counter-cyclical current accounts. While business cycles, fiscal and monetary policies, and other structural characteristics (e.g. demographics, productivity), are well documented determinants of the current account, I find that global financial conditions also matter. In the model, a relaxation of the constraint on global banks leads to higher gross flows, but also to higher global imbalances: countries which were initially net debtor vis-a-vis global banks experience a deterioration of their current account balance, while countries which were initially net creditors vis-a-vis global banks experience an improvement of their current account balance. Put differently, an increase in the leverage of global banks magnifies global imbalances, while a decrease in the leverage of global banks reduces global imbalances. This result is reminiscent of Kraay and Ventura (2000) who study the current account response to transitory income shocks and find that favorable shocks lead to deficits in external debtor countries and surpluses in external creditor countries.

Finally, this paper is closely related to the nascent theoretical literature on the global financial cycle. Akinci et al. (2022) find that an increase in U.S. uncertainty leads to global deleveraging pressures, a decrease in global asset prices, and an appreciation of the dollar. Their model has implications for net flows and asset prices, but not for gross flows. While their model focuses on two economies, advanced and emerging market economies, I build a multi-country framework which allows to distinguish different countries within each group of economies. Davis and van Wincoop (2021) develop a theory to account for changes in prices of risky and safe assets and gross and net capital flows over the global financial cycle (GFC). Their model is a portfolio model with heterogeneity in return and risk aversion, but without financial intermediaries such as global banks. Similar to their paper, and in order to keep my model analytically tractable with both within and cross-country heterogeneity, I simplify in the time dimension by using a two-period model. While they consider frictionless trade in equity and safe bonds by households across borders, I explicitly model financial institutions, in the form of local and global banks, and the constraints under which they operate. My paper relates to this recent literature by providing a theoretical framework to understand the propagation of global financial conditions through banks in an multi-country economy.

The rest of the paper is organized as follows. In section 2, I present some stylized facts related to capital flows and the global banking system. In section 3, I develop a multi-country model of the international banking system with both local and global banks, and derive some key predictions to be tested against the data. Section 4 presents my empirical analysis and confirms that the main predictions of the model are borne out in the data, and section 5 concludes.

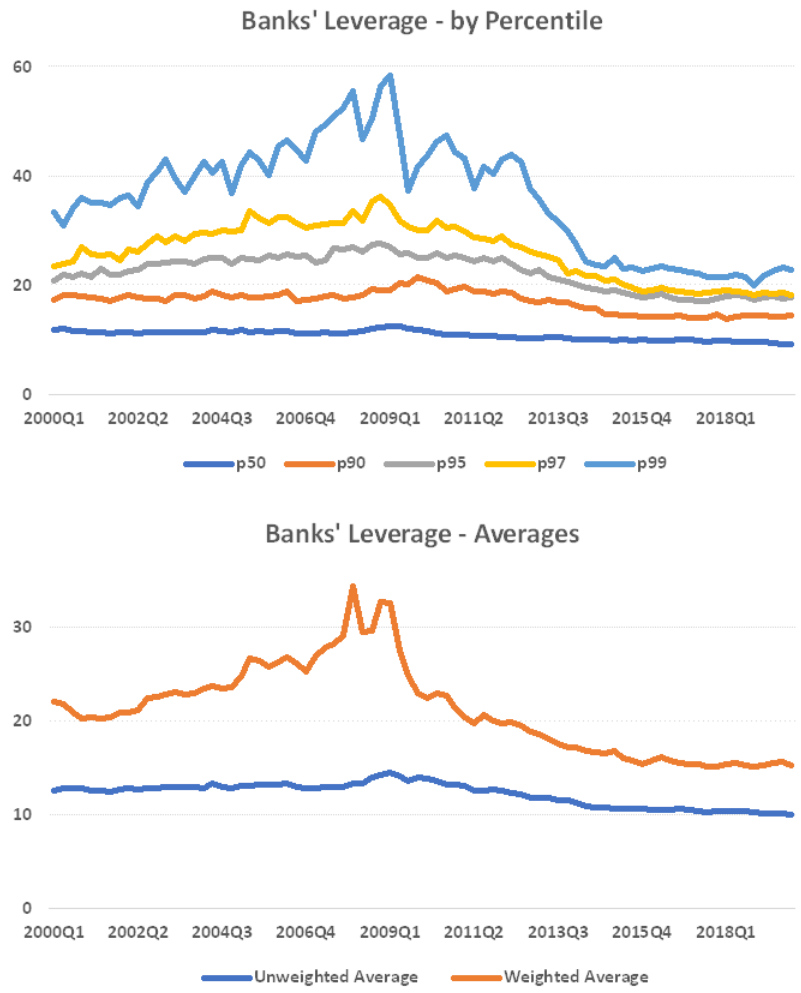
2 Stylized Facts

This section presents some stylized facts related to the global banking system that are used to guide the assumptions made in the theoretical model.

Stylized Fact 1:. The leverage of financial intermediaries displays large heterogeneity. The leverage of bigger financial intermediaries is not only higher but also more volatile than the leverage of other financial intermediaries.

Figure 2 shows the evolution of leverage over time for a large panel of 365 financial intermediaries located in 27 countries. Quarterly data are obtained from Compustat - Capital IQ and Bloomberg to compute quarterly leverage at the intermediary level. Leverage is defined as the ratio of assets over book equity, defined as common equity. More details regarding the source and construction of the data is provided in Appendix C.2. The upper panel shows the evolution of all banks' leverage for different percentiles of leverage. The lower panel shows the evolution of the average leverage—both simple and weighted by asset size—over time. As can be seen from Figure 2, the leverage of financial intermediaries displays large heterogeneity. Table 1 provides summary statistics. The weighted average of banks' leverage is both higher and more volatile than the unweighted average of their leverage. This suggests that large financial intermediaries in terms of asset size tend to be have a higher and more volatile leverage ratio than smaller financial intermediaries. Those findings are in line with the evidence in Coimbra and Rey (2017).

Figure 2 Time Series of All Banks' Leverage by Leverage Percentiles



Note. The upper panel shows the evolution of a panel of 365 banks' leverage by leverage percentile. The lower panel shows the time series of unweighted and weighted averages of leverage across all 365 banks in the sample. Source: Capital IQ and Bloomberg.

Table 1 Leverage - Summary Statistics by Percentile - All Banks

Variable	Obs	Mean	Std. Dev.	Min	Max
p50	80	10.93	0.85	9.28	12.54
p90	80	17.22	1.94	13.92	21.66
p95	80	22.49	3.21	17.12	27.64
p97	80	26.30	5.21	18.15	36.23
p99	80	36.13	10.25	20.11	58.52
Unweighted Average	80	12.22	1.25	9.99	14.45
Weighted Average	80	21.17	4.83	15.11	34.40

Note. This Table shows summary statistics for all banks' leverage by percentile. It also shows summary statistics of unweighted and asset-weighted averages of leverage across all banks in the sample. Source: Capital IQ and Bloomberg.

This fact motivates the focus on the leverage of large global banks. In order to compute a measure of the leverage of global banks, I only keep large institutions with assets worth more than 500 billions USD on average over 2000Q1-2019Q4. This sub-sample contains 27 financial intermediaries located in 11 countries. The median and weighted average of global banks' leverage are shown in Figure 3. The list of global banks is provided in Table 2. The global banks located in the U.S., the U.K., Japan, Germany, and France (which I denote as Top 5 countries) account for 16 banks, i.e. 60% of this sample, and for 75% of global banks' average assets[2].

Stylized Fact 2. Large global banks are located in a small number of advanced countries. The global banks located in the U.S., the U.K., Japan, Germany, and France (denoted as Top 5 countries) account for 60% of global banks, and for 75% of global banks' average assets.

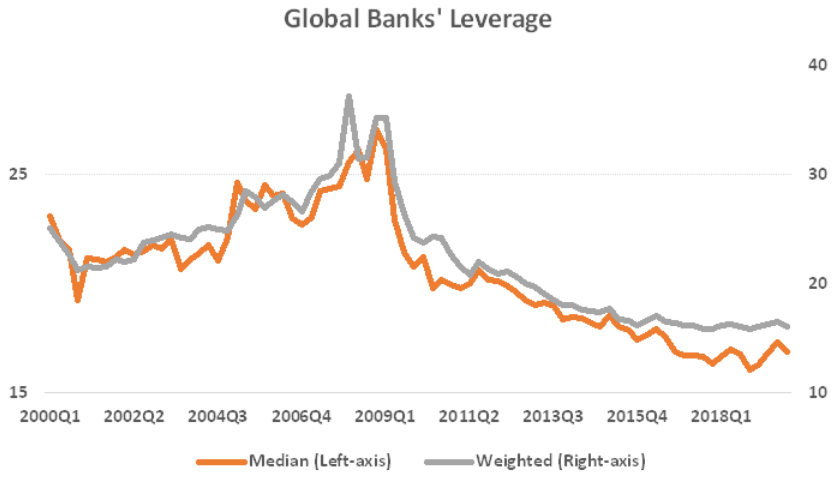
[2]Using data from Aldasoro et al. (2022), I find that 42 out of 96 headquarters of global bank holdings of BIS reporting banks are located in 5 countries (United States, United Kingdom, Japan, France, and Germany). A similar pattern holds when looking at global systemically important banks instead of BIS reporting banks. The list of G-SIBs is provided in Appendix D.

Table 2 Global Banks

Ticker	Bank Name	Country	% Assets
NABZY	NATIONAL AUSTRALIA BK	AUS	2%
BNS	BANK OF NOVA SCOTIA	CAN	2%
RY	ROYAL BANK OF CANADA	CAN	2%
TD	TORONTO DOMINION BANK	CAN	2%
CSW	CREDIT SUISSE	CHE	3%
UBS	UBS	CHE	4%
CNK	COMMERZBANK	DEU	2%
DB	DEUTSCHE BANK AG	DEU	6%
SAN	BANCO SANTANDER SA	ESP	4%
BBVA	BBVA	ESP	2%
NDA	NORDEA	FIN	2%
BNPQY	BNP PARIBAS	FRA	7%
SCGLY	SOCIETE GENERALE GROUP	FRA	4%
BCS	BARCLAYS PLC	GBR	5%
HSBC	HSBC HLDGS PLC	GBR	6%
LYG	LLOYDS BANKING GROUP PLC	GBR	3%
NWG	NATWEST GROUP PLC	GBR	5%
ISP	INTESA SANPAOLO	ITA	2%
UNI	UNICREDIT	ITA	3%
MUFG	MITSUBISHI FG	JPN	7%
SMFG	SUMITOMO MITSUI FINANCIAL GR	JPN	4%
BAC	BANK OF AMERICA CORP	USA	5%
CITI	CITIGROUP	USA	5%
GS	GOLDMAN SACHS	USA	2%
JPM	JPMORGAN CHASE & CO	USA	6%
MS	MORGAN STANLEY	USA	2%
WFC	WELLS FARGO & CO	USA	3%

Note. This Table shows the list of 27 global banks, the location of their headquarters, as well as their share in global banks' total assets over the period 2000Q1-2019Q4. Source: Capital IQ and Bloomberg.

Figure 3 Time Series of All Banks' Leverage by Leverage Percentiles



Note. The chart shows the evolution of median and weighted average of global banks' leverage over time. Source: Capital IQ and Bloomberg.

Using the Locational Banking Statistics database from the BIS, I find that BIS reporting banks–essentially internationally active global banks according to Bruno and Shin (2015)–interact mainly with the banking sector in counter-party countries, and through loans and deposits. This evidence is reported in Table 3 and holds both for their asset and liabilities. On average during the period from 2000Q1 to 2019Q4, 64% of BIS reporting banks liabilities were towards other banks, and 88% of BIS reporting banks liabilities were in the form of loans and deposits. This motivates the focus on the interaction between global and the domestic banking sector through loans and deposits in my model.

Stylized Fact 3. Global banks interact mainly with domestic banks, through loans and deposits.

Finally, I document that the top 5 countries have on average over the 2000-2020 period larger gross external positions (blue box plots), but smaller net external positions (red box

Table 3 BIS Reporting Banks Cross-border Positions

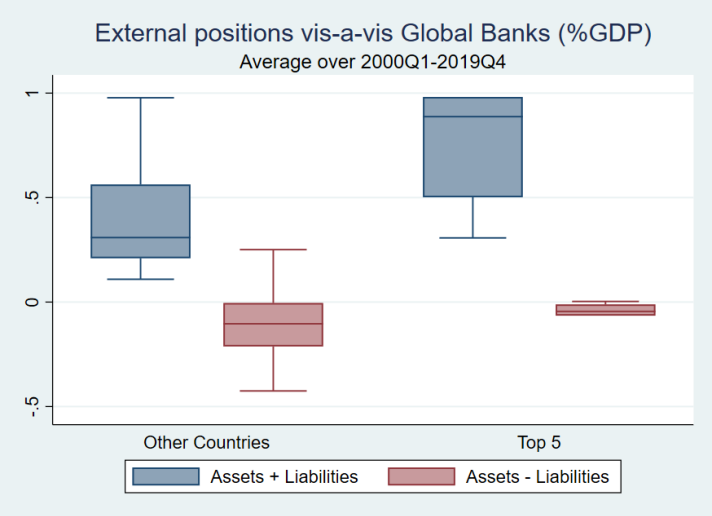
Sector	% Total	Instruments	% Total
Total claims - All sectors	100%	Total claims - All instruments	100%
Total claims - Banks, total	60%	Total claims - Loans and deposits	72%
Total claims - Non-banks, total	39%	Total claims - Debt securities	21%
Total claims - Unallocated by sector	1%	Total claims - Other instruments	7%
Total liabilities - All sectors	100%	Total liabilities - All instruments	100%
Total liabilities - Banks, total	64%	Total liabilities - Loans and deposits	88%
Total liabilities - Non-banks, total	29%	Total liabilities - Debt securities	8%
Total liabilities - Unallocated by sector	7%	Total liabilities - Other instruments	4%

Note. The table provides the decomposition of total claims and liabilities of all BIS reporting banks by counter-party sector and by instrument. The numbers correspond to the average over the period from 2000 to 2020. Source: BIS LBS.

plots) vis-a-vis global banks, than other countries. Put differently, a large share of the international borrowing in the top 5 countries is used to finance international, as opposed to local, lending. This suggests that global banks have a better ability to intermediate capital across countries by borrowing from and lending to other banks abroad. Moreover, there is a large distribution of net external positions vis-a-vis global banks in other countries (red box plot on the right). Some countries are on average net creditors against global banks, while other countries are on average net debtor towards global banks. This distinction between countries differs from the traditional distinction between advanced and emerging market countries. For example, Switzerland, Belgium, Bolivia, Peru and Israel are net creditors on global banks, while Spain, Austria, Lithuania, Turkey and Brazil are net debtor against global banks. See Table 14 in Appendix for more details.

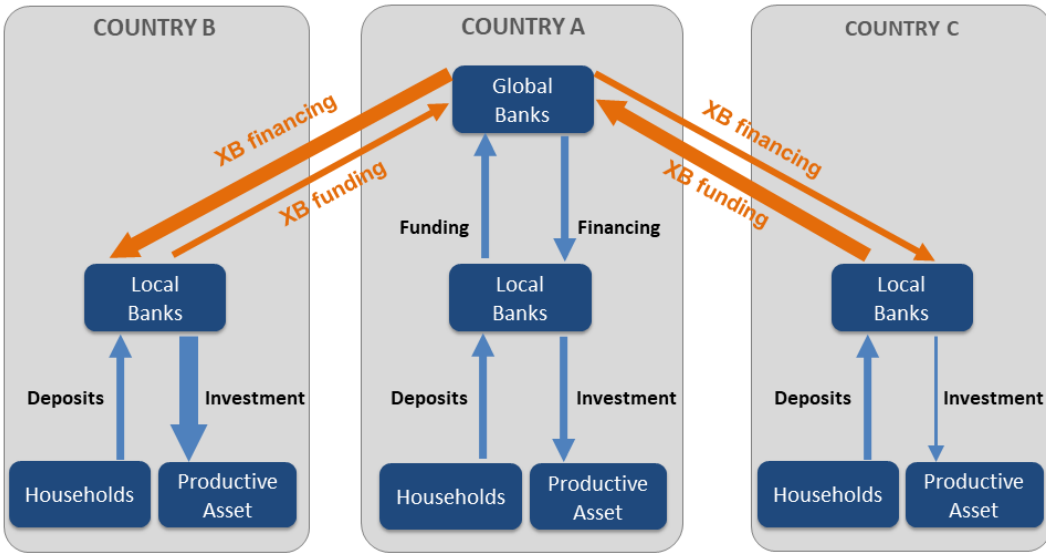
Stylized Fact 4. The top 5 countries have on average over the 2000-2020 period larger gross external positions, but smaller net external positions vis a vis global banks, than other countries. Moreover, there is a large distribution of net external positions vis-a-vis global banks in other countries.

Figure 4 External Positions vis a vis Global Banks



Note. The charts shows the cross-sectional distribution of the average external positions over 2000-2020 for the top 5 countries (right) and the remaining countries (left). It reports the distribution for both the total positions (blue), and net assets (red). Source: BIS LBS, author's calculations.

Figure 5 Model - Simplified Overview



Note. This chart provides a simplified schematic representation of the model for the case where $N = 3$, $s^A = 1$, and $R^C < R^A < R^B$. The red arrows denote cross-border (XB) transactions and the blue arrows denote local transactions. Global banks intermediate funds across countries. In this simplified example, country B is a net recipient of funds while country C is a net exporter of funds.

3 A Multi-Country Model with Global and Local Banks

In this section, I develop a multi-country model of the international banking system where global banks interact with local banks. The model features global banks located heterogeneously across countries, and, in each country, a continuum of local banks that have uncertain bank-specific project returns. The key ingredient of the model is that there is both cross-country and within-country heterogeneity regarding the returns on local projects. Additionally, local banks interact with global banks on the wholesale interbank market, but do not interact with each other. The double heterogeneity associated with this institutional feature of the international banking system rationalizes stylized facts of the data presented in the previous sections.

Set-up. Consider a single-good, two-period ($t = 1, 2$) economy. The world economy consists of a large number $N \geq 3$ of countries indexed by superscript i. There are three type of agents: households, local banks, and global banks. In each country, there is a representative household who faces an inter-temporal consumption-savings decision, and a unit continuum of local banks indexed by superscript j. Each local bank raises deposits from their domestic household on the local retail market, has access to a stochastic bank-specific project, and can participate to the global wholesale market. There is also a unit continuum of global banks indexed by superscript g, and located across countries, which perform wholesale banking operations allowing them to reallocate assets among local banks, subject to a leverage constraint. We denote by s^i the share of global banks which is headquartered in country i, with $\sum_{i=1}^{N} s^i = 1$. The distribution of global banks across countries is exogenous. A simplified schematic of the model economy is sketched in Figure 5. The following sections provide more details regarding the timelime and each agent.

