Banc Ceannais na hÉireann
Central Bank of Ireland
Eurosystem

Research Technical Paper

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Vol. 2020, No. 13

Global Risk and Portfolio Flows to Emerging Markets: Evidence from Irish-Resident Investment Funds*

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Abstract

In this paper we analyse the behaviour of investment fund flows to emerging markets after the Global Financial Crisis (GFC). Our data points towards a structural growth in investment funds that purchase debt rather than equity securities. Empirically, we find that debt flows have higher sensitivity to global risk than equity flows, suggesting an increasing policy focus primarily on debt funds. We also show that Irish-resident funds' sensitivity to changes in global risk sentiment co-varies negatively with a measure of sovereign credit rating of the receiving emerging market economy, a finding consistent with a notion that good fundamentals in host countries can mitigate outflows arising from swings in external funding conditions. Finally, we show that funds whose equity structure is tilted towards investors residing further away tend to invest less in countries than funds whose investors are closer to the same countries. This is noteworthy, given these results refer to Irish-resident investment funds that intermediate global financial flows.

JEL classification: F20, F32

Keywords: Investment Funds, Financial Flows, Emerging Markets, VIX

*We thank Peter Dunne, Lorenz Emter, Brian Golden, Reamonn Lydon, Vasileios Madouros, Kitty Moloney and the participants of IMF MCM Policy Forum for their comments and suggestions. Luke Doyle and Kieran Sheehan provided excellent research assistance. The views expressed in this paper are personal and do not represent the views of the Central Bank of Ireland.

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1 Introduction

The 'push' and 'pull' framework for understanding financial flows came to prominence with the work of Calvo et al. (1993, 1996). Empirically, global liquidity and risk are usually found to be the leading 'push' factors (Forbes and Warnock, 2012; Fratzscher, 2012). As to the 'pull' factors, Alfaro et al. (2008) point towards the quality of institutions in explaining the level of capital inflows to emerging markets.[1] However, global financial conditions do not have a symmetric effect on flow-receiving countries (Fratzscher, 2012; Cerutti et al., 2019). Using high quality in-house data on Irish-resident funds, in this paper we empirically assess the post-GFC sensitivity of fund flows to global risk sentiment as well as its conditionality on domestic policies of emerging markets.

Over the past decade, portfolio investment has overtaken bank finance to become a more prevalent form of finance for emerging markets (Shin, 2013; Carney, 2019). The share of market-based funding has increased significantly.[2] This structural growth in portfolio flows suggests that 'pipes' that transmit financial flows across the globe have been changing. Investment funds have become an important player in provision of non-bank funding and transmission of financial conditions to emerging market economies (Aitken, 1996). Meanwhile, as emerging markets are becoming increasingly important for the global economy, shocks hitting this group of countries can spill back to advanced economies. Accordingly, understanding post-GFC sensitivity of fund flows to global financial conditions is of paramount importance.

Building on Calvo et al. (1993), Chuhan et al. (1998) analyse the determinants of capital flows to developing countries.[3] They provide evidence in favour of both domestic factors, such as countries' credit rating, and global factors, such as US interest rates, in explaining capital inflows. Highlighting the distinction between domestic and foreign investors, Forbes and Warnock (2012) study episodes of capital flow waves from

[1] Using bilateral data on bank flows, Everett and Galstyan (2020) estimate a financial gravity model to extract the host and source fixed effects that are then matched against various macroeconomic variables to help identify 'pull' factors. The advantage of this approach is that the factors do not have to be identified in advance, while also allowing for a presence of bilateral linkages. The authors find, for instance, that stronger institutions in recipient countries are positively correlated with bank inflows.

[2] Ireland is an important hub for this type of funding. For a discussion of the Irish financial landscape see Lane and Moloney (2018) and Cima et al. (2019).

[3] For a review of literature on capital flows to emerging markets see Koepke (2015).

1980 through 2009. They find that global risk is the main driver of capital flow waves, while domestic factors are found to be statistically unimportant in explaining the latter. In a follow-up project, these authors extend the sample to incorporate more recent observations (Forbes and Warnock, 2020). They find a declining role for global risk in explaining large movements in capital flows.

The studies by Cerutti et al. (2019) and Fratzscher (2012) are, in essence, closer to the purpose of this paper, since they address cross-country heterogeneity of flow sensitivities to global factors. Cerutti et al. (2019), using a latent factor model over the period 2001-2015, extract the common factor affecting capital flows. The estimated factor loadings are then regressed on a set of determinants. The authors find that emerging markets that are reliant on investment fund flows show higher sensitivity of portfolio flows to global factors. Furthermore, they find little evidence in favour of institutional quality and macroeconomic fundamentals in explaining cross-sectional variation of estimated sensitivities. Fratzscher (2012) uses weekly fund level flow data from EPFR over the period 2005-2010. Using a factor model, he finds that global risk had a significant effect on capital flows during the GFC and post-GFC periods. He also finds empirical support for institutional and domestic macroeconomic variables in explaining the observed heterogeneity of factor loadings.

Similar to this literature, we estimate post-GFC sensitivity of emerging market inflows to global risk. There are, however, important differences between this paper and the work mentioned above. For instance, the EPFR data used by Fratzscher (2012) are not measuring reported flows, but rather measure net inflows into a fund that are distributed across destinations using past shares of fund's assets under management. We, on the other hand, use high quality in-house data that resident funds submit to the Central Bank of Ireland. In contrast to Cerutti et al. (2019), who use quarterly balance of payments data for the aggregate of all institutional sectors, our primary interest lies with Irish-resident fund flows.[4]

We use sovereign credit rating as a proxy for current and expected fundamentals. This is a different choice from commonly used variables, such as institutional quality,

[4]Financial centres play a non-trivial role in intermediating global financial flows (Lane and Milesi-Ferretti, 2011).

openness, level of public debt, etc.[5] In addition, our approach to normalisation of flows is such that fluctuations in the denominator are entirely eliminated, allowing us to capture the impact of global risk sentiment on the numerator (ie. flows) only. Finally, our sample period reflects more recent developments and ranges from the euro area sovereign debt crisis to the start of COVID-19 pandemic.[6]

Turning to our findings, we estimate that Irish-resident funds alone account for about 15 percent of emerging markets portfolio investment liabilities owned by the entire fund industry. We also report a significant growth of Irish-resident funds that purchase debt rather than equity securities. Next, we show that Irish-resident funds reduce their exposures to emerging market economies in response to spikes in global risk sentiment. Furthermore, our results suggest higher sensitivity of debt flows to shifts in global risk sentiment than equity flows. We also show that Irish-resident funds' sensitivity to changes in global risk sentiment co-varies negatively with a measure of sovereign credit rating of the receiving emerging market economy. Thus we find that good fundamentals in receiving countries can help mitigate outflows arising from swings in external funding conditions.

