Corporate tax changes and bank lending

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Abstract

This paper examines the effect of corporate taxation on the cost of credit. We employ corporate income tax rate changes across the U.S. states as a quasi-natural experiment to examine their implications on the pricing of syndicated loans. We find that changes in the state corporate tax rates have an asymmetric effect on the cost of credit: loan spreads decrease by approximately 5.9 basis points in response to a one percentage tax cut in the borrower's state, but they are insensitive to corporate tax rises. We show that the easing effect of tax cuts comes from changes in credit demand by firms and is primarily concentrated in firms with greater reliance on debt and own funds. The transmission of corporate tax cuts to loan spreads depends on the firm's access to alternative financing sources as firms with access to bond financing benefit to a greater extent.

Keywords: Corporate tax; Cost of credit; Syndicated lending; Loan demand.
JEL classification: G21; F31; F33; F34

1. Introduction

How do changes in corporate taxation affect the cost of credit? From an economics perspective corporate taxation is important for investment, consumption, and government policy goals. From a finance perspective, the determination of lending rates and overall borrowing costs is important for firms' corporate finance decisions and investment opportunities. Even though a large theoretical and empirical tax literature suggests that firms' financing decisions are highly sensitive to corporate taxes (see, e.g., Stiglitz, 1973; King, 1974; Mayer, 1986), there is limited empirical work identifying the effect of corporate tax changes on the cost of credit or empirical work identifying the mechanisms through which this effect is transmitted.

Theoretically, there are three mechanisms through which changes in corporate tax rates can affect credit costs: the one is supply (bank) driven and the other two demand (firm) driven. On the supply side, a change in the corporate tax rates changes the banks' profit maximizing behavior. Specifically, a decrease in corporate taxation (including taxes on banks) leads to an increase in banks' profitability, potentially releasing more loanable funds at lower cost. We refer to this as the *supply effect*.

On the demand side, one mechanism relates to the traditional Keynesian effect, where a decrease in corporate tax rates causes firms to increase investment, potentially expanding their credit demand. This implies a rightward shift in the loan demand curve. Without a concomitant shift in the loan supply curve, this mechanism implies an increase in lending rates, ceteris paribus. We refer to this as the *investment demand effect*.

Symmetrically with the supply effect, the third and perhaps most interesting mechanism works through the change in firms' profitability, liquidity, and capital structure. A decrease in the corporate tax rate, increases profits and reduces default probability. This implies a fall in the risk premium of the loan and a decrease in loan spreads. Moreover, this mechanism triggers firm incentives to restructure their debt, taking the opportunity to alter their tax shields and/or

turning to alternative ways of financing their operations. A tax decrease, and the associated increase in profitability and liquidity, induces firms to increase the use of retained earnings to finance operations, leading to a decrease in loan demand and a reduction in loan spreads. Moreover, interest payments are deductible from taxable income, and debt confers a tax benefit on borrowing firms, leading to a decrease in leverage. We call this the *profitability demand effect*. This mechanism is consistent with the literature on the persistent effects of taxation-driven debt-restructuring and leverage (see DeAngelo and Masulis, 1980; Stiglitz and Weiss, 1981; Auerbach, 2002; Heider and Ljungqvist, 2015) and the literature on alternative forms of financing (see Becker and Ivashina, 2014).[1]

Given these theoretical mechanisms, our contribution is twofold. We first identify a negative effect of tax cuts on the cost of borrowing, which rules out the investment demand effect. Subsequently, we shut down the supply effect using the structure of our dataset and examine the prevalence of the profitability demand effect through the identification of its mechanisms.

Our empirical analysis resorts to a quasi-natural experiment using the 147 staggered changes in corporate income taxes (47 tax increases in 24 States and 100 tax decreases in 27 States), levied by individual U.S. states from 1988 to 2015 (for similar implementation, see Heider and Ljungqvist, 2015). We match these tax changes with loan-level data from DealScan and with firm-level and bank-level data from Compustat. Our key outcome variable is the all-in-spread drawn (AISD), that is the loan spread over the LIBOR plus any facility fee.

We first find an asymmetric effect of corporate tax increases and corporate tax decreases on loan spreads. According to our baseline results, tax decreases lead to a significant negative effect: a one-point decrease of the corporate tax rate shaves approximately 6 basis

[1] On the same line, higher use of debt is positively related to firm-specific marginal tax rates; however, this depends on firm size, as small firms face different tax rates than large firms (MacKie-Mason, 1990; Graham, 1996; Gordon and Lee, 2001).

points from the AISD. Economically this is a sizeable effect, equal to a 2.7% lower AISD compared to the average in our sample. To put this number into perspective, for a loan of average size and duration, there is USD 1.26 million of reduced interest payments for the average borrower in our sample. In contrast, the effect of tax increases is statistically and economically insignificant. The negative overall effect of tax cuts on loan spreads provides evidence against the investment demand effect, which predicts an increase in loan spreads following tax cuts.

Next, we identify whether the effect of corporate tax changes on loan pricing is demand or supply driven. To control for the supply effect, we exploit the fact that banks give out more than one loans to different firms within one year (multiple loan observations within year). This allows including bank × year fixed effects, which saturate the model from annually-varying changes in the lead bank characteristics and the associated changes in the bank risk-taking incentives that might affect the cost of borrowing (Jiménez, Ongena, Peydró and Saurina, 2012; 2014; Delis et al., 2021). In even more stringent specifications, we use bank × quarter fixed effects, which saturate our model from quarterly-varying bank behaviors. Delving deeper into any supply-side explanations of our findings, we interact our indicators of corporate tax changes with equivalent indicators of corporate tax changes in the lender's state (Farre-Mensa and Ljungqvist, 2016) or with variables reflecting bank capitalization and liquidity (Kashyap and Stein, 2000; Jiménez, Ongena, Peydró and Saurina, 2014). We find that our results in the bank fixed effects models are very similar to the baseline, while the interaction terms of tax changes with relevant bank characteristics are statistically insignificant. These findings suggest against a supply effect and leave only the profitability demand channel open to affect our inferences.

To explicitly verify the operation of the profitability demand channel, we pinpoint the importance of firm characteristics and access to alternative sources of finance. We find that the

easing effect of corporate tax cuts on loan spreads is concentrated in firms with greater reliance on debt. Intuitively, these firms have reduced capacity to take on more bank debt at competitive interest rates, which decreases their demand for loans and consequently loan spreads. We complement this finding with evidence that the effect of tax cuts on loan spreads is lower for firms with higher retained earnings. An additional explanation is provided when considering firms' alternative financing sources. Arguably, firms with financing flexibility can achieve lower cost of credit, ceteris paribus. In this respect, firms with ability to issue public bonds, and therefore to substitute bank credit, face lower financing constraints. We find this to be the case, as firms obtaining bond financing experience even more the beneficial effect of corporate tax cuts on their loan spreads.

The study closer to ours is Agca and Igan (2019), who show that contractionary fiscal policy (both tax hikes and government spending cuts) causes a significant increase in loan spreads, attributed to an increase of the risk premium from the side of the lenders. Compared with Agca and Igan (2019), we aim to separately identify the mechanisms (especially distinguishing the supply-side effect from the demand-side effects) and find that what matters most is tax cuts (as opposed to tax hikes). Consistent with these premises, Smolyansky (2019) notes that increases in bank taxes reduce the credit supply within the state and increases the credit supply in neighboring states.

From a more general perspective, we also add to the literature of the general economic effects of corporate tax changes. Increases in corporate tax rates exert a sizeable direct negative effect on employee wages. This is because employee wages have a negative long-run elasticity with respect to taxation, also depending on the presence of collective bargaining (see Arulampalam, Devereux and Maffini, 2012; Fuest, Peichl and Siegloch, 2018). Corporate tax changes further matter for aggregate economic indicators, because higher effective corporate income taxes are mainly associated with lower investment in manufacturing, a larger unofficial

economy, and greater reliance on debt as opposed to equity finance (see Djankov, Ganser, McLiesh, Ramalho and Sleifer, 2010). This is further confirmed for changes at the United States federal level, as tax cuts raise real GDP (but not employment and consumption), while also exerting a sizeable effect on investment (see Romer and Romer, 2010; Mertens and Ravn, 2013).

The rest of the paper proceeds as follows. Section 2 presents the data and Section 3 discusses the empirical identification strategy. Section 4 presents and discusses the main empirical results, showing the impact of corporate tax changes on the firm cost of credit. Section 5 identifies the mechanisms for the transmission of tax changes to loan spreads and how this transmission varies according to certain bank and firm traits. Section 6 concludes the paper. An Internet Appendix provides several additional summary statistics and robustness checks.

2. Data

We obtain data from three sources. First, syndicated loan deals (at the facility level) for 1988-2015 are from DealScan, which includes the most comprehensive and historical loan-deal information available on the U.S. syndicated loan market. Second, we identify all state corporate income tax changes in the U.S. by extending the data of Heider and Ljungqvist (2015) and Farre-Mensa and Ljungqvist (2016). We find 47 tax increases in 27 States that are associated with 770 firms receiving 1,393 loans from 245 lead banks. We further observe 100 tax decreases in 32 States affecting 1,311 firms that received 3,104 loans from 184 lead banks. Figure 1 shows the magnitude and the number of these changes per State and year. Appendix Tables A1 and A2 list all corporate tax increases and decreases, respectively (including the States and years).

Third, we match the dataset with bank-specific and firm-specific characteristics from Compustat. The number of loan facilities for our baseline specifications ranges from 20,369 to 37,234, depending on the controls and the set of fixed effects used. These 37,234 loans are granted by 726 lead lenders headquartered in 24 states to 6,352 borrowers in 51 states. Table 1 defines all variables used in our empirical analysis and Table 2 reports summary statistics.

[Insert Figure 1 and Tables 1 & 2 about here]

2.1. Measures of tax changes and the cost of borrowing

In our baseline specifications, we employ binary tax-change indicators because not all tax changes can be quantified in terms of changes in marginal tax rates (Heider and Ljungqvist, 2015).[2] *Tax increase* is a binary variable equal to one for a corporate tax increase in the borrower's state in the current fiscal year, and zero otherwise. Similarly, *Tax decrease* is a binary variable equal to one for a corporate tax decrease in the borrower's state in the current fiscal year, and zero otherwise. In robustness tests, we replace our binary tax-change indicators with two continuous variables reflecting the actual changes (increase and decrease respectively) in the corporate tax rate.

Our binary and continuous tax-change measures include changes in the state corporate income tax, in the tax surcharge on tax liability, and in state tax deductibility. The measures exclude changes in the service rates (e.g., B&O service rates) in the capital stock/foreign franchise tax, and in the corporation franchise tax.[3] In robustness tests, we estimate specifications by including all types of changes.

[2] For example, the California 2002 and New Jersey 2002 tax increases or the Texas 2008 tax cut. The direction of the tax changes is, however, unambiguous (see Appendix Tables 1 and 2).

[3] Among the changes excluded from our baseline tax-change measures are the minimal changes in the Missouri corporation franchise tax (reduced gradually from 1/30 of 1% to 1/150 of 1% from 2012 to 2015 and then to 0% in 2016), the change in the calculation of the corporate tax rate on the basis of the primary rate and the change in top tax income bracket in Nebraska in 2008, the capital stock/foreign franchise tax changes in Pennsylvania occurring almost every year since 1998, and the rollback of all B&O service rates to 1.5% in Washington in 1998 and the increase in all B&) service rates from 1.5% to 1.8% from 2010 to 2013.

Our key outcome variable is the all-in-spread drawn (AISD), defined as the spread over the LIBOR plus any facility fee. Lenders generally use a menu of spreads and different fee types rather than a single price measure to ensure an appropriate expected return (Berg, Saunders and Steffen, 2016). Thus, we also use the all-in-spread undrawn (AISU), defined as the sum of the facility fee and the commitment fee. We find that other loan fees do not respond to tax-rate changes and thus exclude them from our analysis.

We identify the lender's and the borrower's state using their headquarters. In the event where a loan is provided by the parent bank's affiliate or subsidiary that operates in a different state than the parent, the lender's state is set as the state of the affiliate/subsidiary. Similarly, for firms receiving loans through their subsidiaries, we set the borrower's state as the state of the affiliate/subsidiary.[4]

2.2. Other variables

We include several control variables (thorough definitions in Table 1 and summary statistics in Table 2). Following the relevant literature (e.g., Ivashina, 2009; Hasan, Hoi, Wu and Zhang, 2017; Kim, 2019; Delis, Hasan and Ongena, 2020), we control for loan characteristics such as the log of the loan amount, loan maturity (in months), the number of lenders in the syndicate, dummies for loans having performance-pricing provisions and/or collateral, and the total number of covenants.[5] We use loan type fixed effects; these are very important as loan facilities include credit lines and term loans, which have fundamental differences in their contractual

[4] In addition to the presence of subsidiaries, we further adopt this approach in cases of mergers. A complete example is that of Paramount Petroleum Corporation, headquartered in the state of California, that was acquired in 2006 by Alon USA Energy Inc., headquartered in the state of Texas (the U.S.-based refining and marketing subsidiary of Alon Israel Oil Co. Ltd.). For loans received by Paramount Petroleum, we set the borrower's state as California, wheras for those received by Alon we set the borrower's state as Texas. Alon merged in 2017 with Delek US Holdings, Inc., headquartered in the state of Tennessee. In sensitivity tests, we further examine cases of cross-state loans, where the borrowing firm has an affiliate or subsidiary in the bank's state. To accomplish this, we identify all firms' subsidiaries in the bank's state. Similarly, we identify all banks' subsidiaries in the firm's state. In either case, the number of these cases is small. We discuss this further in Section 4.

[5] For robustness purposes, we further replace the number of total covenants in the loan contract with the number of financial covenants (*Financial covenants*) and the number of general covenants (*General covenants*).

arrangements and pricing (Berg, Saunders and Steffen, 2016). We also include loan purpose fixed effects (e.g., corporate purposes, working capital, takeovers or acquisitions, debt repayment, etc.).

