Changes in the Cost of Bank Equity and the Supply of Bank Credit

"When it Rains in Milan or Brussels, Does It Drizzle in Frankfurt?" *

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Abstract

We explore the effect of tax reforms that decrease the cost of equity on bank lending. In 2000 and 2006, Italy and Belgium, respectively, introduced an allowance for corporate equity so that both firms and banks could deduct a notional interest on their equity from their taxable income. Because local firms were also affected by these reforms, we employ loan level data from a credit register in a third-country, i.e., Germany, to better identify the differential impact on lending by banks that were 'treated' by these tax reforms versus a control group of banks that were not. We find that the decrease in the cost of equity leads banks to raise their equity ratio, and to concurrently expand their balance sheet by increasing the amount of credit supplied in Germany. Conversely, the reversal of these reforms leads to a decrease in lending.

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1 Introduction

The financial crisis of 2007-2008 demonstrated that highly levered banks can generate large negative externalities for the rest of the economy when they become distressed. As a consequence, a vigorous debate has ensued to what extent capital requirements imposed on banks should be increased (Admati et al., 2013; Hanson et al., 2011). If equity is expensive, however, increasing capital requirements could lead banks to contract lending, which in turn may negatively affect the real economy. Aiyar et al. (2014), Fraisse et al. (2015) and Jiménez et al. (2016), for example, empirically show that increasing the level of capital requirements had such a contractionary impact on bank lending in various settings. But to reduce bank leverage there exists an alternative to increasing capital requirements, i.e., decreasing the cost of equity. Such a decrease should on the margin increase the relative benefit of issuing equity thereby reducing bank leverage. Schepens (2016) for example shows that the introduction of a tax reform that reduces the cost of equity in Belgium in 2006 leads to better capitalized financial institutions there. Does a decrease in cost of equity also affect bank lending? And if so, to what extent?

To address this question, we study the introduction of a so-called *Allowance for Corporate Equity* (ACE) which took place in Italy and Belgium in 2002 and 2006, respectively. Corporate income tax systems generally allow for the deductibility of interest payments on debt, while the return on equity is not considered as a deductible cost. This asymmetry favors debt over equity as a means of funding investments, which may lead to excessive leverage. The objective of the ACE is to establish a symmetric tax treatment between debt and equity at the firm level. More precisely, the ACE allows firms (and also banks) to deduct a notional interest on the book value of part or the totality of their equity from their taxable income. Although ACE will have a direct cost in terms of foregone tax revenues for the government, it may also yield tangible benefits through: (1) the debt-equity substitution and the consequent lower deduction of interest costs on debt; (2) the enhancement of financial stability because of the lower leveraging of financial

institutions in particular; and (3) an expansion in bank lending. Estimating the effect of the ACE on bank lending is therefore key to consider the possible impact of this type of reform.

How can a decrease in the cost of equity through an ACE impact bank lending? Three different mechanisms are potentially at play. First, the tax deduction of the notional interest on equity generates an additional income that banks can directly lend to firms, this is what we refer to as the *income effect*. Second, subsidizing equity should result in a lower total cost of capital, therefore leading to a decrease in the cost of funds for banks, and hence of lending rates. Lending may then increase if more projects become profitable. This is the *cost of funds* effect. Finally, decreasing the relative tax advantage of debt may induce banks to hold more equity, thereby relaxing the regulatory constraints on equity ratios and allowing them to lend more, the *capital structure effect*. Whereas the income effect should be rather small, the magnitude of the cost of funds or capital structure effects could be large. In the end whether a reduction in the fiscal cost of equity expands lending, and if yes, what mechanism is at play, is the empirical question we aim to answer.

We therefore study the impact on local bank lending of ACE reforms that occurred abroad but that 'treated' only a subset of local credit-granting banks in Germany. The first ACE reform we investigate is the one implemented for banks in Italy in 2000. With this reform, a notional interest for *post-reform equity* stocks is applied and taxed at a reduced rate of 19%, instead of 37% for profits. This reform was progressively phased out starting from 2002. The second ACE reform is the one that was passed in 2006 in Belgium. This reform allows all corporations, including financial institutions, to deduct a notional charge on the book value of their entire equity from their taxable income. We estimate whether these ACE reforms, which decrease the fiscal cost of equity of 'treated' banks, lead to an increase in their supply of credit in Germany compared to that of 'control' banks. By using loan level data we can further comprehensively account for concurrent changes in the demand for bank credit by German firms.

We focus on credit granted in Germany to uniquely identify how the reforms did impact bank lending. We surmise that credit demand in Germany did not

cause or influence any of the reforms we investigate. We access the German credit register which includes *all* bank-firm exposures that initially surpassed 1.5 million euros. We study the entire 1994-2013 period and for identification purposes restrict the sample to firms that borrowed at least once during this sample period from banks headquartered in two different countries, including Germany (given this and other imposed identifying restrictions and the resultant focus on firms in Germany with multiple banks of different nationalities, the aforementioned exposure hurdle is likely not binding). Our final sample involves 6 Italian banks, 4 Belgian banks and 3,525 German banks.

We follow a difference-in-differences approach, whereby we compare before and after each reform, the lending that takes place to the same firm by treated banks versus control banks. We analyze both the changes in committed credit volume (i.e., the intensive margin) and the likelihood that a new loan is granted (i.e., the extensive margin). Across specifications, and in addition to comprehensive sets of fixed effects, we also control for various bank and bank-firm relationship characteristics.

Our estimations are lined up as follows. First, we show that banks increase equity ratios within two years after the introduction of the ACE, both in Italy and in Belgium, and, most importantly, that the effect is reversed when the reforms are ended. We obtain this result using a subsample of matched banks based on pre-reform observable characteristics (Heckman et al., 1997). This result is in line with the finding of Schepens (2016) on the introduction of the ACE in Belgium, and, more generally, with Gambacorta et al. (2016) on the effect of corporate taxes on bank capital structure.

Second, we find that treated banks expand lending abroad when the cost of equity decreases, and that the effect is reversed when the relative cost of equity increases. The magnitude of the effect is large, suggesting that the effect is not only driven by a pure income effect, but also by the fact that equity is a binding constraint in lending. More precisely, Italian and Belgian banks increased lending to German firms on the intensive margin by more than 40% relative to other banks. On the extensive margin, the increase in the probability of granting a

new loan is less significant, but up to 6 percentage points for Belgian banks after the introduction of the ACE in Belgium. The effect on the riskiness of the loan portfolio still has to be investigated.

As a robustness check, we provide additional uniquely clean evidence that higher capital requirements have a negative effect on lending. Jiménez et al. (2016) show that the introduction and later modification of dynamic provisioning in Spain affected bank lending there. We extend their work by studying the impact on lending by Spanish banks in Germany. We find that after the introduction of dynamic provisioning in 2000 Spanish banks cut committed credit by more than the other (i.e., German or other foreign) banks that were concurrently lending to the same firms in Germany. These findings also hold on the extensive margin of credit granting. Similarly we find that the modification in 2005 (which implied an overall loosening of the dynamic provisioning requirements) is followed by an increase in the amount of credit granted by Spanish banks relative to the amounts granted by their German or foreign counterparts to the same firms in Germany. The magnitude of the estimated impact is higher than to those reported in Jiménez et al. (2016). This validates our chosen identification strategy and resultant estimates. But it also provides new evidence (in line with their findings) in a setup that is totally free of any lingering concerns about the endogeneity of changes in banking regulation.