To verify robustness of these findings and draw additional conclusions, we deviate from the panel structure of our data that is standard in similar literature. From our micro data we are able to construct synthetic bilateral series that capture bilateral flows and exposures between a pair of countries that are intermediated by Irish-resident funds. Using this alternative structure of the data, we are able to verify our findings. We also provide evidence in favour of additional indirect 'push' factors, such as residence and geographic proximity of ultimate creditors in determining financial flows to emerging markets. This is interesting given the results refer to Irish-resident investment funds that intermediate global financial flows.

As to policy, the distribution of financial flows changes when there is a shift in either push factors, pull factors or a change in pipes. The changing composition of pipes has non-negligible impact on the sensitivity of capital flows to push factors, as has been highlighted by Carney (2019). In this context, our results show the growing

[5] In fact, a range of macroeconomic variables are taken into consideration when assigning a rating.

[6] Both Fratzscher (2012) and Cerutti et al. (2019) find significant heterogeneity in sensitivities across sub-samples.

importance of bond funds in cross-border exposures to emerging markets. This changing composition of pipes, in turn, suggests that cross-border flows may have become more sensitive to shifts in global risk sentiment, providing ammunition to claims that broader macroprudential policy tools for the funds sector may need to be developed (Carney, 2019; CBI, 2020; Makhlouf, 2020).

The rest of the paper is structured as follows. In Section 2 we describe some developments in emerging-market financing. Section 3 describes the data. In Section 4 we discuss the empirical specification, while in Section 5 we present our findings. Finally, we conclude in Section 6.

2 A Glance at Emerging Market Financing

As is evident from Carney (2019), portfolio investment has overtaken bank finance to become a more prevalent form of finance for emerging markets in the past decade. The share of banks in external liabilities of emerging markets has declined from 36.4 percent in 2008 to 24 percent in 2017. Over the same period the share of market-based funding has increased from 23.1 percent to 32.4 percent. Investment funds in particular have increased their share in external liabilities of emerging markets from 4.6 percent to 9.4 percent. In terms of portfolio investments, the share of funds in external liabilities of emerging markets that excludes banks and FDI was 29 percent at the end of 2017.[7]

Using the ESCB Security Holdings Statistics database, we have calculated portfolio debt and equity exposures of euro area entities to emerging markets at the end of 2018 (Table 1). The table shows portfolio holdings of investment funds, both total and by residency, vis-à-vis emerging markets.[8] The last row of the table shows total external liabilities of emerging markets excluding intra-EM positions. These are calculated using IMF's Coordinated Portfolio Investment Survey database. The table shows that, in the euro area, Ireland is the second largest hub for investment funds after Luxembourg. Furthermore, portfolio flows from Irish-resident investment funds into emerging markets

[7] See Chart 12 in Carney (2019).

[8] A side note, euro area resident investment funds' holdings vis-à-vis the sample of emerging markets used in this paper are larger than the combined holdings of euro area resident banks and money market funds by multiple factors for both debt and equity securities.

show high levels of correlation with balance of payments based inflows into emerging markets (Figure 1).[9]

Using Table 1 and Chart 12 data from Carney (2019), we calculate the implied share of euro area resident funds in total investment fund holdings of emerging-market portfolio assets at 67 percent. Similarly, we estimate that Irish-resident funds alone account for about 15 percent of emerging markets portfolio investment liabilities owned by the entire fund industry. It is important to note, however, that the sample of emerging markets used in this paper is different from Carney (2019) sample. Allowing also for nuances in definitions of functional categories, the table, nevertheless, provides evidence on the weight of Irish-resident investment funds in external liabilities of emerging markets. Accordingly, for the purpose of this paper, we utilise high quality in-house data on Irish-resident investment funds, internally known as OFI2 database.

3 Data

The Central Bank of Ireland collects granular balance-sheet level information from Irish-resident investment funds. These data describe domestic and cross border flows as well as investment positions of resident funds at quarterly frequency. Since our primary interest lies in macroeconomic variables, we aggregate fund level data to construct our final dataset. The sample period is from 2014Q1 to 2019Q4.

Additionally, we use the liability structure of resident funds to construct synthetic bilateral series that capture bilateral exposures and flows between a pair of countries that are intermediated by Irish-resident funds. Construction of these series involves exploitation of the investor base of Irish-resident funds' equity liabilities. That is, we first construct the exposure of investor-country j to a resident-fund f at the beginning of period t:

$$w^f_{j,t} = L^f_{j,t-1} / \sum_j L^f_{j,t-1} \tag{1}$$

where $L^f_{j,t-1}$ is portfolio equity liability of fund f vis-à-vis country j at the end of period $t-1$.

[9] Gross portfolio liability flows presented in the figure are simple aggregates of the reported components of the financial account and do not exclude intra-EM flows.

Next we define the bilateral position of country i vis-à-vis country j as follows:

$$A^f_{ji,t} = \sum_f w^f_{j,t} A^f_{i,t} \tag{2}$$

where $A^f_{i,t}$ captures holdings of fund f in country i at the end of period t. We use this approach to construct bilateral flows as well. In the latter case $A^f_{i,t}$ represents net purchases (flows) of fund f of liabilities issued by country i. Hence, even though the funds are resident in Ireland, we are able to capture bilateral exposures and flows between a pair of countries that are intermediated by Irish-resident funds.

