

OECD Economics Department Working Papers No. 1613

Capital flow deflection under the magnifying glass

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https://dx.doi.org/10.1787/398180d0-en

OECD

Organisation for Economic Co-operation and Development

ECO/WKP(2020)21

Unclassified **English - Or. English**

27 August 2020

ECONOMICS DEPARTMENT

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Authorised for publication by Luiz de Mello, Director, Policy Studies Branch, Economics Department.

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JT03464661

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ABSTRACT/RESUME

Capital flow deflection under the magnifying glass

In a financially interconnected world, individual countries' policy choices affect other economies and can become a source of international shocks. Leveraging on a new quarterly dataset of capital control adjustments, we find renewed evidence that the introduction of capital controls in one economy increases capital inflows to other similar borrowing economies. However, not all flows are deflected alike. Capital flow deflection is primarily driven by portfolio investment and bank credit, and only controls targeting these types of flows generate this externality. Moreover, analysing bilateral capital flows, we find that that capital controls targeting portfolio investment tend to deflect flows from investors in advanced economies, while restrictions on bank-related flows primarily deflects lending from EME banks. The adoption of a particular type of capital restriction therefore has the effect of altering the geography of international financial linkages for both borrowing and lending countries. Finally, we find both a policy and a market reaction to deflection: Spillover-receiving countries tend in turn to tighten capital controls and international investors discount the likelihood of such capital account tightening by frontloading investment in the new destination. The paper concludes that these externalities may have important consequences in spillover-receiving countries, calling for multilateral cooperation in capital account policy.

JEL classification codes: F21, F32, F38, F42

Keywords: Capital controls, Spillovers, Externalities, Emerging markets, Bilateral capital flows,

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La déviation des flux de capitaux à la loupe

Dans un monde financièrement interconnecté, les choix politiques de pays donnés affectent d'autres économies et peuvent ainsi devenir une source de chocs internationaux. Tirant parti d'une nouvelle base de données trimestrielle codant les ajustements de contrôles de capitaux, ce papier confirme que l'introduction de contrôles dans une économie donnée augmente les flux de capitaux entrants dans des économies similaires. Cependant, tous les flux ne sont pas déviés de la même façon. La déviation des flux de capitaux est principalement provoquée par les flux de portefeuille et bancaires, et seulement les contrôles s'appliquant à ces types de flux génèrent cette externalité. De plus, une analyse des flux de capitaux bilatéraux permet de déterminer que les contrôles de capitaux s'appliquant aux flux de portefeuille ont tendance à dévier les investissements provenant de pays avancés, tandis que les restrictions aux flux bancaires dévient principalement des flux bancaires de pays émergents. L'adoption d'un type particulier de restrictions aux mouvements de capitaux a donc pour conséquence l'altération de la géographie des liens financiers internationaux pour les pays emprunteurs et créanciers. Enfin, ce papier met en évidence une réponse à la fois des politiques et des marchés à cette déviation : les pays receveurs de plus de flux ont tendance à leur tour à renforcer leurs contrôles, tandis que les investisseurs internationaux anticipent la probabilité de contrôles renforcés en augmentant leurs investissements vers cette nouvelle destination. Nous concluons que ces externalités peuvent avoir des conséquences importantes pour les pays receveurs, appelant à plus de coopération sur les politiques du compte financier au niveau multilatéral.

Classification JEL : F21, F32, F38, F42

Mots-clés : contrôles de capitaux, effets de débordement, externalités, marchés émergents, flux de capitaux bilatéraux,

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Capital flow deflection under the magnifying glass

Filippo Gori, Etienne Lepers and Caroline Mehigan [1]

1. Introduction

1. Over the last decade, the importance of cross-border financial flows and holdings has increased dramatically and with it, the impact of external shocks on domestic economies (Gourinchas and Rey, 2014; Lane and Milesi-Ferretti, 2007; OECD, 2018). The global transmission of shocks from the United States has strengthened and financial spillbacks from large emerging market economies (EMEs) has grown significantly, reflecting the growth of their footprint in international financial markets (IMF, 2016). Global push-factors are key drivers of international financial flows and represent major determinants of domestic financial conditions (Forbes and Warnock, 2012; Ghosh, Qureshi, Kim, et al., 2014; Rey, 2013).

2. Countries – individually and collectively – can deal with some of the consequences of international financial shocks, through macroeconomic policy adjustment or putting in place macro-economic and prudential frameworks – such as exchange rate arrangements and prudential rules for the financial sector. These policies can make them more stable and resilient to adverse spillovers. Against this background, since the global financial crisis, countries have used an increasing variety of financial policies, including capital flow management measures, as a way to stem the effect of abrupt changes in international financial flows on the domestic economy (de Crescenzio et al., 2017; Lepers and Mehigan, 2019).

3. However, in a financially integrated world, shifts in domestic capital account policy can in turn be a source of international spillovers, via portfolio rebalancing and general equilibrium effects, potentially leading to negative collective outcomes for the global financial system. In this context, the assessment of externalities relating to capital flow management policies (CFMs) is crucial and provides an important rationale for multilateral agreements and fora that discuss the appropriate use of instruments influencing capital flows, such as the OECD Code of Liberalisation of Capital Movements (OECD, 2019).

4. This paper contributes to the literature on spillovers originating from capital controls centred on the so-called capital flow deflection effect: a rise of capital inflows to a country following the imposition of controls on capital inflows by a similar borrowing economy (Figure 1). Empirical studies focusing on emerging market economies, point to the existence of such externality. Forbes et al. (2016) and Lambert et al. (2011) study the case of the Brazilian tax on inflow financial transactions (IOF) and provide evidence of significant and economically relevant reallocation of portfolio investment to other countries. Using panel data, Giordani et al. (2017) and Ghosh et al. (2014) find evidence that capital controls deflect capital flows to other receiving countries sharing similar

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economic characteristics. Focusing on bank flows, Avdjiev et al. (2016) find that changes in macroprudential tools have a significant effect on international bank lending, while Beirne and Friedrich (2017) show that these spillovers are a function of banking sector conditions both at home and abroad. More recently, Cerutti and Zhou (2018) analyse the joint effect of capital controls and macroprudential policies on cross-border bank flows; they find a strong association of lenders' capital outflow restrictions with local affiliate lending, primarily through affiliates in advanced economies. Using a similar set of financial policy measures, Pasricha et. al. (2018) concludes that spillovers in the post-crisis period and spillovers between BRICSs have been more significant.

5. Relying on a new granular dataset for capital control adjustments and on a new dataset of bilateral capital flows, in this paper we look closely at capital flow deflection. In contrast to existing work, we analyse spillovers along three main dimensions: the type of flows, the type of controls, and the type of investors. We also examine how spillovers influence capital account policy in the spillover-receiving country.

6. We find multiple results. First, we provide evidence of capital flow deflection among similar borrowing EMEs. However, not all financial flows are deflected alike, as capital flow deflection is primarily driven by portfolio investment (both debt and equity) and bank credit. Moreover, we find that spillovers to new destination countries not only entails higher capital inflow volumes but also higher volatility.

7. Second, using bilateral capital flow data, we find that international lenders in EMEs and advanced economies (AEs) react differently to cross-border lending restrictions. Following the introduction of capital controls in an emerging market economy, international investors in AEs mostly divert their equity portfolios (to other EMEs), while international investors located in other EMEs redirect bank-related flows. This implies that controls targeting different types of assets can affect the source and composition of capital inflows, changing the geographic footprint of international lenders in both receiving and originating countries.

8. Finally, we find evidence that, after the introduction of a capital control, similar borrowing economies have a higher probability of introducing similar measures. This can be thought of as a way to stem the underlying spillover. This result is consistent with Pasricha et al. (2018) that identify a domestic policy response to foreign capital control changes in similar countries. We go a step further and explore whether this policy reaction is discounted in international investors' investment decisions. We find evidence that international investors react to the introduction of a capital control in one country by also increasing their purchases in new destinations. This can be explained by the expectation of capital account tightening in the spillover receiving country. In other words, after the introduction of a capital control, international investors not only redirect capital flows to similar economies, but they also frontload their purchases, anticipating that the introduction of similar capital account restrictive measures may limit future investments in new destination countries. The overall effect of the introduction of a capital account restriction on the inflow of international capital to other borrowing economies can therefore be decomposed between a portfolio rebalancing effect, originating from pure capital flow deflection, and a frontloading effect caused by expected policy changes in new destination countries.

9. The remainder of this paper is organised as follows: Section 2 discusses the benchmark empirical specification and presents our data. Section 3 presents results for the aggregate capital flow data and a breakdown by type of flows and controls. Section 4

provides a bilateral perspective on deflection effect. Section 5 further assesses the policy and investor responses to spillovers, and Section 6 discusses policy implications.

2. Empirical specification and data

2.1. Baseline Specification

10. Let us consider a simple model for capital flows in a dynamic panel setting,

$$y_{i,t} = \varphi\, y_{i,t-1} + \beta\, x^J{}_{i,t-1} + \gamma\, \Omega'_{i,\tau} + \alpha_i + \varepsilon_{i,t} \qquad (1)$$

where $y_{i,t}$ is a measure of capital flows for a generic country *i* of a set *I,* at time *t*. In the analysis, we consider gross capital flows as a percentage of GDP. $\Omega_{i,\tau}$ is a vector of possibly lagged $(t, t-1 \in \tau)$ controls identifying relevant determinants of capital flows; α_i is a country fixed effect, and $\varepsilon_{i,t}$ is an idiosyncratic zero mean error term. The key variable in Model (1) is $x^J{}_i$, identifying capital account policy shifts in a set of countries J. Hence, the coefficient β measures the average (spillover) effect on country i $(y_{i,t})$ capital flows associated with the introduction or tightening of capital account restrictions in a generic country $j \in J$.

11. The definition of an appropriate set *J* of spillover-originating countries is key for the analysis. To the extent that, after the introduction of inflow controls, capital is deflected to similar borrowing economies, the literature on capital flow deflection builds on the key consideration that countries in *J* should share some similarities with the domestic economy *i*. The concept of similarity can span over different dimensions; one possible option is to group countries on the basis of geographical proximity (Ghosh et al., 2014), or on the basis of common economic characteristics, for example defining *J* to only include EMEs. Alternatively, the set *J* can be defined on the basis of similarity in some selected macroeconomic fundamentals, or on the basis of a similar country risk profile (Giordani et al., 2017).

