

**WORKING PAPER 04/2020**

**SECTORAL CAPITAL FLOWS: COVARIATES, CO-MOVEMENTS, AND CONTROLS**

**Etienne Lepers**

**and**

**Rogelio Mercado, Jr.**



The South East Asian Central Banks (SEACEN) Research and Training Centre (80416-M)

Kuala Lumpur, Malaysia

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**June 2020**

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# Sectoral Capital Flows: Covariates, Co-movements, and Controls

Etienne Lepers\* and Rogelio Mercado, Jr.†

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## Abstract

This paper assembles a comprehensive sectoral capital flows dataset for 64 advanced and emerging economies from 2000-18, including direct, portfolio, and other investment to and from five sectors: namely, central banks (CB), general government (GG), banks (BKs), non-financial corporates (NFCs) and other financial corporates (OFCs). Using this data, the paper highlights the usefulness of a sectoral approach in assessing capital flow covariates, co-movements, and the effectiveness of capital controls. We show that 1) sectoral flows have varying sensitivities to measures of the global financial cycle and different cyclicalities with respect to output growth; 2) co-movements in intra-sectoral resident and non-resident and co-movements with OFC sectoral flows explain a large part of the observed positive correlation between gross inflows and outflows; and, 3) sector-specific tightening capital control measures appear effective in reducing the volume of flows to NFCs and OFCs.

Keywords: Sectoral Capital Flows, Capital Flows Correlations, Capital Controls

JEL codes: F21, F38, F41, and G20

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\*Economist, Organisation for Economic Co-operation and Development (OECD), [etienne.lepers@oecd.org](mailto:etienne.lepers@oecd.org)  
†Senior Economist, The SEACEN Centre, [rogelio.mercado@seacen.org](mailto:rogelio.mercado@seacen.org). The authors appreciate the comments and suggestions of Winfrid Blaschke and Ole Rummel. The views expressed in this paper are those of the authors alone and do not reflect the official views of the SEACEN Centre, the OECD or any of its member economies.

## 1. Introduction

Capital flows have been studied from various angles, such as determinants or covariates, cyclicity of capital flows, gross flow correlations or co-movements, and the impact of capital account openness.<sup>1</sup> Existing studies have generally focused on aggregate or specific types of flows, highlighting the importance of the composition of capital flows and the importance of differentiating resident and non-resident flows in understanding their determinants and impacts.

One crucial angle of capital flow analysis for which empirical evidence has been scarcer relates to the differences in the cross-border behaviour of the different sectors of an economy. Considering capital flows along sectoral lines reveals sectoral specificities behind observed patterns in capital flows as different sectors may be undertaking different cross-border financial transactions and react differently to shocks. For instance, there is evidence that banking sector flows largely explain the surge and sudden stop before and during the global financial crisis (GFC) of 2008-09 (Milesi-Ferretti and Tille, 2011), as well as the moderate levels of gross flows post-GFC (McCauley et al., 2019; McQuade and Schmitz, 2017) and drive co-movements in debt flows (Avdjiev et al., 2018). In addition, the past decades have seen structural changes in the actors engaged in financial systems: in many countries, the relative importance of non-bank financial institutions has dramatically increased with traditional deposit taking institutions playing a lesser role in financial intermediation (Patalano and Roulet, 2020). In the case of the United States for instance, the assets of non-bank financial institutions have increased from 44% of GDP in 1980 to 155% in 2016, with the ratio of deposit bank assets to non-bank assets decreasing from 142% to 40% in the same period. Large non-financial multinationals and domestic corporates have also integrated more deeply in global and national financial systems, with many of them now engaging in financial intermediation and acting as banks (Bruno and Shin, 2017a; Caballero et al., 2015). These stylized facts highlight both the importance of a sectoral lens and the need for a comprehensive approach to the analysis of financial account dynamics.

Although recent studies on specific sectoral flows extend our understanding of capital flow patterns, it appears important to consider a broader and finer classification of sectoral flows capturing the full financial account to provide a complete sectoral picture of gross capital flows.<sup>2</sup> First, broader and finer sectoral groupings can highlight further sectoral identities and heterogeneities in cross-border investments; and as such allow for greater understanding of potential policy and risks transmissions. For instance, government borrowing may be driven by a different set of factors from those of banking sector borrowing. Likewise, the investment decisions of the banking sector may differ from those of other financial corporations and from those of non-financial corporates. Second, capital flows take various forms including direct, portfolio equity, portfolio debt, loans; and each sector may be active in all such transactions. Focusing on a specific type of investment by specific sectors may miss the complete picture of sectoral gross flows, which should sum

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<sup>1</sup> On covariates using global (push) and domestic (pull) factors, see Calderon and Kubota (Calderón and Kubota, 2013), Calvo et al. (1993), Cavallo and Frankel (2008), Chuhan et al. (1998), Forbes and Warnock (2012), Fratzscher (2012), Ghosh et al. (2014), Li et al. (2018), Mercado and Park (2011), Mercado (2018), Puy (2016), and Reinhart and Reinhart (2008). On cyclicity of capital flows, refer to Kaminsky et al (2004). On correlations, see Avdjiev et al. (2018), Alfaro et al. (2014), Broner et al. (2013), and Davis and van Wincoop (2018). On capital controls, see Ahmed and Zlate (2014), Chamon and Garcia (2016), Forbes et al (2015), Lepers and Mehigan (2019), and Magud and Reinhart (2006).

<sup>2</sup> Several studies have considered the sectoral identities of investment holdings, including Allen (2019), Boermans and Vermeulen (2020), Lane (2015), and Galstyan et al. (2016).

up to total gross flows. For these reasons, capturing a broader set of sectors and all types of investments appears crucial.

This paper aims to revisit capital flow covariates, correlations, and effectiveness of capital controls from such a granular sectoral approach. Unlike previous studies, this paper considers five main sectors of the economy, namely: central bank/monetary authority (CB); general government (GG); banks (BKs); non-financial corporates (NFCs); and other financial corporates (OFCs); and includes direct, portfolio, and other investments by resident and non-residents.<sup>3</sup> Using such detailed breakdown, the empirical analyses considered in this paper are three-fold. First, we examine the global and domestic covariates of sectoral flows to highlight sectoral heterogeneities and understand the cyclicity of sectoral flows in relation to domestic output growth. Second, we evaluate the correlations among resident sectoral flows, among non-resident sectoral flows, as well as between resident and non-resident sectoral flows. This will enable us to assess which sectoral co-movement may explain the observed positive correlation between gross capital inflows and outflows. Finally, we provide the first analysis assessing the effectiveness of capital controls on sectoral flows by classifying capital controls along sectoral lines, i.e., whether they apply to BK, NFC, and OFC sectors. This shift in focus complements the earlier literature on capital control effectiveness given that capital flow surges and sudden stops may be driven by specific dominant sectors.

In undertaking the abovementioned empirical analyses, we proceed as follows. First, we construct a new dataset on sectoral capital flows using the IMF's Balance of Payments Statistics (BPM6) as our primary data source on sectoral flows and expand it by applying sectoral weights taken from various data sources to reported gross flow values. Our final sectoral flow dataset includes 28 advanced economies (AEs) and 36 emerging economies (EMEs) from 2000-18; and covers all types of flows. Such a dataset allows us to assess sectoral flow covariates using push and pull factors, as well as co-movements between sectoral gross inflows and outflows. Next, we construct a sectoral capital controls dataset by reclassifying the Lepers and Mehigan (2019) capital controls dataset across our five sectors of interest. Armed with such an additional dataset, we regress sectoral flows on sectoral capital controls to assess the effectiveness of controls in lowering corresponding sectoral flows.

Our results reveal the value added of a sectoral approach for the understanding of capital flows. First, on sectoral flows covariates, we find that global liquidity moves positively with BK, NFC, and OFC resident and non-resident sectoral flows but not with CB and GG flows. Global risk aversion is significant for resident and non-resident BK flows. Higher domestic output growth is associated with higher resident BK flows, but lower resident OFC flows. On the inflow side, higher domestic output growth is significantly associated with higher all non-resident private sector flows, but with lower non-resident GG flows, suggesting countercyclicality. Our results also emphasize important differences across sectoral flows. For instance, unlike BK and OFC sectoral flows, NFC flows are positively associated with higher global commodity prices but are much less responsive to global risk aversion. These results imply that although sectoral flows may have common drivers, they exhibit varying responses and sensitivities to global and domestic factors that need to be considered.

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<sup>3</sup> Resident sectoral flows refer to the domestic resident sector undertaking net acquisition of foreign assets, while non-resident sectoral flows refer the resident investee or recipient sectors of non-resident flows.

Second, on sectoral flows co-movements, we first find that OFC flows play an important role in driving cross-sectoral correlations among resident and non-resident flows. Second, there is no one sector dominating the positive correlation among gross sectoral inflows and gross sectoral outflows. Third, the positive correlation between gross inflows and outflows appears to be driven by intra-sectoral flows. However, the impact of global risk aversion on these intra-sectoral inflow-outflow correlations varies across sectors, amplifying the correlation for NFC and OFC while mitigating it for BK. Taken together, we provide evidence on the positive co-movement between gross inflows and outflows along sectoral lines, although the significance and strength of the positive co-movement appear heterogeneous across sectors. In addition, our findings highlight the importance of OFC sectoral flows as well as intra-sectoral resident and non-resident flows in driving the positive correlations, again with varying strength and with different sensitivity to global shocks across sectors.

Third, focusing on the emerging market economies sample, we find evidence that tighter capital controls on non-resident flows to NFC and OFC are associated significantly with lower flows to these sectors. This contrasts with existing research, which generally finds no volume effect. We find no strong evidence for banking sector controls as well as for controls on flows from resident sectors. Nonetheless, we find evidence of potential circumvention of tighter controls on resident NFC flows through resident BK and OFC flows.

The contributions of our analyses are thus three-fold. First, considering OFC flows reveals the sector's growing importance on cross-border investments, especially for advanced economies. More importantly, OFC sectoral flows exhibit significant positive co-movement with other sectoral resident and non-resident flows, as well as responsiveness to OFC specific non-resident capital controls for emerging market economies. Second, the inclusion of direct investment (DI) provides a more accurate assessment on the responsiveness of NFC sectoral flows to covariates and sector-specific controls as NFC sector accounts for the largest share of significant cross-border greenfield and mergers and acquisition investments. In addition, the inclusion of direct investment captures the rise of corporate savings in advanced and emerging economies (Chen et al., 2017; Gruber and Kamin, 2016). Third, our analysis on sector-specific capital controls presents a new perspective in assessing the effectiveness of capital flows as well as in imposing targeted controls.

Our results have several theoretical, empirical and policy implications. Theories on the correlation between inflows and outflows must consider that this correlation is mainly driven by intra-sectoral flows, in line with Davis and van Wincoop (2018) and Davis (2015). Regarding empirical implications, sectoral decompositions of direct investment flows must be part of BoP sectoral reporting. Our sectoral dataset is the first to decompose direct investment flows, portfolio, and banking flows into a common sectoral mapping. Applying a common data compilation and reporting standard for all sectors of the financial account balance, including direct investment, will improve our understanding of capital flow dynamics.

Regarding policy implications, this paper highlights the usefulness of a sectoral approach to issues of capital flow management. We show that the effectiveness of capital controls in emerging economies varies depending on the sector in which they are imposed—with controls on NFCs and OFCs appearing more effective than banking sector controls. In addition, the intra-sectoral procyclicality of resident and non-resident flows may exacerbate procyclicality in the domestic banking sector, adding another argument for a



countercyclical approach to prudential policy (Araujo et al., 2017; Lane and McQuade, 2014).

This paper proceeds as follows. In Section 2, we discuss our sectoral capital flows dataset and provide stylised facts. Readers interested in sectoral flows covariates may proceed to Section 3. Those that are interested in sectoral flows co-movements may proceed reading Section 4; while those interested on sectoral controls may proceed to Section 5. Section 6 provides concluding remarks.

## 2. Sectoral Capital Flows Data and Stylised Facts

### 2.1 *Sectoral Capital Flows Dataset*

The primary data source for our sectoral capital flows dataset is the IMF's Balance of Payments Statistics (BoP). The BoP statistics report a sectoral breakdown for portfolio debt; portfolio equity; currency and deposits; loans; trade credits and advances; insurance and pension funds; and, other receipts and payables for resident (assets) and non-resident (liabilities) flows.<sup>4</sup> The reported sectors include central banks/monetary authorities (CB), general government (GG), banks (BKs), non-financial corporations (NFCs), and other financial corporations (OFCs).<sup>5</sup> Reported sectoral breakdowns are based on the residency principle of cross-border financial transactions. For financial account assets, the sectoral classification refers to the resident or source sector undertaking a net acquisition of foreign assets. For financial account liabilities, sectoral classification pertains to the resident investee or recipient sectors of non-resident flows, which represent a net incurrence of liabilities to non-residents.

As the IMF's BoP Statistics reports the sectoral breakdown for portfolio and other investment flows, the lion share of our sectoral breakdown are actual flows data. However, some economies do not report a detailed breakdown of Other Sector flows into NFC and OFC flows for some or all years. In addition, there are years when some countries do not report specific sectoral flows for CB, GG, and/or BKs. In these cases, we attempt to fill in missing values from other data sources or to proxy the value based on weights from stock data.

We start with a few straightforward data filling steps. For cases when data for either CB, GG, BKs, or Other Sector is unreported, we take the difference between total flows and the three reported sectors to come up with the value for the missing sector, similar to Avdjiev et al. (2018). For filling-in the breakdown of Other Sector flows into NFC and OFC sectors for years without a breakdown, we use reported classification for years with available breakdown to determine whether the unclassified values fall into either NFC or OFC. For instance, if a country classifies Other Sector flows into NFC for 2013-2018 but reports Other Sector flows for 2000-12, then the unclassified values from 2000-2012 will be classified under NFC flows. The same method is applied even if there are reported OFC

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<sup>4</sup> See Avdjiev et al. (2014) and Avdjiev et al. (2018) for discussions on sectoral capital flows using BoP Statistics.

<sup>5</sup> Based on Balance of Payments Manual 6, banks (BKs) are deposit-taking corporations except the central bank. Non-financial corporations (NFCs) include non-financial corporations, households, and non-profit institutions. Other financial corporations (OFCs) include money market funds, investment funds, other financial intermediaries, financial auxiliaries, captive financial institutions and money lenders, insurance corporations, and pension funds. For earlier years, BoP statistics group NFC and OFC flows as Other Sector flows. In contrast to Avdjiev et al. (2018), we used reported data for NFCs and OFCs and estimated missing values for these two sectors.

values (whether zero or non-zero) for later years, say from 2015-18, as the values from 2013-14 must be attributed to NFCs. For trade credit and advances, unclassified reported Other Sector flows data are classified under NFCs based on classification of most reporting economies. For insurance and pension flows, unclassified reported Other Sector flows data are classified under OFCs based on classification of most reporting economies.

Next, on data computation, for cases when values for two or more sectors are missing, data are calculated by multiplying the reported total flows by the average sectoral weight(s) of the missing sector(s). Similarly, for years with missing Other Sector breakdown between NFC and OFC sectors, values for either NFCs or OFCs are derived by multiplying the reported Other Sector flows by the average sectoral weight for the missing sector. Values for the remaining missing sector are then computed as the difference between the value for reported Other Sector flows and the computed value for NFC or OFC flows. In both cases, the average sectoral weights are derived as the share of reported sectoral holding to total holdings.

For portfolio flows, the weights are primarily derived from the IMF's International Investment Position (IIP), then the IMF's Coordinated Portfolio Investment Survey (CPIS) where IIP data is not available, and finally from the Bank for International Settlements' (BIS) Locational Banking Statistics (LBS)<sup>6</sup>, in that order. For other investment flows, weights were taken from IIP and then LBS. The use of IIP sectoral breakdown is our preferred data source because it is the stock equivalent of the Financial Account Balance of the BoP Statistics. Among the sources, LBS is used last as the data pertains to banking sector counterparty data only.

Among the different types of capital flows, sectoral breakdowns of direct investment and foreign direct investment are most difficult to compute. Unfortunately, the BoP Statistics does not provide a sectoral breakdown for direct investment flows. However, excluding direct investments would provide an incomplete picture of total gross sectoral flows. Instead of assuming that direct investment flows are all NFC flows, we opt to compute a sectoral breakdown, as other sectors like OFCs and BKs also undertake direct investments. Consequently, we classify sectoral direct investment flows into BKs, NFCs, and OFCs as GG and CB are not expected to undertake direct investments.