Turning to risk sentiment, for the purposes of this paper, we measure global risk aversion with CBOE 3-Month Volatility Index. Since pairwise correlation between VIX and various financial condition indices are usually positive and high, we do not expect significant changes in our empirical results when an alternative index is used. Daily closing values of the VIX are taken at the beginning of each period. This choice of timing mitigates endogeneity concerns that could otherwise feed back into a measure of implied volatility and affect our regression results.

Finally, credit rating values for emerging markets are sourced from Oxford Economics. Numerical values between 0 and 20 (20 = AAA) are assigned to the average of the sovereign ratings from Fitch, Moodys and S&P. And, as is commonplace, information on geographical distance between country i and country j, as well as common language and common border variables are sourced from the CEPII Distances database.

4 Empirical Specification

Panel Data Specification

Pesaran and Smith (2014), study the problem of interpreting the signs of estimated coefficients in multivariate time-series regressions and show that the sign of the total impact (both direct and indirect) can be obtained by using a bivariate regression. As our primary interest is the aggregate impact of global risk on fund flows, we use this argument and estimate the following minimalistic panel regression:

$$Y^i_{j,t} = \alpha_j + \beta \ln(VIX_t) + \gamma \ln(A^i_{j,t-1}) + e_{j,t} \tag{3}$$

where $Y^i_{j,t}$ captures Irish-resident funds' net acquisitions of securities of country j in instrument $i \in$ (portfolio debt, portfolio equity), normalised by average opening position of the underlying instrument. This normalisation eliminates fluctuations in the denominator, and ensures comparability of estimated coefficients across various specifications by bringing them to a common scale. In addition to flows, we consider the logarithmic change in Irish-resident funds' exposures to emerging markets in instrument i as an alternative dependent variable. As to the regressors, global risk sentiment is captured by VIX at the start of period t. This timing mitigates endogeneity concerns that could otherwise feed back into a measure of implied volatility. Finally, $A^i_{j,t}$ is the end of period t funds' exposure to an emerging market economy j, while α_j capture country-specific time-invariant effects.

To control for the impact that host country fundamentals can have on the sensitivity of flows to global risk, we expand the above specification and estimate the following panel regression:

$$Y^i_{j,t} = \alpha_j + \mu_{j,t} \ln(VIX_t) + \gamma \ln(A^i_{j,t-1}) + e_{j,t} \tag{4}$$

where to the first order of approximation $\mu_{j,t} \approx \beta + \theta \ln(CR_{j,t})$, and $CR_{j,t}$ is the sovereign credit rating of country j. Prioritising efficiency, we have chosen not to include the sovereign credit rating as main effect in this benchmark specification due to little within-country variation in the sovereign credit rating. In this case, inclusion of the credit rating together with country fixed effects would tend to adversely affect estimated standard errors.[10] Despite the trade-off between efficiency and robustness, for completeness, we also report the results that condition on the credit rating as well.

We use a measure of sovereign credit rating as we think of it as a good proxy for capturing current as well as expected emerging market fundamentals. This choice is also driven by our considerations in relation to the sample size. In particular, while in large samples we would aim to include a larger set of possibly correlated variables capturing fundamentals, in the current sample this approach could result in larger estimated standard errors. As above, we estimate this specification for both flows and logarithmic

[10] Furthermore, if credit rating is included as main effect as well, the conditional coefficient has two interpretations: (i) sensitivity of flows to the VIX conditional on credit rating, (ii) sensitivity of flows to the sovereign credit rating conditional on the VIX. While in both cases the empirical specification is the same, interpretation of the results is not.

shifts in external positions. In all panel specifications we report Driscoll and Kray (1998) standard errors.

Financial Gravity Specification

To further exploit our data and the robustness of our results, we estimate the following bilateral gravity-type regression for $j-k$ country pair:

$$Y^i_{jk,t} = \alpha_j + \alpha_k + \beta \ln(VIX_t) + \boldsymbol{x}_{jk}\boldsymbol{\psi} + \gamma \ln(A^i_{jk,t-1}) + e^i_{jk,t} \tag{5}$$

where $\boldsymbol{x}_{jk}$ is a row vector of gravity-type controls with ψ column vector of coefficients, while α_j and α_k are investor and receiver fixed effects.[11] The control variables include the logarithm of bilateral distance between $j-k$ country pair, a dummy for common language and a dummy for common border. We again consider two dependent variables: (i) bilateral flows divided by the arithmetic mean of holders' and issuers' average closing positions (ie. the denominator is (mean-by-holder + mean-by-issuer)/2), and (ii) the logarithmic change between closing and opening bilateral positions.

As in the case of panel data, we also incorporate potential dependencies of the VIX sensitivity to receiving-country fundamentals by estimating the following regression:

$$Y^i_{jk,t} = \alpha_j + \alpha_k + \mu_{j,t} \ln(VIX_t) + \boldsymbol{x}_{jk}\boldsymbol{\psi} + \gamma \ln(A^i_{jk,t-1}) + e^i_{jk,t} \tag{6}$$

where to the first order of approximation $\mu_{j,t} \approx \beta + \theta \ln(CR_{j,t})$. In all bilateral specifications we cluster the standard errors at host, source and country-pair levels.[12]

To verify the robustness of our primary specifications, we also estimate all our equations (both panel and gravity) without an interaction term for two different sub-samples: 'low' credit rating and 'high' credit rating. The cut-off point is arbitrarily determined by the median value of the sovereign credit rating. These additional set of regressions are presented in Appendix B.

[11] Gravity models were initially developed in the context of international trade in goods, but later extended to financial flows (see Okawa and Van Wincoop, 2012).

[12] See Cameron et al. (2011).

5 Results

Stylised Facts

During the 2014Q1-2019Q4 period portfolio exposure to emerging markets doubled for Irish-resident investment funds, as is evident from the top left panel of Figure 2. The same period witnessed a significant rise of investment funds that invest in debt rather than equity securities, with the share of debt securities in total portfolio holdings rising from around 34 to 42 percent (top right panel).

