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Eliminating the Tax Shield through Allowance for Corporate Equity: Cross-border Credit Supply Effects *

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Abstract

This paper studies how the elimination of the corporate tax bias on bank leverage affects banks' credit provisioning using a quasi-natural experiment, the introduction of an allowance for corporate equity (ACE) in Belgium. We find that affected banks increased their contribution *within* cross-border syndicated loan facilities relative to other foreign banks, and that this effect was stronger for relatively safe borrowers. We estimate that Belgian bank-led loans had on average 20-50 basis points lower spreads when ACE was in effect. Finally, our results suggest a relatively large, positive credit supply effect domestically.

Keywords: Cross-border lending; Syndicated loans; Credit supply; Allowance for Corporate Equity; Bank taxation

JEL codes: G21; G28; E51; H25

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1 Introduction

A growing number of papers provide evidence that corporate income taxation is an important determinant of bank capital structure (Heider and Ljungqvist, 2015; De Mooij and Keen, 2016), which is driven by the tax deductibility of interest payments in most countries. Beside biasing investment behavior, the wedge that the tax shield creates between the cost of debt financing and equity financing incentivizes high leverage ratios which then contribute to financial instability (de Mooij et al., 2015). Because of its anticipated beneficial effects on financial stability, the elimination of the debt tax shield has gained renewed interest (De Mooij, 2012; Hemmelgarn and Teichmann, 2014). While there is evidence that such policies can be effective at lowering bank leverage (Schepens, 2016)[1], there is little evidence on what other effects they have on banks.

This is where this paper contributes. We study the impact of the elimination of the debt shield on banks' cross-border lending. For identification, we exploit the introduction of an allowance for corporate equity (ACE) in Belgium in 2006. This new tax policy allowed all corporations, including banks, to deduct a notional interest on equity, thereby reducing the difference in the tax treatment of equity and debt.

The new policy had two main consequences for banks with potentially opposite effects on credit supply as we will discuss below. First, the deductibility of a notional interest on equity lowered banks' total funding cost. Second, ACE lowered the cost of equity relative to debt, as a result of which Belgian banks increased their capitalization (Schepens, 2016). We study the combined effect of these two shocks, distinguishing our paper from most other papers in the literature that study credit supply effects of bank shocks, such as bank funding shocks.

Using a difference-in-difference approach on syndicated loan data, and controlling for loan demand by exploiting variation *within* loan facilities (similar to Heider et al., 2019), we find that on average Belgian banks increased the volume of cross-border loans relative to non-Belgian banks following the implementation of ACE.

[1] See also Gambacorta et al. (2021); Bremus et al. (2020) for the liability side effects of taxation on banks.

Cross-border syndicated loans offer an ideal setting to identify the credit-supply effects of ACE. First, cross-border syndicated loans are a significant source of funding for European firms with an annual average total volume of USD 589 billion[2] during the 2000-2008 period. Importantly, Belgian banks are active on this market having the seventh largest market share among European lenders as shown in Figure 1. Second, the granularity of the data allows us to control for a host of unobserved potential confounders. The included facility fixed effects control for global shocks that affect borrowers and lenders in a given time period, as well as for all time varying and fixed borrower characteristics (including loan demand), and loan and syndicate characteristics.

In our main tests we concentrate on cross-border lending, as opposed to total or domestic lending, because for these deals we achieve clean identification: we compare lending to the same borrower by treated and untreated foreign banks. We also confirm that these results are not driven by other confounders by carrying out various placebo tests. First, we shift the treatment and control periods by two years. Second, we test if Dutch banks' credit supply showed a similar pattern around the introduction of ACE. Both of these placebo tests support our interpretation of ACE affecting bank credit supply.

The overall increase in credit supply is not an obvious outcome ex ante, since the two main impacts of ACE on banks have potentially opposite implications for risk taking. Lower funding costs are expected to incentivize banks to scale up their activities, and existing empirical evidence suggests that banks increase lending especially to risky borrowers following positive funding shocks (De Jonghe et al., 2019; Liberti and Sturgess, 2018). This suggests that the reduction in overall funding costs incentivized Belgian banks to unambiguously lend more to relatively risky borrowers. The second shock, the fall in the cost of equity relative to debt, and the resulting higher bank capitalization, on the other hand, has ambiguous effects on credit supply and risk taking. First, a higher level of capital may allow banks to take more risk, because of a lower cost of bankruptcy, or because regulatory constraints are less binding (as in Devereux et al., 2019; and Horváth, 2020). Alternatively,

[2]Calculated at constant 2008 prices, using GDP deflators from the World Bank's World Development Indicators database.

higher capital ratios may induce banks to take less risk, as they have more skin-in-the-game (see for example Holmström and Tirole, 1997) and weaker incentives to engage in asset substitution (Jensen and Meckling, 1976).

In our tests we find evidence for decreased risk taking, as the increase in credit supply was larger for borrowers with a higher Altman's Z score, i.e. for relatively safe borrowers. We verify the robustness of this result using several alternative proxies to measure borrower risk, such as a borrower's leverage, the standard deviation of its ROA, and whether it was heavily exposed to the financial crisis as proxied by a large drop in its assets during 2008 and 2009. We also show that the relatively high increase in credit supply toward safe borrowers cannot be explained by Belgian banks redirecting their lending towards countries with certain characteristics that the literature identified as potential drivers of credit provisioning, such as geographic distance between borrowers and lenders, and the level of competition and regulatory stringency in borrower countries. These results suggest that the decrease in the relative cost of equity dominated the effects of lower overall funding costs, as the latter channel predicts higher risk taking.

All of the above results are drawn from changes at the intensive margin of lending. Regressions of the number of loans extended in a borrower country-industry in the periods before and after the tax reform suggest that Belgian banks increased loan provisioning at the extensive margin as well. Admittedly, in these regressions identification is somewhat weaker, since we can control for loan demand only at the borrower country-industry-time level.

Our data allows us to compare the size of the impact of ACE on cross-border lending to its impact on domestic lending. Identifying the domestic credit supply effect is made more difficult by the fact that we do not have untreated Belgian banks to serve as a control group for domestic loans. Hence, we estimate the impact of ACE on domestic loan supply by comparing the lending of Belgian banks with a group of foreign banks lending in Belgium, and to the lending of non-Belgian banks to domestic borrowers in their respective countries while still including facility fixed effects to control for loan demand. We find that Belgian banks increased loan provisioning to Belgian borrowers even more than to foreign borrowers, when

compared to non-Belgian lenders.[3] This suggests that the increase in Belgian banks' cross-border credit supply was not at the detriment of their domestic lending.

Finally, we provide additional evidence that the increase in loan volumes experienced by borrowers of Belgian banks was not driven by an increase in demand for loans by looking at the pricing of syndicated loans before and after the tax reform. After controlling for various combinations of loan facility, borrower, borrower-lender, and lender country characteristics and fixed effects, we find that borrowers obtained loans with lower spreads after the Belgian tax reform if the loan syndicate contained at least one Belgian bank as a lead arranger. This corroborates the hypothesis that Belgian lenders' supply curve shifted outward after the introduction of ACE.

A major contribution of our paper is that we provide a direct, and well-identified estimate of the credit supply effect of a fiscal policy tool. Existing papers study shocks that are arguably in the control of central banks (monetary policy shocks); and regulators and supervisors (capital shocks, changes to prudential requirements); or shocks that are beyond direct control of policy makers (crises). This paper highlights that governments have fiscal tools at their discretion that they can use to influence bank credit supply and financial stability. This seems especially significant as central banks have become increasingly independent in recent decades. Importantly, the new additional lending comes without major threats to financial stability, as it is mainly targeted at relatively safe borrowers.

As a second main contribution, this paper adds to the literature by studying a shock that differs from previously studies shocks. First, while almost all existing papers exploit negative shocks[4], we study a positive shock that lowered banks' funding cost. It is not immediately obvious that funding and balance sheet shocks should have symmetric effects on bank lending. It is possible, for instance, that

[3]Since non-financial firms were also allowed to use ACE deductions one would expect that these firms borrowed less after the introduction of ACE. Indeed, the evidence in Kestens et al. (2012); Princen (2012); Panier et al. (2013) suggests that at least some Belgian firms reduced their leverage ratios in response to ACE, while Van Campenhout and Van Caneghem (2013) find no evidence that small and medium sized enterprises changed their leverage. These findings are not in contradiction to our finding that Belgian banks increased the *supply* of syndicated loans as we keep demand for loans constant.

[4]See for example the evidence on the effects of negative shocks to bank capital (Peek and Rosengren, 1997, 2000) and/or liquidity (Cerutti et al., 2014; De Haas and Van Horen, 2013; Cetorelli and Goldberg, 2011; Liberti and Sturgess, 2018).

negative shocks have large negative effects on lending as a way to avoid or mitigate fire sale losses, while positive shocks have smaller or insignificant effects. Second, we exploit a quasi-natural experiment that simultaneously lowered banks' total funding cost, as well as the cost of equity relative to debt, akin to a simultaneous funding and capital shock. Since it is not clear how one should combine past studies' estimates of credit supply responses to either type of shock, our approach has the benefit that it provides a direct estimate of the combined effects.

An emerging literature shows that policy-induced credit supply shocks transmit internationally through global banks. These policies include monetary policy (Cetorelli and Goldberg, 2012; Morais et al., 2019; Temesvary et al., 2018) and bank regulation (Forbes et al., 2017; Houston et al., 2012; Ongena et al., 2013). We show that taxation can also be a source of international spillovers.

Overall, the evidence on the effects of bank taxation on bank lending is scarce. Buch et al. (2016) find that the German bank levy taxing liabilities had a negative impact on lending. Devereux et al. (2019) and Horváth (2020) find that corporate income taxes and bank levies on leverage induce banks to change the composition of their balance sheets toward less and more risky assets, respectively. Closest to our paper is the paper by Célérier et al. (2020) who use the German credit registry to study the cross-border credit supply effect of various tax reforms, including the introduction of ACE in Belgium. Their main finding is that taxes that increase the cost of leverage result in a shift in banks' balance sheets toward more lending, which is at least partly driven by increased credit supply. We also study how Belgian banks' overall credit supply and risk taking was affected, and, in addition, contribute in several different ways. Using a dataset that includes borrowers in several countries we are able to study the heterogeneous effect of ACE on credit supply across different borrower countries. Second, we provide an estimate of the impact of ACE on domestic credit supply, allowing us to make inferences about Belgian banks' overall credit supply, not just cross-border supply. Finally, we exploit that our data includes information on loan terms to study whether borrowers benefited from cheaper loans following the introduction of ACE, which provides further tests of whether changes in Belgian banks' lending was demand or supply driven.

Finally, we show that banks do not necessarily pass through a reduction of funding costs to borrowers. Instead, our findings suggests that the pass-through is stronger for banks acting as lead banks, as opposed to participating banks. In this way our paper is also related to the literature studying the incidence of bank taxation (c.f. Huizinga et al., 2014) and the process of syndicated lending (c.f. Bruche et al., 2020).

In the remainder of this paper, we proceed as follows. In section 2, we describe the Belgian tax reform and the circumstances under which it was introduced, provide the theoretical background for the empirical analysis, and develop our hypotheses. In section 3 we describe our data. In section 4 we discuss the difference-in-difference method we use to estimate the effect of ACE on loan volumes, and present the results of these estimations. In section 5 we present additional empirical evidence on the effect of ACE on cross-border credit supply at the extensive margin, on domestic credit supply, and on loan spreads. We conclude in section 6.

2 Institutional background and hypotheses

2.1 The introduction of Allowance for Corporate Equity in Belgium

Schepens (2016) provides a detailed discussion of the introduction of allowance for corporate equity in Belgium. The Belgian government introduced ACE in response to the ruling of the European Commission which prohibited the favorable tax treatment of multinational firms' subsidiaries in Belgium. Such subsidiaries, also called coordination centers, were created to provide financial and accounting services to their parents companies. Belgian tax legislation between 1982 and 2003 allowed such coordination centers to calculate their taxable income based on expenses less financial and salary costs, as opposed to profits. In 2003, the European Commission ruled that this practice was discriminatory against Belgian companies. In order to retain the attractiveness of the country for multinationals, the Belgian government passed legislation on June 30, 2005, which allowed all companies subject to cor-

porate income taxation in Belgium to deduct a notional interest from their tax liabilities. Since there was considerable uncertainty about the implementation with further adjustments made to the tax in September and October 2005, we take 2006 as the first treatment year, which is consistent with other papers that use the same shock (for example Schepens, 2016; Célérier et al., 2020).

The specific implementation of ACE in Belgium allows firms to deduct a notional interest proportional to the book value of their equity from their taxable income. The deduction equals the calculated average 10-year Belgian government bond rate observed two years before the actual fiscal year (3.44%, 3.78% and 4.31% in the first three years of the implementation), with a maximum set at 6.5% and with the restriction that the rate cannot change by more than 1 percentage point year over year.