The sectoral values for direct investment resident and non-resident flows are calculated based on derived average weights of BK and OFC sectors to total direct investment of an economy. Direct investment weights for BKs and OFCs are derived based on reported stock or flow values on direct investment abroad (assets) and foreign direct investment (liabilities) by economic activity.

For some economies, detailed DI breakdown between BKs and OFCs are reported, in which case the weights for both BKs and OFCs are computed relative to total direct investment abroad and foreign direct investment; while the weights for NFCs are derived as the residual value of shares such that the total of NFC, BK, and OFC shares must sum to one (1). Consequently, NFC sectoral weights refer to the share of all economic activity excluding financial services to total direct investment abroad or foreign direct investment. Data on direct investment abroad and foreign direct investment by economic industry are sourced from the OECD Foreign Direct Investment Database (FDI positions) and national

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<sup>6</sup> See Luna and Hardy (2019) for a discussion on BIS LBS sectoral data.

sources accessed through the CEIC.<sup>7</sup> For the few remaining economies without industry breakdown on financial services for direct investment abroad and foreign direct investment, sectoral weights for BKs and OFCs are computed as the share of financial services to total direct investments multiplied by the respective shares of BKs and OFCs assets to total domestic financial system assets. These shares are derived using their respective asset holdings to total domestic financial system assets as reported by the IMF's Financial System Stability Assessment (FSSA) country reports for available years.

Average sectoral weights are used instead of annual (time-varying) weights to smoothen sharp fluctuations in weights (especially for weights based on flows data such as the case for some of our direct investment flows).<sup>8</sup> In addition, the computed sectoral flows, based on average weights, are interpreted as "expected" sectoral flows, which can be viewed as "*how much a sector is expected to invest or borrow from abroad over time*". "Expected" sectoral flows are a better alternative to "estimated" sectoral flows using time-varying weights, which aim to approximate actual sectoral flows. The practical choice of using average weights is also driven by data constraints. For instance, sectoral holdings data from BIS LBS, which is used for other investment flows, are only available for 2013-2018. For instance, average weights from 2013-18 were used to classify values for NFCs and OFCs for 2000-12. OECD sectoral FDI positions are also patchy for many countries in many of the years. In the case of Indonesia, it reported the IIP sectoral breakdown only for 2018. The sectoral share is then used to derive computed sectoral flows for 2000-17. Although the composition of sectoral financial holdings changes over time, we believe that average weights provide the best option in the context of scarce and uneven annual sectoral data. Consequently, our average weights provide the best available estimate of which of the sectors are "expected" to receive more and less flows.

To complete the dataset, we classify official reserve assets as belonging to CB and other equity flows are assumed to fall under GG as it includes transactions pertaining to quasi-corporations and international institutions. Data on financial derivatives are mostly reported in net asset basis, hence they are excluded from the dataset. All reported zero values are included in the dataset. But for filled-in and computed sectoral flows, missing values are not left blank, i.e., not replaced by zero values.

After compiling sectoral flows for each financial account component, data are then added by sector, yielding total sectoral capital flows which includes all types of investments. Our final sectoral capital flows dataset runs from 2000 to 2018 for over 41 economies for resident sectoral flows and 64 economies for non-resident sectoral flows. The difference between the number of economies for resident and non-resident flows is due to fact that some economies do not have reported breakdowns of direct investment abroad by economic activity. Consequently, these economies are excluded from the sample, yielding only 41 economies for resident sectoral flows.

Our final sectoral capital flows dataset comprises 73% of reported values, 7% of filled-in values, and 20% of computed (expected) values across five sectors and different types of investment flows. Sectoral direct investment flows data account for the largest share of computed values, as such breakdown is not reported in IMF BoP statistics.

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<sup>7</sup> Such data sources classify direct investment by economic activity according to the ISIC classification (International Standard Industrial Classification of All Economic Activities). We map this classification into the BoP sectoral breakdown that we have for portfolio and other flows: namely, banking sector (BK) are activities engaged in monetary intermediation, while non-bank financial corporate (OFC) are those for insurance and pension funds, trust funds, and holding companies.

<sup>8</sup> We average sectoral weights from all available annual data from 2000-18.

## 2.2 Sectoral Flows Stylised Facts

Using our sectoral capital flows dataset, we present several stylised facts. Figures 1 and 2 show sectoral resident and non-resident flows, respectively. Both figures document the dramatic rise and fall of banking sector (BK) flows around the global financial crisis of 2008-09. Moreover, the figures show that the banking sector has not fully recovered in the years that followed, consistent with McCauley et al. (2019) and McQuade and Schmitz (2017). Figure 1 also indicates the growing importance of resident OFC flows. In fact, for 2017-18, resident OFC flows dominate resident flows, outpacing NFCs which have been large in recent years. Nonetheless, NFC flows remain the largest non-resident sectoral flows since 2008. These global trends closely follow those of advanced economies, shown in Figures 3a and 3b, which is not surprising given the volume of AEs cross-border transactions. For emerging economies, resident flows are dominated by BK, NFC, and CB sectors in recent years (Figure 4a).<sup>9</sup> For EM non-resident flows (Figure 4b), non-resident NFC flows are the largest, in line with Avdjiev et al. (2014), followed by non-resident BK flows.

Table 1 presents summary statistics of sectoral flows. For total sectoral flows, both NFC and OFC resident flows register the largest flows of more than US\$25 billion, on average, while NFC and BK sectors have the largest non-resident total flows of more than US\$15 billion, on average. In terms of volatility, BK and OFC flows are the most volatile for total resident flows, while BK sector flows are the most volatile for total non-resident flows. Table 2 shows the period summary statistics. We note the significant reversal of BK and OFC resident and non-resident sectoral flows in the crisis years of 2008-09. But also noted is the resilience of NFC resident and non-resident sectoral flows across periods. Non-resident GG flows jumped from around US\$7 billion, on average, in the period crisis period to around US\$10 billion, on average, in the crisis and post-crisis period, suggesting increasing public sector debt. In terms of volatility, BK sector flow variability has dropped significantly from the pre-crisis years to post-crisis period.

These stylised facts based on our sectoral capital flows data confirm the general patterns of gross capital flows highlighted in past research. BK sector flows account for the huge rise of gross flows pre-GFC; their subsequent drop during GFC; and for the tepid flows post-GFC. NFC flows have been rising, especially in EMEs while GG non-resident flows have also risen. BK sector flows have traditionally been the most volatile, particularly in the pre- and crisis years. What is new in our stylised facts is that these sectoral flows now include all types of capital flows. More importantly, we are the first to document the growing contribution of resident OFC sector flows across all types of flows, which is largely attributed to the advanced economies.

## 3. Sectoral Capital Flows Covariates

### 3.1 Motivation

Capital flows are driven by push and pull factors. Existing studies on capital flows have tested the relevance of these two factors in determining the magnitude and volatilities of capital inflows and their components; the occurrence of sudden stops and surges; the size of capital flows during extreme episodes, and the proportion of variance attributed to each

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<sup>9</sup> Resident sectoral flows for emerging economies exclude Brazil, China, Indonesia, and Russia, which are large emerging economies, due to data unavailability for sectoral direct investment flows.

of these factors.<sup>10</sup> The use of the push and pull framework as an analytical tool in understanding the covariates of capital flows has important policy implications. If push factors are more relevant, policymakers have little control over capital flows and hence, they must rely on domestic financial resilience to counter the adverse consequences of huge and volatile capital inflows. On the other hand, if pull factors are more relevant, policy makers have more levers to influence the size, composition, and volatility of cross-border financial inflows.

Empirical studies provide strong evidence for the relevance of push or global factors such as global or advanced economy output growth, global interest rates, global commodity price levels, global liquidity and global investor risk aversion.<sup>11</sup> More recent papers propose that global factors that drive capital flows relate to financial conditions in advanced economies. Financial conditions in advanced economies impact risk aversion and uncertainty, leading to co-movements in capital flows and asset prices, constituting a global financial cycle (Rey, 2016, 2013). Yet most studies also highlight the importance of pull or domestic factors. Strong output growth, lower macroeconomic risks, trade and financial openness, quality of governance, and financial depth of receiving economies are associated with *larger capital inflows*.<sup>12</sup> Of importance is the significance of domestic growth on gross flows as it suggests cyclicity of capital flows in relation to domestic output. If the domestic growth and capital inflows are pro-cyclical, then this may exacerbate financial fragilities and may lead to financial instability. For instance, strong domestic growth may lead to larger external borrowings of BK and NFC sectors. On the other hand, gross flows and domestic growth may be countercyclical as growth slows, since economic sectors may borrow more abroad, leading to large gross inflows.

This section aims to assess the significance of capital flow covariates, with emphasis on global financial conditions and domestic output growth. However, unlike previous studies, this section considers gross flows from a sectoral angle. Specifically, this section asks: 1) *are sectoral flows responsive to global financial conditions*; and, 2) *are sectoral flows pro-cyclical, counter-cyclical or acyclical to domestic output growth?* Addressing these questions from a sectoral capital flows view relate to the existence of a global financial cycle and implies cyclicity of gross flows. Considering the responsiveness of sectoral resident and non-resident flows, presented in Section 2, to a common set of push and pull covariates allows us to differentiate CB, GG, BK, NFC, and OFC sectors from one another based on their respective sensitivities to common set of covariates. In addition, considering resident and non-resident sectoral flows allows us to assess whether domestic

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<sup>10</sup> Refer to Ahmed and Zlate (2014), Byrne and Fiess (2016), Fratzscher (2012), Mercado and Park (2011), Milesi-Ferretti and Tille (2011), and Wang (2018) on the size or magnitude of capital flows; Calderon and Kubota (2013), Cavallo and Frankel (2008), Forbes and Warnock (2012), and Reinhart and Reinhart (2009) on the occurrence of sudden stops and/or surges; Ghosh et al. (2014), Li et al. (2018) and Mercado (2018) on the occurrence of surges and associated magnitude of capital flows; Calvo et al. (1993) on global factor principal component analysis; and Cerutti et al. (2019), Chuhan et al. (1998), Puy (2016), Sarno et al. (2016), and Shirota (2015) on variance decompositions of global and domestic factors.

<sup>11</sup> Higher global growth is significantly correlated with higher inflows in EMs (Li et al., 2018), while higher global interest rate is strongly associated with lower capital inflows to emerging economies (Byrne and Fiess, 2016; Giordani et al., 2017; Ghosh et al., 2014; Li et al., 2018; and Mercado, 2018). Higher commodity prices tend to increase capital inflows to emerging/developing economies (Byrne and Fiess, 2016; Mercado, 2018; Reinhart and Reinhart, 2008). Higher global risk aversion leads to reversals of inflows, more so during periods of financial stress (Ahmed and Zlate, 2014; Fratzscher, 2012; Ghosh et al., 2014; and Giordani et al., 2017).

<sup>12</sup> Higher domestic growth signifies higher potential profits (Giordani et al., 2017; Mercado and Park, 2011). Lower or stable inflation signals macroeconomic policy stability, while higher domestic interest rate, relative to world or foreign interest rate, relates to higher expected returns (Li et al., 2018). Byrne and Fiess (2016), Ghosh et al. (2014), Mercado and Park (2011) and Mercado (2018) also affirm the importance of trade and financial openness, governance, and financial depth.

and foreign investors respond symmetrically or asymmetrically to a common set of covariates.

### 3.2 Empirical Specification of Sectoral Flow Covariates

To address the questions, we consider a common set of covariates and assess their significance on sectoral capital flows. Specifically, we estimate:

$$CF_{i,j,t} = \alpha + X_t^G \beta' + X_{i,t}^D \gamma' + \varepsilon_{i,j,t} \quad (\text{Equation 1})$$

where CF refers to resident and non-resident sectoral flows of country  $i$ , sector  $j$ , and time  $t$  in percent of nominal GDP.  $X$  pertains to row vector of contemporaneous global (G) and domestic (D) covariates. For global factors, we include global growth, global liquidity, global risk aversion, and global commodity price.<sup>13</sup> These global factors are included in the empirical specification in their contemporaneous values as capital flows respond instantaneously with global covariates (Ghosh et al., 2014; Mercado, 2018). On the other hand, domestic GDP growth is lagged by one year. Equation 1 is estimated with country-fixed effects to account for unobserved heterogeneities, and robust standard errors clustered at country level are used. The estimation involves annual values from 2000-18.

Table 3 presents the summary statistics of resident and non-resident sectoral flows in percent of nominal GDP and global and domestic covariates. The summary statistics for sectoral flows indicate the large volume of NFC flows and volatile BK sector flows, consistent with stylised facts presented in Section 2. Table 3 shows that among covariates, global commodity price is the most volatile variable, while global growth is the least volatile.

### 3.3 Sectoral Flow Covariates Results

Table 4 presents the covariates of resident and non-resident sectoral flows. Several key findings can be noted. For resident flows, higher global liquidity is positively associated with private sector flows (BK, NFC, and OFC), while higher global risk aversion is negatively associated with BK and OFC sector flows. These confirm that private sectoral flows are highly responsive to global financial cycle conditions. Domestic GDP growth is procyclical with resident BK flows but countercyclical with resident OFC flows. The latter result is consistent with the theory given that stronger domestic growth should encourage investment, pension, and insurance funds to invest more in the domestic market.

For non-resident flows, higher global liquidity positively covary with private sector flows (BK, NFC, and OFC), while higher global risk aversion is only negatively associated with BK sector flows. Domestic GDP growth is procyclical with non-resident private sector flows (BK, NFC, and OFC) but countercyclical with non-resident GG flows, consistent with Alfaro et al. (2014).

The results in Table 4 also highlight differences in responsiveness of sectors to common covariates. For resident flows, although BK and OFC sectors are sensitive to global financial conditions, they have varying sensitivities to global growth and commodity

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<sup>13</sup> Global GDP growth and domestic GDP growth are year-on-year change in percentage terms. Global liquidity, global risk aversion, and global commodity price are indices. We run sensitivity tests using growth rates for global liquidity and global commodity price. Refer to Appendix 2 for data definitions and sources.

prices. Moreover, both sectors differ in their cyclicalities with respect to domestic output growth. Non-resident flows to BK and NFC sectors respond in the opposite way to global commodity prices, and the NFC sector is much less sensitive to global growth and global risk aversion. In addition, unlike OFCs and BKs, resident and non-resident NFC flows are positively linked to global commodity prices; but they are less sensitive to global risk aversion. These results imply differences across private sector flows. Moreover, resident OFCs reduce investment abroad when domestic growth increases, while non-resident flows to OFCs increase when domestic growth increases.

These findings hold in several sensitivity tests, including 1) removing country fixed-effects; 2) using lagged global covariates; 3) using unclustered robust standard errors; 4) including domestic governance, financial depth and financial openness measures; 5) using pooled regression with additional domestic covariates; 6) winsorising resident and non-resident sectoral flows at the top and bottom 10%; 7) using G7 growth instead of global growth; 8) using global commodity inflation instead of price level; 9) using global liquidity growth instead of level; 10) including global interest rate as global covariate; and, 11) adding the domestic macroeconomic volatility measure.<sup>14</sup>

Aside from the baseline results and sensitivity tests, several extensions are conducted. First, considering net sectoral flows, private sector net flows (BK, NFC, and OFC) are countercyclical with domestic growth, suggesting that when domestic growth is robust, the private sector incurs more foreign liabilities than they acquire foreign assets (Table 5).<sup>15</sup> In contrast, public sector net flows are procyclical as the GG sector incurs less foreign liabilities when domestic growth is strong. Second, splitting the sample into advanced and emerging economies reveals the baseline results are driven by advanced economies (Table 6). For emerging economies, few covariates are significant (Table 7). But when winsorised sectoral flows data are used, emerging economies' private non-resident flows (BK, NFC, and OFC) are responsive to global financial conditions, while BK and OFC non-resident flows are procyclical with domestic GDP growth whereas GG non-resident flows are countercyclical. Lastly, we split the sample into equity and debt flows, where equity flows include direct and portfolio equity, and debt flows are portfolio debt and loans. For equity flows, higher global liquidity is positively associated with higher private sector resident and non-resident sectoral flows, while some sectors are responsive to global risk aversion (Table 8). For debt flows, resident and non-resident private sector flows are responsive to global liquidity conditions, but less so for global risk aversion (Table 9). For non-resident debt flows, there is a clear distinction between private and public sector cyclicalities with domestic GDP growth. These results broadly hold 1) using unclustered robust standard errors; 2) using pooled OLS regression; and, 3) using winsorised sectoral flows data.<sup>16</sup>

*In summary, this section illustrates resident and non-resident sector flow heterogeneities in responses to global and domestic covariates. The results show private sector sensitivity to global financial conditions; and non-resident private sector procyclicality with domestic growth. In addition, non-resident government flows are countercyclical with domestic growth. These findings are broadly consistent with past research. Our findings nonetheless underscore important differences between the five sectors: for instance,*

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<sup>14</sup> Macroeconomic volatility is defined as five-year moving standard deviation of domestic inflation rate. The results of these sensitivity tests are presented in Tables S1 to S11 in the supplementary material.