The figure also plots the dynamics of cumulative flows, using Irish-resident funds' holdings of emerging market securities at the beginning of the sample period as the starting point for accumulation of flows. In general, valuation effects were predominantly behind the increases in positions for equities (bottom right panel). While valuation effects also played an important role for the increases in portfolio debt positions, the increased exposure of Irish resident funds to emerging markets in this category was primarily driven by flows (bottom left panel).

In terms of distributions across fund types, Table 2 shows that Irish-resident funds' debt holdings are primarily concentrated in bond funds with a share of 91 percent. These are closely followed by bond holdings of mixed funds at 6 percent and bond holdings of equity funds at 1 percent. Hedge funds and other funds have the smallest exposure to emerging markets as a share of total Irish-resident funds' holdings of emerging market bonds. The distribution of equity holdings follows a similar pattern, with equity funds having the highest equity share in emerging markets at 91 percent. These are then followed by mixed funds (6 percent), bond funds (1 percent), hedge funds (1 percent) and other funds (1 percent).

We further exploit our data by constructing synthetic bilateral series that capture bilateral exposures between a pair of countries that are intermediated by Irish-resident investment funds. Table 3 provides the geographic breakdown of equity liabilities of Irish-resident investment funds. The table also summarises the geographic composition of Irish-resident investment funds' exposures to individual emerging markets.

Starting with liabilities, the top panel of Table 3 shows the top five investors in Irish-resident funds. We observe a prima facie creditor concentration. The UK holdings of emerging market portfolio debt liabilities via Irish domiciled investment funds are equal

to €22 billion or 33 percent of the total exposure. Luxembourg and the Netherlands follow with 15 and 11 percent shares. The ranking of these three countries in relation to equity holdings via Irish-resident investment funds in emerging markets is the same. Turning to the issuers, the largest single debtor country, Mexico, accounts for a 15 percent of total bonds, followed by Indonesia and Russia. On the equity side, the debtor composition differs. Over one third of Irish funds' equity exposures to emerging markets is to Greater China (Mainland and Hong Kong), followed by Korea and India.

Panel Data Results

Table 4 shows the results from estimating equations (3) and (4) for portfolio debt. In columns (1)-(3) the dependent variable is the level of Irish-resident funds' flows into emerging markets divided by average opening position of the underlying instrument. This normalisation eliminates fluctuations in the denominator, and enforces comparability of estimated coefficients across various specifications by bringing them to a common scale. In addition, in columns (4)-(6) we consider an alternative specification where the dependent variable is the logarithmic change between funds' closing and opening portfolio debt positions.

Across all specifications, the estimated coefficient on a measure of global risk sentiment is negative and statistically significant. Estimates in column (1) imply that a one percentage point higher level of VIX is associated with 0.2 percentage point decline of bond flows relative to the average opening position, while estimates in column (4) of the same table imply that a one percentage point higher level of VIX is associated with a -0.3 percentage point shift in bond position of Irish-resident funds. Fratzscher (2012), using micro data on investment funds, finds somewhat similar results, with estimated sensitivity of -0.4 for bond flows during the Global Financial Crisis period.

Columns (2) and (4) summarise our findings from estimating the specification of equation (4), where we account for the conditionality of the VIX elasticity on receiving country fundamentals, approximated by the sovereign credit rating. The coefficient on the interaction term between the sovereign credit rating and the VIX is positive and statistically significant in both specifications. This finding suggests that a spike in global risk is associated with a smaller in absolute value contraction in bond flows from countries with stronger fundamentals than from countries with weaker fundamentals.

Using micro data and a different methodology, Frantzscher (2012) also tests for the significance of sovereign credit rating and finds that a better rating reduces the negative effect of a risk shock on fund flows, though the exercise is not conducted for bond and equity funds individually.

We find qualitatively similar results for equity flows in Table 5. The estimated coefficient on VIX is significant across all specifications. Column (1) suggests that a one percentage point higher level of VIX is associated with 0.1 percentage point decline of equity flows, while a one percentage point higher level of VIX is associated with a -0.2 percentage point shift in equity position. Using high frequency fund-level data, Fratzscher (2012) estimates a somewhat similar sensitivity of -0.14 for equity flows to the VIX. We also find that the aggregate VIX elasticity is sensitive to the level of sovereign credit rating of the receiving country: the interaction term between the latter variable and the VIX is positive and statistically significant.

Comparing the first rows of both tables, we also note a higher sensitivity of bond flows to the VIX than compared to equity flows. The difference is statistically significant, given the estimated standard errors. This is different from Chuhanet al. (1998), for example, who, using aggregate flows, find the opposite result. The distinction is important, as aggregate flows mask sectoral heterogeneity and dynamics, particularly given the structural growth in investment funds that purchase debt rather than equity securities. On the other hand, Fratzscher (2012), using fund flow data, finds results similar to ours. Interestingly, he also finds that during the non-crisis period the direction of bond flows is reversed, while equity flows loose their link with the VIX.

In relation to sensitivities of stock changes, the point estimates again yield a higher sensitivity of bonds. The difference, however, is not statistically significant, given the standard errors. Finally, comparing column (4) and (1) and columns (5) and (2) in both tables, we observe higher absolute VIX sensitivity for shifts in positions than for flows. This is unsurprising, since price changes incorporated in stocks are mores responsive to shifts in the VIX.

As elaborated in the section on the empirical specification, we have chosen not to include the sovereign credit rating as main effect into the benchmark regressions. For completeness, columns (3) and (6) of Tables 4 and 5 display the estimated coefficients from a specification with credit rating as main effect. The results highlight statistical insignificance of the sovereign credit rating when included together with the interaction

term in flow regressions. Furthermore, the Schwarts-Bayes information criteria provides little evidence in support of the expanded specification. We interpret this finding as evidence in favour of our primary specification that prioritises efficiency.

To further verify the robustness of these results, we also estimate equation (3) for two different sub-samples: 'low' credit rating and 'high' credit rating. The cut-off point is arbitrarily determined by the median value of the sovereign credit rating.[13] These additional set of regressions are presented in Appendix B. The regressions support our findings of higher sensitivity of debt flows to the VIX in the low credit rating sample compared to the high credit rating sample. The results for equity, however, are not confirmed in these alternative specifications. We also confirm a higher sensitivity of debt flows to equity flows, as seen in the corresponding columns.

