Observables and residuals: exploring cross-border differences in Small and Medium Enterprise borrowing costs

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Observables and residuals: exploring cross-border differences in SME borrowing costs

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Abstract

Cross-country comparisons of average loan interest rates, often carried out using statistics provided by national and international authorities, should be accompanied by strong caveats. If underlying compositional differences in loans, borrowers or lenders are unaccounted for, claims of over/under-pricing may be unfounded. In this paper, we propose a simple methodology that compares interest rates between countries after controlling for such differences. We apply our method to loan-level data from three Irish banks operating in both Ireland and the UK. We find that controlling for such factors reduces the the cross-country interest rate premium significantly. We attribute any remaining interest rate "gap" to overall lending market conditions – for example, to differences in the recoverability of collateral, the level of competition among banks, the aggregate perception of risk, or banks' expectations on the relative movements in policy rates and exchange rates between the UK and the euro area.

Keywords: SME, loan-level data, interest rate differentials

Non Technical Summary

This paper proposes a simple model to compare the cost of credit between countries using micro-data. Our estimate controls for a large number of cross-country compositional differences in loans, borrowers and lenders. The aim is to present an estimate of the cross-country borrowing cost differential which can be attributed to *market-wide conditions* facing firms. We apply our method to SME loan-level data from three Irish banks lending in both Ireland and the UK. Our model includes a number of loan characteristics (loan balance, term, collateral and modification) and borrower characteristics (total debt, sector, size and the bank's internal ratings). A key strength of our analysis is our use of loan-level data from banks operating in multiple locations. This allows us to rule out many lender-based financial drivers of interest rate differentials between countries – for example, cost of funding, profitability or balance sheet stress. After controlling for such factors, we find that interest rates in the UK are 110 basis points lower than Ireland (average across all models). This is approximately half the difference in unconditional country averages in our data. We attribute any remaining interest rate "gap" to overall lending market conditions – for example, to differences in the recoverability of collateral, the level of competition among banks, the aggregate perception of risk, or banks' expectations on the relative movements in policy rates and exchange rates between the UK and the euro area.

1 Introduction

Cross-country divergences in enterprise borrowing costs are a regular source of policy discussion and debate. Within the euro area, where monetary policy decisions are common to all member states, such divergences take on heightened importance, given that they may be suggestive of "financial fragmentation". Indeed, during the recent crisis, SME borrowing cost differentials were regularly cited by the European Central Bank (ECB) as evidence that accommodative monetary policy was not reaching all member states in the same way, leading to the conclusion that further stimulative policy measures were necessary to improve credit conditions in certain countries.[1] ECB President Mario Draghi, when announcing the Outright Monetary Transactions (OMT) program in 2012, provided the following justification:[2]

> The euro area has experienced a very severe fragmentation in its financial markets. In recent months, we have seen highly divergent borrowing costs for the real economy in different parts of the euro area. In our analysis, these differences were larger than justified by individual credit risk. They reflected, to a considerable extent, unfounded fears about the future of the euro area.

There are numerous factors which can explain divergences in interest rates across countries: (a) credit market features which are a matter for national authorities such as bank competition, banks' aggregate risk perception, economic growth potential and the recoverability of collateral; (b) credit market features that can be eased by monetary policy such as banks' funding costs and aggregate financing conditions; (c) the composition and risk profile of borrowing enterprises.

In this paper we propose a methodology that can cleanly rule out the role played by factors (b) and (c) in explaining cross-country SME interest rate differentials, leaving only factor (a), the broader aggregate economic, credit and institutional environment (which we refer to as "lending market conditions"). We estimate a number of loan-level interest rate models for new facilities issued in 2014 and 2015. A key strength of our analysis is our use of loan-level data from Irish-headquartered banks operating in both Ireland and the UK. With such data, we can immediately rule out feature (b) described above, given that all loans in the data, regardless of borrower location, were issued by

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[1]See for example the following quotation from, "SME financing, market innovation and regulation", Speech by Benoit Coeuré, Member of the Executive Board of the ECB, Eurofi High Level Seminar organised in association with the Irish Presidency of the Council of the EU, Dublin, 11 April 2013: *the effectiveness of monetary policy itself has been hindered by financial fragmentation, in particular against the backdrop of a sovereign debt crisis in some euro area jurisdictions. As a result, the accommodative monetary policy stance set by the Governing Council has affected firms rather unevenly"*.