<sup>15</sup> Net sectoral flows are computed as resident sectoral flows minus non-resident sectoral flows.

<sup>16</sup> Tables S12 to S26 present the sensitivity tests for the extensions presented in Tables 5 to 9.

*resident and non-resident OFC flows, unlike other private sectors, display opposite sensitivities to domestic output growth as would be expected by the theory.*

## 4. Sectoral Flows Co-movements

### 4.1 *Theoretical and Empirical Motivation*

While the previous section discussed the global and domestic drivers of resident and non-resident flows, this section seeks to analyse co-movements in sectoral flows. Real business cycle models predict that higher productivity raises expected returns, leading to higher non-resident inflows but lower resident outflows. Under the same framework, higher perceived riskiness of domestic asset returns leads to a decline in non-resident inflows but an increase in gross outflows. Hence, resident and non-resident gross capital flows are expected to be negatively correlated. But existing studies show an increasingly positive correlation between resident and non-resident flows (Broner et al., 2013). This raises a puzzle to which more recent theoretical and empirical work have tried to provide answers.<sup>17</sup> The positive correlation between gross inflows and outflows may raise concerns as it can reinforce global imbalances, especially if they are attributed to financial frictions and asymmetries between economies (Broner et al., 2013; Milesi-Ferretti and Tille, 2011; Tille and van Wincoop, 2010).<sup>18</sup>

While most studies on the correlation between gross inflows and gross outflows focus on aggregate flows data, several recent papers have analysed these correlations through a sectoral lens. Davis and van Wincoop (2018) suggest that when capital inflows lead to an accumulation of official reserves, this may be combined with official reserve outflows, thereby reinforcing a positive correlation, especially for emerging economies. Davis (2015) proposes that the positive correlation may be driven by bank liquidity management where banks reduce their outward investment to manage liquidity shortfalls when faced with lower non-resident inflows. Using sectoral debt flow data, Avdjiev et al. (2018) find that, while a positive correlation is seen for all cross-sector combinations, the size of the correlation for banking sector flows is by far the most important, particularly in advanced economies.

A second perspective aside from gross inflows and outflows correlations, concerns cross-sectoral correlations of gross flows. For instance, Alfaro et al. (2014) highlight that GG flows behave countercyclically with other sectoral flows. Using a more restricted sectoral flow dataset and focusing on loan inflows, Cerutti and Hong (2018) find that there has been a substitution of bank loans for portfolio debt for NFCs in AEs and GG in EMEs and AEs, while bank loans and portfolio debt flows have been complementary for NFCs in EMEs. Avdjiev et al. (2018) find a negative correlation between inflows to BK and GG, and a positive correlation between inflows to BK and NFCs. They also find symmetrical dynamics for outflows.

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<sup>17</sup> Broner et al. (2013) emphasize that the positive correlation between capital inflows and outflows may be attributed to asymmetries between economies. Tille and Van Wincoop (2010) develop a model which shows capital inflows and outflows are positively correlated due to different optimal hedging of resident and non-resident investors against inflation or future expected returns or non-asset income. Davis and van Wincoop (2018) provide empirical evidence on the role of financial globalisation in explaining observed positive correlation.

<sup>18</sup> Hnatkovska (2010) and Tille and van Wincoop (2010) argue that positive correlation may arise from productivity shocks even without financial frictions.



This section contributes to both strands of literature by considering cross-sectoral correlations or co-movements for each gross flow, and sectoral correlations between resident and non-resident flows. Specifically, it asks two questions. *First, which sectoral flows correlate significantly with other sectoral flows? Second, do resident and non-resident sectoral flows exhibit positive correlation and through which sectors?* These questions have been addressed by the abovementioned studies (Avdjiev et al., 2018; Broner et al., 2013; Cerutti and Hee Hong, 2018). But, unlike these papers, the empirical analysis in this section casts a wider scope. First, five sectors are considered, namely: CB, GG, BK, NFC, and OFC, to clearly differentiate correlations between main economic sectors. Second, we cover the full financial account while other empirical studies have only studied specific types of investments.<sup>19</sup> Third, we provide empirical tests of some of the channels which drive the underlying correlations.

#### 4.2 Empirical Specification of Sectoral Flows Co-movement

To address the questions in this section, we proceed in two steps. First, we consider cross-sectoral correlations of resident and non-resident flows, and second, we focus on sectoral correlations between resident and non-resident sectoral flows. We estimate the contemporaneous conditional correlations based on the following equation:

$$CF_{i,j,t} = \alpha + X_t^G \beta' + X_{i,t}^D \gamma' + SCF_{i,j,t} \delta' + \varepsilon_{i,j,t} \quad (\text{Equation 2})$$

where CF refers to sectoral flows of country  $i$ , sector  $j$ , and time  $t$  in percent of nominal GDP.  $X$  pertains to the row vector of contemporaneous global (G) and domestic (D) covariates as discussed in Section 3. SCF is the row vector of other sectoral flows of country  $i$  at time  $t$ . To address the first question, we include other sectoral resident (non-resident) flows in the estimation, respectively. The sign and significance of the estimated coefficients will imply the cross-sectoral correlations. For the second question, we regress resident (non-resident) sectoral flows on non-resident (resident) sectoral flows. If the estimated coefficients are positive and significant, then we confirm which sectors may explain positive correlations between gross non-resident and resident flows.

The estimated coefficients for Equation 2 thus pertain to conditional correlations. They are conditional on given values of global and domestic factors as well as other sectoral flows. Using simple pairwise correlations may overestimate the magnitude and significance of conditional correlations. Hence, the inclusion of other sectoral flows in the conditional correlations is warranted. The estimation involves annual values from 2000-18; and robust standard errors clustered at the country level are used.

#### 4.3 Sectoral Flows Cross-Correlations

Results are displayed in the first and second panels of Table 10, showing the estimated coefficients across sectoral flows and not the full regression output to save space. Several findings are noted: First, on the outflow side, flows from resident BKs are positively associated with higher flows from OFCs. Second, on the inflow side, the correlations are highest between BK and OFC non-resident flows, and NFC and OFC non-resident flows. These correlations suggest the important contribution of OFC flows in driving cross-sectoral correlations for resident and non-resident flows which contrasts with previous

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<sup>19</sup> We extend our empirical analysis by considering equity and debt sectoral correlations separately with the aim of contrasting our results with previous papers.

findings showing the dominance of BK flows. In addition, all non-resident sectoral flows significantly co-move with BK and NFC flows, suggesting that no one sector dominates intra-sectoral correlations for non-resident flows. Third, the negative correlation between BK flows and CB and GG flows confirms Alfaro et al. (2014) finding that sovereign flows tend to be countercyclical with other sectoral flows. However, this negative correlation is not common to all private sector flows but only for the BK sector.

Digging deeper into these co-movements by splitting the sample into advanced and emerging economies reveals heterogeneities of observed patterns along country income groups.<sup>20</sup> The strong positive cross-sectoral correlations between OFC and BK flows hold for resident and non-resident flows in AEs. For EMEs, the positive correlation between OFC and BK flows holds only for non-resident flows. The negative correlation between BK and CB flows only holds for AEs and not EMEs.

Finally, we split sectoral flows along debt and equity lines, with a focus on private sector flow co-movements for data availability reasons, thus precluding the estimations of some regressions using public sector flows.<sup>21</sup> Overall, private sector flows co-movements are stronger for equity flows than debt flows. On the other hand, the importance of OFC flows in driving non-resident flow co-movements is significantly stronger for debt flows.

#### 4.4 Resident and Non-Resident Sectoral Flow Correlations

Turning to the sectoral correlations between resident and non-resident flows reported in the third and fourth panels of Table 10, we note several findings. First, same sector resident and non-resident flows are significantly and positively correlated. This observation is true for all sectors, including CB and GG. It implies that intra-sectoral flows are an important driver of the positive correlation between gross inflows and outflows, consistent with Davis and van Wincoop (2018) on CB flows and Davis (2015) on BK sector flows. Second, resident NFC and OFC sectoral flows positively co-move with non-resident NFC and OFC flows and conversely. Non-resident BK and OFC flows positively co-move with resident BK and OFC flows. Interestingly, resident and non-resident NFC and BK flows do not display significant co-movements. Thus, the OFC sector appears crucial in driving co-movements in private sector resident and non-resident flows.

The positive sectoral correlations between sectoral gross inflows and outflows hold in both the advanced and emerging economies split.<sup>22</sup> The results imply that although shocks, financial frictions, and asymmetries may explain the observed positive correlations in both country groups, the sources of those determinants may differ, although both groups may face similar challenges. Going deeper by distinguishing equity and debt flows, it is equity flows and in particular OFC equity flows which seem to be driving these private sector co-movements.<sup>23</sup> Intra-sectoral resident and non-resident co-movements are generally confirmed for both equity and debt flows, with the exception of the NFC sector, where debt flows do not co-move.

*Taken together, the observed positive correlation between gross inflows and outflows is mainly driven by 1) intra-sectoral flows; 2) OFC flows co-movements with other private sectors; and, 3) equity flows.*

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<sup>20</sup> The results are presented in the first and second panels of Tables S27 and S28 in the supplementary results.

<sup>21</sup> The results are presented in Table S29 in the supplementary results.

<sup>22</sup> The results are presented in the third and fourth panels of Tables S27 and S28 in the supplementary results.

<sup>23</sup> The results are presented in Table S29 in the supplementary results.

#### 4.5 Global Factors and Correlations of Sectoral Resident and Non-Resident Flows

Finally, we extend the analysis on resident and non-resident sectoral flows correlations by testing the role of global factors, in particular global risk aversion proxied by the VIX, in driving such co-movements. Towards this aim, in addition to controlling for changes in the VIX as a separate regressor, we include interaction between our sectoral flow variables and the VIX. We plot in Figures 5a-5e the marginal effects of sectoral flow X on sectoral flow Y conditional on the level of the VIX.<sup>24</sup> To save space, we only display significant interaction terms and focus on the most significant patterns raised above.

First, the VIX has a significant impact on intra-sectoral resident and non-resident co-movements, but its impact is heterogenous across sectors, highlighting the importance of analysing capital flows patterns by sectors. Higher risk aversion increases the intra-sectoral correlations of both OFC and NFC flows, suggesting that as the VIX increases the intra-sectoral correlations between OFC and NFC resident and non-resident flows increases (Figures 5a and 5b). In contrast, higher risk aversion decreases the intra-sectoral correlations of resident and non-resident BK flows (Figure 5c). Second, higher global risk aversion significantly affects other resident and non-resident sectoral correlations. Higher risk aversion increases the correlation between resident BK flows and non-resident GG flows; and lower correlation between non-resident BK flows and resident NFC flows, even turning negative at some point (Figures 5d and 5e).

*In this section, we provide additional evidence on the positive co-movement between gross inflows and outflows along sectoral lines, although the significance and strength of the positive co-movement appear heterogenous across sectors, country income groups, and equity and debt splits. Unlike in previous studies, this section highlights the contribution of OFC sectoral flows as well as intra-sectoral resident and non-resident flows in driving the positive correlations. Finally, we point to the role of global risk aversion in driving these correlations and highlight heterogeneous sectoral behaviour to higher level of risk aversion.*

### 5. Sectoral Flows and Capital Controls

#### 5.1 Empirical Motivation

A third research area where our sectoral approach may provide new insights is on capital controls and their effectiveness. The effectiveness of capital controls or capital flow management measures remains an unsettled question despite decades of empirical work. The literature traditionally finds that capital controls have no impact on the volume of inflows but may affect the composition of inflows, e.g., shift inflows from short-term towards longer maturity instruments. More recent work using new methodologies and more refined capital controls data still finds no impact on capital flows (Forbes et al., 2015) or at best a temporary one (Baba and Kokenyne, 2011; Pasricha et al., 2018). Some works find limited impact on a cumulative basis and in the specific post-GFC period (Ahmed and Zlate, 2014). The recent literature has thus shifted to an assessment of the impact of capital controls on other variables than flows, notably in the context of a broader discussion on the prudential role of controls.<sup>25</sup> On the other hand, empirical evidence on

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<sup>24</sup> We present the marginal plots instead of the regression results, as the interaction terms are both continuous variables. Hence, the marginal analysis is more relevant in the discussion of results.

<sup>25</sup> The findings in this literature are also mixed. Forbes et al. (2015) find no impact of capital controls on exchange rate, inflation, equity indices, different volatilities, and interest rate differential, while Ostry et al.

capital controls for outflows remain sparse and also point to limited effectiveness with the exception of Malaysia (Magud and Reinhart, 2006) or when supported by strong fundamentals and institutions, and if existing restrictions are already comprehensive (Saborowski et al., 2014).

In this section, we complement recent work attempting to disaggregate capital flows and capital controls to yield more targeted results (Lepers and Mehigan, 2019). Specifically, we extend the analysis by looking into the effectiveness of tighter sectoral controls in reducing sectoral flows. A shift to a sectoral approach is neither obvious nor trivial. After all, controls are usually applied to specific transactions rather than specific sectors. Hence, all capital controls classifications to date have taken, if any, an instrument-based approach (Fernández et al., 2015; Lepers and Mehigan, 2019; Pasricha et al., 2018). But a more detailed look at controls themselves reveal the usefulness of a sectoral approach.

First, perhaps most clear-cut is the case of outward controls on domestic financial institutions, where the sector and not the transaction is the prime feature of the control. In many countries, banks, insurers, pension funds, and investment funds are subject to dedicated limits on their foreign assets as percentage of their equity or technical reserves in the case of insurers and pension funds. These institutions are engaged in different business activities and are usually supervised by different regulators, which explain to a large extent the existence of sector-specific controls. Horizontal limits on the foreign assets of banks have, however, become less common. For instance, no OECD country currently maintains such limits (OECD, 2019a). Limits on foreign assets of insurers were also dismantled in many countries, as most regulators and supervisors decided to move to risk-based rather than residency-based approaches (OECD, 2015). This is notably the case under the Solvency II framework of the European Union. Limits on pension fund investments abroad are more frequent, although gradually reduced in many countries, as highlighted by the OECD annual survey on investment regulation of pension funds (OECD, 2019b). The problem of classifying such controls in traditional instrument-based approaches is that these controls are horizontal, applying in most cases to all foreign assets of a particular type of institution. This concern is recognized by the IMF's AREAER, which dedicates a separate section to such controls (XII. Provisions Specific to the Financial Sector), and which most capital control datasets decide not to include. As these represent the bulk of outward controls, a sectoral approach thus appears appropriate.

Second, another straightforward application of a sector classification on the inflow side concerns FDI and equity. FDI restrictions are largely sectoral by nature, such that foreigners are allowed to invest in certain sectors but not in others, or under certain equity limits, as shown for instance in the OECD FDI Restrictiveness Index, which provides a split along 22 economic sectors. But other controls also lend themselves naturally to a sectoral classification. Many controls apply to natural persons, some controls are specific to the banking sector in the case of credit intermediation, while many other controls, such as on external borrowing, are also specific to certain types of corporates <sup>26</sup>. For these

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(2012) find that controls are associated with lower share of FX lending and lower share of portfolio debt in external liabilities. Pasricha et al. (2018) show that controls lead to increased monetary policy autonomy. In the specific case of Brazil, Chamon and Garcia (2016) find that the controls generally had some impact on the spread between onshore and offshore dollar interest rates but no significant effect on exchange rate appreciation. Alfaro et al. (2014) use firm level data point to the negative microeconomic impact of controls such as harder access to funding for firms that depend on external finance, typically for small and medium sized firms.

<sup>26</sup> To name a few examples: India increased at several occasion quantitative limits on foreign borrowing ("ECB" program: External Commercial Borrowing) by specific sectors (e.g. infrastructure, manufacturing etc). South Africa allowed in 2014 subject to authorisation primary listing abroad and foreign borrowing for

reasons, considering the effectiveness of sector-specific capital controls on sectoral flows is warranted.

