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What 'special purposes' explain cross-border debt funding by banks? Evidence from Ireland*

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Abstract

The factors driving debt issuance by banks are known to relate to their risk profiles. This appears to be particularly true when it comes to cross-border issuance and issuing debt through the special purpose entity (SPE) channel. Both of these areas are relatively unexplored, however, particularly the latter. We examine a key global channel, namely international banks issuing debt through Irish-resident SPEs for determinants of both the decision to issue debt and volumes issued. At the bank-level, we find that debt issuance through SPEs is consistently explained by larger bank size and higher loan loss provisioning, and, for banks from advanced economies, higher regulatory capital. At the country-level, we find spillover effects from higher levels of both capital flow and macro-prudential regulation in the bank's home country and, for banks from advanced economies, higher domestic corporate taxation was also an important determinant. Therefore, a cross-border SPE could act as a risk indicator for financial stability analysis and regulatory monitoring.

JEL classification: G21, G01, G15.
Keywords: International banking, cross-border debt funding, special purpose entities (SPEs), Irish non-bank financial sector.

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Non-technical summary

In this paper, we examine cross-border debt issuance by international banks through the SPE channel. Ireland, as a major channel for international debt flows, likely represents a sample with global resonance. We posit that our results help to shed light on risk analysis of banks from regulatory and financial stability perspectives where information has been somewhat scarce, namely identifying potential risk channels between countries and what motivates the use of SPEs. We extend previous research on bank-level indicators explaining debt issuance through Irish-resident SPEs (Golden and Maqui (2018)), by implementing a different empirical methodology and expanding the analysis to a country-level perspective.

At the bank-level, our results mostly resonate with our previous research. Bigger banks, with more access to global capital markets, are prominent as are banks with higher loan loss provisions. We also find that higher regulatory capital is an important factor in the decision to issue debt, most likely as a reassurance for investors. This result requires the exclusion of sponsor banks from emerging econonomies (EMEs) and does not show through in debt volumes, however. We find that increasingly profitable banks are more likely to employ SPEs in our full sample, but not when EMEs are excluded.

At the country-level, we find that more general capital flow management policies encourage cross-border debt funding through the SPE channel in almost all cases, especially for banks that are funding constrained in terms of higher loan growth financed by higher interest expenses. The domestic corporate tax environment of the sponsor bank features only in the decision to issue debt through SPEs for AE bank sponsors. Macro-prudential policy tools in the broad sense also have an overall positive effect on the decision to issue debt through SPEs but not debt issuance volumes. Finally, our findings suggest that herding behaviour is a highly significant factor explaining cross-border debt issuance through SPEs.

1 Introduction and motivation

Special purpose entities (SPEs) are a relatively opaque channel for the increasingly common tendency for banks to issue debt across borders. The decision of a bank to issue cross-border debt through an SPE is threefold: (i) the decision to issue debt, for which there is an extensive literature, (ii) the cross-border dimension and (iii) employing an SPE, where, in both cases, there has been much less research, likely due to data availability.[1] The SPE channel can have a significant impact on the financial risk profile of the bank, however. SPEs are legal entities that fulfil narrow, specific purposes. Banks raise debt through SPEs in various ways, typically through the transfer of risk, lower funding costs by ring-fencing assets and/or improving liquidity by issuing debt collateralised by non-liquid assets. Securitisation is a particular form of these activities, where assets, or the credit risk associated with these assets, transfers to investors in SPE debt securities. However, changing the risk profile of a bank is not alone a sufficient condition to warrant more attention from a supervisory and financial stability perspective as most banking activities do this to some degree. Understanding what drives a bank to undertake cross-border issuance through an SPE sheds light on risk analysis of banks, not least on ranking risks and allocating finite resources. This paper also aims to contribute a new dimension to the literature on cross-border debt issuance by international banks and extend the literature on bank securitisation into this area.

This paper extends previous research on bank-level indicators explaining debt issuance through Irish-resident SPEs (Golden and Maqui (2018)) by implementing a different empirical methodology and expanding the analysis to a country-level perspective, including more controls and interaction terms, to determine the nature of cross-border links between banks and non-banks more precisely. One of the key findings of this research was that those international banks issuing debt though Irish-resident SPEs were larger and exhibited weakness across a wide range of bank-level indicators relative to other banks. This paper tests this key finding with a new empirical methodology and country-level controls to see if it still holds true. In addition, we seek to enrich our insight into the motivation of banks by testing the explanatory power of country-level controls and interaction terms. We also split our sample to focus on sponsor banks from advanced economies, in case those from emerging market economies (EMEs) are driving results.[2]

[1] Lane (2014) calls out that datasets lack the detailed information to provide a sufficient basis for risk surveillance and monitoring.

[2] Sponsor refers to the entity on whose behalf the SPE was established. For example, if a bank sets up an SPE to securitise loans originated in its balance sheet, the bank is the sponsor. Where an asset manager sets up an SPE to acquire a portfolio of securitised loans originated by a bank, the asset manager is the sponsor. This does not refer to a charitable trust that owns shares of the SPE in an orphan vehicle structure.

Our results are likely to resonate more widely than our Irish-focused sample for three reasons. First, Ireland is a major global channel for such flows. Irish-resident SPEs engaged in securitisation amounted to €398 billion of total assets over 848 vehicles in Q4 2016, accounting for 22 per cent of the euro area total. Total assets in other SPEs were €342 billion in Q4 2016 over 934 vehicles. Bank-sponsored vehicles are around half of all securitisation SPEs and a quarter of all other SPEs. Second, SPEs in Ireland are facilitated to issue debt by specific tax provisions designed to prevent double taxation. Finally, our sample has extensive network links across borders, consisting of debt issuance by 742 international banks, across 19 countries where at least one bank issued debt through Irish-resident SPEs.

Our hypothesis is that a bank is more likely to employ a cross-border SPE when faced with more pressure from various sources, whether that is a higher degree of stress evident on the balance sheet and/or a less business-friendly environment in their home country. The simple reason being that an SPE allows an element of risk sharing between the bank and other investors. The price of this risk sharing is essentially profit sharing, where cost-benefit analysis favours riskier banks. Furthermore, banks can reduce their cost of funding by employing SPEs and this is more likely for a riskier bank, particularly one where bankruptcy is a slightly higher tail risk than for other banks as collateral is ring-fenced in the SPE. The fact that we see definite clusters of banks employing Irish-resident SPEs hints at distinguishing motivating factors within this population. At a broad level, country links within bank-sponsored vehicles show a distinct Western European bias among securitisation vehicles, with British, French and German banks prominent (figure 1). Within other SPEs, most banks from advance economies (AE) implement investment strategies while Russian banks mainly use SPEs for external financing purposes (figure 2).