At the bank-level, we use total assets (*Bank size*), the return on assets (*Bank ROA*), and non-performing loans (*Bank NPLs*). However, in most specifications we use bank × year fixed effects that make these variables redundant. More importantly, we use variables reflecting the willingness and capacity of banks to supply loans. Thus, we introduce bank capital (the ratio of total bank capital over total assets), which is the most widely used measure of the bank's agency problems (Holmstrom and Tirole 1997; Dell'Ariccia, Laeven and Marquez, 2014). We further use the bank's liquidity (ratio of bank liquid assets over total assets), as more liquid assets may prompt bank managers to expand their lending supply (Acharya and Naqvi 2012; Delis, Hasan and Mylonidis, 2017).

Our firm controls include size (*Firm size*), return on assets (*Firm return on assets*), and Tobin's Q (*Firm Tobin's Q*). We also include firm-year variables with the aim to specifically identify the demand-side channels. First, we use retained earnings (divided by total assets) because this variable contains information about expected returns that fluctuate following fiscal policy changes (e.g., Ball, Gerakos, Linnainmaa and Nikolaev, 2020). Next, we use leverage (*Firm leverage*) to examine the role of capital structure and indebtedness in the relation between tax changes and loan pricing decisions. In robustness tests, we also use borrower's risk-adjusted returns, as measured by the Altman's (1968) modified Z-score, as well as credit ratings, which are however available for fewer firms.

Last, we include macroeconomic controls. To distinguish between the effect of corporate tax changes at the state level and the respective at the federal level, we include the federal effective corporate tax rate. Moreover, we consider the stance of monetary policy, to avoid attributing our findings to the credit channel of monetary policy. On the supply side, the

commitment of a central bank for lower (future) interest rates induces banks to assume greater risk, thereby expanding lending supply (Maddaloni and Peydró, 2011; Altunbas, Gambacorta and Marques-Ibanez, 2014; Jiménez, Ongena, Peydró and Saurina, 2014; Delis, Hasan and Mylonidis, 2017; Paligorova and Santos, 2017). On the demand side, a low interest rate environment induces borrowers to demand more credit because of their higher asset and collateral values (Kashyap and Stein 2000). Finally, we use several fixed effects that are important for identification purposes, and we thoroughly discuss in the next section.

3. Anecdotal evidence and identification strategy

In Panel A of Table 3 we report summary statistics for key loan characteristics for firms not experiencing a state corporate tax change in a given year. Panel B reports their differences vs. firms experiencing an increase or a decrease, respectively, in the state corporate tax rate. Evidently, loans to firms in states with a corporate tax increase carry a 5.8 basis points higher *AISD* than loans to firms where the corporate tax does not change. However, this difference is only weakly statistically significant. In the case of a tax decrease, the difference is larger (7.3 basis points) and statistically significant at the 1% level. Moreover, we also observe a statistically significant lower *AISU*.

[Insert Table 3 about here]

We observe additional differences in the loan characteristics depending on the direction of the corporate tax change. First, loans granted to firms in states implementing a tax increase (decrease) in the current year carry a lower (higher) maturity relative to loans granted to firms in states where no tax change occurs. Moreover, loans to firms in states with tax increases, are typically granted from syndicates with fewer members, and carry fewer provisions and covenants. These are first-hand anecdotal evidence that loan spreads might be affected by

corporate tax changes; it remains to be examined whether there is a causal effect running from those changes to the cost of lending and pinpointing the channels through which this happens.

To this aim, the general form of our empirical model is:[6]

$$Cost\ of\ credit_{lbft} = a_0 + a_1 Tax\ increase_{st} + a_2 Tax\ decrease_{st} + \\ + a_3 Controls_{lbft} + u_{lbft} \quad (1)$$

In equation 1, $Cost\ of\ credit_{lt}$ measures the cost of loan facility l granted by lead bank b to firm f in year t. $Tax\ increase_{st}$ and $Tax\ decrease_{st}$ are the binary variables discussed previously and carry the coefficients of main interest in our analysis. We expect that a_1 and a_2 are positive and negative, respectively, if corporate tax changes significantly affect loan spreads. $Controls_{lfbt}$ is a vector of loan, firm, and bank characteristics used as control variables, the vector a_0 denotes a set of fixed effects described later and u_{lbft} is the remainder stochastic disturbance.

The first and key identification challenge is our effort to distinguish between the four theoretical mechanisms driving the relation between tax rate changes and loan spreads, beginning with the isolation of demand from supply forces.[7]

To distinguish between the demand channels and the supply channel, we alternatively use bank × year fixed effects to absorb annually varying, observed and unobserved bank heterogeneity affecting loan spreads. Effectively, these fixed effects control for supply-side explanations for our findings, such as bank-year changes in risk appetite, changes in loan

[6] Heider and Ljunqvist (2015), employ a model where binary indicators on state corporate income tax increases and decreases affect firm leverage in the state adopting the corporate tax changes. Farre-Mensa and Ljungqvist (2016), evaluate how well five popular measures (paying dividends, having a credit rating, and the Kaplan-Zingales, Whited-Wu and Hadlock-Pierce indices) identify financially constrained U.S. firms. They use several tests, among them, state corporate tax rate changes affecting banks that lend in the state the firm is headquartered.
[7] Our empirical model does not suffer from reverse causality: the corporate tax rate changes do not occur because of lending terms, especially as our outcome variable is observed at the loan-level.

supply, lenders' corporate governance, etc. (see Jiménez, Ongena, Peydró and Saurina, 2014). This means that we obtain identification from banks with at least two loan facilities extended within the same year, thus comparing changes in borrowing costs during the same year by the same bank to firms that differ in their demand for loan financing. In even more stringent specifications, we use bank × quarter fixed effects, comparing changes in borrowing costs of loans extended by the same bank in the quarter following the tax rate change.

A second identification challenge relates to selection issues. The first selection problem concerns the probability that firms apply for a loan (firms self-select themselves into the syndicated loan market), The second selection problem is that tax changes might not be random events but constitute a "treatment" for potentially unobserved state-year developments that affect firms. If these firm characteristics and behaviors also correlate with loan spreads, then the effect of the tax changes identified via the OLS fixed effects model will be biased. We overcome this challenge by employing Heckman's (1979) two-stage regression model. We further discuss the details of our approach below.

4. Empirical results

4.1. Baseline results

Table 4 reports the results (coefficient estimates and t-statistics) from the estimation of equation 1, using the OLS fixed effects model. We cluster standard errors by borrower's state (the unit of the analysis of *Tax increase* and *Tax decrease*). In the last row of each table, we report the number of banks and firms from which we obtain identification in the corresponding estimations.

In each column, we sequentially introduce different fixed effects, as denoted in the lower part of the table. Column 1 includes loan type, loan purpose, year, bank, and firm fixed effects. In column 2, we add bank × year fixed effects, which is a first important control for

time-varying supply-side explanations of the findings. In column 3, we introduce industry × year fixed effects to control for time-varying developments that affects all firms in a given industry. In column 4, we include bank × quarter fixed effects, thereby restricting our sample to banks that extend at least two loans in the same quarter. This specification further saturates the model from within-year (quarterly) changes in supply-side behavior. Across all specifications, the coefficients on *Tax increase* are statistically insignificant. In contrast, the coefficients on *Tax decrease* are consistently negative and statistically significant at conventional levels. We choose specification 2 as our baseline because it fully controls for bank-year effects (observed and unobserved), while the addition of industry × year fixed effects does not affect the results.

The coefficient on *Tax decrease* shows that a corporate tax cut in the state of the borrowing firm decreases *AISD* by an average of 5.9 basis points or 2.7% (= 5.9 basis points ÷ 216.6 basis points for the average loan in our sample). Given that the average loan size is USD 314 million, firms at states with tax cuts save approximately USD 0.19 million (= USD 314 million × 5.9 basis points) per year in reduced interest payments. For an average loan maturity of 3.9 years, this represents approximately USD 0.74 million in interest savings over the loan's duration.[8] Moreover, each borrowing firm in our sample receives on average 1.7 loans per year, thereby raising the overall savings arising from the firm's total borrowing operations to a substantial USD 1.26 million (= USD 0.74 million × 1.7 loans).

[Insert Table 4 about here]

The results in this table provide clear evidence against the investment demand effect, which predicts a positive coefficient. We note that saturating the model from the supply effect, via bank × year fixed effects, leaves the coefficient estimate on *Tax decrease* in columns 2 and

[8] Assuming four annual payments and LIBOR as the discount rate, the decrease in interest expense equals USD 2.77 million for the average 12-month LIBOR rate of 2.1% during our sample period (for similar calculations, see Ivashina and Sun, 2011).

3 almost intact compared to column 1 (where we do not include bank × year fixed effects). This is first-hand evidence that the supply effect is not potent. Thus, the profitability and capital-structure demand effects most probable drive our results. We disentangle these effects in the next section.

The size and magnitude of coefficients on the control variables in Table 4 are in line with expectations and relevant studies by Ivashina (2009), Cai, Saunders and Steffen (2018), and Delis, Hasan and Ongena (2020). Loan spreads decrease with the loan amount and maturity. The imposition of collateral causes an increase in *AISD*, as these loans are generally deemed to be riskier. Also, loans are more competitively priced when more performance provisions are included. The limited importance of bank-level variables in column 1 (and comparing the results with column 2) is another indication that supply-side forces might not be significant in our setting. Last, the estimates on the firm-level variables are largely anticipated. Specifically, greater size and return on assets are associated with decreasing *AISD*, while leverage increases spreads.

4.2. Heckman regressions

In this section, we address the possibility of selection bias driving our inferences. The first source of such bias is that tax changes might drive the firm's decision to use the syndicated loan market. We follow Dass and Massa (2011) and employ Heckman's (1979) two-stage model to control for the probability of a firm entering into a loan deal. In the first stage, we estimate a probit model on the firm's loan-taking decision. During this stage, our sample includes all syndicated loan facilities available in Dealscan.

In line with Dass and Massa (2011), we assume that the borrower's decision to access the syndicated loan market is a function of several loan, bank, and firm characteristics; a set of annual weights for the number, origin, and direction of loans made in a given year; and loan

type, loan purpose, year, bank, and firm dummies. The annual weights include the number of loans by a given bank (*Bank loans*), the number of loans to a given firm (*Firm loans*), and the number of loans between a given bank-firm and a given bank-borrower's state pair (*Bank-firm loans* and *Bank-state loans*, respectively).

We report estimates from the first stage in Table A4 of the Appendix, while results from the second stage are in Table 5. Probit estimates (columns 1-3 of Appendix Table A4), indicate that the lower a firm's size, return on assets, and leverage, the more likely is a firm to resort to syndicated loan financing. Moreover, firms requesting smaller loans, with shorter maturity, and with securitization are more likely to access the syndicated loan market.

We calculate Heckman's lambda (inverse mills ratio) from the first stage and include it as an additional control variable in the second stage OLS estimations. The second-stage regressions (columns 1-3 of Table 5) confirm the strong negative impact of the *Tax increase* on *AISD*. If anything, the estimates are somewhat stronger compared to our baseline.

In columns 4-5 of Appendix Table A4, we tackle the second potential selection problem, modelling the probability that the borrower's state will implement a corporate tax increase or decrease, respectively. To this end, we model the state's corporate tax decision as a function of macroeconomic and general economic characteristics at the state-level and federal-level. According to the first-stage results, almost all these variables affect the state's decision to proceed with a tax rate change, while their sign is generally in line with our expectations. In specific, lower GDP, inflation rate, personal income tax rate, and interbank rate increase the probability for a corporate tax rate cut in the borrower's state; moreover, corporate tax rates are more likely to decrease in states with Republican governors. The second stage estimates in columns 4-5 in Table 5 are almost identical to our baseline results.

Several robustness tests on the variables used in the first stage of both models also produce very similar results (available on request). Overall, we conclude that our baseline results are not driven by relevant selection bias.

4.3. Additional robustness checks

We perform several additional robustness tests to confirm the validity of our baseline estimates. First, we relax our definition on what qualifies as a corporate tax change and include all types.[9] Column 1 of Table 6 reports the results. Again, the coefficient on our corporate tax rise measure is statistically insignificant and the one on the corporate tax cut is negative and statistically significant. In fact, the effect of the latter is even stronger compared to our baseline: a corporate tax cut lowers spreads by 6.6 basis points.

[Insert Table 6 about here]

So far, we have lumped all tax changes (large and small) together by focusing on binary tax-change indicators. In column 2, we replace our binary tax-change indicators with the actual changes in the marginal tax rates. Again, the results show that loan spreads react negatively to decreases in corporate tax rates, while remaining unresponsive to corporate tax increases. In specification 3, we distinguish between large and small tax changes, by including separate indicators for tax changes in the top and bottom terciles of our sample. We find that although loan spreads react more strongly to large tax cuts, small decreases in the tax rate also lower *AISD*.

In column 1 of Table 7, we control for pipeline risk, namely the risk faced by lenders that they must retain larger shares in loans for which investors are willing to participate less than expected (Bruche, Malherbe and Meisenzahl, 2020). In fact, certain term loan facilities

[9] The difference between the two measures mainly concerns cases of corporate tax decreases, as the cases of corporate tax increases under both measures are approximately the same. Specifically, the number of corporate tax cuts in our sample increases from 3,104 to 4,240, while that of corporate tax increases from 1,393 to 1,398.

are structured specifically to appeal to institutional investors rather than banks: within a loan package, the lending syndicates for Term Loan B, C, and higher usually include nonbank lenders (Lim, Minton and Weisbach, 2014; Nadauld and Weisbach, 2012). Importantly, these loans often feature weak covenants, longer maturities, and very low amortization, that would require high capital requirements if banks were to hold them. Given that, we interact our tax change indicators with an indicator for non-amortizing loans (Term Loan B or higher). Results from column 1 confirm our baseline estimates, while provide no evidence of differential pricing of institutional term loans following the corporate tax cut (the non-significant coefficient on *Tax decrease* × *Institutional term loan*).[10]

[Insert Table 7 about here]

In columns 2 and 3, we augment our baseline specification with variables reflecting the stance of monetary policy. The risk-taking channel of monetary policy predicts a positive relation between expansionary monetary policy and bank risk-taking (Jiménez, Ongena, Peydró and Saurina, 2014; Delis, Hasan and Mylonidis, 2017). If low interest rates entice banks to take more risk, the asymmetric response of loan spreads to corporate tax changes might capture such risk differences induced by monetary policy shocks. Finally, low interest rates may increase firm credit demand through higher asset and collateral values (Kashyap and Stein 2000). To examine this, we initially consider the shadow short rate (three-month average), since it effectively measures the monetary policy stance when interest rates are near the zero-lower bound (e.g., Krippner, 2016). We observe that the estimate on the shadow rate is negative and statistically significant, consistent with the literature on the effect of monetary policy on loan spreads (see Delis, Hasan and Mylonidis, 2017; Paligorova and Santos, 2017). Subsequently, in specification 3 we include the Taylor residuals, which use inflation and the

[10] In unreported regressions we restrict our definition of institutional loans even further to include only Term Loan Bs, or differentiate between bank and non-bank creditors (institutional investors).

output gap as inputs for federal funds rate decisions (Taylor, 1993). In either specification, the coefficients on our indicators for tax rate changes are very similar to the baseline.