Finally, turning to the topology of funds, estimates of equation (3) by fund types suggest a very high degree of heterogeneity of flows to global risk.[14] In terms of bonds, we find higher sensitivities for hedge funds compared to bond funds both in terms of normalised flows and in shifts is positions. The pattern is somewhat similar in relation to equity regressions, with hedge funds being more sensitive to the VIX than equity funds. Given that hedge funds' business models imply higher leverage, our finding is consistent with leverage amplifying fund sales and purchases in response to shocks to the VIX.

Financial Gravity Results

To verify the robustness of our findings from the previous section, we turn to our synthetic bilateral series as an alternative source of structured data. These data, in principle, contain more information, but at the same time are noisier. We estimate gravity equations (5) and (6) and report our findings for two dependent variables: (i) bilateral flows divided by the arithmetic mean of holder's and issuer's average closing positions (ie. the denominator is (mean-by-holder + mean-by-issuer)/2), and (ii) the logarithmic change between closing and opening bilateral positions. The set of control variables includes the logarithm of bilateral distance between the capitals of country pairs, a

[13] Clearly, this arbitrary choice of the cut-off point does not correspond to the correct clustering of countries, while the results will also be sensitive to the location of the threshold. Estimation of threshold regressions for the purpose of identification of the true cut-off point is not addressed in this paper.

[14] These results are available from the authors upon request.

dummy for common language and a dummy for common border. These regression also allow for conditioning on both host and source country fixed (or approximately invariant) characteristics. The estimates are presented in Table 6 for portfolio debt and Table 7 for portfolio equity.

The results confirm our findings regarding VIX sensitivities, since the coefficient on the VIX is negative and statistically significant across our primary specifications in both debt and equity regressions. We again find a positive and statistically significant coefficient on the interaction term between sovereign credit rating and the VIX in benchmark debt regressions. This finding provides further support to the hypothesis that following a spike in risk sentiment countries with better fundamentals tend to experience smaller outflows in absolute terms. The results for the conditional sensitivity to credit rating are weaker in equity regressions. As in the case of panel data, we find a higher sensitivity of debt flows to shifts in the VIX compared to equity flows. Finally, the results again show higher sensitivity of positions to VIX compared to flows.[15]

For completeness, columns (3) and (6) of Tables 6 and 7 display the estimated coefficients from a specification with credit rating as main effect. The estimated coefficient on the credit rating is statistically significant and positive in column (3), while the interaction term looses its significance. In contrast, sub-sample regressions provide support for higher sensitivity of debt flows to the VIX in the low credit rating sample compared to the high credit rating sample (Appendix B). We do not find a similar pattern for equities in this alternative specification. Matching the the corresponding coefficients, we again find that debt flows tend to have higher sensitivity to the VIX.

As to geographical factors, these usually proxy bilateral linkages and information costs and are captured by bilateral distance and the common language dummy (see for instance Galstyan and Lane, 2013). The coefficient on distance is negative and particularly pronounced in regressions where the dependent variable captures the shifts in bilateral holdings. This negative coefficient implies that funds, whose equity structure is tilted towards investors residing further away, tend to invest less in countries than funds whose investors are closer to the same countries. Thus our estimates provide some evidence in favour of additional 'push' factors, such as the residence and geographic proximity of ultimate creditors in determining financial flows

[15] See columns (4) and (1), and columns (5) and (2) in either table.

to emerging market economies. This is interesting given these results refer to Irish-resident investment funds that intermediate global financial flows. We also find evidence of mean-reversion, as captured by the negative and mostly statistically significant coefficient on initial holdings. The coefficients on the remaining bilateral variables are statistically insignificant.

Finally, in unreported gravity-style regressions by topology of Irish-resident investment funds, we also look at global sentiment and geographic factors in explaining bilateral flows. We find that the coefficient on the VIX is negative and statistically significant in most specifications. We also observe substantial heterogeneity across fund types. In particular, shifts in equity positions of hedge funds are most sensitive to movements in the VIX. We also find that the coefficient on distance is significantly negative for bond flows of hedge funds. Geographic proximity also seems to be important in explaining shifts in bilateral positions in both bonds and equities of Irish-resident investment funds. In the latter case, the estimated coefficient on distance for hedge funds is larger in absolute value than for equity funds.

6 Conclusions

The structural growth in portfolio flows suggests that pipes that transmit financial flows to various corners of the world have been changing. Investment funds have become an important player in provision of non-bank funding and transmission of financial conditions to emerging markets. The latter, in turn, suggests cross-border flows may have become more sensitive to changes in global risk sentiment, providing ammunition to claims that broader macroprudential policy tools for the funds sector may need to be developed (Carney, 2019; Makhlouf, 2020).

Using high quality in-house data on Irish-resident investment funds, we find that debt flows are more responsive to changes in global risk sentiment than equity flows. This matters, given the documented growth in investment funds that purchase debt rather than equity securities, suggesting an increasing policy focus on debt funds. We also find that among different types of funds, hedge funds appear most sensitive to changes in global risk sentiment. Given that their business models imply higher leverage, our finding is consistent with leverage amplifying fund sales and purchases in response to shocks to the VIX.

We also find evidence in favour of additional 'push' factors, such as residence and geographic proximity of ultimate creditors in determining financial flows to emerging market economies. We find that the funds whose equity structure is tilted towards investors residing further away, tend to invest less in countries than funds whose investors are closer to the same countries. This is noteworthy, given these results refer to Irish-resident investment funds that intermediate global financial flows.

Finally, while external conditions matter, domestic policies in receiving countries have also a role to play in the behaviour of investment fund flows. We find that Irish-resident funds' sensitivity to changes in global risk sentiment co-vary negatively with a measure of sovereign credit rating of emerging markets. The finding suggests that good fundamentals in receiving countries help mitigate outflows arising from swings in external funding conditions.