12. The set of "similar" countries can be either pre-defined or based on a continuous weighting scheme, with different weights representing different degrees of similarity. There are many possible ways of coding $x^J{}_{i,t}$ to combine changes in capital account policy in countries in *J*; one of the simplest is to consider a linear weighting scheme such as:

$$x^J{}_{i,t} = \sum_{j \neq i}^{J} c_t{}^j \rho_t{}^j \qquad (2)$$

where $c_t{}^j$ is a variable identifying the introduction of capital flow measures in country *j* at time *t*. $\rho_t{}^j$ is a weight measuring the relative significance of the introduction of this measure for capital flow dynamics for the domestic economy (country *i*). $\rho_t{}^j$ measures how close a generic country *j* in *J* to *i* with respect to all other countries in *J*. The choice of an adequate weighting scheme, thus of the set of $\rho_t{}^j$, is not trivial and it should reflect a compelling prior about the mapping between countries originating and receiving spillovers. In this paper, we assess countries' similarity based on the correlation between capital

inflows. This implies the use of a continuous weighting scheme in which the set of weighs $\rho_t{}^j$ are defined by the correlation coefficient between the inflow of capital in country *i* and each country *j* in *J*.[2] The use of this continuous weighting scheme implies that the contribution of each country *j* to the spillover variable depends on the extent to which capital inflows in both countries (*i* and *j*) correlate. Figure 2 provides the resulting matrix in the bilateral correlations of capital inflows from 2004 to 2014.[3]

13. The economic rationale of this choice for the construction of the spillover variable lies on the idea that, if capital inflows to two distinct countries (*i* and *j*) co-move in relation to each other, this underlines similarity in the two countries' assets in the eyes of international investors. We argue that this measure is more effective in measuring similarity among two countries than alternatives based on location (as assets even in nearby countries may have different investment characteristics) or fundamentals (as fundamentals are often unable to explain asset price dynamics). In fact, this measure has some correspondence with the concept of *similarity* of assets in stock market analysis.[4]

14. The variable $c_t{}^j$, measuring the introduction or tightening of capital controls, is constructed following Lepers and Mehigan (2019). The index is coded as 1 for every measure that is introduced or tightened in the quarter, and -1 for every measure that is removed or eased. [5] Only positive values measuring the introduction or tightening of controls are considered when assessing capital flow deflection.

15. Model (1) is estimated including the following domestic controls: the money market interest rate - to control for the monetary policy stance in the country receiving capital flows - the inflation rate, and GDP growth, as well as a measure of capital controls on inflows in country *i*. [6] All country-specific regressors and the spillover variable are lagged by one quarter. We control for global factors with the log of the VIX index. Finally, we lag the dependent variable to address likely persistence in capital flows.[7]

2.2. Data

16. The data for capital controls are from Lepers and Mehigan (2019). These series are constructed using the "changes" sections of the IMF Annual Report on Exchange Arrangements and Exchange Restrictions (AREAER) as well as complementary sources such as OECD reports. This can be categorised as a de-jure index measuring changes in

[2] Inflow correlations are computed over rolling windows of 8 quarters.

[3] We set negative inflow correlations to 0. The idea is to eliminate from the set of similar countries *J*, all economies whose capital inflow is negatively correlated with the one of country *i*, and whose capital account policy shift would otherwise be added with negative sign (thus subtracted) from the spillover variable.

[4] Similarity between two stocks is measured with the correlation of returns.

[5] This practice of coding policy change has been recognised for other types of policies by De Crescenzio et al (2015), Cerutti et al (2017), Beirne et al (2017) and others as a more appropriate method to analyse the effects of these policies.

[6] While not of specific interest for identifying the deflection effect in part due to endogeneity concerns between capital flows and the likelihood of introducing controls to stem these flows, we still believe it is important to include it as it may in theory mitigate deflection dynamics.

[7] While we include a dynamic component to control for persistency in capital inflows, our quarterly panel data is large enough to downplay the importance of the Nickell bias.

capital controls. The data comprises quarterly changes in policy measures (both inflow and outflow) for a set of advanced and emerging market economies. The data are split by asset type (FDI, portfolio debt, portfolio equity, credit). The time sample used in this paper ranges from 2000Q1 to 2017Q4 at a quarterly frequency. Table 1 provides the number of instances of adjustments in capital flow measures captured in the overall dataset, split by inflow and outflow and asset type. Figure 3 displays the quarterly adjustment in capital flow measures. The figure shows an increase in the use of capital account restrictions since the global financial crisis.

17. The use of this dataset has several advantages with respect to comparable data used in the literature. First, the frequency is quarterly, while much of the literature analysing spillovers from capital controls uses yearly data. Second, the dataset does not simply map the presence of controls but also captures its adjustments, hence not only capturing the changes to the extensive margin (new controls) but also the intensive margin (tightening of existing controls). These advantages are relevant as slow-moving measures (such as the Chinn and Ito (2002) or the Fernandez et al index (2015)) are based on the presence of restrictions (i.e. 0/1 dummies). Such indices may be missing a large part of the dynamics in capital account polices. The difference between our index and the traditional capital account openness index is clearly demonstrated with the case of India for which traditional indices point to an unchanged (or slightly more restrictive) capital account policy since the 2000's, while our index displays a significant gradual liberalisation of the capital account (Figure 4).

18. In addition, the dataset offers high level of granularity allowing a split between inflow and outflow restrictions, as well as a granular classification between measures targeting different type of assets. Such granularity is key as policies are usually targeted at specific asset classes and different policies have been found to have very different effects on output variables (Lepers and Mehigan, 2019). Despite these benefits, our dataset does not fully deal with the issue of intensity, as some policy changes may have a stronger impact than others. However, a solution to the intensity issue is difficult to solve when comparing across flow type, control type and countries.

19. Capital flow data are sourced from the IMF Balance of Payment Statistics.[8] Remaining macroeconomic variables are from OECD datasets or, when data are not available, supplemented with data from the World Economic Outlook database or the International Financial Statistics of the IMF.

[8] The Sixth Edition of the Balance of Payments Manual (BPM6), refers to "capital flows" as cross-border financial transactions recorded in economies' external financial accounts. Gross capital inflows arise when the economy incurs more external liabilities (inflows with a positive sign) or the economy reduces its external liabilities (inflows with a negative sign). Thus, gross inflows are net sales of domestic financial instruments to foreign residents. Gross capital outflows arise when the economy acquires more external assets (outflows with a positive sign) or the economy reduces its holdings of external assets, i.e. retrenchment (outflows with a negative sign). Thus, gross outflows are net purchases of foreign financial instruments by domestic residents. Gross outflows can fall due to residents acquiring less assets abroad, or an increase in residents bringing capital home.

3. Capital inflow restrictions and spillovers – deflection effect

3.1. ***Baseline capital flow deflection***

20. Table 2 reports regression results for Model (1) estimated using 14 emerging market economies.[9] The coefficient of the spillover variable, measuring the introduction of capital inflow restrictions in other EMEs, is positive and significant. Following the introduction of capital inflow restrictions in one EME, other similar EMEs experience an increase in gross capital inflows (an increase in net purchases to domestic assets by non-residents); international investors, not being able to purchase assets in the country restricting its capital account, redirect their purchases in countries offering assets with a similar investment profile, resulting in stronger capital inflows in new destination. We find significant deflection effects up to 3 quarters after the introduction of controls. This result provides evidence of the so-called *deflection effect* and it corroborates similar empirical evidence found in the literature (K. Forbes et al., 2016; Giordani et al., 2017).

21. The coefficients of controls have signs consistent with previous findings in the literature and with economic priors. The lag of capital inflows (dependent variable) is also positively and significantly related to current capital inflows, highlighting the persistence of flows to the same destination over time.

22. There is no statistically significant evidence of the effectiveness of inflow-targeted capital flow measures in reducing the volume of capital inflows. As mentioned earlier, this result may be due to the endogeneity of domestic CFMs with respect to capital flows, as restrictions to capital inflows are typically introduced to stem potentially destabilising and sustained waves of capital inflows.

3.2. ***Breakdown by flow and control type: the role of portfolio equity, debt and other investment***

23. Table 3 explores compositional effects relating to capital flow deflection. The regression assesses the extent to which different types of international capital are associated with this type of spillover. Results in the first four columns of Table 3 show that capital inflows are deflected primarily by restrictions targeting the inflow of portfolio investment (equity and debt) and credit-targeted capital controls. There is little evidence that international investors react to capital inflow restrictions targeting FDI inflows. This result is unsurprising as FDI are typically project- and destination specific and cannot be quickly redirected to other countries even if sharing similar economic characteristics.[10]

24. A related question concerns the type of capital involved in spillovers. The last set of models in Table 3 show that there is a correspondence between the capital targeted in the inflow restriction - in the spillover originating country - and the one involved in the externality. That is, a tightening in portfolio inflows produces an increase in the inflow of portfolio investment to similar borrowing countries. The same applies to a restriction targeting credit. This link supports the argument that these empirical results are linked to capital flow deflection.

[9] These are Argentina, Brazil, Chile, China, Colombia, Hungary, India, Indonesia, Mexico, Poland, Russia, South Africa, Thailand and Turkey.

[10] We also note that tightening controls on FDI is much less frequent in our dataset than tightening other cross-border operations.

25. The finding that "hot money" - portfolio investment and credit - are the primary drivers of capital flow deflection may provide further grounds for concerns about capital account policy spillovers. These type of flows are typically considered to be more volatile and prone to abrupt fluctuations than longer-term investment such as FDI. Large portfolio and credit inflows may represent a significant driver of domestic asset prices and credit cycles (Igan and Tan, 2017; Lane and McQuade, 2014) and a source of macroeconomic instability in the spillover-receiving country.

3.3. Volatility spillovers

26. Capital flow volatility is a concern for macroeconomic and financial stability. We assess the impact of the introduction of capital flow measures on the short-term volatility of capital flows in emerging market economies. We regress the standard deviation of capital flows (in USD, not scaled by GDP) on the spillover variable and controls used in the baseline specification. The model takes the following form:

$$\sigma_{i,T} = s^{\varphi}\sigma_{i,T-k} + s^{\beta}\, x^{J}{}_{i,t-1} + S'_{i,\tau}s^{\theta} + s_i^{\alpha} + \omega_{i,T} \quad (3)$$

Where $\sigma_{i,T}$ is the log of forward-looking standard deviations of capital flows calculated over the time interval T, spanning k quarters from time, thus $T = [t+1, t+1+k]$. $S'_{i,\tau}$ contains the same controls as baseline Equation (3), s_i^{α} is a country fixed effect and $\omega_{i,T}$ a zero mean i.i.d error term. We estimate the model for k=4 (one year ahead following Pagliari and Hannan, 2017) over overlapping time spells. Table 4 shows regression results for standard deviations computed over 4 quarters with and without the lagged dependent variable (at *t-4*). Results are similar to previous models; the introduction of capital controls generates a significant increase in the volatility of capital inflows in the spillover receiving country.