Loan spreads might also be subject to alternative supply-side forces stemming from corporate tax changes in the lender's state. To the extent that lenders are in a different state and such changes coincide with changes in the borrower's state, the response of loan spreads might be also driven by the decision of banks to relax or restrict credit supply following tax changes in their state of domicile. To examine this contingency, we interact our indicators for corporate tax changes in the borrower's state with equivalent indicators for the lender's state. In our sample, we observe 253 cases where there is a simultaneous tax hike in both the borrower's and lender's state, while there are 3,510 observations of a simultaneous tax cut in both states. Estimates in column 4 show that the effects of corporate tax changes do not differ based on whether there is a simultaneous tax change in the lending bank's state.

Finally, we examine the role of relationship lending. Prior lending relationships allow lenders to acquire valuable information about the borrowing firm's operations and credit risk. We expect that if the firm has a long-lasting relationship with the lead bank, asymmetric information is lower and lending terms are more competitive (see, e.g., Bharath, Dahiya, Saunders and Srinivasan, 2009; Dass and Massa, 2011). As such, our results on the easing effect of corporate tax cuts on loan spreads might not be attributed to firms' lower demand for credit but rather to the ability of relationship borrowers to obtain credit at more favorable terms relative to first-time borrowers. We examine this premise in column 5, where we interact our tax change indicators with an indicator on the existence of a prior lending relationship. Our estimates confirm the responsiveness of loan spreads to corporate tax cuts, while they provide no evidence of different lower spreads for relationship borrowers.

Our results are also robust to several additional robustness tests, the results of which we report and discuss in the Appendix. In specific, we estimate regressions with different

controls (at the loan- and firm-level), different standard error clustering, and different weights based on the number of loans directed to firms and borrower states. We further examine the role of political conditions as reflected in the timing of gubernatorial elections and the Governor's political affiliation (Republican or Democratic). Finally, we control for within-year developments in the lenders' and borrower's states, for bank and firm subsidiaries in the borrower's state and the lender's state respectively, as well as for firms headquartered in states with special corporate tax treatment (such as Delaware and South Dakota).

5. Identifying the mechanisms

Our results in section 4 provide strong indications for the profitability and capital-structure demand-driven effects. In this section, we delve deeper in identifying the mechanisms driving our baseline results and distinguishing between the two remainder channels: the profitability demand effect and the capital-structure demand effect. We further elaborate on the asymmetric effects of corporate tax changes by examining potential heterogeneity in the response of loan spreads to tax hikes.

5.1. Heterogeneity in the response to tax hikes

Having demonstrated that loan spreads are not sensitive to tax hikes, in this section we examine whether this insensitivity is homogeneous across economic conditions and borrower types. Our first exercise concerns the role of corporate tax changes at the federal level and how they interact with those at the state level in shaping firm borrowing costs. Changes at the federal level exert a direct as well as indirect effect on corporations, primarily by changing investment opportunities and wage settings (see, e.g., Djankov, Ganser, McLiesh, Ramalho and Sleifer, 2010). Moreover, since state corporate income taxes are generally lower relative to federal taxes, variation in the latter directly translates into variation in the total taxes a firm pays.

Hence, we hypothesize that a simultaneous tax hike at both the state- and federal-level might induce firm demand for credit, thereby driving loan spreads up. To examine this premise, we interact our state-level indicators with the proxies for federal corporate income tax shocks of Mertens and Ravn (2013). Estimates from column (1) in Table 8 show that although a state corporate tax increase alone is not material for loan spreads, it can nevertheless lead to a rise in *AISD* if it is complemented by an increase in the federal corporate tax rate. This indicates that to be effective, state-level corporate tax hikes should be accompanied by federal-level tax changes in the same direction. On the other hand, a corporate tax cut does not appear to interact with any changes in the federal corporate income tax rate.

[Insert Table 8 about here]

We further look for heterogeneities with regard to firm size, as this is likely to confer differential response mechanisms to higher corporate tax rates. Furthermore, larger firms often face lower borrowing costs, partly owing to presence of government guarantee. Given that, we expect that larger firms may resort to loan financing even in the presence of a rise in corporate taxes at more favourable loan rates. Results from column (2) confirm this conjecture, as greater firm size exerts a negative differential effect on *AISD* following a tax hike. This is further confirmed in column (3), where we further distinguish between firms with total assets above and below our sample mean. The key takeaway from this exercise is that the insensitivity of loan spreads to state corporate tax hikes is not homogeneous across firms; it is rather contingent on the prevailing federal corporate tax rate and the nature of the borrowing firm.

5.2. Further evidence on the absence of supply effects

Table 7 includes the interaction of our tax indicators with banks' liquidity and capital adequacy. These are key variables in the literature identifying the credit channel of monetary policy (e.g., Kashyap and Stein, 2000; Jiménez, Ongena, Peydró and Saurina, 2014). Banks hold cash and

other liquid assets to manage liquidity risk, and this might be especially important in times of crises, or when faced with monetary or fiscal policy shocks. Moreover, well-capitalized banks are better in buffering policy shocks (e.g., Ivashina and Scharfstein, 2010; Cornett, McNutt, Strahan and Tehranian, 2011; Thakor, 1996; Gambacorta and Mistrulli, 2004). Thus, we expect that for an operative supply effect, there will be a differential effect of tax changes for banks with different levels of liquidity and capital. However, both specifications of Table 9 show that the relevant interaction terms are statistically non-significant. Thus, our results confirm the limited role of supply-side forces for the effect of tax changes on loan spreads, consistent with our findings in Table 4 and the role of bank × year fixed effects.

[Insert Table 9 about here]

5.3. Further evidence on the existence of demand effects

In this section, we pinpoint the potential demand-side explanations of our baseline findings, consistent with the profitability demand effect. Along the lines of the previous section, in Table 9 we interact our tax change indicators with relevant firm characteristics. Profitable firms are more likely to incur tax liabilities, making top marginal statutory corporate tax rates to be more relevant for these firms compared to less-profitable ones (see Faccio and Xu, 2015). As such, we expect that the loan spreads of profitable firms are more sensitive to corporate tax changes. Moreover, corporate tax rates affect differently firms with higher cash holdings, especially during tax uncertainty (see Hanlon, Maydew and Saavedra, 2017). We hypothesize that corporate tax cuts, through the associated increase in liquidity, will induce firms to increase the use of retained earnings to finance operations, leading to a decrease in loan demand and a reduction in loan spreads.

To examine this conjecture, we interact our corporate tax change indicators with the level of retained earnings. Estimates from specification 1 of Table 10 show that the decrease

in firm borrowing costs following the corporate tax cut is indeed primarily observed for firms with higher retained earnings. Economically, a one standard deviation (or 17.4%) increase in the firm's retained earnings to total assets ratio enables the firm to receive a 5.4% basis points discount on its loans (coefficient on *Tax decrease* × *Firm retained earnings*).

[Insert Table 10 about here]

The second key element backing the profitability demand channel relates to firms' incentives to change their capital structure. The U.S. tax system subsidizes firms' use of debt, thereby making interest payments tax deductible. Thus, in theory, firms take on more debt to take advantage of the debt's favorable tax treatment. In practice, although there is some evidence that corporate taxes are a first-order determinant of capital structure (Faccio and Xu, 2015; Heider and Ljungqvist, 2015), there is no consensus on whether changes in corporate income tax rates are actually linked to corporate capital structure (Graham, 2003; Fleckenstein, Longstaff and Strebulaev, 2020).

We report estimates in column 2 of Table 10, where we observe a statistically significant coefficient on the interaction term between *Tax decrease* and *Firm leverage*, while the main term on *Tax decrease* becomes statistically insignificant. This is an important result of our paper, showing that the negative effect of a decrease in corporate tax rates on loan spreads comes from firms with greater reliance on debt. Therefore, our findings are fully consistent with the capital structure part of the profitability demand channel.[11]

Our last test in this section concerns firms' access to bond financing, explicitly testing for the possibility of loan-to-bond substitution. By construction, this test rests on the least financially constrained firms, whose investment may be the least sensitive to the supply of bank credit. The basic mechanism behind the identification is that firms issue bonds because bonds

[11] Introducing additional interaction terms with firm Z-scores and credit ratings yields similar inferences (results available on request).

are cheaper or more accessible than loans, thereby decreasing even further their demand for bank credit (e.g., Becker and Ivashina, 2014). Thus, it is the firms that can substitute bonds for loans that are most likely to be affected by the decrease in corporate tax rates. As specification 3 shows, firms obtaining bond financing enjoy a decline in their loan spreads for a given decrease in the corporate tax rate (negative and statistically significant coefficient on *Tax decrease* × *Bond issue*).

6. Conclusion

This study examines the sensitivity of firm borrowing costs to corporate income tax changes. This is important considering the current debate on the efficiency of corporate income tax cuts. To conduct our empirical analysis we consider a natural experiment consisting of 147 changes in corporate income tax rates across U.S. states. By distinguishing between increases and decreases in the corporate tax rate we examine their effects on the pricing of more than 37,000 syndicated loans during the 1988-2015 period.

We find that loan spreads decrease by approximately 5.9 basis points in response to a cut in the corporate tax rate in the borrowing firm's state but are insensitive to corporate tax rises. This spread decrease represents USD 0.74 million of interest savings for the average loan or 1.26 for the average firm's total borrowing operations. Our results persist in an array of sensitivity exercises and alternative estimation methods and are mostly attributed to demand-side forces. In this regard, the easing effect of corporate tax cuts on loan spreads is primarily observed for firms, with greater reliance on debt. Arguably, their limited capacity to take on more debt at competitive interest rates, decreases their demand for loans and consequently loan spreads. We find this to be a credible mechanism, since loan spreads further decrease for firms with greater reliance on own funds.

An alternative mechanism operates through the firms' access to alternative financing sources. The additional financing flexibility, increased transparency and constant communication with market participants that is associated with issuing public bonds allows firms using bond financing to benefit more from the easing effect of corporate tax cuts. Our analysis further reveals that the easing effect of corporate tax cuts is more potent in the year of the tax change, when occurring in the middle of the political cycle, while it is entirely reversed under Republican gubernatorial administration. Moreover, their effect is independent of fiscal fundamentals in the borrower's state.

Our analysis is an important first step in identifying the ability of state corporate tax changes to the affect firm borrowing costs and the underlying mechanisms. An additional question is whether and these changes influence the firm borrowing behavior and the choice between bank and non-bank financing; we leave that to future research.

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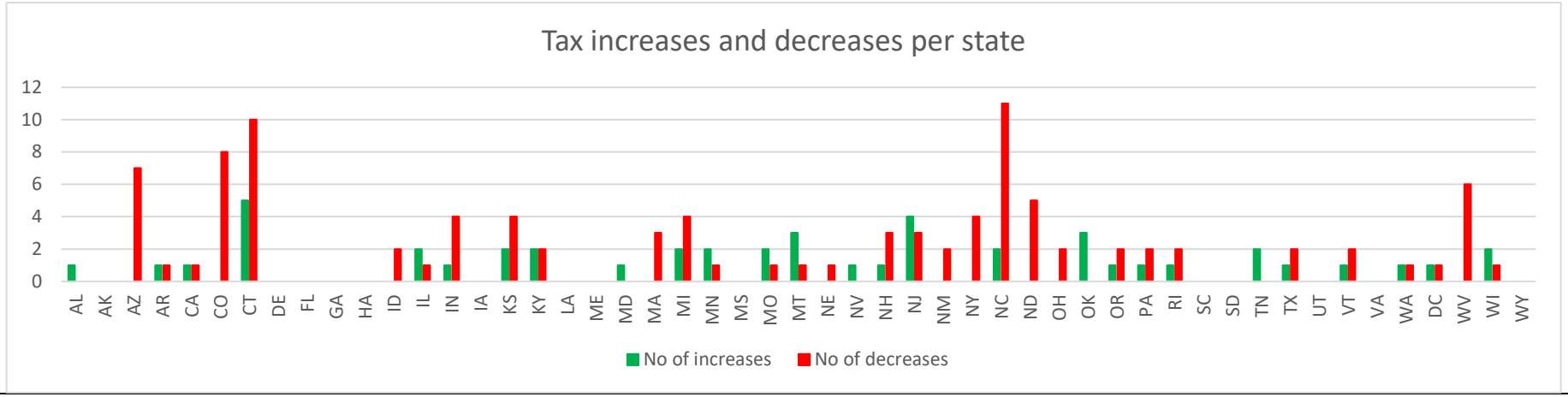
Figure 1. Number and average level of tax increases and tax cuts per State and per year

Panel A depicts the number of tax increases and decreases per state. Panel B shows on the left the number of tax increases and decreases per year. The dots show the average increase or decrease measured in the right-hand axis.