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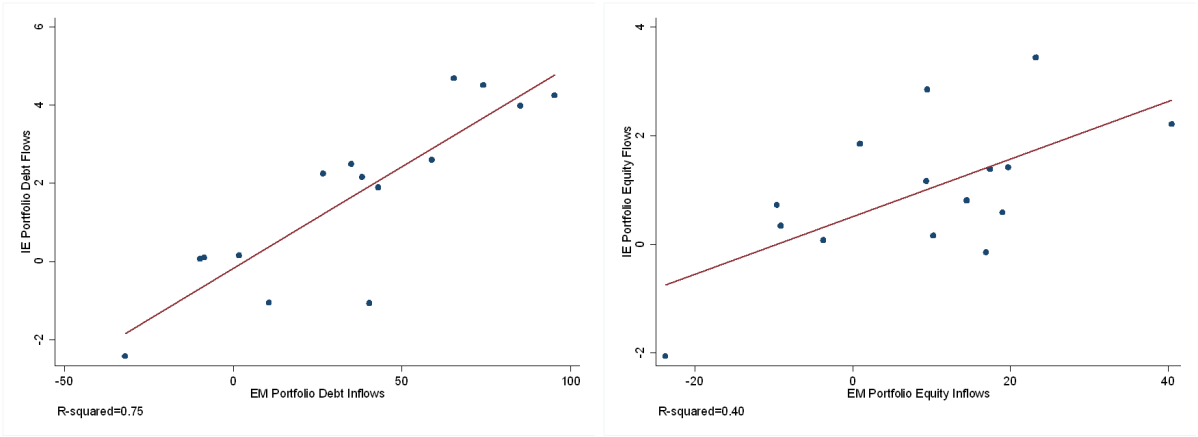
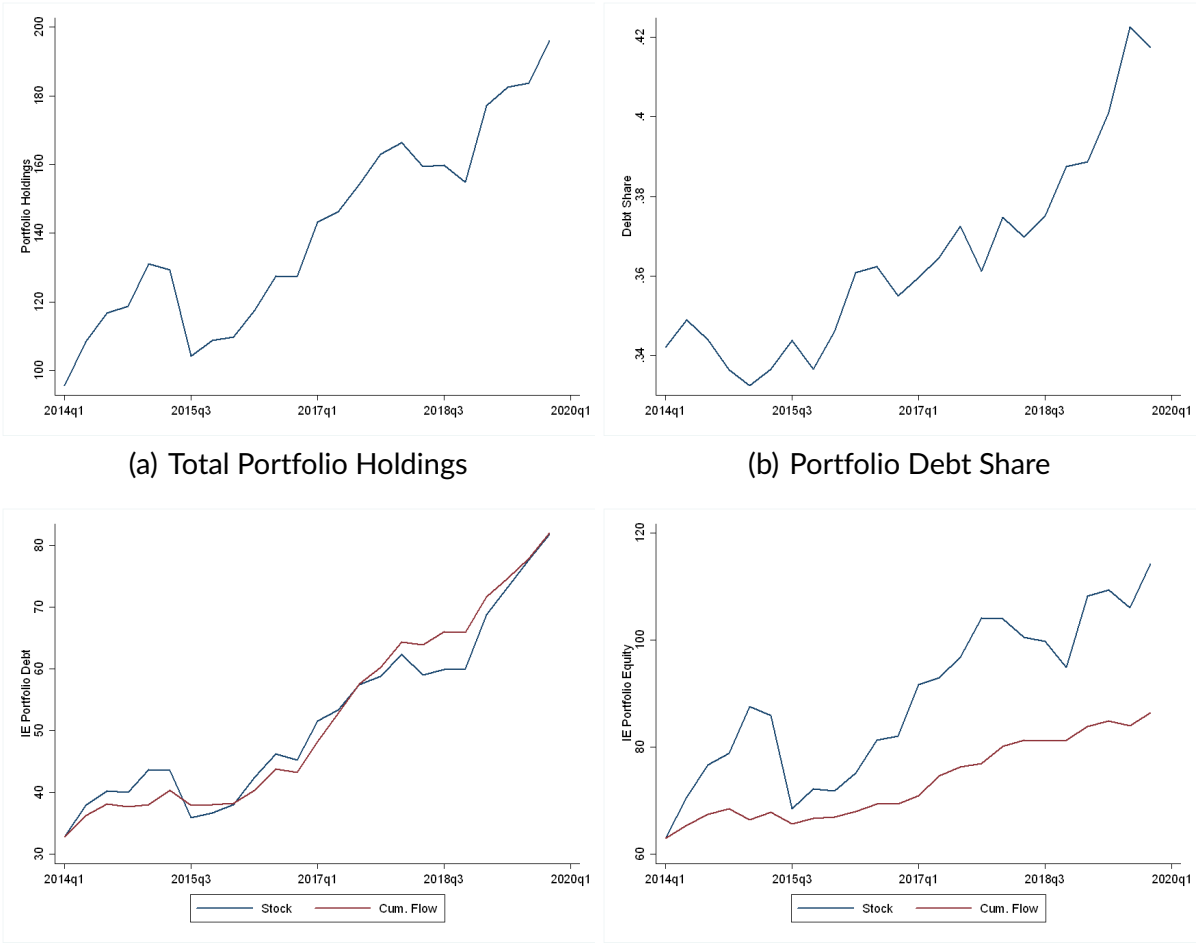
Figure 1. Portfolio Investment Flows to EM



(a) Portfolio Debt Flows (b) Portfolio Equity Flows

Note: Authors' calculations based on OFI2 and IMF BOP data. EM gross portfolio liability flows are on the horizontal axis, while Irish-resident fund flows are on the vertical axis. Gross portfolio liability flows presented in the figure are simple aggregates of the reported components of the financial account and do not exclude intra-EM flows. Each dot corresponds to a quarter in our sample. Data are in euro billions.