We employ both a bivariate probit model and a tobit model to analyse what determines the decisions of international banks issuing debt through SPEs. This approach is appealing in that the economic costs and benefits for international banks to issue debt through SPEs is likely to be contemporaneously correlated with alternative debt funding choices. The bivariate probit model assesses whether the binary decision to issue debt through an SPE may be determined by balance sheet information and relevant country-level economic and regulatory indicators (namely capital flow management policies[3], tax environment and broad-based macro-prudential regulation) including a set of interaction terms and country-level variables as controls. The tobit model focuses on the determinants of the volume of debt issued through the SPE. This essentially acts as a higher test for the explanatory

[3]Capital flow management policies refer to controls (restrictions) on capital movements across borders.

power of an indicator. In order to account for potential differences between AE banks and banks from emerging market economies (EME), we undertake our analysis on both the full sample and a sub-sample excluding EME sponsor banks, which account for 15 per cent of our sample observations. This split reflects the potential for differing motivations between AE and EME banks, particularly in terms of spillovers from the domestic environment of the bank and access to capital markets. As pointed out in Serena and Moreno (2016), compared to AE firms, cross-border debt funding by EME firms is characterised by information asymmetries and issuance tends to be more infrequent and volatile.

The remainder of the paper is organised as follows. Section 2 briefly reviews the related literature. In section 3 we describe our data and present summary statistics. Section 4 describes the econometric methodology. Section 5 discusses our empirical results. We conclude in section 6.

2 Related literature

Previous literature on SPEs has focused primarily on securitisation. Gorton and Souleles (2007) find that the value of US securitisation largely derives from the bank sponsor avoiding potential bankruptcy costs so that the risk of the sponsor, as measured by their bond ratings, is consistently significant. Nevertheless, investors shun debt securities issued by the SPE if the risks of bankruptcy are too high. Similarly, Skarabot (2001) model the optimum asset structure of firms based on SPEs reducing bankruptcy costs. Both of these papers focus on the domestic US market so the cross-border dimension does not arise. These results are consistent with our findings to the extent that banks sponsoring SPEs exhibit a higher risk profile based on balance sheet indicators. Golden and Maqui (2018) also finds that debt issuance through SPEs impacts on balance sheet indicators for up to a year while access to other debt markets improves thereafter. Galstyn, McQuade and Maqui (2019) also focuses on debt issuance through Irish-resident SPEs, in their case using a gravity model approach, which further validates the value of a country-level approach.

Our methodological approach resonates with Carbó-Valverde, Rosen, and Rodríguez-Fernández (2011), who employ a multinominal panel logit model to assess a bank's decision to issue covered bonds or mortgage backed securities, mainly based on bank balance sheet information. They find that covered bonds are usually used for liquidity purposes, compared to mortgage back securities which are more associated with agency issues while herding behaviour is also a relevant factor. We use a similar approach to study whether debt issu-

ance through SPEs from banks in a certain country leads to more such issuance from banks in that country. In terms of country-industry level analysis, our paper relates to Serena and Moreno (2016) who explore offshore debt funding based on a panel study, though with a focus on non-financial corporations in emerging markets. Their results point to differences between onshore and offshore market depth as a key factor, indicating that limited domestic funding options together with looser external conditions drive offshore debt issuance. Camba-Méndez, Carbó-Valverde, and Rodríguez-Palenzuela (2014) also study internal and external factors for a bank as determinants of bank debt issuance, both in terms of the decision to issue and volumes issued. They highlight the importance of credit ratings as a factor driving uncollateralised debt issuance, and its lack of economic significance in terms of explaining debt issuance volumes.

Previous literature has focused primarily on securitisation SPEs. Most empirical work has extended the analysis of securitisation in a number of directions relevant to our research, notably modeling the optimal asset structure of firms (Skarabot (2001)), securitisation as a risk-transfer channel (Carbó-Valverde, Marqués-Ibañez, and Rodríguez-Fernández (2012)), the impact of securitisation on the capital structure of banks (Almazan, Martín-Oliver, and Saurina (2015)) and whether banks and securitisation SPEs are complements or substitutes (Gornicka and Zoican (2016)). More generally, Pozsar, Adrian, Ashcraft, and Boesky (2010) highlight securitisation SPEs as a key channel for intermediation between the regular banking and shadow banking systems. In particular, data availability has limited the analysis of other SPE types, as illustrated in the seminal paper of Gorton and Souleles (2007).

Regarding taxes as a determinant of banking behaviour, our rationale draws on Han, Park, and Pennacchi (2015), who study the relationship between corporate income tax and bank loan sales for commercial banks in the US. Their findings suggest that banks operating in states with higher tax rates tend to sell more mortgages. Similarly, Gong, Hu, and Ligthart (2015) look at the impact of country-level tax rates on securitisation making use of interaction terms that combine bank-level balance sheet information and tax variables. Our interaction terms are similarly constructed. Based on a sample of banks belonging to OECD countries, they find that the taxation environment is positively related to securitisation, which is stronger for banks facing funding constraints.

Focusing on the regulatory environment, Houston, Lin, and Ma (2012) analyse regulatory arbitrage as a determinant of international bank flows. They find evidence supporting

a "race to the bottom", in the sense that funds flow from more to less regulated countries. They argue that the impact of cross-country differences in regulations can only be explained in tandem with strong property and creditor rights in recipient countries. Cerutti, Claessens, and Laeven (2015) analyse the effectiveness of macro-prudential policies at an international level, and find that they are related to greater bank cross-border borrowing, suggesting a certain degree of spillover effects. Furthermore, potential spillover effects of macro-prudential policies may be limited by greater constraints in terms of cross-border capital flows. This provides support for including both macro-prodential and capital flow management policies as country-level variables in our analysis.

Further support for the inclusion of a macro-prudential variable comes from Avdjiev, Koch, McGuire, and von Peter (2016), who use a large country-level panel dataset and find evidence that more stringent prudential regulations bring about cross-border loan growth spillovers. In addition, Buch and Goldberg (2016) look at the effectiveness of prudential tools on international bank-level spillovers across countries. Their main findings point to prudential policy effects driving international spillover effects in terms of cross-border lending, with a certain degree of heterogeneity, and differentiating between inward and outward transmission channels.

Our analysis aims to contribute to the literature in three ways. First, we provide a step forward towards a better understanding of the particular factors explaining cross-border debt funding at the bank level. To the best of our knowledge, empirical work to date has focused on the more general question of the determinants of bank debt issuance rather than the particular cross-border dimension. Second, we expand the relatively extensive analysis of the potential impact of taxes and regulation across countries to cover the relatively less explored impact of capital flow management policies. Finally, we aim to capture the extent to which these country-level factors may induce global linkages between the bank and non-bank sectors, with banks shifting to non-bank funding sources through cross-border activities.