Panel A



Panel B

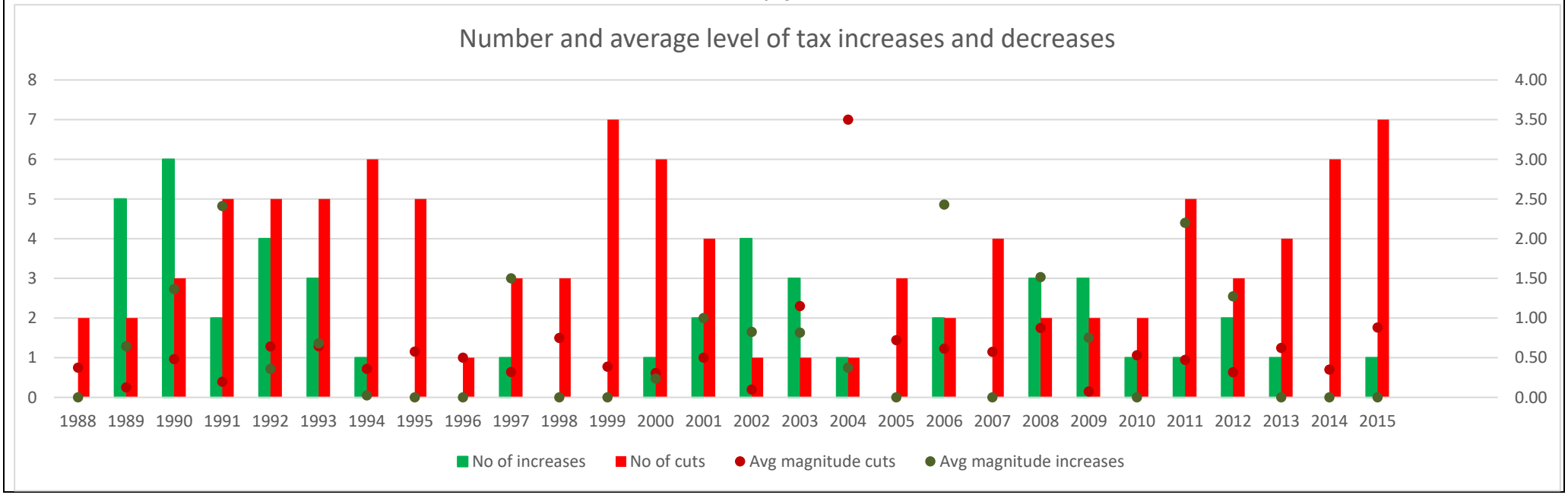


Table 1. Variable definitions and sources

Variable	Description	Source
A. The dependent variables in main specifications		
AISD	All-in spread drawn, defined as the sum of the spread over LIBOR plus any facility fee.	DealScan
AISU	All-in spread undrawn, defined as the sum of the facility fee and the commitment fee.	DealScan
B. Main explanatory variables: State corporate tax changes		
Tax increase	A binary variable equal to one for an increase in the corporate income tax rate in the state of the borrower during the year of the loan, and otherwise zero. The variable includes changes in the state corporate income tax, in the tax surcharge on tax liability, and in state tax deductibility, and excludes changes in the service rates (e.g., B&O service rates) in the capital stock/foreign franchise tax, and in the corporation franchise tax. The variable *Tax increase (all types)* is the equivalent variable including all changes. The variable *Tax increase (rate)* is the equivalent numerical increase in the corporate income tax rate.	Heider and Ljungqvist (2015) and own estimations
Tax decrease	A binary variable equal to one for a decrease in the corporate income tax rate in the state of the borrower during the year of the loan, and otherwise zero. The variable includes changes in the state corporate income tax, in the tax surcharge on tax liability, and in state tax deductibility, and excludes changes in the service rates (e.g., B&O service rates) in the capital stock/foreign franchise tax, and in the corporation franchise tax. The variable *Tax decrease (all types)* is the equivalent variable including all changes. The variable *Tax decrease (rate)* is the equivalent numerical decrease in the corporate income tax rate (in absolute value).	Heider and Ljungqvist (2015) and own estimations
Tax increase (lender's state)	A binary variable equal to one for an increase in the corporate income tax rate in the state of the lender during the year of the loan, and otherwise zero. The variable includes changes in the state corporate income tax, in the tax surcharge on tax liability, and in state tax deductibility, and excludes changes in the service rates (e.g., B&O service rates) in the capital stock/foreign franchise tax, and in the corporation franchise tax.	Farre-Mensa and Ljungqvist (2016) and own estimations
Tax decrease (lender's state)	A binary variable equal to one for a decrease in the corporate income tax rate in the state of the lender during the year of the loan, and otherwise zero. The variable includes changes in the state corporate income tax, in the tax surcharge on tax liability, and in state tax deductibility, and excludes changes in the service rates (e.g., B&O service rates) in the capital stock/foreign franchise tax, and in the corporation franchise tax.	Farre-Mensa and Ljungqvist (2016) and own estimations
C. Explanatory variables: Loan characteristics		
Loan amount	Log of the loan facility amount in USD.	DealScan
Maturity	Loan duration in months.	DealScan
Collateral	A binary variable equal to one if the loan is secured with collateral, and zero otherwise.	DealScan
Number of lenders	The number of banks involved in the syndicated loan.	DealScan
Performance provisions	A binary variable equal to one if the loan has performance pricing provisions, and zero otherwise.	DealScan
General covenants	The total number of covenants in the loan contract.	DealScan
Financial covenants	The number of financial covenants in the loan contract.	DealScan
Net covenants	The number of net covenants in the loan contract.	DealScan
Loan type	A series of binary variables indicating loan type (e.g., term loans, revolvers, etc.).	DealScan
Loan purpose	A series of binary variables indicating loan purpose (e.g., corporate purpose, debt repay, etc.).	DealScan
D. Explanatory variables: Lender characteristics		
Bank size	The log of total bank assets.	Compustat
Bank return on assets	The return on total bank assets.	Compustat
Bank NPLs	The ratio of non-performing loans to total loans.	Compustat
Bank liquidity	The ratio of liquid assets to total assets.	Compustat

Bank capital	The ration of capital to total assets.	Compustat
Bank Lerner index	The Lerner index of the bank, which equals (p-mc/p), where p is the average lending rate given by each bank in each year and mc is the marginal cost of producing bank output (also at the bank-year). We proxy the lending rate from the ratio of interest income to total commercial loans and we estimate the marginal cost from the non-parametric estimation of a cost function. We provide more details at the end of this Appendix.	Compustat and own estimations
Bank subsidiary	A binary variable equal to one if the bank operates an establishment in the borrower's state, and zero otherwise.	DealScan and own estimations

E. Explanatory variables: Borrower characteristics

Firm size	The log of total firm assets.	Compustat
Firm return on assets	The return on total firm assets.	Compustat
Firm leverage	The ratio of total debt to total assets.	Compustat
Firm common equity	The ratio of common shareholders' equity to total assets.	Compustat
Firm retained earnings	The ratio of retained earnings to total assets.	Compustat
Firm Z-score	The Altman's (1968) Z-score of the firm.	Compustat and own estimations
Firm rating category	The credit rating category of the firm. The rating categories range from 1 to 4 with higher categories including higher credit ratings (category 1 includes ratings from AAA to AA-, category 2 includes ratings from A+ to A-, category 3 includes ratings from BBB+ to B- and category 4 includes ratings below B-).	S&P Credit Ratings
Bond issue	A binary variable equal to one if the firm issues a bond in the current year, and zero otherwise.	SDC
Firm subsidiary	A binary variable equal to one if the firm operates an establishment in the lender's state, and zero otherwise.	DealScan and own estimations

F. Explanatory variables: Lender-borrower level

Relationship lending	A binary variable equal to one for a prior loan facility between the lender and the borrower in the 5-year period before the loan facility's origination year, and zero otherwise.	DealScan
Relationship lending number	The ratio of the number of prior loan facilities between the lender and the borrower in the 5-year period before the loan facility's origination year to the total number of loans received by the borrower during the same period.	DealScan
Relationship lending amount	The ratio of the amount of prior loan facilities between the lender and the borrower in the 5-year period before the loan facility's origination year to the total amount of loans received by the borrower during the same period.	DealScan

G. Explanatory variables: State-level

Budget balance	The government budget balance in the borrower's state in the year before the loan facility origination year (USD million).	

H. Explanatory variables: Federal-level

Effective corporate tax rate	The federal corporate income tax effective rate in the year before the loan facility origination year.	Own estimations
Shadow rate	The quarterly shadow short rate (Krippner, 2016).	Krippner (2016)
Taylor residuals	The quarterly Taylor residuals, calculated as the residuals from the regression of the federal funds rate on the output gap and the inflation rate.	Own estimations
Federal tax change	The federal corporate income tax shock in the quarter before the loan facility origination quarter (Mertens and Ravn, 2013).	Mertens and Ravn (2013)

Table 2. Summary statistics

The table reports summary statistics (number of observations, mean, standard deviation, minimum and maximum values) for all variables used in the estimations of the main text. All variables are defined in Table 1.

	Obs.	Mean	Std. dev.	Min.	Max.
AISD	37,234	216.64	145.77	0.70	1,655.00
AISU	21,834	32.21	23.66	0.75	750.00
Tax increase	37,234	0.04	0.19	0.00	1.00
Tax increase (all types)	37,234	0.04	0.19	0.00	1.00
Tax increase (rate)	37,061	0.05	0.43	0.00	5.06
Tax decrease	37,234	0.08	0.28	0.00	1.00
Tax decrease (all types)	37,234	0.11	0.32	0.00	1.00
Tax decrease (rate)	37,061	0.04	0.18	0.00	3.05
Loan amount	37,234	18.29	1.80	9.21	24.62
Loan amount (USD million)	37,234	314.00	772.00	0.01	49,000.00
Maturity	37,234	47.32	24.70	0.00	396.00
Collateral	37,234	0.57	0.50	0.00	1.00
Number of lenders	37,234	7.63	8.80	1.00	176.00
Performance provisions	37,234	0.39	0.49	0.00	1.00
General covenants	37,234	1.43	1.60	0.00	7.00
Bank size	23,553	13.04	1.48	5.73	16.45
Bank return on assets	22,585	1.42	1.05	-3.61	21.62
Bank NPLs	21,048	1.85	1.79	0.05	11.72
Bank liquidity	17,788	4.35	2.13	0.00	29.29
Bank capital	24,084	12.58	1.56	8.70	19.94
Firm size	37,234	6.78	2.02	-6.91	18.44
Firm return on assets	37,234	4.72	9.87	-50.91	30.97
Firm leverage	37,234	32.54	25.42	0.00	286.03
Firm Tobin's Q	37,234	0.38	0.35	-1.59	1.61
Firm retained earnings	17,016	19.96	17.41	0.00	99.04
Firm Z-score	22,412	2.13	1.22	0.50	8.96
Firm rating category	11,425	3.06	0.74	1.00	4.00
Bond issue	8,192	0.11	0.31	0.00	1.00
Relationship lending	37,234	0.35	0.48	0.00	1.00
Effective corporate tax rate	37,234	0.41	0.02	0.35	0.45
Shadow rate	24,084	2.53	3.29	-5.20	6.54
Taylor residuals	37,234	-0.01	0.40	-1.37	1.14
Federal tax change	29,011	-0.02	0.40	-2.50	2.68

Table 3. Summary statistics for corporate tax changes and non-changes

The table reports summary statistics for key price and non-price loan terms. All variables are defined in Table 1. Panel A includes observations with no change in the corporate tax rate in the borrower's state. Panel B includes observations with an increase in the corporate tax rate in the borrower's state. Panel C includes observations with a decrease in the corporate tax rate in the borrower's state. Panel B reports results from the mean-comparison test for differences in the mean and standard error between observations with no change in the corporate tax rate in the borrower's state and observations with an increase in the corporate tax rate (No change vs. tax increase) and between observations with no change in the corporate tax rate in the borrower's state and observations with a decrease in the corporate tax rate (No change vs. tax decrease). The*** mark denotes statistical significance at 1% level.

	Obs.	Mean	Std. dev.	Min.	Max.
Panel A: No change in state corporate tax rate					
AISD	32,737	217.03	146.17	0.70	1,655.00
AISU	19,251	32.28	23.76	1.11	750.00
Loan amount	32,737	18.30	1.79	10.60	24.62
Maturity	32,737	47.25	24.63	0.00	396.00
Collateral	32,737	0.57	0.50	0.00	1.00
Number of lenders	32,737	7.63	8.79	1.00	176.00
Performance provisions	32,737	0.40	0.49	0.00	1.00
General covenants	32,737	1.44	1.60	0.00	7.00

Panel B: Mean-comparison test for the mean and standard error

	No change vs. tax increase		No change vs. tax decrease	
	Mean	Std. error	Mean	Std. error
AISD	5.76*	4.13	-7.25***	2.62
AISU	0.37	0.94	-1.03**	0.53
Loan amount	0.13	0.05	-0.02	0.35
Maturity	-2.39***	0.69	1.88***	0.47
Collateral	-0.01	0.01	-0.00	0.01
Number of lenders	-0.33*	0.22	0.17	0.17
Performance provisions	-0.04**	0.01	-0.02**	0.01
General covenants	-0.17***	0.04	-0.01	0.03

Table 4. Baseline results with different fixed effects

The table reports coefficients and t-statistics (in brackets). The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. Each specification includes a different set of fixed effects, as given in the penultimate part of the table. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Tax increase	-0.950	1.204	1.314	2.995
	[-0.288]	[0.299]	[0.319]	[0.846]
Tax decrease	-5.849**	-5.866***	-6.060***	-5.036**
	[-2.317]	[-3.209]	[-3.141]	[-2.520]
Loan amount	-10.251***	-11.235***	-11.163***	-10.538***
	[-10.318]	[-16.440]	[-16.808]	[-16.865]
Maturity	-0.227***	-0.243***	-0.239***	-0.187***
	[-3.442]	[-4.972]	[-4.885]	[-3.534]
Collateral	32.481***	32.671***	31.975***	32.413***
	[11.048]	[15.421]	[14.365]	[18.306]
Number of lenders	-0.122	-0.009	-0.022	-0.059
	[-0.925]	[-0.083]	[-0.223]	[-0.629]
Performance provisions	-22.493***	-24.141***	-23.575***	-23.548***
	[-8.768]	[-11.509]	[-11.921]	[-11.505]
General covenants	3.049***	2.436***	2.574***	2.835***
	[3.111]	[3.184]	[3.382]	[3.426]
Bank size	-8.598			
	[-1.554]			
Bank return on assets	0.612			
	[0.216]			
Bank NPLs	-1.303			
	[-0.775]			
Firm size	-12.465***	-14.844***	-15.367***	-14.281***
	[-4.506]	[-7.400]	[-7.583]	[-6.498]
Firm return on assets	-168.552***	-128.873***	-1.297***	-1.298***
	[-10.140]	[-12.716]	[-14.783]	[-11.146]
Firm leverage	64.379***	69.134***	0.694***	0.706***
	[5.619]	[9.176]	[9.473]	[9.196]
Firm Tobin's Q	-26.727***	-31.245***	-31.951***	-32.867***
	[-6.803]	[-8.350]	[-8.014]	[-8.810]
Effective corporate tax rate	13.853	28.506	7.499	
	[0.118]	[0.394]	[0.104]	
Constant	586.683***	506.125***	516.757***	498.080***
	[8.263]	[15.380]	[15.847]	[29.188]
Observations	20,362	37,234	37,061	35,178
Adj. R-squared	0.718	0.731	0.732	0.750
Loan type	Y	Y	Y	Y
Loan purpose	Y	Y	Y	Y
Year effects	Y	N	N	N
Bank effects	Y	N	N	N
Firm effects	Y	Y	Y	Y
Borrower's state effects	Y	Y	Y	Y
Bank × year effects	N	Y	Y	N
Industry × year effects	N	N	Y	Y
Bank × quarter effects	N	N	N	Y
Number of banks	143	726	716	675
Number of firms	3,697	6,352	6,292	6,032