Timeline. In this two-period economy, the sequence of events is the following:

1. Period 1:

   (a) At the beginning of period 1, local banks compete to raise deposits from their domestic household in the retail market.

   (b) At the end of period 1, after the retail market closes, the stochastic bank-specific returns are revealed and global banks reallocate capital across local banks worldwide, by borrowing and lending on the wholesale funding market, subject to a leverage constraint.

2. Period 2: The projects are financed and output is consumed by banks and households.

The economic interpretation of this sequence of events in period 1 is that deposits are considered as long-term, and more sticky, while investment opportunities are more volatile.

This characterization of global and local banks follows Gertler et al. (2016) who distinguish between the subset of financial intermediaries, usually investment banks, that is highly leveraged, often with short-term debt and relies heavily on borrowing from other financial institutions in wholesale markets, and banks borrowing from households in retail markets. In my model, global banks are defined as highly leveraged internationally active banks that lend to foreign entities through cross-border loans. The local banks, i.e. the retail banking sector, in turn, includes financial institutions that rely mainly on household saving for external funding and are either net lender or borrower of short-term funds vis-a-vis global wholesale banks[3].

[3]In my model, I assume that projects are bank-specific and financed by local banks. Thus, global banks lend to local banks in order to finance projects. Shen (2021) finds that local (resp. global) banks have a comparative advantage in extracting information on local (resp. global) risk, and this double information asymmetry creates a segmented credit market.

3.1 Households

In each country i, there is a representative household. Households are born with a wealth endowment W^i in period 1, optimally consume and save through local bank deposits d^i at the gross competitive deposit rate R^i_H. Households in country i maximize:

$$\max_{d^i} U^i = u(c^i_1) + \beta^i \, \mathbb{E}[c^i_2] \tag{1}$$

Their budget constraints in period 1 and 2 are given by:

$$c^i_1 + d^i = W^i \tag{2}$$

$$c^j_2 = R^i_H d^i \tag{3}$$

3.2 Productive Assets

Local banks have access to a bank-specific project[4] with gross return $R^{i,j}$, which can be decomposed between a stochastic country-specific component R^i and a stochastic bank-specific component ϵ^j. The project of local bank j located in country i produces output according to the following technology:

$$y^{i,j} = \left(\underbrace{R^i + \epsilon^j}_{\equiv R^{i,j}} \right) k^{i,j} \tag{4}$$

where $R^i \sim \mathcal{U}_{[\underline{R};\overline{R}]}$ is a stochastic country-specific productivity parameter uniformly distributed on the interval $[\underline{R};\overline{R}]$, $\epsilon^j \sim \mathcal{U}_{[-\sigma;\sigma]}$ is a bank-specific stochastic productivity shock uniformly distributed on the interval $[-\sigma, \sigma]$, and $k^{i,j}$ is the amount of capital invested by

[4] An alternative interpretation of the model is that local banks are located on a continuum of islands and, given their supply of available funds, can only make friction-less (equity-like) loans to non-financial firms located on the same island (Gertler and Kiyotaki (2010)).

bank j located in country i in its project. R^i and ϵ^j are independent random variables, and we denote $R \equiv \mathbb{E}[R^i]$. These assumptions regarding the distribution of country-specific and bank-specific shocks do not affect the essence of the results. We denote by $G(x)$ the global cumulative distribution function of projects' returns at the end of period 1, and by $F_i(x)$ the cumulative distribution function of projects' returns at the end of period 1 in country i.

3.3 Local Banks

Within each country i, there is a unit continuum of local banks indexed by superscript j. Local banks are endowed with an initial equity endowment $E^{i,j}$, and have access to a bank-specific project with gross return $R^{i,j}$. At the beginning of period 1, local banks are active on the retail market, through which they can raise deposits $d^{i,j}$ at the competitive rate R^i_H from households. At the end of period 1, local banks are active on the interbank wholesale market, through which they can borrow $d^{i,j}_M$ at the competitive rate R^d_M or lend $l^{i,j}_M$ at the competitive rate R^l_M. Local banks borrow from or lend to global banks, but not directly to each other[5].

Retail operations. At the beginning of period 1, before uncertainty is resolved, local banks compete to raise deposits $d^{i,j}$ from their home representative household. Local banks set their demand for deposits $d^{i,j}$ in order to maximize their expected profits $\mathbb{E}[\pi^{i,j}]$ in period 2:

[5]This assumption can be micro-founded by introducing an agency problem between borrowers and lenders. More specifically, we can assume that after global and local banks obtains funds on the wholesale market, they can respectively divert a fraction θ^G and θ^L of the borrowed funds and default on their debt. The creditors may re-claim the remaining fraction of funds. Because creditors recognize banks' incentive to divert funds, they will restrict the amount they lend. In this way a borrowing constraint may arise. I implicitly consider the corner case where $\theta^G = 0$ and $\theta^L = 1$, but the main results would hold as long as $\theta^G < \theta^L$, i.e. as long as global banks have a lower incentive to divert funds than local banks (e.g. due to higher reputation, or tighter regulatory constraints). See for example Gertler et al. (2016). This institutional feature of the international banking system is also consistent with Cetorelli and Goldberg (2012a) and Cetorelli and Goldberg (2012b) who conjecture that global banks manage liquidity on a global scale, actively using cross-border internal funding in response to local shocks.

$$\max_{d^{i,j}} \ \mathbb{E}[\pi^{i,j}] \tag{5}$$

Interbank operations. At the end of period 1, after the stochastic returns are revealed, local banks can lend an amount $l_M^{i,j}$ to or borrow an amount $d_M^{i,j}$ from global banks on the global wholesale market. Local banks can invest up to $\bar{k}$ units of capital in their project, which pays off in period 2. Local banks maximize their period-2 profits:

$$\max_{d_M^{i,j}\geq 0, l_M^{i,j}\geq 0} \pi^{i,j} = \left(\underbrace{R^i + \epsilon^j}_{\equiv R^{i,j}} \right) k^{i,j} + R_M^l l_M^{i,j} - R_H^i d^{i,j} - R_M^d d_M^{i,j} \tag{6}$$

Local banks are subject to a balance sheet identity:

$$k^{i,j} + l_M^{i,j} = E^{i,j} + d^{i,j} + d_M^{i,j} \tag{7}$$

and to a technological constraint:

$$k^{i,j} \leq \bar{k} \tag{8}$$

This technological constraint, which puts a limit on the availability of projects for local banks, is made to prevent a corner solution where, given the linear technology specification in (4), only the bank with the highest realization of the shocks receives market funding from all other banks. Figure 6 represents the balance sheet of a local bank.

3.4 Global Banks

Global banks are endowed with initial equity E^g and have the ability to lend an amount l_M^g to or borrow an amount d_M^g from local banks, located either at home or abroad, on the global wholesale market through their broker-dealer entities. At the end of period 1, after returns'

Figure 6 Balance sheet of local bank j located in country i

Assets	Liabilities
$k^{i,j}$	$E^{i,j}$
$l_M^{i,j}$	$d^{i,j}$
	$d_M^{i,j}$

uncertainty is resolved, global banks can reallocate capital across local banks, subject to a leverage constraint. To summarize, global banks perform wholesale banking operations, through which they reallocate assets globally among local banks, from the least efficient to the most efficient banks. Global banks maximize their period-2 profits:

$$\max_{l_M^g \geq 0, d_M^g \geq 0} \pi^g = R_M^d l_M^g - R_M^l d_M^g \tag{9}$$

Global banks are subject to a balance sheet identity:

$$l_M^g = E^g + d_M^g \tag{10}$$

and a to leverage constraint:

$$d_M^g \leq \bar{\lambda} \tag{11}$$

The leverage constraint, which sets a limit on the size of global banks' balance sheet will play a key role in the model. In particular, a tight leverage constraint (i.e. a low $\bar{\lambda}$) limits the ability of global banks to borrow funds on the wholesale market, and thus prevents them from reallocating capital from local banks associated with a low return project to the ones associated with a high return project. Figure 7 represents the balance sheet of a global bank.

Figure 7 Balance sheet of global bank g

Assets	Liabilities
l_M^g	E^g
	d_M^g

3.5 Equilibrium

Definition. In the competitive equilibrium: (i) Global banks set their levels of l_M^g and d_M^g so as to maximize their profits subject to their balance sheet and leverage constraints, taking the interbank rates as given; (ii) Local banks raise deposits $d^{i,j}$, and set their levels of $l_M^{i,j}$ and $d_M^{i,j}$ contingent on the realization of their productivity parameter, so as to maximize their expected profits subject to their balance sheet and technological constraints, taking the interbank rates and the bank deposit rate as given; (iii) Households set their level of d^i so as to maximize their utility, taking the bank deposit rate as given; and (iv) the lending and borrowing interbank rates, R_M^l and R_M^d, and the bank deposit interest rates, R_H^i, clear the global wholesale market and the local retail markets for household deposits in all countries. We derive the equilibrium by starting with the equilibrium on the wholesale market at the end of period 1, and then the equilibrium on the retail markets at the beginning of period 1. It will be useful to make the following assumption.

Assumption 1 *Households and all local banks receive the same initial endowment across and within countries, i.e.* $W^i = \bar{W}\ \forall i$ *and* $E^{i,j} = \bar{E}_L\ \forall i, j$. *Moreover, we assume that all global banks receive the same initial endowment, i.e.* $E^g = \bar{E}_G\ \forall g$.

Remark 1 *Given Assumption 1, the deposits collected from households by local banks are equalized across all local banks, i.e.* $d^{i,j} = d^i = \bar{d}\ \forall i, j$.

Proof. In Appendix B.1. ■

The reason for introducing such assumption is that it reduces the heterogeneity of local banks to their asset side, while their liabilities, both their internal equity and the deposits collected from households, are similar across all local banks after the retail market closes. This assumption simplifies the model and it does not affect the essence of the results.

3.5.1 Equilibrium in the inter-bank wholesale market

At the end of period 1, after uncertainty is resolved, local banks set $d_M^{i,j}$ and $l_M^{i,j}$ in order to maximize their profits in period 2. As shown in Appendix B.2, the optimization problem of local banks leads to corner solutions. We can distinguish 3 cases regarding the decisions of local banks, depending on the realization of $R^{i,j}$: banks with high returns borrow on the wholesale market and invest until their technological constraint binds, banks with intermediate returns are inactive on the wholesale market, i.e. invest their deposits in their own project, and banks with low returns lend all their funds on the wholesale market. We have:

$$\begin{cases} d_M^{i,j} = \bar{k} - E^{i,j} - d^{i,j} \text{ and } l_M^{i,j} = 0 & \text{if } R^{i,j} \geq R_M^d \\ d_M^{i,j} = 0 \text{ and } l_M^{i,j} = 0 & \text{if } R_M^d \geq R^{i,j} \geq R_M^l \\ d_M^{i,j} = 0 \text{ and } l_M^{i,j} = E^{i,j} + d^{i,j} & \text{if } R^{i,j} \leq R_M^l \end{cases} \tag{12}$$

Note that there is a wedge between the lending R_M^l and borrowing R_M^d rates on the inter-bank market if the leverage constraint of global banks is binding (i.e. if $d_m^g = \bar{\lambda}\ \forall g$). Thus, global banks realize a profit from intermediating funds on the inter-bank market. If the constraint of global banks is not binding then there is no wedge between the lending and borrowing rates, and the economy efficiently allocates funds worldwide.

Equilibrium. At the end of period 1, the supply of funds on the inter-bank market comes both from the internal liabilities of global banks–their equity–and their external liabilities–

the funds borrowed by their broker-dealer entities on the inter-bank wholesale market from local banks. In particular, local banks will supply funds on the inter-bank market if the inter-bank lending rate is higher than the return on their project. The supply of funds by local bank j in country i is given by:

$$l_M^{i,j} = \begin{cases} E^{i,j} + d^{i,j} & \text{if } R^{i,j} \leq R_M^l \\ 0 & \text{otherwise} \end{cases} \tag{13}$$

The demand of funds on the inter-bank market comes from the local banks which borrow funds from global banks to finance local projects. In particular, local banks will demand funds on the inter-bank wholesale market if the inter-bank borrowing rate is lower than the return on their project. The demand of funds by local bank j in country i is given by:

$$d_M^{i,j} = \begin{cases} \bar{k} - E^{i,j} - d^{i,j} & \text{if } R^{i,j} \geq R_M^d \\ 0 & \text{otherwise} \end{cases} \tag{14}$$

In equilibrium, the global supply of funds should be equal to the global demand for funds on the inter-bank market. The equilibrium condition is:

$$\underbrace{\underbrace{\int_g E^g}_{\text{Global banks' internal equity}} + \underbrace{\sum_{i=1}^{N} \int_j \left(E^{i,j} + d^{i,j}\right) \mathbb{I}(R^{i,j} \leq R_M^l)}_{\text{Local banks' lending}}}_{\text{Global banks' lending}} = \underbrace{\sum_{i=1}^{N} \int_j \left(\bar{k} - E^{i,j} - d^{i,j}\right) \mathbb{I}(R^{i,j} \geq R_M^d)}_{\text{Local banks' borrowing}} \tag{15}$$

where $\mathbb{I}(R^{i,j} \leq R_M^l)$ is an indicator function equal to 1 if $R^{i,j} \leq R_M^l$ and 0 otherwise. Similarly, $\mathbb{I}(R^{i,j} \geq R_M^d)$ is an indicator function equal to 1 if $R^{i,j} \geq R_M^d$ and 0 otherwise. The two terms on the left-hand side represent the liabilities of global banks, both their internal liabilities–their equity–and their external liabilities–the funds borrowed from local banks. A

change in their leverage constraint changes their ability to take on external liabilities. In equilibrium, the sum of those liabilities is equal to global banks' lending, which is itself equal to local banks' borrowing.

Lemma 3.1 *If $\bar{\lambda} < \lambda^*$, then the inter-bank lending rate R_M^l is given by:*

$$R_M^l = G^{-1}\left(\frac{\bar{\lambda}}{N\left(\bar{E}_L + \bar{d}\right)}\right) \tag{16}$$

and is increasing in $\bar{\lambda}$. Moreover, the inter-bank borrowing rate R_M^d is given by:

$$R_M^d = G^{-1}\left(1 - \frac{\bar{\lambda} + \bar{E}_G}{N\left(\bar{k} - \bar{E}_L - \bar{d}\right)}\right) \tag{17}$$

and is decreasing in $\bar{\lambda}$.

If $\bar{\lambda} \geq \lambda^*$, then the inter-bank lending rate R_M^l and borrowing rate R_M^d are equalized:

$$R_M^l = R_M^d \tag{18}$$

where $\lambda^* = \frac{1 + \frac{\bar{E}_G}{N(\bar{k} - \bar{E}_L - \bar{d})}}{\frac{1}{N(\bar{E}_L + \bar{d})} + \frac{1}{N(\bar{k} - \bar{E}_L - \bar{d})}}$.

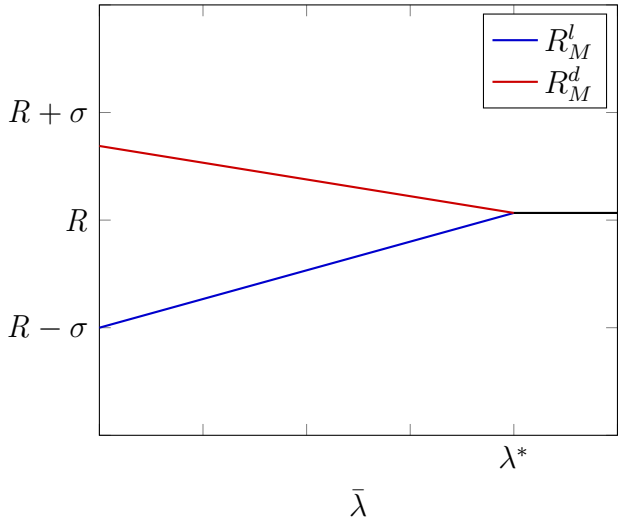
Proof. In Appendix B.1. ■

The inter-bank lending rate R_M^l at which local banks can lend their funds on the wholesale market is increasing in the leverage of global banks $\bar{\lambda}$, and is decreasing in the quantity of funds supplied. Intuitively, as global banks can increase their leverage, their demand for funds increases, which drives the lending rate up. Conversely, the interbank borrowing rate R_M^d at which local banks can borrow funds on the wholesale market (or, the borrowing rate at which local project can get funding from global banks) is decreasing in the leverage of global banks $\bar{\lambda}$, and is increasing in the quantity of funds demanded. Intuitively, as global banks can increase their leverage, their supply of funds increases, which drives the borrowing

rate down. The two rates are equalized, i.e. there is no spread on the interbank market (or between the rate at which global banks can raise funding on the wholesale market and the rate at which they lend to local project), when the leverage constraint of global banks does not bind anymore, i.e. when $\bar{\lambda} \geq \lambda^*$. In the remainder of this paper, we consider the case where the leverage of global banks is binding, i.e. $\bar{\lambda} < \lambda^*$.

Figure 8 represents the inter-bank interest rates as a function of global banks' leverage, in the special case where there is no country-specific productivity shock, i.e. $R^i = R \; \forall i$.

Figure 8 Inter-bank Borrowing and Lending Rates



Note This figure shows the inter-bank borrowing (red line) and lending (blue line) rates as a function of global banks' leverage, in partial equilibrium, in the special case where $R^i = R \; \forall i$. The value λ^* denotes the leverage level such that the constraint of global banks does not bind.

To summarize, in the inter-bank wholesale market, local banks with a low-return project $R^{i,j} \leq R_M^l$ will lend a quantity $E^{i,j} + d^{i,j}$ to global banks, local banks with a high-return project $R^{i,j} \geq R_M^d$ will borrow a quantity $\bar{k} - E^{i,j} - d^{i,j}$ from global banks, and local banks with intermediate-return projects will be inactive on the wholesale market. Each global bank will borrow $\bar{\lambda}$ from local banks and lend $\bar{E}_G + \bar{\lambda}$ to local banks, such that equation (15) holds. The inter-bank lending and borrowing rates are given by equations (16) and (17). An

increase in the leverage of global banks $\bar{\lambda}$, i.e. a relaxation of their constraint, leads to an increase in their demand for funds on the wholesale lending market, which drives the lending rate up, and to an increase in their supply of funds on the wholesale borrowing market, which drives the borrowing rate down. This reduction in the spread on the wholesale market is associated with a reduction in the number of inactive local banks: some local banks which were initially inactive will lend on the wholesale market following the relaxation on global banks' constraint, and some other local banks will obtain funding from global banks.