Therefore, this section looks at the impact of controls imposed on a given sector on corresponding resident and non-resident sectoral flows. We expect that the more restrictions are imposed on a sector, the lower the volume of gross sectoral flows. This research question is relevant for emerging economies as capital controls may, in certain cases, be found useful in addressing capital flow surges and sudden stops. Hence, the focus of our analysis is on emerging economies; and on tightening measures, as opposed to easing or liberalising restrictions, as we contribute to the literature on the effectiveness of different tools in mitigating extreme episodes of capital flows, like surges and sudden stops. We also limit our focus to BK, NFC, and OFC sectors as these sectors are those that are most likely affected by capital control measures.

## 5.2 Sectoral CFMs and Stylised Facts

Datasets on capital controls have evolved significantly and improved in recent years. While initial datasets were aggregate indices based on a small set of binary dummies (Chinn and Ito, 2006) or later on the absence or presence of controls per instrument (Fernández et al., 2015), recent efforts have sought to move beyond indices based on the presence/absence of restrictions to capture both the extensive and intensive margins of controls, i.e., the introduction and removal of restrictions and the tightening or easing of existing measures (Lepers and Mehigan, 2019; Pasricha et al., 2018). These datasets capture the dynamic aspect of capital account liberalisation while accounting for the intensity of measures.

The dataset of Lepers and Mehigan (2019) provides the most comprehensive data on capital control adjustments with over 2,300 adjustments for a set of 51 economies since 1999. The data is mainly sourced from the yearly changes in restrictions of the IMF's AREAER reports.<sup>27</sup> It is then complemented with additional sources, notably public and internal OECD reports in the context of the *OECD Capital Movements Code* mapping restrictions on cross-border transactions for the Code's adherents, as well as data from the *OECD Survey on Investment Regulations of Pension Funds* and similar surveys covering the insurance sector. The textual description of the policy change is then transformed into numerical format and classified at a granular level—by inflow/outflow and by asset category.

We use this dataset as a starting point and reclassify each of the policy adjustment along sectoral lines, i.e., whether they apply to the BK, NFC or OFC sector or a combination thereof. To match our flow data, we make the classification based on the resident sector, i.e., the investor sector for outflow controls and investee sector for inflow controls.<sup>28</sup> The resulting capital controls dataset is available at daily frequency and aggregated at annual

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technology, media, telecommunication companies. Indonesia required in 2015 that nonbank corporates which borrow abroad hedge 25% of their net offshore liabilities through domestic banks. Slovenia in 1999 restricted the purchase abroad of certain shares by residents other than banks, investment funds and insurance companies.

<sup>27</sup> More specifically, the dataset includes restrictions specified in “Section XI: Capital Transactions” of the IMF AREAER reports which provide qualitative information on every policy change classified by the type of investments affected, including capital and money market instruments, derivatives, credit operations, direct investment, as well as “Section XII: Provisions Specific to the Financial Sector” which details restrictions specific to a type of financial institution – banks, pension funds, insurance, and funds.

<sup>28</sup> All coding rules are discussed in Appendix 3.

frequency. The number of capital control adjustments is summed up in each year within each sectoral control category for each country. The final annual sectoral capital controls dataset pertains to the count values of capital control adjustments.

Table 11 presents the number of capital control adjustments broken down by sectors and key instrument for all economies included in our capital controls dataset.<sup>29</sup> While the number of BK and NFC controls for resident and non-resident flows appear to be in the same range, controls on resident OFC portfolio equity, portfolio debt and collective investment security are larger. Controls on direct investment are less frequent, while credit controls are (unsurprisingly) applied more to the BK sector. Figures 6a and 6b plot yearly adjustments in non-resident and resident sectoral capital controls, from 2000 onwards; while Figures 7a and 7b plot the cumulative adjustment in capital controls from 2000 onwards for resident and non-residents, respectively.

Several interesting patterns stand out. First, the figures capture the well-known continuous trend of capital account liberalisation in most countries over the last two decades. For controls on resident flows, the OFC sector has clearly been most liberalised, reflecting the dismantling, described above, of limits on foreign assets by insurers and pension funds. For controls on non-resident flows, the NFC sector has seen more liberalisation. Overall, restrictions on banks have been liberalised relatively less, partly due to higher initial openness in 2000. Second, the cumulative measures indicate a temporary stagnation, post-GFC, of the liberalisation of resident flows and a temporary reversal of the liberalisation of non-resident flows. Controls on non-resident flows have been used in the post-GFC period in the context of surges in emerging economies that experienced surges. Controls on resident flows were reintroduced slightly later in 2011-15, in response to deepening financial turbulence in certain countries like Greece and Iceland. From a sectoral perspective, controls on non-resident flows mostly targeted BKs, and to some extent NFCs, while controls on resident flows mostly applied to OFCs and NFCs.

### 5.3 Empirical Specification

To test the effectiveness of capital controls from a sectoral perspective, we add to our baseline specification (Equation 1) a policy variable capturing the changes in sectoral capital controls in country  $i$  in year  $t$ . We run different regressions by matching sector-specific flows with their corresponding sector-specific controls. For instance, we regress BK non-resident flows on BK non-resident controls. Specifically, we estimate:

$$CF_{i,j,t} = \alpha + X_t^G \beta' + X_{i,t-1}^D \gamma' + \delta Controls_{i,j,t-1} + \varepsilon_{i,j,t} \quad (\text{Equation 3})$$

where CF refers to sectoral resident and non-resident flows of country  $i$ , sector  $j$ , and time  $t$  in percent of nominal GDP.  $X$  pertains to the row vector of global (G) and domestic (D) covariates, where domestic factors are lagged while global factors are included in their contemporaneous values. CONTROLS are sector  $j$  specific controls for resident and non-resident flows of country  $i$  at time  $t-1$ . They are count variables reflecting the introduction of new restrictions or the tightening of existing ones imposed on a given sector each year. The specification involves annual values from 2000-18 and includes country fixed-effects. Robust standard errors clustered at the country level are again used.

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<sup>29</sup> We present stylised facts for the complete sample of advanced and emerging economies in our capital controls dataset to show global sectoral trends. But the empirical analysis is focused on emerging economies.

The sample includes 23 emerging economies for non-resident flows and 11 emerging economies for resident flows.<sup>30</sup> We narrow our focus to emerging markets as these economies are more likely to struggle with volatile capital flows and resort more to the use of capital controls. As previously mentioned, we only consider here the introduction or tightening of sector-specific capital controls.<sup>31</sup> Consequently, Equation 3 assesses the effectiveness of tightening actions in reducing sectoral flows and not on the more structural trend of capital account liberalisation.

We lag our capital controls variable for several reasons. First, lagged regressors limit potential endogeneity issues where capital controls are tightened in reaction to large capital flows. Second, capital flows are expected to react with a lag following policy implementation. Third, most of the tightening adjustments happen in the first half of the year, giving additional motivation to lag the capital controls variable.<sup>32</sup>

#### 5.4 Results, Sensitivity Tests, and Extensions

Tables 12 and 13 present the results on the effectiveness of sector-specific capital controls on sectoral non-resident and resident flows, respectively. We present only the estimated coefficients and standard errors of corresponding sector-specific capital controls for BK, NFC, and OFC sectoral flows to save space.<sup>33</sup> Two key results stand out. First, controls on inflows to NFCs are associated with lower non-resident flows to NFCs, a result that is statistically significant at the 5% level. Second, controls on inflows to OFCs are also associated with lower non-resident flows to OFC, albeit of smaller magnitude and statistically significant at the 10% level. These results are notable in relation to the earlier literature which usually does not find a significant impact of capital controls in reducing the magnitude of non-resident flows. This suggests the importance of considering the sectoral dimension in assessing the effectiveness of capital controls to complement the use of an instrument-approach. The impact of controls on inflows to BKs, on the other hand, is negative but statistically insignificant. Table 13 shows that tighter restrictions on resident flows are largely ineffective in lowering corresponding sectoral resident flows, at least in this setting.

These baseline results are robust to a wide battery of sensitivity tests. For non-resident flows presented in Table 12, the findings hold 1) when winsorised sectoral flows data are used; 2) when country fixed effects are removed; and, 3) when unclustered robust standard errors are used.<sup>34</sup> The results are robust to the addition of contemporaneous controls to test the potential impact on capital flows within the same year when the controls are

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<sup>30</sup> The sample for non-resident sectoral flows includes 23 emerging economies, namely: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Croatia, Hungary, India, Indonesia, Malaysia, Mexico, Peru, Philippines, Poland, Romania, Russia, Serbia, South Africa, Thailand, Turkey, Ukraine, and Uruguay. For resident sectoral flows, 11 emerging economies are included, namely: Bulgaria, Chile, Colombia, Croatia, Hungary, India, Malaysia, Poland, Thailand, Turkey, and Ukraine.

<sup>31</sup> This is warranted by the fact that we are interested in the effectiveness of different tools in mitigating extreme episodes of capital flows, but also from an empirical point of view because easing and tightening adjustments may be expected to have an offsetting impact on sectoral flows.

<sup>32</sup> Other empirical studies using quarterly data consider the impact of controls over a four-quarter period. We conduct a sensitivity test to include implemented capital controls in the same year to test whether they compact capital flows quickly.

<sup>33</sup> Tables S30 to S37 in the supplementary material report the complete estimation results for non-resident sectoral flows, while Tables S38 to S45 present the results for resident sectoral flows.

<sup>34</sup> Sectoral flows data are winsorised at the top and bottom 10% of the sample.

introduced. But there is evidence of a negative impact of lagged NFC controls on contemporaneous NFC flows.

While the use of a lag structure should mitigate endogeneity and potential simultaneity bias involving capital flows and capital control tightening, it may not fully address it. To address this concern, we follow Ahnert et al. (2018), Auerbach and Gorodnichenko (2013) and Furceri et al. (2018) who estimated “exogenous” policy shocks, thereby removing the potential for endogenous adjustments. We adopt their approach by running a two-stage regression framework. In the first stage, we estimate the likelihood of adjusting capital controls from a range of variables, notably capital flows themselves and our baseline regressors. In the second stage, we re-run our baseline model but by replacing the capital control variable with the residuals obtained from the first stage (i.e., the variation of the policy changes that is not explained by macro-financial variables). The baseline results again hold.

Next, we test an alternative sector-specific capital controls aggregation method to avoid putting too much emphasis on economies that frequently tighten controls but by a small margin. To this aim, the sector-specific control variables are transformed into a binary dummy variable taking the value of 1 if there was tightening of controls and 0 otherwise. While our results on OFC hold and are of much stronger in magnitude, the results for non-resident NFC flows lose statistical significance, albeit with the correct sign. Finally, we control for simultaneous adjustment of different sectoral controls within the same year. This will test whether the sectoral results are driven by simultaneous restrictions in other sectors, which may indirectly impact sector specific flows. Again, NFC sectoral controls lose significance while the OFC controls result holds.

Table 13 presents the same results for resident sectoral flows and resident sector-specific controls. The results are almost all insignificant with conflicting signs. The results may be attributed to the fact that tightening resident outward flows has rarely been used by the 11 emerging economies in the sample. Nonetheless, we find a negative and significant result on resident OFC flows from the tightening of OFC controls within the same year.

Finally, we extend our analysis by considering potential circumvention from capital controls through a sectoral approach. Recent efforts have highlighted geographic and asset spillovers from capital controls. From a lender/investor perspective, investors reallocate lending and investment portfolios to countries that are economically similar or to neighbouring economies (Forbes et al., 2016; Giordani et al., 2017; Gori et al., 2020; Pasricha et al., 2018). But from a domestic perspective, there may also be asset spillovers whereby controls on specific transactions may lead to the build-up of vulnerabilities through other transactions not covered by the control.

For analysing domestic circumvention, a sectoral approach may prove particularly suitable. Recent work on macroprudential policies demonstrate that a macroprudential policy that typically targets banks, shifts the risk to other sectors like shadow banks or foreign bank branches filling in the credit gap (Aiyar et al., 2012) or with NFCs taking on additional currency risks (Ahnert et al., 2018). Other studies show that capital controls are evaded through the operations of multinational affiliates raising money offshore and lending it back to the parent as disguised FDI (Bruno and Shin, 2017b; Caballero et al., 2015).<sup>35</sup>

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<sup>35</sup> This in turn has productivity implications as NFCs may engage in carry trade rather than investing.



To test the circumvention of capital controls through sectoral shifts, we tweak our baseline estimates by regressing NFC+OFC flows on BK controls, BK+OFC flows on NFC controls, and NFC+BK flows on OFC controls. The capital control variables are this time sector specific controls, dropping controls applying simultaneously to other sectors. The estimates for resident and non-resident flows are presented in Tables 14 and 15, respectively. The results provide no evidence of any circumvention through an increase in flows to other sectors when controls on non-resident flows are tightened. In contrast, tighter controls on resident NFC flows are associated with a strong and significant increase in resident financial sector outflows, pointing to potential circumvention through resident BK and OFC flows.<sup>36</sup>

*In summary, this section provides new evidence that tighter capital controls on non-resident flows to NFC and OFC sectors are significantly associated with lower NFC and OFC non-resident sectoral flows. We find no conclusive evidence for BK non-resident controls as well as for resident sector-specific controls. Nonetheless, we find evidence of potential circumvention of tighter controls on resident NFC flows through resident BK and OFC flows.*

## 6. Concluding Remarks

This paper seeks to revisit and deepen the study of capital flow covariates, co-movements, and effectiveness of capital controls by adopting a sectoral approach to these questions. To this aim, we assemble a unique dataset of sectoral capital flows for 64 advanced and emerging economies, from 2000-18, including direct, portfolio, and other investment to and from five sectors: namely, central banks (CB), general government (GG), banks (BKs), non-financial corporates (NFCs) and other financial corporates (OFCs). Secondly, we construct a sectoral capital controls dataset classifying adjustments in capital controls along the five sectors studied over the same time period.

Armed with data, we show that: First, while global financial cycles and domestic output growth generally drive private sector flows, there are notable differences in the way certain sectoral flows respond to these variables. Second, intra-sectoral co-movement and movements in OFC sectoral flows explain a large part of the observed positive correlation between gross inflows and outflows found in previous studies. Third, the introduction or tightening of capital controls applied to NFCs and OFCs appear effective in reducing the volume of flows to these sectors. Our results are robust to several sensitivity tests and extensions. Our findings highlight the usefulness of a sectoral approach for the understanding of capital flows and raise several implications for researchers and policymakers. Research on capital flow covariates and co-movements must consider potentially divergent sectoral behaviour of sectors. As for policy, we show that the effectiveness of capital controls may depend on the sector on which they are imposed and that a sectoral lens may also help understand regulatory circumvention.

This paper provides many avenues for future research. On the data side, the underlying sectoral data will without doubt improve in the coming years. On the empirical side, we provide preliminary evidence on three key capital flow angles (covariates, co-movements and control effectiveness). Our results may be deepened by a narrower focus. Finally, further research is needed on the theory side to explain some of the patterns in the cross-border behaviour of the different sectors raised in this paper.

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<sup>36</sup> A more detailed and refined analysis of circumvention by sectors, including other target variables such as credit and highlighting the potential financial stability risks of circumvention is left for future research.