Table 5. Heckman regressions

The table reports the estimates from the second-stage OLS regression for the effect of state corporate income tax changes on loan spreads (the first-stage estimates are reported in Appendix Table A4). The dependent variable is *AISD* and all variables are defined in Table 1 The estimation method is OLS with standard errors clustered by borrower's state. Each of the specifications includes the inverse mills ratio (*Lambda*) from the corresponding first-stage specification. The lower part of panel B denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Tax increase	-1.429	0.658	0.870	0.433	0.090
	[-0.435]	[0.188]	[0.247]	[0.111]	[0.023]
Tax decrease	-7.804***	-7.520***	-7.482***	-5.820***	-5.547***
	[-3.059]	[-2.872]	[-2.748]	[-3.075]	[-2.930]
Loan amount	-19.867***	-21.239***	-13.649***	-11.121***	-11.119***
	[-7.022]	[-9.356]	[-6.406]	[-16.416]	[-16.421]
Maturity	-0.337***	-0.370***	-0.248***	-0.236***	-0.236***
	[-5.118]	[-4.773]	[-3.858]	[-4.878]	[-4.874]
Collateral	36.562***	36.248***	32.491***	32.571***	32.537***
	[12.080]	[12.890]	[11.233]	[15.486]	[15.451]
Number of lenders	-2.432***	-2.219***	-0.826**	-0.024	-0.026
	[-3.505]	[-5.804]	[-2.109]	[-0.240]	[-0.252]
Performance provisions	-31.436***	-29.002***	-23.954***	-24.075***	-24.113***
	[-7.662]	[-10.794]	[-7.125]	[-11.411]	[-11.387]
General covenants	1.476	1.756	2.314*	2.378***	2.387***
	[1.168]	[1.495]	[1.894]	[3.032]	[3.056]
Firm size	-16.861***	-16.961***	-13.695***	-14.699***	-14.690***
	[-5.702]	[-5.558]	[-4.537]	[-7.347]	[-7.382]
Firm return on assets	-182.753***	-188.328***	-172.971***	-1.277***	-1.277***
	[-10.131]	[-11.793]	[-10.179]	[-13.185]	[-13.177]
Firm leverage	57.158***	50.725***	60.515***	0.689***	0.689***
	[4.886]	[4.570]	[5.251]	[9.166]	[9.135]
Firm Tobin's Q	-23.524***	-23.615***	-24.679***	-31.495***	-31.499***
	[-6.456]	[-7.222]	[-7.426]	[-8.503]	[-8.503]
Effective corporate tax rate	-25.158	-121.196	-57.658	34.066	91.899
	[-0.199]	[-1.003]	[-0.482]	[0.234]	[0.908]
Lambda	121.545***	126.572***	38.461*	-1.153	7.954
	[3.529]	[6.386]	[1.759]	[-0.126]	[0.963]
Constant	583.926***	647.980***	536.828***	503.665***	461.808***
	[8.953]	[9.736]	[8.588]	[11.322]	[8.192]
Observations	20,149	19,021	19,021	36,824	36,824
Adj. R-squared	0.789	0.793	0.792	0.797	0.797
Fixed effects	Y	Y	Y	Y	Y
Number of banks	136	112	112	723	723
Number of firms	3,667	3,527	3,527	6,305	6,305

Table 6. Alternative tax change measures

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of alternative corporate income tax change measures. The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), *Tax increase (all types)* and *Tax decrease (all types)* include all types of corporate income tax changes. In specification (2), *Tax increase (rate)* and *Tax decrease (rate)* include actual changes in the corporate income tax rate. In specification (3), *Large (small) increase (decrease)* is a binary variable equal to one if the actual change in the corporate income tax rate is in the top (bottom) tercile of the sample, and otherwise zero. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Tax increase (all types)	0.923		
	[0.232]		
Tax decrease (all types)	-6.615***		
	[-3.502]		
Tax increase (rate)		-0.224	
		[-0.114]	
Tax decrease (rate)		-4.828**	
		[-2.188]	
Large tax increase			-1.247
			[-0.173]
Small tax increase			1.468
			[0.270]
Large tax decrease			-7.697*
			[-1.945]
Small tax decrease			-5.250*
			[-1.842]
Loan amount	-11.231***	-11.171***	-11.237***
	[-16.418]	[-13.590]	[-13.860]
Maturity	-0.242***	-0.240***	-0.243***
	[-4.954]	[-3.299]	[-3.451]
Collateral	32.666***	31.969***	32.664***
	[15.426]	[12.261]	[12.495]
Number of lenders	-0.007	-0.023	-0.009
	[-0.070]	[-0.214]	[-0.081]
Performance provisions	-24.150***	-23.527***	-24.129***
	[-11.473]	[-9.581]	[-9.540]
General covenants	2.434***	2.563***	2.434***
	[3.182]	[2.996]	[2.843]
Firm size	-14.856***	-15.412***	-14.860***
	[-7.412]	[-8.307]	[-7.751]
Firm return on assets	-1.291***	-1.298***	-1.289***
	[-12.697]	[-12.234]	[-11.002]
Firm leverage	0.691***	0.695***	0.692***
	[9.163]	[7.424]	[7.179]
Firm Tobin's Q	-31.236***	-31.980***	-31.230***
	[-8.366]	[-7.557]	[-7.703]
Effective corporate tax rate	30.893	2.296	27.106
	[0.425]	[0.018]	[0.216]
Constant	505.420***	519.098***	506.812***
	[15.258]	[10.677]	[10.504]
Observations	37,234	37,061	37,061
Adj. R-squared	0.731	0.731	0.730
Fixed effects	Y	Y	Y
Number of banks	726	726	726
Number of firms	6,352	6,292	6,292

Table 7. Robustness checks

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of the shadow rare, the corporate tax changes in the lender's state, the corporate income tax changes at the federal level and the budget balance in the borrower's state. The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we double-interact *Tax increase* and *Tax decrease* with *Institutional term loan*, i.e., a binary variable equal to one if the loan facility is a non-amortizing term loan (Term Loan B or higher), and zero otherwise. In specification (3), we include as an additional control variable *Taylor residuals*, i.e. the quarterly Taylor residuals. In specification (2), we include as an additional control variable *Shadow rate*, i.e. the quarterly shadow short rate. In specification (3), we include as an additional control variable *Taylor residuals*, i.e. the quarterly Taylor residuals. In specification (4), we double-interact *Tax increase* and *Tax decrease* with *Lender's state tax increase*. i.e., a binary variable equal to one for an increase in the corporate income tax rate in the state of the lender, and zero otherwise and *Lender's state tax decrease*. i.e., a binary variable equal to one for a decrease in the corporate income tax rate in the state of the lender, and zero otherwise. In specification (5), we double-interact *Tax increase* and *Tax decrease* with *Relationship lending*, i.e., a binary variable equal to one for a prior lending relationship between the lender and the borrower during the previous 2-year period, and zero otherwise. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Tax increase	-0.716	2.126	1.207	2.187	-0.988
	[-0.196]	[0.582]	[0.300]	[0.593]	[-0.243]
Tax decrease	-5.387**	-6.262**	-5.868***	-7.495***	-6.623**
	[-2.635]	[-2.321]	[-3.202]	[-2.981]	[-2.587]
Tax increase × Institutional term loan	8.325				
	[1.193]				
Tax decrease × Institutional term loan	-1.938				
	[-0.687]				
Shadow rate		-2.160*			
		[-1.777]			
Taylor residuals			-0.221		
			[-0.114]		
Tax increase × Lender's state tax increase				-25.970	
				[-1.667]	
Tax decrease × Lender's state tax decrease				7.225	
				[1.219]	
Tax increase × Relationship lending					7.050
					[1.382]
Tax decrease × Relationship lending					-0.081
					[-0.018]
Observations	37,234	29,339	37,234	31,258	37,243
Adj. R-squared	0.731	0.731	0.731	0.732	0.719
Full set of controls	Y	Y	Y	Y	Y
Fixed effects	Y	Y	Y	Y	Y
Number of banks	726	545	726	324	726
Number of firms	6,352	5,108	6,352	5,460	6,352

Table 8. Identifying the mechanisms: Heterogeneity in the response to tax hikes

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of lagged changes in the corporate income tax rate, the corporate tax changes in the lender's state, the corporate income tax changes at the federal level and the budget balance in the borrower's state. The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we double-interact *Tax increase* and *Tax decrease* with *Federal tax change*, i.e., the federal-level corporate income tax shock of Mertens and Ravn (2013) one quarter before the loan facility origination quarter. In specification (2), we double-interact *Tax increase* and *Tax decrease* with *Firm size*. In specification (3), we double-interact *Tax increase* and *Tax decrease* with *High firm size*, i.e., a binary variable equal to one if *Firm size* is above the sample mean, and zero otherwise. In specification (4), we triple-interact *Tax increase* and *Tax decrease* with *Firm size* and *Firm leverage*. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Tax increase	-0.465	29.950**	6.909	-18.370
	[-0.090]	[2.161]	[1.077]	[-0.896]
Tax decrease	-5.003**	-15.670	-8.981**	-3.090
	[-2.612]	[-1.186]	[-2.514]	[-0.193]
Tax increase × Federal tax change	26.111***			
	[3.151]			
Tax decrease × Federal tax change	14.958			
	[1.098]			
Tax increase × Firm size		-3.852**		3.607
		[-2.554]		[1.287]
Tax decrease × Firm size		1.339		0.699
		[0.737]		[0.321]
Tax increase × High firm size			-10.883**	
			[-2.020]	
Tax decrease × High firm size			6.455	
			[1.043]	
Tax increase × Firm leverage				1.524**
				[2.327]
Tax decrease × Firm leverage				-0.323
				[-0.932]
Tax increase × Firm size × Firm leverage				-0.234**
				[-2.541]
Tax decrease × Firm size × Firm leverage				0.014
				[0.304]
Observations	29,011	37,234	37,234	37,208
Adj. R-squared	0.745	0.731	0.731	0.733
Full set of controls	Y	Y	Y	Y
Fixed effects	Y	Y	Y	Y
Number of banks	664	726	726	726
Number of firms	5,498	6,352	6,352	6,348

Table 9. Identifying the mechanisms: The loan-supply channel

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of a number of bank-level characteristics. The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we double-interact *Tax increase* and *Tax decrease* with *Bank liquidity*. In specification (2), we double-interact *Tax increase* and *Tax decrease* with *Bank capital*. In specification (3), we double-interact *Tax increase* and *Tax decrease* with *Lerner index*, i.e., the Lerner index in the banking industry. All specifications include loan type, loan purpose, year, bank, firm and borrower's state fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Tax increase	-11.443	8.364	2.879
	[-1.446]	[0.235]	[0.597]
Tax decrease	-14.450**	-18.696*	-11.413***
	[-2.105]	[-1.849]	[-2.757]
Tax increase × Bank liquidity	3.654		
	[1.607]		
Tax decrease × Bank liquidity	2.189		
	[1.660]		
Tax increase × Bank capital		-0.375	
		[-0.132]	
Tax decrease × Bank capital		1.126	
		[0.943]	
Tax increase × Lerner index			-7.108
			[-0.380]
Tax decrease × Lerner index			21.939
			[1.394]
Observations	17,788	24,084	37,234
Adj. R-squared	0.756	0.738	0.731
Full set of controls	Y	Y	Y
Fixed effects	Y	Y	Y
Number of banks	221	268	726
Number of firms	3,509	4,473	6,352

Table 10. Identifying the mechanisms: The loan-demand channel

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of a number of firm-level characteristics. The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we double-interact *Tax increase* and *Tax decrease* with *Firm retained earnings*. In specification (2), we double-interact *Tax increase* and *Tax decrease* with *Firm leverage*. In specification (3), we double-interact *Tax increase* and *Tax decrease* with *Bond issue*, i.e., binary variable equal to one if the firm issues a bond in the current year, and zero otherwise. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Tax increase	2.861	-3.810	-1.024
	[0.663]	[-0.510]	[-0.122]
Tax decrease	2.419	0.074	4.149
	[0.529]	[0.022]	[0.681]
Tax increase × Firm leverage	-3.628		
	[-0.257]		
Tax decrease × Firm leverage	-22.848**		
	[-2.227]		
Tax increase × Firm retained earnings		-0.055	
		[-0.182]	
Tax decrease × Firm retained earnings		-0.309**	
		[-2.549]	
Tax increase × Bond issue			-1.311
			[-0.068]
Tax decrease × Bond issue			-19.375**
			[-2.385]
Observations	37,208	14,709	8,192
Adj. R-squared	0.733	0.747	0.757
Full set of controls	Y	Y	Y
Fixed effects	Y	Y	Y
Number of banks	726	443	377
Number of firms	6,348	3,535	2,151

Internet Appendix
Corporate tax changes and bank lending

Abstract

This appendix includes additional information on the sample and additional empirical results. The first section includes information on the state corporate tax changes by year. The second section reports the first-stage estimates from the Heckman two-stage regression model. The third section includes the discussion of additional results and robustness checks. The fourth section reports (i) estimates from specifications with different controls, (ii) results from alternative estimation methods, (iii) results for other loan characteristics.