2.2 Theoretical background

It is well known that in a Modigliani-Miller world[5] banks' capital structure is irrelevant for the value of the bank. This is no longer true in the presence of frictions. In the optimal capital structure literature banks trade off the agency and bankruptcy costs of debt with the benefits of debt financing (see for example Orgler and Taggart, 1983). As ACE reduces the relative cost advantage of debt financing, the optimal capital structure literature suggests that banks respond by increasing their capital ratios, consistent with the findings of Schepens (2016). Additionally, the particular implementation of ACE in Belgium lowered banks' funding costs by lowering their tax liabilities. The latter channel is expected to induce banks to unambiguously increase their supply of credit. The overall credit supply effect of a change in the relative cost of debt is, however, ambiguous ex ante as it may depend on risk taking.

The introduction of ACE is expected to influence banks' risk taking by encouraging them to increase their capital ratios. A higher level of bank capital incentivizes less risk taking through a skin in the game effect (see for example Holmström and Tirole, 1997) and mitigates asset substitution (Jensen and Meckling, 1976). These considerations suggest that riskier borrowers may experience a relatively small in-

[5] Modigliani and Miller (1958)

crease, or even decrease, in credit supply.

Alternatively, the relatively lower cost of equity capital might have enabled Belgian borrowers to invest in assets that require more regulatory capital (Devereux et al., 2019; Horváth, 2020). Similarly, banks might lend to riskier industries because a higher level of capitalization ceteris paribus reduces their expected bankruptcy costs. In order to balance expected marginal bankruptcy costs with expected returns on their investments, banks may adjust by increasing the riskiness of their portfolios (see for instance Koehn and Santomero, 1980; Kim and Santomero, 1988; Allen et al., 2015).

In addition, there is some empirical evidence suggesting that banks tighten the supply of credit to risky borrowers (e.g. small firms with little tangible assets) following a negative funding shock (De Jonghe et al., 2019; Ongena et al., 2015; Liberti and Sturgess, 2018). Thus, Belgian banks might have increased credit supply to riskier borrowers relatively more because regulatory or market imposed constraints are less binding, or on account of their reduced funding costs.

3 Data

To measure bank lending we obtain syndicated loan data from the Loan Pricing Corporation's DealScan database. This database contains information on individual lenders and borrowers at the loan level, including the size of the loan and each bank's contribution in the loan.[6] Since we focus on how the introduction of ACE affected banks' cross-border credit allocation we drop all domestic loans in the main sample. Next, we only include loans provided to borrowers in Europe. Limiting the sample to European countries makes it more likely that banks in our sample faced similar demand conditions.

We further narrow the sample by only including loans made between 2004 and 2007, which ensures that we have a symmetric observation period around the treatment. Since ACE was implemented at the end of 2005 we define the treatment period as the years 2006 and 2007, while the control period is defined as the years

[6]Syndicated loans are typically provided by several lenders. For a description of the syndication process and the market see for example Sufi (2007).

2004 and 2005. We limit the treatment period to run up to 2007 in order to avoid the impact of the global financial crisis starting in 2008. Finally, we drop sole-lender loans, since our identification relies on observing the same borrower in the same time period borrowing from multiple lenders, as well as observations where a lender's loan contribution is not available in DealScan. After these adjustments our sample contains 7,035 loan observations issued by 571 banks in 52 countries, including 5 Belgian banks.[7]

For the external validity of our analysis, it is important that the Belgian banking sector is sufficiently active in the cross-border syndicated loan market. Figure 1 illustrates that between 2000 and 2008, the total market share of the Belgian banking sector in European cross-border syndicated lending is around 2.5%, which is comparable to larger economies such as Italy (3.1%) and Spain (3.7%). Germany has the largest market share amounting to 12.9%.

If Belgian banks increased loan supply we would expect a simultaneous increase in loan volumes and a reduction in loan spreads. Hence, our two main dependent variables are $Volume$, which is the natural logarithm of the size of the loan in US dollars; and $Spread$ (all-in-spread drawn), which is the loan spread in basis points. The average contribution of lenders in our sample is 81.8 million US dollars, while the average spread is 235 basis points (as shown in Table 1). Additionally, we also test the impact of ACE on credit supply at the extensive margin. In these regressions the dependent variable is $Number$, which is the natural logarithm of the number of loans a bank made to all firms in a given industry in a given country over the periods 2004-05 and 2006-07. Table 1 reports that the sample mean of loans provided by banks in our sample to a country-industry is close to 7 in a two-year period.

The key independent variables are interaction terms of a treatment dummy, $Belgian$, which indicates that a lender is headquartered in Belgium; and $Post$, indicating loans made in 2006 or 2007. In an extension in which we study domestic lending and include domestic loans in the sample, we interact with a dummy vari-

[7]The Belgian banks in our sample are Artesia, KBC, Fortis and two subsidiaries of the latter. In a robustness test we show that the results are not sensitive to assigning the loans provided by the subsidiaries of Fortis to the parent bank.

able, *Domestic*, indicating that the lender is headquartered in the same country as the borrower. In these regressions domestic loans represent 43% of the sample. In some specifications we include further interactions with measures of borrower risk and other borrower market characteristics.

Our primary borrower risk measure is Altman's *Z Score*, defined as the weighted sum of five financial ratios, measured in 2005.[8] Higher values of *Z Score* indicate safer firms with a sample mean of 1.5. In addition, we consider three alternate proxies to measure borrower risk. Like *Z Score*, *Leverage* and the standard deviation of ROA, *SD(ROA)* measure the ex-ante risk of a borrower. Additionally, we consider *Crisis exposure* as an ex-post measure of borrower risk. *Crisis exposure* is a dummy which equals 1 if the borrower's total assets declined more than 25.1% during the global financial crisis from 2008 to 2009, corresponding to the 20th percentile of borrowers' asset growth distribution. Higher values of these three alternative risk measures indicate higher firm risk, and we calculate them (as well as *Z Score*) using balance sheet data from Worldscope.[9]

Among borrower market characteristics, *Distance* is the geographic distance between the capital of the country in which the lender bank is headquartered and the capital of country of the borrower's residence, measured in log-kilometers. Table 1 shows that the mean distance between lenders and borrowers is about 2,700 km. We also consider an alternative measure of distance, *Non-contiguous*, a dummy variable indicating that the countries of the borrower and lender do not share a common border. In our sample about 90% of the loan agreements are between companies from non-neighboring countries. As a third proxy of information availability in the borrower country we create a dummy variable, *No subsidiary*, which indicates that the lender's parent bank has no subsidiary in the borrower's country. This is the case in about 60% percent of the loans in our sample.

The second set of borrower characteristics capture competition in borrower country banking sectors. *HHI* is the Herfindahl-Hirschman index of banking market concentration on the syndicated loan market in the borrower country measured in

[8] Altman's Z score is calculated as 1.2 (Working Capital/Total Assets) + 1.4 (Retained Earnings/Total Assets)+3.3 (Earnings Before Interest and Taxes/Total Assets)+0.6 (Market Value of Equity/Book Value of Liabilities) + 0.999 (Net Sales/Total Assets).

[9] We thank Ferreira and Matos (2012) for sharing their data link between Dealscan and Worldscope.

2005. The sample mean of *HHI* is 0.022. Next, *Lerner index* is the markup of the median bank in the borrower's country in 2005, with higher values indicating lower competition and a sample mean of 0.23. *HHI* is calculated using Dealscan data, while *Lerner index* is taken from the World Bank's Global Financial Development Report.

The final set of borrower characteristics capture the regulatory environment in the borrower country. *Official supervisory power* is an index that measures the extent to which supervisory authorities in the borrower's country have the authority to take specific actions to prevent and correct banking problems. This variable ranges between 5.385 and 14, with higher values reflecting more supervisory power. Next, *Capital stringency* measures whether the capital requirement in the borrower's country reflects certain risk elements and deducts certain market value losses from capital before minimum capital adequacy is determined, and ranges between 1 and 6 with higher values reflecting more stringent rules. Finally, *Activity restrictions* is an index of restrictions on various activities (securities, insurance and real estate) banks in the borrower's country are allowed to engage in. Higher values of this variable reflect more restrictions, ranging between 4 and 9. Data on bank regulation is obtained from the third wave of the World Bank's Bank Regulation and Supervision Survey, which was released in 2007 and measures the quality of regulation in 2006 (Barth et al., 2013).

We control for the macroeconomic environment and level of economic development in lender countries by including *GDP per capita*, the *GDP growth* rate and consumer price index (*CPI*) of these countries in the year when the loan was extended. These data are taken from the World Bank's World Development Indicators database.

We also include the dummy variable *Relationship*, which is one if the borrower had borrowed from the lender in the preceding five years. About 30.7% of the loans in our sample were taken from lenders with which borrowers had prior relationships.

In facility-level regressions of loan spread we control for the unweighted means of lender country characteristics (*GDP per capita*, *GDP growth*, *CPI*) and *Relationship*; as well as various borrower and facility characteristics. *Borrower size* is

the natural logarithm of the total assets of the borrower with sample mean 13.8. *Borrower leverage* is total liabilities over total assets, *Borrower ROA* is net income over total assets, while *Borrower tangible assets* is the amortized book value of properties, plants and equipments over total assets. All of these borrower level variables are taken for the year prior to the loan to mitigate any bias resulting from the loan's impact on these variables. The average borrower in our sample has a leverage ratio of 30.7%, ROA of 7.5% and a tangible assets ratio of 32.5%.

Collateral is a dummy variable which equals one if Dealscan reports the loan as secured and zero otherwise. *Revolver* is also a dummy taking the value of one if the reported loan type is either "Revolver/Line $<$ 1 Yr.," "Revolver/Line $>=$ 1 Yr.," "364-Day Facility," "Revolver/Term Loan," or "Limited Line." The *Covenant* dummy equals one if the loan has a net worth or financial covenant, and zero otherwise. *Maturity* is the maturity of the loan is months with sample mean 82.9 (about 6.9 years). *Senior* is a dummy variable indicating that the loan is a senior loan, while the *Purpose* dummy indicates that the primary purpose of the loan is for corporate purposes.

4 Empirical evidence on the effect of ACE on loan volumes

4.1 Econometric methodology

We identify the effect of ACE on banks' cross-border credit supply and risk taking using a difference-in-difference methodology. For this purpose we estimate the following model:

$$\begin{aligned} Volume_{i,j,k,l,t} = &\beta_1 Belgian_i * Post_t + \beta_2 Belgian_i * Post_t * Z\ score_l \\ &+\beta_3 Belgian_i * Z\ score_l + \beta_4 C_{j,t} \\ &+\beta_5 Relationship_{i,l,t} + \gamma_i + \delta_k + \epsilon_{i,j,k,l,t}, \end{aligned} \tag{1}$$

where the dependent variable, $Volume_{i,j,k,l,t}$ is the log of the USD amount of the contribution of lender i, headquartered in lender country j, in loan k, to borrower

l, in year t. The main variables of interest are $Belgian_i * Post_t$ indicating lending by Belgian banks in the post-treatment period, and its interaction with $Z\ score_l$, which is Altman's Z score for borrower l measured in 2005, i.e. before the treatment to mitigate endogeneity concerns.[10]

The vector $C_{j,t}$ consists of control variables that capture the business cycle (GDP growth and CPI) in and economic development (GDP per capita) of lender country j in year t. Following a similar strategy as in Khwaja and Mian (2005), we control for loan demand by exploiting multiple lender-borrower relationships. We do this by including loan (facility) fixed effects (δ_k). We also include bank fixed effects (γ_i), which control for time-invariant bank characteristics, such as a bank's overall activity on the syndicated loan market. In some specifications we even include bank-year fixed effects, controlling for unobserved, time-varying lender characteristics; and bank-borrower fixed effects, controlling for changes in the composition of borrowers with positive demand for credit. Finally, we also include the *Relationship* variable, which controls for a prior lending relationship between lender i and borrower l. Past relationship mitigates information asymmetries and allows lenders to contribute larger amounts in the loan. We estimate equation (1) with OLS and cluster standard errors at the bank level.

To reduce the likelihood that our results are driven by unobserved bank heterogeneity we also estimate equation (1) on a matched sample. We create this sample using propensity score matching based on the following bank and lender country characteristics. We approximate bank size by a bank's total volume of cross-border syndicated lending over 2004 and 2005.[11] We also match on the growth rate of a bank's total syndicated lending from 2004 to 2005, as well as the average total assets and Altman's Z Score of its borrowers in 2004 and 2005. The final matching variables are GDP growth and inflation in 2005 in the country where the lender is headquartered. We match the nearest five non-Belgian banks with four Belgian

[10] We cannot estimate the coefficients of *Belgian*, *Post*, *Z score* and *Post * Z score* as they are subsumed by the included fixed effects.

[11] For the matching we replace missing loan contributions in Dealscan following the approach of Ivashina (2009). We regress loan contributions on a dummy variable for a lead role and use the predicted values when the loan contribution data is missing. We identify whether the lender is a lead arranger using the variable "lead arranger credit" from Dealscan.

banks in our sample with replacement.[12]

4.2 The impact of ACE on cross-border syndicated loan supply and risk taking

Table 2 shows the result of estimating equation (1) without the interaction terms including *Z score*, in order to provide an estimate of the average treatment effect. We start by estimating the model using the full sample. Regression 1 shows that the overall impact of the introduction of ACE on Belgian banks' cross-border lending activity was positive and significant as evidenced by the coefficient of *Belgian* * *Post*. The estimated coefficient implies that Belgian banks increased their loan supply by about 13.3% following the tax reform. While this is a large increase in absolute terms, it amounts to about a tenth of the standard deviation of the log loan volume variable (see Table 1). We also find that lenders retain on average a 16.2% higher share of the loan if they had a prior relationship with the borrower, which is consistent with the idea that this helps overcome information asymmetries among lenders (Sufi, 2007).