3.5.2 Equilibrium in the retail markets for local deposits

At the beginning of period 1, before uncertainty is resolved, local banks compete to raise deposits $d^{i,j}$ from their home representative household. The supply of deposits d^i is given by households' first-order condition:

$$u'(W^i - d^i) = \beta^i R_H^i \tag{19}$$

Assuming $u(.) = \ln(.)$, we have:

$$d^i = W^i - \frac{1}{\beta^i R_H^i} \tag{20}$$

The supply of deposits is increasing in R_H^i.

Local banks set their demand for deposits $d^{i,j}$ in order to maximize their expected profits in period 2. Using equations (6) and (12), their expected profits are given by:

$$\begin{aligned}\mathbb{E}[\pi^{i,j}] = R_M^l \left(E^{i,j} + d^{i,j}\right) G(R_M^l) + \mathbb{E}\left[R^{i,j} | R_M^l \leq R^{i,j} \leq R_M^d\right] \left(E^{i,j} + d^{i,j}\right) \left[G(R_M^d) - G(R_M^l)\right] \\ + \left[\mathbb{E}\left[R^{i,j} | R_M^d \leq R^{i,j}\right] \bar{k} - R_M^d \left(\bar{k} - E^{i,j} - d^{i,j}\right)\right] \left[1 - G(R_M^d)\right] - R_H^i d^{i,j}\end{aligned} \tag{21}$$

In order to derive local banks' demand for deposits, it will be useful to introduce the following lemma.

Lemma 3.2 *If $\bar{\lambda} < \lambda^*$ then the deposit rate for households in any country i is strictly higher than the lending rate on the inter-bank market: $R_H^i > R_M^l$.*

Corollary 1 *If $\bar{\lambda} < \lambda^*$ then no local bank will raise deposits $d^{i,j}$ such that $d^{i,j} > \bar{k} - E^{i,j}$.*

Proof. In Appendix B.1. ■

As shown in Corollary 1, local banks do not want to accumulate funds in excess of $\bar{k}$. Thus, local banks face a natural limit on $d^{i,j}$ given by:

$$d^{i,j} \leq \bar{k} - E^{i,j} \tag{22}$$

Also, note that $d^{i,j}$ cannot take negative values:

$$d^{i,j} \geq 0 \tag{23}$$

Local banks maximize their expected profits in (21) subject to the constraints in (22) and (23). As we are interested in the consequences of a change in the leverage of global banks, we will make the following assumptions to ensure that some local banks will be active on the wholesale market at the end of period 1.

Assumption 2 *The following conditions on the exogenous parameters hold:*

$$0 \leq W^i - \frac{1}{\beta^i(\underline{R} - \sigma)} \tag{24}$$

$$W^i - \frac{1}{\beta^i(\overline{R} + \sigma)} \leq \bar{k} - E^{i,j} \tag{25}$$

As shown in Appendix B.3, these conditions ensures that in equilibrium local banks do not raise enough deposits such that their technological constraint is binding. Intuitively, the first condition ensures that even if local banks were certain to obtain the lowest possible return on their project, they would still raise non-negative deposits from households. The second condition ensures that even if local banks were certain to obtain the highest return on their project, this would not be able to raise sufficient deposits from households so as to make their technological constraint to bind. Local banks' demand for deposits is given by:

$$\mathbf{R^e} \equiv R^l_M G(R^l_M) + \mathbb{E}\left[R^{i,j} | R^l_M \leq R^{i,j} \leq R^d_M\right]\left[G(R^d_M) - G(R^l_M)\right] + R^d_M\left[1 - G(R^d_M)\right] = R^i_H \tag{26}$$

Local banks make no profits in expectation, so they are indifferent over all values of $0 \leq d^{i,j} \leq \bar{k} - E^{i,j}$. If $R^i_H < \mathbf{R^e}$, then local banks want to raise as much deposits as possible, subject to their constraint. Assumption 2 ensures that in equilibrium $R^i_H = \mathbf{R^e}$. The left hand side represents the expected marginal value of the deposit for the local bank, and it is equal to its marginal cost. The expected marginal value is increasing in the inter-bank lending rate and in the inter-bank borrowing rate. However, as shown in Lemma 3.1 an increase in the leverage of global banks has opposite effects on the inter-bank lending and borrowing rates. An increase in the leverage of global banks increases the inter-bank lending rate, and thus raises the expected marginal value of deposits. On the opposite, an increase in the leverage of global banks decreases the inter-bank borrowing rate, and thus lowers the expected marginal value of deposits. Thus, the impact of a higher leverage of global banks on the equilibrium deposit rate is ambiguous. We establish the following lemma:

Lemma 3.3 *There exists* $\underline{k}$ *such that* $\forall \bar{k} > \underline{k}$ *we have* $\frac{d\mathbf{R^e}}{d\lambda} > 0$.

Proof. In Appendix B.1. ■

Intuitively, the inter-bank borrowing rate is less sensitive to the leverage of global banks as the limit on the technological constraint increases. This is because with a higher limit on the technological constraint, only a small fraction of local banks with a high-return project will be borrowing. In the limit as $\bar{k} \to \infty$ only the local bank with the highest project return will borrow on the inter-bank market. Lemma 3.3 states that there is a threshold $\underline{k}$ above which the impact of a higher leverage of global banks has more effect on the lending rate than on the borrowing rate, and unambiguously leads to an increase in $\mathbf{R^e}$ and in the equilibrium deposit rate and amount of deposits.

Equilibrium. In a symmetric equilibrium, the deposits raised by every local bank, both within and across countries, are equalized. As noted in Remark 1, we have: $d^{i,j} = d^i = \bar{d}\ \forall i, j$. Using this equality, the demand for deposits (26) and the supply of deposits (19), and the equilibrium inter-bank lending and borrowing rates, the equilibrium domestic bank deposits $\bar{d}^*$ solves the fixed-point problem:

$$\bar{d}^* = W^i - \frac{1}{\beta^i \mathbf{R^e}(\bar{d}^*)} \tag{27}$$

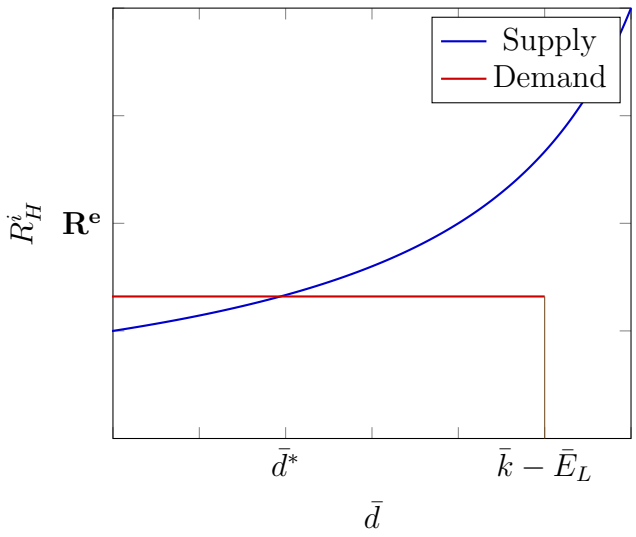
Figure 9 represents the equilibrium on the retail market for local deposits.

As seen from equation (26) the deposit rate for households R^i_H is higher than the lending rate on the inter-bank market R^l_M. Thus, local banks might default. For simplicity, I assume that local banks are well capitalized and do not raise sufficient deposits to be in the default region. The introduction of costly default in this model is left for future research.

3.6 Country Aggregates

Capital Flows. We turn to the analysis of capital flows. The main derivations are reported to Appendix B.4. In order to obtain a unique closed-form solution for countries' capital

Figure 9 Equilibrium on the Retail Market for Local Deposits



Note This figure shows the equilibrium on the retail market for local deposits. The supply of deposits is given by equation (19), and the demand for deposits is given by equation (26).

inflows and outflows we will make the following assumption.

Assumption 3 *The lending by any local bank to global banks is equally distributed across all global banks, whether those global banks are headquartered in the same country as the local bank or not. Similarly, the borrowing by any local bank from global banks is equally distributed across all global banks, whether those global banks are headquartered in the same country as the local bank or not.*

At the margin global banks are indifferent between borrowing from a local bank located in the same country or abroad. The former does not generate a cross-border capital flow while the latter does. Thus, I need to make this assumption to uniquely pin-down cross-border flows.

Special case. In a first step, and in order to clarify the exposition, I first present a special case where there is no country-specific heterogeneity in the productivity parameter, i.e.

$R^i = R \ \forall i$. Note that in this specific case, the global and local cumulative distribution function of projects' returns at the end of period 1 in country i are the same. The capital outflows of country i are given by:

$$O^i = \left(1 - s^i\right) \frac{\bar{\lambda}}{N} + s^i \left(\frac{N-1}{N}\right) \left(\bar{E}_G + \bar{\lambda}\right) \tag{28}$$

The first term corresponds to the money lent by local banks of country i to global banks headquartered outside of country i. Note that if all global banks are headquartered in country i, i.e. if $s^i = 1$, then this first term is equal to zero as local banks do not lend funds to banks located outside of the country. The second term corresponds to the money lent by global banks headquartered in country i to local banks located outside of country i. Similarly, the capital inflows of country i are given by:

$$I^i = \left(1 - s^i\right) \frac{\bar{E}_G + \bar{\lambda}}{N} + s^i \left(\frac{N-1}{N}\right) \bar{\lambda} \tag{29}$$

The first term corresponds to the money borrowed by local banks of country i from global banks located outside of country i. The second term corresponds to the money borrowed by global banks headquartered in country i from local banks not located in country i.

As can be seen from equation (28) and (29), a country's capital inflows and outflows are both increasing in global banks' leverage $\bar{\lambda}$. This feature of the model is in line with the global financial cycle hypothesis (Rey (2013)). Moreover, capital flows are both increasing in the share of global banks headquartered in the country s^i as long as the number of countries is large enough[6].

[6]More formally, $\frac{dL^i}{ds^i} >$ if and only if $N > 2 + \frac{\bar{E}_G}{\bar{\lambda}}$. Because global banks are highly leveraged, I assume that their debt liabilities are larger than their equity, $\bar{\lambda} > \bar{E}_G$. Thus, the condition simplifies to $N \geq 3$.

The net capital outflows of country i, are given by:

$$N^i \equiv O^i - I^i = \bar{E}_G \left[s^i - \frac{1}{N} \right] \tag{30}$$

Note that countries which host more global banks tend to have higher capital outflows because they can use their own internal equity to lend to local banks located in other countries. In this special case without country-specific heterogeneity in the productivity parameter across countries, the net capital flows of all countries are equal to zero if either $\bar{E}_G = 0$ or $s^i = \frac{1}{N}$ $\forall i$. Put differently, there are no global imbalances if either global banks have no internal capital or are equally distributed across countries. Moreover, in this special case, the leverage of global banks has no effect on net capital flows.

General case. Building on the above analysis, we turn to the general case, where there is country-specific heterogeneity in the productivity parameter R^i. As shown in Appendix B.4, the capital outflows of country i are given by:

$$O^i = \left(1 - s^i\right) \frac{\bar{\lambda}}{N} \frac{F_i(R_M^l)}{G(R_M^l)} + s^i \left(\bar{E}_G + \bar{\lambda}\right) \left[\frac{N\left(1 - G(R_M^d)\right) - \left(1 - F_i(R_M^d)\right)}{N\left(1 - G(R_M^d)\right)} \right] \tag{31}$$

As before, the first term corresponds to the money lent by local banks of country i to global banks headquartered outside of country i, and the second term corresponds to the money lent by global banks headquartered in country i to local banks located outside of country i. Note that if $F_i(R_M^d) = G(R_M^d)$ and $F_i(R_M^l) = G(R_M^l)$ then we are back to the special case. Moreover, both $F_i(R_M^d)$ and $F_i(R_M^l)$ are decreasing in R^i. Thus, capital outflows are decreasing with R^i, i.e. with the realization of the country-specific productivity shock. Intuitively, if a country has a higher country-specific productivity shock then it will invest less abroad. In particular, local banks will provide less funding to the global wholesale

market, and domestic global banks will lend less to foreign local banks. Similarly, the capital inflows of country i are given by:

$$I^i = \left(1 - s^i\right) \frac{\bar{E}_G + \bar{\lambda}}{N} \frac{1 - F_i(R_M^d)}{1 - G(R_M^d)} + s^i \bar{\lambda} \left[\frac{NG(R_M^l) - F_i(R_M^l)}{NG(R_M^l)} \right] \tag{32}$$

The first term corresponds to the money borrowed by local banks of country i from global banks headquartered outside of country i. The second term corresponds to the money borrowed by global banks headquartered in country i from local banks located abroad. Capital inflows are increasing with R^i, i.e. with the realization of the country-specific productivity shock. Intuitively, if a country has a higher country-specific productivity shock then it will attract more investment. In particular, local banks will borrow more funding from the wholesale market, and domestic global banks borrow more funds from foreign local banks.

As derived in the Appendix, a country's gross capital flows are both increasing in global banks' leverage $\bar{\lambda}$ and in the share of global banks headquartered in the country s^i.

Proposition 1 *The net capital outflows of country i, are given by:*

$$N^i \equiv O^i - I^i = \frac{\bar{\lambda}}{N} \left[\underbrace{\frac{F_i(R_M^l)}{G(R_M^l)} - \frac{1 - F_i(R_M^d)}{1 - G(R_M^d)}}_{\equiv \xi^i} \right] + \frac{\bar{E}_G}{N} \left[s^i N - \frac{1 - F_i(R_M^d)}{1 - G(R_M^d)} \right] \tag{33}$$

The change in net capital outflows, i.e. the current account balance, in response to a change in global banks' leverage depends on the net external position vis-a-vis global banks.

The proposition states that the sign and the magnitude of a change in net outflows N^i, i.e. the current account balance, in response to a change in global banks' leverage $\bar{\lambda}$ depends on the sign of the net external position vis-a-vis global banks ξ^i. The variable ξ^i

depends on the relative distribution of projects' returns in a given country (both the lower and upper tail) compared to projects' returns worldwide. Net external assets vis-a-vis global banks are decreasing with R^i, i.e. with the realization of the country-specific productivity shock. Intuitively, if a country has a higher country-specific productivity shock then it will invest less abroad and it will attract more investment. In particular, local banks will provide less net funding to (or obtain more net borrowing from) the global wholesale market and domestic global banks provide less net funding to (or obtain more net borrowing from) foreign local banks. Countries with a positive value of ξ^i are thus net creditor vis-a-vis global banks, and can be thought as low-productivity, capital abundant countries, while countries with a negative value of ξ^i are net debtor vis-a-vis global banks, and can be thought as high-productivity, capital scarce countries[7].

A natural extension of this result is to decompose the current account between saving and investment. It is a well-know identity in international macroeconomics that the current account of a country is equal to the difference between its savings and investment. Thus, any change in the current account should be reflected by a change in savings and/or investment. In the model, following an increase in global banks' leverage, investment is increasing in aggregate, and more in countries which are net debtor against global banks, while savings are increasing in aggregate without distinction across countries. Put differently, the heterogeneous impact on the current account across countries is entirely driven by heterogeneous responses of investment across countries.

Proposition 2 *The differentiated response of the current account in response to a change in global banks' leverage is driven by investment, not by savings.*

Proof. In Appendix B.1. ■

[7]The focus of this paper is on private, as opposed to public, capital flows. In my model, consistent with the empirical evidence in Gourinchas and Jeanne (2013), countries with faster productivity growth attract more foreign private capital.

Intuitively, this proposition follows from two facts. First, the fact that all local banks have a similar structure on their liabilities side after raising deposits in the beginning of period 1, because they face the same constraints and the same expected return on their project. Second, the fact that they have heterogeneous realized returns, and thus that they will have different optimal composition on the asset side of their balance sheet.

3.7 Comments

In the model, both within and across country heterogeneity are needed to explain the pattern of gross and net capital flows. Indeed, within-country heterogeneity in local projects' returns will lead to both gross banking inflows and outflows as global banks channel funds across countries from banks associated with the least productive projects to the ones associated with the most productive projects. Additionally, cross-country heterogeneity in the country-specific return R^i will lead to net external banking positions at the country level, where the high-return, capital-scarce, countries will have net external banking liabilities, and the low-return, capital-abundant, countries will have net external banking assets. Moreover, the distribution of global banks across countries helps explain why some countries have higher external gross assets and liabilities, In the model, countries which host more global banks' headquarters have both higher external banking assets and liabilities.

In order to make the model tractable with both within and cross-country heterogeneity, I assume that uncertainty about returns is resolved at the end of period 1. Thus, the model allows me to analyze changes in the leverage of global banks, but not to study cycles where the leverage goes up and down over time. Moreover, the leverage of global banks, which is a measure their risk-capacity (Gabaix and Maggiori (2015)), is considered as exogenous in the model and I do not explicitly analyze their its underlying determinants such as monetary policy or risk-aversion shocks (Akinci et al. (2022), Coimbra and Rey (2017)).

4 Empirical Analysis

The closed-form solutions given by the model provide some testable predictions. In particular, the two main predictions to be tested in the data are the following:

1. The response of the current account to global banks' leverage depends on the country's net external position against global banks.

2. This differentiated response of the current account is driven by investment, not savings.

To test those predictions, I compile a database of cross-border borrowing and lending by internationally active banks using the Locational Banking Statistics (LBS) from the Bank for International Settlements (BIS). I supplement the database with data on GDP, current account balances, equity prices, and real exchange rates from multiple sources. The main results in this empirical section are obtained using dynamic panel regressions. I also complement those results with some cross-sectional evidence during the global financial crisis.