3 Data and descriptive statistics

3.1 Data

Our analysis on debt funding decisions by international banks is based on a unique database collected by the Central Bank of Ireland. The dataset is built upon quarterly granular balance sheet data at the SPE-level and a registration form for all vehicles including details

on the name, country and sector of the sponsor of the vehicle (that is, the entity on whose behalf the vehicle was set up).[4] This is an important look-through mechanism as SPEs are often part of complex financial structures that span a number of countries. Since SPEs act as "pass-through" vehicles, the identification of the sponsor-level is key to uncover cross-border linkages.

We use this data, combined with other sources, to construct a dataset that allows us to both analyse patterns associated with cross-border bank debt funding and characterise banks issuing debt through Irish-resident SPEs. The data includes 258,815 debt securities issued by 742 banks from 19 countries and covers the period Q1 2005 to Q4 2016.[5] Though undoubtedly interesting to split our sample into pre-crisis, crisis and/or post-crisis periods, this proved to be impractical in terms of the available data.[6] Within the sample, 10% (74 banks) issue debt through Irish SPEs, comprising 2,525 debt securities linked to 243 bank-sponsored Irish-resident SPEs.[7] The remaining 90% either carry out debt activities elsewhere or, in a minority of cases, are not active in debt markets during this period. We aggregate debt issuance at the quarterly frequency, rendering 8,458 observations. Debt issuance decisions are identified at the consolidated bank-level and at a quarterly frequency from Q1 2005 to Q4 2016. This structure is matched to alternative debt funding choices (i.e. all other debt issuance), also at the consolidated bank-level. We then add balance sheet and income statement information and country-level indicators of economic and regulatory conditions. Table 1 provides a detailed description of the variables included in our dataset and their sources.

We construct our dependent variables on debt issuance activity with data obtained from the Central Bank of Ireland and *SNL financial* databases. Using data from the Central Bank of Ireland, we extract the effective date and volumes of debt issued through SPEs. From *SNL financial*, we extract the effective date of senior and subordinated debt issued

[4] Other papers in the area refer to the term 'originator', which is the entity originating the securitised assets. The concept of sponsor is in our view more appealing in that it refers to either the entity originating the securitised assets or the entity acquiring the securitised assets from the originator and setting up the vehicle.

[5] The sample includes the following list of identified SPE sonsor banks' countries: Austria, Belgium, Canada, China, France, Germany, Greece, Italy, Japan, Netherlands, Poland, Portugal, Russia, Spain, Switzerland, Turkey, United Arab Emirates, United Kingdom and United States.

[6] Most of our data points are in the post-crisis period. This allowed us to at least confirm that our results hold in the post-crisis period.

[7] 7,823 debt securities were issued via securitisation SPEs and 365 via other SPEs during the sample period, rendering a total of 8,400 debt issues (accounting also for reclassifications in vehicle type) for the Irish-resident SPE sector. 5,220 securities have available issuance date (all with available issuance volume as well), of which 2,525 are linked to 243 bank-sponsored Irish vehicles.

other than through SPEs. This information allows us to combine and aggregate the different types of debt issued at the sponsor bank-level by quarter, resulting in three measures of debt issuance. *DFB (Irish SPE)* is our dependent binary variable indicating debt issuance through an Irish SPE, *DFR (Irish SPE)* is our dependent left-censored[8] continuous variable capturing the ratio of aggregate debt issuance volumes to total assets[9] and *DFB (other)* is our dependent binary variable indicating debt issuance other than through an Irish SPE. This results in the identification of 540 debt issuances through Irish SPEs and 3,936 debt issuances other than through Irish SPEs (of which 2,053 are senior debt, and 821 are subordinated debt).[10]

For the empirical analysis, the chosen regressors at the sponsor bank-level from *Bloomberg* capture whether the decision to issue cross-border debt through an SPE is influenced by the financial conditions and/or the overall strategy of the sponsor bank (Camba-Méndez, Carbó-Valverde, and Rodríguez-Palenzuela (2014), Carbó-Valverde, Rosen, and Rodríguez-Fernández (2011) and Gong, Hu, and Ligthart (2015)). The natural logarithm of total assets measuring the size of sponsor banks (*Size*) essentially acts as a control variable for indicators of pressures on their balance sheets. These include the ratio of returns to total assets (*ROA* as an indicator of profitability, the regulatory Tier 1 capital to total assets ratio (*Tier 1 ratio*) serving as a proxy for bank solvency and the ratio of loan loss provisions to total loans (*LLP/Loans ratio*) capturing the risk profile, as recognised by the bank itself.[11]

We also construct two binary variables to measure particular interactions. Following a similar approach to Gong, Hu, and Ligthart (2015), we construct a binary variable indicating 1 for banks with loan growth rates greater than the median level of all bank quarter observations and funding interest expenses greater than the median level of all sponsor bank quarter observations, and 0 otherwise. In this way, *Funding constraint* aims to identify banks with loan expansion opportunities but higher interest expenses, therefore with particular incentives to issue cross-border debt. We also construct a *Low Tier 1 ratio* binary variable indicating 1 for sponsor banks with a Tier 1 ratio lower than the median level of all sponsor bank quarter observations, and 0 otherwise, as in Carbó-Valverde, Rosen, and Rodríguez-Fernández (2011). This indicator captures the behaviour of "undercapitalised"

[8] Variable *DFR (Irish SPE)* is left-censored at 0.

[9] Debt issuance volumes are divided by sponsor bank total assets in our regression analysis, in order to have comparable units across sponsor banks.

[10] We account for duplicates representing issuance in tranches. Separately, observations for which pricing and issuance volumes are not available are removed from the dataset.

[11] Sponsor bank-level balance sheet indicators are interpolated by combining quarterly, semi-annual and yearly bank reports.

banks with low Tier 1 regulatory capital.