Next, we are interested in whether the increased credit supply was directed towards riskier borrowers. To that end we first reestimate regression 1 on the sample of borrowers for which balance sheet data is available, and find a somewhat larger estimate for the credit supply effect (0.164, regression 2) than for the full sample. Next, in regression 3 we include the interactions of *Z score* with *Belgian* * *Post* and *Belgian*. The triple interaction obtains a positive and significant coefficient, while the coefficient of *Belgian* * *Z score* is insignificant.

In regression 4 we include an even more restrictive set of fixed effects: beside facility fixed effects we include bank-year fixed effects, controlling for all observable and unobservable, time-varying bank characteristics. In these regressions *Belgian* * *Post* and lender country variables are spanned by fixed effects. The richness of our data, however, allows us to estimate the coefficient of the triple interaction, which is positive and significant in regression 4.

[12] We cannot match one Belgian bank (Artesia) because balance sheet data for this bank's borrowers is not available.

In columns 5 to 8 we present the results of re-estimating regressions 1 to 4 on the matched sample. In all three regressions, in which we can estimate *Belgian* * *Post*, this interaction term obtains positive coefficients, which are statistically significant in regressions 6 and 7. In regression 7 *Belgian* * *Post* * *Z score* continues to have a positive and significant coefficient, while in regression 8 it is also positive, but insignificant.

In Table 3 we present the results of re-estimating regressions 3 and 7 of Table 2 using *Leverage*, *SD(ROA)* and *Crisis exposure* as alternative measures of borrower risk. In all six regressions *Belgian* * *Post* obtains positive coefficients, which are significant in regressions 1, 2, 3, and 6. Furthermore, the triple interaction terms including one of the borrower risk measures, *Belgian* and *Post* obtain negative coefficients in all six regressions, which are statistically significant at least at the 5% level in all cases when we use the full sample (regressions 1, 3 and 5). Using the matched sample we obtain a significant coefficient in regression 2, in which the risk measure is *Leverage*.

Overall, Tables 2 and 3 provide persuasive evidence that Belgian banks increased their overall supply of cross-border syndicated loans following the adoption of ACE and that they did so relatively more to safer borrowers. These results suggest that the effects of the change in the relative cost of debt induced by ACE dominated the effects of the overall funding cost reduction, since the latter is expected to have resulted in greater risk taking and greater overall credit supply, while the former has an ex ante ambiguous effect on risk taking and credit supply.

4.3 Parallel Trends and placebo tests

The validity of our difference-in-differences set-up relies on the common trend assumption, which means that the cross-border lending behaviour of the treated and the control groups should have followed a parallel trend in the absence of the treatment (see e.g. Angrist and Krueger, 1991). We assess the validity of this assumption first by plotting the coefficient estimates obtained from estimating versions of equation (1), where we replace the interaction term *Belgian* * *Post* by interactions of the *Belgian* dummy and a set of dummy variables indicating the year of loan origi-

nation. In these regressions the sample runs from 2002 to 2008, and the year of the passing of the ACE legislation, 2005, serves as the excluded, base category.

Figure 2 shows the dynamic evolution of Belgian banks' credit supply relative to the control group. On the left hand side of panel (a) we plot the coefficients obtained from a regression analogous to regression 1 of Table 2 using the full sample, while the right hand side figure shows coefficients obtained from a regression analogous to regression 5 of Table 2 using the matched sample. In both graphs the coefficients for the years 2002-2004 are insignificant, suggesting that the parallel trends assumption holds. Turning to the post-treatment period, we find coefficients that are also not significantly different from zero. On closer inspection, however, we find that the coefficients for 2006 are (statistically and economically) significantly larger than the corresponding coefficients for 2004, which is consistent with some Belgian banks adjusting their credit supply already in 2005. This is plausible, given that the ACE legislation was passed in June 2005.

In panel (b) the sample includes borrowers for which balance sheet data is available and Altman's Z score can be calculated, plotting coefficients from regressions analogous to regressions 2 and 6 in Table 2. Now the coefficient for 2002 is negative and significant for the full sample (which is however not significantly different from the coefficient for 2004 as a potential alternative final pre-treatment year), while the other pre-treatment coefficients are insignificant. For both samples we find positive coefficients for 2006, significant in case of the matched sample, both larger than their corresponding counterparts in panel (a). The finding that the estimated credit supply effect is stronger for the samples used in panel (b) is consistent with our results on reduced risk taking, as these samples include largely publicly listed firms[13], while the samples used to create panel (a) include private firms as well, which are generally more opaque.

The coefficients plotted in panels (a) and (b) of Figure 2 show average treatment effects, and thus may hide heterogeneity in treatment effects across different kinds of borrowers. In panels (c) and (d) we plot coefficients from regressions estimated on subsamples that include borrowers above and below the median Z score, re-

[13]This is because Worldscope targets coverage of publicly quoted companies.

spectively. Panel (c) shows that for borrowers with above-median Z scores Belgian banks' credit supply was not significantly different from the credit supply of banks in the control group in the pre-ACE period, while in 2006 they increased their supply of credit, evidenced by significantly positive coefficients for both the full and matched samples. For the sample of borrowers with Z scores below the median we find a relatively small increase in credit supply in 2006, which is insignificant in both samples (full and matched). The coefficients for 2002 and 2003 for the full sample and for 2002 for the matched sample are significantly negative, but not significantly different from the the corresponding coefficients for 2004, and thus might be a result of some increase in credit supply in 2005. Overall, the graphs in Figure 2 are consistent with our main results that Belgian banks increased credit supply after the introduction of ACE, and especially so for relatively safer borrowers.

In Table 4 we present the results of various placebo tests. First, we change the treatment period to 2004-05, the two year-period prior to the implementation of ACE, and the control years to 2002-03. We then re-estimate regressions 1, 3, 5, and 7 of Table 2 (with the appropriately updated Post dummy and using observations from 2002 to 2005) and present the results as regressions 1 to 4 in Table 4, respectively. All of the interaction terms obtain insignificant coefficients, confirming the lack of trend before treatment.

Next, we provide further evidence that the effects that we capture are specific to Belgian banks, and we are not picking up shocks that affected banks in the region. We perform a placebo test where we assume that the treatment took place in the Netherlands. The Netherlands is an ideal choice for carrying out such an exercise because of its geographic proximity to Belgium, and because they are similar in size (with population sizes of around 16 million in the Netherlands and 10.5 million in Belgium), level of economic development (Dutch GDP per capita was 49,720 in 2010 US dollars, while the Belgian figure stood at 43,782 in 2005, based on data from WDI) and number of banks in the sample (18 Dutch banks and 5 Belgian ones).

Columns 5 and 6 in Table 4 present the results of re-estimating the baseline regressions 1 and 3 of Table 2, with the Belgian dummy replaced by *Dutch*. We

find that none of the interaction terms are statistically significant, indicating that the loan supply effects we identified in previous tables were not driven by other, regional factors.

4.4 Further robustness tests

In this section we address a number of potential concerns with the results presented so far. One such concern is that the composition of firms that had positive demand for syndicated loans might have changed differently from the pre-treatment period to the post-treatment period for Belgian and non-Belgian banks. We address this concern by exploiting variation within borrower-bank relationships, thus ensuring that we keep borrower composition constant. In columns 1 and 3 of Table 5 we present regressions that are analogous to our baseline specifications, regressions 1 and 5 of Table 2 (for the full and matched samples, respectively), and additionally include borrower-bank fixed effects, while keeping facility fixed effects. In these specifications *Belgian * Post* has insignificant coefficients, perhaps because Belgian banks only increased credit supply in some firm-bank relations. Indeed, when we add further interactions with *Z score*, we find positive and statistically significant coefficients for *Belgian * Post * Z Score* (see columns 2 and 4), confirming our earlier results.

As an alternative way to address the concern that Belgian lenders' borrowers are systematically different from non-Belgian banks' borrowers, we again re-estimate the baseline regressions of 1, 3, 5, and 7 of Table 2 on a subsample that only includes loans that involve at least one Belgian bank as lender. Columns 5 to 8 in Table 5 show the results of these regressions. The coefficients in these regressions and their standard errors are close to their baseline estimates, confirming the robustness of our results.

A third concern is that perhaps the lending decisions of the three Belgian entities of Fortis in our sample were jointly determined at the parent level, rendering the subsidiary level fixed effects and clustering inadequate. In particular, subsidiary level clustering assumes uncorrelated errors across subsidiaries, a violation of which may inflate the standard errors in our baseline regressions. In columns 9 to 12 we

address this issue by assigning all loans provided by Belgian Fortis subsidiaries to the parent bank and re-estimate regressions 1, 3, 5 and 7 of Table 2. The double interaction term *Belgian* * *Post* has a positive and significant coefficient in regression 9, insignificant coefficients in regressions 10 and 11, and a negative and significant coefficient in regression 12. Meanwhile, the triple interaction *Belgian* * *Post* * *Z Score* continues to have positive and significant coefficients in both regressions 10 and 12. These results support our previous findings of relatively large credit supply increases for safe borrowers.

Next, a potential endogeneity concern about the results regarding the effects of ACE on risk taking is that perhaps our measures of borrower risk are correlated with certain borrower country characteristics, and the heterogeneity in the credit supply effects of ACE reflect these factors, not risk taking. In this section we address this concern by re-estimating our baseline regression 3 of Table 2 on the full sample with an additional set of interactions between *Belgian*, *Post* and one borrower country characteristic at a time, and present the results in Table 6.

Before discussing the results related to borrower country heterogeneity, we note that regardless of the included borrower country characteristic, the triple interaction term between *Belgian*, *Post* and *Z score* has positive and significant coefficients in all regressions in Table 6. These results confirm that Belgian banks increased their supply of syndicated loans following the tax reform especially toward safer borrowers; and this source of heterogeneity was unrelated to other borrower country characteristics.

Proceeding to heterogeneity in country characteristics, the first set of included variables measure distance between lender and borrower countries. Physical distance between lenders and borrowers has been shown to affect the terms of and access to loans either because of transportation and monitoring costs[14] (Degryse and Ongena, 2005), or because of asymmetric information (Agarwal and Hauswald, 2010). These studies are consistent with theoretical work suggesting that lenders enjoy market power over local borrowers (Dell'Ariccia, 2001; Hauswald and Marquez, 2006). As Belgian banks become more competitive due to their lower funding costs

[14] Among others, these may include the cost of lending to culturally more distant borrowers (Giannetti and Yafeh, 2012; Fisman et al., 2017).

these papers suggest that they would expand lending relatively more in markets where they do not enjoy an informational advantage, for example geographically more distant markets.

In regressions 1 to 3 of Table 6 we include interactions with alternatively the natural log of the distance between a borrower country and a lender country (*Distance*), a dummy variable indicating that the borrower and lender countries do not share a common border (*Non-contiguous*) and a dummy variable indicating that the lender does not have a subsidiary in the borrower's country (*No subsidiary*). All three interactions between *Belgian* * *Post* and the distance variables have negative coefficients, which are significant in regressions 2 and 3 when *Non-contiguous* and *No subsidiary* are used. These results suggest that Belgian banks increased loan supply especially to safe borrowers in countries that are physically not far from the headquarters of the lender and where information about borrowers is more easily available, consistent with reduced risk taking.

Next, the strength of borrower market competition may also affect Belgian banks' decision to differentially expand lending across various markets. Since lower funding costs and a higher level of capitalization suggest an outward shift in credit supply, banks may disproportionately increase lending where they expect higher margins. Alternatively, in the presence of entry barriers in uncompetitive markets, lower funding costs may enable Belgian banks to compete in markets where they were previously not competitive.

In regressions 4 and 5 we include measures that capture the structure of a borrower country's syndicated loan market (HHI), and the overall banking marketplace (*Lerner index*), respectively. Neither of the interactions of either variable enters the regressions with significant coefficients. Thus, we find no evidence that Belgian banks increased cross-border loan supply especially in more or less competitive markets.

Finally, differences in the regulatory environment might have also affected Belgian banks' decisions about where to allocate additional credit after the introduction of ACE. Indeed, there is evidence that international bank capital flows from countries with strict regulation to countries with laxer standards (Houston et al., 2012),

and banks maintain lower lending standards abroad when domestic regulation is tighter (Ongena et al., 2013). Thus, it is possible that Belgian banks increased their lending in countries with lax regulatory standards relatively more.