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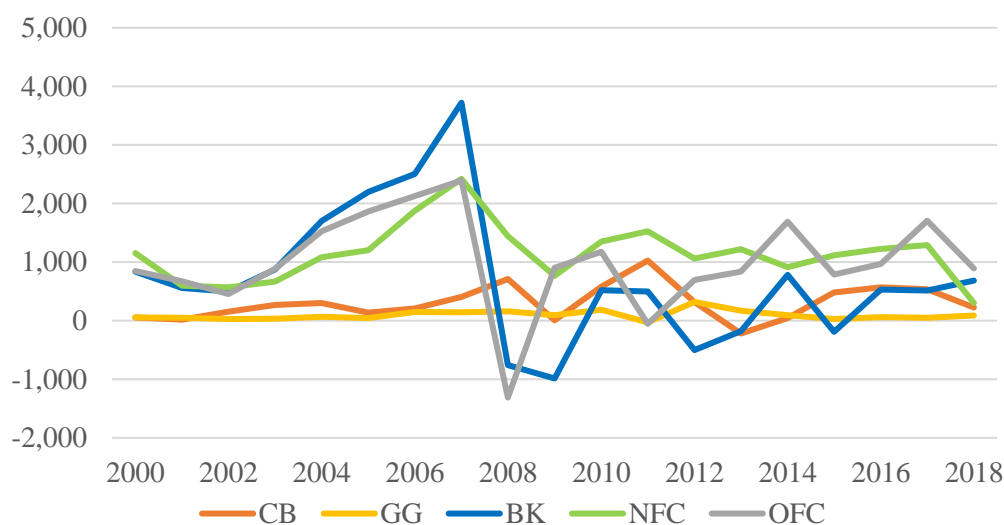
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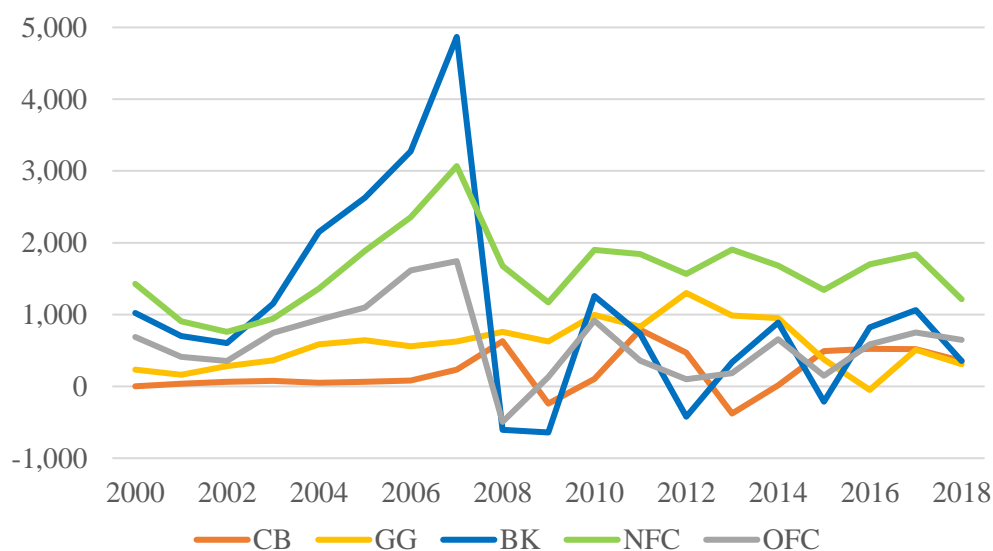
## Figures and Tables

Figure 1: Sectoral Resident Flows (US\$ billions)



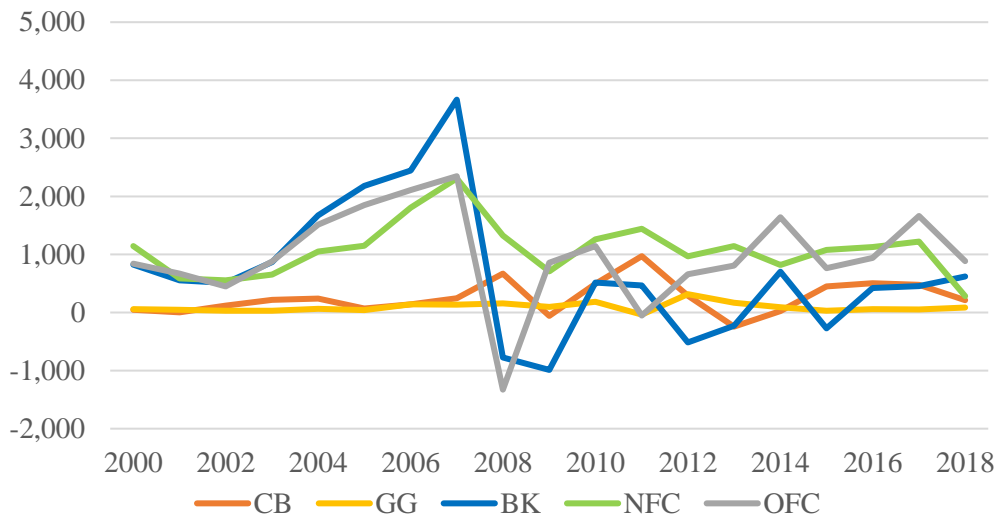
Notes: Resident sectoral flows are financial account assets of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC) across types of investments including direct, portfolio, and other investments.  
Source: Data taken from IMF's Balance of Payments Statistics and authors' computations.

Figure 2: Sectoral Non-Resident Flows (US\$ billions)



Notes: Non-resident sectoral flows are financial account liabilities of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC) across types of investments including direct, portfolio, and other investments.  
Source: Data taken from IMF's Balance of Payments Statistics and authors' computations.

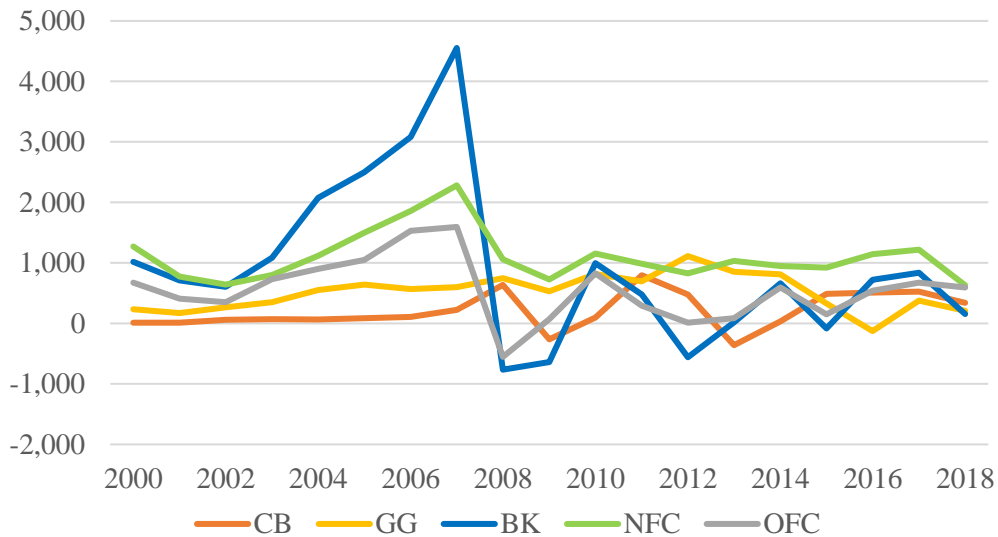
Figure 3a: Sectoral Resident Flows (US\$ billions), Advanced Economies



Notes: Resident sectoral flows are financial account assets of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC) across types of investments including direct, portfolio, and other investments. Refer to Appendix 1 for the list of advanced economies.

Source: Data taken from IMF's Balance of Payments Statistics and authors' computations.

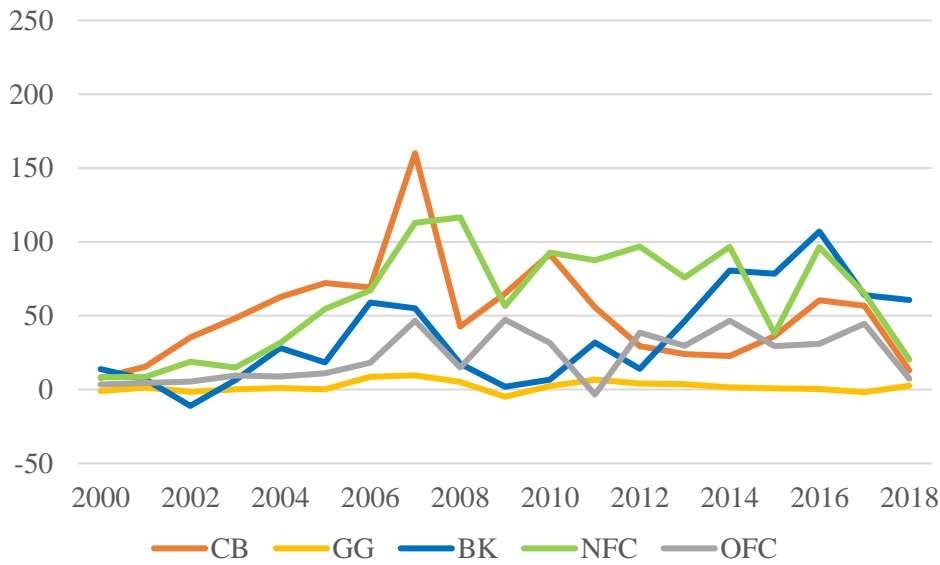
Figure 3b: Sectoral Non-Resident Flows (US\$ billions), Advanced Economies



Notes: Non-resident sectoral flows are financial account liabilities of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC) across types of investments including direct, portfolio, and other investments. Refer to Appendix 1 for the list of advanced economies.

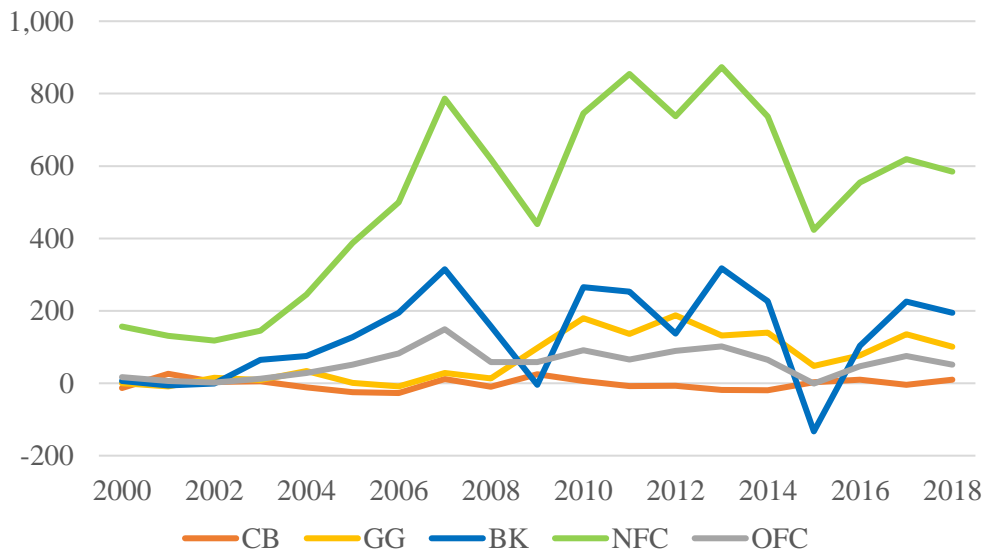
Source: Data taken from IMF's Balance of Payments Statistics and authors' computations.

Figure 4a: Sectoral Resident Flows (US\$ billions), Emerging Economies



Notes: Resident sectoral flows are financial account liabilities of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC) across types of investments including direct, portfolio, and other investments. Refer to Appendix 1 for the list of emerging economies.  
 Source: Data taken from IMF's Balance of Payments Statistics and authors' computations.

Figure 4b: Sectoral Non-Resident Flows (US\$ billions), Emerging Economies

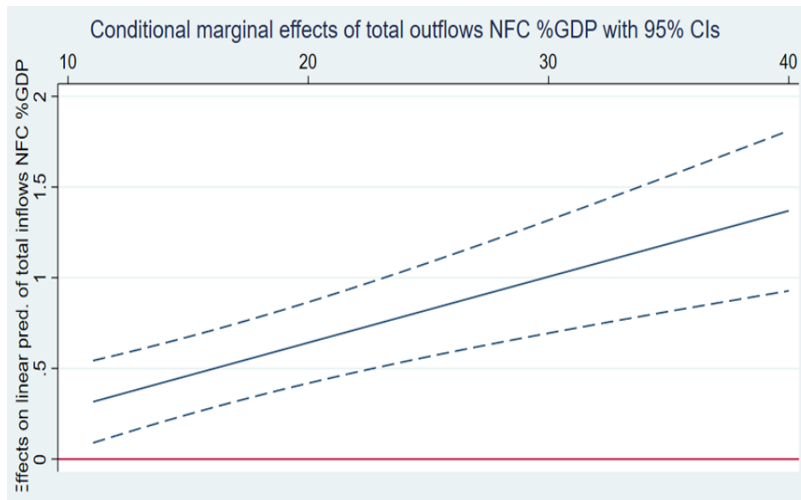


Notes: Non-resident sectoral flows are financial account liabilities of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC) across types of investments including direct, portfolio, and other investments. Refer to Appendix 1 for the list of emerging economies.  
 Source: Data taken from IMF's Balance of Payments Statistics and authors' computations.

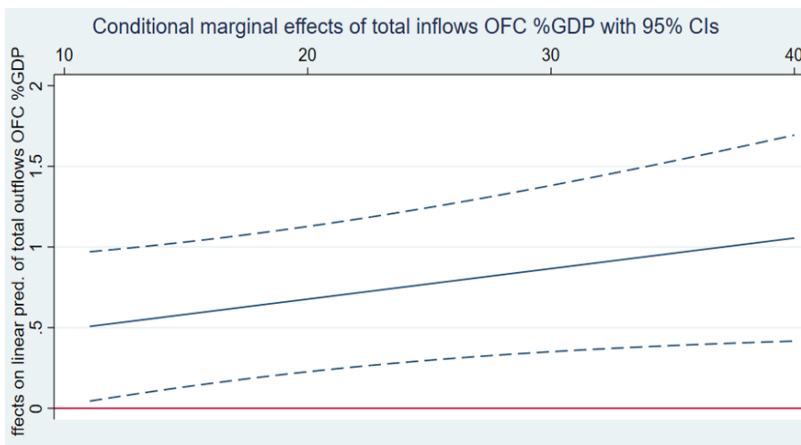


Figure 5: Conditional Marginal Effects of Sectoral Correlations on Higher VIX

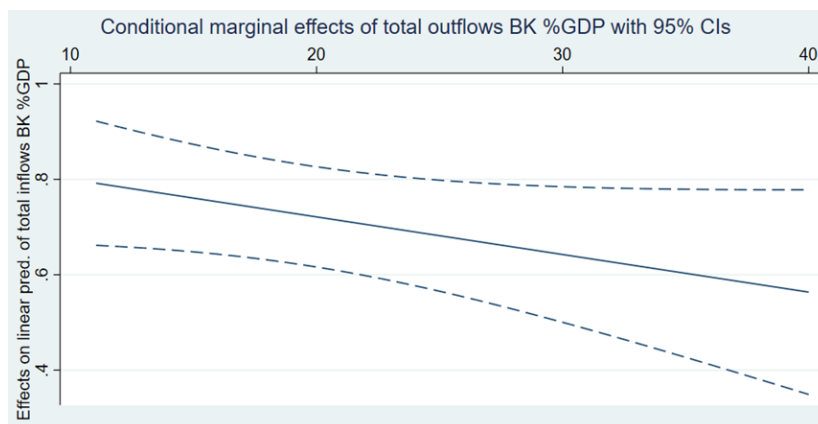
a) Resident and Non-Resident NFC Flows



b) Resident and Non-Resident OFC Flows



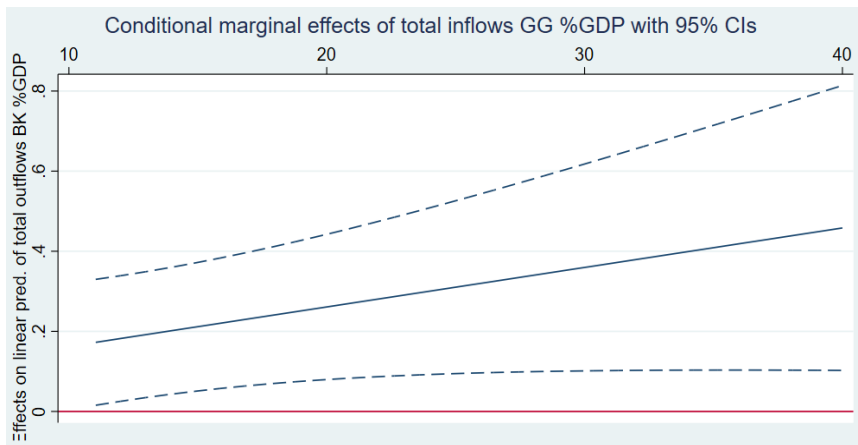
c) Resident and Non-Resident BK Flows



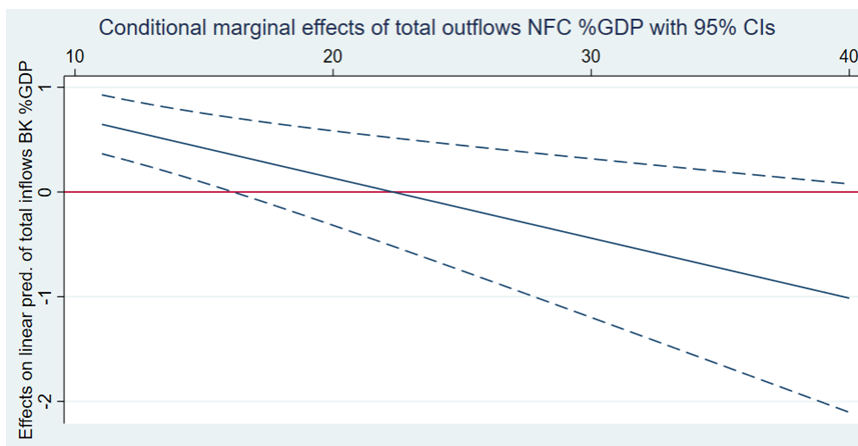
Note: Plots traces the correlations between sectoral flows given increasing VIX.