Economic and regulatory environment indicators from different sources are employed in our analysis of interaction terms. *CFM* represents capital flow management policies at the country-level, and it is given by the overall index of capital flow controls (restrictions) including all asset categories.[12] Capital flow controls may be a relevant factor explaining spillover effects by limiting cross-border debt funding (Serena and Moreno (2016)), particularly when interacted with the *Funding constraint* binary variable. *Tax*, measured by the corporate income tax rate at the country-level, is employed to examine the potential impact of tax differentials on debt funding decisions. This indicator is not meant to capture the particular interaction of tax regimes in Ireland and the country of the sponsor bank through double taxation treaties. These are described in Golden and Hughes (2018) and double taxation treaties are found to be a significant factor driving cross-border debt issuance in the gravity-model approach undertaken by Galstyn, McQuade and Maqui (2019). However, these are too complex to model so we concentrate on the general tax environment. *Macro-pru* is defined as the cumulative change in the aggregate sector-specific capital buffer instruments, more concentrated in EMEs but also covering a significant portion of AEs, requiring banks to finance a larger fraction of these exposures with capital (including real estate credit, consumer credit and other sectors).[13] This variable serves as a proxy for macro-prudential regulatory effects, and captures regulatory arbitrage incentives when interacted with the *Low Tier 1 ratio* binary variable. Moreover, we employ other country-level variables controlling for the economic cycle, which comprise *GDP growth* defined as the quarterly growth rate of GDP per capita and *Population growth* given by the quarterly growth rate of population.[14]

Finally, in order to test for potential herding behaviour by banks in debt issuance through SPEs, we construct a proxy for herding. We construct count variable *Country DFB (Irish SPE)*, which captures the occurrence of debt issuance through an SPE at the country-level by quarter. This variable enables us to study whether international sponsor banks are more likely to issue debt through an SPE when banks belonging to the same country have recently done so.

[12] See Fernández, Klein, Rebucci, Schindler, and Uribe (2015).

[13] See Cerutti, Claessens, and Laeven (2015)

[14] Country or country-time fixed effects turned out not to be practical, likely due to the volume of countries in the sample.

3.2 Descriptive statistics

Table 2 reports the main descriptive statistics of the dependent and explanatory variables included in our study, covering the full sample from 2005 Q1 to 2016 Q4. We observe that debt funding issued through SPEs (*DFB (Irish SPE)*) is considerably less frequent with an average 0.14, as compared to debt issued other than through SPEs averaging 0.5 over the sample period. Debt funding volumes issued through SPEs represent, on average, a small per centage of total assets (0.04), although there is a high degree of dispersion ranging from 0 to almost 30. This is due to the fact that the majority of our sponsor bank quarter observations reflect no debt issuance, which means that the ratio of debt issuance volume to total assets (*DFR (Irish SPE)*) is zero.

Our explanatory variables of interest show a high degree of dispersion. As for sponsor bank-level indicators, the average level of *Tier 1 ratio* stands at around 11 on average, and is quite heterogeneous as evidenced by a standard deviation of 3 and a min-max range from 4.3 to approximately 25, similar to the *Low Tier 1 ratio* binary variable. This is also evident for the *Funding constraint* binary variable, which presents a 0.35 standard deviation for an average of 0.14. *ROA* and *LLP/Loans ratio* show some extreme negative values reflecting banking sector developments during the financial crisis period, when banks faced heavy losses. As for country-level variables, *GDP growth* and *Population growth*, reflecting economic cycle developments during the sample period, exhibit min-max values ranging between negative and positive growth rates. Our economic environment variables of interest (*CFM*, *Tax* and *Macro-pru*) also reflect considerable country-level heterogeneity in our sample.

4 Econometric methodology

As discussed in the previous section, the decision to issue cross-border debt through SPEs may be influenced by how such funding aligns with the overall strategy and situation of the sponsor bank. Moreover, economic environment characteristics at the country-level (such as capital flow management policies, taxation and macro-prudential regulation) may also drive sponsor bank preferences to fund debt through SPEs. We examine the factors that lead a bank to issue debt through SPEs and, then, how such issuance affects the financial conditions of the bank itself. We undertake this analysis on the full sample of observable debt issuance and on a sub-sample which excludes EME sponsoring banks.[15] Some

[15] The sub-sample, which accounts for 85 per cent of the total sample in terms of instances of debt issuance, excludes the following EME countries: Poland, Russia, Saudi Arabia, South Africa, Turkey and United Arab Emirates.

differences can be expected in the empirical results between the two samples.[16] EME bank sponsored SPEs dominate debt issuance by SPEs engaged in external financing, where the bank uses the SPE to access, or obtain cheaper funding from, debt markets. Furthermore, securitisation activity is relatively low among EME bank sponsored SPEs. Finally, this sample split serves as a type of outlier test.

4.1 Debt funding binary decision

In this subsection we present our baseline econometric model to assess banks' binary decisions to issue debt through SPEs. For this purpose, we employ a bivariate probit simultaneous regression model. The economic costs and benefits for international banks to issue debt through SPEs is likely to be contemporaneously correlated with alternative debt funding choices. As the alternative debt funding choices are not mutually exclusive, we discard potential competing econometric approaches such as the multinomial logistic model employed in other empirical studies (Carbó-Valverde, Rosen, and Rodríguez-Fernández (2011)). We therefore model sponsor banks' binary debt funding choice among two alternatives: debt funding issued through an Irish SPE and debt funding issued other than through an Irish SPE as follows:

$$DFB_{m,i,j,t} = I(DFB^{*}_{m,i,j,t} > 0), m = 1, 2 \tag{1}$$

$$DFB^{*}_{m,i,j,t} = \beta' W_{m,i,j,(t-1)} + \gamma' Z_{m,j,(t-1)} + \sum_{t} \delta_t T_t + \epsilon_{i,j,t} \tag{2}$$

where m represents the debt issuance choice among the two alternatives: *DFB (Irish SPE)* and *DFB (other)*. i, j, t denote sponsor bank, country and quarter, respectively. $W_{m,i,j,(t-1)}$ is a vector of regressors capturing sponsor bank-specific characteristics, which include proxies for size, profitability, solvency and risk profile as described in the previous section. All sponsor bank-specific variables are lagged by one period to avoid potential endogeneity problems.[17] $Z_{m,j,(t-1)}$ consists of country-level control variables, including economic and population growth. The parameter T_t represents time dummies, capturing common global macroeconomic developments affecting all sponsor banks within a quarter. $\epsilon_{i,j,t}$ is an i.i.d. error term which follows a normal distribution. Finally, all regressions include heteroscedasticity robust standard errors which are clustered at the sponsor bank-level.[18]

[16] The analysis cannot not be separately undertaken on EME sponsor banks only as the regression analysis becomes unidentifiable.

[17] See Camba-Méndez, Carbó-Valverde, and Rodríguez-Palenzuela (2014).

[18] As a robustness check, we winsorise sponsor bank-specific variables at the 5 per cent level to limit the impact of outliers. Extreme values do not appear to bias our results in any case.