3.4. Robustness

27. In Table 5, we present estimation results from a set of alternative specifications for the spillover variable for the baseline model detecting capital flow deflection. First, we test whether the results are robust to a set of global factors beyond the VIX, including global GDP growth, the global 10 year bond yield, and the growth in global liquidity (Column 1). We also test whether the results are robust to the introduction of year fixed effects (Column 2).[11] The coefficient for the spillover variable remains positive and significant.

28. We then split our sample between pre and post the 2008 crisis (Columns 3 and 4). We find that the spillover variable is positive in both regressions but the level of significance drops in the pre-crisis sample. This result is consistent with evidence presented by Pasricha, et. al. (2018), possibly explained by the global abundance of liquidity after the global financial crisis. Going forward, the unprecedented liquidity injection associated with the 2020 COVID-19 shock is likely to further increase the likelihood of deflection.

[11] We prefer not to have time fixed effects in our baseline model as time fixed effects, by construction, capture co-movements across countries in the sample, thus are partially collinear with spillovers.

29. Finally, we test the robustness of the results to changes in the specification of the spillover variable. In Column 5, we estimate a spillover variable where the inflow correlation weights are replaced by a measure of the risk and return of the recipient country, where risk is measured by a country's credit rating and return by the country's growth rate.[12] In Column 6, the spillover variable is constructed simply with risk (ratings). In Column 7, we construct the spillover variable according to geographic closeness looking at countries of the same region. In Column 8, we estimate an unweighted spillover variable. In Columns 9 and 10, we weight the tightening of controls by the size of the tightening country – respectively by its share in total international assets and liabilities, and by its GDP. In Column 11 we consider fixed time correlations using the first 8 quarters of the dataset. Finally, we control for the possibility of cross-sectional dependence of the residuals by using Driscoll and Kraay standard errors, which provides even stronger results for our spillover variable (Column 12). We also re-estimate models in Table 3 in a system framework using seemingly unrelated regression to account for possible interdependence in desegregated capital flows equations. Similar robustness checks are performed for the regressions considering capital flows disaggregated by type of capital flows and type (these latter results are omitted from the Appendix for space constraints). The spillover variable is positive and significant with most alternative specifications, offering confidence about the robustness of our baseline deflection effect.

4. A bilateral perspective on the deflection effect: who invests where?

30. In this section, we turn to a recently developed dataset of bilateral capital flows, with breakdown by asset class, to get more granularity into how capital flow deflection operates. This data allows us to assess if country A shifts investment from country B to country C following the introduction of controls in B. In concrete terms, we can investigate the location of investors active in this portfolio rebalancing, and whether there is a connection between investor location and asset class involved in the spillover. Shifting to a bilateral approach however requires us to shift to use annual data.

31. Indeed we leverage on recent data compilation efforts by the Joint Research Center of the European Commission based on Hobza and Zeugner (2014) and described in Nardo et al, (2017). The authors compile and harmonise data on bilateral FDI from the OECD, on portfolio flows from the IMF CPIS, and on banking flows from the BIS to produce a dataset of bilateral stocks and flows with annual frequency ranging from 2001 to 2017. Figure 5 presents the networks of bilateral flows in cross-border bonds, equity and loans in 2017, highlighting the difference in the key players across asset classes. The famous "triad" – the EU, US and Japan is clearly visible in the three markets. Figure 6 further highlights the fast-growing relevance of intra-EME linkages in global banking.

32. Table 7 lists the top ten bilateral exposures per asset type (bond, equity and loans). The US appears by far the larger equity investor, while the UK is the world's largest banking centre. The table also highlights the very important role of financial centres or hubs. These centres act as intermediaries for a large portion of the world's capital.

[12] EMEs are divided in four groups, with high risk and high growth, high risk and low growth, low risk and high growth, and low risk and low growth, where boundaries between these groups are defied by the two medians for growth and risk.

33. In order to look closer at how the deflection effect operates, we adjust our baseline model to allow for bilateral investment flows and control for both source and destination countries:

$$log(Y_{zi,T}) = \beta\, x^J{}_{i,T-1} + \gamma\Omega'_{i,\tau} + \vartheta\Omega'_{z,\tau} + \delta_{zi} + e_{zi,T} \qquad (4)$$

Where, $Y_{zi,t}$ represents the flow of capital from country *z* to country *i*, at time *t*. Instead of scaling flows by the GDP of one of the partners, we log flows as per common practice in bilateral gravity models. $\Omega'_{i,\tau}$ and $\Omega'_{z,\tau}$ are vectors of controls specific to the source/investing country and to the destination/invested country respectively, namely interest rate and GDP growth. It also includes capital controls on inflows for the receiving country *i* and capital controls on outflows for the sending country *z* so that barriers to cross-border capital movements are controlled on both ends of the relationship. Finally, $x^J{}_{i,T-1}$ is the spillover variable used in the baseline model, defined as the sum of capital controls on inflows in countries similar to *i*, i.e. weighted by the bilateral correlations of capital inflows between that country and *i*. [13]

34. The specification this time includes country-pair fixed effects δ_{zi}. Such fixed effects will effectively control for all factors which are common to the pair of country and do not change overtime, such as common language, history, religion or distance, which have been found to matter in a large literature on gravity models. It importantly controls for bilateral factors which are harder to measure as distance and linguistic ties may not fully capture trust and social linkages. $e_{zi,t}$ is the zero expected value idiosyncratic error term.

35. Results in Table 8 illustrate differences between investors in advanced and emerging economies. International investors in AEs mainly shift their *equity* portfolio following the tightening of controls in an emerging economy. Banks from advanced economies also appear to shift their *lending* portfolio to other countries following the introduction of controls in one EMEs. On the other hand, emerging market economies banks shift their *lending* to other EMEs after the tightening of controls in one EME. This differences can be explained by different financial linkages connecting AEs and EMEs to international financial markets. One important implication of this result is that the introduction capital controls targeting specific types of transactions and asset classes not only generates capital deflection but also changes the geography of international financial linkages for both spillover originating and destination countries.

36. The role of credit-targeted controls in generating spillovers among EMs certainly reflects the significant growth of cross-border activity of EME banks and of EME-to-EME interlinkages specifically, highlighted in Figure 6. This increase in the number of material bilateral partners increases the potential for capital flow deflection. Evidence shows that EME-EME links often make up more than half of EMEs' cross-border borrowing (Cerutti et al., 2018), and the prominence of bank cross-border linkages with respect to portfolio investments for EMEs. In our bilateral dataset, EME-EME links represented in 2017 43%

[13] Shifting from quarterly to annual data may miss some of the potential immediate reaction to capital controls if capital controls are introduced at the relative beginning of the year. However, for obvious reasons of endogeneity, we do not take the contemporaneous value of our spillover variable which would wrongly capture capital flows happening before the introduction of the measure.

of banking inflows to EMEs, while they represent only 1% of equity inflows to EME and 8% of debt flows. Conversely, AE investors are dominant in equity flows.[14]

37. Like for the aggregate analysis, we test whether the deflection patterns in certain asset types match the controls on the same asset type (Table 9). We find that EME banks redirect lending away from countries introducing restrictions on foreign bank loans, while investors from advanced economies' do redirect equity investment away from countries restricting equity inflows. However, this is not the case for restrictions on portfolio debt flows. These differences across asset classes and between EME and AEs are likely explained by size, network, and volatility effects. EME and AE are present to different extent in different countries and in different asset classes.

38. As robustness checks, we replace country-pair fixed effects by both source and destination country fixed effects and results remain similar.

5. Responses to spillovers

5.1. Policy reactions in spillover-receiving countries

39. Existing literature suggests that spillovers relating to capital flow deflection induce policymakers in spillover-receiving countries to in turn adopt capital controls, to stem the increase in inflows following capital diversion (Pasricha et al., 2018). We assess this hypothesis by estimating a *probit* model where the conditional probability of a country introducing restrictions to capital inflows depends on previous capital inflow tightening in similar economies. The model takes the following form:

$$\Pr(Z_{i,\tau}^{CFM} = 1|\,\mathrm{X}) = \phi(b\,\chi^{J}{}_{i,t-1} + \mathrm{c}\,\Gamma'_{i,t-1}) \qquad (5)$$

With $\chi^{J}{}_{i,t-1}, \Gamma_{t-1} \in X$. The dichotomous dependent variable is defined as $Z_{i,\tau}^{CFM}$=1 if a country tightens capital inflow controls during the period τ defined as the current and next quarter and 0 otherwise. $\Gamma_{i,t-1}$ is a vector of controls which can be expected to impact the probability of tightening capital controls on inflows.[15] $\chi^{J}{}_{i,t-1}$ is the same spillover variable used in the baseline model, and it measures the introduction of capital inflow restriction in a set of similar economies *J*. The coefficient b in Equation (5) measures the impact of the introduction of capital controls on inflows in similar economies on the probability of the introduction of corresponding control in the domestic economy. Results are reported in Table 10**.** The spillover variable is positive and significant confirming the result that countries tend to respond to capital inflow spillovers by introducing capital controls.

[14] It is important to note than in the Balance of Payments Statistics framework, equity flows include investment fund shares, which may be bond or equity funds, and are typically a more volatile component of total equity flows.

[15] We control for the Vix, and capital inflows, interest rate and GDP growth in the previous quarter in line with our previous models. We also try additional variables that may be driving capital controls adjustments such as the credit to GDP gap, the exchange rate regime, and previous easing or tightening of controls (Fratzscher, 2012; Pasricha, 2017), but these were dropped for simplicity purposes as they were statistically insignificant.

Splitting again by control type, the spillover variable remains positive and of higher statistical significance for controls on bonds and controls on bank lending.

5.2. Decomposing capital flow deflection: diversion and expectation effect

40. The previous Section identified a policy response by policymakers in spillover receiving countries. In this Section, we test the possibility that this response could have an effect on international investor decision to divert their investment in the spillover receiving countries. In fact, international investors could react to an *expected* tightening in capital inflow regulation in the spillover receiving country, ultimately adjusting capital inflow to these destinations.