4.1 Sample and Variables

My sample consists of a quarterly panel of 43 advanced and emerging market economies[8], for the period from 2000Q1 to 2019Q4. The list of countries is provided in Appendix C.1. All countries have a large foreign bank penetration, as measured by the number of foreign banks and by the share of domestic banking assets held by foreign-owned local institutions documented by Claessens et al. (2008). Following the literature (e.g. Bruno and Shin (2015), Cesa-Bianchi et al. (2018), Cerutti et al. (2017)), I use the U.S. Broker-Dealers' leverage as

[8]List of countries: United States, Austria, Denmark, France, Germany, Italy, Norway, Sweden, Canada, Japan, Finland, Greece, Portugal, Spain, Turkey, Australia, New Zealand, South Africa, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, Uruguay, Israel, India, Korea, Rep. of, Philippines, Thailand, Armenia, Rep. of, Russian Federation, China, P.R.: Mainland, Czech Rep., Slovak Rep., Latvia, Hungary, Lithuania, Slovenia, Rep. of, Poland, and Rep. of, Romania.

a proxy for global banks' leverage[9]. As shown in Appendix, results are robust to using the different measures of the leverage of global banks computed in Section 2. Leverage is defined as the ratio of assets to equity of the U.S. broker dealer sector and is obtained from the Federal Reserve's Flow of Funds[10]. I also include the VIX and the world real GDP growth rate, which are factors that also affect capital flows according to the global financial cycle literature, as control variables in my baseline regressions. I use BIS Locational Banking Statistics (LBS) to measure the net cross-border positions vis-a-vis global banks. The LBS collects data from internationally active banks which report both their claims on and liabilities towards different countries. As argued by Bruno and Shin (2015), global banks account for most of these international exposures reported by internationally active banks. The key organisational criteria of the BIS locational statistics data are the country of residence of the reporting banks and their counter-parties as well as the recording of all positions on a gross basis, including those vis-a-vis own affiliates. This makes the LBS appropriate for measuring the role of global banks in the intermediation of international capital flows and lending flows. In my empirical analysis, I define a country's net position vis-a-vis global banks as the difference between the liabilities of BIS reporting banks against

[9]Bank leverage has been used in the literature to proxy for financial intermediaries' funding conditions (higher leverage indicating greater ease of funding) and risk attitudes (higher leverage indicating risk-on attitudes). As such, the literature interprets US broker–dealer leverage as a proxy for wider financial conditions, and papers (e.g. Bruno and Shin (2015) and Cerutti et al. (2017)) have found a relationship between broker–dealers' leverage and cross-border bank flows. As for the leverage of the global banks, the empirical counterpart should ideally be measured as the leverage of the broker dealer subsidiaries of the global banks that facilitate cross-border lending. However, the reported balance sheet data for European banks are consolidated numbers at the holding company level that includes the much larger commercial banking unit, rather than the wholesale investment banking subsidiary alone. For the reasons discussed in Adrian and Shin (2010), broker dealers and commercial banks differ in important ways in their balance sheet management. The broker dealer sector much more closely mirrors the wholesale funding operations of the global banks. For this reason, I use instead the leverage of the US broker dealer sector from the Flow of Funds series published by the Federal Reserve as our empirical proxy for global bank leverage. I may expect to capture the main forces at work to the extent that US broker dealers are influenced by the same forces as the broker dealer subsidiaries of the European global banks.

[10]As the leverage of US Broker-Dealers is endogenous to the US business cycle, I conduct robustness checks excluding the U.S. from the sample. The results (available upon request) are robust to removing the U.S. from the sample.

all counter-party sectors located in this country minus the assets of BIS reporting banks on all counter-party sectors located in this country. To be clear, a negative value means that a given counter-party country has net liabilities towards global banks, while a positive value means that a given counter-party country has net assets on global banks. As a robustness check, I use the net position of the local bank counter-party sector vis-a-vis global banks. The results are robust to using the position of the local bank counter-party sector vis-a-vis global banks. All variables are normalized by the counter-party country's GDP.

I use data on the current account to GDP ratio from the International Monetary Fund (IMF). I also construct an alternative measure of net flows by taking the difference between total gross outflows and total gross inflows in a given quarter[11], normalized by the country's GDP. Investment, defined as gross fixed capital formation, is obtained from the IMF IFS database. Savings are computed as the sum of the current account and investment, using the equality that the current account is equal to the difference between savings and investment ($CA = S - I$). I supplement those data with real effective exchange rate, real GDP growth, and real equity prices from different sources (IMF, BIS, Global Financial Database). More details on the sources and variables construction are provided in Appendix C.2. Table 13 in Appendix provides some summary statistics of the variables used in the empirical analysis.

4.2 Panel Regressions

In this section, I analyze the impact of the global banks' leverage on the current account, and focus on the role of a country's net position vis-a-vis global banks in driving the result. The specification follows the closed-form solutions obtained in the theoretical section. More

[11] I construct total gross inflows as the sum of FDI gross inflows, portfolio gross inflows, and other investment gross inflows. I construct total gross outflows as the sum of FDI gross outflows, portfolio gross outflows, other investment gross outflows, and reserves outflows. All variables are obtained from the IMF BOP database.

specifically, I estimate the following regressions:

$$Y_{i,t} = c_i + \beta_0^i t + \beta_1 L_t + \beta_2 L_t * P_{i,t-1} + \beta_3 P_{i,t-1} + \alpha_1 \mathbb{X}_t + \beta_4 Y_{i,t-1} + \epsilon_{i,t} \tag{34}$$

where $Y_{i,t}$ is either the current account to GDP, net outflows to GDP, the gross fixed capital formation to GDP, or savings to GDP, in country i and quarter t; L_t is the leverage of global banks; $P_{i,t-1}$ is the net external asset positions of all counter-party resident sectors of country i on global banks at $t-1$; and $\mathbb{X}_t$ is a vector including the world real GDP growth rate and the VIX. I include one lag of the dependant variable as an explanatory variable to control for country-time specific conditions.

All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustered standard errors by country and time. By doing so, I allow for correlated shocks across countries for a given quarter, as well as correlated shocks over time for a given country. I also report R^2 values from within-country variation. A difficulty arises with the fixed effects model in the context of a dynamic panel data model because the demeaning process creates a correlation between the regressor and the error. Yet, Nickell (1981) demonstrates that the inconsistency is of order $1/T$, which should be limited in my estimations given that in my panel $T = 80$. I show that my results are robust to removing the lagged dependent variable from the regressors. I also use the net external asset positions of banks counter-party resident sectors, instead of all counter-party resident sectors, of country i on global banks at $t-1$ in my robustness checks (Tables not reported). I also provide a multitude of robustness checks where I include some financial centers (see list of countries in Appendix C.1) or exclude the global financial crisis years (2007-2009) from the regressions, or change the specification to include additional controls, or to include time fixed effects in addition to country fixed effects.

I want to test the main predictions of the model in this panel of advanced and emerging market economies. I am interested in the coefficient β_2. First, the model predicts that countries with higher net external liabilities against global banks tend to experience a larger improvement in their current account balance following a deleveraging by global banks. Thus, I expect the sign to be positive for the current account and net outflows regressions. Second, the model predicts that this differentiated response of the current account is driven by investment, not savings. Thus, I expect the sign to be negative for investment, and not significant for savings.

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Results. The main results are presented in Table 4. Following the closed-form solutions given by the model, my focus is on the coefficient on the interaction between the leverage of global banks and the net assets on global banks, reported on the first line. The coefficient on column 1 is positive and significant for the current account, meaning that when the leverage of global banks increases, the current account balance improves in countries which are net creditor against global banks, while it deteriorates in countries which are net debtor against global banks. The main result is confirmed by the positive and significant coefficient in the regression in column 2 for net outflows, which is used as a proxy for the current account. Countries which are more net debtor vis a vis global banks tend to receive more inflows when the leverage of global banks goes up. As shown in columns 3 and 4, this differentiated effect on the current account is driven by the response of investment, and not by savings. As predicted by the model, a higher leverage of global banks is associated with both higher global investment and savings. Yet, when the leverage of global banks increases, investment increases more in countries which are net debtor against global banks, while there is no significant difference in the response of savings across countries related to different positions against global banks.

Table 4 Impact on the Current Account, Investment, and Savings
Baseline Results

$$Y_{i,t} = c_i + \beta_0^i t + \beta_1 L_t + \beta_2 L_t * P_{i,t-1} + \beta_3 P_{i,t-1} + \alpha_1 \mathbb{X}_t + \beta_4 Y_{i,t-1} + \epsilon_{i,t}$$

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.178***	0.328***	-0.169***	-0.043
# Net Assets on Global Banks	[0.055]	[0.065]	[0.035]	[0.058]
Global Banks Leverage	-0.050	-0.062	0.112***	0.060**
	[0.032]	[0.043]	[0.030]	[0.029]
Net Assets on Global Banks	-2.174	-7.389***	5.800***	3.869**
	[1.586]	[1.836]	[1.973]	[1.865]
World Real GDP Growth	0.099	-0.335	0.293	0.367
	[0.235]	[0.294]	[0.410]	[0.314]
VIX	-0.020	-0.075***	0.028	0.005
	[0.019]	[0.025]	[0.024]	[0.021]
Lagged Dependent Variable	0.218*	0.124	0.213***	0.143***
	[0.115]	[0.087]	[0.059]	[0.050]
Constant	1.696	3.217**	14.370***	17.868***
	[1.119]	[1.472]	[1.692]	[1.574]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	4,040	4,037	3,493	3,445
R-squared	0.591	0.425	0.544	0.729
R-squared (within)	0.097	0.061	0.133	0.052

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time.

In Appendix, I provide robustness checks excluding financial centers in Table 15, and excluding financial centers and the financial crisis years in Table 16, to show that my results are not driven by a few financial center countries, or by a specific period around the global financial crisis. Also, I complement the results by using the banking counter-party sector net external assets on global banks instead of all country-party sectors net external assets on global banks in Tables 17, 18, and 19, and find similar results. Finally, the results are also robust to including countries' own real GDP growth, a driver of the current account according to the open-economy RBC literature, and an interaction term between the leverage of U.S. Broker-Dealers and a dummy variable equal to 1 for emerging market countries and 0 for advanced economies, as control variables (Table 20). Thus, I find strong empirical support for the mechanism described in the model, which shows that the net external position of a country against global banks plays a key role in explaining its macroeconomic response to a change in global financial conditions.

4.3 Robustness Checks

To confirm that the estimates are not driven by the inclusion of a lag of the dependent variable as a control variable, I replicate the analysis without the lagged dependent variable in control variables. I also provide results for a specification with both country fixed effects and time fixed to control for broader financial conditions not captured by the VIX or world real GDP growth. The results are reported in Tables 5 and 6, and confirm the results from the baseline analysis. Also, I repeat this robustness analysis using banks external positions vis a vis global banks in the Appendix (Tables 21 and 22). Finally, in Appendix C.4, I estimate the regression for the full sample (2000-2019), and also for two sub-periods before (2000-2007) and after (2010-2019) the global financial crisis. I also use alternative measures of the leverage of global banks as described in Section 2. The main results remain robust.

Table 5 Impact on the Current Account, Investment, and Savings
Robustness - Without Lagged Dependent Variable

$$Y_{i,t} = c_i + \beta_0^i t + \beta_1 L_t + \beta_2 L_t * P_{i,t-1} + \beta_3 P_{i,t-1} + \alpha_1 \mathbb{X}_t + \epsilon_{i,t}$$

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.228***	0.376***	-0.215***	-0.049
# Net Assets on Global Banks	[0.069]	[0.083]	[0.040]	[0.069]
Global Banks Leverage	-0.062	-0.069	0.141***	0.070**
	[0.038]	[0.048]	[0.036]	[0.033]
Net Assets on Global Banks	-2.694	-8.076***	7.168***	4.521**
	[1.899]	[2.087]	[2.271]	[2.184]
World Real GDP Growth	0.230	-0.256	0.145	0.352
	[0.219]	[0.291]	[0.418]	[0.318]
VIX	-0.024	-0.080***	0.034	0.006
	[0.019]	[0.025]	[0.027]	[0.022]
Constant	2.007	3.474**	18.460***	20.914***
	[1.246]	[1.615]	[1.442]	[1.272]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	4,044	4,043	3,497	3,452
R-squared	0.571	0.416	0.524	0.724
R-squared (within)	0.053	0.047	0.093	0.032

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time.

Table 6 Impact on the Current Account, Investment, and Savings
Robustness - Using Time Fixed Effects

$$Y_{i,t} = c_i + a_t + \beta_2 L_t * P_{i,t-1} + \beta_3 P_{i,t-1} + \epsilon_{i,t}$$

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.237***	0.365***	-0.172***	0.040
# Net Assets on Global Banks	[0.078]	[0.089]	[0.051]	[0.080]
Net Assets on Global Banks	-4.626*	-10.227***	6.221**	2.316
	[2.519]	[2.793]	[2.787]	[2.906]
Constant	-0.171	-0.406**	23.202***	23.250***
	[0.103]	[0.176]	[0.180]	[0.081]
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	4,044	4,043	3,497	3,452
R-squared	0.493	0.343	0.458	0.697
R-squared (within)	0.037	0.030	0.016	0.032

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustured standard errors by country and time.

4.4 Additional Results

In this section, I present some additional results by extending the analysis to other macroeconomic variables. As the leverage of global banks has a differentiated impact across countries, depending on their net position vis a vis global banks, I test whether this differentiated impact is also significant for other domestic macroeconomic variables such as the real exchange rate, real equity prices and real GDP. To obtain meaningful estimates, I take the log difference of those variables, and correspondingly use the change in global banks leverage as a regressor. I use the following specification:

$$\Delta Y_{i,t} = c_i + a_t + \beta_2 \Delta L_t * P^b_{i,t-1} + \beta_3 P^b_{i,t-1} + \sum_{h=1}^{4} \delta_h \Delta Y_{i,t-h} + \epsilon_{i,t} \tag{35}$$

where Δ represents the first-difference operator, $Y_{i,t}$ is the log of either the real effective exchange rate (an increase represents an appreciation), the real equity index, or real GDP, in country i and time t. L_t is the leverage of U.S. Broker-Dealers, and $P^b_{i,t-1}$ is the net external asset positions of banks counter-party resident sectors of country i on global banks at $t-1$. In some regressions, I include four lags of the dependant variable as explanatory variables to control for country-time specific conditions. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustured standard errors by country and time.

Results. As in the baseline analysis, my focus is on the coefficient on the interaction between the leverage of global banks and the net assets of banks counter-party residents on global banks, reported on the first line. The coefficient on column is negative and significant for all variables, meaning that when the leverage of global banks increases, the real exchange rate appreciates more, and real equity prices and GDP increase more in countries which are net debtor against global banks. The results are significant in all regressions except for real

GDP growth when including 4 lags as controls. Results are robust to using the net external assets of all counter-party sectors on global banks $P_{i,t-1}$. As another robustness check for my baseline results, I also reproduce my results for the current account, net outflows, investment and savings in first-difference and using time fixed effects in Tables 24 and 25 in Appendix. This confirms the baseline results obtained in the previous section.

Table 7 Impact on the REER, Real Equity Returns, and Real GDP Growth

$$\Delta Y_{i,t} = c_i + a_t + \beta_2 L_t * P^b_{i,t-1} + \beta_3 P^b_{i,t-1} + \sum_{h=1}^{4} \delta_h Y_{i,t-h} + \epsilon_{i,t}$$

	Dependent Variable					
	Δ REER		Δ Equity Index		Δ Real GDP	
	(1)	(2)	(3)	(4)	(4)	(4)
Δ Global Banks Leverage	-0.249**	-0.283**	-0.384***	-0.416***	-0.031	-0.037**
# Banks Net Assets on Global Banks	[0.115]	[0.118]	[0.087]	[0.089]	[0.022]	[0.014]
Banks Net Assets on Global Banks	-0.257	-0.250	1.907	2.932*	0.829**	1.006***
	[0.567]	[0.589]	[1.247]	[1.609]	[0.328]	[0.356]
Constant	0.070***	0.064***	0.968***	1.040***	0.538***	0.709***
	[0.023]	[0.018]	[0.066]	[0.056]	[0.065]	[0.012]
Country FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Lags Dependent Variable	Yes	No	Yes	No	Yes	No
Observations	3,900	4,108	2,908	3,068	3,415	3,557
R-squared	0.110	0.053	0.606	0.557	0.339	0.311
R-squared (within)	0.061	0.003	0.082	0.007	0.047	0.016

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustured standard errors by country and time.

4.5 Cross-sectional Causal Evidence

In this section, I provide some cross-sectional evidence during the global financial crisis. As a result of the global financial crisis, the leverage of U.S. broker dealers tightened markedly in 2008Q4. As shown in Figure 11 in Appendix, the change in the leverage of U.S. broker-dealers was equal to -12.5, which corresponds to a change greater than 6 standard deviations. This sudden and major financial event which originated in the U.S. financial sector is arguably exogenous to other countries' external positions, and the risk of reverse causality is limited because of the unexpected nature of the financial crisis. Thus, I use this for my identification and to obtain a causal interpretation of my results. More specifically, I test whether the net exposure of counter-party banks located in given country towards global banks is a significant determinant of the response of the current account, investment, and savings in this country during the global financial crisis. I use the following specification:

$$Y_{i,2008Q4} - Y_{i,T} = \beta_1 P^b_{i,T} + \beta_2 C_{i,T} + \beta_3 A_{i,T} + \epsilon_i \tag{36}$$

where $Y_{i,t}$ is either the current account to GDP, net outflows to GDP, the gross fixed capital formation to GDP, or savings to GDP, in country i and quarter t. $P^b_{i,t}$ is the net external asset positions of banks counter-party resident sectors of country i on global banks at t, $C_{i,t}$ is the current account to GDP, and $A_{i,t}$ is the total net external asset position of the country i at time t. I consider two different dates T for the pre-crisis values: 2008Q3 (1-quarter) or 2007Q4 (4-quarter). Because I am interested in whether the pre-shock net external positions vis-a-vis global banks has predictive power for the macroeconomic adjustment during the crisis I focus on the β_1 coefficient, reported on the first line.

Results. As shown in Table 8 the effect on the 1-quarter change in the current account balance and on net outflows is negative and significant: the higher the net external liabilities

positions of banks counter-party resident sectors of a country on global banks, the higher the increase in the current account in this country between 2007Q4 and 2008Q4. Quantitatively, a 50% GDP difference in the net liabilities towards global banks (a number equal to one cross-sectional standard deviation excluding financial centers for 2008Q3) is associated with a 5 percentage point difference change in the current account to GDP ratio between and with a 3 percentage point difference change in the investment to GDP ratio between 2008Q3 and 2008Q4. The results complement the findings of Milesi-Ferretti and Tille (2014) about the heterogeneity of the impact of the crisis on capital flows across assets and country groups.

Table 8 Impact on the Current Account, Investment, and Savings
Event-Specific Results (1-Quarter Change)

$$Y_{i,2008Q4} - Y_{i,2008Q3} = \beta_1 P^b_{i,2008Q3} + \beta_2 C_{i,2008Q3} + \beta_3 A_{i,2008Q3} + \epsilon_i$$

	Dependent Variable (2008Q3 - 2008Q4)			
2008Q3	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Banks Net Assets on Global Banks	-10.002***	-20.615***	6.038**	-3.147
	[2.801]	[4.989]	[2.680]	[3.198]
Current Account	-0.579***	-0.319	0.279**	-0.329**
	[0.110]	[0.197]	[0.113]	[0.134]
Total Net External Assets	0.105***	0.078**	-0.046**	0.053**
	[0.019]	[0.034]	[0.019]	[0.022]
Constant	-0.844	-2.593**	-0.335	-1.407*
	[0.640]	[1.141]	[0.650]	[0.776]
Observations	52	52	44	44
R-squared	0.421	0.291	0.178	0.161

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. Change between 2008Q3 and 2008Q4 against variables in 2008Q3.