This paper contributes to the literature that seeks to identify the impact of bank capital regulation on bank lending. Whereas the existing literature has focused on the impact of an increase in capital requirements (Aiyar et al., 2014; Fraisse et al., 2015; Jiménez et al., 2016; **?**; **?**), we investigate the effect of a decrease in the cost of equity. We find strong effects. We therefore contribute to the debate on optimal capital regulation, by providing the first evidence that a lower cost of equity can increase both bank equity ratios and bank lending. Our results are also related to the debate on whether equity is cheap or not for large financial institutions (Gandhi et al., 2016; Baker and Wurgler, 2015).

By looking at the impact of changes in regulation abroad, we better control for the inevitable endogeneity in regulation. We also find that the effects of changes

in capital regulation abroad are amplified. In this way, our paper also adds to the literature on cross-border banking. Ongena et al. (2013) show that tighter bank regulation is associated with lower lending standards abroad. Aiyar et al. (2014) analyse the impact of changes in UK regulation on lending of UK banks to foreign country and find that a 100 basis point increase in the requirement is associated with a reduction in the growth rate of cross-border credit of 5.5 percentage points. We substantially extend their analysis by looking at multiple shocks in capital regulation and by controlling better for credit demand with firm fixed effects.

Finally, our study complements the literature on the impact of taxes on bank capital structure (Schepens, 2016; Keen and de Mooij, 2012), Gu et al. (2015), Gambacorta et al. (2016) and) and on the allocation of loans across affected and non affected states (Smolyansky, 2016). Schepens (2016) in particular investigates the effect of the introduction of the ACE on the capital structure of Belgian banks. As far as we know, this paper is the first in the literature that looks at the effect of taxes on bank lending when controlling for demand.

The remainder of our paper proceeds as follows. Section 2 describes the ACE reforms we exploit, Section 3 describes our data. We present our results in Section 4. Section 5 concludes.

2 ACE Tax Reforms

This section describes the ACE tax reforms we investigate.

2.1 The ACE in Italy

In December 1996, a comprehensive tax reform including an ACE mechanism is voted in Italy. Financial firms, i.e. banks and insurance companies, which initially do not benefit from the ACE, are included starting from the year 2000.[1,2]

The 1996 tax reform implements an ACE type mechanism called *Dual Income*

[1]See the legislative decree n.466, December 15, 1997. `http://www.camera.it/parlam/leggi/deleghe/97446dl.htm`, `http://www.finanzaefisco.it/agenziaentrate/cir_ris_2001/cir61-01.htm`.

[2](Zangari, 2014) compares the Italian and Belgian ACE experiences for firms.

Tax. This ACE aims at reducing the tax burden on equity-financed investment by taxing a given notional return on equity at a reduced tax rate of 19% rather than at the ordinary corporate tax rate of 37%. This *Dual Income Tax* is therefore equivalent to a partial ACE scheme. The notional rate starts off at 7%, and is applied to the book value of new equity, taking the year 1996 as a reference. The resulting average rate of tax on profits could not fall below 27%.[3]

The reform is extended to banks and insurance companies in 2000, while converging to a system where almost the entire capital stock is considered. The ACE base for banks indeed includes the new equity at the end of the year 2000 compared to the existing equity at the end of the year 1996, multiplied by 1.2. In 2000, the tax reform that is applied for banks is therefore very close to a full ACE.

One of the objective of the 1996 tax reform is to reduce the strong incentives to debt-funding in Italy. In 1996, before the reform, every additional euro of interest costs made possible a tax saving of 0.53 cents at the corporate level, while there is no tax saving for an additional euro of equity costs. In addition, the tax treatment of the return on equity and debt at the personal level either exacerbated the tax advantage to debt, or mitigated it only to a limited extent. This strong tax-related debt bias, coupled with the importance of family firms, partly contribute to the traditionally high reliance of Italian firms on debt finance.

The ACE base is initially restricted to "new" capital to limit short-term revenue losses, while giving firms incentives to invest. But following the 1996 reform, companies do not seem to be properly discounting the *Dual Income Tax* benefit on new investments, and therefore press the Government for clearer, more immediate tax reductions instead. As a result, in 1999 the Ministry of Finance allows corporation to compute the ordinary return by calculating increases in new equity and retained earnings for a multiple of their value (by 1.2 in 2000 and by 1.4 from 2001 onwards). The objective is to speed up the transition to a system in which the ordinary return will be computed on all equity capital, and reduces further the cost of capital on a new equity financed investment (Bordignon et al., 1999, 2001).

[3]The 1996 tax reforms has another component: the so-called "local income tax", levied on profits at a flat rate of 16.2%, is replaced with a new value added tax called *Imposta Regionale sulle Attivita' produttive* featuring a very broad tax base and a low tax rate equal to 5.4%.

After the 2001 elections the ACE is progressively phased out. In 2002, the book value is cut again to 100%, only equity increases until June 2001 are taken into account, the notional interest rate is decreased down to 3.5%, and the corporate tax rate is decreased from 37 to 33%. Apparently, one of the reasons for the repeal by the new government is the reduction of the tax revenues following the 1996 tax reform, for which the ACE is considered mostly responsible (see Guerra, 2002).

2.2 The ACE in Belgium: 2006

Belgium, in 2006, introduces an ACE tax reform that allows all corporations, including financial institutions, to deduct from their taxable income notional interests on equity. These interests amount to the product of the book value of equity times a benchmark rate based on the average rate on 10-year bonds the year preceding the fiscal year and with some restrictions. In each year, the rate cannot exceed by more than 1 percentage point the rate applied in the previous year, and it could not be in any case larger than 6.5% until 2011, 3% after (Zangari, 2014; Schepens, 2016).[4] No investment in tangible or intangible assets is required to benefit from the allowance. Finally, the Belgian ACE applies to resident companies and non-resident companies with a permanent establishment or holding immovable properties in Belgium.

The reform is voted two years after the European Commission put an end to a unique Belgian fiscal advantage for subsidiaries of non-Belgian multinationals, the *coordination center* regime created in 1983.[5] The objective of the *coordination center* regime was to attract profitable service centers, the *coordination centers*, with minor cost structures. These *coordination centers* were specialized in financial, accounting and administrative services, and benefited from a fixed tax rate, ranging from 4 to 10%, based on expenses less financial and salary costs rather than on profits. With this fiscal advantage, Belgium indeed became a popular destination for a significant number of *coordination centers*.

The fear of losing profit centers to other countries following the dismantlement

[4]The ACE rate was equal to 3.442%, 3.781%, 4.307%, 4.473%, 3.80%, 3.425%, 3% and 2.742% respectively in 2006, 2007, 2008, 2009, 2010, and 2011

[5]The European Commission took the decision to ban this fiscal regime on February, 17 2003

of the *coordination center* regime in February 2003 lead to the 2006 ACE tax reform. The reform is approved in parliament in June 2005 and implemented in July 2006. The introduction of the ACE coincides with the elimination of a 0.5% tax on new equity issuance, but this concurrent elimination has only a minor economic importance compared to the recurrent tax benefits from the ACE.

The Belgian ACE includes some limited specific anti-avoidance rules, providing banks, as well as non financial firms, with incentives to optimize the use of ACE across subsidiaries.[6] Multinational firms have hence implemented double-dipping structures, whereby a parent company abroad is injecting equity in a Belgian subsidiary, for example by taking a loan, and is able to deduct from taxes abroad the interests on this loan. Hence the Belgian reform had an effect not only on Belgian banks, but also on the Belgian subsidiaries of foreign banks.[7,8] This scenario is con-

[6]Anti-avoidance rules consist in deducting from the ACE base the company own shares - a company increasing equity (by issuing new shares) and simultaneously subscribing it would indeed artificially boost its capital for the purpose of increasing the ACE base -, assets whose costs exceeds business needs (e.g. luxury cars), those not generating periodic taxable income (e.g. jewellery, artworks, precious metals) and real estate used by company directors, their spouses or their children.