Furthermore, to identify specific economic and regulatory environment effects on sponsor banks, our model incorporates additional interaction terms of interest. We interact the binary variable identifying funding constrained sponsor banks with the variables reflecting capital flow management policies (Cerutti, Claessens, and Laeven (2015)) and the taxation environment as in Gong, Hu, and Ligthart (2015). The coefficient associated with both of these interaction terms shows the effect on sponsor banks with loan expansion opportunities and limited funding capabilities; in other words, seeing the impact of country-level variables on a subset of banks already under relative financial pressure. A positive and significant coefficient would be evidence of capital flow management policies spillovers or tax differential incentives, in their respective model specifications, for funding constrained banks to issue debt through an SPE. Similarly, we interact our binary variable that identifies sponsor banks with low Tier 1 regulatory capital with our proxy of macro-prudential regulation. This approach allows macro-prudential regulatory effects to vary depending on the degree of bank capitalisation. A positive and significant coefficient, could be interpreted as evidence of regulatory arbitrage incentives for "undercapitalised" sponsor banks facing more stringent regulatory requirements to issue debt through SPEs.

Finally, we analyse if sponsor bank debt funding decisions are influenced by herding behavior. We follow a similar approach to Carbó-Valverde, Rosen, and Rodríguez-Fernández (2011) to study the possibility that there may be agency reasons for issuing cross-border debt through SPEs. The rationale is that a sponsor bank may be more likely to issue debt through an SPE, when other banks from the same country have recently done the same. We include an additional count variable as a regressor in our model, in order to capture country-level intensity of offshore debt issuance activity through Irish-resident SPEs.[19]

4.2 Debt funding ratio decision

To expand our analysis to include the volume of cross-border debt issued through SPEs, we regress the ratio of debt issuance volume in quarter t to total assets in quarter $t-1$ on sponsor bank-specific balance sheet information and country-level variables (Camba-Méndez, Carbó-Valverde, and Rodríguez-Palenzuela (2014), Gong, Hu, and Ligthart (2015)). Since we assume each sponsor bank in our sample makes funding decisions by trading off costs and benefits in doing so through Irish-resident SPEs, we observe zero debt funding in the dependent variable when sponsor banks find debt funding through Irish-resident SPEs not to be profitable. Our sample is therefore left-censored at zero. The implemented

[19] All country-level regressors also enter our regressions lagged by one quarter.

baseline Tobit regression model is as follows:

$$DFR_{i,j,t} = \begin{cases} DFR^*_{i,j,t} & \text{if } DFR^*_{i,j,t} > 0 \\ 0 & \text{if } DFR^*_{i,j,t} \leq 0 \end{cases} \tag{3}$$

$$DFR^*_{i,j,t} = \beta' W_{i,j,(t-1)} + \gamma' Z_{j,(t-1)} + \sum_t \delta_t T_t + \epsilon_{i,j,t} \tag{4}$$

where i, j and t denote the sponsor bank, country and quarter, respectively. The dependent variable $DFR_{i,j,t}$ is the ratio of total volume of debt issued to total assets, for sponsor bank i in country j in quarter t. $DFR^*_{i,j,t}$ is the latent variable in our Tobit regressions.

$W_{i,j,(t-1)}$ is a vector sponsor bank-specific regressors, including proxies of size, profitability, solvency and risk lagged by one period. $Z_{j,(t-1)}$ consists of country-level control variables. $\epsilon_{i,j,t}$ is an i.i.d. error term which follows a normal distribution. We include clustered standard errors only in our Probit regression analysis due to model constraints in the Tobit analysis. Moreover, we mimic the analysis of interaction terms and testing of additional regressors included in the bivariate probit model as described in the previous subsection.

5 Empirical results

5.1 What determines debt funding binary decisions?

Table 3 presents the results of estimating equation 2 using our full sample over the period 2005 Q1 to 2016 Q4, explaining sponsor banks' cross-border debt funding binary decisions through Irish-resident SPEs. Table 4 provides the results replicating the analysis on the subsample excluding EME sponsoring banks.

The baseline regression in column 1 of both tables can be compared to the more extensive bank-level balance sheet variables in Golden and Maqui (2018), made possible by the model and the exclusion of country variables.

The estimated coefficients associated with *Size* and *LLP/Loans ratio* are statistically significant at the 1 per cent level in both samples and were also prominent in our previous research. We suggest that bigger banks would face easier access and lower fixed, as a portion of total, costs in issuing offshore debt through SPEs given their presence in global capital markets. The significance of a higher loan loss provisions to total loans ratio relates to the probability of cross-border debt funding through SPEs increasing with the perceived

forward-looking risk, as evidenced by provisions for future losses, of the loan portfolio, particularly for AE sponsor banks. This is described in Carbó-Valverde, Marqués-Ibañez, and Rodríguez-Fernández (2012) as a potential "credit risk transfer" channel where issuance through SPEs could form part of a pre-emptive loan portfolio risk management strategy by sponsor banks. Golden and Maqui (2018) found, however, that international banks issuing debt through Irish-resident SPEs do so to sustain rather than reduce their risk profiles.

The *Tier1 ratio* turns significant, as in our previous research, when EM sponsor banks are excluded. This suggests that, for AE sponsor banks, the ability to issue offshore debt through SPEs may be dependent on investor perceptions of the solvency of the bank. This is perhaps unsurprising given the very sharp decline in bank securitisation, in Ireland and globally, during the financial crisis and subsequent signs of recovery once balance sheets had recovered. *ROA*, the return on assets, is positive and significant at the 10 per cent level in the baseline regression. When EME sponsor banks are excluded, however, the variable loses significance in all instances, pointing to outliers as the issue. Furthermore, positive significance does not chime with our previous research.[20]

Both of the standard control variables *GDP growth* and *Population growth* are insignificant, except for GDP growth when EM sponsor banks are excluded. This may indicate that, for AE sponsor banks, debt issuance options improve over the business cycle, reducing the need to recur to cross-border debt funding through SPEs.

We add our first set of country-level variables and interaction terms in column 2.[21] Capital controls turn out to be a strong determinant of bank cross-border debt issuance through SPEs. The estimated coefficient for the interaction term between our *Funding constraint* binary variable and *CFM* is positive and significant at the 1 per cent level. We interpret this result as evidence of capital flow controls being a driving factor for international banks with growing investment opportunities but with a constrained funding base. Excluding EME sponsor banks is particularly intuitive given the relative prevalence of capital flow management measures in emerging markets. Nevertheless, even after excluding EME sponsors, the estimated coefficient holds significant at the 5 per cent level.

[20] We present the ROA regressor as banks with higher returns, and hence potentially more profitable investment and balance sheet expansion opportunities, are more likely to issue offshore debt through SPEs. However, we find it more intuitively appealing that those banks under balance sheet pressure regarding profitability are more likely to employ SPEs.

[21] Differences across specifications are driven by specification, rather than sampling, differences.