Additonal Results. As shown in Table 9, the effects on the 4-quarter change in net outflows and investment are still significant, but the net asset position of banks on global banks is not significant anymore in the current account regression.

Table 9 Impact on the Current Account, Investment, and Savings
Event-Specific Results (4-Quarter Change)

$$Y_{i,2008Q4} - Y_{i,2007Q4} = \beta_1 P^b_{i,2007Q4} + \beta_2 C_{i,2007Q4} + \beta_3 A_{i,2007Q4} + \epsilon_i$$

	Dependent Variable (2007Q4 - 2008Q4)			
2007Q4	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Banks Net Assets on Global Banks	-3.174	-21.199***	3.702**	0.803
	[2.043]	[5.050]	[1.701]	[2.098]
Current Account	-0.437***	-0.364**	0.098	-0.382***
	[0.067]	[0.166]	[0.059]	[0.073]
Total Net External Assets	0.049***	0.118***	-0.022	0.029*
	[0.016]	[0.039]	[0.013]	[0.016]
Constant	-0.187	1.210	-1.207**	-1.504**
	[0.540]	[1.334]	[0.460]	[0.567]
Observations	52	52	44	44
R-squared	0.487	0.286	0.137	0.447

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. Change between 2007Q4 and 2008Q4 against variables in 2007Q4.

Finally, as shown in Table 10, the annualized drop in real GDP was more pronounced in countries which were more net debtors vis a vis global banks. Quantitatively, a 50% GDP difference in the net liabilities towards global banks (a number equal to one cross-sectional standard deviation excluding financial centers for 2008Q3) is associated with a 4 percentage point difference in the real GDP growth between 2007Q4 and 2008Q4.

Table 10 Impact on Real GDP Growth
Event-Specific Results (4-Quarter Change)

$$Y_{i,2008Q4} - Y_{i,2007Q4} = \beta_1 P^b_{i,2007Q4} + \beta_2 C_{i,2007Q4} + \beta_3 A_{i,2007Q4} + \epsilon_i$$

	Dependent Variable (2007Q4 - 2008Q4)			
	Δ Real GDP			
2007Q4	(1)	(2)	(3)	(4)
Banks Net Assets on Global Banks	2.842**	6.098***	8.013***	8.755***
	[1.232]	[1.569]	[2.882]	[2.970]
Current Account		-0.002		-0.097
		[0.055]		[0.064]
Total Net External Assets		-0.030**		0.005
		[0.012]		[0.018]
Constant	-0.937**	-1.454***	-0.157	-0.355
	[0.426]	[0.422]	[0.470]	[0.581]
Observations	49	49	43	43
R-squared	0.102	0.278	0.159	0.243

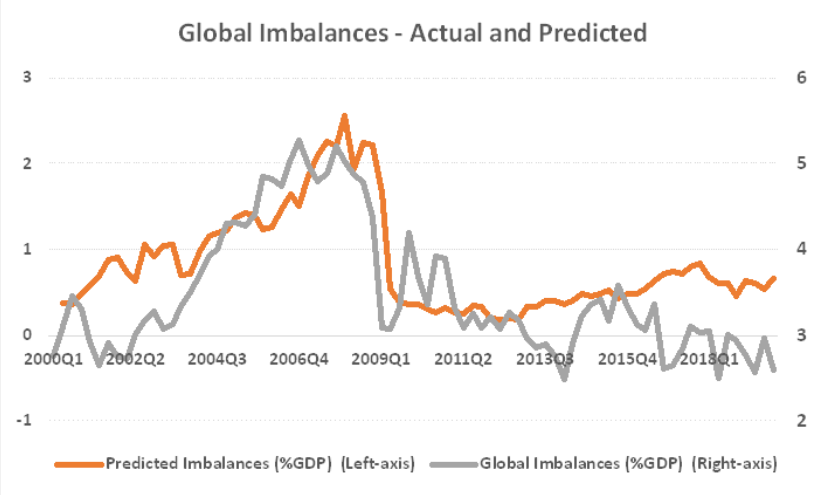
Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. Change between 2007Q4 and 2008Q4 against variables in 2007Q4. Columns (3)-(4) exclude financial centers.

4.6 The Global Financial Cycle meets Global Imbalances

In this last section, I test the predictions of my model regarding global imbalances. In order to do so, I obtain the predicted values for current account balances from the regression estimated in Table 5. Then, predicted global imbalances are computed as the quarterly sum of the absolute value of predicted current account balances across countries, normalized by world nominal GDP. As shown in Figure 10, the mechanism described in my model can rationalize the increase in global imbalances which preceded the global financial crisis, as well as the reversal in global imbalances which followed the crisis.

Figure 10 Global Imbalances - Actual versus Predicted



Note. This chart shows the actual and predicted values of global imbalances. Actual global imbalances are computed as the quarterly sum of the absolute value of current account balances across countries, normalized by world nominal GDP. Predicted global imbalances are computed as the quarterly sum of the absolute value of predicted current account balances obtained from the regression estimated in Table 5 across countries, normalized by world nominal GDP. Source: IMF BOP, author's calculations.

To summarize, changes in the leverage of global financial intermediaries not only have implications for gross flows, as highlighted by the global financial cycle literature, but also for net flows and global imbalances.

5 Conclusion

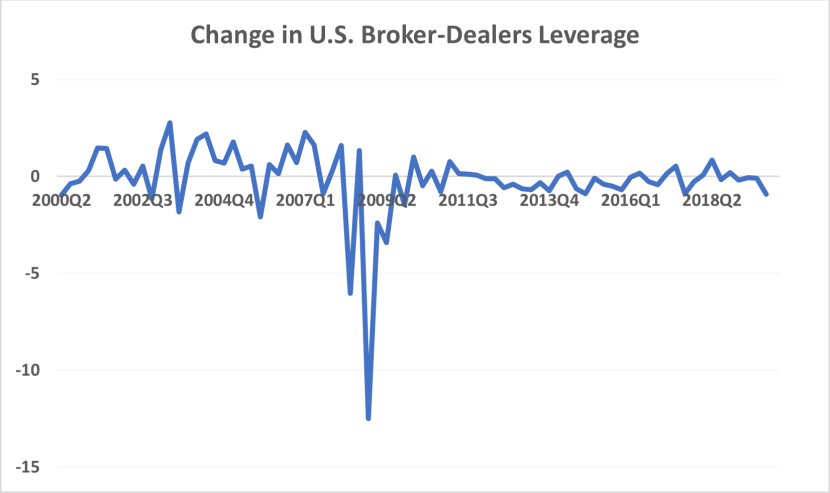
This paper develops a tractable multi-country model of the international banking system where global banks interact with local banks. In the model, consistent with the data, when the leverage of global banks goes up, countries experience higher gross capital inflows and outflows, and global imbalances increase. Thus, changes in global banks' leverage not only have impact on gross flows, but also on net flows. The main prediction of the model is that a country's net external position against global banks —its assets on global banks minus its liabilities towards global banks— plays a key role in explaining its macroeconomic response to a change in global financial conditions. In particular, countries with higher net external liabilities against global banks tend to experience a larger drop in their current account balance following a deleveraging by global banks.

The main predictions of the model are borne out in a large panel study of advanced and emerging market countries. I also provide additional empirical evidence that this differentiated impact across countries of a change in global financial conditions is also reflected in risky asset prices and real GDP growth, in line with what is observed for the current account balance.

The model presented in this paper could be extended to include a tradable sector and a non-tradable sector in order to introduce the exchange rate. Another potential extension is to introduce a distinction between global banks' affiliates and non-related banks among local banks as in Cao et al. (2021). Finally, it would be interesting to study the normative implications of the model, and in particular the need for macro-prudential policies. This is left for future research.

A Appendix - Charts

Figure 11 Change in Global Banks' Leverage



Note. This charts shows the first-difference of the U.S. Broker-Dealer sector leverage. Source: Flows of Funds.

B Appendix - Derivations

B.1 Proofs

Proof. (Remark 1) Under Assumption 1, all representative households face the same optimization problem. Thus, their supply schedule of deposits is the same across countries. Moreover, all local banks face the same problem, and in particular the same expected rate of return R on their project, at the beginning of period 1, before uncertainty is revealed. Thus, their demand schedule for deposits is the same, both across and within countries. As a result, every local bank offers the same deposit rate and collects the same quantity of deposit. ■

Proof. (Lemma 3.1) Using Assumption 1 and Remark 1, the equilibrium condition given by equation (15) in the main text simplifies to:

$$\bar{E}_G + N\left(\bar{E}_L + \bar{d}\right) G(R_M^l) = N\left(\bar{k} - \bar{E}_L - \bar{d}\right)\left(1 - G(R_M^d)\right) \tag{B.1}$$

If the leverage constraint of global banks is binding, then we have:

$$N\left(\bar{E}_L + \bar{d}\right) G(R_M^l) = \bar{\lambda} \tag{B.2}$$

Solving for R_M^l yields:

$$R_M^l = G^{-1}\left(\frac{\bar{\lambda}}{N\left(\bar{E}_L + \bar{d}\right)}\right) \tag{B.3}$$

Using equations (B.1) and (B.2), we obtain:

$$\bar{E}_G + \bar{\lambda} = N\left(\bar{k} - \bar{E}_L - \bar{d}\right)\left(1 - G(R_M^d)\right) \tag{B.4}$$

Solving for R_M^d yields:

$$R_M^d = G^{-1}\left(1 - \frac{\bar{\lambda} + \bar{E}_G}{N\left(\bar{k} - \bar{E}_L - \bar{d}\right)}\right) \tag{B.5}$$

Using equations (B.3) and (B.5) we can solve for the leverage threshold λ^* above which the leverage constraint does not bind:

$$\lambda^* = \frac{1 + \frac{\bar{E}_G}{N\left(\bar{k} - \bar{E}_L - \bar{d}\right)}}{\frac{1}{N\left(\bar{E}_L + \bar{d}\right)} + \frac{1}{N\left(\bar{k} - \bar{E}_L - \bar{d}\right)}} \tag{B.6}$$

■

Proof. (Lemma 3.2) Assume $R_H^i \leq R_M^l$. Then, a local bank in country i can set $R_H^i + \epsilon < R_M^l - \epsilon$, where ϵ is arbitrarily small, raise more deposits from households at the beginning of period 1, and either lend them on the inter-bank market at the end of period 1 and make a profit with certainty if $R_H^i < R_M^l$, or lend them on the inter-bank market or use them to invest in its project at the end of period 1, and increase its expected profits if $R_H^i = R_M^l$. Thus, this is not an equilibrium. ■

Proof. (Corollary 1) Assume one local bank raises $d^{i,j} > \bar{k} - E^{i,j}$. Then, using the balance sheet identity (7), we must have $l_M^{i,j} > 0$ independently of the realization of the stochastic return $R^{i,j}$. Yet, because $R_H^i > R_M^l$ if $\bar{\lambda} < \lambda^*$, the local bank incurs a loss with certainty, independently of the realization of its stochastic return, equal to a least $(R_H^i - R_M^l)(d^{i,j} - \bar{k} + E^{i,j})$. The local bank can unambiguously increase its profits by instead setting $d^{i,j} = \bar{k} - E^{i,j}$. Thus, this is not an equilibrium. ■

Proof. (Lemma 3.3) **[In Progress]** We want to show that there exists $\underline{k}$ such that $\forall \bar{k} > \underline{k}$ we have $\frac{d\mathbf{R^e}}{d\bar{\lambda}} > 0$. We compare $\mathbf{R^e}_1$ to $\mathbf{R^e}_2$, with $\bar{\lambda}_1 < \bar{\lambda}_2$:

$$\mathbf{R^e}_1 \equiv R^l_{M,1} G(R^l_{M,1}) + \mathbb{E}\left[R^{i,j} | R^l_{M,1} \leq R^{i,j} \leq R^d_{M,1}\right]\left[G(R^d_{M,1}) - G(R^l_{M,1})\right] + R^d_{M,1}\left[1 - G(R^d_{M,1})\right]$$
$$\mathbf{R^e}_2 \equiv R^l_{M,2} G(R^l_{M,2}) + \mathbb{E}\left[R^{i,j} | R^l_{M,2} \leq R^{i,j} \leq R^d_{M,2}\right]\left[G(R^d_{M,2}) - G(R^l_{M,2})\right] + R^d_{M,2}\left[1 - G(R^d_{M,2})\right]$$

The difference is given by:

$$\begin{aligned}\mathbf{R^e}_2 - \mathbf{R^e}_1 = &\underbrace{\left(R^l_{M,2} - R^l_{M,1}\right)}_{>0} G(R^l_{M,1}) + \underbrace{\left(R^l_{M,2} - \mathbb{E}\left[R^{i,j} | R^l_{M,1} \leq R^{i,j} \leq R^l_{M,2}\right]\right)}_{>0}\left[G(R^l_{M,2}) - G(R^l_{M,1})\right] \\ &+ \underbrace{\left(R^d_{M,2} - \mathbb{E}\left[R^{i,j} | R^d_{M,2} \leq R^{i,j} \leq R^d_{M,1}\right]\right)}_{<0}\left[G(R^d_{M,1}) - G(R^d_{M,2})\right] + \underbrace{\left(R^d_{M,2} - R^d_{M,1}\right)}_{<0}\left[1 - G(R^d_{M,1})\right]\end{aligned}$$

where $R^l_M = G^{-1}\left(\frac{\bar{\lambda}}{N\left(\bar{E}_L + \bar{d}\right)}\right)$ and $R^d_M = G^{-1}\left(1 - \frac{\bar{\lambda} + \bar{E}_G}{N\left(\bar{k} - \bar{E}_L - \bar{d}\right)}\right)$.

The sign of the difference is ambiguous.

Note that $\frac{dG(R^l_M)}{d\bar{\lambda}} = \frac{1}{N\left(\bar{E}_L + \bar{d}\right)}$ and $\frac{dG(R^d_M)}{d\bar{\lambda}} = -\frac{1}{N\left(\bar{k} - \bar{E}_L - \bar{d}\right)}$.

If $\bar{k} \to \infty$ then $G(R^d_M) \to 1$ and $\frac{dG(R^d_M)}{d\bar{\lambda}} \to 0$. Thus, if $\bar{k} \to \infty$ then:

$$\mathbf{R^e}_2 - \mathbf{R^e}_1 \to \underbrace{\left(R^l_{M,2} - R^l_{M,1}\right)}_{>0} G(R^l_{M,1}) + \underbrace{\left(R^l_{M,2} - \mathbb{E}\left[R^{i,j} | R^l_{M,1} \leq R^{i,j} \leq R^l_{M,2}\right]\right)}_{>0}\left[G(R^l_{M,2}) - G(R^l_{M,1})\right] > 0$$

The sign of the difference is unambiguously positive.

Tentative: Find the lower bound on $\bar{k}$. A sufficient condition is:

$G(R^l_{M,1}) > 1 - G(R^d_{M,1})$ and $|\frac{dG(R^l_M)}{d\bar{\lambda}})| > |\frac{dG(R^d_M)}{d\bar{\lambda}}|$. This is equivalent to:

$\frac{\bar{\lambda}}{N\left(\bar{E}_L + \bar{d}\right)} > \frac{\bar{\lambda} + \bar{E}_G}{N\left(\bar{k} - \bar{E}_L - \bar{d}\right)}$ and $\frac{1}{N\left(\bar{E}_L + \bar{d}\right)} > \frac{1}{N\left(\bar{k} - \bar{E}_L - \bar{d}\right)}$. Or:

$\bar{k} > \frac{2\bar{\lambda} + \bar{E}_G}{\bar{\lambda}}\left(\bar{E}_L + \bar{d}\right)$ and $\bar{k} > 2\left(\bar{E}_L + \bar{d}\right)$ (which is redundant given that $\bar{E}_G \geq 0$).

We can note that $\bar{d}$ is bounded above by $W^i - \frac{1}{\beta^i(\overline{R}+\sigma)}$. Thus we obtain:

$$\bar{k} > \frac{2\bar{\lambda} + \bar{E}_G}{\bar{\lambda}} \left(\bar{E}_L + W^i - \frac{1}{\beta^i(\overline{R} + \sigma)} \right) \equiv \underline{k} \tag{B.7}$$

■

Proof. (Proposition 1) See section B.4.2. ■

Proof. (Proposition 2) As shown in Proposition 1 the impact on net flows is heterogeneous across countries. As shown in Lemma 3.3, if $\bar{k} > \underline{k}$ then an increase in global banks' leverage $\bar{\lambda}$ leads to an increase in the deposit rate to households R^i_H. This increase in the deposit rate leads to an increase in the equilibrium deposits for all local banks, and in all countries, using Remark 1. Thus, the impact on savings is the same across countries. As a result, the heterogeneity across countries comes from investment. ■

B.2 Equilibrium in the inter-bank wholesale market

We solve the model backwards. At the end of period 1, after uncertainty is resolved, local banks set $d^{i,j}_M$ and $l^{i,j}_M$ in order to maximize their profits in period 2:

$$\max_{d^{i,j}_M \geq 0, l^{i,j}_M \geq 0} \pi^{i,j} = \left(\underbrace{R^i + \epsilon^j}_{\equiv R^{i,j}} \right) k^{i,j} + R^l_M l^{i,j}_M - R^i_H d^{i,j} - R^d_M d^{i,j}_M \tag{B.8}$$

subject to a balance sheet identity:

$$k^{i,j} + l^{i,j}_M = E^{i,j} + d^{i,j} + d^{i,j}_M \tag{B.9}$$

and a technological constraint:

$$k^{i,j} \leq \bar{k} \tag{B.10}$$

The Lagrangian is given by:

$$\mathcal{L}^{i,j} = R^{i,j}\left(E^{i,j} + d^{i,j} + d_M^{i,j} - l_M^{i,j}\right) + R_M^l l_M^{i,j} - R_H^i d^{i,j} - R_M^d d_M^{i,j} - \mu_1\left(\bar{k} - (E^{i,j} + d^{i,j} + d_M^{i,j} - l_M^{i,j})\right) - \mu_2(d_M^{i,j}) - \mu_3(l_M^{i,j}) \tag{B.11}$$

The FOCs are:

$$\frac{d\mathcal{L}^{i,j}}{dd_M^{i,j}} = 0 \ : \ R^{i,j} - R_M^d = \mu_1 + \mu_2 \tag{B.12}$$

$$\frac{d\mathcal{L}^{i,j}}{dl_M^{i,j}} = 0 \ : R^{i,j} - R_M^l = \mu_1 - \mu_3 \tag{B.13}$$

As discussed below, we focus on the case where the technological constraint of local banks does not bind at the beginning of period 1, i.e. $\mu_1 = 0$, so that local banks have the possibility to borrow from global banks at the end of period 1. The optimization problem of local banks leads to corner solutions. We can distinguish 3 cases regarding the decisions of local banks, depending on the realization of $R^{i,j}$: banks with high returns borrow on the wholesale market and invest until $k^{i,j} = \bar{k}$, banks with intermediate returns are inactive on the wholesale market, and banks with low returns lend all their funds on the wholesale market. We have:

$$\begin{cases} d_M^{i,j} = \bar{k} - E^{i,j} - d^{i,j} \text{ and } l_M^{i,j} = 0 & \text{if } R^{i,j} > R_M^d \\ d_M^{i,j} = 0 \text{ and } l_M^{i,j} = 0 & \text{if } R_M^d \geq R^{i,j} \geq R_M^l \\ d_M^{i,j} = 0 \text{ and } l_M^{i,j} = E^{i,j} + d^{i,j} & \text{if } R^{i,j} < R_M^l \end{cases} \tag{B.14}$$

Global banks maximize their period 2 profits:

$$\max_{d_M^g} \pi^g = R_M^d l_M^g - R_M^l d_M^g \tag{B.15}$$

subject to a balance sheet identity:

$$l_M^g = E^g + d_M^g \tag{B.16}$$

and a leverage constraint:

$$d_M^g \leq \bar{\lambda} \tag{B.17}$$

The Lagrangian is given by:

$$\mathcal{L}^g = R_M^d \left(E^g + d_M^g\right) - R_M^l d_M^g + \mu^g \left[\bar{\lambda} - d_M^g\right] \tag{B.18}$$

The FOC is:

$$\frac{d\mathcal{L}^g}{dd_M^g} = 0 \ : \ R_M^d = R_M^l + \mu^g \tag{B.19}$$

There is a wedge between the lending and borrowing rates on the inter-bank market if and only if the leverage constraint is binding.