[7]Note that in principle double-dipping structures combining interest deductibility and ACE allowance are possible not only within multinational groups, but also at the domestic level. Indeed, while there is a specific anti-avoidance rule providing that the ACE base of the domestic parent will be decreased by the ACE base created at the level of the financing company, the rule is only relevant when the parent has a positive ACE base. Instead, when the parent is a domestic company performing (also) holding activities, it is possible that its ACE base is already reduced to zero given the correction for the participations in other companies. In such case, all additional equity injected into the financing company will generate additional ACE base for the latter company without decreasing the ACE base of the parent (i.e. the ACE base cannot be negative). If the tax base of the parent is initially positive enough (more likely in the case of a mixed holding), taking up a loan to fund the equity contribution will generate an additional tax saving through the deduction of interest costs.

[8]To fix ideas, imagine that the foreign parent company provides 1,000 of equity to the Belgian financing company, which in turn provides a loan of the same amount to a foreign or domestic subsidiary. Assume for illustrative purposes that the interest rate is 5% and the rate of the ACE is 3%. If the domestic subsidiary has an Earnings Before Interest and Taxes (EBIT) of 100, then after deduction of its interest payment to the financing company of 50, its taxable profit is 50 (i.e. 100-50), which leads to a tax liability of 16.995 at the statutory tax rate of 33.99% applicable in Belgium. The net profit of 33.005 (i.e. 50-19.995) is paid to the foreign parent company in the form of a dividend where it often benefits from a participation exemption (often at 100%). The tax base of the financing company is made of the interest received (50), minus the ACE (30), that is 20. This means a tax liability in Belgium of 6.798. The after-tax profit is then paid to the parent company as dividend, where it also benefits from the participation exemption. For the group, the total tax liability is 16.995 + 6.798 = 23.793. The same example without the ACE would lead to a tax liability of 33.99 (16.995 + 16.995), that is the statutory Belgian tax rate. Note that the same analysis applies if the company injecting equity is a domestic holding company that already has an ACE base reduced to zero because of the corrections for the participations. If on top the foreign parent (or the domestic mixed holding with a zero ACE

sistent with the spectacular flow of equity capital into Belgian companies following the ACE introduction that was redirect abroad as loans granted to other group's companies.[9] In addition, following the Argenta Spaarbank case (C-350/11), banks did not need to exclude the net assets of its permanent establishment abroad in computing the ACE.[10]

The ACE regime has being weakened over the last years, with the progressive reduction of the ACE notional rate, the elimination of the carry-forward for the unutilized ACE in 2011, and, in August 2013, with the introduction of the fairness tax which has basically transformed the Belgian ACE in a partial ACE scheme.

3 Data

3.1 Bank Level Data

Bank level data is from the bureau van Dijk Bankscope database. We select all EU-27 commercial, savings and cooperative banks. For each shock we keep all European banks that have data available during the 5-year period around the shock. We convert data into constant dollars, and we drop banks with a jump/decrease of more than 150%/-50% in the total value of their assets to avoid bias due to mergers and acquisitions or bank failures.

base and an initial positive tax base) takes out a bank loan to fund the equity injection into the Belgian financing company, it may be entitled to deduct interest costs against its own corporate tax base, and therefore the consolidated tax liability will be even lower (by how much will depend on the statutory tax rate of the country where the parent is located). This is a typical case of double dipping. A more aggressive scheme is the one where companies injecting equity fund the transaction through loans granted by the same companies whose capital they are subscribing. This type of scheme can be challenged ex-post by tax authorities under some circumstances (see par. 2.3).

[9]See Banque Nationale de Belgique (Economic Review, 2008) for figures regarding capital flows following the introduction of the ACE.

[10]The ECJ ruling was retroactive and gave companies the possibility to claim back up to five years of the excess of paid corporate taxes. An infringement against Belgium was started in 2009 on a similar issue regarding the exclusion of foreign immovable property from the ACE base. For a discussion of the Argenta Spaarbank case, see O'Shea (2014).

3.2 Bank-Loan Level Data

Our principal data source is the German Credit Register compiled by the Deutsche Bundesbank.

The Bundesbank collects quarterly information on all outstanding loans that when granted exceeded 1.5 million euros. Important for our purposes, and in contrast to a number of other credit registers, this data is requested from both German and foreign banks. Essential for our estimations is also that the Register includes information on both the lenders' and the borrowers' identities and on the amount of credit that is outstanding at all times. Unfortunately the Register contains no immediate information on the interest rate paid or on the maturity of the outstanding loans.

The data set we extract contains at a quarterly frequency all credit exposures of banks to firms that borrow from banks headquartered in *at least two different countries* during the sample period, which spans 20 years from 1994 to 2013. In total there are 573,638 such bank-firm-quarter observations.

Accessing the Register we construct a balanced quarterly panel of bank-firm pairs. We include all bank-firm pairs that appear at least once during the sample period **starting in 1994**. For each bank-firm pair, we then back-fill all quarters for which the pair is not in the Register with a zero exposure. Hence, if bank b lends to firm f and is repaid within a year, the bf pair will be in our data every quarter during the entire sample period, even though the bank-firm exposure will be equal to zero most of the time..[11]

One concern we have is that by construction our findings could be biased upward. Indeed, 1) exposures that start below 1.5 million are not reported, while 2) exposures that start above 1.5 million are always indicated, even if they eventually drop below 1.5 million (through repayment). Hence, when building our balanced sample, we in effect set loan amounts that are below 1.5 million equal to zero at the beginning of a bank-firm relationship and thereby overestimate the increase in this bank-firm exposure when it then jumps above the 1.5 million hurdle. However,

[11] When two banks merge, we artificially create a third bank for the time period after the merger.

our focus on firms that borrow from foreign banks should mitigate this concern, because these firms are often larger and more likely to borrow in large volumes. In addition, in our main model we restrict the sample even further, keeping only firms that borrow concurrently from multiple banks (and again especially large firms do so). Finally, we also perform an analysis that focuses exclusively on the intensive margin, i.e., when the loan amount starts above 1.5 million (this analysis confirms the robustness of our results).

We then merge our loan level data with the bank level data from Bankscope.[12]

3.3 Preliminary Statistics

Table 1 lists the three shocks we study and the number of lending banks and borrowing firms in Germany that are in each case affected. We focus on the impact of the ACE introduction and phasing-out in Italy and of the ACE introduction in Belgium on the the lending by Italian and Belgian banks, respectively. We have two times 6 Italian banks and 4 Belgian banks in our sample that lend to 639, 599, and 1,337 firms, respectively. To validate the three direct shocks to the cost of equity, we also check the effect of the introduction and modification of Dynamic Provisioning on the lending of Spanish banks. We have 3 and 2 Spanish banks in our sample that lend to 205 and 335 firms, respectively.

INSERT TABLE 1

Table 2 shows descriptive statistics on bank-firm exposures, firm and bank characteristics over our sample period form firms and banks that are respectively not treated and treated by each shock. We find that treated banks are larger and more capitalized than the average German bank in our sample, whereas the their exposure to German firms is lower. We control for these differences in the empirical analysis. The median number of banks the firms borrow from is 3.

INSERT TABLE 2

[12]Our loan level analysis also includes bank level data from the Bundesbank as controls.