41. Such intuition was also tested in Forbes et al (2016) which argued that investors will be less likely to invest in countries which they see more likely to introduce controls. However, controls on inflows are the sign of (too) good times (tightened during surges) – i.e. these countries are actually profitable investment destinations in which investors are pouring in. Hence, investors should seek to benefit from the investment opportunities before other countries take on controls instead of disinvesting in these countries.

42. This can be empirically tested by augmenting Equation (1) with a dummy variable measuring the introduction of an inflow-targeted capital control, coincident with the dependent variable. Furthermore, this dummy is treated as an endogenous variable that depends on several determinants including the spillover variable. In this setup, the impact of the spillover from the introduction of capital account restrictions on capital inflow is composed of two effects: (i) a direct portfolio rebalancing effect conditional on a standard set of control variables, and (ii) an indirect effect reflecting an increase in capital inflow associated with the probability of the introduction of a capital account restriction in the spillover receiving country. Formally, this new empirical specification combines a linear capital flow model with an equation modelling capital controls in the spillover receiving country similar to the one discussed in the previous Section. Such a framework has been applied by previous literature to assess the dual effects of financial liberalisation on growth (Caldera Sánchez and Gori, 2016; Ranciere et al., 2006; Razin and Rubinstein, 2006), and it develops along the lines of a standard treatment effect model (Maddala, 1983).

43. Let us consider this new equation:

$$y_{i,t} = \varphi\, y_{i,t-1} + \beta\, x^{J}{}_{i,t-1} + \Omega'_{i,\tau}\gamma + \theta\, Z^{CFM}_{i,t} + \alpha_i + \upsilon_{i,t} \qquad (6)$$

The capital control dummy $Z^{CFM}_{i,t}$ is treated as an endogenous variable that depends on a number of variables including the spillover variable $x^{J}{}_{i,t-1}$ and is modelled within a probability framework according to the following equation, similar to Equation 5 in the previous Section:

$$\Pr(Z^{CFM}_{i,\tau} = 1|\, \mathrm{X}) = \phi(b\, \chi^{J}{}_{i,t-1} + \mathrm{c}\Gamma'_{i,\tau}) \qquad (7)$$

Where $Z^{CFM}_{i,\tau}$ is defined as in the previous Section and controls include the same variables considered in Equation (5) as well a variable measuring capital control tightening within the past year. This latter variable is unique to the Probit model and considered for

identification purposes, being a good a good predictor of a future capital tightening, but not a determinant of capital flow deflection.[16]

44. Errors in Equations (6) and (7) are assumed to be jointly normal distributed. The use of a non-linear model such as the Probit model for the estimation of Equation (7) has some advantages, as the non-linearity of the specification should, in principle, be sufficient to achieve identification.[17] Estimation is performed via full maximum likelihood (MLE), results are reported in Table 11.

45. Column (1) shows regression results for the linear regression model (Equation 6), Column (2) shows results for the endogenous binary-treatment model (equation 7). Both the spillover variable and the endogenous treatment model showing the probability of country introducing inflow capital controls are positive and significant. This is evidence that part of the increase in capital flows among EMEs after the introduction of a capital inflow restriction in a similar borrowing economy, is not due to a pure portfolio rebalancing effect, but instead driven by an expectation of a future tightening in the spillover receiving country. This expectation urges international investors to frontload purchases of international asset in the new destination.

6. Conclusions and policy implications

46. High economic and financial integration raises challenges for domestic and international policy. In a financially interconnected world, policy choices taken in one country affect other economies. Against this background, countries need to adjust to new sources of spillovers. In this paper, we find strong evidence that capital controls put into place by individual countries have pervasive effects on capital flow dynamics in other economies.

47. In this paper we identified externalities arising from capital controls in one economy on capital inflows of other similar borrowing economies, consistently with what the literature has called capital flow deflection. However, not all flows are deflected alike: capital flow deflection is primarily driven by portfolio investment (both debt and equity) and bank credit, and only controls targeting these types of flows effectively generate this externality. This finding represents a source of additional concerns for policymakers, as capital inflow measures targeting portfolio investments ultimately tilt the capital flow composition of spillover-receiving countries toward this type of riskier assets. In addition, capital account policy spillbacks not only result in capital flow increases (or declines) but also extend to their volatility.

48. Moreover, using bilateral flow data, we found that portfolio investors from advanced economies shift their investment following the introduction of capital controls on portfolio investment, while international lenders in EMEs appear particularly sensitive to controls targeting bank flows. This result highlights that the introduction of capital controls targeting a particular type of international asset (liability) not only determines

[16] We noted before that the spillover effect linked to capital flow deflection dies out after three quarters.

[17] However, Arellano (2005) shows that relying only on the non-linearity of the specification for identifying the model may result in weak identification and is advisable to include in the treatment equation some excluded instruments.

spillovers to similar borrowing economies, but also affect the geography of international financial linkages, shifting the composition of international borrowers across regions.

49. Finally, consistently with similar results in the literature (Pasricha et al., 2018), we found evidence that the introduction of a capital control increases the likelihood of a capital account tightening in the spillover receiving economy. This policy response aims at stemming spillover-related capital account pressures. However, we also found evidence that international investors tend to anticipate the tightening, frontloading purchases of international assets in new destinations. The overall quantitative impact linked with capital flow deflection can therefore be divided in a pure portfolio rebalancing effect and an incremental effect due to international investors' anticipation of the introduction of capital controls in spillover receiving economies.

50. Ultimately, the existence of significant cross-border spillovers from individual countries' capital account policies, creates the premises for competing policy actions, potentially delivering collectively negative outcomes. To the extent it generates negative externalities, the introduction of capital account restrictions has the potential for triggering cascading effects on the degree of international financial openness for a larger number of countries. In this paper we find evidence that investor reactions to expected tightening in spillover receiving countries has the potential to exacerbate capital flows externalities. As countries increasingly resort to unilateral capital controls in the context of volatile flows (Blanchard, 2017), policy reactions to a first mover may degenerate in "regulatory wars" (Jeanne, 2014; Pereira et al., 2017), ultimately delivering largely suboptimal equilibria for global welfare.

51. In this context, there is ground for renewing a call for deeper international coordination of capital account policies, as collective policy co-ordination can mitigate negative externalities arising from unilateral actions. Policy coordination, even if often complex to implement, may effectively curb the possible realisation of particularly negative end games and result in better global outcomes. International policy coordination can take different forms, for example establishing and fostering global standards and rules of conduct, along with continued multilateral dialogue, including in international fora like the G20. In the specific context of capital flow measures, the international community has put in place agreements that specify the appropriate use of instruments that influence capital flows. The OECD Code of Liberalisation of Capital Movements, introduced in 1961 and recently revised in 2019, is an example of an established and tested process of transparent international dialogue and co-operation on capital flow management issues and policies (OECD, 2019). From a policy standpoint, international frameworks such as the Code, represent a potential backstop to collectively damaging unilateral capital account actions, and provide ground for the improvement of economic outcomes for each country individually and for the international financial system.

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Fgure 1: Deflection of capital flows

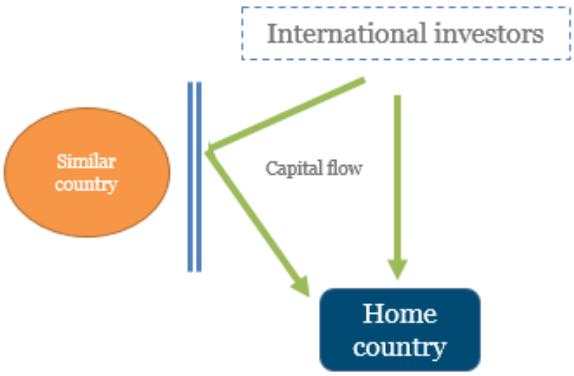


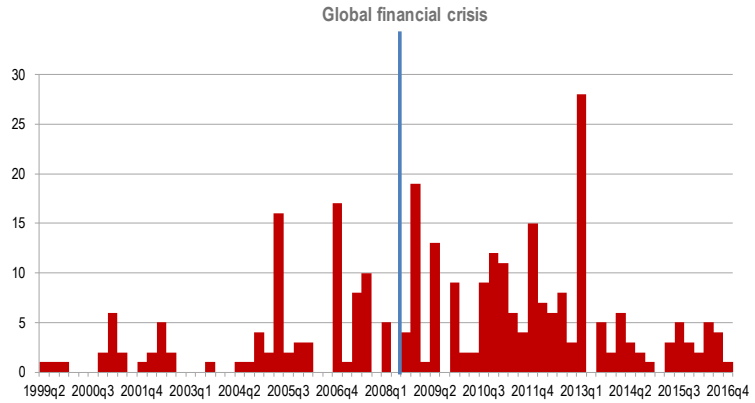
Figure 2: Flow of international liabilities, pairwise correlations 2004-2014