[2]Draghi speech: Building the bridge to a stable European economy, at the annual event "Day of the German Industries" organised by the Federation of German Industries, Berlin, 25/9/2012, http://www.ecb.europa.eu/press/key/date/2012/html/sp120925.en.html.

institutions facing identical group-wide funding costs, capital constraints and regulatory pressures. Given that our data includes information on sector of activity, loan collateralisation, loan size, firm size, term at origination, an indicator of loan modification, the lender's internal credit rating of the SME, and the firm's total debt outstanding, we believe we can reliably control for the influence of factors (c). By virtue of the research design and the set of controls available, any difference between UK and Irish interest rates that remains in our empirical models can be attributed to factors (a). Estimating the role of factors (a) in cross-country interest rate differentials is important from a policy perspective. For example, a large interest rate gap (after controlling for factors (b) and (c)) may highlight the need for targeted national policies to stimulate competitive forces in banking or the institutional environment in which lending takes place.

An additional factor which may remain after controlling for factors (b) and (c), but does not precisely fit into the category (a) described above, is the possibility that banks are charging different interest rates to similar borrowers across countries due to expectations of diverging policy rate paths and resultant exchange rate fluctuations. In an extension, we show that large differentials remain between Irish-headquartered banks' SME lending rates in Great Britain compared to their lending to similar firms in Northern Ireland, both of which are within the Sterling currency area and subject to the same Bank of England policy rate. This suggests that this final factor is likely not to be the dominant explanatory factor remaining once our methodology is applied.

Given that cross-border loan-level data is extremely rare, there are few comparable studies. One exception is from Carroll and McCann (2016) who show that controlling for firm-level survey information on turnover, employment, sector, firm age and recent sales growth does not alter the rank ordering of SME borrowing costs across European countries. Their findings point to the role of market-level factors such as the level of bank competition, SME default risk, macro-financial risk and macroeconomic performance in explaining differences across the euro area. However, relative to the categorical survey data available in Carroll and McCann (2016), the large set of loan-level variables available in the current study allows us to control for a considerably larger set of confounding factors before identifying cross-country interest rate differences.

Our key result is that, for SME loans issued by the same set of Irish-headquartered banks, and controlling as completely as possible for the creditworthiness of the borrowing firms, the interest rate on new lending in the UK is between 105 and 158 basis points lower than Ireland. This range of values is arrived at using eight OLS models combining firm-level explanatory factors in varying permutations. As an additional robustness check, we run these eight permutations using four different propensity score matching (PSM) techniques, yielding 32 coefficient estimates where the rate differential is always significantly different from zero and ranges between 79 and 157 basis points. The average coefficient estimate across all specifications is 112 basis points. This gap is approximately half the difference in

unconditional country averages.[3]

The literature on cross-country borrowing cost differentials for enterprises has generally focussed on variation in the pass-through of changes in monetary policy rates to lending rates in the real economy, rather than directly on comparisons of the rates themselves. Andries and Billon (2016) provide a survey of the literature on pass-through in the euro area. Darracq Paries et al. (2014) provide a model of interest rate pass-through for households and firms in France, Germany, Italy and Spain. Their models suggest that in the latter two economies during the post-2012 period, "sovereign bond market tensions and a deteriorating macroeconomic environment have put upward pressure on composite lending rates to non-financial corporations and households, in spite of policy rates and market reference rates of higher maturities falling to record low levels". Holton and Rodriguez d'Acri (2015) show that weaker bank balance sheets and weaker real economic performance both acted to impair pass-through of ECB rate changes to enterprise borrowing costs using a panel of euro area banks. Arnold and van Ewijk (2014) look at the role of sovereign and credit risk factors in the decreasing interest rate convergence experienced in the euro area during the crisis and conclude that the former is the more important explanatory factor. In all of the above studies, the within-country variation in the characteristics of borrowing enterprises cannot be accounted for due to the usage of country-level or bank-level data. Our analysis in this current study suggests that such variation is likely to explain a substantial component of the cross-country variation in average interest rates, with roughly half of the differential between the UK and Ireland remaining after applying our methodology.

The rest of the paper is structured as follows: Section 2 introduces our loan-level dataset and the empirical methods used; Section 3 presents our results; Section 4 concludes.

2 Methods and Data

Our goal is to estimate cross-country interest rate differentials which control for differences in both lender and borrower populations. To achieve this we use SME loan-level data from three Irish-headquartered banks operating in both Ireland and the UK to estimate the following OLS model:[4]

$$IR_i = UK_i + X_i + e_i \tag{1}$$

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[3]An examination of non-financial corporation lending rates in the UK and Ireland available from national authorities shows a 1.5 percentage point premium in the latter (based on average monthly interest rates in 2015). This comparison is used for illustrative purposes only. The UK rates are sourced from the Bank of England and are a weighted average of "other" loans ("new advances") up to and including £1 million. Irish rates are sourced from the ECB and are for loans other than revolving loans and overdrafts, convenience and extended credit card debt ("new business") up to and including €1 million. The differential among loans in our data set is larger than this.