Table A1. List of state corporate income tax increases

The table lists all U.S. state corporate income tax rises in 1988-2014 affecting firms in fiscal years 1988-2014. In states with more than one tax bracket, we report the change to the top bracket. Tax changes are identified from Heider and Ljungqvist (2015), the Tax Foundation (an abbreviated version of which is available at http://www.taxfoundation.org), the Book of the States, a search of the "Current Corporate Income Tax Developments" feature published periodically in the Journal of State Taxation, state tax codes accessed through Lexis-Nexis, and other official state legislative information and documentation..

State	Year	Descriptions	No of firms
IL	1989	Increase in top corporate income tax rate from 4% to 4.8%	
KY	1989	Increase in top corporate income tax rate from 7.25% to 8%	
MN	1989	Enactment of alternative minimum tax at 7% rate	
NJ	1989	Introduction of 0.375% tax surcharge on tax liability	
RI	1989	Increase in top corporate income tax rate from 8% to 9%	
CT	1990	Introduction of 20% tax surcharge, increasing top marginal tax rate from 11.5% to 13.8%	
MN	1990	Increase in corporate income tax rate from 9.5% to 9.8%	
MO	1990	Increase in top corporate income tax rate from 5% to 6.5%	
MT	1990	Introduction of 5% tax surcharge on tax liability	
NJ	1990	Introduction of 0.417% tax surcharge on tax liability	
OK	1990	Increase in top corporate income tax rate from 5% to 6%	
NC	1991	Increase in top corporate income tax rate from 7% to 7.75% and introduction of 4% tax surcharge on tax liability	
PA	1991	Increase in top corporate income tax rate from 8.5% to 12.25%	
KS	1992	Increase in top corporate income tax rate (including surcharge) from 6.75% to 7.35%	
KY	1992	Increase in top corporate income tax rate from 8% to 8.25%	
MT	1992	Re-introduction of tax surcharge on tax liability at 2.3% rate	
WI	1992	Introduction of a temporary recycling surcharge on regular corporations at a 5.5% rate of gross tax liability and on tax-option corporations at a 0.4345% rate of net Wisconsin business income	
MO	1993	Increase in top corporate income tax rate from 5% to 6.25% and reduction in federal income tax deductibility from 100% to 50%	
MT	1993	Increase in tax surcharge on tax liability from 2.3% to 4.7%	
WA	1993	Introduction of 6.5% temporary tax surcharge to most B&O classifications	
DC	1994	Introduction of additional 2.5% surcharge on tax liability	
VT	1997	Increase in top corporate income tax rate from 8.25% to 9.75%	
WI	2000	Introduction of a permanent surcharge for regular corporations at a 3% rate of gross tax liability and at a 0.2% rate of net income for other business entities	
AL	2001	Increase in top corporate income tax rate from 5% to 6.5%	
NH	2001	Increase in top corporate income tax rate from 8% to 8.5%	
CA	2002	Suspension of state net operating loss (NOL) deduction, affecting profitable firms that have tax loss carry-overs for California state income tax purposes	
KS	2002	Increase in tax surcharge on taxable income from 3.35% to 4.5%	
NJ	2002	Introduction of Alternative Minimum Assessment tax, under which firms pay the greater of a gross receipts tax and the corporate franchise (net income) tax; suspension of NOL deduction	
TN	2002	Increase in top corporate income tax rate from 6% to 6.5%	
AR	2003	Introduction of 3% tax surcharge on tax liability	
CT	2003	Introduction of 20% tax surcharge on tax liability	
IN	2003	Repeal of gross income tax (based on revenue rather than profits) and of supplemental income tax; effective adjusted gross income tax rate (on profits) increased from 7.75% to 8.5%	
CT	2004	Increase in tax surcharge on tax liability to25%	
NJ	2006	Introduction of 4% tax surcharge on tax liability	
TX	2006	Introduction of tax at a 4.5% rate on net taxable earned surplus	

MD	2008	Increase in top corporate income tax rate from 7% to 8.25%
MI	2008	Introduction of corporate income tax with a top rate of 4.95%; replaces a gross-receipts tax without interest deductibility
TN	2008	Introduction of franchise tax at a rate of 0.25% of the greater of net worth or real and tangible property
CT	2009	Introduction of 10% tax surcharge on tax liability for companies with revenues > $100m
NC	2009	Introduction of 3% tax surcharge on tax liability
OR	2009	Increase in top corporate income tax rate from 6.6% to 7.9%
OK	2010	Introduction of business activity tax (BAT)
IL	2011	Increase in top corporate income tax rate from 4.8% to 7%
CT	2012	Unscheduled two-year extension of tax surcharge on tax liability and increase to 20%
MI	2012	Increase in top corporate income tax rate from 4.95 % to 6%
OK	2013	Introduction of franchise tax on all corporations or associations
NV	2015	Introduction of Commerce Tax on businesses with a gross revenue exceeding $4,000,000 in the taxable year

Table A2. List of state corporate income tax cuts

The table lists all U.S. state corporate income tax cuts in 1988-2014 affecting firms in fiscal years 1988-2014. In states with more than one tax bracket, we report the change to the top bracket. Tax changes are identified from Heider and Ljungqvist (2015), the Tax Foundation (an abbreviated version of which is available at http://www.taxfoundation.org), the Book of the States, a search of the "Current Corporate Income Tax Developments" feature published periodically in the Journal of State Taxation, state tax codes accessed through Lexis-Nexis, and other official state legislative information and documentation.

State	Year	Descriptions	No of firms
CO	1988	Reduction in top corporate income tax rate from 6% to 5.5%	
NH	1988	Reduction in top corporate income tax rate from 8.75% to 8.0%	
CO	1989	Reduction in top corporate income tax rate from 5.5% to 5.4%	
WV	1989	Reduction in top corporate income tax rate from 9.6% to 9.45%	
AZ	1990	Reduction in top corporate income tax rate from 10.5% to 9.3%	
CO	1990	Reduction in top corporate income tax rate from 5.4% to 5.3%	
WV	1990	Reduction in top corporate income tax rate from 9.45% to 9.3%	
CO	1991	Reduction in top corporate income tax rate from 5.3% to 5.2%	
MN	1991	Reduction in the legislated tax increase of 0.4%	
MT	1991	Repeal of 5% tax surcharge	
NJ	1991	Reduction in tax surcharge from 0.417% to 0.375%	
WV	1991	Reduction in top corporate income tax rate from9.3% to 9.15%	
CO	1992	Reduction in top corporate income tax rate from5.2% to 5.1%	
CT	1992	Reduction in tax surcharge from 20% to 10%	
MO	1992	Reduction in top corporate income tax rate from 6.5% to 5%	
NC	1992	Reduction in tax surcharge from 4% to3%	
WV	1992	Reduction in top corporate income tax rate from 9.15% to 9%	
CO	1993	Reduction in top corporate income tax rate from 5.1% to 5.0%	
CT	1993	Repeal of 10% tax surcharge	
NC	1993	Reduction in tax surcharge from 3% to 2%	
NE	1993	Repeal of 15% tax surcharge	
NH	1993	Reduction in top corporate income tax rate from 8% to 7.5%	
AZ	1994	Reduction in top corporate income tax rate from 9.3% to 9%	
NC	1994	Reduction in tax surcharge from 2% to 1%	
NH	1994	Reduction in top corporate income tax rate from 7.5% to 7%	
NJ	1994	Repeal of 0.375% tax surcharge	
PA	1994	Reduction in top corporate income tax rate from 12.25% to 11.99%	
RI	1994	Repeal of 11% tax surcharge	
CT	1995	Reduction in top corporate income tax rate from 11.5% to 11.25%	
DC	1995	Reduction in top corporate income tax rate from 10% to 9.5% (+2 tax surcharges at 2.5% each)	
NC	1995	Repeal of 1% tax surcharge	
PA	1995	Reduction in top corporate income tax rate from 11.99% to 9.99%	
WA	1995	Reduction in the B&O tax surcharge from 6.5% to 4.5%	
CT	1996	Reduction in top corporate income tax rate from 11.25% to 10.75%	
CA	1997	Reduction in top corporate income tax rate from 9.3% to 8.84%	
CT	1997	Reduction in top corporate income tax rate from 10.75% to 10.5%	
NC	1997	Reduction in top corporate income tax rate from 7.75% to 7.5%	
AZ	1998	Reduction in top corporate income tax rate from 9% to 8%	
CT	1998	Reduction in top corporate income tax rate from 10.5% to 9.5%	
NC	1998	Reduction in top corporate income tax rate from 7.5% to 7.25%	
CO	1999	Reduction in top corporate income tax rate from 5% to 4.75%	
CT	1999	Reduction in top corporate income tax rate from 9.5% to 8.5%	
MI	1999	Reduction in Single Business Tax (SBT) rate from 2.3% to 2.2%	

NC	1999	Reduction in top corporate income tax rate from 7.25% to 7%
NY	1999	Reduction in top corporate income tax rate from 9% to 8.5%
OH	1999	Reduction in top corporate income tax rate from 8.9% to 8.5%
WI	1999	Repeal of temporary recycling tax surcharge
AZ	2000	Reduction in top corporate income tax rate from 8% to 7.968%
CO	2000	Reduction in top corporate income tax rate from 4.75% to 4.63%
CT	2000	Reduction in top corporate income tax rate from 8.5% to 7.5%
MI	2000	Reduction in Single Business Tax (SBT) rate from 2.2% to 2.1%
NC	2000	Reduction in top corporate income tax rate from 7% to 6.9%
NY	2000	Reduction in top corporate income tax rate from 8.5% to 8%
AZ	2001	Reduction in top corporate income tax rate from 7.968% to 6.968%
ID	2001	Reduction in top corporate income tax rate from 8% to 7.6%
MI	2001	Reduction in Single Business Tax (SBT) rate from 2.2% to 2.1%
NY	2001	Reduction in top corporate income tax rate from 8% to 7.5%
MI	2002	Reduction in Single Business Tax (SBT) rate from 2.1% to 2.0%
KS	2003	Reduction in tax surcharge from 4.5% to 3.35%
ND	2004	Reduction in top corporate income tax rate from 10.5% to 7%
AR	2005	Repeal of 3% tax surcharge
KY	2005	Reduction in top corporate income tax rate from 8.25% to 7%
OH	2005	Tax reform phasing out corporate income tax while phasing in gross receipts tax over period of 5 years
CT	2006	Reduction in tax surcharge from 25% to 20%
VT	2006	Reduction in top corporate income tax rate from 9.75% to 8.9%
KY	2007	Reduction in top corporate income tax rate from 7% to 6%
ND	2007	Reduction in top corporate income tax rate from 7% to 6.5%
NY	2007	Reduction in top corporate income tax rate from 7.5% to 7.1%
VT	2007	Reduction in top corporate income tax rate from 8.9% to 8.5%
CT	2008	Repeal of 20% tax surcharge
KS	2008	Reduction in tax surcharge from 3.35% to 3.1%
KS	2009	Reduction in tax surcharge from 3.1% to 3.05%
ND	2009	Reduction in top corporate income tax rate from 6.5% to 6.4%
MA	2010	Reduction in top corporate income tax rate from 9.5% to 8.75%
NJ	2010	Repeal of 4% tax surcharge
KS	2011	Reduction in tax surcharge from 3.05% to 3%
MA	2011	Reduction in top corporate income tax rate from 8.75% to 8.25%
NC	2011	Repeal of 3% tax surcharge
ND	2011	Reduction in top corporate income tax rate from 6.4% to 5.4%
OR	2011	Reduction in top corporate income tax rate from 7.9% to 7.6%
ID	2012	Reduction in corporate income tax rate from 7.6% to 7.4%
IN	2012	Reduction in Adjusted Gross Income Tax (general corporations, non-financial Institutions) from 8.5% to 8%
MA	2012	Reduction in top corporate income tax rate from 8.25% to 8%
IN	2013	Reduction in Adjusted Gross Income Tax (general corporations, non-financial Institutions) from 8% to 7.5%
ND	2013	Reduction in top corporate income tax rate from 5.15% to 4.53%
OR	2013	Reduction in top corporate income tax rate from 7.6% to 6.6% through an increase in the taxable income for applying the top corporate income tax rate
WV	2013	Reduction in top corporate income tax rate from 7.75% to 7%
AZ	2014	Reduction in top corporate income tax rate from 6.968% to 6.5%
IN	2014	Reduction in Adjusted Gross Income Tax (general corporations, non-financial Institutions) from 7.5% to 7%

NC	2014	Reduction in top corporate income tax rate from 6.9% to 6%
NM	2014	Reduction in top corporate income tax rate from 7.6% to 7.3%
TX	2014	Temporary reduction in franchise tax rates from 0.5% to 0.4875% for retailers and wholesalers and from 1% to 0.975% for other entities
WV	2014	Reduction in top corporate income tax rate from 7% to 6.5%
AZ	2015	Reduction in top corporate income tax rate from 6.5% to 6%
IL	2015	Reduction in top corporate income tax rate (excluding S corporations) from 7% to 5.25%
IN	2015	Reduction in Adjusted Gross Income Tax (general corporations, non-financial Institutions) from 7% to 6.5%
NC	2015	Reduction in top corporate income tax rate from 6% to 5%
NM	2015	Reduction in top corporate income tax rate from 7.3% to 6.9%
RI	2015	Reduction in top corporate income tax rate from 9% to 7%
TX	2015	Temporary reduction in franchise tax rates from 0.4875% to 0.475% for retailers and wholesalers and from 0.975% to 0.95% for other entities

Table A3. Heckman regressions

The table reports the first-stage estimates of the Heckman two-stage regression model (the second-stage estimates are reported in Table 5). The dependent variable is in the second line of the table and all variables are defined in Table 1. The estimation method is maximum likelihood. Different specifications report estimates from the first-stage probit model to estimate the determinants of the firm's loan-taking decision (specifications 1-3) and the borrower state's tax increase and decrease decision (specifications 4-5). The lower part of the table denotes the dummy variables used in each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

The loan-taking decision by the firm and the tax increase/decrease decision by the borrower's state