			United States	United Kingdom	France	Ireland	Spain	Netherlands	Austria	Portugal	Sweden	Germany	Italy	Denmark	Greece	Korea	Japan	Australia	Canada	Poland	Hungary	Czech Republic	Thailand	Israel	South Africa	Turkey	Russia	India	Indonesia	Argentina	Brazil	Chile	Colombia	Mexico	
AEs	US	United States	1	0.712	0.581	0.553	0.415	0.385	0.383	0.365	0.358	0.356	0.320	0.230	-0.107	0.582	0.480	0.234	0.233	0.410	0.155	0.150	0.445	0.388	0.336	0.262	0.316	0.171	0.050	0.198	0.171	0.117	0.025	-0.011	
	AE Europe	United Kingdom	0.712	1	0.595	0.470	0.412	0.462	0.513	0.420	0.471	0.638	0.389	0.348	0.054	0.676	0.366	0.061	0.009	0.298	0.199	-0.052	0.315	0.280	0.294	0.110	0.190	0.080	-0.107	0.187	0.072	0.071	-0.171	-0.139	
		France	0.581	0.595	1	0.593	0.747	0.261	0.500	0.520	0.346	0.495	0.528	0.437	0.305	0.555	0.092	0.176	-0.151	0.531	0.338	0.118	0.380	0.426	0.228	0.143	0.387	0.004	-0.103	0.162	-0.009	-0.181	-0.233	-0.209	
		Ireland	0.553	0.470	0.593	1	0.521	0.400	0.508	0.533	0.363	0.352	0.383	0.471	0.172	0.442	0.286	0.064	-0.053	0.284	0.305	0.136	0.101	0.119	0.289	0.146	0.247	0.097	-0.058	0.146	-0.008	-0.041	-0.057	-0.160	
		Spain	0.415	0.412	0.747	0.521	1	0.123	0.545	0.549	0.240	0.405	0.555	0.417	0.489	0.418	0.045	0.182	-0.123	0.359	0.452	0.217	0.095	0.250	0.176	0.211	0.393	-0.100	-0.177	0.157	-0.095	-0.086	-0.313	-0.219	
		Netherlands	0.385	0.462	0.261	0.400	0.123	1	0.401	0.504	0.733	0.417	0.211	0.301	-0.022	0.579	0.347	-0.061	-0.078	-0.011	0.065	-0.012	0.211	0.050	0.289	0.084	0.125	-0.009	-0.025	0.111	-0.004	0.079	-0.080	0.032	
		Austria	0.383	0.513	0.500	0.508	0.545	0.401	1	0.533	0.402	0.490	0.590	0.583	0.357	0.460	0.107	-0.016	-0.097	0.313	0.361	0.046	0.153	0.141	0.209	0.090	0.328	-0.102	-0.236	0.128	-0.136	-0.104	-0.310	-0.154	
		Portugal	0.365	0.420	0.520	0.533	0.549	0.504	0.533	1	0.281	0.400	0.393	0.364	0.274	0.527	0.109	-0.005	-0.259	0.152	0.206	0.139	0.019	0.125	0.097	-0.133	0.122	-0.207	-0.292	-0.068	-0.210	-0.218	-0.493	-0.251	
		Sweden	0.358	0.471	0.346	0.363	0.240	0.733	0.402	0.281	1	0.459	0.152	0.312	0.006	0.479	0.189	0.011	0.012	0.097	0.168	-0.077	0.270	0.182	0.284	0.105	0.302	0.049	-0.038	0.250	0.073	0.039	-0.012	0.089	
		Germany	0.356	0.638	0.495	0.352	0.405	0.417	0.490	0.400	0.459	1	0.457	0.388	0.124	0.522	0.152	0.074	-0.220	0.205	0.034	0.006	0.373	0.047	0.153	0.127	0.184	0.005	-0.228	0.308	0.117	-0.123	-0.248	-0.106	
		Italy	0.320	0.389	0.528	0.383	0.555	0.211	0.590	0.393	0.152	0.457	1	0.469	0.191	0.461	0.049	-0.043	-0.060	0.258	0.038	0.090	0.192	0.134	0.252	0.218	0.246	-0.069	-0.087	0.307	0.036	-0.037	-0.147	-0.095	
		Denmark	0.230	0.348	0.437	0.471	0.417	0.301	0.583	0.364	0.312	0.388	0.469	1	0.434	0.243	-0.090	0.039	-0.093	0.281	0.302	-0.012	0.116	0.032	0.108	-0.005	0.196	-0.082	-0.257	0.193	-0.209	-0.008	-0.294	-0.202	
		Greece	-0.107	0.054	0.305	0.172	0.489	-0.022	0.357	0.274	0.006	0.124	0.191	0.434	1	-0.018	-0.168	0.282	0.003	0.212	0.430	0.080	0.008	0.066	0.078	0.083	0.107	0.054	-0.081	0.007	-0.140	-0.118	-0.336	-0.186	
	Other AE	Korea	0.582	0.676	0.555	0.442	0.418	0.579	0.460	0.527	0.479	0.522	0.461	0.249	-0.018	1	0.406	0.088	0.017	0.362	0.046	0.228	0.290	0.201	0.407	0.241	0.396	0.075	-0.028	0.231	0.146	0.179	-0.132	0.101	
		Japan	0.480	0.366	0.092	0.286	0.045	0.347	0.107	0.109	0.189	0.152	0.049	-0.090	-0.168	0.406	1	0.067	0.030	0.121	0.019	0.336	0.210	-0.178	0.164	0.239	0.188	0.120	0.101	-0.032	0.093	0.211	0.107	0.094	
		Australia	0.234	0.061	0.176	0.064	0.182	-0.061	-0.016	-0.005	0.011	0.074	-0.043	0.039	0.282	0.088	0.067	1	0.416	0.362	0.156	0.315	0.408	0.231	0.379	0.471	0.366	0.555	0.349	0.210	0.449	0.356	0.245	0.325	
		Canada	0.233	0.009	-0.151	-0.053	-0.123	-0.078	-0.097	-0.259	0.012	-0.220	-0.060	-0.093	0.003	0.017	0.030	0.416	1	0.355	-0.014	0.053	0.313	0.212	0.442	0.438	0.207	0.652	0.592	0.299	0.582	0.528	0.496	0.546	
	EME Europe	Poland	0.410	0.298	0.531	0.284	0.359	-0.011	0.313	0.152	0.097	0.205	0.258	0.281	0.212	0.362	0.121	0.362	0.355	1	0.177	0.123	0.471	0.406	0.403	0.408	0.525	0.462	0.365	0.333	0.459	0.272	0.196	0.234	
		Hungary	0.155	0.199	0.338	0.305	0.452	0.065	0.361	0.206	0.168	0.034	0.038	0.302	0.430	0.046	0.019	0.156	-0.014	0.177	1	0.079	-0.122	0.200	0.169	0.048	0.372	0.020	-0.035	0.072	-0.133	0.088	-0.186	-0.210	
		Czech Republic	0.150	-0.052	0.118	0.136	0.217	-0.012	0.046	0.139	-0.077	0.006	0.090	-0.012	0.080	0.228	0.336	0.315	0.053	0.123	0.079	1	0.219	0.003	0.115	0.450	0.485	0.310	0.117	0.170	0.173	0.174	0.015	0.254	
	Other EME	Thailand	0.445	0.315	0.380	0.101	0.095	0.211	0.153	0.019	0.270	0.373	0.192	0.116	0.008	0.290	0.210	0.408	0.313	0.471	-0.122	0.219	1	0.348	0.430	0.500	0.407	0.551	0.415	0.288	0.447	0.217	0.208	0.471	
		Israel	0.388	0.280	0.426	0.119	0.250	0.050	0.141	0.125	0.182	0.047	0.134	0.032	0.066	0.201	-0.178	0.231	0.212	0.406	0.200	0.003	0.348	1	0.340	0.268	0.258	0.242	0.248	0.348	0.239	-0.015	0.007	0.094	
		South Africa	0.336	0.294	0.228	0.289	0.176	0.289	0.209	0.097	0.284	0.153	0.252	0.108	0.078	0.407	0.164	0.379	0.442	0.403	0.169	0.115	0.430	0.340	1	0.487	0.366	0.548	0.553	0.452	0.507	0.608	0.328	0.391	
		Turkey	0.262	0.110	0.143	0.146	0.211	0.084	0.090	-0.133	0.105	0.127	0.218	-0.005	0.083	0.241	0.239	0.471	0.438	0.408	0.048	0.450	0.500	0.268	0.487	1	0.627	0.696	0.611	0.513	0.647	0.512	0.478	0.604	
		Russia	0.316	0.190	0.387	0.247	0.393	0.125	0.328	0.122	0.302	0.184	0.246	0.196	0.107	0.396	0.188	0.366	0.207	0.525	0.372	0.485	0.407	0.258	0.366	0.627	1	0.438	0.248	0.256	0.365	0.346	0.120	0.419	
		India	0.171	0.080	0.004	0.097	-0.100	-0.009	-0.102	-0.207	0.049	0.005	-0.069	-0.082	0.054	0.075	0.120	0.555	0.652	0.462	0.020	0.310	0.551	0.242	0.548	0.696	0.438	1	0.792	0.452	0.815	0.571	0.630	0.692	
		Indonesia	0.050	-0.107	-0.103	-0.058	-0.177	-0.025	-0.236	-0.292	-0.038	-0.228	-0.087	-0.257	-0.081	-0.028	0.101	0.349	0.592	0.365	-0.035	0.117	0.415	0.248	0.553	0.611	0.248	0.792	1	0.329	0.797	0.617	0.766	0.727	
	EME South America	Argentina	0.198	0.187	0.162	0.146	0.157	0.111	0.128	-0.068	0.250	0.308	0.307	0.193	0.007	0.231	-0.032	0.210	0.299	0.333	0.072	0.170	0.288	0.348	0.452	0.513	0.256	0.452	0.329	1	0.503	0.343	0.325	0.287	
		Brazil	0.171	0.072	-0.009	-0.008	-0.095	-0.004	-0.136	-0.210	0.073	0.117	0.036	-0.209	-0.140	0.146	0.093	0.449	0.582	0.459	-0.133	0.173	0.447	0.239	0.507	0.647	0.365	0.815	0.797	0.503	1	0.546	0.748	0.684	
		Chile	0.117	0.071	-0.181	-0.041	-0.086	0.079	-0.104	-0.218	0.039	-0.123	-0.037	-0.008	-0.118	0.179	0.211	0.356	0.528	0.272	0.088	0.174	0.217	-0.015	0.608	0.512	0.346	0.571	0.617	0.343	0.546	1	0.472	0.564	
		Colombia	0.025	-0.171	-0.233	-0.057	-0.313	-0.080	-0.310	-0.493	-0.012	-0.248	-0.147	-0.294	-0.336	-0.132	0.107	0.245	0.496	0.196	-0.186	0.015	0.208	0.007	0.328	0.478	0.120	0.630	0.766	0.325	0.748	0.472	1	0.602	
		Mexico	-0.011	-0.139	-0.209	-0.160	-0.219	0.032	-0.154	-0.251	0.089	-0.106	-0.095	-0.202	-0.186	0.101	0.094	0.325	0.546	0.234	-0.210	0.254	0.471	0.094	0.391	0.604	0.419	0.692	0.727	0.287	0.684	0.564	0.602	1	
																																		EMEs

Note: This matrix represents the pairwise correlations of capital inflows from 2004-2014.