Figure 2. Portfolio Investments Holdings of EM Securities



(a) Total Portfolio Holdings

(b) Portfolio Debt Share

(c) Portfolio Debt

(d) Portfolio Equity

Note: Authors' calculations based on OFI2 data. Panel (a) shows quarterly closing position of Irish-resident funds' total portfolio holdings in EM in euro billions, while Panel (b) shows the share of portfolio debt in total holdings. The blue line (Stock) in Panels (c)-(d) shows quarterly closing position of Irish-resident funds' portfolio holdings in EM, while the red line (Cum. Flow) measures Irish-resident funds' cumulative portfolio flows to EM (starting from 2014Q1 position). Data are in euro billions.

Table 1. Exposure to EM Portfolio Investment Liabilities

	Portfolio Debt		Portfolio Equity	
	€ billion	% of EM	€ billion	% of EM
EA Investment Funds	336.5	26.0	370.9	15.9
of which resident in				
Luxembourg	185.1	14.3	193.7	8.3
Ireland	58.8	4.5	94.1	4.0
Germany	51.5	4.0	16.7	0.7
Rest of EA	41.1	3.2	66.4	2.9
EM external Liabilities	1292.8		2328.4	

Note: Authors' calculations based on data from SHS and CPIS. The table displays euro area investment funds' holdings of EM debt and equity liabilities (columns "€billion") based on SHS data. Column "% of EM" shows the ratio of these holdings relative to the total external liabilities of EM in a given functional category (the last row). The latter are calculated using IMF's CPIS data and exclude intra-EM positions. Data refer to 2018Q4.

Table 2. Irish Funds Exposure to EM

	Portfolio Debt		Portfolio Equity	
	€billion	% of Total	€billion	% of Total
Bond Funds	61.9	91.4	0.9	1.1
Equity Funds	0.8	1.2	76.7	91.3
Hedge Funds	0.5	0.7	0.8	0.9
Mixed Funds	4.0	5.9	4.7	5.6
R. Estate Funds			0.2	0.3
Other Funds	0.5	0.7	0.7	0.8

Note: Authors' calculations based on OFI2 data. The table displays holdings of EM debt and equity liabilities (columns "€billion") of Irish investment funds. Column "% of Total" shows the ratio of these holdings relative to their total. Data refer to 2020Q1.

Table 3. Top Holders and Issuers

Portfolio Debt	€billion	% of Total	Portfolio Equity	€billion	% of Total
Holders			**Holders**		
United Kingdom	22.1	32.8	United Kingdom	30.7	36.7
Luxembourg	9.9	14.7	Luxembourg	8.1	9.7
Netherlands	7.4	10.9	Netherlands	6.6	7.8
Ireland	4.2	6.3	Ireland	6.2	7.4
United States	2.9	4.3	Finland	3.2	3.8
Issuers			**Issuers**		
Mexico	10.3	15.3	China	18.8	22.5
Indonesia	6.6	9.9	Korea	13.6	16.2
Russia	5.7	8.4	India	11.7	14.0
South Africa	4.5	6.7	Hong Kong	10.3	12.4
Brazil	4.3	6.4	Brazil	4.7	5.6

Note: Authors' calculations based on OFI2 data. For each Irish-resident fund the share of equity liabilities vis-à-vis a given country is used to construct the country's exposure to the EM. Once constructed for all funds, these bilateral exposures have been aggregated at a country level. Data refer to 2020Q1.

Table 4. Panel Evidence: VIX and Irish-Resident Funds' Debt Exposure to EM

	(1) PDF	(2) PDF	(3) PDF	(4) dln(PDS)	(5) dln(PDS)	(6) dln(PDS)
ln(VIX)	-0.194	-0.252	-0.555	-0.289	-0.396	-1.161
	(0.047)***	(0.040)***	(0.242)**	(0.118)**	(0.121)***	(0.404)***
ln(VIX)*ln(CR)		0.026	0.151		0.048	0.365
		(0.011)**	(0.094)		(0.016)***	(0.169)**
ln(CR)			-0.379			-0.959
			(0.279)			(0.471)*
ln(S0)	0.015	0.009	0.011	-0.106	-0.118	-0.113
	(0.018)	(0.019)	(0.019)	(0.033)***	(0.036)***	(0.033)***
Observations	483	483	483	483	483	483
R-squared	0.070	0.078	0.084	0.153	0.165	0.180
BIC	-590.8	-588.9	-585.7	-209.3	-209.6	-212.2
Countries	21	21	21	21	21	21

Note: The dependent variable in columns (1)-(2) is Irish-resident funds' debt flows divided by average opening debt position. The dependent variable in columns (3)-(4) is the log change of Irish-resident funds' debt position. VIX is 3 the month VIX, S0 is the opening position at each period, and CR stands for a measure of credit rating of a country. All regressions include host country fixed effects. R-squared measures within cross-sectional variation. BIC reports the Schwarz-Bayes information criteria. Driscoll and Kray (1998) standard errors in parenthesis. ***, **, and * denote significance at 1%, 5%, and 10% respectively.

Table 5. Panel Evidence: VIX and Irish-Resident Funds' Equity Exposure to EM

	(1) PQF	(2) PQF	(3) PQF	(4) dln(PQS)	(5) dln(PQS)	(6) dln(PQS)
ln(VIX)	-0.045	-0.107	-0.043	-0.219	-0.376	-0.173
	(0.031)	(0.034)***	(0.117)	(0.086)**	(0.091)***	(0.201)
ln(VIX)*ln(CR)		0.028	0.001		0.070	-0.014
		(0.010)**	(0.040)		(0.028)**	(0.067)
ln(CR)			0.080			0.256
			(0.123)			(0.182)
ln(S0)	-0.003	-0.031	-0.032	-0.192	-0.260	-0.264
	(0.020)	(0.022)	(0.023)	(0.034)***	(0.046)***	(0.044)***
Observations	483	483	483	483	483	483
R-squared	0.019	0.057	0.058	0.217	0.266	0.268
BIC	-1362.1	-1375.0	-1369.5	-692.9	-717.6	-713.2
Countries	21	21	21	21	21	21

Note: The dependent variable in columns (1)-(2) is Irish-resident funds' equity flows divided by average opening equity position. The dependent variable in columns (3)-(4) is the log change of Irish-resident funds' debt position. VIX is 3 the month VIX, S0 is the opening position at each period, and CR stands for a measure of credit rating of a country. All regressions include host country fixed effects. R-squared measures within cross-sectional variation. BIC reports the Schwarz-Bayes information criteria. Driscoll and Kray (1998) standard errors in parenthesis. ***, **, and * denote significance at 1%, 5%, and 10% respectively.