B.3 Equilibrium in the retail markets for local deposits

The profits of local bank j located in country i in period 2 are:

$$\pi^{i,j} = R^{i,j} k^{i,j} + R_M^l l_M^{i,j} - R_M^d d_M^{i,j} - R_H^i d^{i,j} \tag{B.20}$$

Local banks are subject to a balance sheet identity:

$$k^{i,j} + l_M^{i,j} = E^{i,j} + d^{i,j} + d_M^{i,j} \tag{B.21}$$

and to a limit on the availability of projects (a technological constraint):

$$k^{i,j} \leq \bar{k} \tag{B.22}$$

At the beginning of period 1, before uncertainty is resolved, local banks compete to raise deposits $d^{i,j}$ from their home representative household in order to maximize their expected profits in period 2. Using equations (B.20) and (B.14), expected profits are given by:

$$\begin{aligned}\mathbb{E}[\pi^{i,j}] = R_M^l \left(E^{i,j} + d^{i,j}\right) G(R_M^l) + \mathbb{E}\left[R^{i,j} | R_M^l \leq R^{i,j} \leq R_M^d\right] \left(E^{i,j} + d^{i,j}\right) \left[G(R_M^d) - G(R_M^l)\right] \\ + \left[\mathbb{E}\left[R^{i,j} | R_M^d \leq R^{i,j}\right] \bar{k} - R_M^d \left(\bar{k} - E^{i,j} - d^{i,j}\right)\right] \left[1 - G(R_M^d)\right] - R_H^i d^{i,j}\end{aligned} \tag{B.23}$$

Note that there is a natural limit on $d^{i,j}$ given by Corollary 1:

$$d^{i,j} \leq \bar{k} - E^{i,j} \tag{B.24}$$

Also, note that $d^{i,j}$ cannot take negative values:

$$d^{i,j} \geq 0 \tag{B.25}$$

Local banks maximize their expected profits in (B.23) subject to the constraints in (B.24) and (B.25). The Lagrangian is:

$$\begin{aligned}\mathcal{L}^{i,j} = R_M^l \left(E^{i,j} + d^{i,j}\right) G(R_M^l) + \mathbb{E}\left[R^{i,j} | R_M^l \leq R^{i,j} \leq R_M^d\right] \left(E^{i,j} + d^{i,j}\right) \left[G(R_M^d) - G(R_M^l)\right] \\ + \left[\mathbb{E}\left[R^{i,j} | R_M^d \leq R^{i,j}\right] \bar{k} - R_M^d \left(\bar{k} - E^{i,j} - d^{i,j}\right)\right] \left[1 - G(R_M^d)\right] - R_H^i d^{i,j} \\ -\mu_0^{i,j} \left[d^{i,j} - s_0^{i,j}\right] - \mu_1^{i,j} \left[d^{i,j} - \bar{k} + E^{i,j} + s_1^{i,j}\right]\end{aligned} \tag{B.26}$$

For notation purposes, it will be convenient to denote:

$$\mathbf{R^e} \equiv R_M^l G(R_M^l) + \mathbb{E}\left[R^{i,j} | R_M^l \leq R^{i,j} \leq R_M^d\right]\left[G(R_M^d) - G(R_M^l)\right] + R_M^d\left[1 - G(R_M^d)\right] \quad \text{(B.27)}$$

Taking derivatives:

$$\frac{d\mathcal{L}^{i,j}}{dd^{i,j}} = \mathbf{R^e} - R_H^i - \mu_0^{i,j} - \mu_1^{i,j} \quad \text{(B.28)}$$

$$\frac{d\mathcal{L}^{i,j}}{d\mu_0^{i,j}} = d^{i,j} - s_0^{i,j} \quad \text{(B.29)}$$

$$\frac{d\mathcal{L}^{i,j}}{d\mu_1^{i,j}} = d^{i,j} - \bar{k} + E^{i,j} + s_1^{i,j} \quad \text{(B.30)}$$

From this point onward, the complementary slackness conditions have to be considered. We have two slack variables $s_0^{i,j}$ and $s_1^{i,j}$ and the corresponding Lagrange multipliers are $\mu_0^{i,j}$ and $\mu_1^{i,j}$. We now have to consider whether a slack variable is zero (the corresponding inequality constraint is active) or the Lagrange multiplier is zero (the corresponding inequality constraint is inactive). There are three possible cases:

1. $\mu_0^{i,j} = \mu_1^{i,j} = 0$ and $s_0^{i,j} = d^{i,j} = \bar{k} - E^{i,j} - s_1^{i,j}$, $s_1^{i,j} = \bar{k} - E^{i,j} - d^{i,j}$.

   For $R_H^i = \mathbf{R^e}$, local banks make no profits in expectation, so they are indifferent over all values of $0 \leq d^{i,j} \leq \bar{k} - E^{i,j}$.

2. $\mu_0^{i,j} = 0$, $\mu_1^{i,j} \neq 0$ and $s_0^{i,j} = d^{i,j} = \bar{k} - E^{i,j}$, $s_1^{i,j} = 0$.

   For $R_H^i < \mathbf{R^e}$, local banks want to raise as much deposits as possible, subject to their constraint, so $d^{i,j} = \bar{k} - E^{i,j}$.

3. $\mu_0^{i,j} \neq 0$, $\mu_1^{i,j} = 0$ and $s_0^{i,j} = d^{i,j} = 0$, $s_1^{i,j} = \bar{k} - E^{i,j}$.

   For $R_H^i > \mathbf{R^e}$, local banks do not want to raise deposits, so $d^{i,j} = 0$.

Thus, in the $(d^{i,j}, R_H^i)$ space, local banks' demand for deposits is horizontal at $R_H^i = \mathbf{R^e}$ for $0 \leq d^{i,j} \leq \bar{k} - E^{i,j}$ and is vertical at $d^{i,j} = \bar{k} - E^{i,j}$ for $R_H^i < \mathbf{R^e}$.

Households in country i maximize:

$$\max_{d^i} U^i = u(c_1^i) + \beta^i \, \mathbb{E}[c_2^i] \tag{B.31}$$

Their budget constraints in period 1 and 2 are given by:

$$c_1^i + d^i = W^i \tag{B.32}$$

$$c_2^j = R_H^i d^i \tag{B.33}$$

The supply of deposits d^i is given by households' first-order condition:

$$u'(W^i - d^i) = \beta^i R_H^i \tag{B.34}$$

Thus, households' supply of deposits is increasing in R_H^i.

To solve for the equilibrium in the retail markets for local deposits, we assume non-binding constraints (i.e. deposit supply curve crosses the horizontal line at $\mathbf{R^e}$). We obtain:

$$u'(W^i - d^i) = \beta^i \mathbf{R^e} \tag{B.35}$$

Assuming that $u(.) = \ln(.)$, we obtain:

$$d^i = W^i - \frac{1}{\beta^i \mathbf{R^e}} \tag{B.36}$$

For this to be a solution, we need the following condition to be satisfied:

$$0 \leq W^i - \frac{1}{\beta^i \mathbf{R^e}} \leq \bar{k} - E^{i,j} \tag{B.37}$$

We can note that $\mathbf{R^e}$ is bounded above by the highest realization possible of the project return $(\overline{R} + \sigma)$ and bounded below by the lowest realization possible of the project return $(\underline{R} - \sigma)$. We assume that the following conditions on the exogenous parameters holds so that condition (B.37) is satisfied:

$$0 \leq W^i - \frac{1}{\beta^i(\underline{R} - \sigma)} \tag{B.38}$$

$$W^i - \frac{1}{\beta^i(\overline{R} + \sigma)} \leq \bar{k} - E^{i,j} \tag{B.39}$$

Intuitively, the first condition ensures that even if local banks were certain to obtain the lowest possible return on their project, they would still raise non-negative deposits from households. The second condition ensures that even if local banks were certain to obtain the highest return on their project, this would not be able to raise sufficient deposits from households so as to make their technological constraint to bind.

B.4 Country Aggregates

B.4.1 Special case

The external assets of country i are given by:

$$A^i = \left(1-s^i\right)\int_j l_M^{i,j} + s^i\left[\sum_{i=1}^{N}\int_j \left(k - E^{i,j} - d^{i,j}\right)\mathbb{I}(R^{i,j} > R_M^d) - \int_j \left(k - E^{i,j} - d^{i,j}\right)\mathbb{I}(R^{i,j} > R_M^d)\right] \tag{B.40}$$

$$= \left(1-s^i\right)\left(\bar{E}_L + \bar{d}\right)G(R_M^l) + s^i\left[(N-1)\left(k - \bar{E}_L - \bar{d}\right)\left(1 - G(R_M^d)\right)\right] \tag{B.41}$$

$$= \left(1-s^i\right)\frac{\bar{\lambda}}{N} + s^i\left(\frac{N-1}{N}\right)\left(\bar{E}_G + \bar{\lambda}\right) \tag{B.42}$$

Using equations (B.2) and (B.4) to move from the second to third line.

The external liabilities of country i are given by:

$$L^i = \left(1-s^i\right)\int_j d_M^{i,j} + s^i\left[\sum_{i=1}^{N}\int_j \left(E^{i,j} + d^{i,j}\right)\mathbb{I}(R^{i,j} < R_M^l) - \int_j \left(E^{i,j} + d^{i,j}\right)\mathbb{I}(R^{i,j} < R_M^l)\right] \tag{B.43}$$

$$= \left(1-s^i\right)\left(k - \bar{E}_L - \bar{d}\right)\left(1 - G(R_M^d)\right) + s^i\left[(N-1)\left(\bar{E}_L + \bar{d}\right)G(R_M^l)\right] \tag{B.44}$$

$$= \left(1-s^i\right)\frac{\bar{E}_G + \bar{\lambda}}{N} + s^i\left(\frac{N-1}{N}\right)\bar{\lambda} \tag{B.45}$$

The derivatives of external positions with respect to the leverage of global banks and the share of global banks are:

$$\frac{dA^i}{d\bar{\lambda}} = \frac{dL^i}{d\bar{\lambda}} = \frac{1}{N} + \left(\frac{N-2}{N}\right)s^i > 0 \tag{B.46}$$

$$\frac{dA^i}{ds^i} = \left(\frac{N-1}{N}\right)\bar{E}_G + \left(\frac{N-2}{N}\right)\bar{\lambda} > 0 \tag{B.47}$$

$$\frac{dL^i}{ds^i} = \left(\frac{-1}{N}\right)\bar{E}_G + \left(\frac{N-2}{N}\right)\bar{\lambda} > 0 \tag{B.48}$$

B.4.2 General case

The external assets of country i are given by:

$$A^i = \left(1-s^i\right)\int_j l_M^{i,j} + s^i\left[\sum_{i=1}^{N}\int_j \left(k-E^{i,j}-d^{i,j}\right)\mathbb{I}(R^{i,j}>R_M^d) - \int_j \left(k-E^{i,j}-d^{i,j}\right)\mathbb{I}(R^{i,j}>R_M^d)\right] \tag{B.49}$$

$$= \left(1-s^i\right)\left(\bar{E}_L+\bar{d}\right)F_i(R_M^l) + s^i\left[N\left(k-\bar{E}_L-\bar{d}\right)\left(1-G(R_M^d)\right) - \left(k-\bar{E}_L-\bar{d}\right)\left(1-F_i(R_M^d)\right)\right] \tag{B.50}$$

$$= \left(1-s^i\right)\frac{\bar{\lambda}}{N}\frac{F_i(R_M^l)}{G(R_M^l)} + s^i\left[\left(\bar{E}_G+\bar{\lambda}\right) - \frac{\left(\bar{E}_G+\bar{\lambda}\right)\left(1-F_i(R_M^d)\right)}{N\left(1-G(R_M^d)\right)}\right] \tag{B.51}$$

$$= \left(1-s^i\right)\frac{\bar{\lambda}}{N}\frac{F_i(R_M^l)}{G(R_M^l)} + s^i\left(\bar{E}_G+\bar{\lambda}\right)\left[\frac{N\left(1-G(R_M^d)\right)-\left(1-F_i(R_M^d)\right)}{N\left(1-G(R_M^d)\right)}\right] \tag{B.52}$$

Using equations (B.2) and (B.4) to move from the second to third line.

The external liabilities of country i are given by:

$$L^i = \left(1-s^i\right)\int_j d_M^{i,j} + s^i\left[\sum_{i=1}^{N}\int_j \left(E^{i,j}+d^{i,j}\right)\mathbb{I}(R^{i,j}<R_M^l) - \int_j \left(E^{i,j}+d^{i,j}\right)\mathbb{I}(R^{i,j}<R_M^l)\right] \tag{B.53}$$

$$= \left(1-s^i\right)\left(k-\bar{E}_L-\bar{d}\right)\left(1-F_i(R_M^d)\right) + s^i\left[N\left(\bar{E}_L+\bar{d}\right)G(R_M^l) - \left(\bar{E}_L+\bar{d}\right)F_i(R_M^l)\right] \tag{B.54}$$

$$= \left(1-s^i\right)\frac{\bar{E}_G+\bar{\lambda}}{N}\frac{1-F_i(R_M^d)}{1-G(R_M^d)} + s^i\bar{\lambda}\left[\frac{NG(R_M^l)-F_i(R_M^l)}{NG(R_M^l)}\right] \tag{B.55}$$

The net external assets of country i, are given by:

$$N^i \equiv A^i - L^i = N^i = \frac{\bar{\lambda}}{N}\left[\frac{F_i(R_M^l)}{G(R_M^l)} - \frac{1-F_i(R_M^d)}{1-G(R_M^d)}\right] + \frac{\bar{E}_G}{N}\left[s^iN - \frac{1-F_i(R_M^d)}{1-G(R_M^d)}\right]$$

The derivatives of external positions with respect to the leverage of global banks are:

$$\frac{dA^i}{d\bar{\lambda}} = \left(1 - s^i\right) \frac{1}{N} \frac{F_i(R_M^l)}{G(R_M^l)} + s^i \frac{1}{N} \left[N - \frac{\left(1 - F_i(R_M^d)\right)}{\left(1 - G(R_M^d)\right)} \right] \tag{B.56}$$

$$\frac{dL^i}{d\bar{\lambda}} = \left(1 - s^i\right) \frac{1}{N} \frac{1 - F_i(R_M^d)}{1 - G(R_M^d)} + s^i \frac{1}{N} \left[N - \frac{F_i(R_M^l)}{G(R_M^l)} \right] \tag{B.57}$$

$$\frac{dN^i}{d\bar{\lambda}} = \frac{1}{N} \left[\frac{F_i(R_M^l)}{G(R_M^l)} - \frac{1 - F_i(R_M^d)}{1 - G(R_M^d)} \right] \tag{B.58}$$

C Appendix - Empirical Analysis

C.1 Sample - Countries

Table 11 Advanced Economies

Country Name	ISO	WEO	fincenter
United States	USA	111	0
Austria	AUT	122	0
Denmark	DNK	128	0
France	FRA	132	0
Germany	DEU	134	0
Italy	ITA	136	0
Norway	NOR	142	0
Sweden	SWE	144	0
Canada	CAN	156	0
Japan	JPN	158	0
Finland	FIN	172	0
Greece	GRC	174	0
Portugal	PRT	182	0
Spain	ESP	184	0
Australia	AUS	193	0
New Zealand	NZL	196	0
United Kingdom	GBR	112	1
Belgium	BEL	124	1
Netherlands, The	NLD	138	1
Switzerland	CHE	146	1
Ireland	IRL	178	1
China, P.R.: Hong Kong	HKG	532	1

Table 12 Emerging Market Economies

Country Name	ISO	WEO	fincenter
Turkey	TUR	186	0
South Africa	ZAF	199	0
Argentina	ARG	213	0
Bolivia	BOL	218	0
Brazil	BRA	223	0
Chile	CHL	228	0
Colombia	COL	233	0
Costa Rica	CRI	238	0
Mexico	MEX	273	0
Peru	PER	293	0
Uruguay	URY	298	0
Israel	ISR	436	0
India	IND	534	0
Korea, Rep. of	KOR	542	0
Philippines	PHL	566	0
Thailand	THA	578	0
Armenia, Rep. of	ARM	911	0
Bulgaria	BGR	918	0
Russian Federation	RUS	922	0
China, P.R.: Mainland	CHN	924	0
Czech Rep.	CZE	935	0
Slovak Rep.	SVK	936	0
Latvia	LVA	941	0
Hungary	HUN	944	0
Lithuania	LTU	946	0
Croatia, Rep. of	HRV	960	0
Slovenia, Rep. of	SVN	961	0
North Macedonia, Republic of	MKD	962	0
Poland, Rep. of	POL	964	0
Romania	ROU	968	0

C.2 Variables - Definitions and Sources

The data set includes the period 2000:Q1-2019:Q4 (subject to availability) for the following variables:

U.S. Broker-Dealers leverage. U.S. Broker-Dealers leverage computed as the ratio of assets to equity of the U.S. broker-dealer sector and obtained from the Federal Reserve's Flow of Funds.