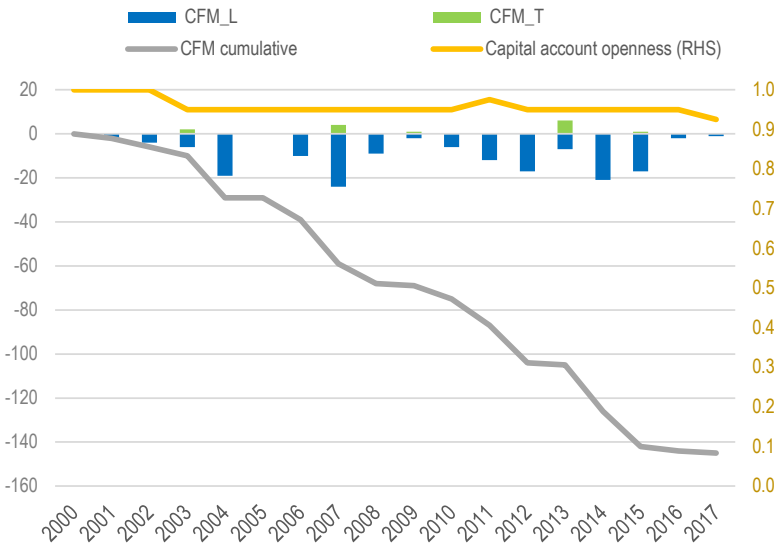
Source: IMF Balance of Payment statics database.

Figure 3: The tightening of capital flow restrictions increased since the global financial crisis



Note: The figure shows the quarterly introduction or tightening of capital flow measures in a set of 62 advanced and emerging market economies for the period 2000-2017. The tightening or introduction of a financial policy is coded as +1.
Source: Lepers and Mehigan (2019).

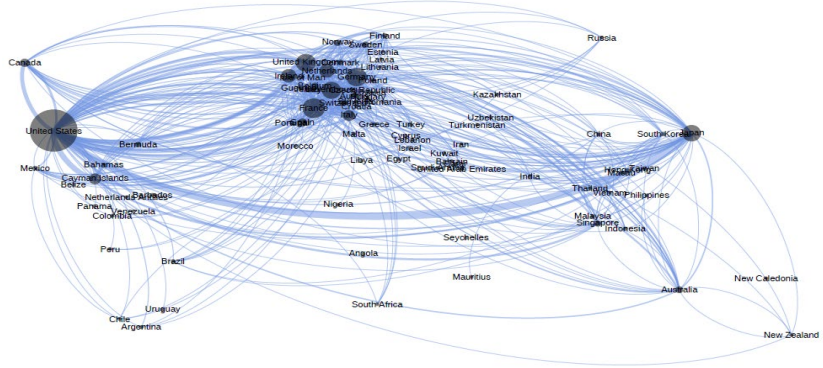
Figure 4*:* Difference between our capital control measure and traditional capital account openness indices in the case of India



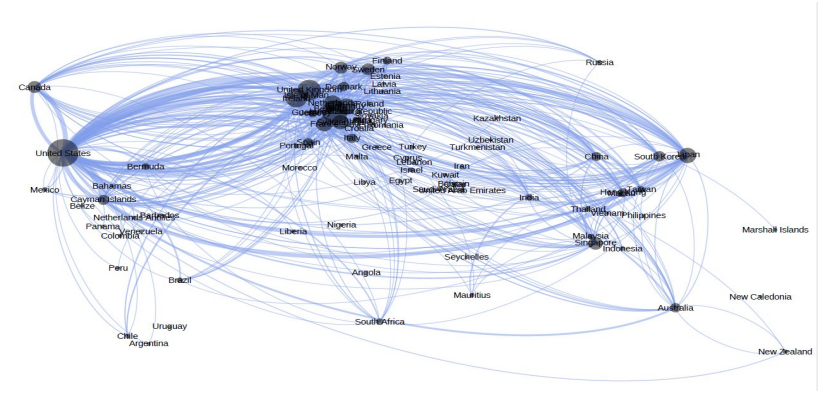
Note: The figure shows the difference between our index of capital controls (line shows cumulative adjustment while bars show quarterly tightening (CFM_T, +1) and easing (CFM_E, -1)) and Fernandez et al (2015) capital account openness index (right axis).

Figure 5: Global capital flow network

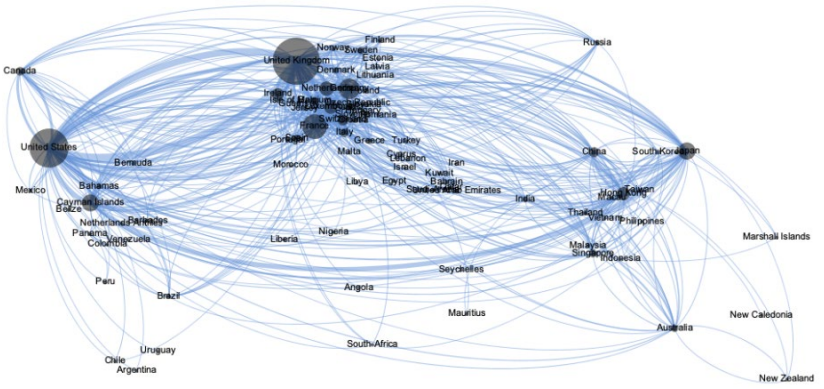
Cross-border equity exposure (2017)



Cross-border bond exposure (2017)



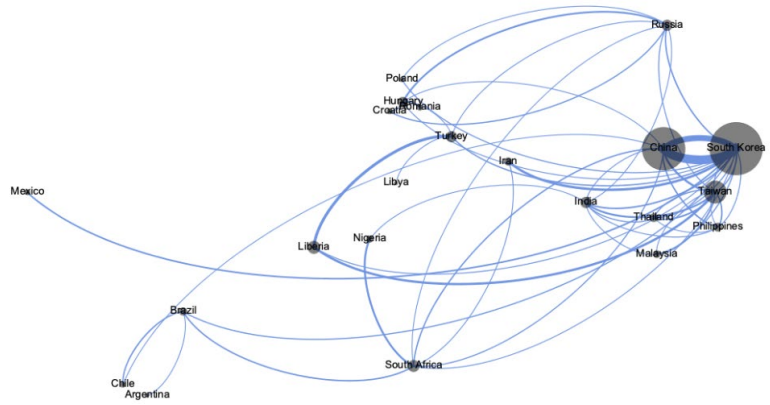
Cross-border credit exposure (2017)



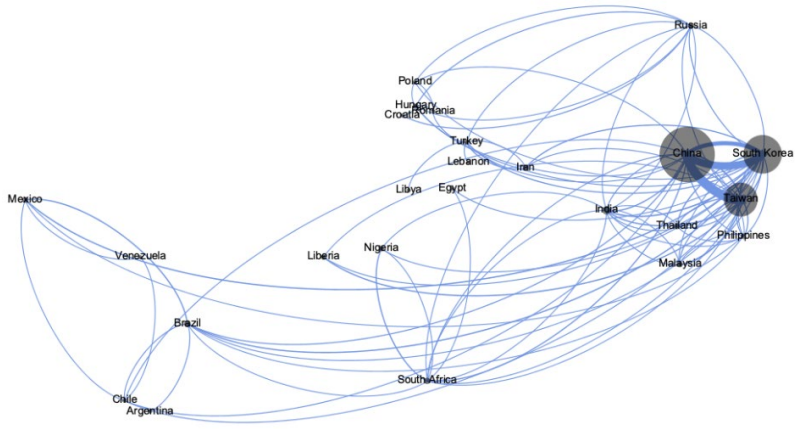
Note: Stock data in 2005 and 2017. Only bilateral exposures above 4 trillion EUR are represented to limit the number of links represented. The direction of the relationship is to be read clockwise going from the source to the recipient countries.
Source: Authors calculations based on Finflows database as of September 2019 (described in Nardo et al 2017)

Figure 6: **Global network of intra-EME cross-border loans**

2005



2017



Note: Stock data in 2005 and 2017. Only bilateral exposures above 100 million EUR are represented to limit the number of links represented. The direction of the relationship is to be read clockwise going from the source to the recipient countries.
Source: Authors calculations based on Finflows database as of September 2019 (described in Nardo et al 2017)

Table 1: Number of adjustments in capital flow measures per asset type

RBM on inflows	937	RBM on outflows	1287
RBM inflow - FDI	103	RBM outflow - FDI	109
RBM - FDI liquidation	7	RBM outflow - FDI liq	6
RBM inflow - bond capital market	140	RBM outflow - bond capital market	197
RBM inflow - bond money market	124	RBM outflow - bond money market	172
RBM inflow - collective investment securities	64	RBM outflow - collective investment securities	164
RBM inflow - credit	220	RBM outflow - credit	139
RBM inflow - derivatives	90	RBM outflow - derivatives	114
RBM inflow - equity	104	RBM outflow - equity	194
RBM inflow - other personal transactions	17	RBM outflow - other personal transactions	70
RBM inflow - real estate	68	RBM outflow - real estate	97
		RBM outflow - repatriation	25

Source: Lepers and Mehigan (2019)

Table 2: Baseline capital flow deflection – EMEs

	(1) Capital Inflow	(2) Capital Inflow	(3) Capital Inflow	(4) Capital Inflow	(5) Capital Inflow	(6) Capital Inflow
First lag	0.137***	0.137***	0.131***	0.130***	0.130***	0.125***
	(0.031)	(0.029)	(0.028)	(0.026)	(0.025)	(0.023)
Vix	-0.632***	-0.695***	-0.724***	-0.733***	-0.731***	-0.871***
	(0.166)	(0.159)	(0.169)	(0.160)	(0.171)	(0.175)
Inflation (t-1)	-0.548	-0.609	-0.568	-0.587	-0.587	-0.701
	(0.493)	(0.481)	(0.490)	(0.502)	(0.535)	(0.533)
Growth (t-1)	0.055**	0.060**	0.059**	0.058**	0.057**	0.060***
	(0.021)	(0.022)	(0.021)	(0.020)	(0.019)	(0.020)
Interest rate (t-1)	-0.021**	-0.018*	-0.019**	-0.020**	-0.021**	-0.017**
	(0.009)	(0.009)	(0.008)	(0.008)	(0.008)	(0.008)
CFM (t-1)	0.010	-0.001	-0.001	-0.002	0.015	-0.008
	(0.018)	(0.016)	(0.016)	(0.017)	(0.019)	(0.016)
CFM spillover (t-1)		0.146**				0.134*
		(0.064)				(0.062)
CFM spillover (t-2)			0.102*			0.064*
			(0.048)			(0.032)
CFM spillover (t-3)				0.090**		0.040*
				(0.032)		(0.021)
CFM spillover (t-4)					0.093	0.078
					(0.069)	(0.065)
Country set	EME	EME	EME	EME	EME	EME
Number of countries	13	13	13	13	13	13
Observations	927	927	916	905	894	894

Emerging Market Economies (EME) include: Argentina, Brazil, Chile, China, Colombia, Hungary, India, Indonesia, Mexico, Poland, Russia, South Africa, Thailand and Turkey. The dependent variable are net sales of domestic financial instruments to foreign residents (gross flow of international liabilities) to GDP. Country fixed effects. Standard errors clustered at country level. Robust standard errors in parentheses.