Table 6. Gravity: VIX and Irish Funds' Debt Exposure to EM

	(1) PDF	(2) PDF	(3) PDF	(4) dln(PDS)	(5) dln(PDS)	(6) dln(PDS)
ln(VIX)	-0.044	-0.118	-0.041	-0.639	-1.313	-1.202
	(0.011)***	(0.022)***	(0.034)	(0.092)***	(0.160)***	(0.359)***
ln(VIX)*ln(CR)		0.002	-0.001		0.017	0.014
		(0.000)***	(0.001)		(0.003)***	(0.008)*
ln(CR)			0.046			0.066
			(0.018)**			(0.176)
ln(Distance)	-0.001	-0.001	-0.001	-0.025	-0.026	-0.026
	(0.002)	(0.002)	(0.002)	(0.012)**	(0.012)**	(0.012)**
Language	-0.004	-0.004	-0.004	0.004	0.005	0.005
	(0.002)	(0.002)	(0.002)	(0.018)	(0.018)	(0.018)
Border	0.002	0.002	0.002	-0.025	-0.025	-0.025
	(0.005)	(0.005)	(0.005)	(0.028)	(0.029)	(0.029)
ln(S0)	0.001	0.001	0.001	-0.161	-0.165	-0.165
	(0.001)	(0.001)	(0.001)	(0.012)***	(0.012)***	(0.012)***
Observations	40,476	40,476	40,476	43,516	43,516	43,516
R-squared	0.034	0.036	0.037	0.103	0.106	0.106

Note: In column (1)-(2) the dependent variable is Irish-resident funds' debt flows divided by average of holders and issuers closing positions (ie. the denominator is (mean-by-holder + mean-by-issuer)/2). In columns (3)-(4) the dependent variable is the logarithmic change between Irish-resident funds' closing and opening portfolio debt positions. All regressions include host and source fixed effects. The standard errors are clustered at host, source and country-pair levels. ***, **, and * denote significance at 1%, 5%, and 10% respectively.

Table 7. Gravity: VIX and Irish Funds' Equity Exposure to EM

	(1) PQF	(2) PQF	(3) PQF	(4) dln(PQS)	(5) dln(PQS)	(6) dln(PQS)
ln(VIX)	-0.009	-0.014	-0.003	-0.319	-0.472	-0.206
	(0.004)**	(0.007)**	(0.016)	(0.059)***	(0.216)**	(0.340)
ln(VIX)*ln(CR)		0.001	-0.001		0.004	-0.003
		(0.001)	(0.001)		(0.004)	(0.007)
ln(CR)			0.007			0.168
			(0.008)			(0.123)
ln(Distance)	0.004	0.004	0.004	-0.021	-0.021	-0.021
	(0.002)	(0.002)	(0.002)	(0.008)**	(0.008)**	(0.008)**
Language	-0.001	-0.001	-0.001	0.020	0.020	0.020
	(0.002)	(0.002)	(0.002)	(0.016)	(0.016)	(0.016)
Border	-0.001	-0.001	-0.001	0.009	0.009	0.009
	(0.004)	(0.004)	(0.004)	(0.021)	(0.022)	(0.022)
ln(S0)	-0.002	-0.002	-0.002	-0.095	-0.095	-0.095
	(0.001)***	(0.001)***	(0.001)***	(0.008)***	(0.009)***	(0.009)***
Observations	44,447	44,447	44,447	46,251	46,251	46,251
R-squared	0.025	0.025	0.025	0.062	0.062	0.062

Note: In column (1)-(2) the dependent variable is Irish-resident funds' equity flows divided by average of holders and issuers closing positions (ie. the denominator is (mean-by-holder + mean-by-issuer)/2). In columns (3)-(4) the dependent variable is the logarithmic change between Irish-resident funds' closing and opening portfolio equity positions. All regressions include host and source fixed effects. The standard errors are clustered at host, source and country-pair levels. ***, **, and * denote significance at 1%, 5%, and 10% respectively.

Appendix A: Sample of Emerging Market Economies

The sample of emerging market economies is composed of Argentina, Brazil, Chile, China, Colombia, Egypt, Ghana, Hong Kong, India, Indonesia, Israel, Lebanon, Malaysia, Mexico, Nigeria, Pakistan, Philippines, Russia, Saudi Arabia, Singapore, South Africa, Korea, Thailand, Turkey, and Ukraine.

Appendix B: Split Around the Median

Table 8. VIX: Summary Results

	(1)	(2)	(3)	(4)
	Flow		Change in stock	
	low	high	low	high
Panel A: Panel regressions				
Portfolio Debt				
ln(VIX)	-0.261	-0.136	-0.393	-0.196
	(0.065)***	(0.045)***	(0.133)***	(0.113)*
Observations	245	238	245	238
Portfolio Equity				
ln(VIX)	-0.044	-0.037	-0.229	-0.213
	(0.041)	(0.024)	(0.101)**	(0.078)**
Observations	245	238	245	238
Panel B: Gravity regressions				
Portfolio Debt				
ln(VIX)	-0.056	-0.031	-0.825	-0.394
	(0.014)***	(0.011)**	(0.119)***	(0.097)***
Observations	22,235	18,248	23,562	19,956
Portfolio Equity				
ln(VIX)	-0.005	-0.012	-0.362	-0.283
	(0.003)*	(0.006)*	(0.072)***	(0.075)***
Observations	20,005	24,443	21,510	24,742

Note: The table shows regression results from estimating equations (3) and (5) for portfolio debt and equity (ie. without interaction effects). 'low' and 'high' refer to low sovereign credit rating and high sovereign credit rating. The split is determined by the median value of sovereign credit rating. Panel A reports Driscoll and Kray (1998) standard errors, while in Panel B the standard errors are clustered at host, source and country-pair levels.***, **, and * denote significance at 1%, 5%, and 10% respectively.

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