VIX. CBOE Volatility Index (VIX Index).

World GDP growth rate. Source: OECD, IMF, IFS,Bloomberg.

Nominal and Real GDP. Source: IMF IFS, Global Financial Database.

Consumer prices. Consumer price index. Source: IMF IFS, Global Financial Database.

Net Assets on Global Banks. Computed as liabilities (all instruments, in all currencies) of all BIS reporting banks vis-a-vis all counter-party sectors located in the country minus claims (all instruments, in all currencies) of all BIS reporting banks vis-a-vis all counter-party sectors located in the country. The net external position vis-a-vis global banks is normalized by the counter-party country's GDP. Source: BIS.

Banks Net Assets on Global Banks. Computed as liabilities (all instruments, in all currencies) of all BIS reporting banks vis-a-vis the banking counter-party sector located in the country minus claims (all instruments, in all currencies) of all BIS reporting banks vis-a-vis the banking counter-party sector located in the country. The net external position vis-a-vis global banks is normalized by the counter-party country's GDP. Source: BIS.

Net flows. Computed as the difference between total gross outflows and total gross inflows as a share of GDP. Total gross inflows are computed as the sum of FDI gross inflows, portfolio gross inflows, and other investment gross inflows. Total gross outflows are computed as the sum of FDI gross outflows, portfolio gross outflows, other investment gross outflows, and reserves outflows. Source: IMF BOP database.

Current account to GDP ratio. Current account balance as a share of nominal GDP. Source: IMF IFS, IMF BOP.

Investment. Gross fixed capital formation as a share of GDP. Source: IMF IFS.

Savings. Computed as the difference between the sum of the current account to GDP ratio and investment to GDP ratio.

Equity index. Equity price index deflated by consumer price index. Source: IMF IFS, Global Financial Database.

Real effective exchange rate. Index such that an increase is an appreciation. Source: IMF IFS, BIS, Global Financial Database.

Total net external assets. Total external assets minus total external liabilities, normalized by GDP. Source: Lane and Milesi-Ferretti (2001) updated database.

Banks' Leverage. I use balance sheet data from Compustat - Capital IQ and Bloomberg to compute quarterly leverage at the intermediary level. Leverage is defined as the ratio of assets over book equity, defined as common equity[12]. I include institutions from the following countries: Argentina, Australia, Brazil, Canada, Switzerland, Chile, Colombia, Germany, Denmark, Spain, Finland, France, the U.K., Greece, Ireland, Italy, Japan, Korea, Luxembourg, the Netherlands, Panama, Peru, Portugal, Singapore, Sweden, the U.S., and South Africa. I linearly interpolate the value for assets and equity if the value is missing for a given quarter. I drop negative equity from the dataset, and institutions with assets worth less than 10 millions USD on average over 2000Q1-2019Q4 or with less than 60 quarterly observations. I also remove institutions that have leverage higher than 150 at least once across the sample. The final sample contains 365 financial intermediaries.

[12]The Compustat - Capital IQ Bank Fundamentals Quarterly database provides granular regulatory financial data for 16,000+ operating and 29,000+ global historical holding companies, banks, and credit unions. I complement this database with data collected from Bloomberg in order to include the main investment banks characterized as G-SIBs by the BIS but not included in the Compustat - Capital IQ Bank Fundamentals Quarterly database. This includes Citigroup, Goldman Sachs, Morgan Stanley, Credit Suisse, UBS, Unicredit, Nordea, Nomura, Intesa Sanpaolo, Commerzbank, and Mitsubishi FG.

C.3 Additional Empirical Results

Table 13 Summary Statistics

	All			Excl. Financial Centers		
	Count	Mean	Std	Count	Mean	Std
Global Banks Leverage	4160	28.12	9.18	3680	28.12	9.18
Δ Global Banks Leverage	4108	-0.16	1.86	3634	-0.16	1.86
Net Assets on Global Banks	4160	-0.09	0.29	3680	-0.10	0.16
Banks Net Assets on Global Banks	4160	-0.03	0.20	3680	-0.04	0.11
Total Net External Assets	4140	-17.39	63.87	3660	-27.20	41.42
World Real GDP Growth	4108	0.67	0.50	3634	0.67	0.50
VIX	4160	19.49	7.81	3680	19.49	7.81
Δ VIX	4108	-0.64	22.41	3634	-0.64	22.41
Current Account	4092	-0.36	6.28	3640	-0.85	5.98
Δ Current Account	4040	0.02	5.13	3594	0.03	4.83
Net Outflows	4090	-0.42	7.45	3638	-0.84	6.43
Δ Net Outflows	4037	-0.24	27.98	3591	-0.15	17.73
Investment	3539	23.06	5.24	3059	23.10	5.16
Δ Investment	3493	0.00	4.54	3019	-0.01	4.24
Savings	3491	22.87	6.89	3039	22.36	6.60
Δ Savings	3445	0.02	4.75	2999	0.02	4.88
Δ Real Equity Index	3068	0.91	9.30	2594	1.03	9.57
Δ Real GDP	3599	0.67	1.27	3128	0.68	1.19

Table 14 Net Debtors and Net Creditors vis a vis Global Banks

Country Name	ISO	WEO	Group	fincenter	Average Net Position (%GDP)	Prob.
Ireland	IRL	178	AE	1	-343	28%
Portugal	PRT	182	AE	0	-170	0%
Netherlands, The	NLD	138	AE	1	-169	0%
Austria	AUT	122	AE	0	-113	0%
Spain	ESP	184	AE	0	-113	0%
Norway	NOR	142	AE	0	-113	0%
Finland	FIN	172	AE	0	-110	13%
Hungary	HUN	944	EMDE	0	-109	6%
Italy	ITA	136	AE	0	-106	0%
Croatia, Rep. of	HRV	960	EMDE	0	-106	26%
Denmark	DNK	128	AE	0	-100	6%
Slovenia, Rep. of	SVN	961	EMDE	0	-94	40%
Sweden	SWE	144	AE	0	-85	4%
France	FRA	132	AE	0	-74	0%
Latvia	LVA	941	EMDE	0	-72	48%
Greece	GRC	174	AE	0	-69	40%
Lithuania	LTU	946	EMDE	0	-67	31%
New Zealand	NZL	196	AE	0	-66	4%
Slovak Rep.	SVK	936	EMDE	0	-62	15%
Australia	AUS	193	AE	0	-61	0%
Romania	ROU	968	EMDE	0	-58	40%
Turkey	TUR	186	EMDE	0	-48	28%
Poland, Rep. of	POL	964	EMDE	0	-46	34%
Czech Rep.	CZE	935	EMDE	0	-46	26%
Canada	CAN	156	AE	0	-42	23%
Korea, Rep. of	KOR	542	EMDE	0	-31	66%
Brazil	BRA	223	EMDE	0	-29	70%
Chile	CHL	228	EMDE	0	-27	74%
United States	USA	111	AE	0	-26	93%
Japan	JPN	158	AE	0	-18	78%
Bulgaria	BGR	918	EMDE	0	-17	63%
Thailand	THA	578	EMDE	0	-17	93%
India	IND	534	EMDE	0	-16	88%
Philippines	PHL	566	EMDE	0	-15	95%
Costa Rica	CRI	238	EMDE	0	-13	100%
Colombia	COL	233	EMDE	0	-5	100%
United Kingdom	GBR	112	AE	1	-4	65%
Mexico	MEX	273	EMDE	0	-3	100%
Peru	PER	293	EMDE	0	-2	100%
China, P.R.: Mainland	CHN	924	EMDE	0	-2	100%
Germany	DEU	134	AE	0	1	85%
Argentina	ARG	213	EMDE	0	4	98%
Russian Federation	RUS	922	EMDE	0	5	99%
Georgia	GEO	915	EMDE	0	6	98%
Armenia, Rep. of	ARM	911	EMDE	0	6	89%
South Africa	ZAF	199	EMDE	0	7	100%
North Macedonia, Republic of	MKD	962	EMDE	0	16	100%
Belgium	BEL	124	AE	1	21	84%
Israel	ISR	436	EMDE	0	38	100%
Bolivia	BOL	218	EMDE	0	44	100%
Uruguay	URY	298	EMDE	0	100	100%
Switzerland	CHE	146	AE	1	261	100%
China, P.R.: Hong Kong	HKG	532	AE	1	305	88%

Note. Average Net Position measures the average net position vis a vis global banks over the period 2000Q1-2019Q4 as a share of GDP. The cross-country average of this measure is equal to -35% GDP. Prob measures the probability that the net position vis a vis global banks is above this unconditional average of -35% GDP. The upper sample shows the net debtor countries, defined as countries with an average net position below the unconditional average and a Prob lower than 50%. The lower sample shows the net creditor countries, defined as countries with an average net position above the unconditional average and a Prob higher than 50%.

Table 15 Baseline Results - Excluding Financial Centers

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.385**	0.573***	-0.293**	0.098
# Net Assets on Global Banks	[0.148]	[0.173]	[0.129]	[0.137]
Global Banks Leverage	-0.024	-0.018	0.098**	0.086**
	[0.034]	[0.048]	[0.041]	[0.041]
Net Assets on Global Banks	-7.901	-12.860**	9.176**	1.729
	[5.068]	[5.853]	[3.822]	[4.829]
World Real GDP Growth	-0.078	-0.447	0.419	0.285
	[0.246]	[0.318]	[0.463]	[0.360]
VIX	-0.023	-0.062***	0.035	0.013
	[0.020]	[0.021]	[0.026]	[0.023]
Lagged Dependent Variable	0.256*	0.225***	0.244***	0.108**
	[0.132]	[0.054]	[0.060]	[0.047]
Constant	0.864	1.696	13.885***	17.715***
	[1.186]	[1.608]	[1.840]	[1.831]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	3,594	3,591	3,019	2,999
R-squared	0.589	0.459	0.585	0.696
R-squared (within)	0.129	0.121	0.165	0.041

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time. Excluding financial centers.

Table 16 Baseline Results - Excluding Financial Centers and Financial Crisis Years (2007-2009)

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.491***	0.698***	-0.288*	0.152
# Net Assets on Global Banks	[0.180]	[0.195]	[0.167]	[0.200]
Global Banks Leverage	0.000	0.019	0.093*	0.092
	[0.043]	[0.052]	[0.050]	[0.061]
Net Assets on Global Banks	-10.763*	-16.042***	10.020**	0.996
	[5.674]	[5.735]	[4.711]	[6.291]
World Real GDP Growth	-0.093	-0.564	0.256	0.174
	[0.404]	[0.343]	[0.332]	[0.457]
VIX	-0.015	-0.048***	0.034	0.018
	[0.024]	[0.017]	[0.022]	[0.026]
Lagged Dependent Variable	0.165	0.158***	0.186***	0.086
	[0.129]	[0.049]	[0.062]	[0.053]
Constant	-0.009	0.495	15.607***	18.163***
	[1.290]	[1.506]	[1.935]	[2.595]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	2,996	2,993	2,525	2,505
R-squared	0.562	0.445	0.589	0.704
R-squared (within)	0.055	0.061	0.079	0.028

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time. Excluding financial centers and financial crisis years (2007-2009).

Table 17 Baseline Results - Using Banks Net Assets on Global Banks

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.236**	0.438***	-0.254***	-0.075
# Banks Net Assets on Global Banks	[0.090]	[0.113]	[0.060]	[0.070]
Global Banks Leverage	-0.061*	-0.081*	0.121***	0.059**
	[0.033]	[0.043]	[0.030]	[0.028]
Banks Net Assets on Global Banks	-3.791	-10.955***	8.639***	5.230**
	[2.872]	[3.489]	[2.818]	[2.201]
World Real GDP Growth	0.074	-0.357	0.289	0.346
	[0.234]	[0.295]	[0.410]	[0.317]
VIX	-0.022	-0.077***	0.027	0.003
	[0.019]	[0.024]	[0.023]	[0.021]
Lagged Dependent Variable	0.225*	0.130	0.215***	0.148***
	[0.116]	[0.090]	[0.057]	[0.051]
Constant	1.878	3.632**	14.100***	17.694***
	[1.152]	[1.495]	[1.664]	[1.571]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	4,040	4,037	3,493	3,445
R-squared	0.589	0.423	0.544	0.728
R-squared (within)	0.092	0.057	0.133	0.048

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time. Using banks position vis a vis global banks.

Table 18 Baseline Results - Using Banks Net Assets on Global Banks and Excluding Financial Centers

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.530**	0.775***	-0.379*	0.124
# Banks Net Assets on Global Banks	[0.238]	[0.286]	[0.204]	[0.187]
Global Banks Leverage	-0.043	-0.046	0.114***	0.074*
	[0.035]	[0.046]	[0.038]	[0.038]
Banks Net Assets on Global Banks	-12.200	-18.632*	11.420*	0.705
	[8.077]	[9.490]	[6.082]	[6.394]
World Real GDP Growth	-0.106	-0.476	0.404	0.239
	[0.248]	[0.321]	[0.463]	[0.369]
VIX	-0.025	-0.064***	0.032	0.007
	[0.021]	[0.022]	[0.026]	[0.023]
Lagged Dependent Variable	0.266**	0.237***	0.247***	0.116**
	[0.132]	[0.057]	[0.059]	[0.046]
Constant	1.266	2.329	13.371***	17.690***
	[1.209]	[1.558]	[1.683]	[1.731]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	3,594	3,591	3,019	2,999
R-squared	0.586	0.455	0.584	0.694
R-squared (within)	0.122	0.114	0.163	0.034

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time. Excluding financial centers and using banks position vis a vis global banks.

Table 19 Baseline Results - Using Banks Net Assets on Global Banks and Excluding Financial Centers and Financial Crisis Years (2007-2009)

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.701**	1.003***	-0.370	0.219
# Banks Net Assets on Global Banks	[0.266]	[0.354]	[0.258]	[0.264]
Global Banks Leverage	-0.023	-0.014	0.108**	0.078
	[0.043]	[0.050]	[0.044]	[0.055]
Banks Net Assets on Global Banks	-15.837*	-23.446**	11.983*	-0.406
	[8.246]	[9.838]	[7.053]	[8.190]
World Real GDP Growth	-0.084	-0.549	0.227	0.142
	[0.406]	[0.343]	[0.329]	[0.459]
VIX	-0.015	-0.048***	0.031	0.014
	[0.023]	[0.017]	[0.021]	[0.027]
Lagged Dependent Variable	0.169	0.164***	0.189***	0.091*
	[0.129]	[0.050]	[0.060]	[0.053]
Constant	0.479	1.205	15.067***	18.164***
	[1.298]	[1.459]	[1.733]	[2.416]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	2,996	2,993	2,525	2,505
R-squared	0.560	0.442	0.588	0.702
R-squared (within)	0.051	0.056	0.077	0.024

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time. Excluding financial centers and financial crisis years (2007-2009) and using banks position vis a vis global banks.

Table 20 Baseline Results - Controlling for Own Real GDP Growth and Emerging Market Indicator

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.170***	0.299***	-0.183***	-0.056
# Net Assets on Global Banks	[0.057]	[0.063]	[0.045]	[0.055]
Global Banks Leverage	-0.103*	-0.126*	0.088*	-0.041
# EM Indicator	[0.057]	[0.071]	[0.044]	[0.035]
Global Banks Leverage	-0.018	-0.033	0.054**	0.059**
	[0.033]	[0.038]	[0.020]	[0.026]
Net Assets on Global Banks	-1.670	-6.940***	5.678**	3.906**
	[1.513]	[2.052]	[2.175]	[1.800]
World Real GDP Growth	0.226	-0.386	-0.124	0.067
	[0.250]	[0.349]	[0.334]	[0.279]
VIX	-0.020	-0.069***	0.024	0.003
	[0.018]	[0.025]	[0.019]	[0.018]
Real GDP Growth	-0.162	0.054	0.364***	0.227**
	[0.100]	[0.270]	[0.056]	[0.101]
Lagged Dependent Variable	0.150	0.084	0.199***	0.131*
	[0.115]	[0.093]	[0.065]	[0.066]
Constant	2.539**	4.263***	15.204***	19.019***
	[1.199]	[1.429]	[1.635]	[1.738]
Country FE	Yes	Yes	Yes	Yes
Country # Time FE	Yes	Yes	Yes	Yes
Observations	3,509	3,506	3,362	3,314
R-squared	0.598	0.453	0.575	0.764
R-squared (within)	0.092	0.064	0.151	0.053

Robust standard errors in brackets
*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

Note. EM Indicator is equal to 1 if the country is an emerging market country, and is equal to 0 otherwise. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time.

Table 21 Robustness - Without Lagged Dependent Variable - Using Banks Net Assets on Global Banks

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.299***	0.499***	-0.314***	-0.087
# Banks Net Assets on Global Banks	[0.109]	[0.127]	[0.069]	[0.085]
Global Banks Leverage	-0.076*	-0.091*	0.153***	0.070**
	[0.038]	[0.048]	[0.036]	[0.032]
Banks Net Assets on Global Banks	-4.210	-11.818***	10.265***	6.198**
	[3.523]	[3.858]	[3.312]	[2.601]
World Real GDP Growth	0.207	-0.277	0.135	0.326
	[0.218]	[0.293]	[0.419]	[0.321]
VIX	-0.026	-0.083***	0.032	0.003
	[0.019]	[0.025]	[0.026]	[0.023]
Constant	2.250*	3.959**	18.157***	20.828***
	[1.277]	[1.645]	[1.452]	[1.268]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	4,044	4,043	3,497	3,452
R-squared	0.568	0.413	0.524	0.722
R-squared (within)	0.045	0.041	0.092	0.026

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time. Without lagged dependent variable in control variables using banks positions vis a vis global banks.

Table 22 Robustness - With Time Fixed Effects - Using Banks Net Assets on Global Banks

	Dependent Variable			
	Current Account	Net Outflows	Investment	Savings
	(1)	(2)	(3)	(4)
Global Banks Leverage	0.277**	0.447***	-0.250***	-0.016
# Banks Net Assets on Global Banks	[0.129]	[0.145]	[0.077]	[0.093]
Banks Net Assets on Global Banks	-4.860	-11.847*	9.263**	5.888*
	[4.891]	[5.984]	[3.924]	[3.363]
Constant	-0.279***	-0.421***	23.172***	23.108***
	[0.062]	[0.098]	[0.086]	[0.048]
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Observations	4,044	4,043	3,497	3,452
R-squared	0.489	0.338	0.457	0.698
R-squared (within)	0.029	0.023	0.014	0.033

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustured standard errors by country and time. Using banks positions vis a vis global banks.