Table 3: Inflow restrictions and type of capital, EMEs

	Type of controls				Type of controls and flows			
	(1) Capital Inflow	(2) Capital Inflow	(3) Capital Inflow	(4) Capital Inflow	(5) FDI Inflow	(6) Portfolio equity Inflow	(7) Portfolio debt Inflow	(8) Other Inflows
First lag (t-1)	0.138***	0.137***	0.136***	0.136***	0.054***	0.247***	0.129***	0.391***
	(0.031)	(0.030)	(0.029)	(0.029)	(0.004)	(0.049)	(0.027)	(0.050)
Vix	-0.661***	-0.700***	-0.675***	-0.676***	0.185+	-0.164***	-0.321**	-0.265*
	(0.161)	(0.162)	(0.161)	(0.160)	(0.111)	(0.052)	(0.109)	(0.144)
Inflation (t-1)	-0.596	-0.564	-0.567	-0.584	0.135	-0.146**	-0.003	-0.216
	(0.494)	(0.480)	(0.484)	(0.481)	(0.119)	(0.059)	(0.142)	(0.184)
Growth (t-1)	0.054**	0.061**	0.055**	0.057**	0.017**	-0.005+	-0.002	0.021
	(0.020)	(0.023)	(0.021)	(0.021)	(0.006)	(0.003)	(0.006)	(0.013)
Interest rate (t-1)	-0.021**	-0.019*	-0.019*	-0.019**	-0.000	-0.002+	-0.002	-0.009**
	(0.009)	(0.009)	(0.009)	(0.008)	(0.002)	(0.001)	(0.002)	(0.004)
Relevant Inflow CFM (t-1) [1]	0.035	-0.035	0.042	-0.076+	0.048	0.034	0.005	-0.093***
	(0.088)	(0.075)	(0.027)	(0.045)	(0.053)	(0.037)	(0.015)	(0.029)
Inflow CFM spillover (FDI) (t-1)	1.432				0.657			
	(0.949)				(0.716)			
Inflow CFM spillover (Port. equity) (t-1)		0.633***				0.073**		
		(0.201)				(0.033)		
Inflow CFM spillover (Port. debt) (t-1)			0.179**				0.061+	
			(0.064)				(0.035)	
Inflow CFM spillover (Credit) (t-1)				0.395**				0.191***
				(0.139)				(0.048)
Country set	EME	EME	EME	EME	EME	EME	EME	EME
Number of countries	13	13	13	13	13	13	13	13
Observations	927	927	927	927	927	922	927	927

Emerging Market Economies (EME) include Argentina, Brazil, Chile, China, Colombia, Hungary, India, Indonesia, Mexico, Poland, Russia, South Africa, Thailand and Turkey. The dependent variable are net sales of domestic financial instruments to foreign residents (gross flow of international liabilities) to GDP. Models run using country fixed effects. Standard errors clustered at country level.[1] inflow restrictions targeting the dependent variable (e.g. FDI targeted controls in Model 1, portfolio equity targeted controls in Model 2 ...). Clustered-robust standard errors in parentheses.

+ p<0.13, * p<0.10,** p<0.05, *** p<0.01

Table 4: Volatility spillovers

	(1)	(2)
	Standard Deviation of Capital Inflow	Standard Deviation of Capital Inflow
Lagged dependent variable (t-4)		0.387***
		(0.090)
Vix	0.015	0.070
	(0.071)	(0.046)
Inflation (t-1)	1.429***	0.766**
	(0.389)	(0.276)
Growth (t-1)	0.023	0.034
	(0.025)	(0.020)
Interest rate (t-1)	0.008	0.001
	(0.006)	(0.004)
Inflow CFM (t-1)	-0.016	-0.007
	(0.019)	(0.010)
Inflow CFM spillover (t-1)	0.050***	0.022*
	(0.015)	(0.012)
Country set	EME	EME
Countries	13	13
Observations	883	848

The dependent variable is the 4-quarter ahead standard deviation of capital inflow (total international liabilities). Models run using country fixed effects. Estimation performed on overlapping time spells. Standard errors clustered at country level. Robust standard errors in parentheses.
* p<0.10,** p<0.05, *** p<0.01

Table 5: **Robustness checks**

	(1) Capital inflows	(2) Capital inflows	(3) Capital inflows	(4) Capital inflows	(5) Capital inflows	(6) Capital inflows	(7) Capital inflows	(8) Capital inflows	(9) Capital inflows	(10) Capital inflows	(11) Capital inflows	(12) Capital inflows
First lag	0.211***	0.187***	0.033**	0.332***	0.135***	0.137***	0.137***	0.136***	0.235***	0.237***	0.136***	0.137
	(0.027)	(0.035)	(0.012)	(0.037)	(0.031)	(0.030)	(0.031)	(0.028)	(0.013)	(0.010)	(0.029)	(0.104)
Inflow CFM (t-1)	-0.010	-0.010	0.009	0.022	0.006	0.009	0.010	0.009	-0.001	0.010	0.011	-0.001
	(0.015)	(0.016)	(0.022)	(0.039)	(0.018)	(0.019)	(0.018)	(0.017)	(0.018)	(0.019)	(0.018)	(0.021)
Inflow CFM spillover (t-1)	0.110*	0.142+	0.114*	0.084								0.146***
	(0.056)	(0.080)	(0.054)	(0.082)								(0.038)
Risk return inf. CFM spillover (t-1)					0.061+							
					(0.035)							
Ratings inf. CFM spillover (t-1)						0.014						
						(0.027)						
Region inf. CFM spillover (t-1)							-0.020					
							(0.028)					
Unweighted inf. CFM spillover (t-1)								0.059**				
								(0.020)				
Asset/Liab weighted inf. CFM spillover (t-1)									0.035**			
									(0.015)			
GDP weighted inf. CFM spillover (t-1)										0.048*		
										(0.024)		
Fixed time corr weighted inf. CFM spillover (t-1)											0.073*	
											(0.038)	
Inflation (t-1)	-0.346	-0.049	-2.062**	1.344	-0.642	-0.558	-0.514	-0.642	-0.172	-0.111	-0.555	-0.609**
	(0.522)	(0.796)	(0.867)	(1.308)	(0.511)	(0.485)	(0.481)	(0.502)	(0.503)	(0.541)	(0.493)	(0.233)
Vix	-0.927***		-0.863**	-0.937***	-0.608***	-0.624***	-0.642***	-0.707***	-0.808***	-0.779***	-0.630***	-0.695**
	(0.201)		(0.351)	(0.279)	(0.174)	(0.160)	(0.173)	(0.170)	(0.170)	(0.195)	(0.165)	(0.251)
Growth (t-1)	0.020	0.048***	0.057**	-0.083	0.055**	0.056**	0.054**	0.052**	0.055*	0.039	0.055**	0.060***
	(0.019)	(0.015)	(0.022)	(0.083)	(0.021)	(0.020)	(0.021)	(0.021)	(0.027)	(0.038)	(0.021)	(0.018)
Interest rate (t-1)	-0.012	-0.014*	-0.011	-0.003	-0.021**	-0.021**	-0.020**	-0.020**	-0.016**	-0.011	-0.020**	-0.018***
	(0.007)	(0.007)	(0.028)	(0.010)	(0.009)	(0.009)	(0.009)	(0.009)	(0.006)	(0.008)	(0.009)	(0.006)
Time sample	Full	Full	Post-crisis	Pre-crisis	Full	Full	Full	Full	Full	Full	Full	Full
Year FE	N	Y	N	N	N	N	N	N	N	N	N	N
Other Global Controls	Y	N	N	N	N	N	N	N	N	N	N	N
N	875	678	507	420	927	927	927	927	680	676	927	927

The dependent variable are net sales of domestic financial instruments to foreign residents (gross flow of international liabilities) to GDP. Standard errors clustered at country level. Models run using country fixed effects. Clustered-robust standard errors in parentheses. Other global controls include global liquidity yoy, Global 10Y bond yield, Global GDP growth. Column 12 reports Driscoll-Kraay standard errors to control for cross-sectional dependence. + p<0.13, * p<0.10,** p<0.05, *** p<0.01

Table 6: **Robustness checks – by type of controls and type of flows – Fixed correlation spillover variable**

	Type of controls				Type of controls and flows			
	(1) Capital Inflow	(2) Capital Inflow	(3) Capital Inflow	(4) Capital Inflow	(5) FDI Inflow	(6) Portfolio equity Inflow	(7) Portfolio debt Inflow	(8) Other Inflows
First lag (t-1)	0.137***	0.137***	0.136***	0.136***	0.054***	0.248***	0.130***	0.393***
	(0.031)	(0.030)	(0.029)	(0.030)	(0.004)	(0.049)	(0.025)	(0.051)
Vix	-0.609***	-0.647***	-0.631***	-0.642***	0.198	-0.159***	-0.306**	-0.253+
	(0.169)	(0.166)	(0.165)	(0.166)	(0.130)	(0.051)	(0.105)	(0.143)
Inflation (t-1)	-0.545	-0.531	-0.538	-0.567	0.157	-0.141**	0.010	-0.215
	(0.489)	(0.490)	(0.497)	(0.487)	(0.133)	(0.059)	(0.141)	(0.188)
Growth (t-1)	0.055**	0.055**	0.054**	0.053**	0.018**	-0.005*	-0.002	0.019
	(0.021)	(0.022)	(0.021)	(0.021)	(0.007)	(0.003)	(0.006)	(0.013)
Interest rate (t-1)	-0.021**	-0.020**	-0.020**	-0.020**	-0.000	-0.002*	-0.002	-0.010**
	(0.009)	(0.009)	(0.009)	(0.009)	(0.002)	(0.001)	(0.002)	(0.004)
Relevant Inflow CFM (t-1) [1]	-0.049	-0.020	0.050*	-0.045	0.023	0.035	0.008	-0.083**
	(0.092)	(0.073)	(0.027)	(0.048)	(0.057)	(0.037)	(0.016)	(0.029)
Fixed corr. Inflow CFM spillover (FDI) (t-1)	-0.376				0.010			
	(0.386)				(0.289)			
Fixed corr. Inflow CFM spillover (Portfolio equity) (t-1)		0.529**				0.095*		
		(0.201)				(0.050)		
Fixed corr. Inflow CFM spillover (Portfolio debt) (t-1)			0.109+				0.064**	
			(0.066)				(0.024)	
Fixed corr. Inflow CFM spillover (Credit) (t-1)				0.205**				0.201***
				(0.081)				(0.066)
Country set	EME	EME	EME	EME	EME	EME	EME	EME
Number of countries	13	13	13	13	13	13	13	13
Observations	927	927	927	927	927	927	922	927

The dependent variable are net sales of domestic financial instruments to foreign residents (gross flow of international liabilities) to GDP. Models run using country fixed effects. Standard errors clustered at country level. Clustered-robust standard errors in parentheses. [1] inflow restrictions targeting the dependent variable (e.g. FDI targeted controls in Model 1, portfolio equity targeted controls in Model 2 ...).