We explore this possibility in regressions 6 to 8, in which we include interactions of borrower country regulatory variables with our focus variables. In regressions 6 and 7 the interaction terms with *Official Supervisory Power* and *Capital Stringency* obtain insignificant coefficients. In regression 8 we include *Activity restrictions* and find that its interaction with *Belgian* * *Post* has a negative and significant coefficient, while its interaction with *Belgian* is insignificant. Thus, Belgian banks increased their credit supply especially in countries with fewer regulatory restrictions on bank activities, consistent with a negative form of regulatory arbitrage, or "race to the bottom."[15]

5 Additional evidence on the effect of ACE on credit supply

All of our previous tests are designed to measure the impact of ACE on cross-border credit supply at the intensive margin. We view these as our main tests, because this is where we have strongest identification (being able to directly control for demand at the loan level). However, there are several additional questions that are interesting and worth studying, but where the inclusion of facility fixed effects is not possible, or identification suffers from other limitations. In the rest of the paper we address these questions while still controlling for loan demand and other confounders as well as possible.

5.1 The effect of ACE at the extensive margin

The first of these questions is whether ACE had an impact on bank credit supply at the extensive margin. On the one hand, a positive answer to this question

[15] We also estimated the regressions of Table 6 on the matched sample. The results of these regressions, presented in Table A2, are robust to this change. All of the results discussed above continue to hold, except for the interaction of *Activity restrictions* with *Belgian* * *Post*, which obtains an insignificant coefficient when estimated on the matched sample.

would provide additional support for our previous evidence. Additionally, this is an interesting question on its own merit because increased credit supply at the extensive margin may mean that the benefits of easier credit are dispersed more broadly in the receiving economy.

In regression 1 of Table 7 we present our baseline diff-in-diff regression with the log number of loans provided by a lender in a borrower country-industry as dependent variable. The regression includes borrower country-industry-time fixed effects to control for loan demand as comprehensively as the data allows, and borrower country-industry-bank fixed effects to control for time-invariant (and persistent) bank characteristics, such as a bank's inclination to lend in a particular industry in a particular country. The results suggest that Belgian banks provided about 8.5% more loans following the introduction of ACE relative to other banks lending to the same industries.

In regressions 2 and 3 we present placebo tests in the spirit of Table 4: first we change the treatment and control periods to 2004-05 and 2002-03, respectively; then we replace *Belgian * Post* by *Dutch * Post*. Both placebo tests verify the validity of our tests as we do not find significant coefficients for the interaction terms.

5.2 The effect of ACE on domestic credit supply

The next question we address in this section is whether domestic borrowers experienced an expansion in lending as well. This question is of particular interest to policy makers when considering the implementation of ACE and its impact on the domestic economy.

Table 8 presents evidence on the domestic credit supply effect of ACE. In these regressions we also include the previously dropped domestic loans in the sample. In regression 1 of Table 8 we re-estimate regression 1 of Table 2 on this extended sample and obtain a significant coefficient close to our baseline estimate, confirming our earlier results. Next, in regression 2 we include a full set of interaction terms of *Belgian* and *Post* with a dummy variable indicating that the lender is headquartered in the borrower's country. *Belgian * Post* continues to obtain a positive

and significant coefficient. The triple interaction *Belgian * Post * Domestic* also obtains a positive and significant coefficient, suggesting that while the overall loan provisioning of Belgian banks increased, this was especially pronounced on their domestic market.

One potential concern with regressions including domestic loans is that Belgian borrowers' demand might have also been impacted by the introduction of ACE. Since we include facility fixed effects in these regressions, any story about Belgian borrowers' demand driving our results would have to explain why a larger share of this additional demand is extended by Belgian banks in the post-treatment period than in the pre-treatment period. One such story might be that perhaps borrowers' total borrowing on the syndicated loan market is correlated with the share of loans that relationship lenders retain, and borrowers are more likely to have past relationships with domestic lenders than with foreign lenders. We address this concern by including further interactions between *Belgian*, *Post* and the *Relationship* variable in regression 3. The triple interaction between these variables is insignificant, while *Belgian * Post * Domestic* continues to enter the regression with a positive and significant coefficient.

In regressions 4 to 6 we re-estimate regressions 1 to 3 on the loans provided by the sample of matched banks, and find qualitatively similar results to the previous findings, although now we do not estimate *Belgian * Post* with sufficient statistical precision in these regressions. Importantly, *Belgian * Post * Domestic* obtains positive and significant coefficients in both regressions 5 and 6.

Overall, Table 8 suggests that ACE had a positive impact on domestic credit supply. In particular, they also suggest that the increased cross-border supply effect that we identified in the earlier sections is not driven by portfolio rebalancing, in which case we would have expected a decline in lending to Belgian borrowers by Belgian lenders.

5.3 The effect of ACE on loan spreads

We provide further tests of the credit supply effect of ACE by studying loan pricing. Similar to the loan volume regressions, we estimate difference-in-difference

regressions that include various sets of fixed effects and control variables, but this time taking loan spread as the dependent variable, and the facility as the level of observation. The most restrictive specification we estimate is the following:

$$\begin{aligned} Spread_{k,l,t} = \beta_1 * Belgian(lead)_k * Post_t + \beta_2 * C(avrg)_{k,t} \\ +\beta_3 * Borrower\ characteristics_{l,t-1} + \beta_4 * Loan\ terms_k \\ +Relationship(avrg)_{k,t} + \lambda_k + \epsilon_{i,j,k,l,t}, \end{aligned} \tag{2}$$

where the dependent variable, $Spread_{k,l,t}$ is the spread of loan k, to borrower l in year t. The main variable of interest is $Belgian(lead)_k * Post_t$ indicating that at least one of the lead arrangers of the loan is a Belgian bank in the post-treatment period. We also estimate analogous regressions where we replace $Belgian(lead)_k$ by $Belgian(participant)_k$, indicating loans that include at least one Belgian bank as a participant, but no Belgian banks as lead arrangers.

We include a host of variables to control for loan characteristics ($Loan\ terms_k$) as well as time varying borrower characteristics ($Borrower\ characteristics_{l,t-1}$). Unobserved time-invariant borrower heterogeneity is captured by borrower fixed effects (λ_l). The regressions also include the unweighted averages of lender country GDP per capita, GDP growth, and CPI (captured by the vector *C (avrg)*), as well as the fraction of lenders with which the borrower has a prior lending relationship (*Relationship (avrg)*). We estimate the above equation with OLS and calculate Huber-White standard errors that are robust to heteroscedasticity.

Table 9 shows the results of estimating various specifications similar to equation (2). To be consistent with the cross-border loan volume regressions in the previous sections we drop all loans in which all lead banks are headquartered in the same country as the borrower.[16] In regression 1 we include borrower and year fixed effects, facility and lender country macro controls, the relationship variable and Belgian dummy. The variable of interest, *Belgian (lead) * Post* obtains a negative coefficient, significant at 5%. This implies a 19.7 basis points lower loan spread for borrowers that obtained loans from syndications that included at least one Belgian lead bank. The other variables obtain coefficients that are intuitive and in line with

[16]The results are qualitatively similar when we keep all loans. These are available upon request.

findings in other papers.

Next, in regression 2 we add borrower country-year fixed effects to further control for country-level shocks to loan demand and borrower risk. The estimated coefficient for *Belgian (lead) * Post* is negative but no longer significant. In regression 3 we replace borrower fixed effects with time-varying borrower characteristics, while still including borrower country-year fixed effects. The estimated impact of ACE is now -36.8 basis points, which is significant at the 10% level. In these latter regressions the coefficients of other variables are close to their counterparts in regression 1.

In regressions 4-6 we re-estimate regressions 1-3 on the matched sample. In all three regressions *Belgian (lead) * Post* obtains negative coefficients that range between -22.9 and -53 basis points, and are all significant at the 5% level.

A potential weakness of the spread regressions is that we cannot include facility fixed effects, unlike in the loan volume regressions, because all lenders in the facility receive the same interest. As a result, we cannot rule out that the lower spreads we observe are driven by changes in borrower demand or risk. Nonetheless, it is unlikely that this is the case. We take several steps to alleviate this concern. Firstly, we control for observable time-varying borrower characteristics, as well as facility characteristics that might be correlated with borrower risk, such as whether the loan is collateralized. We also control for all unobservable, constant firm characteristics, leaving only unobserved, time-varying shocks to borrowers that could potentially explain the lower spreads we observe.

We exploit a characteristic of the syndicated lending market to test whether such unobserved shocks to borrowers can explain the results in Table 9. In particular, we exploit that in the syndicated loan origination process, lead banks negotiate loan terms and participating banks decide about how much they wish to contribute in the loan taking these terms as given. Thus, we expect that the spreads of loans in which Belgian banks act as lead banks are reduced relative to loans with Belgian banks as participants only.

We implement this test by estimating analogous regressions to those in Table 9, but with *Belgian (lead)* replaced by *Belgian (participant)*, a dummy variable which

equals one if the facility includes at least one Belgian bank as a participant, and no Belgian banks as lead banks. We present the results of these regressions in Table 10. When we use the full sample (regressions 1-3) we do not find statistically significant evidence of borrowers obtaining loans at either a lower or higher rate from Belgian lenders acting as participants. In fact, when we estimate the regressions on the matched sample we find significant, positive coefficients for *Belgian (participant) * Post* in regressions 4 and 5.

These results suggest that the lower spreads we observe for loans originated by syndicates that include at least one Belgian bank is not driven by unobserved borrower heterogeneity, unless this heterogeneity was also correlated with Belgian banks' decisions about acting as lead banks or as participants. In addition, the higher loan volumes combined with lower loan spreads provide compelling evidence that borrowers of Belgian banks experienced an increase in credit supply following the introduction of ACE.

6 Conclusion

We study the impact of a Belgian tax reform that introduced the deductibility of notional interest on equity (ACE) in 2006 on Belgian banks' cross-border lending behaviour. In a difference-in-differences set-up, we compare Belgian and non-Belgian banks' lending to the same foreign firms before and after the tax reform. We find evidence that following the tax reform, Belgian banks contribute more *within* a loan facility relative to other foreign banks following the introduction of ACE. We find no evidence of increased risk taking; on the contrary, the increase in credit supply was larger for safer borrowers as measured by Altman's Z score, leverage, ROA volatility, and borrowers' exposure to the financial crisis. We also show that the results on risk taking are robust to controlling for various country characteristics, such as distance between the lender and the borrower, regulation and competition. Various placebo tests confirm that the effect we identify is driven by the new tax policy.

In additional tests we show that Belgian banks increased credit supply at the

extensive margin as well, by providing a larger number of loans compared to other foreign banks lending to firms in the same borrower country in the same industry. When comparing the cross-border and domestic credit supply effects of ACE we estimate a larger expansion of lending by Belgian banks at home.

Finally, we show that borrowers obtained loans from Belgian bank-lead syndicates with 20-50 basis points lower spreads, further corroborating the finding that Belgian banks increased their supply of cross-border credit. Interestingly, this is not true for loans that included Belgian banks only as participants, but not as lead banks. This suggests that Belgian banks were able and/or willing to pass on the reduction in funding costs to borrowers as lead banks, but not as participants.

These results highlight that tax policy has a significant ability to influence bank lending and financial stability, as our estimates imply a 16.4% overall increase in Belgian banks' syndicated loan supply following the implementation of ACE. Importantly, the expansionary effect of ACE on bank lending comes without significant, negative influences on financial stability, and can even enhance it as ACE reduces risk taking and encourages higher bank capitalization. Many other policies that are designed to increase financial stability through bank capital suffer from weaknesses. For example, higher minimum capital requirements have the ability to hurt bank lending, and create incentives for banks to avoid them through financial innovation. Similarly, taxing bank leverage may induce banks to increase capital ratios, but doing so reduces net worth, and thus incentivizes risk taking.

A key feature of ACE for banks is that it simultaneously reduces the relative cost of bank equity and total cost of bank funding. This suggests that adopting alternative policies that have similar impacts on bank funding costs would have a comparable impact on bank lending to what we find: for example, a levy on bank liabilities combined with a reduction in corporate income taxes might produce similar effects.

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Figure 1: European banks' market shares in European cross-border syndicated lending by country

This graph shows the share of cross-border syndicated loans provided by banks located in a given country relative to the total volume of cross-border syndicated loans to European borrowers during the 2000 to 2008 period. Only European countries with the ten largest shares are shown.