	(1)	(2)	(3)	(4)	(5)
	Loan deal	Loan deal	Loan deal	Tax increase	Tax decrease
Loan amount	-0.109***	-0.131***	-0.123***		
	[-21.533]	[-23.943]	[-22.379]		
Maturity	-0.002***	-0.002***	-0.002***		
	[-5.826]	[-6.370]	[-5.907]		
Collateral	0.052***	0.063***	0.046***		
	[4.574]	[5.178]	[3.805]		
Number of lenders	-0.024***	-0.017***	-0.022***		
	[-35.701]	[-21.546]	[-31.350]		
Performance provisions	-0.099***	-0.077***	-0.074***		
	[-8.809]	[-6.488]	[-6.215]		
General covenants	-0.016***	-0.009**	-0.013***		
	[-3.914]	[-2.134]	[-2.939]		
Bank size	0.311***	0.288***	0.310***		
	[65.824]	[57.521]	[63.714]		
Bank return on assets	-0.113***	-0.198***	-0.185***		
	[-12.346]	[-19.904]	[-18.565]		
Bank NPLs	-0.041***	-0.060***	-0.053***		
	[-11.523]	[-15.277]	[-13.737]		
Firm size	-0.052***	-0.036***	-0.042***		
	[-12.385]	[-8.000]	[-9.170]		
Firm return on assets	-0.209***	-0.244***	-0.233***		
	[-3.420]	[-3.795]	[-3.635]		
Firm leverage	-0.122***	-0.128***	-0.139***		
	[-5.640]	[-5.565]	[-6.060]		
Firm Tobin's Q	0.019	0.022	0.014		
	[1.296]	[1.418]	[0.897]		
Employment				-2.061***	-0.086
				[-12.721]	[-0.800]
Population				1.974***	0.123
				[12.558]	[1.170]
Per capita personal income				0.734***	0.719***
				[12.860]	[16.894]
Republican governor				-0.201***	0.377***
				[-13.719]	[33.891]
GDP (federal)				4.710***	-7.762***
				[17.096]	[-32.562]
Inflation (federal)				0.123***	-0.021***
				[11.348]	[-2.815]
Stock market capitalization				0.003***	0.009***
				[4.141]	[16.606]
Fed funds rate				0.186***	-0.035***
				[21.187]	[-5.569]
Personal income tax rate (federal)				4.761***	-3.685***
				[3.697]	[-3.497]
Effective corporate tax rate	0.071	-0.650**	-0.187	-21.665***	13.362***
	[0.296]	[-2.503]	[-0.730]	[-32.314]	[27.219]

Bank loans		5.299***			
		[23.541]			
Firm loans		-69.909***			
		[-12.794]			
Bank-firm loans			-238.188***		
			[-4.672]		
Bank-state loans			46.643***		
			[19.915]		
Constant	139.732***	147.447***	141.965***	430.605***	-574.301***
	[54.607]	[55.032]	[53.090]	[15.611]	[-23.263]
Observations	113,401	102,123	102,123	131,656	131,656
Loan type dummies	Y	Y	Y	N	N
Loan purpose dummies	Y	Y	Y	N	N
Year dummies	Y	Y	Y	Y	Y
Bank dummies	Y	Y	Y	N	N
Firm dummies	Y	Y	Y	N	N
Lender's state dummies	N	Y	Y	N	N

Additional sensitivity tests

This section includes the discussion of additional results and robustness checks. In Appendix Table A4, we examine the sensitivity of our estimates to the "bad controls" problem, by interchangeably excluding loan-level controls from our specifications. We initially omit all loan-level variables (column 1) and sequentially introduce quantitative information on the loan (*Loan amount*, *Maturity*, *Collateral*, *Number of lenders*, *Performance provisions* and *General covenants*) in columns 2-4. In the remaining specifications (columns 5-7) we include additional firm-level controls, such the ratio of retained earnings over total assets and measures of credit risk, namely the Altman's (1968) modified Z-score and the credit rating category. All specifications provide estimates that are almost similar to that from our baseline regression.[12]

So far, we assumed that all loans enter the model with equal weights. Normally, the fixed effects in Table 4 provide a safeguard against cross-state variation. We nevertheless acknowledge that the empirical specification might leave the analysis open to the critique that firms and/or states receiving more, or fewer loans might affect our results disproportionately. To this end, we re-estimate our preferred specification using weighted least squares and several different weights based on the number of loans at the firm-year and the borrower's state-year level. We retain the same set of fixed effects and report results from this exercise in Appendix Table A5.

We initially weight by the number of loans received by a given firm scaled by the total number of loans in our sample during that year (column 1). Similarly, in column 2, we weight by the number of loans between a given bank and a given firm scaled by the total number of loans extended during that year; in column 3, we do the same for a given lender's state-borrower's state pair. Across all specifications, and irrespective of the type of the chosen weight, the coefficient on *Tax decrease* retains its negative and statistically significant value,

[12] Results are also almost identical when we replace *General covenants* with *Financial covenants* or *Net covenants* (available on request).

even exceeding our initial estimates. As for the coefficients on the set of our loan- and firm-level control variables, these are in line with those suggested by our baseline regressions.

In Appendix Table A6, we confirm the insensitivity of our inferences to the type of standard error clustering. In this respect, we initially cluster standard errors by firm, and subsequently by borrower's state *and* firm, and borrower's state *and* year (columns 1-3). Our next specifications adopt a more demanding clustering, as standard errors are clustered by borrower's state *and* firm *and* year, and bank *and* firm *and* year (columns 4 and 5 respectively). Again, results confirm our baseline estimates.

An extension of our empirical analysis relates to the role of loan fees, since we might expect that corporate tax cuts would also reduce the cost of loans through lower fees. However, information on fees is generally limited since several loans are term loans that have limited fees. Nevertheless, in column (1) of Table A7 we replicate our baseline specification with *AISU* as the dependent variable and do not observe a statistically significant effect of either corporate tax indicator on *AISU*. Thus, it seems that corporate tax cuts are only priced in spreads. The subsequent columns examine the response of other loan characteristics. We observe that although corporate tax cuts further enable firms to obtain loans with longer maturity (column 3), none of the remaining loan terms, namely loan amount, collateral and covenants, is responsive to corporate tax changes (columns 2, 4 and 5).

We further examine the role of political conditions and estimate specifications including the double interactions of our tax change indicators with indicators for the timing and distance of gubernatorial elections from the corporate tax change decision as well as for whether Republican or Democratic governors are in power. We present results in Appendix Table A8, where we initially examine whether the effect of corporate tax changes is contingent on the phase of the political cycle (columns 1 to 5). As the first two specifications reveal, the effect of a corporate tax decrease on loan spreads is consistently negative regardless of whether the tax

cut occurs in an election year (column 1) or the year after the election (column 2). Moreover, we find that corporate tax cuts are more effective when occurring in the middle of the political cycle (column 4); this is intuitive as cuts close to the elections are more predictable and likely to be adopted on the basis of electoral gain (see Bizer and Durlauf, 1990).

Interestingly, according to column 6, the easing effect of *Tax decrease* on *AISD* is entirely reversed under Republican administration: now a tax decrease raises spreads by more than 11.6 basis points. It appears that in the presence of a Republican governor, corporate tax cuts provide a different signal, thereby leading to an increase in loan demand and consequently in loan spreads. This can be partly explained by considering that Republican administrations mainly target the contraction of public sector and the channeling of remaining sources to the private sector. Furthermore, Democratic governors are often associated with increases in state taxes and government spending, particularly if they are ineligible for reelection (see Besley and Case, 1995; Gao, Murphy and Qi, 2019). On the other hand, a tax increase exerts the opposite effect, resulting in lower spreads; it should be noted however, that these effects are not observed for previous Republican administrations (column 7).

We subsequently control for developments in the lenders' and borrower's states within the year through the inclusion of lender's state × year and borrower's state × year fixed effects respectively in specifications 1 and 2 of Appendix Table A9. In either case, our estimates confirm the negative impact of a corporate tax cut on loan spreads, which appears to be even more potent relative to our baseline specifications. In Appendix Table A10, we further examine the role of bank and firm subsidiaries in the borrower's state and the lender's state respectively. To the extent that banks operate a subsidiary in the borrower's state they are affected by corporate tax changes in that state. We find that loans from bank subsidiaries carry a higher loan spread in response to tax cut (column 1); this is not surprising since the subsidiaries are now faced with a lower after-tax profit on their loans. Moreover, the operation of a firm's

subsidiary in the lender's state does not play a differential role for loan spreads regardless of the nature of the corporate tax change (column 2).

Finally, given that certain states attract corporations due to their favorable tax treatment, in Appendix Table A11 we estimate our baseline specification by excluding firms headquartered in the states of Delaware and South Dakota. The rational for their exclusion is that, being tax havens, firms might have purposely moved in these states to take advantage of preferential tax treatment and strict confidentiality rules. This leads to a negligible drop in observations, with all specifications providing support to our baseline estimates.

Table A4. Different loan and firm controls

The table reports coefficients and t-statistics (in brackets). The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is weighted least squares with standard errors clustered by borrower. Different specifications include different loan and firm controls to show that the estimates on the term *Tax increase* and *Tax decrease* are not overly sensitive to the controls used. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax increase	0.220	0.472	0.282	0.796	-5.032	-0.109	-3.097
	[0.052]	[0.116]	[0.068]	[0.188]	[-1.209]	[-0.025]	[-0.845]
Tax decrease	-6.108***	-5.678***	-6.005***	-6.476***	-6.566***	-6.858**	-6.668**
	[-3.128]	[-2.993]	[-3.181]	[-3.247]	[-2.721]	[-2.209]	[-2.258]
Loan amount		-12.427***			-8.471***	-10.802***	-10.268***
		[-17.597]			[-9.624]	[-11.993]	[-9.414]
Maturity		-0.257***			-0.284***	-0.147*	-0.228**
		[-5.508]			[-4.744]	[-1.711]	[-2.601]
Collateral			31.881***		30.778***	27.395***	30.178***
			[15.651]		[11.186]	[9.105]	[8.083]
Number of lenders			-0.451***		-0.068	-0.031	-0.082
			[-4.567]		[-0.674]	[-0.284]	[-0.591]
Performance provisions				-26.185***	-18.168***	-21.349***	-23.594***
				[-11.563]	[-7.010]	[-9.341]	[-10.195]
General covenants				4.513***	3.887***	3.929***	3.378***
				[5.338]	[5.121]	[5.060]	[3.676]
Firm size	-24.316***	-16.984***	-21.019***	-23.713***	-16.456***	-11.287***	-6.467**
	[-11.624]	[-8.323]	[-9.923]	[-11.699]	[-5.126]	[-3.534]	[-2.041]
Firm return on assets	-1.417***	-1.397***	-1.345***	-1.385***	-1.278***	-1.547***	-1.654***
	[-13.687]	[-13.510]	[-12.662]	[-14.039]	[-6.618]	[-8.903]	[-8.895]
Firm leverage	0.753***	0.774***	0.685***	0.740***	0.636***	0.826***	0.686***
	[9.750]	[10.051]	[8.842]	[9.956]	[6.282]	[8.335]	[6.142]
Firm Tobin's Q	-36.476***	-34.209***	-34.065***	-35.359***	-32.636***	-28.930***	-36.879***
	[-9.223]	[-8.817]	[-8.799]	[-9.084]	[-7.877]	[-7.484]	[-9.942]
Effective corporate tax rate	-15.659	12.865	5.628	-16.759	-155.345	-78.941	-131.764
	[-0.221]	[0.184]	[0.079]	[-0.231]	[-1.108]	[-0.866]	[-1.215]
Firm retained earnings					-0.056		
					[-1.286]		
Firm Z-score						-4.395***	
						[-3.074]	
Firm rating category							25.814***
							[9.027]
Constant	384.471***	560.940***	339.680***	384.560***	531.243***	511.431***	414.680***
	[12.534]	[17.863]	[11.003]	[12.326]	[9.110]	[10.611]	[8.217]
Observations	37,234	37,234	37,234	37,234	14,709	22,412	15,487
Adj. R-squared	0.719	0.724	0.723	0.722	0.747	0.749	0.771
Fixed effects	Y	Y	Y	Y	Y	Y	Y
Number of banks	726	324	726	726	443	474	267
Number of firms	6,353	5,442	6,353	6,353	3,535	4,044	2,261

Table A5. Weighted regressions

The table reports coefficients and t-statistics (in brackets). The dependent variable is AISD and all variables are defined in Table 1. The estimation method is weighted least squares with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we weight by the number of loans received by the borrower to the total number of loans in that year. In specification (2), we weight by the number of loans between the lender and the borrower in a given year to the total number of loans extended in that year. In specification (3), we weight by the number of loans between the lender's state and the borrower in a given year to the total number of loans extended in that year. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Tax increase	2.718	-0.976	1.940
	[0.696]	[-0.218]	[0.459]
Tax decrease	-6.117*	-5.885**	-8.151**
	[-1.820]	[-2.156]	[-2.286]
Loan amount	-8.054***	-9.168***	-7.714***
	[-4.649]	[-10.800]	[-6.482]
Maturity	-0.179	-0.205**	-0.195
	[-0.983]	[-2.481]	[-1.536]
Collateral	33.630***	31.781***	32.071***
	[13.285]	[12.589]	[13.521]
Number of lenders	-0.144*	-0.015	-0.006
	[-1.982]	[-0.162]	[-0.057]
Performance provisions	-18.606***	-22.800***	-23.262***
	[-5.577]	[-9.177]	[-6.752]
General covenants	1.763**	1.799*	2.727**
	[2.302]	[1.958]	[2.609]
Firm size	-16.509***	-15.397***	-16.476***
	[-5.696]	[-6.371]	[-6.504]
Firm return on assets	-145.235***	-130.697***	-122.153***
	[-10.287]	[-12.600]	[-10.749]
Firm leverage	76.419***	70.804***	81.586***
	[9.842]	[9.374]	[8.798]
Firm Tobin's Q	-35.263***	-35.527***	-37.825***
	[-9.800]	[-7.719]	[-8.770]
Effective corporate tax rate	-50.296	-11.836	-60.763
	[-0.357]	[-0.115]	[-0.425]
Constant	494.636***	501.015***	494.076***
	[8.049]	[11.516]	[8.918]
Observations	37,237	37,237	37,237
Adj. R-squared	0.744	0.754	0.762
Fixed effects	Y	Y	Y
Number of banks	726	726	726
Number of firms	6,353	6,353	6,353