4 ACE Reforms and Bank Capital Structure

Several papers in the literature have provided some evidence that the implementation of an ACE can lead to more balanced financial structures for firms (Panier et al., 2016) and banks (Schepens, 2016). Our analysis extend the literature in three directions. First, by looking at the effect of the introduction of the Italian ACE in 2000 on bank equity ratios, while firms were already impacted since 1997, we are able to control for changes in bank capital structure that may be driven by a lower demand for loans from firms. Second, we also investigate how the end of an ACE reform impact bank capital structure. Third, by looking at several shocks we can provide some estimates of the elasticity of bank equity ratios to the tax advantage of debt.

4.1 Identification Strategy

To estimate the effect of the three shocks to the tax treatment of equity on bank capital structure, we use a difference-in-differences analysis. We compare the change in capital structure of the treated banks with the change in capital structure of a similar group of European banks for whom the tax environment does not change. For each event, we collect data over two sub-periods: before (3 years) and after the event (2 years). More precisely, the model we estimate is the following:

$$\Delta log Equity\ Ratio_{b,t} = \alpha + \beta Treated_{b,t} + \gamma \text{Post}_t + \eta Treated_{b,t} \times \text{Post}_t + \lambda Y_b + \epsilon_{b,t} \quad (1)$$

Where $Equity\ Ratio_{b,t}$ is the equity ratio of bank b at time t, defined as equity over total assets, $Treated_b$ is a dummy that is equal to one for all treated banks, $Post_t$ is a dummy indicator equal to one in the post-treatment period and Y_b represents a group of bank characteristics that are typically seen as important bank capital structure determinants, i.e., bank profitability (return on assets), bank business model (loan to asset ratio, non interest income share), bank size (log of total assets) and bank risk (non-performing loans). The $Treated_b$ dummy controls for any permanent, time-invariant differences between the treated and

the control group, while the $Post_t$ dummy controls for trends that are common to both groups. The main coefficient of interest is the coefficient η for the interaction variable. Standard errors are clustered at the bank level (and at the country level in Table X in the online appendix).

The key identifying assumptions for obtaining reliable difference-in-differences estimates are the comparability of the treatment and the control groups and their parallel trend. We therefore use a propensity score matching procedure to construct a control group of European banks for each shock, based on their characteristics in the pre-treatment period, among which the trend in the equity ratio (see e.g. Angrist and Krueger (1999), Roberts and Whited (2012)).

The propensity score is calculated on the following variables with their value the year before the shock: total assets, return on assets, contemporaneous, lagged and lagged twice equity ratio, contemporaneous and lagged growth rates of the equity ratio. We take the closest five non-treated financial institutions for each treated financial institution, with possible replacement to maximize comparability (Rosenbaum and Rubin (1983), Smith and Todd (2005)). These replacements happen frequently, which explains the small size of the control group for each of our shock.

INSERT TABLE ON THE MATCHING PROCEDURE

4.2 Results

Tables 3 investigates the impact of the three ACE reforms on the equity ratio of banks located in Italy and in Belgium. Column (1), (3) and (5) show the regression of the logarithm of the equity ratio on a dummy variable *Post* that equals one in the post period, and an interaction term *Post* $\times$ *Treated* where *Treated* indicates whether the bank is treated bank to captures the impact of the tax reform. Columns (2), (4) and (6) compare the difference in the average equity ratio over the *Pre* period with the average ratio over the *Post* period between the treatment and the control group.

The coefficient of the interaction in columns (1) and (2) of Table 3 first show that Italian banks increase their equity ratio after the introduction of the ACE,

by 6 percent, which corresponds to a 0.35 percentage point higher equity ratio. Columns (3) and (4) show that the reversal of the Italian reform has a negative effect of a similar magnitude. Finally, columns (5) and (6) indicate that Belgian banks increase their equity ratio by more than 15 percent on average after the ACE reform, which corresponds to 1 percentage point higher equity ratio and is similar to the estimates in Schepens (2016).[13] increase These are economically very relevant changes in equity ratios that may lead to large swings in lending volumes. For example a bank with 5 euros in equity, 95 euros in deposits and 100 euros in loans, but no access to new equity, would have to reduce its lending to 83 euros (i.e., by 17 percent) in case its equity ratio would have to be raised by 1 percentage point from 5 to 6 percent.

INSERT TABLE 3

5 ACE Reforms and Bank Lending

5.1 Identification Strategy

Our identification strategy to estimate the effect of the changes in the tax treatment of equity on bank lending consists of four steps. First, we look at the effects of each event on all bank-firm exposures. We then try to identify which part of the effect is driven by changes on the intensive margin of lending by focusing *only* on firms that were already borrowing from the treated banks *before the event*. Third, we investigate the effect of each event on the extensive margin by studying new lending. Finally, we look at the effect on aggregate credit at the firm level.

5.1.1 Overall Effect

For each event, we collapse our panel into two sub-periods: before (1 year) and after the event (2 years). For each bank-firm pair, we take the average exposure

[13]Panier et al. (2016) investigate the effects of the introduction of the ACE on the capital structure of non financial firms and find effects of similar magnitude in percentage: Non financial firms increase equity-to-total asset ratios from 32.3% to 33.1%

in each sub-period, as in Bertrand et al. (2004). The benchmark model including all firm-bank data is the following:

$$\Delta logL_{b,f} = \alpha Treated_{b,f} + \beta X_f + \gamma Y_b + \epsilon_{b,f} \tag{2}$$

where $\Delta logL_{b,f}$ is the change in the logarithm of lending exposure of bank b to firm f between the pre- and the post-shock period, $Treated_{b,f}$ is a dummy indicating if the bank has been treated by a specific change in capital regulation, X_f is a vector of firm specific controls to capture changes in lending policies that are related to firm characteristics rather than regulation (size, profitability etc.) or firm fixed effects depending on the specification and Y_b is a vector of bank controls. Error terms are clustered at the bank and firm levels.

Bank controls include the logarithm of total assets, the equity ratio, and the return on assets (ROA) at date $t-1$, and bank type fixed effects. Banks are divided into three categories: commercial banks, savings and cooperative banks, and other financial institutions (which includes mortgage banks, and financial services providers). We divide the vector of bank controls into two separated vectors for German versus non German banks, because controls for German banks from the Bundesbank are at a more disaggregated level (subsidiary) than controls for foreign banks (main bank level).

Firm controls include the number of banks the firm is borrowing from (in log), the total amount of debt of the firm on date $t-1$ (in log), and a indicator variable for firms belonging to the financial sector.[14]

In order to comprehensively account for the firm demand for credit, we saturate various specifications with firm fixed effects. We therefore restrict our sample to multi-bank firms, i.e., firms borrowing from *at least two different banks* in the period **before the shock**. This identification relies on the estimation of the evolution of lending to firm f by bank b that is treated by the regulation shock compared to lending to the same firm f by bank b' that is not exposed to the shock. This approach allows us to control for changes in credit that are driven by

[14]We do not control for relationship characteristics in this specification because for new borrowers the value is automatically zero, which may bias our results downwards.

changes in firm-specific demand.

We finally restrict our sample to firm exposures to foreign banks. The objective is to control for any effect that would be driven by changes in the lending policies of German banks. For example, if the GDP in Germany goes down, German banks may reduce lending, and our effect may only be driven by the higher demand for loans to foreign banks.

5.1.2 Effect on Intensive Margin

In a second step, we restrict ourselves to firms that borrow at least from one bank **exposed to the shock** in the pre-period, and, for these firms, we keep only all bank-firm exposures that are **strictly larger than zero** in the pre-period. We then estimate the same regressions first without and with firm fixed effects, and controlling for relationship characteristics:

$$\Delta logL_{b,f} = \alpha Treated_{b,f} + X_f + \gamma Y_b + \lambda R_{b,f} + \epsilon_{b,f} \tag{3}$$

where X_f are firm fixed effects. Controls are the same as in the previous regressions. Error terms are again clustered at the bank and firm level.