Source: Authors' estimates.

d) Resident BK Flows and Non-Resident GG Flows



e) Resident BK Flows and Non-Resident NFC Flows



Note: Plots traces the correlations between sectoral flows given increasing VIX.

Source: Authors' estimates.

Figure 6a: Yearly Adjustments of Sectoral Controls on Sectoral Non-Resident Flows

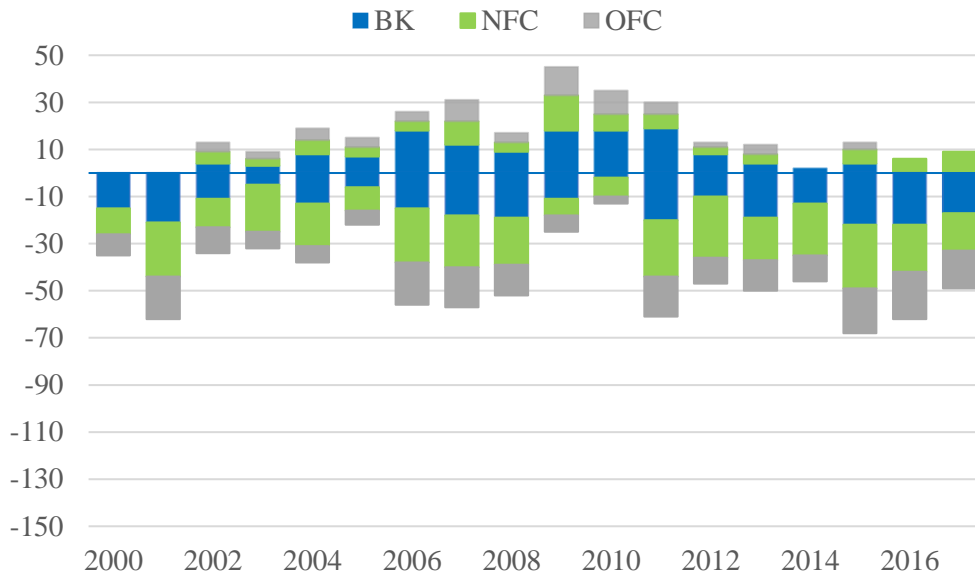
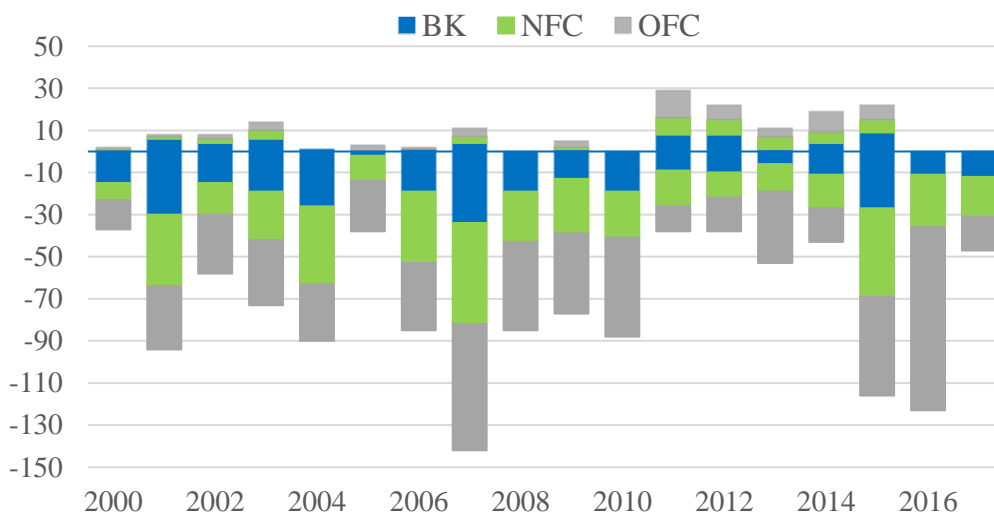


Figure 6b: Yearly Adjustments of Sectoral Controls on Sectoral Resident Flows



Notes: BK = banking sector, NFC = non-financial corporates, OFC = other financial corporates. Values refer to the count of annual changes on sectoral controls for both non-resident (Figure 6a) and resident (Figure 6b) sectoral flows. Positive values refer to tightening measures while negative values are easing measures.

Source: Authors' classification and computations based on Lepers and Mehigan (2019).

Figure 7a: Cumulative Adjustments of Sectoral Controls on Non-Resident Flows

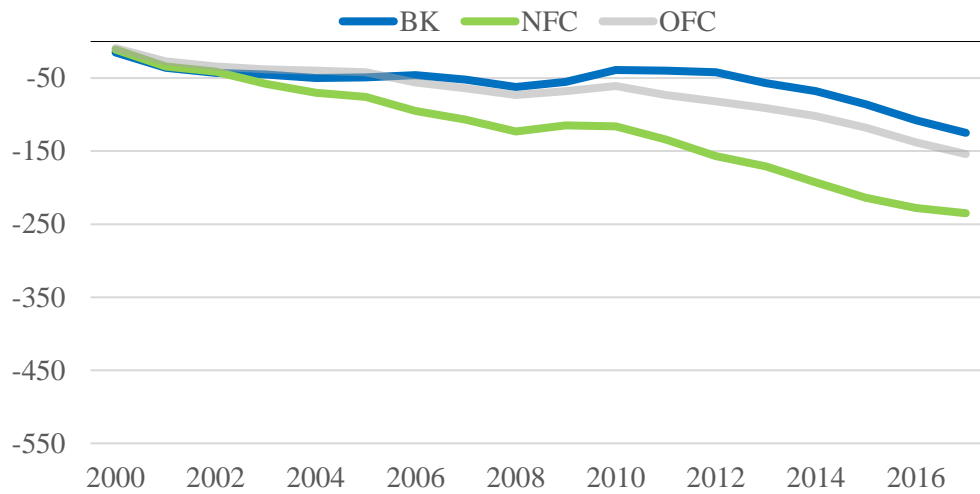
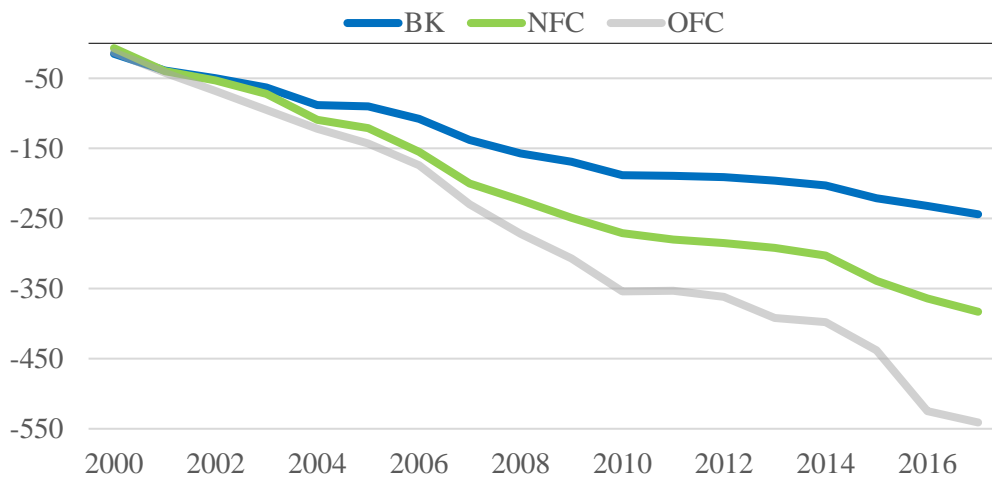


Figure 7b: Cumulative Adjustments of Sectoral Controls on Resident Flows



Notes: BK = banking sector, NFC = non-financial corporates, OFC = other financial corporates. Values refer to the cumulative count of sectoral controls for both non-resident (Figure 7a) and resident (Figure 7b) sectoral flows. Declining values pertain to easing measures.

Source: Authors' classification and computations based on Lepers and Mehigan (2019).

Table 1: Descriptive Statistics: Sectoral Flows, (\$bn)

	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<i><b>Total Sectoral Flows</b></i>					
Resident Flows - CB	772	7.6	39.0	-491.2	534.6
Resident Flows - GG	703	2.5	15.0	-146.3	226.8
Resident Flows - BK	772	17.9	88.4	-744.4	1061.0
Resident Flows - NFC	772	28.2	65.3	-182.5	548.3
Resident Flows - OFC	762	25.0	89.1	-829.8	682.8
Non-Resident Flows - CB	1,068	3.6	21.6	-161.4	264.6
Non-Resident Flows - GG	1,191	9.3	37.3	-173.0	596.9
Non-Resident Flows - BK	1,198	16.7	86.5	-733.9	1280.7
Non-Resident Flows - NFC	1,198	25.5	69.6	-76.0	875.2
Non-Resident Flows - OFC	1,181	9.8	50.7	-355.5	664.1
<i><b>Sectoral Equity Flows</b></i>					
Resident Flows - CB	114	0.1	0.3	-0.7	1.5
Resident Flows - GG	513	2.2	7.0	-5.5	96.6
Resident Flows - BK	772	3.9	8.8	-36.0	71.9
Resident Flows - NFC	772	25.9	62.3	-185.7	489.0
Resident Flows - OFC	753	11.8	34.6	-221.1	419.4
Non-Resident Flows - CB	9	0.0	0.0	0.0	0.0
Non-Resident Flows - GG	189	0.1	0.4	-0.9	3.2
Non-Resident Flows - BK	1,198	4.6	26.1	-188.6	524.7
Non-Resident Flows - NFC	1,198	18.9	46.3	-91.9	441.5
Non-Resident Flows - OFC	1,166	4.2	13.6	-33.9	144.8
<i><b>Sectoral Debt Flows</b></i>					
Resident Flows - CB	311	2.0	7.7	-30.6	54.6
Resident Flows - GG	607	1.4	11.9	-70.0	209.3
Resident Flows - BK	742	9.7	50.3	-533.4	430.8
Resident Flows - NFC	715	0.6	9.0	-111.8	74.9
Resident Flows - OFC	696	12.8	52.1	-594.0	441.4
Non-Resident Flows - CB	708	0.0	3.5	-33.5	26.9
Non-Resident Flows - GG	1,191	9.1	36.4	-121.7	589.2
Non-Resident Flows - BK	1,129	7.5	37.6	-262.8	462.7
Non-Resident Flows - NFC	1,162	5.5	28.8	-59.8	437.7
Non-Resident Flows - OFC	1,058	5.3	36.9	-389.1	492.2

Notes: Resident and non-resident sectoral flows are financial account assets and liabilities, respectively, of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC). Equity flows include both direct and portfolio equity investments, while debt flows are portfolio debt and loans.

Source: Data taken from IMF's Balance of Payments Statistics and authors' computations.

Table 2: Descriptive Statistics: Sectoral Flows, By Period (\$bn)

	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<i>Pre-Crisis 2000-07</i>					
Resident Flows - CB	321	4.8	18.0	-43.4	187.1
Resident Flows - GG	275	2.1	9.9	-15.6	101.3
Resident Flows - BK	321	40.2	108.7	-60.2	1061.0
Resident Flows - NFC	321	29.8	67.4	-21.5	548.3
Resident Flows - OFC	313	34.4	93.5	-5.9	680.5
Non-Resident Flows - CB	424	1.4	6.7	-23.3	60.2
Non-Resident Flows - GG	488	7.1	24.6	-27.9	208.9
Non-Resident Flows - BK	494	33.2	107.9	-29.0	1280.7
Non-Resident Flows - NFC	494	25.7	77.2	-14.3	875.2
Non-Resident Flows - OFC	479	15.8	63.8	-37.1	664.1
<i>Crisis 2008-09</i>					
Resident Flows - CB	82	8.7	83.0	-491.2	534.6
Resident Flows - GG	73	3.5	13.5	-28.8	73.2
Resident Flows - BK	82	-21.3	107.7	-744.4	132.8
Resident Flows - NFC	82	26.9	55.2	-75.1	279.7
Resident Flows - OFC	80	-5.1	123.0	-829.8	207.7
Non-Resident Flows - CB	113	3.4	25.4	-83.6	187.8
Non-Resident Flows - GG	127	10.9	36.9	-173.0	206.7
Non-Resident Flows - BK	128	-9.7	89.5	-733.9	286.1
Non-Resident Flows - NFC	128	22.2	50.8	-58.6	314.0
Non-Resident Flows - OFC	126	-2.9	48.6	-355.5	170.6
<i>Post-Crisis 2010-18</i>					
Resident Flows - CB	369	9.7	37.1	-207.4	250.8
Resident Flows - GG	355	2.7	18.2	-146.3	226.8
Resident Flows - BK	369	7.2	51.6	-289.3	261.5
Resident Flows - NFC	369	27.1	65.6	-182.5	403.5
Resident Flows - OFC	369	23.6	73.9	-166.6	682.8
Non-Resident Flows - CB	531	5.4	27.6	-161.4	264.6
Non-Resident Flows - GG	576	10.8	45.4	-124.7	596.9
Non-Resident Flows - BK	576	8.4	57.9	-376.6	354.1
Non-Resident Flows - NFC	576	26.0	66.2	-76.0	594.1
Non-Resident Flows - OFC	576	7.5	36.1	-170.7	378.0

Notes: Resident and non-resident sectoral flows are financial account assets and liabilities, respectively, of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC).

Source: Data taken from IMF's Balance of Payments Statistics and authors' computations.

Table 3: Summary Statistics: Dependent and Independent Variables

	<b>Obs</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min</b>	<b>Max</b>
<b><i>Total Sectoral Flows</i></b>					
Resident Flows - CB	772	1.57	4.4	-31.7	27.3
Resident Flows - GG	703	0.67	2.7	-14.7	28.3
Resident Flows - BK	772	2.10	8.1	-50.6	65.6
Resident Flows - NFC	772	3.58	7.6	-42.3	105.1
Resident Flows - OFC	762	2.13	4.0	-35.6	30.0
Non-Resident Flows - CB	1,068	0.42	3.7	-41.9	36.5
Non-Resident Flows - GG	1,191	1.67	5.0	-35.3	81.8
Non-Resident Flows - BK	1,198	2.46	10.1	-59.0	121.0
Non-Resident Flows - NFC	1,198	5.43	9.3	-18.7	130.4
Non-Resident Flows - OFC	1,181	0.78	2.6	-21.5	42.0
<b><i>Global Factors</i></b>					
Global GDP Growth	1,216	3.86	1.3	-0.1	5.6
Global Liquidity Index	1,216	46.32	6.9	35.6	63.4
VIX	1,216	19.94	6.9	11.0	40.0
Global Commodity Price Index	1,216	117.07	40.2	56.1	182.7
<b><i>Domestic Factors</i></b>					
Domestic GDP Growth	1,214	3.36	3.6	-15.1	17.3

Notes: Resident and non-resident sectoral flows are financial account assets and liabilities, respectively, of central bank (CB), general government (GG), banks (BK), non-financial corporates (NFC), and other financial corporate (OFC). Values for sectoral flows are in percent of nominal GDP, taken from the IMF's World Economic Outlook Database. Data on global GDP growth are year-on-year changes of world real GDP. Global liquidity, VIX, and global commodity price are indices. Data on domestic GDP growth are year-on-year changes of domestic real GDP. Refer to Appendix II for data definition and sources.

Source: Authors' computations.