As for the analysis of the tax environment in column 3, we find contrasting results between our two samples. For the full sample, we find no evidence supporting the significance of tax effects at the country-level determining offshore debt issuance decisions through SPEs. However, for those vehicles sponsored by banks in AE, *Tax* is significant when interacted with funding constraints at the 1 per cent confidence level. The estimated coefficient is not particularly strong, which may be explained by the generalised tax-neutral structure of vehicles across countries. Nevertheless, funding constrained banks appear to more actively seek out particular tax advantages.[22]

Findings reflected in column 4 show a significant impact of macro-prudential measures on debt issued through Irish-resident SPEs by international sponsor banks, particularly those in AE. This may imply that the introduction of more stringent macro-prudential policy tools affecting bank capital buffers are positively correlated with cross-border funding strategies by banks. Macro-prudential measures do not seem to have a particular impact through the level of regulatory capital, but it appears to affect the decision of international sponsor banks to issue offshore debt through SPEs as a channel itself.

Finally, estimation results in column 5 suggest strong supporting evidence for herding behaviour. We find that international sponsor banks are more likely to issue cross-border debt through an SPE when banks belonging to the same country have recently done the same. The impact of positive changes in *Country DFB (Irish SPE)* (our proxy of herding) is significant and positively related to international sponsor banks' offshore debt issuance through SPEs at the 0.1 per cent level in both samples. This result aligns with Carbó-Valverde, Rosen, and Rodríguez-Fernández (2011), who suggest that there may be agency reasons for issuing debt in particular ways, namely banks and investors in a country gaining knowledge of the benefits of certain types of debt issuance.

5.2 The determinants of debt funding ratios through Irish SPEs

Tables 5 and 6 present the results of estimating our tobit model as defined in equation 4 for the full sample and excluding EME sponsor banks, respectively. The impact of bank-specific regressors on the ratio of debt volume issued through Irish-resident SPEs over total assets reinforces our bivariate probit results included in sub-section 5.1.

[22] Han, Park, and Pennacchi (2015) find a significant effect on US securitisation activity from differences in corporate tax rates between US states, with banks subject to higher tax rates selling more mortgages. Gong, Hu, and Ligthart (2015) conduct similar analysis on OECD banks and also find corporate tax-differentials to be a significant driver of securitisation. Furthermore, when US banks are excluded so that cross-border issuance accounts for more of the sample, the interaction term including tax rates and funding constraints becomes more significant.

As captured in our baseline regression analysis in column 1, estimated coefficients associated with *Size* and *LLP/Loans ratio* are statistically significant in both samples. This suggests that easier access to capital markets with reduced fixed costs and the credit transfer channel are strong determinants in guiding both the cross-border debt issuance choice and the amount of debt issued through SPEs. The *ROA* variable also behaves similarly to the probit model, with significance disappearing when EME sponsor banks are excluded. Significance for *ROA* disappears in all instances, however, when EME sponsors are excluded (table 6). Our empirical results point to a less crucial role for bank soundness associated with our regressor *Tier 1 ratio*, however, when it comes to explaining debt issuance volumes by AE sponsor banks.

Regarding interaction terms, capital flow management tools at the country level in column 2 are significant within the full sample but lose all significance when EME sponsors are excluded. In the full sample, the interaction term between our binary variable *Funding constraint* and *CFM* is significant at the 0.1 per cent level and *Funding constraint* is significant at the 1 per cent level. This may suggest that funding constrained banks impacted by capital flow management policies are driven to issue higher volumes of offshore debt through SPEs. However, this relationship is qualified by the results of the sub-sample analysis.

The potential impact of tax differentials, captured in column 3, somewhat affirms the result in the probit analysis that tax considerations are significant for AE sponsor banks facing funding constraints. When driving volumes of debt issued, however, the significance decreases to the 5 per cent level from 0.1 per cent in the probit model.

Results in column 4 show there is no direct significant impact of macro-prudential measures on cross-border debt volumes issued through SPEs in both samples, which contrasts with their determinant role in terms of debt funding binary decisions as shown in subsection 5.1. Although macro-prudential measures do not seem to have a particular impact through the level of regulatory capital, a low bank regulatory capital ratio appears to affect the decision of international sponsor banks in terms of offshore debt issuance volumes but only in the full sample. This may be related to the wider use of the external financing model among EME sponsored SPEs, which tend to be structured to provide investor reassurance.

Finally, coefficients in column 5 reaffirm the strong impact of herding behaviour in cross-border debt issuance volumes though SPEs, with significance remaining at the 0.1 per cent level in the full sample though it declines to the 5 per cent level excluding EME sponsor

banks. In other words, international sponsor banks are more likely to issue greater volumes of debt following the intensification of activity from banks belonging to the same country.

6 Conclusions

Understanding what 'special purposes' drive cross-border debt funding linkages between banks and non-banks can shine some light on an area that has remained somewhat unexplored to date. Given Ireland's role as a global finance channel, our results may have relevance outside of direct links between international banks and Irish-resident SPEs. Consistent with clustered country links and the identification of particular business models, our results point to specific bank strategies when employing SPEs for offshore debt funding.

Our empirical evidence shows that bigger banks, with more access to global capital markets, are prominent as are riskier banks, as measured by loan loss provisions. Higher regulatory capital is an important factor in the decision to issue debt, most likely as a reassurance for investors, though only for AE banks. At the country-level, capital flow management policies appear to induce bank shifts to cross-border debt funding employing SPEs, particularly for funding constrained banks. Tax considerations also feature in the decision to issue offshore debt through SPEs for AE bank sponsors. Macro-prudential policy tools have an overall positive effect in explaining the decision to issue debt, but not debt issuance volumes. These results suggest a pattern of banks employing SPEs to overcome funding and policy constraints. Finally, herding behaviour is a highly significant factor explaining cross-border debt issuance through Irish-resident SPEs.

By studying cross-border debt issuance by international banks in the context of the Irish non-bank financial sector, we contribute to addressing an area of key global financial policy relevance where information has been relatively scarce. We extend our previous research on bank-level indicators explaining debt issuance through Irish-resident SPEs (Golden and Maqui (2018)) and our key messages are robust to the addition of a new methodology and enhanced by country-level indicators. Risks within the sector are potentially heightened by the weaker risk profile of banks that sponsor Irish-resident SPEs relative to those issuing debt in other markets. Ireland, as a major channel for international debt flows, likely represents a sample with global resonance. Therefore, our findings suggest that a cross-border SPE could act as a risk indicator for financial stability analysis and for supervisors in the country regulating the sponsor bank, not least in terms of analysing the potential for sponsors of SPEs to take on hidden risks.

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Figure 1: Sponsor bank mapping profile of securitisation SPEs.