With this specification, we estimate how a bank that is treated by a shock in regulation changes its lending to its current borrowers compared to the other competing banks that are also lending to the same borrowers, but that are not treated by the same shock.

Bank-firm relationship characteristics include the length of the relationship and the size of this relationship. The length of the relationship is the number of quarters the exposure of bank b to firm f has been strictly positive from 1994 onwards (i.e., the beginning of our sample) to date $t-1$. The size of the bank-firm relationship is the total amount that has been lent by bank b to firm f from 1994 to date $t-1$. Both variables are in logarithm.

5.1.3 Effect on Extensive Margin

In the third model, the dependent variable is a dummy variable that is equal to one if a new loan is granted to a firm with currently zero exposure to the credit

granting bank and is equal to zero otherwise. The objective is to estimate the effect of each shock on new lending by treated banks (extensive margin). We run the following model:

$$NewLoan_{b,f} = \alpha Treated_{b,f} + \beta X_f + \gamma Y_b + \lambda R_{b,f} + \epsilon_{b,f} \tag{4}$$

where X_f is a vector of firm controls. Controls are the same as in previous regressions. Error terms are clustered at the bank level. We estimate this model in both a linear probability and a logit specification.

5.1.4 Aggregate Lending Exposure at the Firm Level

We finally aggregate loan exposure at the firm level and investigate the change in the log of total lending by all engaged banks at the firm level. The objective is to investigate whether treated banks are substituting or not to other banks when they increase lending.

In a first specification, our variable of interest $Treated$ indicates firms that are borrowing from at least one treated bank. We then estimate the following model:

$$\Delta logL_f = \alpha Treated_f + X_f + \epsilon_f \tag{5}$$

where X_f are firm characteristics. Error terms are clustered at the firm level.

In a second specification, we restrict ourselves to firms that borrow at least from one bank in the post-period, i.e. to firms with a *strictly positive loan exposure in the post-period*. Our variable of interest, $ShareTreated$, indicates, among these firms, the share of their loans exposed to a treated bank.[15] We then estimate the following model:

$$\Delta logL_f = \alpha ShareTreated_f + X_f + \epsilon_f \tag{6}$$

[15]We restrict ourselves to this sample because, by definition, the dummy variable $ShareTreated$ is strictly positive only for firms with strictly positive exposure

5.2 Results

Figure 1 shows the (non-conditional) evolution of German firms' percentage exposure to Italian banks in the years around the introduction of the ACE in Italy in 2000. The introduction of the ACE seems to be indeed followed by an increase in lending by Italian banks. The graph plots the share of loans in volumes granted by Italian banks to German firms from our sample every quarter from 1998 to 2001. The red line corresponds to the introduction of the ACE in Italy.

INSERT FIGURE 1

Table 4 shows the change in bank lending by Italian banks relatively to lending by control banks. The coefficient in columns (1) indicates that the exposure to Italian banks would have increased by more than 70% after the introduction of the ACE. When restricting the sample to exposures to foreign banks, the effect is of the same magnitude (column (2)), which implies that exposure to Italian banks have increased even relatively to foreign banks only. The coefficients in columns (4) and (5) suggest that the effect is mostly at the intensive margin. In addition, including firm fixed effects (column (5)) instead of firm controls only slightly decreases the magnitude of the coefficient. When we turn to the extensive margin, however, Italian banks are not more likely to grant a new loan to German firms after the introduction of the ACE. Finally, we find a strong effect on the aggregate borrowing of firms that are affected, meaning that Italian banks have not simply substituted to other banks.

INSERT TABLE 4

Conversely, Figure 2 and Table 5 suggest that the phasing out of the ACE reform in Italy had a strong negative effect on the lending of Italian banks to German firms. The large effect that we observe on all bank firm exposures (columns (1) to (3)) is driven by both intensive and extensive margins. Italian banks have indeed a 13% lower probability to grant a new loan after the end of the ACE reform (columns (6) to (8)).

INSERT FIGURE 2

INSERT TABLE 5

Finally, the introduction of the ACE in Belgium in 2006 has also a large effect on lending by Belgian banks to German firms, both on the intensive and extensive margins. Our result is robust to including firm fixed effects, and to restricting our sample to foreign lending. Because this tax reform took place in a set up as clean as possible (Panier et al., 2016; Schepens, 2016) the large magnitude we observe comfirm the results from the previous analyses based on the Italian ACE.

INSERT FIGURE 3

INSERT TABLE 6

6 Robustness

6.1 Robustness Checks

We run the following additional robustness checks for each of the shock we investigate, and do not find significant variations in our results (see the online appendix (TO BE ADDED)):

- We winsorize bank-firm exposure (2%)
- We exclude financial firms from our sample
- We exclude banks that enter or exit the sample during our period of interest

6.2 External Validity: Estimating the Effect of Dynamic Loan Provisioning in Spain

In order to investigate whether, in general, changes in bank capital regulation are amplified abroad and also to extend the results in this literature, we estimate the effect of dynamic provisioning in Spain on lending by Spanish banks over our period of interest.

Dynamic provisioning was introduced in Spain in 2000.[16] Dynamic provisions are a special kind of loan provisions determined by a simple and transparent formula. Banks that introduced dynamic provisioning in 2000 did not decrease Tear 1 capital ratio. This reform therefore implied an increase in equity ratio of 0.26 percentage point (Jiménez et al., 2016). Jiménez et al. (2016) also find that this average increase in provisions leads to a 10% decrease in lending.

Table 7 shows the changes in bank lending by Spanish banks relatively to lending by non treated banks after the introduction of dynamic provisioning. We find that loan exposure by Spanish banks decreases substantially after the introduction of dynamic provisioning. If we look at intensive margins for example (columns (4) to (6)) lending to relationship firms decreases by around 75%. When we turn to extensive margins, Spanish banks are also less likely to grant a new loan to German firms after the introduction of dynamic provisioning in Spain. If we compare with the results obtained by Jiménez et al. (2016), Spanish banks seem to have transmitted the shock much more strongly abroad than in their home country, despite the fact that their lending in Germany was not subject to the same new provisioning requirements. Yet our findings are consistent with recent empirical work by for example De Haas and Van Horen (2012) who show that banks may cut back dramatically on foreign lending when being hit at home. Also our findings indicate that lending abroad is not an immediate substitute for lending at home.

INSERT TABLE 7

In the beginning of 2005, the parameters of the dynamic provisioning formula were modified. The dynamic provisioning parameters were increased, but at the same time the ceiling of the dynamic provision funds was lowered. As many banks were close to the ceiling, the modification implied a net loosening in provisioning requirements for most banks.

Table 8 shows the estimated coefficients for the treated banks. Now the estimated coefficients are positive, also very large, between +120% and +300%. These findings again correspond well to those in Jiménez et al. (2016) who document the

[16]The new law was introduced in 2000:M7 and enforced at the end of 2000:M9

response of Spanish banks in their domestic lending. Again our results imply that lending in Spain and Germany are not substitutable for Spanish banks but that the loosening of capital requirements in Spain simply frees up funds to lend in Germany.

INSERT TABLE 8

7 Conclusion

We study the impact of shocks to the cost of bank equity that occurred abroad but that treated only a subset of local credit-granting banks in Germany. Using a difference-in-differences approach we compare the lending that takes place to the same firm by treated banks versus untreated banks before and after each shock. The introduction of an ACE, which decreases the cost of bank equity, leads to a large expansion in bank lending. The magnitude of the effect is large, which suggests that bank lending are very sensitive to the cost of equity.