Table 4: Sectoral Flows Covariates – Baseline

	(1)	(2)	(3)	(4)	(5)
<b>Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	-0.172 (0.169)	0.211 (0.178)	0.793** (0.307)	0.499** (0.206)	-0.224 (0.134)
Global Liquidity	0.036 (0.023)	-0.005 (0.010)	0.217*** (0.054)	0.176** (0.066)	0.089*** (0.025)
VIX	-0.056 (0.040)	0.017 (0.012)	-0.128** (0.049)	-0.008 (0.047)	-0.123*** (0.025)
Global Commodity Price	-0.001 (0.006)	0.006** (0.003)	-0.019 (0.013)	0.011* (0.006)	-0.014** (0.006)
Domestic GDP Growth	-0.054 (0.066)	-0.007 (0.030)	0.128* (0.068)	0.089 (0.065)	-0.079*** (0.022)
Observations	772	703	772	772	762
R-squared	0.101	0.462	0.148	0.315	0.278
Country F.E.	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)	(5)
<b>Non-Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	-0.044 (0.180)	-0.026 (0.159)	0.686** (0.291)	0.267 (0.214)	0.144* (0.074)
Global Liquidity	0.007 (0.015)	-0.020 (0.023)	0.312*** (0.071)	0.144** (0.062)	0.051*** (0.016)
VIX	-0.008 (0.038)	0.049 (0.029)	-0.163*** (0.051)	-0.046 (0.069)	-0.022 (0.018)
Global Commodity Price	0.002 (0.004)	0.023*** (0.004)	-0.026*** (0.010)	0.039*** (0.012)	-0.003 (0.003)
Domestic GDP Growth	0.026 (0.028)	-0.192*** (0.037)	0.383*** (0.122)	0.261** (0.130)	0.077*** (0.023)
Observations	1068	1191	1198	1198	1181
R-squared	0.068	0.180	0.227	0.265	0.168
Country F.E.	Yes	Yes	Yes	Yes	Yes

Notes: CB = central bank; GG = general government; BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Dependent variables are sectoral flows in percent of nominal GDP for resident (Panel A) and non-resident (Panel B) sectoral flows. Regressors are in contemporaneous values, except for domestic GDP growth which was lagged. All specifications include country fixed effects. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.



Table 5: Sectoral Flows Covariates – Extension Baseline  
(Using Net Sectoral Flows)

<b>Net Sectoral Flows</b>	<b>(1) CB</b>	<b>(2) GG</b>	<b>(3) BK</b>	<b>(4) NFC</b>	<b>(5) OFC</b>
Global GDP Growth	-0.290 (0.302)	-0.120 (0.153)	-0.170 (0.250)	0.008 (0.172)	-0.398*** (0.118)
Global Liquidity	0.036 (0.032)	-0.019 (0.020)	-0.195*** (0.062)	0.016 (0.057)	0.008 (0.019)
VIX	-0.035 (0.064)	-0.094** (0.035)	0.065 (0.054)	-0.005 (0.035)	-0.088*** (0.023)
Global Commodity Price	-0.003 (0.007)	-0.018*** (0.006)	0.022*** (0.008)	-0.013** (0.006)	-0.006* (0.003)
Domestic GDP Growth	-0.090 (0.069)	0.200*** (0.059)	-0.363*** (0.127)	-0.166** (0.079)	-0.175*** (0.037)
Observations	680	703	772	772	762
R-squared	0.085	0.394	0.212	0.379	0.211
Country F.E.	Yes	Yes	Yes	Yes	Yes

Notes: CB = central bank; GG = general government; BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Dependent variables are net sectoral flows in percent of nominal GDP. Net flows are computed as sectoral resident minus non-resident flows. Regressors are in contemporaneous values, except for domestic GDP growth which was lagged. All specifications include country fixed effects. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

Table 6: Sectoral Flows Covariates – Extension Baseline  
(Advanced Economies)

	(1)	(2)	(3)	(4)	(5)
<b>Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	-0.302 (0.226)	0.265 (0.248)	1.215*** (0.424)	0.748** (0.279)	-0.214 (0.188)
Global Liquidity	-0.005 (0.026)	-0.007 (0.013)	0.302*** (0.069)	0.213** (0.086)	0.114*** (0.033)
VIX	-0.072 (0.058)	0.022 (0.017)	-0.155** (0.070)	-0.001 (0.067)	-0.164*** (0.033)
Global Commodity Price	0.001 (0.007)	0.007* (0.004)	-0.026 (0.019)	0.007 (0.007)	-0.023*** (0.008)
Domestic GDP Growth	0.000 (0.064)	-0.016 (0.046)	0.222** (0.099)	0.164* (0.095)	-0.118*** (0.036)
Observations	525	503	525	525	525
R-squared	0.113	0.466	0.178	0.346	0.266
Country F.E.	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)	(5)
<b>Non-Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	0.107 (0.447)	0.393 (0.246)	1.429** (0.650)	0.576*** (0.197)	0.290** (0.113)
Global Liquidity	0.000 (0.032)	0.011 (0.031)	0.549*** (0.122)	0.166*** (0.055)	0.089*** (0.026)
VIX	-0.043 (0.095)	0.125*** (0.044)	-0.242** (0.092)	-0.008 (0.059)	-0.038 (0.031)
Global Commodity Price	0.007 (0.011)	0.027*** (0.008)	-0.056*** (0.019)	0.012 (0.008)	-0.012** (0.006)
Domestic GDP Growth	0.099 (0.081)	-0.218*** (0.074)	0.709*** (0.215)	0.321*** (0.101)	0.103** (0.039)
Observations	453	525	525	525	525
R-squared	0.057	0.224	0.316	0.234	0.199
Country F.E.	Yes	Yes	Yes	Yes	Yes

Notes: CB = central bank; GG = general government; BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Dependent variables are sectoral flows in percent of nominal GDP for resident (Panel A) and non-resident (Panel B) sectoral flows. Refer to Appendix I for the list of advanced economies. Regressors are in contemporaneous values, except for domestic GDP growth which was lagged. All specifications include country fixed effects. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

Table 7: Sectoral Flows Covariates – Extension Baseline  
(Emerging Economies)

	(1)	(2)	(3)	(4)	(5)
<b>Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	0.114 (0.272)	0.078 (0.098)	-0.003 (0.149)	0.034 (0.272)	-0.302*** (0.094)
Global Liquidity	0.135*** (0.038)	-0.001 (0.015)	0.033 (0.055)	0.099 (0.088)	0.032 (0.027)
VIX	-0.018 (0.040)	0.004 (0.008)	-0.045 (0.037)	-0.005 (0.059)	-0.042** (0.015)
Global Commodity Price	-0.002 (0.010)	0.002 (0.001)	0.002 (0.005)	0.024* (0.011)	0.005 (0.005)
Domestic GDP Growth	-0.183 (0.118)	0.016 (0.021)	0.049 (0.049)	-0.006 (0.059)	-0.042* (0.023)
Observations	247	200	247	247	237
R-squared	0.124	0.164	0.086	0.204	0.324
Country F.E.	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)	(5)
<b>Non-Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	-0.138* (0.076)	-0.342* (0.188)	0.186 (0.133)	-0.004 (0.324)	0.020 (0.087)
Global Liquidity	0.016 (0.013)	-0.052 (0.032)	0.135* (0.070)	0.140 (0.104)	0.024 (0.018)
VIX	0.024 (0.015)	-0.009 (0.038)	-0.074 (0.060)	-0.080 (0.109)	-0.009 (0.021)
Global Commodity Price	0.000 (0.002)	0.020*** (0.004)	0.004 (0.009)	0.062*** (0.019)	0.004 (0.003)
Domestic GDP Growth	-0.010 (0.028)	-0.148*** (0.041)	0.210** (0.090)	0.159 (0.181)	0.047* (0.026)
Observations	615	666	673	673	656
R-squared	0.130	0.164	0.123	0.270	0.123
Country F.E.	Yes	Yes	Yes	Yes	Yes

Notes: CB = central bank; GG = general government; BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Dependent variables are sectoral flows in percent of nominal GDP for resident (Panel A) and non-resident (Panel B) sectoral flows. Refer to Appendix I for the list of emerging economies. Regressors are in contemporaneous values, except for domestic GDP growth which was lagged. All specifications include country fixed effects. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

Table 8: Sectoral Flows Covariates – Extension Baseline  
(Equity Flows)

	(1)	(2)	(3)	(4)	(5)
<b>Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	-0.003 (0.016)	-0.127 (0.121)	0.037 (0.028)	0.225 (0.152)	-0.091* (0.051)
Global Liquidity	-0.001 (0.002)	0.019 (0.020)	0.040** (0.018)	0.131** (0.062)	0.035** (0.015)
VIX	-0.001 (0.004)	-0.005 (0.005)	-0.010 (0.006)	-0.023 (0.037)	-0.044*** (0.011)
Global Commodity Price	0.000 (0.000)	0.004 (0.003)	0.001 (0.001)	0.009* (0.005)	-0.001 (0.002)
Domestic GDP Growth	0.002 (0.005)	-0.017 (0.017)	0.021* (0.012)	0.066 (0.059)	-0.022 (0.016)
Observations	114	513	772	772	753
R-squared	0.203	0.486	0.182	0.325	0.296
Country F.E.	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)	(5)
<b>Non-Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	...	-0.007 (0.005)	0.019 (0.055)	0.070 (0.184)	0.053 (0.032)
Global Liquidity	...	-0.001 (0.001)	0.060* (0.033)	0.089* (0.047)	0.020** (0.010)
VIX	...	-0.000 (0.001)	-0.025** (0.010)	-0.036 (0.060)	0.004 (0.007)
Global Commodity Price	...	0.000 (0.000)	0.003*** (0.001)	0.030*** (0.011)	-0.000 (0.001)
Domestic GDP Growth	...	-0.001 (0.001)	-0.003 (0.020)	0.189* (0.110)	0.012 (0.014)
Observations	...	189	1198	1198	1166
R-squared	...	0.184	0.350	0.244	0.147
Country F.E.	...	Yes	Yes	Yes	Yes

Notes: CB = central bank; GG = general government; BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Dependent variables are sectoral flows in percent of nominal GDP for resident (Panel A) and non-resident (Panel B) sectoral flows. Equity flows include direct investment and portfolio equity flows. Regressors are in contemporaneous values, except for domestic GDP growth which was lagged. All specifications include country fixed effects. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

Table 9: Sectoral Flows Covariates – Extension Baseline  
(Debt Flows)

	(1)	(2)	(3)	(4)	(5)
<b>Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	-0.262 (0.216)	0.423 (0.279)	0.287* (0.152)	0.056* (0.031)	-0.211** (0.084)
Global Liquidity	0.035 (0.021)	-0.021 (0.020)	0.079*** (0.025)	0.009 (0.006)	0.038*** (0.013)
VIX	-0.082 (0.050)	0.035*** (0.010)	-0.028 (0.033)	0.006 (0.006)	-0.081*** (0.019)
Global Commodity Price	-0.015 (0.009)	0.004** (0.002)	-0.004 (0.007)	-0.001* (0.001)	-0.011*** (0.004)
Domestic GDP Growth	-0.078 (0.079)	0.032 (0.040)	0.035 (0.054)	0.015 (0.011)	-0.048** (0.020)
Observations	311	607	742	715	696
R-squared	0.229	0.090	0.125	0.113	0.216
Country F.E.	Yes	Yes	Yes	Yes	Yes

	(1)	(2)	(3)	(4)	(5)
<b>Non-Resident Flows</b>	<b>CB</b>	<b>GG</b>	<b>BK</b>	<b>NFC</b>	<b>OFC</b>
Global GDP Growth	-0.031 (0.078)	-0.034 (0.155)	0.251* (0.126)	0.087 (0.065)	0.057 (0.044)
Global Liquidity	0.012 (0.014)	-0.021 (0.023)	0.113*** (0.035)	0.048** (0.018)	0.029** (0.013)
VIX	0.024 (0.015)	0.051* (0.029)	-0.032 (0.033)	-0.011 (0.017)	-0.023 (0.014)
Global Commodity Price	0.002 (0.003)	0.024*** (0.004)	-0.006 (0.005)	0.008** (0.003)	-0.002 (0.002)
Domestic GDP Growth	-0.034* (0.019)	-0.190*** (0.037)	0.127** (0.061)	0.080*** (0.029)	0.084** (0.032)
Observations	708	1191	1129	1162	1058
R-squared	0.059	0.182	0.162	0.153	0.171
Country F.E.	Yes	Yes	Yes	Yes	Yes

Notes: CB = central bank; GG = general government; BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Dependent variables are sectoral flows in percent of nominal GDP for resident (Panel A) and non-resident (Panel B) sectoral flows. Debt flows include portfolio debt and loans. Regressors are in contemporaneous values, except for domestic GDP growth which was lagged. All specifications include country fixed effects. Values in parentheses are clustered robust standard errors, at country level. \* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

Table 10: Co-movement of Sectoral Flows – Conditional Correlations Baseline  
(Conditional on Baseline Regressors and Country Fixed Effects)

	Resident Flows				
	CB	GG	BK	NFC	OFC
Resident Flows - CB	...	-0.032	-0.240*	0.116**	-0.013
Resident Flows - GG	-0.150	...	0.260	0.050	0.005
Resident Flows - BK	-0.088**	0.020	...	0.153	0.142
Resident Flows - NFC	0.057	0.005	0.203**	...	0.136***
Resident Flows - OFC	-0.023	0.002	0.689***	0.493	...
Observations	700	700	700	700	700
R-squared	0.133	0.470	0.317	0.411	0.421
Country F.E. & Controls	Yes	Yes	Yes	Yes	Yes

	Non-Resident Flows				
	CB	GG	BK	NFC	OFC
Non-Resident Flows - CB	...	-0.094	-0.420***	0.253***	0.019
Non-Resident Flows - GG	-0.057	...	-0.163**	0.494**	-0.030
Non-Resident Flows - BK	-0.077**	-0.049**	...	0.161**	0.068**
Non-Resident Flows - NFC	0.061*	0.196*	0.212**	...	0.097***
Non-Resident Flows - OFC	0.065	-0.164	1.236***	1.343**	...
Observations	1,048	1,048	1,048	1,048	1,048
R-squared	0.108	0.265	0.392	0.479	0.398
Country F.E. & Controls	Yes	Yes	Yes	Yes	Yes

	Resident Flows				
	CB	GG	BK	NFC	OFC
Non-Resident Flows - CB	0.232*	0.032	0.387***	0.242***	0.007
Non-Resident Flows - GG	0.080	0.262***	0.367***	0.054	0.078
Non-Resident Flows - BK	0.077*	0.011	0.559***	0.160	0.051***
Non-Resident Flows - NFC	0.039	0.023	-0.002	0.435***	0.095***
Non-Resident Flows - OFC	-0.089	-0.063*	-0.004	0.943***	0.356***
Observations	671	623	671	671	671
R-squared	0.164	0.606	0.613	0.732	0.561
Country F.E. & Controls	Yes	Yes	Yes	Yes	Yes

	Non-Resident Flows				
	CB	GG	BK	NFC	OFC
Resident Flows - CB	0.208*	0.076	0.515***	0.162**	0.044
Resident Flows - GG	-0.045	0.983***	-0.305*	0.208*	-0.075**
Resident Flows - BK	0.010	0.019	0.869***	0.042	0.057**
Resident Flows - NFC	0.097	-0.014	0.349	0.497***	0.164***
Resident Flows - OFC	-0.108	0.076	0.319***	0.178*	0.360***
Observations	623	700	700	700	700
R-squared	0.168	0.414	0.750	0.587	0.631
Country F.E. & Controls	Yes	Yes	Yes	Yes	Yes

Notes: CB = central bank; GG = general government; BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Values refer to estimated coefficients of the regression sectoral flows (sectors in columns) on global and domestic baseline regressors and other sectoral flows (in rows). All specifications are regressed with country fixed effects and clustered robust standard errors at the country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

Table 11: Number of Capital Control Adjustments, by Sector and Instrument

	<b>BK</b>		<b>NFC</b>		<b>OFC</b>	
	<b>Non-</b>	<b>Resident</b>	<b>Non-</b>	<b>Resident</b>	<b>Non-</b>	<b>Resident</b>
	<b>Flows</b>	<b>Flows</b>	<b>Flows</b>	<b>Flows</b>	<b>Flows</b>	<b>Flows</b>
Direct investment	42	44	47	56	38	44
Portfolio equity	38	47	38	66	36	101
Portfolio debt	58	51	46	64	40	113
Collective investment	26	42	25	54	26	102
Credit	75	54	71	18	50	41

Notes: BK = banking sector, NFC = non-financial corporates, OFC = other financial corporates. Values refer to the total number of sectoral controls for both non-resident and resident sectoral flows across different types of investments.