Table 23 Impact on the Current Account, Investment, and Savings
Additional Results

	Dependent Variable			
	Δ Current Account	Δ Net Outflows	Δ Investment	Δ Savings
	(1)	(2)	(3)	(4)
Δ Global Banks Leverage	0.099*	0.512***	-0.076***	0.018
# Net Assets on Global Banks	[0.050]	[0.162]	[0.026]	[0.047]
Δ Global Banks Leverage	-0.040	0.110	0.052	0.000
	[0.083]	[0.088]	[0.083]	[0.030]
Net Assets on Global Banks	-0.818	-2.041	1.579***	0.422
	[0.711]	[1.444]	[0.482]	[0.349]
World Real GDP Growth	-0.130	-0.582**	0.787***	0.598***
	[0.219]	[0.279]	[0.292]	[0.119]
Δ VIX	-0.003	-0.015**	0.013**	0.008**
	[0.005]	[0.007]	[0.005]	[0.003]
Constant	0.042	0.241	-0.353*	-0.327***
	[0.130]	[0.190]	[0.196]	[0.082]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Lags Dependent Variable	Yes	Yes	Yes	Yes
Observations	3,832	3,825	3,309	3,261
R-squared	0.638	0.408	0.667	0.774
R-squared (within)	0.638	0.407	0.667	0.774

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and country-specific linear time trends, and double-clustured standard errors by country and time.

Table 24 Impact on the Current Account, Investment, and Savings
Additional Results - Robustness - With Time Fixed Effects

	Dependent Variable			
	Δ Current Account	Δ Net Outflows	Δ Investment	Δ Savings
	(1)	(2)	(3)	(4)
Δ Global Banks Leverage	0.112***	0.549***	-0.083**	0.027
# Net Assets on Global Banks	[0.040]	[0.145]	[0.031]	[0.055]
Net Assets on Global Banks	-0.739**	-0.908	1.501***	0.692**
	[0.325]	[0.905]	[0.514]	[0.311]
Constant	-0.029	-0.058	0.144***	0.094***
	[0.022]	[0.064]	[0.033]	[0.025]
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Lags Dependent Variable	Yes	Yes	Yes	Yes
Observations	3,832	3,825	3,309	3,261
R-squared	0.652	0.426	0.687	0.779
R-squared (within)	0.633	0.408	0.664	0.759

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustured standard errors by country and time.

Table 25 Impact on the Current Account, Investment, and Savings Additional Results - Robustness - With Time Fixed Effects and Using Bank Net Assets on Global Banks

	Dependent Variable			
	Δ Current Account	Δ Net Outflows	Δ Investment	Δ Savings
	(1)	(2)	(3)	(4)
Δ Global Banks Leverage	0.147**	0.761***	-0.146**	0.007
# Banks Net Assets on Global Banks	[0.061]	[0.229]	[0.058]	[0.077]
Banks Net Assets on Global Banks	-1.225**	-1.518	1.898**	0.604
	[0.479]	[1.147]	[0.856]	[0.471]
Constant	-0.002	-0.023	0.063**	0.046***
	[0.017]	[0.034]	[0.029]	[0.014]
Country FE	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Lags Dependent Variable	Yes	Yes	Yes	Yes
Observations	3,832	3,825	3,309	3,261
R-squared	0.652	0.426	0.686	0.778
R-squared (within)	0.634	0.408	0.663	0.759

Robust standard errors in brackets
*** p<0.01, ** p<0.05, * p<0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustured standard errors by country and time. Using banks positions vis a vis global banks.

C.4 Robustness Checks

Table 26 Impact on the Current Account, Investment, and Savings
Median Leverage and Full Sample

	Dependent Variable			
Leverage: Median Period: Full Sample	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Global Banks Leverage	0.885***	1.735***	-1.185***	-0.073
# Net Assets on Global Banks	[0.243]	[0.375]	[0.321]	[0.386]
Global Banks Leverage	-0.065	-0.136	0.227	0.126
# EM Indicator	[0.113]	[0.141]	[0.138]	[0.129]
Global Banks Leverage	-0.001	0.076	-0.081	-0.007
	[0.085]	[0.107]	[0.094]	[0.128]
Net Assets on Global Banks	-16.028***	-33.355***	24.704***	5.050
	[5.047]	[9.125]	[6.539]	[8.792]
World Real GDP Growth	-0.097	-0.335	0.046	-0.044
	[0.244]	[0.333]	[0.474]	[0.308]
VIX	0.013	-0.015	-0.019	-0.006
	[0.013]	[0.018]	[0.022]	[0.017]
Real GDP Growth	-0.202*	-0.282*	0.397***	0.241*
	[0.105]	[0.150]	[0.078]	[0.126]
Lagged Dependent Variable	0.425***	0.205***	0.305***	0.161***
	[0.072]	[0.057]	[0.076]	[0.051]
Constant	0.714	0.684	15.192***	18.197***
	[1.389]	[1.874]	[2.537]	[2.109]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	2,914	2,911	2,739	2,719
R-squared	0.754	0.528	0.672	0.784
R-squared (within)	0.256	0.109	0.177	0.0519

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

Table 27 Impact on the Current Account, Investment, and Savings
Median Leverage and Pre-GFC

	Dependent Variable			
Leverage: Median Period: Pre-GFC	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Global Banks Leverage	2.210**	3.111***	-1.465*	0.988
# Net Assets on Global Banks	[0.860]	[0.795]	[0.759]	[0.702]
Global Banks Leverage	-0.095	-0.064	-0.091	-0.156
# EM Indicator	[0.213]	[0.270]	[0.259]	[0.133]
Global Banks Leverage	0.213	0.392*	-0.251	0.053
	[0.155]	[0.209]	[0.243]	[0.158]
Net Assets on Global Banks	-45.190**	-64.594***	25.269	-24.895
	[20.355]	[19.267]	[18.355]	[17.824]
World Real GDP Growth	-0.082	-0.561	0.097	-0.001
	[0.516]	[0.543]	[0.552]	[0.375]
VIX	-0.006	-0.065	0.038	0.032
	[0.025]	[0.044]	[0.035]	[0.025]
Real GDP Growth	-0.078	-0.221**	0.208***	0.188*
	[0.085]	[0.095]	[0.071]	[0.106]
Lagged Dependent Variable	0.099*	0.008	0.059	-0.005
	[0.053]	[0.051]	[0.062]	[0.052]
Constant	-3.937	-6.648*	27.438***	22.639***
	[3.180]	[3.490]	[5.793]	[3.511]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	1,099	1,098	1,020	1,000
R-squared	0.857	0.716	0.750	0.811
R-squared (within)	0.035	0.032	0.036	0.011

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

Table 28 IImpact on the Current Account, Investment, and Savings
Median Leverage and Post-GFC

	Dependent Variable			
Leverage: Median Period: Post-GFC	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Global Banks Leverage	4.108***	5.414***	-3.759***	1.518
# Net Assets on Global Banks	[1.162]	[1.551]	[1.150]	[1.267]
Global Banks Leverage	-1.047**	-0.280	0.864*	-0.462
# EM Indicator	[0.421]	[0.682]	[0.434]	[0.314]
Global Banks Leverage	0.822*	0.309	-0.986***	0.037
	[0.445]	[0.610]	[0.358]	[0.341]
Net Assets on Global Banks	-69.686***	-94.784***	67.652***	-22.559
	[19.880]	[28.494]	[21.067]	[22.569]
World Real GDP Growth	-0.070	-0.605	-1.112	-1.052
	[0.344]	[0.516]	[0.901]	[0.743]
VIX	0.004	-0.013	0.044	0.051
	[0.027]	[0.023]	[0.039]	[0.039]
Real GDP Growth	0.008	0.100	0.128	0.244**
	[0.096]	[0.164]	[0.081]	[0.103]
Lagged Dependent Variable	0.129*	-0.012	-0.020	-0.109*
	[0.064]	[0.022]	[0.074]	[0.058]
Constant	-3.124	-1.261	31.256***	29.680***
	[5.605]	[6.288]	[7.513]	[6.757]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	1,368	1,366	1,296	1,296
R-squared	0.719	0.480	0.742	0.834
R-squared (within)	0.066	0.023	0.037	0.029

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

Table 29 Impact on the Current Account, Investment, and Savings
Weighted Leverage and Full Sample

	Dependent Variable			
Leverage: Weighted	Current Account	Net Outflows	Investment	Savings
Period: Full Sample	(1)	(2)	(3)	(4)
Global Banks Leverage	0.318***	0.720***	-0.470***	-0.049
# Net Assets on Global Banks	[0.106]	[0.177]	[0.136]	[0.190]
Global Banks Leverage	-0.006	-0.045	0.085	0.069
# EM Indicator	[0.052]	[0.070]	[0.066]	[0.062]
Global Banks Leverage	-0.019	0.018	-0.015	-0.005
	[0.039]	[0.051]	[0.035]	[0.061]
Net Assets on Global Banks	-4.774*	-13.887**	10.909***	4.835
	[2.565]	[5.418]	[3.473]	[5.260]
World Real GDP Growth	0.053	-0.120	-0.130	-0.080
	[0.253]	[0.354]	[0.489]	[0.295]
VIX	0.021	-0.003	-0.030	-0.010
	[0.015]	[0.020]	[0.024]	[0.018]
Real GDP Growth	-0.207*	-0.291*	0.402***	0.240*
	[0.104]	[0.151]	[0.079]	[0.127]
Lagged Dependent Variable	0.432***	0.211***	0.312***	0.160***
	[0.074]	[0.061]	[0.078]	[0.051]
Constant	0.231	0.460	15.572***	18.891***
	[0.658]	[1.007]	[1.986]	[1.472]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	2,914	2,911	2,739	2,719
R-squared	0.753	0.525	0.670	0.784
R-squared (within)	0.251	0.104	0.173	0.0529

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

Table 30 Impact on the Current Account, Investment, and Savings
Weighted Leverage and Pre-GFC

	Dependent Variable			
Leverage: Weighted Period: Pre-GFC	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Global Banks Leverage	1.081*	1.326*	-0.948	0.229
# Net Assets on Global Banks	[0.579]	[0.682]	[0.573]	[0.583]
Global Banks Leverage	-0.098	0.165	0.066	0.046
# EM Indicator	[0.143]	[0.254]	[0.148]	[0.111]
Global Banks Leverage	0.001	-0.088	-0.081	-0.088
	[0.139]	[0.217]	[0.227]	[0.200]
Net Assets on Global Banks	-23.662	-28.571	17.382	-8.157
	[16.741]	[19.235]	[15.491]	[16.603]
World Real GDP Growth	0.120	-0.425	0.051	0.129
	[0.466]	[0.495]	[0.463]	[0.452]
VIX	0.006	-0.056	0.034	0.039
	[0.027]	[0.042]	[0.033]	[0.032]
Real GDP Growth	-0.078	-0.225***	0.214***	0.192*
	[0.080]	[0.079]	[0.058]	[0.112]
Lagged Dependent Variable	0.098*	0.008	0.056	-0.006
	[0.053]	[0.049]	[0.061]	[0.052]
Constant	0.549	0.891	22.122***	23.305***
	[2.235]	[2.920]	[4.571]	[4.658]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	1,099	1,098	1,020	1,000
R-squared	0.856	0.715	0.750	0.811
R-squared (within)	0.035	0.029	0.034	0.008

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

Table 31 Impact on the Current Account, Investment, and Savings
Weighted Leverage and Post-GFC

	Dependent Variable			
Leverage: Weighted	Current Account	Net Outflows	Investment	Savings
Period: Post-GFC	(1)	(2)	(3)	(4)
Global Banks Leverage	1.938***	2.884***	-1.808***	0.660
# Net Assets on Global Banks	[0.496]	[0.922]	[0.591]	[0.673]
Global Banks Leverage	-0.316	-0.311	0.103	-0.351*
# EM Indicator	[0.214]	[0.338]	[0.280]	[0.192]
Global Banks Leverage	0.188	0.286	-0.256	0.040
	[0.115]	[0.295]	[0.187]	[0.161]
Net Assets on Global Banks	-29.926***	-48.488**	31.284***	-7.441
	[8.091]	[17.839]	[10.860]	[12.622]
World Real GDP Growth	-0.128	-0.489	-1.021	-0.981
	[0.454]	[0.522]	[0.824]	[0.729]
VIX	0.010	-0.015	0.044	0.055
	[0.020]	[0.026]	[0.042]	[0.036]
Real GDP Growth	0.015	0.115	0.136	0.259**
	[0.101]	[0.168]	[0.081]	[0.111]
Lagged Dependent Variable	0.126*	-0.015	-0.022	-0.106*
	[0.063]	[0.022]	[0.072]	[0.057]
Constant	0.614	-0.587	25.972***	28.133***
	[2.153]	[3.394]	[3.852]	[3.269]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	1,368	1,366	1,296	1,296
R-squared	0.718	0.480	0.740	0.834
R-squared (within)	0.061	0.023	0.031	0.031

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

Table 32 Impact on the Current Account, Investment, and Savings
U.S. Broker-Dealers Leverage and Full Sample

	Dependent Variable			
Leverage: U.S. Broker-Dealers Period: Full Sample	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Global Banks Leverage	0.383***	0.629***	-0.439***	0.062
# Net Assets on Global Banks	[0.112]	[0.168]	[0.130]	[0.115]
Global Banks Leverage	-0.086**	-0.117**	0.097**	-0.031
# EM Indicator	[0.037]	[0.051]	[0.047]	[0.038]
Global Banks Leverage	0.055*	0.077*	-0.021	0.078**
	[0.030]	[0.042]	[0.029]	[0.038]
Net Assets on Global Banks	-7.764*	-13.924**	12.079***	1.961
	[3.986]	[6.480]	[3.506]	[4.427]
World Real GDP Growth	-0.018	-0.214	-0.010	-0.029
	[0.199]	[0.267]	[0.417]	[0.265]
VIX	-0.006	-0.046**	0.018	0.011
	[0.012]	[0.018]	[0.021]	[0.016]
Real GDP Growth	-0.155	-0.208	0.326***	0.235*
	[0.097]	[0.130]	[0.060]	[0.121]
Lagged Dependent Variable	0.400***	0.187***	0.261***	0.153***
	[0.060]	[0.048]	[0.074]	[0.051]
Constant	0.148	1.002	15.534***	17.723***
	[0.782]	[1.103]	[1.683]	[1.422]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	2,914	2,911	2,739	2,719
R-squared	0.758	0.537	0.685	0.785
R-squared (within)	0.268	0.125	0.209	0.0592

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

Table 33 Impact on the Current Account, Investment, and Savings
U.S. Broker-Dealers Leverage and Pre-GFC

	Dependent Variable			
Leverage: U.S. Broker-Dealers Period: Pre-GFC	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Global Banks Leverage	0.818**	0.891*	-0.629**	0.270
# Net Assets on Global Banks	[0.329]	[0.449]	[0.295]	[0.362]
Global Banks Leverage	-0.180*	-0.265	0.122	-0.058
# EM Indicator	[0.099]	[0.161]	[0.168]	[0.104]
Global Banks Leverage	0.083	0.187	0.045	0.137
	[0.106]	[0.167]	[0.141]	[0.140]
Net Assets on Global Banks	-27.960*	-29.679	17.802	-12.937
	[13.915]	[19.055]	[12.400]	[15.005]
World Real GDP Growth	-0.156	-0.586	0.327	0.143
	[0.471]	[0.503]	[0.406]	[0.405]
VIX	-0.015	-0.071	0.060*	0.043*
	[0.027]	[0.049]	[0.033]	[0.025]
Real GDP Growth	-0.082	-0.225**	0.228***	0.203*
	[0.078]	[0.083]	[0.058]	[0.113]
Lagged Dependent Variable	0.092*	0.009	0.046	-0.005
	[0.052]	[0.052]	[0.061]	[0.051]
Constant	0.333	-0.086	16.513***	17.672***
	[2.987]	[5.010]	[4.835]	[3.940]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	1,099	1,098	1,020	1,000
R-squared	0.857	0.715	0.753	0.811
R-squared (within)	0.041	0.029	0.047	0.008

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

Table 34 Impact on the Current Account, Investment, and Savings
U.S. Broker-Dealers Leverage and Post-GFC

	Dependent Variable			
Leverage: U.S. Broker-Dealers Period: Post-GFC	Current Account (1)	Net Outflows (2)	Investment (3)	Savings (4)
Global Banks Leverage	1.523***	2.308***	-1.479**	0.463
# Net Assets on Global Banks	[0.533]	[0.753]	[0.555]	[0.581]
Global Banks Leverage	-0.358	-0.240	0.214	-0.301
# EM Indicator	[0.234]	[0.354]	[0.263]	[0.188]
Global Banks Leverage	0.128	0.133	-0.185	0.023
	[0.129]	[0.256]	[0.138]	[0.159]
Net Assets on Global Banks	-26.022**	-43.320***	29.168**	-4.784
	[10.044]	[15.723]	[11.366]	[12.179]
World Real GDP Growth	-0.299	-0.689	-0.832	-1.030
	[0.387]	[0.464]	[0.824]	[0.715]
VIX	0.003	-0.022	0.041	0.044
	[0.019]	[0.023]	[0.037]	[0.035]
Real GDP Growth	0.001	0.095	0.140	0.251**
	[0.096]	[0.163]	[0.083]	[0.103]
Lagged Dependent Variable	0.125*	-0.013	-0.021	-0.107*
	[0.064]	[0.021]	[0.072]	[0.058]
Constant	2.556	1.732	23.619***	28.546***
	[2.373]	[3.126]	[3.667]	[3.383]
Country FE	Yes	Yes	Yes	Yes
Country-specific Time Trend	Yes	Yes	Yes	Yes
Observations	1,368	1,366	1,296	1,296
R-squared	0.719	0.480	0.741	0.834
R-squared (within)	0.064	0.024	0.033	0.030

Robust standard errors in brackets
*** p< 0.01, ** p< 0.05, * p< 0.1

Note. All regressions are estimated via OLS, include country fixed effects and time fixed effects, and double-clustered standard errors by country and time.

D Appendix - List of Global Banks

List of Global Systemically Important Banks (G-SIBs) as of November 2021:

- U.S. (8): JP Morgan Chase, Citigroup, Bank of America, Goldman Sachs, Bank of New York Mellon, Morgan Stanley, State Street, Wells Fargo.
- China (4): Bank of China, China Construction Bank, Industrial and Commercial Bank of China, Agricultural Bank of China.
- France (4): BNP Paribas, Groupe BPCE, Groupe Crédit Agricole, Société Générale.
- U.K. (3): HSBC, Barclays, Standard Chartered.
- Japan (3): Mitsubishi UFJ FG, Mizuho FG, Sumitomo Mitsui FG.
- Canada (2): Royal Bank of Canada, Toronto Dominion.
- Switzerland (2): Credit Suisse, UBS.
- Germany (1): Deutsche Bank.
- Italy (1): UniCredit.
- Netherlands (1): ING Bank.
- Spain (1): Santander.

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