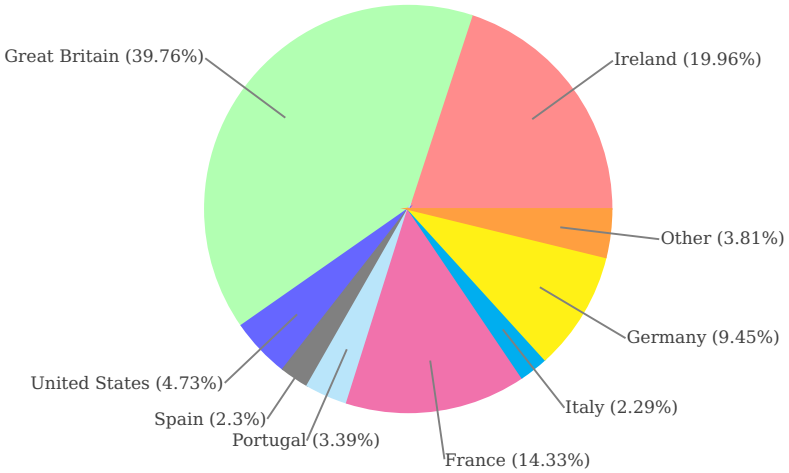

Figure 2: Sponsor bank mapping profile of other SPEs.

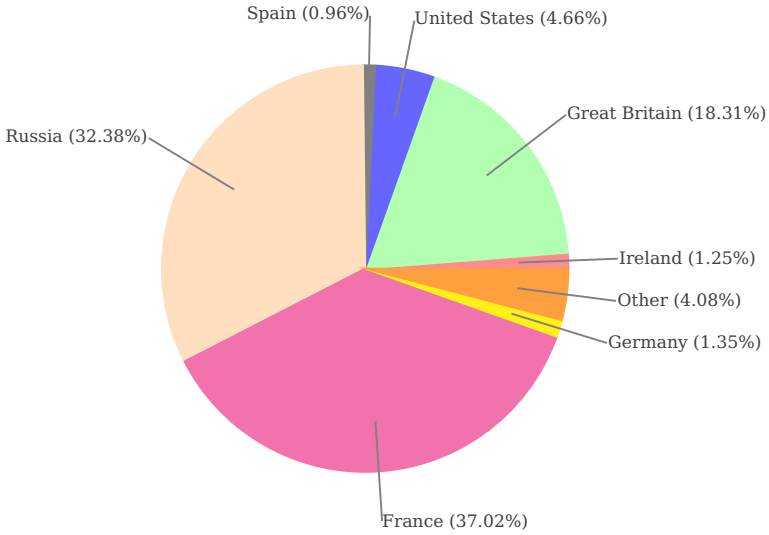

Table 1: Variable description.

Variable	Description	Source
DFB (Irish SPE)	Binary variable indicating 1 for debt issuance through Irish SPEs, and 0 otherwise.	Central Bank of Ireland statistics.
DFR (Irish SPE)	Debt issuance volume through Irish SPEs to total assets ratio, where total assets are lagged by one period.	Central Bank of Ireland statistics.
DFB (other)	Binary variable indicating 1 for debt issuance other than through Irish SPEs, and 0 otherwise.	SNL Financial.
Size	Natural logarithm of total assets.	SNL Financial.
ROA	Return on assets ratio.	SNL Financial.
Tier 1 ratio	Regulatory Tier 1 capital to total assets ratio.	SNL Financial.
LLP/Loans ratio	Loan Loss provisions to loans ratio.	SNL Financial.
Funding constraint	Binary variable indicating 1 for banks with loan growth rates greater than the median level of all bank-quarter observations and funding interest expenses greater than the median level of all bank-quarter observations, and 0 otherwise.	SNL Financial.
Low Tier 1 ratio	Binary variable indicating 1 for sponsor banks with a Tier 1 ratio lower than the median level of all sponsor bank-quarter observations, and 0 otherwise.	SNL Financial.
CFMC	Overall index of capital flow management controls (restrictions) including all asset categories.	Fernández, Klein, Rebucci, Schindler, and Uribe (2015).
CITR	Country-level corporate income tax rate.	OECD.
Macro-pru	Cumulative change in the aggregate sector-specific capital buffer instruments requiring banks to finance a larger fraction of these exposures with capital (including real estate credit, consumer credit and other sectors).	Cerutti, Claessens, and Laeven (2015).
DFB (Irish SPE)	Country-year count of debt issuance through Irish SPEs.	Central Bank of Ireland statistics.

Table 2: Full sample summary statistics.

Variable	N	Mean	SD	Min.	Max.	Med.
DFB (Irish SPE)	35,232	0.01	0.12	0.00	1.00	0.00
DFR (Irish SPE)	27,725	0.02	1.77	0.00	216.85	0.00
DFB (other)	35,232	0.22	0.42	0.00	1.00	0.00
Size	28,372	15.51	2.53	10.50	21.40	15.70
ROA	27,001	0.50	1.00	-7.38	4.13	0.57
Tier 1 ratio	25,881	13.08	5.27	4.90	62.73	12.09
LLP/Loans ratio	19,099	2.74	3.93	0.00	70.24	1.57
Funding constraint	20,864	0.26	0.44	0.00	1.00	0.00
Low Tier 1 ratio	25,881	0.50	0.50	0.00	1.00	1.00
CFMC	35,232	0.19	0.20	0.00	1.00	0.15
CITR	35,128	34.93	7.36	17.92	55.00	40.00
Macro-pru	29,040	0.10	0.50	0.00	5.00	0.00
DFB (Irish SPE)	35,232	7.83	6.69	0.00	24.00	8.00

Table 3: Bivariate probit model for debt funding binary decision.

	Dependent variable: *DFB (Irish SPE)*				
	Baseline (1)	*CFM* (2)	*Tax* (3)	*Macro-pru* (4)	*Herding* (5)
Size	0.457***	0.876***	0.568***	0.490***	0.398***
	(0.035)	(0.085)	(0.063)	(0.034)	(0.033)
ROA	0.192**	0.294*	0.251	0.275***	0.105*
	(0.060)	(0.138)	(0.131)	(0.058)	(0.053)
Tier 1 ratio	0.007	0.041	0.022		0.021
	(0.016)	(0.031)	(0.029)		(0.016)
LLP/Loans ratio	0.137***	0.144*	0.185**	0.195***	0.132***
	(0.024)	(0.070)	(0.069)	(0.028)	(0.024)
GDP growth	0.051	-0.570**	0.022	0.148	0.054
	(0.110)	(0.200)	(0.179)	(0.104)	(0.111)
Population growth	-0.072	0.020	-0.030	0.020	-0.033
	(0.120)	(0.186)	(0.161)	(0.136)	(0.127)
Funding constraint		-0.917***	-0.311		
		(0.230)	(0.597)		
CFM		2.761***			
		(0.775)			
Funding constraint $\times$ *CFM*		5.855***			
		(1.300)			
Tax			-0.002		
			(0.011)		
Funding constraint $\times$ *Tax*			0.012		
			(0.018)		
Low Tier 1 ratio				0.209	
				(0.109)	
Macro-pru				0.152*	
				(0.073)	
Low Tier 1 ratio $\times$ *Macro-pru*				-0.060	
				(0.125)	
Country DFB (Irish SPE)					0.227***
					(0.026)
# Observations	1,882	871	871	1,969	1,882
Time fixed effects	YES	YES	YES	YES	YES
Robust clustered std. errors	YES	YES	YES	YES	YES
Pseudo R^2	0.614	0.840	0.836	0.587	0.624

Note: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 4: Bivariate probit model for debt funding binary decision (excluding EME).