Our paper contributes to the debate on bank capital regulation by investigating the effects of an ACE. The question is whether the positive effect on lending and financial stability may compensate for the fiscal cost of this reform.

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A Figures

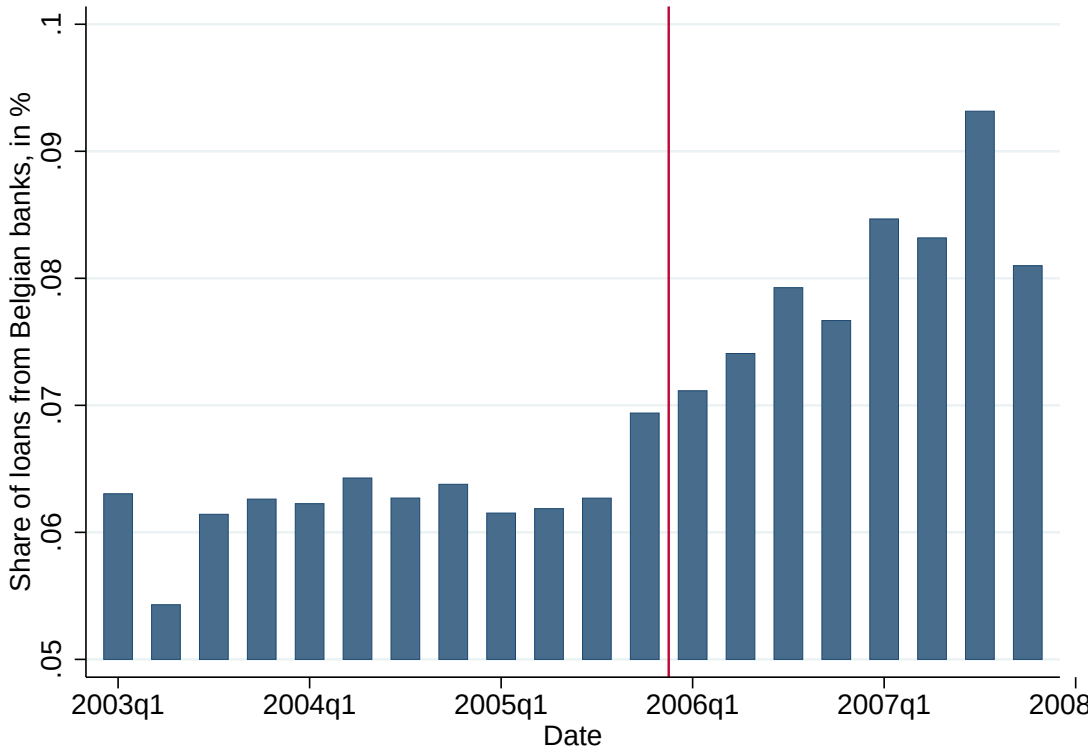
Figure 1. Evolution of German Firm Exposure to Italian Banks around the Introduction of the ACE for banks in Italy in 2000

This figure shows the evolution of the relative exposure of German firms to Italian banks over the 1998-2001 period. The red vertical line corresponds to the introduction of the ACE for banks in Italy in 2000. The relative exposure is computed as the ratio of loans from Italian banks to loans from other banks (in volumes).

Figure 2. Evolution of German Firm Exposure to Italian Banks around the Phasing out of the ACE in Italy (2002)

This figure shows the evolution of the relative exposure of German firms to Italian banks over the 2000-2004 period. The red vertical line corresponds to the beginning of the phasing out of the ACE in Italy starting from 2002. The relative exposure is computed as the ratio of loans from Italian banks to loans from other banks (in volumes).

Figure 3. Evolution of German Firm Exposure to Belgian Banks around the introduction of the ACE if Belgium in 2006



This figure shows the evolution of the relative exposure of German firms to Belgian banks over the 2003-2007 period. The red vertical line corresponds to the introduction of the notional interest deduction in Belgium in 2006. The relative exposure is computed as the ratio of loans from Belgian banks to loans from other banks (in volumes).

B Tables

Table 1. Description of the Shocks

Date	Shock	Country	# Treated Banks	# Firms Borrowing from Treated Banks
Allowance for Corporate Equity Reforms				
2000q1	Introduction for Banks	Italy	6	639
2002q1	Phasing out	Italy	6	599
2006q1	Introduction	Belgium	4	1,337
Robustness Shocks				
2000q3	Creation of Dynamic Provisioning	Spain	3	205
2005q1	Loosening of Dynamic Provisioning	Spain	2	335

This table reports for each ACE reforms and other shocks we exploit the date, the number of banks from our sample that are treated and the number of firms borrowing from these treated banks.

Table 2. Summary Statistics

	Mean (1)	Median (2)
Bank-Firm Exposure (in million euros)		
Year 1999		
From German Banks	12.8	1.6
From Italian Banks	6.2	1.6
From Other Foreign Banks	7.5	0.7
Year 2005		
From German Banks	13.1	1.0
From Belgian Banks	1.5	0.08
From Other Foreign Banks	8.9	0.1
Bank Characteristics		
Year 1999		
German Banks		
Total Assets (billion euros)	24	54
Equity Ratio (in %)	3.8	3.7
ROA (in %)	0.5	0.3
Italian Banks		
Total Assets (billion euros)	49	48
Equity Ratio (in %)	7.5	7.5
ROA (in %)	1.0	1.0
Other Foreign Banks		
Total Assets (billion euros)	89	162
Equity Ratio (in %)	5.2	4.4
ROA (in %)	0.6	0.6
Year 2005		
German Banks		
Total Assets (billion euros)	36.3	120.6
Equity Ratio (in %)	3.9	3.9
ROA (in %)	0.6	0.6
Belgian Banks		
Total Assets (billion euros)	362	328
Equity Ratio (in %)	4.2	4.03
ROA (in %)	0.67	0.64
Other Foreign Banks		
Total Assets (billion euros)	154	328
Equity Ratio (in %)	5.9	5.1
ROA (in %)	0.9	0.8

This table reports summary statistics for the size of all bank-firm exposures, and bank accounting data in 1999, the year before the introduction of the ACE in Italy, and in 2005, the year before the introduction of the ACE in Belgium.

Table 3. ACE Reforms and Bank Capital Structure

	Log(Equity Ratio)					
	Italy (2000) Introduction		**Italy (2002)** End		**Belgium (2006)** Introduction	
	(1)	Average (2)	(3)	Average (4)	(5)	Average (6)
Treated x Post	0.061**	0.056*	-0.051*	-0.095**	0.18***	0.15***
	(0.027)	(0.034)	(0.030)	(0.047)	(0.053)	(0.053)
Post	-0.040***	-0.074***	0.044**	0.044	0.013	-0.084
	(0.008)	(0.019)	(0.019)	(0.043)	(0.018)	(0.054)
Bank FE	Yes	Yes	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,212	6,212	1,280	1,280	660	660

This table analyzes the impact of ACE reforms on the capital structure of treated banks in a differences-in-differences setup. The sample period is 1998-2002 for the introduction of the ACE in Italy, 2000-2004 for the end of the ACE and 2003-2007 for the introduction of the ACE in Belgium. Column (1), (3) and (5) show the regression of the logarithm of the equity ratio on a dummy variable *Post* that equals one in the period after the ACE reform, and an interaction term *Post* × *Treated* where *Treated* indicates whether the bank is an treated bank to captures the impact of the tax reform. Columns (2), (4) and (6) compare the difference in the average equity ratio over the period before the ACE reform with the average ratio over the period after the ACE reform between the treatment and the control group. The control group is obtained through a matching procedure described in Section 3. Models are estimated using OLS with bank fixed effects. Standard errors are clustered at the bank level and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.