+ p<0.13, * p<0.10,** p<0.05, *** p<0.01

Table 7: **Top 10 bilateral exposures per asset type (Mlns EUR, 2017)**

	Portfolio Equity			Portfolio Debt			Loans		
1	United States >	Cayman Islands	1079649	Japan >	United States	903798	United Kingdom >	United States	1043520
2	United States >	United Kingdom	926899	Cayman Islands >	United States	613139	United States >	United Kingdom	869009
3	United States >	Japan	742951	Luxembourg >	United States	506363	Cayman Islands >	United States	637896
4	United Kingdom >	United States	675979	Ireland >	United Kingdom	423183	United Kingdom >	France	611590
5	Canada >	United States	639908	Ireland >	United States	400534	Japan >	Cayman Islands	584358
6	Italy >	Luxembourg	567417	United States >	Canada	398028	United States >	Cayman Islands	367238
7	Japan >	Cayman Islands	538939	United Kingdom >	United States	351837	United States >	Japan	366715
8	Cayman Islands >	United States	501147	United States >	Cayman Islands	331131	United Kingdom >	Ireland	356290
9	Germany >	Luxembourg	480608	United States >	United Kingdom	313273	Germany >	United Kingdom	342689
10	United States >	Canada	429290	Bahamas >	United States	289648	United Kingdom >	Netherlands	332361

Source: Finflows database as of September 2019 (described in Nardo et al 2017)
Note: Stock data in 2017

Table 8: Capital flow deflection: a bilateral perspective

Destination country sample:	EMEs					
Source country sample:	EMEs			Advanced Economies		
	Bank flows	Debt flows	Equity flows	Bank flows	Debt flows	Equity flows
Growth in source (t-1)	0.005	-0.008*	-0.004	-0.003	-0.000	-0.007
	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.005)
Growth in destination (t-1)	-0.010**	-0.007*	0.009**	0.003	-0.002	0.010**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Economic size in source (t-1)	0.376	0.758**	-0.185	0.590*	1.957**	1.132**
	(0.241)	(0.223)	(0.261)	(0.321)	(0.377)	(0.341)
Economic size in destination (t-1)	0.397*	0.710**	1.375**	0.599**	0.575**	0.696**
	(0.221)	(0.222)	(0.247)	(0.182)	(0.224)	(0.207)
Interest rate in source (t-1)	-0.005	-0.016	-0.013	0.099**	-0.058	0.073**
	(0.014)	(0.014)	(0.015)	(0.031)	(0.045)	(0.029)
Interest rate in destination (t-1)	0.001	-0.008	-0.024**	0.010	0.000	-0.002
	(0.014)	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)
Vix	-0.200	-0.610**	-0.270	-0.351**	-0.603**	-0.330**
	(0.154)	(0.165)	(0.165)	(0.137)	(0.151)	(0.157)
Inflow CFM in destination (Credit) (t-1)	-0.102**			0.059**		
	(0.038)			(0.020)		
Outflow CFM in source (Credit) (t-1)	-0.080			-0.011		
	(0.074)			(0.131)		
Inflow CFM in destination (Bond) (t-1)		0.022			-0.024	
		(0.033)			(0.025)	
Outflow CFM in source (Bond) (t-1)		-0.116**			0.016	
		(0.029)			(0.131)	
Inflow CFM in destination (Equity) (t-1)			-0.177**			-0.047
			(0.083)			(0.085)
Outflow CFM in source (Equity) (t-1)			-0.099*			-0.153
			(0.055)			(0.213)
Inflow CFM spillover (t-1)	0.110**	-0.041	0.001	0.111**	0.031	0.100**
	(0.040)	(0.045)	(0.042)	(0.032)	(0.041)	(0.037)
Observations	1954	2082	1887	1610	1538	1564

The dependent variable is bilateral flow (log) split by asset type, within source and destination country samples. Model is estimated using country-pair fixed effects. Standard errors clustered at country pair level. Clustered-robust standard errors in parentheses. * p<0.10,** p<0.05, *** p<0.01

Table 9: Capital flow deflection: matching bilateral flows and controls

Destination country sample:	**EMEs**					
Source country sample:	**EMEs**			**Advanced Economies**		
	Bank flows	**Debt flows**	**Equity flows**	**Bank flows**	**Debt flows**	**Equity flows**
Growth in source (t-1)	0.005	-0.008*	-0.004	-0.005	-0.000	-0.006
	(0.004)	(0.004)	(0.004)	(0.005)	(0.006)	(0.005)
Growth in destination (t-1)	-0.010**	-0.007*	0.009**	0.003	-0.002	0.010**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)
Economic size in source (t-1)	0.365	0.753**	-0.188	0.538*	1.956**	1.132**
	(0.242)	(0.223)	(0.261)	(0.319)	(0.377)	(0.341)
Economic size in destination (t-1)	0.381*	0.712**	1.373**	0.603**	0.574**	0.731**
	(0.222)	(0.223)	(0.248)	(0.186)	(0.224)	(0.209)
Interest rate in source (t-1)	-0.009	-0.017	-0.014	0.089**	-0.058	0.080**
	(0.014)	(0.014)	(0.015)	(0.031)	(0.046)	(0.029)
Interest rate in destination (t-1)	-0.003	-0.010	-0.024**	0.006	0.000	-0.003
	(0.014)	(0.009)	(0.009)	(0.009)	(0.012)	(0.012)
Vix	-0.106	-0.588**	-0.254	-0.248*	-0.590**	-0.381**
	(0.140)	(0.163)	(0.170)	(0.134)	(0.149)	(0.163)
Inflow CFM in destination (Credit) (t-1)	-0.101**			0.061**		
	(0.038)			(0.021)		
Outflow CFM in source (Credit) (t-1)	-0.082			-0.029		
	(0.075)			(0.130)		
Inflow CFM in destination (Bond) (t-1)		0.022			-0.024	
		(0.033)			(0.025)	
Outflow CFM in source (Bond) (t-1)		-0.117**			0.010	
		(0.029)			(0.130)	
Inflow CFM in destination (Equity) (t-1)			-0.176**			-0.044
			(0.083)			(0.086)
Outflow CFM in source (Equity) (t-1)			-0.099*			-0.142
			(0.055)			(0.212)
Credit Inflow CFM spillover (t-1)	0.334**			0.205		
	(0.156)			(0.144)		
Bond Inflow CFM spillover (t-1)		-0.128			0.048	
		(0.090)			(0.083)	
Equity Inflow CFM spillover (t-1)			-0.059			0.719**
			(0.271)			(0.230)
Observations	1954	2082	1887	1610	1538	1564

The dependent variable is bilateral flow (log) split by asset type, within source and destination country samples. Model is estimated using country-pair fixed effects. Standard errors clustered at country pair level. Clustered-robust standard errors in parentheses. * p<0.10,** p<0.05, *** p<0.01

Table 10: Policy reaction in spillover-receiving countries

	(1) Pr(CFM inf. in t or t+1)	(2) Pr(CFM inf. equity in t or t+1)	(3) Pr(CFM inf. bond in t or t+1)	(4) Pr(CFM inf. credit in t or t+1)
Inflow CFM spillover (t-1)	0.048*	0.050	0.082**	0.060**
	(0.028)	(0.046)	(0.029)	(0.028)
Vix	0.098	0.242	-0.010	0.048
	(0.165)	(0.243)	(0.191)	(0.219)
Capital inflows (t-1)	-0.019	0.015	-0.007	-0.013
	(0.015)	(0.009)	(0.013)	(0.014)
Interest rate (t-1)	0.007	-0.004	0.000	0.010*
	(0.005)	(0.007)	(0.005)	(0.005)
Growth (t-1)	0.003	0.035	-0.001	-0.003
	(0.019)	(0.028)	(0.022)	(0.022)
Country Set	EME	EME	EME	EME
Countries	13	13	13	13
Observations	914	914	914	914

The dependent variable is a dichotomous variable measuring reporting 1 if capital inflow restrictions have been introduced in the current and next quarter. Standard errors clustered at country level. Robust standard errors in parentheses. * p<0.10,** p<0.05, *** p<0.01

Table 10: Inflow restrictions and expected tightening in spillover receiving country

	Full MLE	First Step
	(1) Capital Inflow	(2) Pr (Inflow CFM (t, t+1))
Capital inflows (t-1)	0.160*	-0.020
	(0.087)	(0.020)
Vix	-0.883***	0.008
	(0.299)	(0.161)
Inflation (t-1)	-0.711***	
	(0.182)	
Growth (t-1)	0.051	0.031
	(0.035)	(0.020)
Interest rate (t-1)	-0.029***	0.008*
	(0.011)	(0.004)
Inflow CFM (t-1)	-0.005	
	(0.018)	
Inflow CFM in previous year (t-4, t-8)		0.287***
		(0.107)
Inflow CFM spillover (t-1)	0.106***	0.040*
	(0.040)	(0.024)
[Probability of] CFM	4.608***	
	(1.340)	
Country set	EME	EME
Countries	13	13
Observations	914	914

The dependent variable in the first stage is a dichotomous variable measuring reporting 1 if capital inflow restrictions have been introduced in the current and next quarter. The dependent variable in the second stage (Column 1) is gross flow of total international liabilities as percentage of GDP. Standard errors clustered at country level. Robust standard errors in parentheses.

* p<0.10,** p<0.05, *** p<0.01