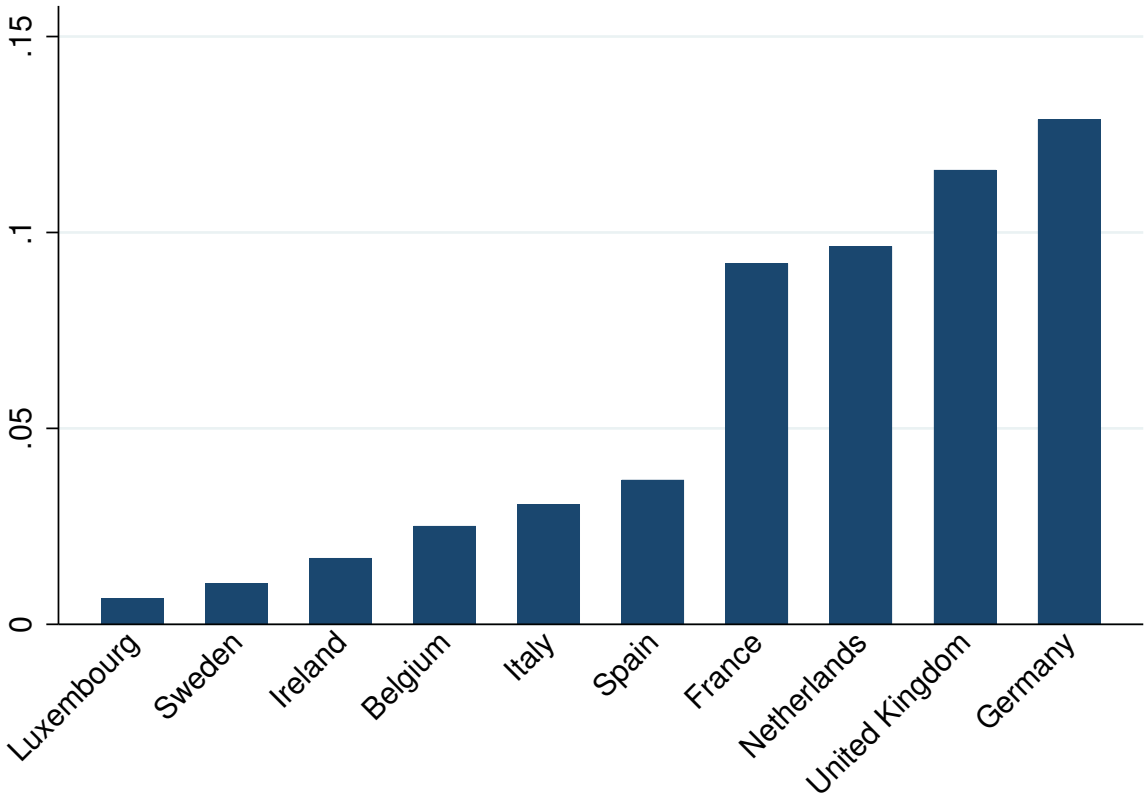
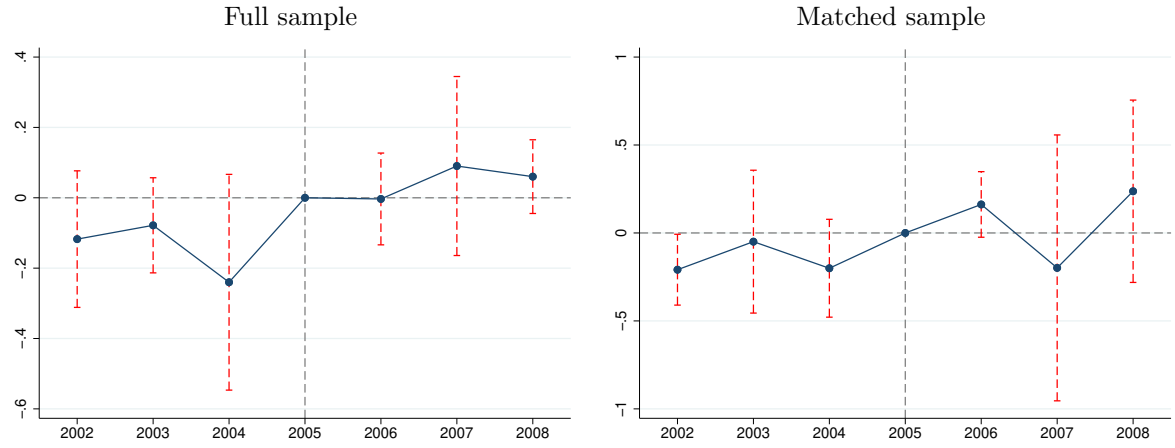
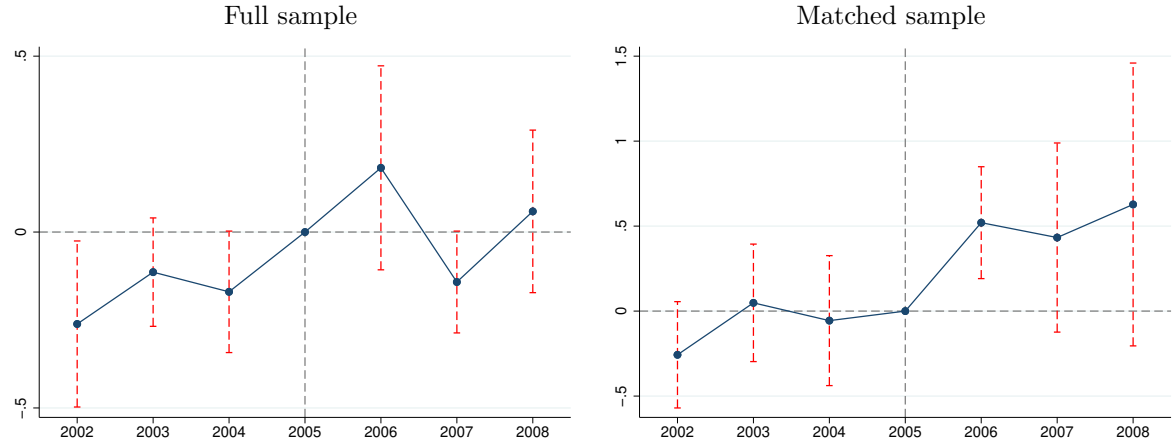


Figure 2: The effect of ACE over time

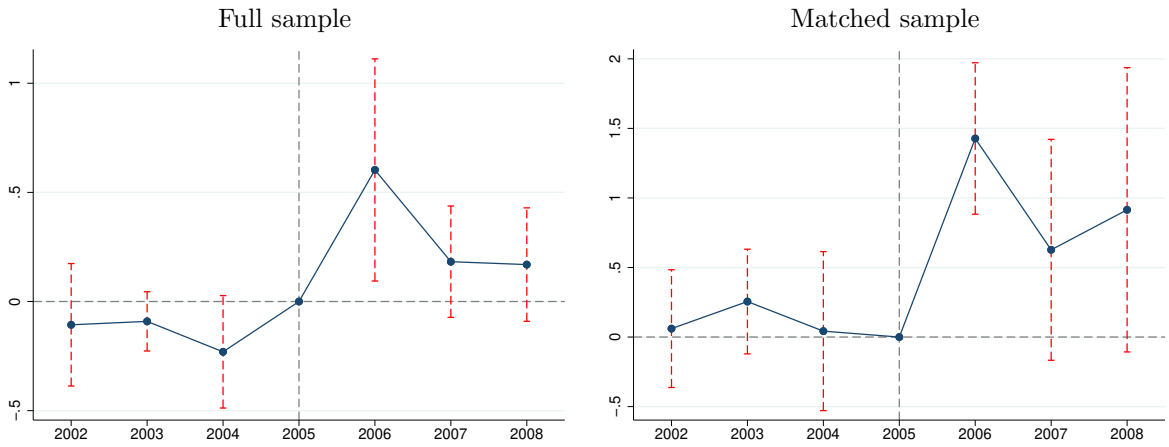
These graphs show the coefficients of regressions of the natural logarithm of the US dollar amount of the contribution of a lender in a loan facility on interactions between a dummy variable indicating that the lender is headquartered in Belgium and a set of dummy variables indicating the years of loan origination, with 2005 being the excluded category, and the same set of control variables as in regression 1 of Table 2. Coefficients plotted on the left hand side of each panel are obtained from regressions using the full sample, while coefficients plotted on the left hand side are obtained from regressions estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. In panel (a) the estimated regressions correspond to regressions 1 and 5 of Table 2. In panel (b) the estimated regressions correspond to regressions 2 and 6 of Table 2. In panels (c) and (d) the samples include borrowers with Z scores above and below the sample median, respectively. Z score is Altman's Z score for the borrower firm, measured in 2005. Higher values of Z score are associated with a lower probability of default. Vertical bars indicate 95 percent confidence intervals based on standard errors clustered at the bank level.



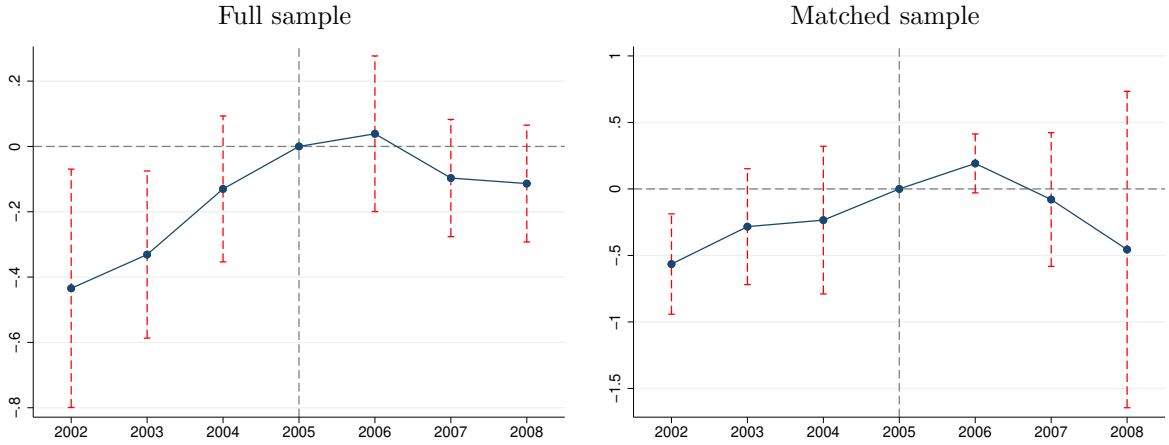
(a) All loans



(b) Loans with available borrower balance sheet data



(c) Z score above median



(d) Z score below median

Table 1: Descriptive statistics

See Table A1 for variable definitions.

	N	Mean	Std. Dev.	Min	Max
Volume (millions of USD)	7035	81.766	233.786	0.019	7825.859
Volume	7035	17.159	1.544	12.686	20.643
Number	4014	7.072	9.058	1.000	132.000
ln(1+Number)	4014	1.712	0.794	0.693	3.466
Spread	6797	235.046	150.837	15.000	700.000
Belgian	7035	0.050	0.219	0.000	1.000
Belgian (lead)	6797	0.078	0.269	0.000	1.000
Belgian (participant)	6797	0.117	0.321	0.000	1.000
Domestic	13175	0.429	0.495	0.000	1.000
Post	7035	0.336	0.472	0.000	1.000
Z score	2264	1.500	2.409	-18.621	5.462
Leverage	3107	0.289	0.208	0.000	1.260
SD(ROA)	4092	0.182	1.250	0.001	12.732
Crisis exposure	2723	0.200	0.400	0.000	1.000
Distance (km)	7035	2686.292	3191.299	164.031	16059.380
Distance (log km)	7035	7.261	1.112	5.106	9.684
Non-contiguous	7035	0.898	0.303	0.000	1.000
No subsidiary	7035	0.595	0.491	0.000	1.000
HHI	7029	0.022	0.007	0.014	0.062
Lerner Index	7035	0.227	0.062	0.089	0.293
Off. Supervisory Power	7035	8.556	2.011	5.385	14.000
Capital Stringency	7035	4.314	1.660	1.000	6.000
Activity Restrictions	7035	5.094	1.207	4.000	9.000
Relationship	7035	0.307	0.461	0.000	1.000
CPI	7035	91.321	4.761	55.075	101.573

GDP per capita	7035	10.485	0.526	7.236	11.213
GDP growth	7035	1.961	1.064	-5.189	7.925
Loan size	6797	18.405	1.509	14.926	22.333
Collateral	6797	0.534	0.499	0.000	1.000
Revolver	6797	0.259	0.438	0.000	1.000
Convenant	6797	0.026	0.161	0.000	1.000
Maturity	6797	82.892	31.416	6.000	222.000
Senior	6797	0.924	0.265	0.000	1.000
Purpose	6797	0.054	0.227	0.000	1.000
Borrower size	860	13.806	1.969	8.557	18.891
Borrower leverage	860	0.307	0.214	0.000	1.077
Borrower ROA	860	0.075	0.148	-0.741	0.520
Borrower tangible assets	860	0.325	0.238	0.001	0.940