Table 4. The Introduction of the ACE for Banks in Italy in 2000 and Bank Lending by Italian Banks in Germany

Model	*All Bank-Firm Exposures*			*Intensive Margin*		*Extensive Margin*			*Aggregate Borrowing*	
Dependent Variable	Δ log(Loan Exposure)			Δ log(Loan Exposure)		New Loan Dummy			Δ log(Total Exposure)	
	OLS			*OLS*		*OLS*		Logit	OLS	
Sample	All	Multibank Firms	Foreign Lending	Ex-ante Treated Firms	Ex-ante Treated Multibank Firms	All	Foreign Lending	All	All Firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treated	0.76***	0.12	0.79***	0.93***	0.98***	0.02	0.01	0.18	0.6***	
	(0.21)	(0.28)	(0.24)	(0.32)	(0.27)	(0.02)	(0.02)	(0.15)	(0.08)	
Share Treated										1.15***
										(0.26)
Firm FE	-	Yes	-	-	Yes	-	-	-	-	-
Firm Characteristics	Yes	-	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
Bank Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-
Relationship Ch.	-	-	-	Yes	Yes	-	-	-	-	-
Observations	121,581	106,983	18,013	14,259	14,221	121,581	18,013	121,581	38,438	33,380
R^2	0.072	0.344	0.087	0.057	0.219	0.106	0.108	0.094	0.199	0.046

This table reports the coefficients of OLS and Logit estimations. The dependent variable in columns (1) to (5) is the change in the log of bank-firm exposure as described in section 3, in columns (6) to (8) a dummy variable that is equal to one if a new loan is granted to a firm with currently zero exposure to the credit granting bank and is equal to zero otherwise, in columns (9) and (10) the change in the log of aggregate lending exposure at the firm level. The initial sample comprises all bank-firm exposures involving firms that borrow from at least two banks headquartered in different countries during the 1994-2013 period. In columns (2) and (5) the sample is restricted to firms that borrow from several banks, in columns (3) and (7) to firm exposure to **foreign banks** and in columns (4) and (5) this sample is restricted to bank-firm exposures that both involve relationship firms, i.e., firms with a strictly positive exposure to *treated bank* and the year prior to shock, and that are strictly positive in the first period. Standard errors are clustered at the bank and firm level in columns (1) to (8) and at the firm level in columns (9) and (10) and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.

Table 5. The Phasing out of the ACE in Italy in 2002 and Bank Lending by Italian Banks in Germany

Model	*All Bank-Firm Exposures*			*Intensive Margin*		*Extensive Margin*			*Aggregate Borrowing*	
Dependent Variable	Δ log(Loan Exposure)			Δ log(Loan Exposure)		New Loan Dummy			Δ log(Total Exposure)	
	OLS			*OLS*		*OLS*		Logit	OLS	
Sample	All	Multibank Firms	Foreign Lending	Ex-ante Treated Firms	Ex-ante Treated Multibank Firms	All	Foreign Lending	All	All Firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treated	-1.47**	-1.83***	-1.62**	-0.64	-0.91**	-0.12***	-0.13***	-0.84**	0.05	
	(0.62)	(0.57)	(0.64)	(0.43)	(0.37)	(0.04)	(0.03)	(0.36)	(0.69)	
Share Treated										-0.89***
										(0.24)
Firm FE	-	Yes	-	-	Yes	-	-	-	-	-
Firm Characteristics	Yes	-	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
Bank Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-
Relationship Ch.	-	-	-	Yes	Yes	-	-	-	-	-
Observations	139,751	123,466	20,067	11,856	11,816	139,751	20,067	139,751	43,062	36,113
R^2	0.088	0.411	0.110	0.055	0.244	0.138	0.155	0.114	0.269	0.050

This table reports the coefficients of OLS and Logit estimations. The dependent variable in columns (1) to (5) is the change in the log of bank-firm exposure as described in section 3, in columns (6) to (8) a dummy variable that is equal to one if a new loan is granted to a firm with currently zero exposure to the credit granting bank and is equal to zero otherwise, in columns (9) and (10) the change in the log of aggregate lending exposure at the firm level. The initial sample comprises all bank-firm exposures involving firms that borrow from at least two banks headquartered in different countries during the 1994-2013 period. In columns (2) and (5) the sample is restricted to firms that borrow from several banks, in columns (3) and (7) to firm exposure to **foreign banks** and in columns (4) and (5) this sample is restricted to bank-firm exposures that both involve relationship firms, i.e., firms with a strictly positive exposure to *treated bank* and the year prior to shock, and that are strictly positive in the first period. Standard errors are clustered at the bank and firm level in columns (1) to (8) and at the firm level in columns (9) and (10) and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.

Table 6. The Introduction of the ACE in Belgium in 2006 and Bank Lending by Belgian Banks in Germany

Model	*All Bank-Firm Exposures*			*Intensive Margin*		*Extensive Margin*			*Aggregate Borrowing*	
Dependent Variable	Δ log(Loan Exposure)			Δ log(Loan Exposure)		New Loan Dummy			Δ log(Total Exposure)	
	OLS			*OLS*		*OLS*		Logit	OLS	
Sample	All	Multibank Firms	Foreign Lending	Ex-ante Treated Firms	Ex-ante Treated Multibank Firms	All	Foreign Lending	All	All Firms	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Treated	0.74**	0.66**	0.58*	0.57*	0.44**	0.07**	0.06**	0.33**	0.13**	
	(0.35)	(0.27)	(0.35)	(0.30)	(0.21)	(0.03)	(0.03)	(0.14)	(0.06)	
Share Treated										0.24
										(0.16)
Firm FE	-	Yes	-	-	Yes	-	-	-	-	-
Firm Characteristics	Yes	-	Yes	Yes	-	Yes	Yes	Yes	Yes	Yes
Bank Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	-	-
Relationship Ch.	-	-	-	Yes	Yes	-	-	-	-	-
Observations	127,831	110,759	22,162	6,314	6,183	127,831	22,162	127,831	48,068	38,792
R^2	0.110	0.399	0.207	0.048	0.320	0.129	0.141	0.103	0.309	0.065

This table reports the coefficients of OLS and Logit estimations. The dependent variable in columns (1) to (5) is the change in the log of bank-firm exposure as described in section 3, in columns (6) to (8) a dummy variable that is equal to one if a new loan is granted to a firm with currently zero exposure to the credit granting bank and is equal to zero otherwise, in columns (9) and (10) the change in the log of aggregate lending exposure at the firm level. The initial sample comprises all bank-firm exposures involving firms that borrow from at least two banks headquartered in different countries during the 1994-2013 period. In columns (2) and (5) the sample is restricted to firms that borrow from several banks, in columns (3) and (7) to firm exposure to **foreign banks** and in columns (4) and (5) this sample is restricted to bank-firm exposures that both involve relationship firms, i.e., firms with a strictly positive exposure to *treated bank* and the year prior to shock, and that are strictly positive in the first period. Standard errors are clustered at the bank and firm level in columns (1) to (8) and at the firm level in columns (9) and (10) and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.