Table A6. Different clustering of standard errors

The table reports coefficients and t-statistics (in brackets). The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS. The penultimate part of the table denotes the type of standard error clustering (BS & F refers to Borrower's state *and* Firm, BS & Y refers to Borrower's state *and* Year , BS & F & Y refers to Borrower's state *and* Firm *and* Year, and B & F & Y refers to Bank *and* Firm *and* Year). The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)
Tax increase	1.204	1.204	1.204	1.204	1.204
	[0.364]	[0.299]	[0.325]	[0.325]	[0.457]
Tax decrease	-5.866**	-5.866***	-5.866**	-5.866**	-5.866**
	[-2.480]	[-3.209]	[-2.416]	[-2.416]	[-2.105]
Loan amount	-11.235***	-11.235***	-11.235***	-11.235***	-11.235***
	[-15.217]	[-16.440]	[-13.879]	[-13.879]	[-11.786]
Maturity	-0.243***	-0.243***	-0.243***	-0.243***	-0.243***
	[-5.027]	[-4.972]	[-3.455]	[-3.455]	[-3.260]
Collateral	32.671***	32.671***	32.671***	32.671***	32.671***
	[16.340]	[15.421]	[12.475]	[12.475]	[11.470]
Number of lenders	-0.009	-0.009	-0.009	-0.009	-0.009
	[-0.099]	[-0.083]	[-0.076]	[-0.076]	[-0.082]
Performance provisions	-24.141***	-24.141***	-24.141***	-24.141***	-24.141***
	[-13.658]	[-11.509]	[-9.549]	[-9.549]	[-10.230]
General covenants	2.436***	2.436***	2.436***	2.436***	2.436***
	[3.402]	[3.184]	[2.861]	[2.861]	[3.237]
Firm size	-14.844***	-14.844***	-14.844***	-14.844***	-14.844***
	[-8.289]	[-7.400]	[-7.731]	[-7.731]	[-8.436]
Firm return on assets	-128.873***	-128.873***	-128.873***	-128.873***	-128.873***
	[-11.486]	[-12.716]	[-11.031]	[-11.031]	[-8.177]
Firm leverage	69.134***	69.134***	69.134***	69.134***	69.134***
	[10.547]	[9.176]	[7.179]	[7.179]	[6.886]
Firm Tobin's Q	-31.245***	-31.245***	-31.245***	-31.245***	-31.245***
	[-10.596]	[-8.350]	[-7.708]	[-7.708]	[-8.954]
Effective corporate tax rate	28.506	28.506	28.506	28.506	28.506
	[0.312]	[0.394]	[0.228]	[0.228]	[0.208]
Constant	506.125***	506.125***	506.125***	506.125***	506.125***
	[12.461]	[15.380]	[10.518]	[10.518]	[8.949]
Observations	37,234	37,234	37,234	37,234	37,234
Adj. R-squared	0.731	0.731	0.731	0.731	0.731
Fixed effects	Y	Y	Y	Y	Y
Clustering	Firm	BS & F	BS & Y	BS & F & Y	B & F & Y
Number of banks	726	726	726	726	726
Number of firms	6,352	6,352	6,352	6,352	6,352

Table A7. Other loan characteristics

The table reports coefficients and t-statistics (in brackets). The dependent variable is denoted in the second line of the table and all variables are defined in Table 1. The estimation method is OLS. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1) AISU	(2) Loan amount	(3) Maturity	(4) Collateral	(5) General covenants
Tax increase	0.168	0.010	0.534	-0.008	-0.012
	[0.491]	[0.388]	[0.615]	[-0.457]	[-0.346]
Tax decrease	-0.607	0.004	1.028**	-0.002	0.028
	[-1.303]	[0.171]	[2.266]	[-0.230]	[0.965]
AISD	0.119***	-0.001***	-0.009***	0.001***	0.000***
	[19.316]	[-15.922]	[-4.920]	[14.372]	[3.223]
Loan amount	-0.326		1.930***	-0.008**	0.000
	[-1.518]		[12.264]	[-2.153]	[0.025]
Maturity	0.032**	0.005***		0.001***	-0.000
	[2.264]	[13.239]		[3.479]	[-0.077]
Collateral	2.578***	-0.051**	1.242***		0.530***
	[4.838]	[-2.099]	[3.323]		[25.225]
Number of lenders	-0.013	0.019***	0.067**	0.001	0.012***
	[-0.966]	[15.951]	[2.549]	[1.481]	[8.465]
Performance provisions	-0.928***	0.120***	2.184***	0.044***	0.880***
	[-3.075]	[9.530]	[4.573]	[5.319]	[26.904]
General covenants	0.116	0.000	-0.010	0.063***	
	[0.842]	[0.025]	[-0.077]	[24.580]	
Firm size	0.056	0.462***	0.345	-0.056***	0.011
	[0.182]	[25.479]	[1.302]	[-8.847]	[0.396]
Firm return on assets	-0.028	-0.002**	0.056***	-0.002***	0.001
	[-1.279]	[-2.168]	[3.088]	[-5.066]	[0.869]
Firm leverage	0.036***	0.002***	0.038***	0.002***	0.000
	[2.787]	[3.248]	[3.793]	[8.769]	[0.513]
Firm Tobin's Q	-0.920	0.078***	1.236**	-0.047***	-0.057
	[-1.436]	[3.962]	[2.418]	[-3.846]	[-1.272]
Effective corporate tax rate	-36.927*	1.389*	34.901**	-0.541*	-1.318
	[-1.850]	[1.707]	[2.419]	[-1.752]	[-1.274]
Constant	30.063***	14.351***	-6.794	1.040***	1.084**
	[3.041]	[40.221]	[-0.972]	[7.970]	[2.449]
Observations	19,828	37,234	37,234	37,234	37,234
Adj. R-squared	0.711	0.827	0.655	0.635	0.705
Fixed effects	Y	Y	Y	Y	Y
Number of banks	394	726	726	726	726
Number of firms	4,135	6,352	6,352	6,352	6,352

Table A8. Political conditions

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of lagged changes in corporate state tax to control for persistent effects. The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we double-interact *Tax increase* and *Tax decrease* with *Election year*, i.e., a binary variable equal to one if a gubernatorial election is held in the borrower's state during the loan facility origination year, and zero otherwise. In specification (2), we double-interact *Tax increase* and *Tax decrease* with *Election year lag*, i.e., a binary variable equal to one if a gubernatorial election is held in the borrower's state in the year before the loan facility origination year, and zero otherwise. In specification (3), we double-interact *Tax increase* and *Tax decrease* with *Republican governor*, i.e., a binary variable equal to one if during the loan facility origination year the governor in the borrower's state is Republican and equal to zero if is Democratic. In specification (4), we double-interact *Tax increase* and *Tax decrease* with *Republican governor lag*, i.e., a binary variable equal to one if the year before the loan facility origination year the governor in the borrower's state is Republican and equal to zero if is Democratic. In specification (5), we double-interact *Tax increase* and *Tax decrease* with *1 year to election*, i.e., a binary variable equal to one if the next gubernatorial election in the borrower's state is held in one year, and zero otherwise. In specification (6), we double-interact *Tax increase* and *Tax decrease* with *2 years to election*, i.e., a binary variable equal to one if the next gubernatorial election in the borrower's state is held in two years, and zero otherwise. In specification (7), we double-interact *Tax increase* and *Tax decrease* with *3 years to election*, i.e., a binary variable equal to one if the next gubernatorial election in the borrower's state is held in three years, and zero otherwise. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tax increase	2.270	1.701	0.42	0.766	1.931	5.168	4.487
	[0.669]	[0.370]	[0.104]	[0.168]	[0.417]	[0.868]	[0.808]
Tax decrease	-7.010***	-6.321***	-7.237***	-3.524	-6.130***	-14.048***	-10.064**
	[-3.474]	[-3.069]	[-3.783]	[-1.313]	[-2.977]	[-2.709]	[-2.546]
Tax increase × Election year	-2.833						
	[-0.549]						
Tax decrease × Election year	3.628						
	[0.813]						
Tax increase × Election year lag		-1.420					
		[-0.270]					
Tax decrease × Election year lag		2.333					
		[0.466]					
Tax increase × 1 year to election			4.139				
			[0.615]				
Tax decrease × 1 year to election			5.502				
			[1.360]				
Tax increase × 2 years to election				2.841			
				[0.409]			
Tax decrease × 2 years to election				-10.428*			
				[-1.824]			
Tax increase × 3 years to election					-2.571		
					[-0.488]		
Tax decrease × 3 years to election					1.337		
					[0.271]		
Tax increase × Republican governor						-11.132*	

						[-1.890]	
Tax decrease × Republican governor						11.616**	
						[2.020]	
Tax increase × Republican governor lag							-7.521
							[-1.133]
Tax decrease × Republican governor lag							5.830
							[1.216]
Observations	37,229	37,229	37,229	37,229	37,229	36,844	36,785
Adj. R-squared	0.731	0.731	0.731	0.731	0.731	0.731	0.731
Full set of controls	Y	Y	Y	Y	Y	Y	Y
Fixed effects	Y	Y	Y	Y	Y	Y	Y
Number of banks	726	726	726	726	726	723	723
Number of firms	6,350	6,350	6,350	6,350	6,350	6,311	6,307

Table A9. Controlling for intra-year state-level developments

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of lender's state × year and borrower's state × year fixed effects to control for developments in the lender's and the borrower's states within the year. The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The penultimate part of the table denotes the type of fixed effects used in each specification. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
Tax increase	0.884	4.296
	[0.228]	[0.615]
Tax decrease	-4.931**	-9.678***
	[-2.539]	[-2.821]
Loan amount	-11.135***	-10.972***
	[-14.953]	[-15.863]
Maturity	-0.220***	-0.245***
	[-3.797]	[-4.896]
Collateral	33.410***	31.590***
	[14.883]	[13.885]
Number of lenders	-0.027	-0.01
	[-0.246]	[-0.100]
Performance provisions	-23.364***	-23.972***
	[-11.337]	[-11.406]
General covenants	2.014***	2.550***
	[2.690]	[3.307]
Firm size	-14.447***	-15.429***
	[-6.694]	[-7.303]
Firm return on assets	-132.179***	-125.294***
	[-11.159]	[-13.046]
Firm leverage	62.641***	69.877***
	[9.598]	[8.598]
Firm Tobin's Q	-30.529***	-31.534***
	[-8.059]	[-7.781]
Effective corporate tax rate	-0.109	17.874
	[-0.001]	[0.232]
Constant	509.914***	510.020***
	[14.681]	[14.956]
Observations	31,258	37,139
Adj. R-squared	0.732	0.736
Loan type	Y	Y
Loan purpose	Y	Y
Firm effects	Y	Y
Bank × year effects	Y	Y
Lender's state × year effects	Y	N
Borrower's state × year effects	N	Y
Number of banks	324	725
Number of firms	5,460	6,338

Table A10. Controlling for bank and firm subsidiaries

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of binary variables to control for the presence of bank and firm subsidiaries in the borrower's and lender's state respectively. The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we double-interact *Tax increase* and *Tax decrease* with *Bank subsidiary*, i.e., a binary variable equal to one if the lender operates a subsidiary in the borrower's state, and zero otherwise. In specification (2), we double-interact *Tax increase* and *Tax decrease* with *Firm subsidiary*, i.e., a binary variable equal to one if the borrower operates a subsidiary in the lender's state, and zero otherwise. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
Tax increase	0.364	2.318
	[0.103]	[0.565]
Tax decrease	-4.101*	-5.149**
	[-1.908]	[-2.314]
Tax increase × Bank subsidiary	-4.808	
	[-0.182]	
Tax decrease × Bank subsidiary	20.983***	
	[6.267]	
Tax increase × Firm subsidiary		-31.755
		[-1.387]
Tax decrease × Firm subsidiary		11.626
		[0.686]
Bank subsidiary	-0.892	
	[-0.132]	
Firm subsidiary		7.021
		[0.968]
Observations	29,128	32,598
Adj. R-squared	0.727	0.733
Full set of controls	Y	Y
Fixed effects	Y	Y
Number of banks	363	714
Number of firms	5,029	5,676

Table A11. Controlling for onshore tax havens

The table reports coefficients and t-statistics (in brackets). The dependent variable is *AISD* and all variables are defined in Table 1. The estimation method is OLS with standard errors clustered by borrower's state. The lower part of the table denotes the number of unique lenders (Number of banks) and borrowers (Number of firms) entering each specification. In specification (1), we exclude all loans to borrowers headquartered in the state of Delaware. In specification (2), we exclude all loans to borrowers headquartered in the state of South Dakota. In specification (3), we exclude all loans to borrowers headquartered in the state of Delaware or the state of South Dakota. All specifications include loan type, loan purpose, firm, borrower's state, and bank times year fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)
Tax increase	1.217	1.173	1.186
	[0.302]	[0.292]	[0.294]
Tax decrease	-5.777***	-5.831***	-5.742***
	[-3.180]	[-3.203]	[-3.174]
Loan amount	-11.140***	-11.227***	-11.131***
	[-16.433]	[-16.451]	[-16.440]
Maturity	-0.246***	-0.243***	-0.247***
	[-5.021]	[-4.980]	[-5.029]
Collateral	32.443***	32.755***	32.526***
	[15.296]	[15.449]	[15.324]
Number of lenders	-0.011	-0.013	-0.016
	[-0.108]	[-0.126]	[-0.151]
Performance provisions	-24.246***	-24.157***	-24.263***
	[-11.428]	[-11.536]	[-11.454]
General covenants	2.425***	2.446***	2.436***
	[3.152]	[3.201]	[3.169]
Firm size	-15.177***	-14.834***	-15.167***
	[-7.659]	[-7.378]	[-7.637]
Firm return on assets	-128.762***	-128.945***	-128.828***
	[-12.669]	[-12.682]	[-12.636]
Firm leverage	69.111***	69.190***	69.168***
	[9.154]	[9.183]	[9.160]
Firm Tobin's Q	-31.294***	-31.236***	-31.284***
	[-8.338]	[-8.313]	[-8.301]
Effective corporate tax rate	29.355	37.907	38.769
	[0.402]	[0.529]	[0.536]
Constant	506.464***	502.082***	502.414***
	[15.223]	[15.402]	[15.244]
Observations	37,036	37,177	36,979
Adj. R-squared	0.731	0.731	0.731
Fixed effects	Y	Y	Y
Number of banks	726	725	725
Number of firms	6,315	6,341	6,304