Table 2: The overall effect of ACE on cross-border syndicated loan supply

The dependent variable in all regressions is Volume, the natural logarithm of the US dollar amount of the contribution of a lender in a loan facility. Belgian is a dummy variable indicating that the lender is headquartered in Belgium. Post is a dummy variable indicating the years 2006 and 2007. Z score is Altman's Z score for the borrower firm, measured in 2005. Higher values of Z score are associated with a lower probability of default. Relationship is a dummy variable indicating that the borrower had taken a syndicated loan in the preceding five years in which the lender participated. CPI is the consumer price index in a lender country. GDP per capita is the natural logarithm of the gross domestic product per capita in a lender country. GDP growth is the annual growth rates of the gross domestic product in a lender country. Regressions 1 to 4 are estimated on the full sample. Regressions 5 to 8 are estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. The sample includes the years 2004 through 2007. t-statistics using standard errors clustered at the bank level are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Full sample				Matched sample			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Belgian * Post	0.133***	0.164*	-0.009		0.077	0.563***	0.329*	
	(3.09)	(1.69)	(-0.11)		(0.99)	(4.29)	(1.77)	
Belgian * Post * Z score			0.182***	0.264***			0.221**	0.358
			(3.01)	(2.93)			(2.15)	(1.25)
Belgian * Z score			0.026	0.026			0.026	0.031
			(1.55)	(1.37)			(0.43)	(0.57)
Relationship	0.162***	0.110***	0.106***	0.112***	0.120	0.049	0.033	0.017
	(5.97)	(3.36)	(3.23)	(3.18)	(1.38)	(0.61)	(0.49)	(0.27)
CPI	0.014	0.038	0.039		0.059	0.221***	0.285***	
	(1.18)	(1.49)	(1.53)		(0.43)	(3.09)	(5.36)	
GDP per capita	0.023	-1.235***	-1.247***		-3.501	4.552	2.463	
	(0.08)	(-3.30)	(-3.28)		(-0.84)	(1.30)	(0.83)	
GDP growth	0.018	0.004	0.004		-0.112*	-0.063	-0.053	
	(1.21)	(0.21)	(0.19)		(-1.88)	(-0.97)	(-0.77)	
Observations	7035	2264	2264	2185	783	289	289	282
adj. R^2	0.920	0.918	0.918	0.914	0.928	0.961	0.962	0.955
Bank FE	Yes	Yes	Yes	-	Yes	Yes	Yes	-
Bank * Year FE	No	No	No	Yes	No	No	No	Yes
Facility FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 3: The heterogeneous effect of ACE on cross-border syndicated loan supply using alternative risk measures

The dependent variable in all regressions is Volume, the natural logarithm of the US dollar amount of the contribution of a lender in a loan facility. Belgian is a dummy variable indicating that the lender is headquartered in Belgium. Post is a dummy variable indicating the years 2006 and 2007. Leverage is the the ratio of the book value of total debt to total assets for the borrower firm measured in 2005. SD(ROA) is the standard deviation of the borrower's operating income during the 1984 to 2005 period. Crisis exposure is a dummy variable that equals 1 if the borrower's total assets declined by more than 25.1% from 2008 to 2009, and zero otherwise. Relationship is a dummy variable indicating that the borrower had taken a syndicated loan in the preceding five years in which the lender participated. CPI is the consumer price index in a lender country. GDP per capita is the natural logarithm of the gross domestic product per capita in a lender country. GDP growth is the annual growth rates of the gross domestic product in a lender country. Regressions 1, 3, and 5 are estimated on the full sample. Regressions 2, 4 and 6 are estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. The sample includes the years 2004 through 2007. t-statistics using standard errors clustered at the bank level are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Leverage		SD(ROA)		Crisis exposure	
	(1)	(2)	(3)	(4)	(5)	(6)
Belgian * Post	0.391**	0.795*	0.241***	0.191	0.195	0.610*
	(2.06)	(2.01)	(3.20)	(0.99)	(1.32)	(1.96)
Belgian * Post * Leverage	-0.854***	-1.682*				
	(-2.74)	(-1.81)				
Belgian * Leverage	0.023	0.173				
	(0.14)	(0.58)				
Belgian * Post * SD(ROA)			-1.994**	-0.297		
			(-2.08)	(-0.16)		
Belgian * SD(ROA)			0.013	-0.164		
			(1.63)	(-0.35)		
Belgian * Post * Crisis exposure					-0.230**	-0.700
					(-2.08)	(-1.52)
Belgian * Crisis exposure					0.257***	0.368*
					(3.23)	(1.87)
Relationship	0.113***	-0.040	0.137***	0.082	0.142***	-0.046
	(4.09)	(-0.57)	(5.54)	(1.09)	(4.61)	(-0.45)
CPI	0.032	0.064	0.031*	-0.062	0.036*	0.090
	(1.55)	(0.61)	(1.73)	(-0.41)	(1.73)	(0.61)
GDP per capita	-0.810**	2.441	-0.639*	-1.526	-0.609	-2.255
	(-2.04)	(0.73)	(-1.88)	(-0.57)	(-1.30)	(-0.43)
GDP growth	0.015	-0.073*	0.028*	-0.073	0.018	-0.104*
	(0.83)	(-1.83)	(1.87)	(-1.38)	(0.91)	(-1.94)
Observations	3107	366	4092	496	2723	305
adj. R^2	0.923	0.951	0.923	0.942	0.922	0.942
Sample	Full	Matched	Full	Matched	Full	Matched
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 4: Placebo tests

The dependent variable in all regressions is Volume, the natural logarithm of the US dollar amount of the contribution of a lender in a loan facility. Belgian is a dummy variable indicating that the lender is headquartered in Belgium. Dutch is a dummy variable indicating that the lender is headquartered in the Netherlands. Post is a dummy variable indicating the years 2004 and 2005 in regressions 1 to 4 and the years 2006 and 2007 in regressions 5 and 6. Z score is Altman's Z score for the borrower firm, measured in 2005. Higher values of Z score are associated with a lower probability of default. Relationship is a dummy variable indicating that the borrower had taken a syndicated loan in the preceding five years in which the lender participated. CPI is the consumer price index in a lender country. GDP per capita is the natural logarithm of the gross domestic product per capita in a lender country. GDP growth is the annual growth rates of the gross domestic product in a lender country. Regressions 1, 2, 5 and 6 are estimated on the full sample. Regressions 3 and 4 are estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. In regression 1 to 4 the sample includes the years 2002 through 2005, while in regressions 5 and 6 it includes the years 2004 through 2007. t-statistics using standard errors clustered at the bank level are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Placebo treatment years = 2004-2005				Placebo treatment: Dutch banks	
	Full sample		Matched sample		Full sample	
	(1)	(2)	(3)	(4)	(5)	(6)
Belgian * Post	0.016	0.039	0.148	-0.019		
	(0.35)	(0.39)	(0.80)	(-0.08)		
Belgian * Post * Z score		0.016		0.062		
		(0.34)		(0.87)		
Belgian * Z score		0.014		-0.027		
		(0.26)		(-0.28)		
Dutch * Post					-0.069	-0.083
					(-1.11)	(-0.65)
Dutch * Post * Z score						-0.002
						(-0.06)
Dutch * Z score						-0.011
						(-0.54)
Relationship	0.138***	0.134***	0.117	0.003	0.177***	0.136***
	(5.77)	(3.91)	(1.66)	(0.04)	-5.98	-4.04
CPI	0.002	-0.009	0.008	0.048	-0.009	0.009
	(0.45)	(-1.07)	(0.14)	(0.45)	(-0.83)	-0.41
GDP per capita	0.607***	0.791**	-2.004	-2.582	0.341	-0.646
	(2.97)	(2.58)	(-1.40)	(-1.17)	-0.91	(-1.35)
GDP growth	-0.018	-0.008	-0.104**	-0.054	0.014	-0.008
	(-1.31)	(-0.40)	(-2.11)	(-1.09)	-0.89	(-0.32)
Observations	9173	3879	1047	486	6446	2083
adj. R^2	0.928	0.907	0.944	0.950	0.908	0.891
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 5: Further robustness tests

The dependent variable in all regressions is Volume, the natural logarithm of the US dollar amount of the contribution of a lender in a loan facility. Belgian is a dummy variable indicating that the lender is headquartered in Belgium. Post is a dummy variable indicating the years 2006 and 2007. Z score is Altman's Z score for the borrower firm. Higher values of Z score are associated with a lower probability of default. Relationship is a dummy variable indicating that the borrower had taken a syndicated loan in the preceding five years in which the lender participated. CPI is the consumer price index in a lender country. GDP per capita is the natural logarithm of the gross domestic product per capita in a lender country. GDP growth is the annual growth rates of the gross domestic product in a lender country. Regressions 1, 2, 5, 6, 9 and 10 are estimated on the full sample. Regressions 3, 4, 7, 8, 11 and 12 are estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. The sample includes the years 2004 through 2007. All regressions include facility fixed effects. Regressions 1 to 4 include lender company - borrower company fixed effects, while regressions 5 to 12 include lender fixed effects. In regressions 5 to 8 the sample excludes loans that do not involve any Belgian banks in any role. In regressions 9 to 12 we assign Fortis's Belgian subsidiaries' loans to the parent bank. t-statistics using standard errors clustered at the bank level are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Within lender-borrower company regressions				Excluding loans without Belgian lenders				Belgian subsidiaries at group level			
	Full sample		Matched sample		Full sample		Matched sample		Full sample		Matched sample	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Belgian * Post	-0.054	-1.009***	0.257	-0.226	0.105**	-0.051	0.071	0.327	0.147***	-0.010	0.024	-1.833***
	(-0.37)	(-4.09)	(0.41)	(-1.01)	(2.11)	(-0.58)	(0.94)	(1.68)	(3.03)	(-0.13)	(0.08)	(-4.88)
Belgian * Post * Z score		0.513***		0.557***		0.201***		0.226*		0.169***		0.843***
		(4.15)		(13.63)		(3.57)		(1.99)		(3.98)		(5.43)
Belgian * Z score						0.008		0.021		0.024		0.067**
						(0.44)		(0.35)		(1.57)		(2.92)
Relationship	0.028	0.079	0.056	-0.372***	0.172***	0.095***	0.171*	0.066	0.167***	0.113***	0.095	0.214*
	(0.48)	(0.85)	(0.19)	(-3.41)	(4.29)	(2.91)	(1.89)	(0.71)	(6.18)	(3.42)	(1.52)	(2.08)
CPI	0.038	0.072**	-0.001	0.654	0.012	0.038*	-0.051	0.326***	0.014	0.039	-0.007	-0.451**
	(1.04)	(2.38)	(-0.00)	(1.21)	(0.71)	(1.85)	(-0.36)	(3.37)	(1.21)	(1.54)	(-0.08)	(-2.93)
GDP per capita	-1.692*	-2.795***	-6.555	10.037	0.086	-1.118**	0.317	2.956	0.018	-1.255***	2.579	17.943**

	(-1.91)	(-3.58)	(-1.01)	(0.96)	(0.15)	(-2.26)	(0.06)	(0.48)	(0.06)	(-3.30)	(0.59)	(3.06)
GDP growth	0.015	0.076	-0.025	0.176	0.014	0.006	-0.173**	-0.065	0.018	0.005	-0.044	-0.300***
	(0.55)	(1.63)	(-0.16)	(1.13)	(0.55)	(0.22)	(-2.33)	(-0.79)	(1.22)	(0.26)	(-0.61)	(-3.72)
Observations	4611	1464	491	169	3597	1190	633	219	7035	2264	617	222
adj. R^2	0.965	0.931	0.992	0.991	0.922	0.948	0.934	0.962	0.920	0.918	0.926	0.945
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank * Borrower FE	Yes	Yes	Yes	Yes	No	No	No	No	No	No	No	No
Facility FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 6: The impact of ACE on cross-border credit supply and borrower country heterogeneity

The dependent variable in all regressions is Volume, the natural logarithm of the US dollar amount of the contribution of a lender in a loan facility. Belgian is a dummy variable indicating that the lender is headquartered in Belgium. Post is a dummy variable indicating the years 2006 and 2007. Z score is Altman's Z score for the borrower firm, measured in 2005. Higher values of Z score are associated with a lower probability of default. Distance is the geographic distance between the capital cities of the countries where the borrower and lender firms are headquartered, measured in log kilometers. Non-contiguous is a dummy variable equal to 1 if the countries where the borrower and lender firms are headquartered don't share a common border. No subsidiary is a dummy variable equal to 1 if the lender does not have a subsidiary in the borrower's country. HHI is the Herfindahl-Hirschman index of banking market concentration, measured as the sum of the squares of the market shares of all banks in a borrower country's syndicated loan market in 2005. Lerner Index is the markup of the median bank in the borrower's country in 2005, with higher values indicating lower competition. Official Supervisory Power is an index that measures the extent to which the supervisory authorities in the borrower's country have the authority to take specific actions to prevent and correct banking problems as of 2006, higher values indicating more supervisory power. Capital Stringency is an index that measures whether the regulatory capital requirements in the borrower's country reflect certain risk elements and deduct certain market value losses from capital before minimum capital adequacy is determined as of 2006, higher values indicating more stringent capital requirements. Activity Restrictions is an index of restrictions on various activities (securities, insurance and real estate) banks in the borrower's country are allowed to engage in as of 2006, higher values reflecting more restrictions. Relationship is a dummy variable indicating that the borrower had taken a syndicated loan in the preceding five years in which the lender participated. CPI is the consumer price index in a lender country. GDP per capita is the natural logarithm of the gross domestic product per capita in a lender country. GDP growth is the annual growth rates of the gross domestic product in a lender country. In each regression we include one of the variables indicated in the column header in place of X. All regressions are estimated on the full sample. The sample includes the years 2004 through 2007. t-statistics using standard errors clustered at the bank level are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Included interaction term (X)							
	Distance	Non-contiguous	No subsidiary	HHI	Lerner index	Official Supervisory Power	Capital Stringency	Activity restrictions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Belgian * Post	0.992	0.158	0.182	0.332	0.273	0.509	-0.064	0.843**
	(1.55)	(1.00)	(1.48)	(1.29)	(0.54)	(1.52)	(-0.40)	(2.15)
Belgian * Post * Z score	0.168***	0.184***	0.167***	0.178***	0.186***	0.181***	0.185***	0.169***
	(3.78)	(4.04)	(3.67)	(3.17)	(2.94)	(3.84)	(3.01)	(3.09)
Belgian * Z score	0.027	0.021	0.025	0.025	0.019	0.024	0.023	0.025
	(1.24)	(1.02)	(1.22)	(1.49)	(1.17)	(1.18)	(1.43)	(1.45)