	Dependent variable: *DFB (Irish SPE)*				
	Baseline (1)	*CFM* (2)	*Tax* (3)	*Macro-pru* (4)	*Herding* (5)
Size	0.733***	1.009***	0.856***	0.738***	0.661***
	(0.057)	(0.107)	(0.105)	(0.063)	(0.055)
ROA	0.062	0.207	-0.074	0.142	-0.022
	(0.062)	(0.162)	(0.152)	(0.104)	(0.048)
Tier 1 ratio	0.087***	0.033	0.106**		0.092***
	(0.022)	(0.033)	(0.036)		(0.022)
LLP/Loans ratio	0.211***	0.129	0.077	0.176**	0.192***
	(0.033)	(0.073)	(0.074)	(0.055)	(0.037)
GDP growth	-0.285*	-0.919***	-0.237	-0.218	-0.267*
	(0.129)	(0.204)	(0.213)	(0.135)	(0.131)
Population growth	-0.192	0.020	-0.012	-0.035	-0.147
	(0.160)	(0.188)	(0.165)	(0.172)	(0.169)
Funding constraint		-0.724**	-2.471***		
		(0.241)	(0.672)		
CFM		3.699***			
		(0.826)			
Funding constraint $\times$ *CFM*		3.771**			
		(1.450)			
Tax			0.019		
			(0.012)		
Funding constraint $\times$ *Tax*			0.074***		
			(0.021)		
Low Tier 1 ratio				-0.079	
				(0.125)	
Macro-pru				0.242*	
				(0.114)	
Low Tier 1 ratio $\times$ *Macro-pru*				-0.622	
				(0.367)	
Country DFB (Irish SPE)					0.220***
					(0.031)
# Observations	1,584	848	848	1,601	1,584
Time fixed effects	YES	YES	YES	YES	YES
Robust clustered std. errors	YES	YES	YES	YES	YES
Pseudo R^2	0.629	0.816	0.820	0.610	0.638

Note: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 5: Tobit model for debt funding ratio decision.

	Dependent variable: *DFR (Irish SPE)*				
	Baseline (1)	*CFM* (2)	*Tax* (3)	*Macro-pru* (4)	*Herding* (5)
Size	0.237***	0.094***	0.067***	0.191***	0.193**
	(0.071)	(0.016)	(0.012)	(0.027)	(0.062)
ROA	0.219**	0.098**	0.108**	0.224***	0.160*
	(0.078)	(0.034)	(0.036)	(0.063)	(0.066)
Tier 1 ratio	0.005	0.005	-0.008		0.016
	(0.017)	(0.005)	(0.007)		(0.019)
LLP/Loans ratio	0.130*	0.035*	0.051**	0.124***	0.125*
	(0.063)	(0.014)	(0.017)	(0.025)	(0.063)
GDP growth	0.002	-0.076	0.018	0.134*	0.005
	(0.091)	(0.048)	(0.039)	(0.066)	(0.089)
Population growth	-0.147	-0.002	-0.022	-0.003	-0.116
	(0.106)	(0.035)	(0.033)	(0.067)	(0.103)
Funding constraint		-0.260**	0.047		
		(0.086)	(0.148)		
CFM		0.149			
		(0.159)			
Funding constraint $\times$ *CFM*		1.608***			
		(0.457)			
Tax			-0.005		
			(0.003)		
Funding constraint $\times$ *Tax*			-0.002		
			(0.004)		
Low Tier 1 ratio				0.170**	
				(0.061)	
Macro-pru				-0.015	
				(0.045)	
Low Tier 1 ratio $\times$ *Macro-pru*				-0.039	
				(0.099)	
Country DFB (Irish SPE)					0.123***
					(0.035)
# Observations	1,882	871	871	1,969	1,882
Time fixed effects	YES	YES	YES	YES	YES
Robust std. errors	YES	YES	YES	YES	YES
Pseudo R^2	0.492	0.888	0.869	0.555	0.503

Note: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6: Tobit model for debt funding ratio decision (excluding EME).

	Dependent variable: *DFR (Irish SPE)*				
	Baseline (1)	*CFM* (2)	*Tax* (3)	*Macro-pru* (4)	*Herding* (5)
Size	0.290**	0.076***	0.067***	0.065***	0.253**
	(0.112)	(0.023)	(0.018)	(0.019)	(0.097)
ROA	0.069	0.060	0.039	0.040	0.036
	(0.059)	(0.032)	(0.029)	(0.022)	(0.043)
Tier 1 ratio	0.051	0.006	0.010*		0.055
	(0.030)	(0.004)	(0.004)		(0.032)
LLP/Loans ratio	0.158*	0.023	0.020	0.029**	0.152
	(0.080)	(0.013)	(0.014)	(0.011)	(0.078)
GDP growth	-0.202	-0.110*	-0.051	-0.035	-0.185
	(0.119)	(0.055)	(0.036)	(0.022)	(0.114)
Population growth	-0.207	-0.010	-0.012	-0.010	-0.180
	(0.129)	(0.026)	(0.025)	(0.029)	(0.120)
Funding constraint		-0.120	-0.359*		
		(0.070)	(0.157)		
CFM		0.269			
		(0.166)			
Funding constraint $\times$ *CFM*		0.412			
		(0.226)			
Tax			-0.001		
			(0.002)		
Funding constraint $\times$ *Tax*			0.009*		
			(0.004)		
Low Tier 1 ratio				0.008	
				(0.015)	
Macro-pru				0.024	
				(0.016)	
Low Tier 1 ratio $\times$ *Macro-pru*				-0.105	
				(0.057)	
Country DFB (Irish SPE)					0.079*
					(0.035)
# Observations	1,584	848	848	1,601	1,584
Time fixed effects	YES	YES	YES	YES	YES
Robust std. errors	YES	YES	YES	YES	YES
Pseudo R^2	0.562	0.938	0.937	0.875	0.568

Note: Standard errors in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

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