Source: Authors' classification and computations based on Lepers and Mehigan (2019).

Table 12: Non-Resident Sectoral Flows on Non-Resident Sectoral Controls  
(Summary of Estimates)

<b>Non-Resident Flows</b>	<b>(1) BK</b>	<b>(2) NFC</b>	<b>(3) OFC</b>
<i>Baseline: Sectoral Inflows</i>			
Correspond. Sectoral Controls	-0.090 (0.096)	-0.389** (0.160)	-0.091* (0.051)
<i>Winsorised sectoral inflows</i>			
Correspond. Sectoral Controls	-0.068 (0.090)	-0.209* (0.112)	-0.089* (0.045)
<i>Without country fixed effects</i>			
Correspond. Sectoral Controls	-0.191* (0.103)	-0.791*** (0.263)	-0.106* (0.053)
<i>Using unclustered robust standard errors</i>			
Correspond. Sectoral Controls	-0.090 (0.092)	-0.389* (0.212)	-0.091* (0.047)
<i>Including contemporaneous and lagged sectoral controls</i>			
Correspond. Sectoral Controls (t-1)	-0.091 (0.101)	-0.399** (0.190)	-0.096* (0.052)
Correspond. Sectoral Controls (t)	-0.019 (0.081)	-0.523** (0.233)	0.048 (0.097)
<i>Using two-step regression</i>			
Correspond. Sectoral Controls	-0.099 (0.101)	-0.294** (0.131)	-0.095* (0.055)
<i>Using binary sectoral controls</i>			
Correspond. Sectoral Controls	-0.585 (0.450)	-1.021 (0.836)	-0.309* (0.168)
<i>Including controls applied to other sectors</i>			
Correspond. Sectoral Controls	-0.115 (0.100)	-0.693 (0.429)	-0.110* (0.058)
BK-only Controls		-0.089 (0.265)	0.021 (0.050)
NFC-only Controls	0.181 (0.428)		0.312 (0.306)
OFC-only Controls	1.157 (1.367)	4.665 (6.649)	

Notes: BK = banks; NFC = non-financial corporates; and, OFC = other financial corporates. Values refer to estimated coefficients of the regression sectoral flows on global and domestic baseline regressors and corresponding sectoral controls. Global factors are regressed in their contemporaneous values, while real GDP growth and corresponding sectoral controls are regressed in lagged values, unless otherwise as indicated. BK-only, NFC-only, and OFC-only controls count only the controls that are specific to that sector, i.e., ignore horizontal controls applying to other sectors as well. All specifications are estimated with country fixed effects. Country sample is restricted to EMEs. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.



Table 13: Resident Sectoral Flows on Resident Sectoral Controls  
(Summary of Estimates)

<b>Resident Flows</b>	<b>(1) BK</b>	<b>(2) NFC</b>	<b>(3) OFC</b>
<i>Baseline: Sectoral outflows</i>			
Correspond. Sectoral Controls	0.211 (0.624)	0.181 (0.245)	0.095 (0.159)
<i>Winsorised sectoral outflows</i>			
Correspond. Sectoral Controls	0.220 (0.577)	0.159 (0.175)	0.146 (0.112)
<i>Without country fixed effects</i>			
Correspond. Sectoral Controls	0.116 (0.561)	-0.331 (0.340)	-0.049 (0.165)
<i>Using unclustered robust standard errors</i>			
Correspond. Sectoral Controls	0.211 (0.548)	0.181 (0.210)	0.095 (0.138)
<i>Including contemporaneous and lagged sectoral controls</i>			
Correspond. Sectoral Controls (t-1)	0.200 (0.630)	0.180 (0.251)	0.078 (0.166)
Correspond. Sectoral Controls (t)	-0.162 (0.195)	-0.029 (0.205)	-0.193* (0.105)
<i>Using two-step regression</i>			
Correspond. Sectoral Controls	0.108 (0.697)	0.245 (0.253)	0.124 (0.130)
<i>Using binary sectoral controls</i>			
Correspond. Sectoral Controls	-0.635 (0.929)	-0.512 (0.745)	-0.165 (0.587)
<i>Including controls applied to other sectors</i>			
Correspond. Sectoral Controls	0.215 (0.627)	0.178 (0.246)	0.093 (0.161)
BK-only Controls		-1.546* (0.733)	0.200 (0.297)
NFC-only Controls	1.053*** (0.127)		-0.090 (0.073)
OFC-only Controls	-0.025 (0.321)	-0.248 (0.180)	

Notes: BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Values refer to estimated coefficients of the regression sectoral flows on global and domestic baseline regressors and corresponding sectoral controls. Global factors are regressed in their contemporaneous values, while real GDP growth and corresponding sectoral controls are regressed in lagged values, unless otherwise as indicated. BK-only, NFC-only, and OFC-only controls count only the controls that are specific to that sector, i.e., ignore horizontal controls applying to other sectors as well. All specifications are estimated with country fixed effects. Country sample is restricted to EMEs. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

Table 14: Circumventing Non-Resident Sectoral Controls

<b>Non-Resident Flows</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
	<b>NFC+OFC</b>	<b>BK+OFC</b>	<b>NFC+BK</b>
Global GDP Growth	-0.086 (0.368)	0.030 (0.193)	0.135 (0.513)
Global Liquidity	0.238 (0.152)	0.157* (0.090)	0.303 (0.185)
VIX	-0.135 (0.108)	-0.064 (0.042)	-0.138 (0.121)
Global Commodity Price	0.046** (0.018)	0.006 (0.008)	0.045** (0.020)
Domestic GDP Growth	0.206 (0.171)	0.245** (0.087)	0.330* (0.184)
BK-only Controls	-0.110 (0.270)		
NFC-only Controls		0.322 (0.377)	
OFC-only Controls			5.211 (7.826)
Observations	408	408	408
R-squared	0.215	0.144	0.221
Country F.E.	Yes	Yes	Yes

Notes: BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Global factors are regressed in their contemporaneous values, while real GDP growth and sectoral controls are regressed in lagged values. BK-only, NFC-only, and OFC-only controls include only the controls that are specific to that sector, i.e., ignore horizontal controls applying to other sectors as well. All specifications are estimated with country fixed effects. Country sample is restricted to EMEs. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

Table 15: Circumventing Resident Sectoral Controls

<b>Resident Flows</b>	<b>(1)</b>	<b>(2)</b>	<b>(3)</b>
	<b>NFC+OFC</b>	<b>BK+OFC</b>	<b>NFC+BK</b>
Global GDP Growth	-0.211 (0.385)	-0.400 (0.226)	0.070 (0.461)
Global Liquidity	0.159 (0.149)	0.084 (0.101)	0.158 (0.180)
VIX	-0.039 (0.091)	-0.106* (0.057)	-0.050 (0.111)
Global Commodity Price	0.031 (0.018)	0.007 (0.012)	0.029 (0.017)
Domestic GDP Growth	-0.029 (0.085)	-0.002 (0.056)	0.055 (0.137)
BK-only Controls	-1.346 (0.949)		
NFC-only Controls		0.961*** (0.186)	
OFC-only Controls			-0.302 (0.363)
Observations	198	198	198
R-squared	0.212	0.138	0.122
Country F.E.	Yes	Yes	Yes

Notes: BK = banks; NFC = non-financial corporates; and, OFC = other financial corporate. Global factors are regressed in their contemporaneous values, while real GDP growth and corresponding sectoral controls are regressed in lagged values. BK-only, NFC-only, and OFC-only controls count only the controls that are specific to that sector, i.e., ignore horizontal controls applying to other sectors as well. All specifications are estimated with country fixed effects. Country sample is restricted to EMEs. Values in parentheses are clustered robust standard errors, at country level.

\* p<0.10, \*\* p<0.05, and \*\*\* p<0.01.

Source: Authors' estimates.

## Appendix 1: Country Classification

<b>Advanced Economies</b>	<b>Emerging Economies</b>
Australia	Albania <sup>^*</sup>
Austria	Argentina <sup>^</sup>
Belgium	Armenia <sup>^*</sup>
Canada	Belarus <sup>*</sup>
Czech Republic	Bosnia and Herzegovina <sup>^*</sup>
Denmark	Brazil <sup>^</sup>
Estonia	Bulgaria
Finland	Chile
France	China <sup>^</sup>
Germany	Colombia
Greece	Croatia
Israel	Georgia <sup>^*</sup>
Italy	Hungary
Japan	India
Korea	Indonesia <sup>^</sup>
Latvia	Kazakhstan <sup>^*</sup>
Lithuania	Kosovo <sup>^*</sup>
Netherlands	Malaysia
New Zealand	Mexico <sup>^</sup>
Norway	Mongolia <sup>^*</sup>
Portugal	Morocco <sup>*</sup>
Slovakia	North Macedonia <sup>^*</sup>
Slovenia	Pakistan <sup>^*</sup>
Spain	Paraguay <sup>^*</sup>
Sweden	Peru <sup>^</sup>
Switzerland	Philippines <sup>^</sup>
United Kingdom	Poland
United States	Romania <sup>^</sup>
	Russia <sup>^</sup>
	Serbia <sup>^</sup>
	South Africa <sup>^</sup>
	Thailand
	Turkey
	Ukraine
	Uruguay <sup>^</sup>
	Zambia <sup>^*</sup>

Notes: (^) indicates emerging economies without resident sectoral flows data. (\*) indicates emerging economies without available data for sectoral controls.

## Appendix 2: Data Definitions and Sources

Data	Notes	Sources
Sectoral capital flows	Refer to Section 2.1 for detailed discussions on data computations and sources	Authors' calculations based on IMF Balance of Payment Statistics, IMF Coordinated Portfolio Investment Survey, IMF International Investment Position, BIS Locational Banking Statistics, OECD Direct Investment Dataset, IMF FSSA reports, and national sources accessed through CEIC database
Nominal GDP	US dollar billions	IMF World Economic Outlook Database 2019
Global GDP growth	Year-on-year change in percent of global real GDP	IMF World Economic Outlook Database 2019
Global liquidity	Index measuring the ease of financing (credit) in global financial markets	Bank for International Settlements
VIX	Index measuring 30-day expected volatility of the U.S. stock market, derived from real-time, mid-quote prices of S&P 500® Index (SPXSM) call and put options	Chicago Board of Exchange
Global Commodity Price	Index pertaining to IMF's Primary Commodity Prices	International Monetary Fund
Domestic GDP Growth	Year-on-year change of real GDP	IMF World Economic Outlook Database 2019
Governance	Average of individual country percentile ranking on measure pertaining to voice and accountability; political stability; government effectiveness; regulatory quality; rule of law; and control of corruption	Worldwide Governance Indicators
Financial depth	Domestic credit provided by the financial sector in percentage of nominal GDP	World Bank's World Development Indicators
Financial Openness	Standardised capital account openness measure	Chinn and Ito (2006)
G7 GDP growth	Annual growth rate of Canada, France, Germany, Italy, Japan, United Kingdom and United States	IMF World Economic Outlook Database 2019
Global Commodity Inflation	Annual year-on-year change of Global Commodity Price index	Authors' calculations
Global Liquidity Growth	Annual year-on-year change of Global Liquidity Index	Authors' calculations
Global Interest Rate	Weighted average of United States, United Kingdom,	Authors' calculations

Data	Notes	Sources
	Japan, Euro Area, China, India, Brazil, and Russia policy rates using GDP at PPP as weights	
Domestic Macroeconomic Volatility	Five year moving standard deviation of domestic inflation, where inflation is sourced from the IMF World Economic Outlook Database 2019	Authors' calculations
Sectoral capital controls	Refer to Section 5.2 for detailed discussions on data computations and sources	Authors' calculation using sector-specific capital controls based on Lepers and Mehigan (2019), IMF AREAER, and OECD data.

## Appendix 3: Coding Capital Controls Dataset

### *A3.1 Coding Rules in the Lepers and Mehigan (2019) Dataset*

Removal or easing of a policy measure are coded as -1 and introduction or tightening of a measure as +1, episodic changes are considered. This enables the analysis to get closer to the intensity of a measure rather than simply its presence or introduction or removal. The policy data is available at daily frequency. In the context of their work, data is aggregated at the yearly frequency. Within the same year, there can be several policy actions. In transforming the list of policy actions into an annual database, all tightening and easing actions taken in the same year are added up.

The following coding rules have been followed in the construction of the dataset:

- Restrictions are coded at their date of implementation, not announcement. While this prevents the analysis of the immediate reaction of economic actors to announcements, it allows a much more consistent timing of actions across countries and importantly increases the coverage. The IMF's AREAER notably provides only the date of implementation.
- Restrictions made to specific countries based on political or national security reasons are not included.
- Restrictions derived from bilateral free trade agreement or investment agreement that applies to specific countries are not included.
- Restrictions on FDI are coded regardless of whether they are sector specific or general restrictions.
- Restrictions on use of accounts are coded as restrictions to the targeted cross border capital operation, as it is the case under the OECD Capital Movements Code.
- Restrictions on FDI in real estate are not considered as FDI restrictions, since these pertain to a different category in the AREAER, and thus classified under the investment in real estate category.
- Requirements of repatriation of the income from a sale in foreign markets are considered controls.
- In the case of securities, restrictions on purchase locally by non-residents, and on sale or issue abroad by residents are coded as controls on capital inflows, as usual in the literature.
- Conversely, restrictions on the purchase abroad by residents, and sale or issue locally by non-residents are coded as controls on capital outflows, as usual in the literature.
- Requirements of "reporting", "registration" or "notification" are dropped as they pertain to formalities.
- Measures impacting several categories of operations are recorded several times as they will impact several capital movements.
- A measure that affects both the inflow and outflow dimension of a specific operation is coded twice, as inflow and outflow action.
- With regards to restrictions on derivatives, when there is no obvious way to tell whether the restrictions is impacting inflows or outflows (derivatives like FX swaps involve both inflow and outflow components), the restriction is coded twice as inflow and outflow action, as usual in the literature.
- Restrictions on foreign investment by resident institutional investors, including insurance companies and pension funds, are included as restrictions.

### *A3.2 Coding Rules for Sector-Specific Capital Controls*

- Sectors have been classified by resident sector, i.e., for controls on inflows, we code the invested/recipient sector. For outflow controls, we code the investing/source sector.
- Sectors are classified based on the manual reading of the description of the measure in the IMF's AREAER or any other sources coded by Lepers and Mehigan (2019).
- We classify measures according to whether they impact the BK, NFC, or OFC sector. We leave out the government and central bank sector as specific rules generally apply despite some of the controls impacting the public sector, i.e., regarding sovereign bonds. On the other hand, we treat operations involving state-owned enterprises as NFCs, OFCs or Banks depending on the nature of their operations.
- When several sectors are mentioned in the description, they are coded as controls impacting each of the sector mentioned. When all sectors are indiscriminately concerned by the measure, it is coded as impacting all sectors. For the empirical analysis, additional aggregation technics and variables are computed, recording BK-only, NFC-only, or OFC-only controls, i.e., measures that are sector-specific.
- To match our flow classification, when a measure applies to individuals, it is classified under NFCs.
- For securities, restrictions on the issuance are generally allowed for classifying the specific issuing sector, while for purchase and sale of securities, all sectors may be involved.
- When no specific sector is mentioned in the description, we make specific assumptions based on manual reading of the measure and likely impact:
  - Farmland, agriculture, and commercial real estate such as hotels are classified as NFCs even though the financial sector is now a major real estate investor for speculative purposes or long-term investment.
  - Residential real estate is classified also in NFCs as we assume it is mostly individuals who are buying and selling residential real estate. In practice, the financial sector may also be involved.
  - If unspecified and unless it concerns relations with affiliates abroad, restrictions on outward financial credit and financial guarantees and sureties are classified under Banks, assuming NFCs traditionally do not engage in financial credit provision and lending by OFCs is relatively less significant.
  - Restrictions on inward credit related to international commercial transactions/ import/exports are classified as NFCs.
  - Matching our capital flow classification, when unspecified, we do not systematically classify inward and outward FDI restrictions as NFC restrictions, as FDI may be involving banks and OFCs. We add all categories in this case.
- When a transaction is simply intermediated by financial institutions on behalf of other sectors, the investing sector is coded, not by intermediary sector.
- Restrictions on financial derivatives were left out to match the breakdown of our capital flow dataset.