Belgian * Post * X	-0.160	-0.351*	-0.365***	-16.664	-1.081	-0.071	0.013	-0.162**
	(-1.56)	(-1.95)	(-2.71)	(-1.65)	(-0.53)	(-1.63)	(0.39)	(-2.17)
Belgian * X	0.060	0.124	0.009	-1.196	-0.730	0.007	-0.028	0.022
	(0.49)	(0.74)	(0.13)	(-0.17)	(-0.60)	(0.16)	(-1.24)	(0.41)
Post * X	0.028	-0.088	0.189**					
	(0.69)	(-0.55)	(2.27)					
X	-0.138***	-0.004	-0.111**					
	(-3.06)	(-0.07)	(-2.07)					
Relationship	0.091***	0.104***	0.103***	0.106***	0.106***	0.105***	0.107***	0.105***
	(2.87)	(3.14)	(3.17)	(3.21)	(3.22)	(3.19)	(3.26)	(3.19)
CPI	0.037	0.039	0.034	0.039	0.039	0.040	0.039	0.039
	(1.40)	(1.54)	(1.42)	(1.53)	(1.54)	(1.54)	(1.54)	(1.53)
GDP per capita	-0.849*	-1.214***	-1.045***	-1.232***	-1.249***	-1.249***	-1.245***	-1.214***
	(-1.73)	(-3.07)	(-2.69)	(-3.28)	(-3.27)	(-3.24)	(-3.27)	(-3.23)
GDP growth	0.013	-0.001	0.004	0.005	0.004	0.004	0.004	0.005
	(0.58)	(-0.05)	(0.20)	(0.23)	(0.21)	(0.17)	(0.18)	(0.22)
Observations	2264	2264	2264	2264	2264	2264	2264	2264
adj. R^2	0.919	0.918	0.919	0.918	0.918	0.918	0.918	0.918
Sample	Full	Full	Full	Full	Full	Full	Full	Full
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 7: The effect of ACE on cross-border credit supply at the extensive margin

The dependent variable in all regressions is Number, the natural logarithm of one plus the total number of syndicated loans provided by a bank in an industry in a borrower country during the pre- and post-treatment periods (2004-2005 and 2006-2007 in regressions 1 and 3 and 2002-2003 and 2004-2005 in regression 2, respectively). Belgian is a dummy variable indicating that the lender is headquartered in Belgium. Dutch is a dummy variable indicating that the lender is headquartered in the Netherlands. Post is a dummy variable indicating the years 2006 and 2007 in regressions 1 and 3 and the years 2004 and 2005 in regression 2. CPI is the consumer price index in a lender country. GDP per capita is the natural logarithm of the gross domestic product per capita in a lender country. GDP growth is the annual growth rates of the gross domestic product in a lender country. All regressions are estimated on the full sample. In regressions 1 and 3 the sample includes the years 2004 through 2007, while in regression 2 it includes the years 2002 through 2005. t-statistics using standard errors clustered at the bank level are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Baseline	Placebo treatment years = 2004-2005	Placebo treatment: Dutch banks
	(1)	(2)	(3)
Belgian * Post	0.096**	-0.111	
	(2.38)	(-0.41)	
Dutch * Post			-0.119
			(-1.22)
CPI	0.008	-0.024	-0.009
	(0.37)	(-1.08)	(-0.36)
GDP per capita	0.477	-0.343	0.973*
	(1.03)	(-0.60)	(1.90)
GDP growth	-0.022	-0.017	-0.025
	(-1.04)	(-0.28)	(-1.11)
Observations	4014	4026	3722
adj. R^2	0.560	0.519	0.567
Sample	Full	Full	Full
Borrower country * Industry * Time FE	Yes	Yes	Yes
Borrower country * Industry * Bank FE	Yes	Yes	Yes

Table 8: ACE and domestic credit supply

The dependent variable in all regressions is Volume, the natural logarithm of the US dollar amount of the contribution of a lender in a loan facility. Belgian is a dummy variable indicating that the lender is headquartered in Belgium. Post is a dummy variable indicating the years 2006 and 2007. Domestic is a dummy variable indicating that the lender is headquartered in the borrower's country. Relationship is a dummy variable indicating that the borrower had taken a syndicated loan in the preceding five years in which the lender participated. CPI is the consumer price index in a lender country. GDP per capita is the natural logarithm of the gross domestic product per capita in a lender country. GDP growth is the annual growth rates of the gross domestic product in a lender country. Regressions 1 to 3 are estimated on the full sample. Regressions 4 to 6 are estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. The sample includes the years 2004 through 2007. t-statistics using standard errors clustered at the bank level are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Full sample			Matched sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Belgian * Post	0.164***	0.120***	0.151***	0.096	0.041	0.114
	(5.37)	(3.15)	(3.38)	(1.35)	(0.52)	(0.94)
Belgian * Post * Domestic		0.258**	0.258**		0.962***	0.978**
		(2.11)	(2.14)		(2.85)	(2.32)
Belgian * Domestic		-0.138	-0.131		-0.485	-0.439
		(-0.85)	(-0.82)		(-1.71)	(-1.59)
Post * Domestic		-0.019	-0.023		-0.133	-0.133
		(-0.48)	(-0.59)		(-0.77)	(-0.79)
Domestic		0.261***	0.262***		0.392***	0.401***
		(8.19)	(8.35)		(4.19)	(4.24)
Belgian * Post * Relationship			-0.169			-0.289
			(-1.23)			(-1.04)
Belgian * Relationship			0.184**			0.190
			(2.40)			(1.56)
Post * Relationship			0.041			-0.011
			(0.66)			(-0.06)

Relationship	0.195***	0.169***	0.156***	0.218**	0.181**	0.163*
	(7.84)	(7.53)	(5.88)	(2.71)	(2.26)	(1.86)
CPI	-0.001	0.002	0.002	-0.123	-0.120	-0.117
	(-0.06)	(0.18)	(0.20)	(-1.05)	(-1.29)	(-1.29)
GDP per capita	0.374	0.352	0.349	3.364	4.479	4.344
	(1.60)	(1.50)	(1.48)	(0.58)	(0.90)	(0.86)
GDP growth	0.014	0.008	0.009	-0.018	-0.030	-0.024
	(1.17)	(0.69)	(0.72)	(-0.30)	(-0.55)	(-0.42)
Observations	13175	13175	13175	1349	1349	1349
adj. R^2	0.908	0.911	0.911	0.912	0.916	0.916
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 9: The effect of ACE on the spread of syndicated loans with Belgian lead banks

The dependent variable in all regressions is Spread, which is the all-in spread drawn in basis points. Belgian (lead) is a dummy variable indicating that at least one of the lead banks is headquartered in Belgium. Post is a dummy variable indicating the years 2006 and 2007. Relationship (avrg) is the fraction of lenders that participated in any syndicated loans taken by the borrower in the preceding five years. CPI (avrg) is the unweighted average of the consumer price indices in the lender countries. GDP per capita (avrg) is the unweighted average of the natural logarithm of the gross domestic product per capita in the lender countries. GDP growth (avrg) is the unweighted average of the annual growth rates of the gross domestic product in the lender countries. Borrower size is the natural logarithm of the total assets of the borrower. Borrower leverage is the borrower's total liabilities over total assets ratio. Borrower ROA is the borrower's net income over total assets ratio. Borrower tangible assets is tangible assets over total assets. Collateral is a dummy variable which equals one if DealScan reports the loan as secured and zero otherwise Revolver is a dummy variable which equals one if the reported loan type is either "Revolver/Line < 1 Yr.", "Revolver/Line >= 1 Yr.", "364-Day Facility", "Revolver/Term Loan", or "Limited Line". Covenant is a dummy variable indicating that the loan has a net worth or financial covenant. Maturity is the maturity of the loan is months. Senior is a dummy variable indicating that the loan is a senior loan. Purpose is a dummy variable indicating that the loan is primarily for corporate purposes. Regressions 1 to 3 are estimated on the full sample. Regressions 4 to 6 are estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. The sample includes the years 2004 through 2007. The sample includes the years 2004 through 2007. t-statistics using using Huber-White heteroskedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Full sample			Matched sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Belgian (lead) * Post	-19.660**	-15.320	-36.801*	-22.915**	-27.036**	-53.016**
	(-2.24)	(-1.59)	(-1.74)	(-2.35)	(-2.45)	(-2.57)
Belgian (lead)	-3.783	-8.531	17.973	5.688	3.695	29.403***
	(-0.41)	(-0.84)	(1.64)	(0.56)	(0.33)	(2.91)
Relationship (avrg)	-18.495***	-14.847**	6.332	-17.019**	-13.222*	-3.353
	(-3.01)	(-2.40)	(0.43)	(-2.39)	(-1.79)	(-0.24)
Loan size	-7.606***	-7.493***	-29.524***	-7.404***	-7.594***	-33.220***
	(-5.17)	(-5.07)	(-10.73)	(-4.57)	(-4.70)	(-10.53)
Collateral	-4.645	-3.709	46.660***	-9.957	-9.954	20.890**
	(-0.99)	(-0.75)	(4.47)	(-1.60)	(-1.52)	(2.02)
Revolver	-37.063***	-36.708***	-67.240***	-34.141***	-34.129***	-55.939***
	(-19.16)	(-18.96)	(-10.18)	(-16.25)	(-16.26)	(-8.94)
Convenant dummy	-0.460	-4.537	12.189	8.255	-1.241	30.620

	(-0.03)	(-0.29)	(0.75)	(0.62)	(-0.09)	(1.27)
Maturity	1.001***	0.995***	0.907***	0.905***	0.903***	0.832***
	(14.45)	(14.53)	(4.91)	(12.44)	(12.31)	(4.57)
Senior	-345.123***	-345.723***	-329.210***	-347.510***	-346.927***	-337.887***
	(-56.65)	(-56.75)	(-11.01)	(-41.67)	(-41.36)	(-8.94)
Purpose	-1.946	-3.219	-12.712	-9.459	-9.564	-20.005**
	(-0.30)	(-0.48)	(-1.14)	(-1.57)	(-1.47)	(-2.17)
CPI (avrg)	-2.834*	-2.763*	-1.643	-3.359	-4.481*	-2.166
	(-1.84)	(-1.74)	(-0.49)	(-1.58)	(-1.93)	(-0.65)
GDP per capita (avrg)	50.095***	58.063***	103.694***	49.115**	48.040**	111.298***
	(3.43)	(3.75)	(3.16)	(2.16)	(2.03)	(3.86)
GDP growth (avrg)	-2.728	-5.385	5.444	-3.774	-7.097	12.382
	(-0.73)	(-1.22)	(0.44)	(-0.58)	(-0.95)	(1.03)
Borrower size			0.796			0.421
			(0.43)			(0.28)
Borrower leverage			47.977**			72.296***
			(2.32)			(3.56)
Borrower ROA			16.725			-31.587
			(0.75)			(-1.43)
Borrower tangibility			-26.025**			0.579
			(-1.96)			(0.05)
N	5053	5044	743	3094	3084	552
adj. R^2	0.843	0.845	0.690	0.867	0.868	0.735
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	No	Yes	Yes	No
Borrower Country * Year FE	No	Yes	Yes	No	Yes	Yes

Table 10: The effect of ACE on the spread of syndicated loans with Belgian participating banks