Table 7. External Validity: The Introduction of Dynamic Loan Provisioning in Spain in 2000 and Bank Lending by Spanish Banks in Germany

Model	*Total Exposure*			*Intensive Margin*			*Extensive Margin*		
Dependent Variable	Δ log(Loan Exposure)			Δ log(Loan Exposure)			New Loan Dummy		
	OLS			*OLS*			*OLS*		Logit
Sample	All		Multibank Firms	Treated Firms		Treated Multibank Firms	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated	-2.52***	-1.62***	-1.90***	-1.68***	-0.52	-1.45***	-0.10***	-0.05**	-0.41***
	(0.27)	(0.35)	(0.50)	(0.51)	(0.57)	(0.51)	(0.02)	(0.02)	(0.15)
Firm FE	-	-	Yes	-	-	Yes	-	-	-
Firm Characteristics	Yes	Yes	-	Yes	Yes	-	Yes	Yes	Yes
Bank Characteristics	-	Yes	Yes	-	Yes	Yes	-	Yes	Yes
Relationship Ch.	-	-	-	Yes	Yes	Yes	-	-	-
Observations	162,949	137,882	122,522	17,605	16,816	16,808	162,949	137,882	137,882
R^2	0.094	0.102	0.422	0.011	0.057	0.381	0.132	0.142	
Pseudo R^2									0.119

This table reports the coefficients of OLS and Logit estimations. The dependent variable in columns (1) to (6) is the change in the log of bank-firm exposure as described in section 3, in columns (7) to (9) a dummy variable that is equal to one if a new loan is granted to a firm with currently zero exposure to the credit granting bank and is equal to zero otherwise. The initial sample comprises all bank-firm exposures involving firms that borrow from at least two banks headquartered in different countries during the 1994-2013 period. In columns (4) to (6) this sample is restricted to bank-firm exposures that both involve relationship firms, i.e., firms with a strictly positive exposure to *treated bank* and the year prior to shock, and that are strictly positive in the first period. Standard errors are clustered at the bank and firm level in columns (1) to (9) and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.

Table 8. External Validity: The Modification of Dynamic Loan Provisioning in Spain in 2005 and Bank Lending by Spanish Banks in Germany

Model	*Total Exposure*			*Intensive Margin*			*Extensive Margin*		
Dependent Variable	Δ log(Loan Exposure)			Δ log(Loan Exposure)			New Loan Dummy		
	OLS			*OLS*			*OLS*		Logit
Sample	All		Multibank Firms	Treated Firms		Treated Multibank Firms	All		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated	1.00***	0.72***	0.79***	0.60**	1.73**	1.61**	0.14***	0.05*	0.25
	(0.21)	(0.23)	(0.30)	(0.27)	(0.69)	(0.67)	(0.03)	(0.03)	(0.26)
Firm FE	-	-	Yes	-	-	Yes	-	-	-
Firm Characteristics	Yes	Yes	-	Yes	Yes	-	Yes	Yes	Yes
Bank Characteristics	-	Yes	Yes	-	Yes	Yes	-	Yes	Yes
Relationship Ch.	-	-	-	Yes	Yes	Yes	-	-	-
Observations	161,161	130,361	114,029	3,176	3,002	2,950	161,161	130,361	130,361
R^2	0.099	0.106	0.368	0.020	0.057	0.168	0.150	0.147	
Pseudo R^2									0.118

This table reports the coefficients of OLS and Logit estimations. The dependent variable in columns (1) to (6) is the change in the log of bank-firm exposure as described in section 3, in columns (7) to (9) a dummy variable that is equal to one if a new loan is granted to a firm with currently zero exposure to the credit granting bank and is equal to zero otherwise. The initial sample comprises all bank-firm exposures involving firms that borrow from at least two banks headquartered in different countries during the 1994-2013 period. In columns (4) to (6) this sample is restricted to bank-firm exposures that both involve relationship firms, i.e., firms with a strictly positive exposure to *treated bank* and the year prior to shock, and that are strictly positive in the first period. Standard errors are clustered at the bank and firm level in columns (1) to (9) and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.

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Appendix A - Figures

Appendix B - Tables

Table A1. The Introduction of the ACE for Banks in Italy in 2000 and Bank Equity Ratios

Dep. Variable	Ln(Equity Ratio)	Average Ln(Equity Ratio)	Ln(Equity)	Ln(Total Assets)
Treated x Post	0.061**	0.056*	0.025	-0.009
	(0.027)	(0.034)	(0.047)	(0.031)
Post	-0.040***	-0.074***	-0.056***	-0.009
	(0.008)	(0.008)	(0.008)	(0.009)
Bank FE	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Cluster	Yes	Yes	Yes	Yes
Observations	6,212	3,106	6,212	6,212

This table analyzes the impact of the introduction of the ACE on the capital structure of Italian banks in a differences-in-differences setup. The sample period is 1998-2001. Column (1), (3) and (4) show the regression of the logarithm of respectively the equity ratio, total equity and total assets, on a dummy variable *Post* that equals one in 2000-2001, and an interaction term *Post* × *Treated* where *Treated* indicates whether the bank is an Italian bank to captures the impact of the tax reform. Column (2) compares the difference in the average equity ratio over the 1998-1999 period with the average ratio over the 2000-2001 period between the treatment and the control group. The control group is obtained through a matching procedure described in Section 3. Models are estimated using OLS with bank fixed effects. Standard errors are clustered at the bank level and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.

Table A2. The Phasing Out of the Dual Income Tax in Italy in 2002 and Bank Equity Ratios

Dep. Variable	Ln(Equity Ratio)	Average Ln(Equity Ratio)	Ln(Equity)	Ln(Total Assets)
Treated x Post	-0.051*	-0.095**	0.035	0.046
	(0.030)	(0.047)	(0.037)	(0.028)
Post	0.044**	0.044	0.263***	0.203***
	(0.019)	(0.043)	(0.026)	(0.025)
Bank FE	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Cluster	Bank	Bank	Bank	Bank
Observations	1,281	514	1,281	1,281

This table analyzes the impact of the phasing out of the ACE on the capital structure of Italian banks in a differences-in-differences setup. The sample period is 2000-2003. Column (1), (3) and (4) show the regression of the logarithm of respectively the equity ratio, total equity and total assets, on a dummy variable *Post* that equals one in 2002-2003, and an interaction term *Post* × *Treated* where *Treated* indicates whether the bank is an Italian bank to captures the impact of the tax reform. Column (2) compares the difference in the average equity ratio over the 1998-1999 period with the average ratio over the 2000-2001 period between the treatment and the control group. The control group is obtained through a matching procedure described in Section 3. Models are estimated using OLS with bank fixed effects. Standard errors are clustered at the bank level and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.

Table A3. The Introduction of the Equity Tax Shield in Belgium in 2006 and Bank Equity Ratios

Dep. Variable	Ln(Equity Ratio) (1)	Average Ln(Equity Ratio) (2)	Ln(Equity) (3)	Ln(Total Assets) (4)
Treated x Post	0.178***	0.150**	0.187**	0.043
	(0.053)	(0.065)	(0.076)	(0.062)
Post	0.013	-0.084	0.199***	0.205***
	(0.018)	(0.054)	(0.033)	(0.038)
Bank FE	Yes	Yes	Yes	Yes
Bank Controls	Yes	Yes	Yes	Yes
Country Controls	Yes	Yes	Yes	Yes
Cluster	Bank	Bank	Bank	Bank
Observations	660	264	660	660

This table analyzes the impact of the introduction of the ACE on the capital structure of Belgian banks in a differences-in-differences setup. The sample period is 2003-2007. Column (1), (3) and (4) show the regression of the logarithm of respectively the equity ratio, total equity and total assets, on a dummy variable *Post* that equals one in 2006-2007, and an interaction term *Post* $\times$ *Treated* where *Treated* indicates whether the bank is an Belgian bank to captures the impact of the tax reform. Column (2) compares the difference in the average equity ratio over the 1998-1999 period with the average ratio over the 2000-2001 period between the treatment and the control group. The control group is obtained through a matching procedure described in Section 3. Models are estimated using OLS with bank fixed effects. Standard errors are clustered at the bank level and reported in brackets, * p<0.10, ** p<0.05, *** p<0.01.