[4]This data is collected by the Central Bank of Ireland and captures all outstanding SME lending at Allied Irish Banks, Bank of Ireland and Permanent TSB on June 30th 2015.

where IR_i is the interest rate charged on SME loan i, X_i is a vector of loan and borrower controls, e_i are the standard OLS regression errors and UK_i is a dummy variable which takes a one when the borrowing firm is located in the UK and a zero when the firm is located in the Republic of Ireland. Our method is similar in spirit to previous work on cross-border credit constraints by Holton et al. (2013), who extract country-level estimates of credit rejection probabilities after controlling for firm-level characteristics across the euro area.

A large literature on bank-firm relationships provides a wealth of evidence on the factors associated with enterprise borrowing costs. This literature has generally found that stronger relationships lead to a benefit for the borrower in the form of a lower interest rate, in line with theoretical predictions of models such as Boot and Thakor (1994) and Petersen and Rajan (1994). Relationship "strength" is measured in many ways in this literature: often by the duration of the relationship, as well as by identifying borrowing from a firm's main bank, physical distance or the scope of products at the bank utilised by the borrower. Examples of the "relationship benefit" via lower interest rates can be found across a large range of jurisdictions including the USA (Berger and Udell, 1995; Bharath et al., 2011; Agarwal and Hauswald, 2010; Santikian, 2014), Belgium (Degryse and Ongena, 2005), Germany (Harhoff and Korting, 1998; Norden and Weber, 2010) and Italy (Gambacorta and Mistrulli, 2014; Sette and Gobbi, 2015).

While the focus of this literature has been on the benefits of relationships, a range of other notable facts on the pricing of enterprise credit emerge. For example, Petersen and Rajan (1994), Harhoff and Korting (1998), Degryse and Van Cayseele (2000), Hernández-Cánovas and Martínez-Solano (2010) and Gambacorta and Mistrulli (2014) find that larger and older firms are charged lower rates. Both Berger et al. (2011) and Berger et al. (2016) find that collateralised loans have lower risk premiums (interest rate minus the rate on U.S. Treasury securities). Both of these studies also find that rates are lower for loans with longer maturities. Although measured in researchers' data much less often, financially distressed firms (included in Harhoff and Korting (1998)) or those with weaker profitability (included in Petersen and Rajan (1994)) are shown to be charged a higher interest rate. Studies which include banks' internal ratings of borrowers are much less rare, with Norden and Weber (2010) being the only paper to our knowledge to show that a riskier internal rating is associated with a higher cost of credit.

Our vector of control variables (X_i in Equation 1) includes sector of activity, loan collateralisation, loan size (loan located in either the "Micro" or "SME" segment of bank's corporate portfolio), term at origination, an indicator of loan modification and three measurements of debt exposure: the natural log of total company debt at the lending bank; the natural log of the loan amount i and the loan-to-debt ratio. In a second set of models, X_i also contains a five-point internal rating scale, which is the most direct measure of the lenders' own view of the creditworthiness of SME borrowers. These

internal ratings are available for a subset of loans.

Our analysis focuses on 58,446 new amortising loans (predominately term loans, leasing and hire-purchasing) which originated between June 2014 and June 2015. Loans that have already entered default by June 2015 are removed from the sample. Table 1 provides summary statistics for our regression sample. 97 per cent of the loans in the sample are issued to firms based in the Republic of Ireland. This large skew in the data and small UK sample size makes it all the more important to analyse any differences in sample composition across the two jurisdictions. Columns three and four show three key sectoral differences between countries: Ireland shows lower shares in Construction (3.3 versus 25 per cent) and higher shares in Other Community, Social and Personal Services (OCSP) (42 versus 10 per cent) and Primary (27 versus 19 per cent).[5] It is also evident that UK lending is skewed towards larger firms – the share of firms in the "Micro" segment is 34% in the UK and 84% in Ireland. These differences are also borne out in the much larger average company debt totals and loan balances in the UK. Furthermore, loans issued in the UK have longer terms (calculated as the duration between origination and maturity date (years)). Finally, secured lending is more common in Ireland (46 per cent versus 36).[6] In Figure 1, we plot the distribution of new loan balances in the data, which clearly shows that the majority of loans are under €30,000. The right tail of the distribution is, however, extremely long and thin with loan balances of multiple millions of euro observed in the top percentile of the distribution. The log form imposed on this variable in regression analysis will limit the impact of such large loans on the overall findings of our empirical model.

The small sample and compositional difference of UK firms is a potential concern for our baseline OLS regressions. To provide a robustness check, we statistically match each of the 1,737 UK firms to a directly comparable group of Irish SMEs using Propensity Score Matching (PSM), rather than relying on a comparison of averages across all loans from the baseline OLS model. Once each UK loan has been matched to a set of "nearest neighbours", the average difference in interest rate between the "treated" UK loans and the "control" matched Irish loans is assessed and compared to the OLS coefficients.

3   Results

Table 2 reports results from the OLS regression described in Equation 1. In models (1) to (4), we exclude banks' internal ratings and vary the way in which SME debt balances are included. In models (5) to (8), the specifications of models (1) to (4) are repeated with the inclusion of the five internal

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[5]The Primary sector is comprised of agriculture, forestry and fishing

[6]To protect the confidentiality of the banks submitting the LLD to the Central Bank of Ireland, we do not report sample splits by bank or by internal rating category. Furthermore, within this amortising loans sample, our regressions are not able to control for loan product type as this information is missing for the UK firms.

rating categories. The key result from this table is that the coefficient on UK_i is extremely stable across all eight specifications: among loans issued by the same set of Irish-headquartered banks and controlling as completely as possible for the creditworthiness of the firm, UK firms have an interest rate on new lending that is between 105 and 158 basis points lower than similar firms in the Republic of Ireland.

A number of other control variables appear to be important factors in Irish banks' pricing decisions. Across all models, higher rates are observed for Manufacturing firms (14 to 31 basis points, depending on model) and OCPS firms (43 to 64 basis points) relative to the reference category (Wholesale and Retail firms), while Agricultural firms ("Primary") benefit from an interest rate reduction (9 to 32 basis points). Similar to previous research, we observe a significant size effect – relative to firms in the "Micro" segment, firms in the "SME" segment have rates which are 10 to 83 basis points lower (not significant in Model (5)). Secured loans receive a substantial discount, but only when internal ratings are included (94 to 108 basis points). In all models, a longer term is associated with lower interest rates, perhaps capturing the fact that longer term loans are often issued for investment purposes, which may associated with more productive and larger firms in the data.

On firms' debt balances, when we include either the total debt of the firm or the value of the particular loan, we find that larger debts are associated with lower interest rates. This pattern is borne out in Central Bank of Ireland (2016) and is likely driven by a firm size effect, whereby banks give the largest firms more favourable pricing treatment. However, when we include the loan-to-debt ratio, which is more a measure of the expansionary nature of the loan, we find that banks charge a *higher* rate when this ratio is higher, suggesting that large expansions in firm debt are treated as risky propositions. All coefficients on firm debt exposure and loan size are robust to the inclusion of banks' internal ratings in models (5) through (8). The result that larger debt and balance is associated with lower interest rates is also robust to the inclusion of balance deciles rather than continuous variables (see Table A1 in Appendix) – again, with few exceptions, higher balances have lower rates. The discount for the highest decile appears to be particularly large.

The very small share of UK loans in the data set is a concern when interpreting the OLS coefficients on UK_i. As a robustness check, we apply Propensity Score Matching (PSM) techniques to the data (Table 3). We utilise four distinct matching methodologies: nearest neighbour with one match, five matches and ten matches, and finally Kernel matching. We run eight separate models for each methodology, where the set of X_i used in each of the models of Table 2 is used to match UK and Irish firms for comparison. The results of Table 3 suggest that the estimate of the coefficient on UK_i is again very stable across specifications and methodologies, with the coefficient ranging from 79 and 158 basis points across all thirty-two models. The average across all models in Table 3 suggests that UK firms are charged 108 basis points less.

In Table 4, we offer an additional example of our methodology by testing whether the UK interest rate differential varies across Northern Ireland (NI) and Great Britain (GB). Here we repeat models (4) and (8) from Table 2, but disaggregate UK_i into two dummy variables depending on the location within the UK. We expect to observe heterogeneity across the UK as there is likely a different mix of lending banks in these locations. Furthermore, the banks ex ante perception of risk is likely to be different given that NI and GB have different business cycles, with NI undergoing a more severe housing downturn in the post-2007 period for, example. The model estimates show that GB firms benefit from lower interest rates than those in NI – relative to comparable firms in Ireland, the interest rate is 97-84 basis points lower in NI and 137-140 lower in GB.

The estimation of separate coefficients for NI and GB also sheds light on the mechanisms likely to be at play when we attribute our country dummy coefficients to factors beyond those referred to as (b) and (c) in the introduction (bank-specific factors such as funding costs; firm-specific factors such as riskiness). There are a range of country-specific factors such as bank competition, aggregate risk perception and the institutional environment, all of which are referred to as factor (a) in the introduction, which are likely to explain the differentials across countries that remain once our methodology is applied. However, an additional factor that could explain interest rate differentials between Ireland and the United Kingdom is banks' expectations regarding future policy rate and exchange rate movements. If for example the bank believes that the euro is likely to appreciate relative to Sterling over the horizon of the loan's maturity, it may justify charging a higher interest rate to compensate for the weaker euro earnings on its UK loans due to Sterling's weakness. A comparison of the GB and NI coefficients in Table 4 shows that there are statistically significant differences in interest rates between GB and NI, both of which are subject to the same policy rate and within the same currency area. This difference shows that it is certainly not the case the the differences we attribute to factor (a) are dominated by exchange rate considerations, but rather that factors such as bank competition, aggregate risk perception and the institutional environment are at play.

Finally, in Table 5, we test whether the differential uncovered above is consistent across other types of credit facilities. We repeat models (4) and (8) from Table 2 on a sample of non-amortising loans (predominantly overdrafts). These models exclude the loan term due to missing maturity dates for most non-amortising loans. The results differ somewhat to the amortising loan analysis. For example, Manufacturing and OCSP sectors are charged lower rates (higher for amortising loans) and the size effect is considerably stronger – interest rates of firms in the SME segment are around 110 basis points lower than firms in the Micro segment. As with amortising loans, the UK coefficient is negative and significant. However, the magnitude of the effect is smaller: UK firms pay 61-80 basis points less for non-amortising facilities.

4 Concluding Remarks

There are several reasons which could explain cross-county differences in the cost of business credit. For example, countries will differ in terms of firm riskiness and indebtedness. It is also possible that firms in a particular country are smaller and less investment-oriented, leading to lower demand for larger, longer term loans. On the supply side, banks will differ in their funding costs, profitability and balance sheet stress. Furthermore, banks in a particular country could have higher approval rates of riskier credit applications, leading to higher interest rates for their entire portfolio. In this paper, we propose a simple method which attempts to remove the effects of many of these fundamental drivers. We note that it is not our goal to identify where a country's interest rate *should* be, but rather to estimate a measure of cross-country differentials which strips out borrower and bank factors, and therefore can identify differences in market-wide credit conditions facing firms across countries.

Our application employs a large sample of recent amortising loans from three Irish banks operating in Ireland and the UK. This data set allows us to control for a number of important loan and borrower characteristics. We further allow for borrower risk by including the banks' own internal ratings. A key strength of our analysis is that all banks in our sample lend in both jurisdictions which, by construction, allows us to rule out any lender-based drivers of interest rate differentials between countries. The direction and significance of our controls is broadly in line with expectations – interest rates are lower for larger firms, larger loans and longer terms. We also find that firms with higher total outstanding debt receive lower interest rates. However, the loan-to-debt ratio has a positive effect, which implies that banks charge higher rates when the loan is relatively expansionary. After controlling for these factors, we find that interest rates in the UK are 110 basis points lower than Ireland (average across all models). This difference is approximately half that which is suggested by unconditional country averages.

We posit that any remaining interest rate gap is attributable to broader market conditions, such as the level of competition between banks , banks' aggregate perception of risk, the institutional environment and banks' exchange rate expectations. For example, Central Bank of Ireland (2015) shows that the share of defaulted SME loans is particularly high in Ireland relative to the euro area (as of December 2013). In this regard, it is likely that a bank's past experience with impairments increases its current perceptions of risk. Low levels of competition in Ireland may also be a driving factor (see Carroll and McCann (2016)). For example, World Bank (2016) show that the market share of three largest commercial banks is 52% in the UK versus 84% in Ireland.[7] Furthermore, Central Bank of Ireland (2016) shows that concentration levels in Irish SME lending have generally been increasing

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[7]Assets of three largest commercial banks as a share of total commercial banking assets. Total assets include total earning assets, cash and due from banks, foreclosed real estate, fixed assets, goodwill, other intangibles, current tax assets, deferred tax assets, discontinued operations and other assets.

since 2010 and that the combined market share of the three main banks is currently 92%. While we do not formally test for these potential effects, we believe that both offer interesting avenues for future research.

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Figures

Figure 1: Loan balance distribution
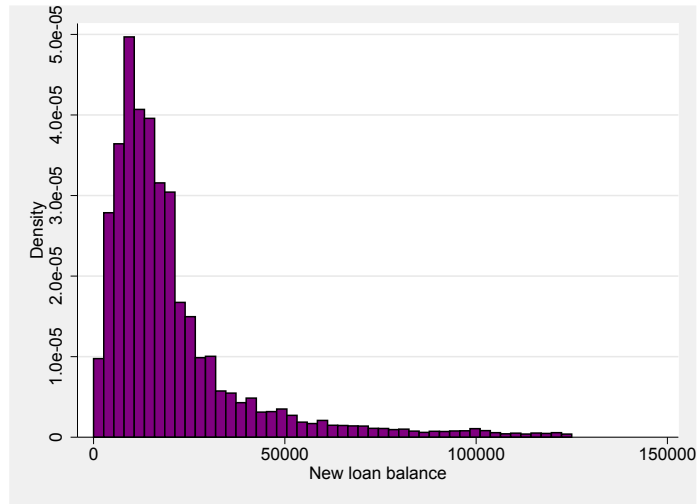
The sample is comprised of Irish and UK loans originating between June 2014 and June 2015 by three Irish-headquartered banks. For ease of exposition, histogram restricted to loans of €125,000 which represents the 95th percentile of observed loan balances.

Tables

Table 1: Summary statistics.

Variable	Full sample	Ireland sample	UK sample
Loan Term (months)	44.2	44.0	53.2
log Company Debt	10.5	10.4	12.8
log Loan Balance	9.8	9.7	11.5
Loan-to-Debt Ratio	0.7	0.7	0.5
Interest Rate	6.8	6.9	4.8
UK	3.0%		
Bus./Admin. Services	10.5%	10.3%	16.8%
Construction	4.0%	3.3%	25.3%
Hotels/Restaurants	2.4%	2.2%	6.7%
Manufacturing	3.4%	3.4%	3.4%
OCSP	41.3%	42.2%	10.0%
Primary	27.0%	27.3%	19.1%
Wholesale/Retail	11.4%	11.2%	18.8%
Micro	82.9%	84.4%	34.3%
Secured	46.0%	46.3%	36.0%
Modification	1.1%	1.1%	0.3%

Notes: this table presents the means (first five variables) and sample shares (remaining variables) for all variables employed in regressions. Internal ratings are excluded due to confidentiality. The sample is comprised of Irish and UK loans originating between June 2014 and June 2015 by three Irish-headquartered banks.

Table 2: Model of Ireland and UK interest rates; Irish-headquartered bank loan level data.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
UK	-1.358***	-1.107***	-1.586***	-1.115***	-1.215***	-1.054***	-1.517***	-1.045***
	(0.0422)	(0.0417)	(0.0450)	(0.0412)	(0.0429)	(0.0425)	(0.0458)	(0.0421)
Bus./Admin. Services	-0.0987***	-0.0333	0.0307	-0.0597**	0.103***	0.103***	0.171***	0.0871***
	(0.0251)	(0.0245)	(0.0252)	(0.0246)	(0.0261)	(0.0258)	(0.0267)	(0.0258)
Construction	0.0707**	0.131***	0.213***	0.106***	0.0481	0.0502	0.130***	0.0352
	(0.0342)	(0.0339)	(0.0346)	(0.0340)	(0.0364)	(0.0363)	(0.0374)	(0.0362)
Hotels/Restaurants	-0.345***	-0.164***	-0.259***	-0.201***	0.0230	0.106**	0.0343	0.0827*
	(0.0459)	(0.0438)	(0.0474)	(0.0439)	(0.0445)	(0.0427)	(0.0462)	(0.0427)
Manufacturing	0.144***	0.229***	0.232***	0.215***	0.311***	0.312***	0.311***	0.313***
	(0.0399)	(0.0389)	(0.0408)	(0.0388)	(0.0413)	(0.0406)	(0.0424)	(0.0405)
OCSP	0.425***	0.538***	0.636***	0.481***	0.429***	0.447***	0.446***	0.438***
	(0.0227)	(0.0215)	(0.0228)	(0.0222)	(0.0315)	(0.0309)	(0.0321)	(0.0308)
Primary	-0.317***	-0.259***	-0.220***	-0.267***	-0.0921***	-0.136***	-0.0875***	-0.123***
	(0.0210)	(0.0206)	(0.0212)	(0.0206)	(0.0224)	(0.0219)	(0.0228)	(0.0219)
SME	-0.436***	-0.521***	-0.836***	-0.435***	0.0151	-0.228***	-0.528***	-0.103***
	(0.0233)	(0.0217)	(0.0229)	(0.0225)	(0.0266)	(0.0232)	(0.0248)	(0.0247)
Secured	0.0157	-0.00160	-0.0172	-0.0136	-1.035***	-0.936***	-1.080***	-0.940***
	(0.0146)	(0.0142)	(0.0149)	(0.0142)	(0.0212)	(0.0206)	(0.0220)	(0.0205)
Loan Term	-0.00987***	-0.00483***	-0.0121***	-0.00526***	-0.00908***	-0.00507***	-0.0120***	-0.00544***
	(0.000191)	(0.000196)	(0.000197)	(0.000199)	(0.000209)	(0.000208)	(0.000215)	(0.000210)
Modification	-0.566***	-0.538***	-0.539***	-0.550***	-0.121***	-0.122***	-0.0674	-0.140***
	(0.0408)	(0.0388)	(0.0434)	(0.0387)	(0.0406)	(0.0391)	(0.0417)	(0.0393)
Log Total Firm Debt	-0.211***				-0.249***			
	(0.00497)				(0.00638)			
Log Loan Balance		-0.391***		-0.395***		-0.379***		-0.389***
		(0.00693)		(0.00694)		(0.00737)		(0.00742)
Loan-to-Debt Ratio			0.176***	0.226***			0.129***	0.282***
			(0.0201)	(0.0194)			(0.0240)	(0.0231)
Constant	11.22***	12.46***	9.301***	12.30***	11.60***	12.58***	9.665***	12.36***
	(0.339)	(0.260)	(0.334)	(0.272)	(0.307)	(0.241)	(0.322)	(0.253)
Bank dummies	Y	Y	Y	Y	Y	Y	Y	Y
Quarter dummies	Y	Y	Y	Y	Y	Y	Y	Y
Internal Ratings	N	N	N	N	Y	Y	Y	Y
N	58446	58446	58446	58446	35495	35495	35495	35495
r2	0.291	0.316	0.262	0.318	0.361	0.383	0.327	0.385

Notes: Robust standard errors in parentheses. Statistical significance denoted by $*(p < 0.1)$, $**(p < 0.05)$, $***(p < 0.01)$. The sample is comprised of Irish and UK loans originating between June 2014 and June 2015 by three Irish-headquartered banks.

Table 3: Propensity Score Matching estimates of the difference between UK and Irish interest rates

	NN1	NN5	NN10	Kernel
Model (1)	-1.278***	-1.188***	-1.188***	-1.239***
	(0.121)	(0.078)	(0.068)	(0.054)
Model (2)	-0.824***	-0.791***	-0.801***	-0.881***
	(0.093)	(0.07)	(0.066)	(0.056)
Model (3)	-1.363***	-1.368***	-1.389***	-1.577***
	(0.071)	(0.057)	(0.054)	(0.047)
Model (4)	-0.875***	-0.813***	-0.804***	-0.879***
	(0.092)	(0.071)	(0.066)	(0.057)
Model (5)	-1.264***	-1.175***	-1.254***	-1.167***
	(0.191)	(0.107)	(0.091)	(0.073)
Model (6)	-0.866***	-0.888***	-0.899***	-0.889***
	(0.112)	(0.084)	(0.077)	(0.075)
Model (7)	-1.357***	-1.375***	-1.388***	-1.485***
	(0.073)	(0.058)	(0.056)	(0.049)
Model (8)	-0.846***	-0.806***	-0.858***	-0.876***
	(0.114)	(0.085)	(0.079)	(0.077)

Notes: Standard errors in parentheses. Statistical significance denoted by $^{*}(p < 0.1),^{**}(p < 0.05),^{***}(p < 0.01)$. Each model number refers to the set of covariates used in the matching algorithm, which in each case matches models (1) to (8) from Table 2. "NN" refers to nearest neighbour matching.

Table 4: Model of Ireland, Northern Ireland and Great Britain interest rates; Irish-headquartered bank loan level data.

	(1)	(2)
Northern Ireland	-0.966***	-0.844***
	(0.0527)	(0.0515)
Great Britain	-1.368***	-1.400***
	(0.0557)	(0.0596)
Bus./Admin. Services	-0.0535**	0.0990***
	(0.0245)	(0.0257)
Construction	0.119***	0.0561
	(0.0341)	(0.0364)
Hotels/Restaurants	-0.195***	0.0933**
	(0.0439)	(0.0427)
Manufacturing	0.214***	0.311***
	(0.0388)	(0.0404)
OCSP	0.488***	0.444***
	(0.0223)	(0.0308)
Primary	-0.267***	-0.123***
	(0.0205)	(0.0218)
SME	-0.433***	-0.0997***
	(0.0225)	(0.0247)
Secured	-0.0164	-0.954***
	(0.0142)	(0.0205)
Loan Term	-0.00539***	-0.00563***
	(0.000200)	(0.000211)
Modification	-0.550***	-0.136***
	(0.0389)	(0.0394)
Log Loan Balance	-0.388***	-0.378***
	(0.00698)	(0.00743)
Loan-to-Debt Ratio	0.223***	0.274***
	(0.0194)	(0.0231)
Constant	12.25***	12.29***
	(0.273)	(0.255)
Bank dummies	Y	Y
Quarter dummies	Y	Y
Internal Ratings	N	Y
N	58446	35495
r2	0.318	0.387

Notes: Robust standard errors in parentheses. Statistical significance denoted by $^{*}(p < 0.1),^{**}(p < 0.05),^{***}(p < 0.01)$. The sample is comprised of Irish and UK loans originating between June 2014 and June 2015 by three Irish-headquartered banks.

Table 5: Interest rate differentials for non-amortising loans

	(1)	(2)
UK	-0.608***	-0.796***
	(0.133)	(0.150)
Bus./Admin. Services	0.0253	0.0341
	(0.0407)	(0.0329)
Construction	-0.0245	-0.0167
	(0.0380)	(0.0347)
Hotels/Restaurants	0.0480	0.0473
	(0.0544)	(0.0484)
Manufacturing	-0.234***	-0.134**
	(0.0681)	(0.0588)
OCSP	-0.122***	-0.139***
	(0.0461)	(0.0461)
Primary	-0.219***	-0.189***
	(0.0330)	(0.0304)
SME	-1.115***	-1.129***
	(0.0581)	(0.0592)
Secured	-0.162***	-0.188***
	(0.0433)	(0.0472)
Modification	-0.124	-0.0800
	(0.144)	(0.144)
Log Loan Balance	-0.129***	-0.108***
	(0.00512)	(0.00593)
Loan-to-Debt Ratio	-0.111***	0.0139
	(0.0374)	(0.0336)
Constant	9.198***	9.150***
	(0.0669)	(0.0874)
Bank dummies	Y	Y
Quarter dummies	Y	Y
Internal Ratings	N	Y
N	15888	13726
r2	0.426	0.521

Notes: Robust standard errors in parentheses. Statistical significance denoted by $^{*}(p <$ $0.1),^{**}(p < 0.05),^{***}(p < 0.01)$. The sample is comprised of Irish and UK loans originating between June 2014 and June 2015 by three Irish-headquartered banks.

Appendix Tables

Table A1: Robustness check – adding debt and balance deciles.

	(1)	(2)	(3)	(4)
UK	-1.417***	-1.225***	-1.310***	-1.202***
	(0.0428)	(0.0427)	(0.0440)	(0.0436)
Bus./Admin. Services	-0.0883***	-0.0248	0.113***	0.109***
	(0.0250)	(0.0244)	(0.0261)	(0.0260)
Construction	0.0792**	0.140***	0.0593	0.0689*
	(0.0342)	(0.0338)	(0.0365)	(0.0363)
Hotels/Restaurants	-0.331***	-0.202***	0.0240	0.0470
	(0.0460)	(0.0446)	(0.0449)	(0.0438)
Manufacturing	0.154***	0.219***	0.315***	0.305***
	(0.0399)	(0.0392)	(0.0415)	(0.0408)
OCSP	0.435***	0.517***	0.438***	0.435***
	(0.0227)	(0.0217)	(0.0316)	(0.0310)
Primary	-0.320***	-0.264***	-0.106***	-0.133***
	(0.0210)	(0.0206)	(0.0224)	(0.0220)
SME	-0.369***	-0.546***	0.0470	-0.291***
	(0.0248)	(0.0219)	(0.0287)	(0.0231)
Secured	0.0272*	-0.0145	-1.008***	-0.952***
	(0.0148)	(0.0144)	(0.0217)	(0.0211)
Loan Term	-0.0101***	-0.00472***	-0.00943***	-0.00521***
	(0.000199)	(0.000213)	(0.000218)	(0.000223)
Modification	-0.531***	-0.527***	-0.0994**	-0.116***
	(0.0399)	(0.0382)	(0.0396)	(0.0389)
Debt Decile 2	-0.109***		-0.192***	
	(0.0241)		(0.0375)	
Debt Decile 3	-0.0539**		-0.111***	
	(0.0238)		(0.0403)	
Debt Decile 4	-0.119***		-0.174***	
	(0.0236)		(0.0385)	
Debt Decile 5	-0.172***		-0.202***	
	(0.0240)		(0.0353)	
Debt Decile 6	-0.204***		-0.290***	
	(0.0248)		(0.0322)	
Debt Decile 7	-0.271***		-0.333***	
	(0.0251)		(0.0307)	
Debt Decile 8	-0.387***		-0.447***	
	(0.0264)		(0.0315)	
Debt Decile 9	-0.596***		-0.716***	
	(0.0290)		(0.0340)	
Debt Decile 10	-1.244***		-1.384***	
	(0.0335)		(0.0424)	
Loan Balance Decile 2		-0.234***		-0.168***
		(0.0288)		(0.0343)
Loan Balance Decile 3		-0.367***		-0.394***
		(0.0271)		(0.0323)
Loan Balance Decile 4		-0.351***		-0.361***
		(0.0276)		(0.0368)
Loan Balance Decile 5		-0.411***		-0.502***
		(0.0265)		(0.0328)
Loan Balance Decile 6		-0.494***		-0.648***
		(0.0264)		(0.0344)
Loan Balance Decile 7		-0.547***		-0.645***
		(0.0265)		(0.0317)
Loan Balance Decile 8		-0.639***		-0.770***
		(0.0268)		(0.0294)
Loan Balance Decile 9		-0.817***		-0.902***
		(0.0275)		(0.0290)
Loan Balance Decile 10		-1.670***		-1.534***
		(0.0334)		(0.0337)
Constant	8.561***	8.665***	9.117***	9.348***
	(0.365)	(0.190)	(0.334)	(0.173)
Bank dummies	Y	Y	Y	Y
Quarter dummies	Y	Y	Y	Y
Internal Ratings	N	N	Y	Y
N	58446	58446	35495	35495
r2	0.290	0.310	0.357	0.374

Notes: Robust standard errors in parentheses. Statistical significance denoted by *($p < 0.1$),**($p < 0.05$),***($p < 0.01$). The sample is comprised of Irish and UK loans originating betbween June 2014 and June 2015 by three Irish-headquartered banks.