The dependent variable in all regressions is Spread, which is the all-in spread drawn in basis points. Belgian (participant) is a dummy variable indicating that none of the lead banks are headquartered in Belgium and at least one of the lenders is headquartered in Belgium. Post is a dummy variable indicating the years 2006 and 2007. Relationship (avrg) is the fraction of lenders that participated in any syndicated loans taken by the borrower in the preceding five years. CPI (avrg) is the unweighted average of the consumer price indices in the lender countries. GDP per capita (avrg) is the unweighted average of the natural logarithm of the gross domestic product per capita in the lender countries. GDP growth (avrg) is the unweighted average of the annual growth rates of the gross domestic product in the lender countries. Borrower size is the natural logarithm of the total assets of the borrower. Borrower leverage is the borrower's total liabilities over total assets ratio. Borrower ROA is the borrower's net income over total assets ratio. Borrower tangible assets is tangible assets over total assets. Collateral is a dummy variable which equals one if DealScan reports the loan as secured and zero otherwise Revolver is a dummy variable which equals one if the reported loan type is either "Revolver/Line < 1 Yr.", "Revolver/Line >= 1 Yr.", "364-Day Facility", "Revolver/Term Loan", or "Limited Line". Covenant is a dummy variable indicating that the loan has a net worth or financial covenant. Maturity is the maturity of the loan is months. Senior is a dummy variable indicating that the loan is a senior loan. Purpose is a dummy variable indicating that the loan is primarily for corporate purposes. Regressions 1 to 3 are estimated on the full sample. Regressions 4 to 6 are estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. The sample includes the years 2004 through 2007. The sample includes the years 2004 through 2007. t-statistics using using Huber-White heteroskedasticity-robust standard errors are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Full sample			Matched sample		
	(1)	(2)	(3)	(4)	(5)	(6)
Belgian (participant) * Post	5.985	1.372	25.851	18.502**	17.354*	19.026
	(0.67)	(0.14)	(1.60)	(1.97)	(1.78)	(1.14)
Belgian (participant)	-9.132	-7.331	12.986	-8.690	-6.809	22.130**
	(-1.39)	(-1.08)	(1.20)	(-1.34)	(-1.04)	(2.20)
Relationship (avrg)	-18.877***	-15.017**	10.269	-15.144**	-10.936	6.905
	(-3.07)	(-2.41)	(0.69)	(-2.14)	(-1.48)	(0.49)
Loan size	-7.656***	-7.568***	-29.312***	-7.345***	-7.474***	-32.577***
	(-5.18)	(-5.11)	(-11.27)	(-4.52)	(-4.61)	(-10.68)
Collateral	-4.767	-3.522	51.039***	-9.677	-8.498	26.767***
	(-1.00)	(-0.71)	(4.87)	(-1.58)	(-1.32)	(2.62)
Revolver	-37.211***	-36.895***	-65.372***	-34.081***	-34.008***	-52.500***
	(-19.17)	(-18.97)	(-10.00)	(-16.20)	(-16.17)	(-8.44)
Convenant dummy	-1.145	-4.352	14.906	4.365	-5.450	32.679

	(-0.08)	(-0.28)	(0.89)	(0.33)	(-0.37)	(1.27)
Maturity	1.001***	0.996***	0.920***	0.906***	0.904***	0.870***
	(14.42)	(14.51)	(5.03)	(12.42)	(12.28)	(4.79)
Senior	-345.224***	-345.864***	-329.564***	-347.903***	-347.589***	-337.159***
	(-56.23)	(-56.46)	(-10.93)	(-41.57)	(-41.33)	(-8.70)
Purpose	-2.345	-3.221	-15.280	-9.782	-10.100	-23.652**
	(-0.36)	(-0.48)	(-1.37)	(-1.63)	(-1.55)	(-2.56)
CPI (avrg)	-2.871*	-2.882*	-1.914	-3.278	-4.490*	-2.630
	(-1.86)	(-1.82)	(-0.58)	(-1.57)	(-1.96)	(-0.78)
GDP per capita (avrg)	49.907***	58.171***	100.401***	47.654**	48.417**	105.822***
	(3.41)	(3.74)	(3.06)	(2.09)	(2.02)	(3.68)
GDP growth (avrg)	-1.970	-4.515	6.304	-4.727	-8.602	11.543
	(-0.52)	(-1.01)	(0.51)	(-0.72)	(-1.13)	(0.95)
Borrower size			0.871			0.598
			(0.47)			(0.39)
Borrower leverage			51.646**			81.961***
			(2.40)			(3.86)
Borrower ROA			19.021			-19.872
			(0.86)			(-0.93)
Borrower tangibility			-27.847**			-5.449
			(-2.12)			(-0.46)
N	5053	5044	743	3094	3084	552
adj. R^2	0.843	0.845	0.690	0.867	0.867	0.734
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Borrower FE	Yes	Yes	No	Yes	Yes	No
Borrower Country * Year FE	No	Yes	Yes	No	Yes	Yes

Appendix

Table A1: Data description and sources

Variable	Description	Data Source
Volume	The natural logarithm of the US dollar amount of the contribution of a lender in a loan facility.	DealScan
Number	The natural logarithm of 1 plus the number of loans a bank made to all firms in a given industry in a given country over the periods 2004-05 and 2006-07.	DealScan
Spread	The all-in spread drawn in basis points.	DealScan
Belgian	Dummy variable indicating that the lender is headquartered in Belgium.	DealScan
Belgian (lead)	Dummy variable indicating that at least one of the lead banks is headquartered in Belgium.	DealScan
Belgian (participant)	Dummy variable indicating that none of the lead banks are headquartered in Belgium and at least one of the lenders is headquartered in Belgium.	DealScan
Domestic	Dummy variable indicating that the lender is headquartered in the borrower's country.	Dealscan
Post	Dummy variable indicating the years 2006 and 2007.	Authors' calculations.
Z score	Altman's Z score for the borrower firm calculated as 1.2 (Working Capital/Total Assets) + 1.4 (Retained Earnings/Total Assets)+3.3 (Earnings Before Interest and Taxes/Total Assets)+0.6 (Market Value of Equity/Book Value of Liabilities) + 0.999 (Net Sales/Total Assets), measured in 2005. Higher values of Z score are associated with a lower probability of default.	WorldScope
Leverage	The ratio of book value of total debt to total assets for the borrower firm measured in 2005.	WorldScope
SD(ROA)	The standard deviation of the borrower's operating income during the 1984 to 2005 period.	WorldScope
Crisis exposure	Dummy variable that equals 1 if the borrower's total assets declined by more than 25.1% from 2008 to 2009, and zero otherwise.	WorldScope
Distance	Geographic distance between the capital cities of the countries where the borrower and lender firms are headquartered, measured in log kilometers.	http://techslides.com/list-of-countries-and-capitals (downloaded on June 27, 2016)
Non-contiguous	Dummy variable equal to 1 if the countries where the borrower and lender firms are headquartered do not share a common border.	http://data.okfn.org/data/ppKrauss/country-geotime (downloaded on October 17, 2016)
No subsidiary	Dummy variable equal to 1 if the lender's parent bank has a subsidiary in the borrower country.	DealScan

Table A1: Data description and sources (continued)

Variable	Description	Data Source
HHI	The Herfindahl-Hirschman index of banking market concentration, measured as the sum of the squares of the market shares of all banks in a borrower country's syndicated loan market in 2005.	DealScan
Lerner Index	The markup of the median bank in the borrower's country in 2005, with higher values indicating lower competition.	Global Financial Development Report
Official Supervisory Power	An index that measures the extent to which the supervisory authorities in the borrower's country have the authority to take specific actions to prevent and correct banking problems as of 2006, higher values indicating more supervisory power.	Barth et al. (2013)
Capital Stringency	An index that measures whether the regulatory capital requirements in the borrower's country reflect certain risk elements and deduct certain market value losses from capital before minimum capital adequacy is determined as of 2006, higher values indicating more stringent capital requirements.	Barth et al. (2013)
Activity Restrictions	An index of restrictions on various activities (securities, insurance and real estate) banks in the borrower's country are allowed to engage in as of 2006, higher values reflecting more restrictions.	Barth et al. (2013)
Relationship	Dummy variable indicating that the borrower had taken a syndicated loan in the preceding five years in which the lender participated.	DealScan
CPI	The consumer price index in a lender country in the year of the origination date of the loan.	World Development Indicators
GDP per capita	The natural logarithm of the gross domestic product per capita in a lender country in the year of the origination date of the loan.	World Development Indicators
GDP growth	The annual growth rates of the gross domestic product in a lender country in the year of the origination date of the loan.	World Development Indicators
Borrower size	The natural logarithm of the total assets of the borrower at the end of the year prior to the loan.	WorldScope
Borrower leverage	The borrower's total liabilities over total assets ratio at the end of the year prior to the loan.	WorldScope
Borrower ROA	The borrower's net income over total assets ratio for the year prior to the loan.	WorldScope
Borrower tangible assets	The borrower's tangible assets over total assets ratio at the end of the year prior to the loan.	WorldScope
Collateral	Dummy variable which equals one if DealScan reports the loan as secured and zero otherwise.	DealScan
Revolver	Dummy variable which equals one if the reported loan type is either "Revolver/Line < 1 Yr.", "Revolver/Line >= 1 Yr.", "364-Day Facility", "Revolver/Term Loan", or "Limited Line".	DealScan
Covenant	Dummy variable indicating that the loan has a net worth or financial covenant.	DealScan

Table A1: Data description and sources (continued)

Variable	Description	Data Source
Maturity	The maturity of the loan is months.	DealScan
Senior	Dummy variable indicating that the loan is a senior loan.	DealScan
Purpose	Dummy variable indicating that the loan is primarily for corporate purposes.	DealScan

Table A2: The impact of ACE on loan supply and borrower country heterogeneity using the matched sample

The dependent variable in all regressions is Volume, the natural logarithm of the US dollar amount of the contribution of a lender in a loan facility. Belgian is a dummy variable indicating that the lender is headquartered in Belgium. Post is a dummy variable indicating the years 2006 and 2007. Z score is Altman's Z score for the borrower firm. Higher values of Z score are associated with a lower probability of default. Distance is the geographic distance between the capital cities of the countries where the borrower and lender firms are headquartered, measured in log kilometers. Non-contiguous is a dummy variable equal to 1 if the countries where the borrower and lender firms are headquartered don't share a common border. No subsidiary is a dummy variable equal to 1 if the lender does not have a subsidiary in the borrower's country. HHI is the Herfindahl-Hirschman index of banking market concentration, measured as the sum of the squares of the market shares of all banks in a borrower country's syndicated loan market in 2005. Lerner Index is the markup of the median bank in the borrower's country in 2005, with higher values indicating lower competition. Official Supervisory Power is an index that measures the extent to which the supervisory authorities in the borrower's country have the authority to take specific actions to prevent and correct banking problems as of 2006, higher values indicating more supervisory power. Capital Stringency is an index that measures whether the regulatory capital requirements in the borrower's country reflect certain risk elements and deduct certain market value losses from capital before minimum capital adequacy is determined as of 2006, higher values indicating more stringent capital requirements. Activity Restrictions is an index of restrictions on various activities (securities, insurance and real estate) banks in the borrower's country are allowed to engage in as of 2006, higher values reflecting more restrictions. Relationship is a dummy variable indicating that the borrower had taken a syndicated loan in the preceding five years in which the lender participated. CPI is the consumer price index in a lender country. GDP per capita is the natural logarithm of the gross domestic product per capita in a lender country. GDP growth is the annual growth rates of the gross domestic product in a lender country. In each regression we include one of the variables indicated in the column header in place of X. All regressions are estimated on a sample matching each Belgian bank with the five most similar non-Belgian banks using propensity score matching. The sample includes the years 2004 through 2007. t-statistics using standard errors clustered at the bank level are shown in parentheses. *, **, and *** denote significance at 10%, 5%, and 1%, respectively.

	Included interaction term (X)							
	Distance	Non-contiguous	No subsidiary	HHI	Lerner index	Official Supervisory Power	Capital Stringency	Activity restrictions
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Belgian * Post	1.141	1.196**	0.499	0.939	0.600	0.846*	1.014**	0.785
	(1.34)	(2.45)	(1.47)	(1.00)	(0.87)	(1.87)	(2.45)	(0.46)
Belgian * Post * Z score	0.186**	0.211**	0.201*	0.202*	0.216**	0.205**	0.184**	0.219*
	(2.26)	(2.46)	(2.04)	(1.78)	(2.32)	(2.47)	(2.16)	(2.01)

Belgian * Z score	0.018	0.026	0.026	0.043	0.019	0.021	0.028	0.026
	(0.28)	(0.45)	(0.42)	(0.69)	(0.29)	(0.37)	(0.46)	(0.43)
Belgian * Post * X	-0.149	-1.144**	-0.357	-28.225	-0.711	-0.073	-0.123	-0.092
	(-1.16)	(-2.26)	(-0.75)	(-0.69)	(-0.25)	(-1.40)	(-1.52)	(-0.26)
Belgian * X	-0.060	0.409	-0.010	21.178	-2.351**	-0.053**	-0.088***	-0.016
	(-0.83)	(1.69)	(-0.10)	(1.04)	(-2.46)	(-2.57)	(-3.24)	(-0.43)
Post * X	-0.058	0.498	-0.011					
	(-0.22)	(1.13)	(-0.03)					
X	-0.159	-0.322	-0.011					
	(-0.88)	(-1.67)	(-0.13)					
Relationship	0.003	0.044	0.017	0.031	0.021	0.026	0.012	0.029
	(0.05)	(0.69)	(0.31)	(0.41)	(0.27)	(0.37)	(0.19)	(0.43)
CPI	0.282***	0.306**	0.271	0.261***	0.294***	0.314***	0.298***	0.293***
	(4.33)	(2.50)	(1.70)	(3.93)	(5.28)	(5.48)	(6.09)	(4.97)
GDP per capita	2.022	2.381	1.974	2.689	3.116	1.282	2.932	2.673
	(0.92)	(0.83)	(0.47)	(0.95)	(1.01)	(0.60)	(0.86)	(0.92)
GDP growth	-0.069	-0.054	-0.059	-0.044	-0.051	-0.051	-0.039	-0.052
	(-1.26)	(-0.59)	(-0.56)	(-0.66)	(-0.68)	(-0.71)	(-0.63)	(-0.80)
Observations	289	289	289	289	289	289	289	289
adj. R^2	0.964	0.963	0.962	0.962	0.963	0.963	0.964	0.961
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Facility FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes