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Corporate tax changes and credit costs

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Corporate tax changes and credit costs

Abstract

We examine changes in the corporate tax rate across the U.S. and their implications on the pricing and quantity of loans. We find 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, but they are insensitive to corporate tax increases. Primarily, a debt restructuring effect (working via firm's leverage) and, secondarily, a credit supply effect (working via bank market power and bank capital) drive the easing effect of tax cuts on equilibrium loan pricing, while the effect on the equilibrium quantity of loans is insignificant.

Keywords: Corporate taxation; Cost of credit; Syndicated loans; Loan demand; Loan supply
JEL classification: G21; F31; F33; F34

1. Introduction

Corporate taxation is an important government policy tool, affecting investment, consumption, government spending, and real outcomes. A large theoretical and empirical tax literature suggests that firms' investment and capital structure decisions are highly sensitive to corporate taxes (e.g., Modigliani and Miller, 1963; Stiglitz, 1973; King, 1974; Mayer, 1986; Heider and Ljungqvist, 2015). However, the empirical literature identifying the effect of corporate tax changes on lending terms and the mechanisms through which this effect is transmitted is limited.

Theoretically, the effect of corporate taxes on lending terms, can stem either from loan demand (firms) or loan supply (banks). Specifically, a decrease (increase) in corporate tax rates increases (reduces) firm profitability, reducing (increasing) their risk premium, which can lead banks to decrease (increase) credit costs, unless other bank characteristics counteract this effect (e.g., the bank is unwilling to lose clients or the banking sector is well capitalized and can absorb a tax increase). We refer to this as the *credit-supply effect*.

On the demand side, and in line with traditional Keynesian theory, we expect that a change in taxation affects the demand for investment. For example, a decrease in corporate tax rates increases firm profitability and investment, leading to higher credit demand. In this economic environment, a standard loan-supply/loan-demand model implies higher lending rates and higher loan amounts. We refer to this as the *credit-demand effect*.

The credit-demand effect might be offset, however, by attempts to restructure debt, which also work on the demand side. Specifically, if lower corporate tax rates induce firms to restructure their debt to exploit tax shields, we observe a leftward shift in the loan-demand curve and lower lending rates, because firms would replace loans with other non-credit sources of financing (e.g., ample liquidity via retained earnings would be available). We call this the *debt-restructuring effect*.

The intersection between classical theory and new-Keynesian theory on the credit market (e.g., Stiglitz and Greenwald, 2003) guides most of our empirical analysis toward an examination of the responses on lending rates (and secondarily on the loan amount). A key reason for focusing on lending rates is that the loan-supply curve is more inelastic than the loan-demand curve, especially in the short run and when lending to new, riskier firms (see Figure 1). Thus, any demand effect (or any combined demand and supply effects) might cause larger and easier-to-identify fluctuations in lending rates compared to the loan amount. However, we also examine changes in the loan amount, especially when aiming to pinpoint supply effects.

[Insert Figure 1 about here]

Our empirical analysis employs a quasi-natural experiment around the 147 staggered changes in corporate income tax rates levied by the United States from 1988 to 2015 (47 tax increases in 24 States and 100 tax decreases in 27 States). We match these tax-rate changes with loan-level data from DealScan and firm-level and bank-level data from Compustat. Our key outcome variable is the all-in spread drawn (AISD), which is the loan spread over LIBOR plus any facility fee.

Our empirical analysis proceeds in two steps. We first identify the baseline responses of loan spreads to changes in corporate tax rates and find that tax decreases bear a statistically and economically significant negative effect on loan spreads. According to our baseline results, a one-point decrease in the corporate tax rate shaves approximately 6 basis points from the AISD. Economically this is a sizeable effect, equal to a 2.6% lower AISD compared to the average in our sample. To put this number into perspective, for a loan of average size and maturity, the average firm in our sample will experience USD 1.21 million of reduced interest payments. In contrast, the effect of tax increases is statistically and economically insignificant,

uncovering an important asymmetry in the effect of taxation policy. This finding is mostly consistent with significant debt restructuring and credit-supply effects.

These results are robust to several tests. First, we conduct a number of placebo tests to show that our results are not spuriously led by unobserved characteristics changing at the same time as corporate tax rates. Second, we conduct an event study by examining the evolution of loan spreads in a 2-year window surrounding the tax change to control for treatment heterogeneity in the presence of variation in treatment timing (the potential problem with staggered DID identified by, e.g., Baker, Larcker and Wang, 2022). Third, we horserace the binary indicators of corporate tax changes with actual changes in the corporate tax rate. Fourth, we use specifications with different control variables to show that the results are not driven by a "bad-controls problem." Fifth, the results are robust when using a Heckman-type model, which considers the probability of a firm self-selecting in the syndicated loan market. Sixth, we control for the presence of bank subsidiaries in the firm's state as well as of firm subsidiaries in the bank's state. Finally, we exclude from our sample all firms operating in tax-haven states, such as Delaware and South Dakota, since choice of state might be governed by tax-minimization considerations.

The second step of our analysis identifies the channels at work. The initial evidence that the strongest effect is demand-side debt restructuring originates from the sequential exclusion/inclusion of bank × year or bank × quarter fixed effects, which saturate the model from supply-side forces (e.g., Jiménez, Ongena, Peydró and Saurina, 2012; 2014; Delis, Hong, Paltalidis and Philip, 2021). The inclusion of these fixed effects leaves the baseline results largely unaffected, suggesting that the credit-supply effect is less relevant than the debt-restructuring effect. Moreover, we pinpoint the relevance of the *debt-restructuring effect* by looking at the importance of firm retained earnings and leverage as a source of our baseline findings and 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, their 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.

However, estimating loan amount regressions does not produce the expected negative effect of tax decreases (the effect is positive but insignificant), implying that the debt-restructuring effect is not the only relevant factor. Delving deeper into supply-side forces, we interact our indicators of corporate tax changes with variables reflecting bank market power (Delis, Kokas and Ongena, 2017) and capital adequacy (Kashyap and Stein, 2000; Jiménez, Ongena, Peydró and Saurina, 2014). We find that bank competition constitutes an important mechanism through which tax changes affect credit costs, as greater levels of competition induce banks to lower spreads in response to corporate tax cuts. We further observe that, although banks do not adjust the aggregate quantity of funds offered, they do adjust their share in each loan, i.e., better-capitalized banks increase their loan share and form a more concentrated syndicate for a given tax cut.

Overall, considering the theoretical implications summarized in Figure 1, our results are consistent with a strong negative effect of tax cuts on loan spreads stemming primarily from the debt-restructuring effect and secondarily from the credit-supply effect. Consistent with an inelastic loan-supply curve and the opposing forces of the debt-restructuring and credit-supply effects, the equilibrium loan amount remains largely unaffected.

Finally, we extend our analysis to the secondary loan market, as this is used by banks to off-load loans to third parties thereby sharing the risk of their loans with a wider group of investors. We show that tax cuts convey moderately positive signals to the market, lowering the probability that the loan will end up as distressed. This is particularly the case for loans

granted to larger and less-leveraged firms, as these require less monitoring after the loan is issued in the primary market.

The studies closest to ours are Ağca and Igan (2019) and Heider and Ljungqvist (2015). While the former shows that general contractionary fiscal policy causes a significant increase in loan spreads, attributed to an increase in the risk premium of lenders (supply-driven mechanism), we focus instead on the effect of corporate taxation on the loan market and not on a general contractionary fiscal policy. Moreover, we separately identify the mechanisms (especially distinguishing the supply-side from demand-side effects) and find that tax cuts (as opposed to tax hikes) are of greatest significance.

Heider and Ljungqvist (2015) suggest that debt and leverage exhibit hysteresis, with leverage positively responding only to tax increases but not to tax cuts, in part because an increase in corporate taxation causes firms to readjust their leverage to benefit from the tax shield. We infer instead that an economically significant and asymmetric effect of corporate tax changes on firms' credit cost exists. Most importantly, our baseline result stems from tax cuts (as opposed to the effect of tax increases on leverage in Heider and Ljungqvist).

The rest of the paper proceeds as follows. Section 2 presents the theoretical mechanisms that explain the effects of taxation on lending rates. Section 3 describes the data. Section 4 discusses the empirical identification strategy. Section 5 presents and discusses the main empirical results, showing the impact of corporate tax changes on the firm cost of credit. Section 6 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 7 concludes the paper. The Internet Appendix provides several additional summary statistics and robustness tests.

2. Demand and supply effects of corporate taxation on credit costs

We identify two forces that theoretically support a relation between corporate taxation and cost of credit: the first is driven by supply (banks) and the second by demand (firms). We analyze the effect of these forces on bank lending with the help of a simple loan-demand/loan-supply model, as shown in Figure 1. The shape of the curves merges information from the classical model (where loan demand is negatively and loan supply is positively sloped) and from the Keynesian Stiglitz and Greenwald (2003) model, where loan supply is backward-bending because borrower risk increases at higher lending rates.[1] We assume in the figure that equilibrium is at the "classical" parts; however, the backward-bending supply curves have implications for our theory and findings.

On the supply side, a change in corporate tax rate affects banks' profit-maximizing behavior. Specifically, a decrease in corporate taxation leads to an increase in firms' profitability, a reduction in their risk of default, and an expansion of their investment opportunities. Thus, banks might be willing to release more loanable funds, implying a rightward shift in the loan-supply curve. Without a concomitant shift in the loan-demand curve and under a positively sloped loan-supply curve, this mechanism implies a release of larger loan amounts at lower lending rates. Opposite effects should prevail for an increase in corporate tax rates. This is a standard *credit-supply effect*.

Implications for the demand side can be more interesting when focusing on taxation policy (as opposed to e.g. monetary policy). In line with traditional Keynesian theory, a change in taxation affects firm investment and credit. Specifically, a decrease in corporate tax rates increases firm profitability by lowering their risk premium and increasing their investment and credit demand. If firms do not (or cannot) turn to alternative sources of financing (e.g., debt

[1] For simplicity, we do not show a credit rationing equilibrium, as in Stiglitz and Greenwald (2003), as this does not affect our theoretical considerations.

restructuring, use of retained earnings), and without a concomitant shift in the loan-supply curve, this mechanism implies a rightward shift in the loan-demand curve. Thus, loan amounts and lending rates increase, *ceteris paribus*. Again, opposite effects should prevail for an increase in corporate tax rates. We refer to this as the *credit-demand effect.*

A change in taxation, however, also alters firm incentives to restructure their debt and reassess their tax shields, potentially resulting in a credit-demand effect that is opposite to the Keynesian. For example, a tax decrease might lead firms with already high reliability on leverage to demand less credit. Moreover, a tax decrease increases profitability and retained earnings, allowing firms to finance projects, at least partially, with their own funds. Other firm characteristics, such as firm size and market power, may also be important because they imply better access to alternative sources of finance. We find, under these mechanisms, a leftward shift in the loan-demand curve, a decrease in the loan amount, and a decrease in loan spreads, *ceteris paribus,* i.e., the *debt-restructuring effect*. This effect is consistent with the literature on the effects of taxation-driven debt restructuring and leverage (e.g., DeAngelo and Masulis, 1980; Stiglitz and Weiss, 1981; Auerbach, 2002; Heider and Ljungqvist, 2015), as well as that on alternative forms of financing (e.g., Becker and Ivashina, 2014).

A notable element in the three effects discussed above is that the loan-supply curve becomes relatively inelastic as firm risk and lending rates increase, which intensifies in the short run after a change in corporate taxes due to the increased availability of loanable funds. Furthermore, it is possible that two, or even all three of the effects could work simultaneously, thereby rendering the mechanisms leading to a new equilibrium more complex. For example, as shown in Figure 1, a simultaneous leftward shift in loan demand and rightward shift in loan supply might imply a significantly larger reduction in the lending rate compared to a change in the loan amount. Our empirical analysis aims to disentangle and separately identify these effects.

3. Data

We obtain data from three sources. First, syndicated loan deals (at the facility level) for 1988-2015 are derived 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 dataset of Heider and Ljungqvist (2015) and Farre-Mensa and Ljungqvist (2016). Third, we match the resulting dataset with bank-specific and firm-specific characteristics from Compustat.

Table 1 defines all variables used in our empirical analysis and Table 2 reports summary statistics. The number of loan facilities in 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. We observe 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 2 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 in the U.S. during our sample period.

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

3.1. Measures of tax changes and the cost of borrowing

Our key explanatory variables reflect corporate tax changes. *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. We mainly use binary tax measures because tax changes across states are different in terms of structure and/or

inclusion of credits, thus not all changes can be quantified in terms of changes in marginal tax rates; however, the direction of the tax changes is unambiguous.[2] 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 measures include changes in state corporate income tax, in the tax surcharge on tax liability, and in state tax deductibility. The measures exclude changes in 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 that include all the above.

Our key outcome variable reflecting lending rates is the all-in-spread drawn (*AISD*), defined as the spread over the LIBOR plus any facility fee. Moreover, lenders generally use a menu of spreads and fees rather than a single price measure (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 focus on loan pricing, given our theoretical considerations suggesting that changes in corporate tax rates are more likely than the quantity of loans to significantly affect lending rates (predominantly due to the shape of the loan-supply curve). We also estimate loan-amount specifications, using the lead lender shares of the loan (*Bank share*). On the same line, we estimate a measure of the concentration of holdings within the syndicate, using each syndicate member's share in the loan (*Herfindahl*). Tax-rate changes affecting the loan-demand/loan-

[2] For example, the California 2002 and New Jersey 2002 tax increases or the Texas 2008 tax cut (see Appendix Tables A1 and A2).

[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&O service rates from 1.5% to 1.8% from 2010 to 2013.

supply model should also affect the equilibrium loan rate, largely depending on the shape of the loan-supply curve and the location of the initial equilibrium (see the discussion above in Section 2).

We identify each lender's and borrower's state using the location of their headquarters. However, the presence of borrowing subsidiaries makes this matching more labor intensive. Specifically, should a loan be provided by an affiliate or subsidiary that operates in a different state from a parent bank, we hand-match the lender's state with that of the affiliate/subsidiary. Similarly, for firms receiving loans through their subsidiaries, we hand-match the borrower's state with that of the affiliate/subsidiary.[4]

3.2. Control variables

We use several control variables at loan, firm, bank, state, and federal levels (definitions are provided 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 amount*), loan maturity in months (*Maturity*), the number of lenders in the syndicate (*Number of lenders*), dummies for loans having performance-pricing provisions (*Performance provisions*), *collateral*, and the total number of covenants (*Net covenants*).[5] We also use loan type fixed effects, which are very important as loan facilities include credit lines and term loans that are fundamentally different in their contractual arrangements and pricing (Berg, Saunders and

[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, whereas 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*).

Steffen, 2016), as well as 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*). 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 bank agency problems (Holmstrom and Tirole 1997; Dell'Ariccia, Laeven and Marquez, 2014). We further use *Bank 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). Finally, we include the *Bank Lerner index*, as banks operating in a more competitive environment might be less willing to increase their loan spreads, so as not to lose clients (Deli, Delis, Hasan and Liu, 2019).

We also include firm-year variables to specifically identify demand-side channels. These variables include size (*Firm size*), return on assets (*Firm return on assets*), and Tobin's Q (*Firm Tobin's Q*). Also, we use leverage (*Firm leverage*) to examine the role of capital structure and indebtedness in the relation between tax changes and loan-pricing decisions, and the ratio of retained earnings by total assets (*Firm retained earnings*) as it contains information about expected returns that fluctuate following fiscal policy changes pinpointing alternative sources of financing investment decisions (e.g., Ball, Gerakos, Linnainmaa and Nikolaev 2020). To capture the firm's risk of default, we use the borrower's risk-adjusted returns, as measured by the Kaplan-Zingales index (*Firm KZ index*) and the firm's credit-rating category (*Firm rating category*); we employ the latter variables in robustness tests.

We also include macroeconomic controls at the federal level to capture any unobservable characteristics affecting fiscal and monetary policy. Since corporate income taxes at the federal level constitute the primary tax burden for corporations, relative to those at

the state level, we control for the former by including the effective federal corporate tax rate and a proxy for changes in that rate (see Mertens and Ravn, 2013. Finally, 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 to lower (future) interest rates induces banks to assume greater risk, thereby expanding the 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); in this regard, we estimate alternative specifications that include the quarterly shadow rate.

4. Empirical methodology

4.1. Empirical specification

Findings in Table 3 provide the first indication of a significant and asymmetric effect of corporate tax changes on loan pricing. In Panel A of Table 3, we report summary statistics for key loan characteristics for firms not experiencing a state corporate tax change. Panel B reports their differences vs. firms experiencing an increase or a decrease, respectively, in state corporate tax rates. Evidence shows that loans to firms in states with a corporate tax increase carry a 5.8 basis points higher *AISD* than do loans to firms where the corporate tax rates are unchanged. However, this difference is only weakly statistically significant. In the case of a tax decrease, the difference is larger (7.3 basis points) and is statistically significant at the 1% level. Moreover, we observe a statistically significant lower *AISU* in the unchanged vs. tax-decrease group.

[Insert Table 3 about here]

We observe additional differences in other loan characteristics depending on the direction of the corporate tax change. Specifically, loans granted to firms in states implementing a tax increase (decrease) in the current year have a lower (higher) maturity relative to those granted 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. Whether this anecdotal evidence translates to causal effects, as well as pinpointing the channels through which this mechanism occurs, remain to be examined.

Our main regression equation is:

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

In equation (1), $AISD_{lt}$ measures the all-in-spread drawn of loan facility *l* granted by lead bank *b* to firm *f* in year *t*. We use several different dependent variables to pinpoint the channels driving our results (e.g., *AISU*, *Lead shares*, etc.). $Tax\ increase_{st}$ 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 discussed below; and u_{lbft} is the stochastic disturbance.[6]

[6] The same approach is adopted by Heider and Ljunqvist (2015), who employ a model with binary indicators on state corporate income tax increases and decreases to examine the response of firms' leverage ratio in states adopting corporate tax changes. Moreover, 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 in which the firm is headquartered.

4.2. State tax changes and other loan financing-relevant changes

In this section, we discuss how we tackle the "more basic" identification problem, namely distinguishing the effect of corporate tax changes in equation (1) from other confounding (unobserved) effects. Considering the identification of changes in loan supply from changes in loan demand, we conduct tests as described in the following sections.

A key feature of our identification strategy is the comparison of borrowing costs between firms located in a state with a corporate tax-rate change in a given year and firms in other states without such a tax change. *Ceteris paribus*, the level of borrowing costs among firms in states without tax changes provides a counterfactual estimate of how the borrowing costs of firms in the state with a tax change would have evolved absent the tax change. The difference in differences (DID), i.e., the difference across firms in different states of the within-firm change in borrowing costs following the tax change, provides an estimate of the tax sensitivity of firm credit costs.[7]

The key assumption for a valid DID would be violated if state corporate tax changes coincide systematically with variation in the business cycle, with labor-market conditions, or with changes in other taxes or state policies that affect bank supply and firm demand for debt regardless of the corporate tax change. For example, if states raise taxes in economic downturns, and downturns induce firms to borrow more (Korajczyk and Levy, 2003), we may observe a spurious correlation between taxes and loan spreads.

[Insert Table 4 about here]

To obtain a sense of the scope of such confounds, Table 4 relates borrower states' tax policies to their economic and political conditions (as in Heider and Ljungqvist, 2015). In columns 1-3 we report state-level summary statistics for certain explanatory variables reflecting political and economic conditions in the borrower's state (for all observations and

[7] The main and interaction terms are omitted, given the respective fixed effects.

for observations pertaining to tax increases and tax decreases, respectively), and in column 4 we report the difference between values for tax increases and decreases. As a general result, economic and political conditions play a limited role in states' tax policies. We observe that most states implementing tax changes are more often governed by Republicans, although there is no systematic difference when distinguishing between tax hikes and cuts. Compared to states that increase taxes, those that cut taxes tend to run budget surpluses and experience higher growth.

Next, we estimate linear-probability models of borrower states' decisions to raise or cut corporate taxes. The models include year and state fixed effects and cluster the standard errors at the state level. Column 5 shows that taxes are more likely to increase in states with lower growth and unemployment rates. In column 6, we observe that states under Republican administration are 6.5% more likely to cut taxes, while this probability further increases with the state's unemployment rate. We obtain similar results in columns 7-9, where we model the magnitude (rather than the likelihood) of tax changes.[8]

While the political factors revealed in Table 4 have no obvious link to firms' loan financing choices, the economic factors do. As a result, our DID specifications control for observed variation in economic conditions at the state level. However, this tax sensitivity could also be subject to other confounding effects, such as time-variant developments at the borrower's industry level that affect all firms in a given industry or at the bank level that affect an individual lender's willingness to lend. An advantage of our fixed-effect specifications over alternative model specifications (e.g., first-differenced) is that the former can reasonably control for these confounding effects. In this respect, through the inclusion of borrowers' states fixed effects in our baseline specification, we isolate the effect of relevant political or economic

[8] Using this first-stage analysis more formally in a Heckman two-stage model to estimate equation (1) produces results very similar to our baseline. The inverse Mills ratio enters with an insignificant coefficient, reflecting no selection bias in this analysis. These results are available on request.

factors. On the same line, the industry × year effects in alternative specifications control for time-varying, industry-wide developments.

It might be the case that corporate tax changes coincide with other important state-level changes that could affect firm demand for debt, such state taxes on personal income, capital gains, or banks, as well as changes in state investment-incentive programs (i.e., tax credits for investment, R&D, and job creation). However, such changes were not shown to systematically affect state corporate tax changes when Heider and Ljungqvist (2015) employed them to examine their effect on firm capital structure. Moreover, we expect that industry × year fixed effects will capture most of these effects.

An additional identification challenge stems from staggered DID regressions often being susceptible to bias introduced by treatment effect heterogeneity (Barrios, 2021; Goodman-Bacon, 2021; Baker, Larcker and Wang, 2022). This bias arises because two-way fixed effects (TWFE) DID regressions may not be appropriate in settings with multiple treatment periods or where homogeneous treatment effects cannot be assumed, unless there is a relatively small percentage of never-treated units. In our context, the possibility of this bias is small for two reasons. First, we do not employ a panel dataset; the unit of our analysis is at the loan level, as firms often receive more than one loan per year (i.e., we do not follow the same loan over time). Second, we have a large group of never-treated units as controls, that places less weight on the DID estimator (Sun and Abraham, 2021): from a total of 6,352 borrowers in our sample, 4,502 are not subject to a tax change (never-treated units).

To ensure that our inferences are robust, we implement an event study where we group all loans in a (-2, +2) year window around the corporate tax change (either increase or decrease). This follows from Sun and Abraham (2021), especially for cases when there is a large group of non-treated units. Baker, Larcker and Wang (2022) call this the "stacked regression estimator." We then conduct a DID, where we examine the evolution of loan spreads

of firms subject to a tax change (treated firms) relative to those of firms not subject to a change (control firms). We conduct this study separately for firms subject to a tax increase and a tax decrease and discuss the results in Section 5.[9] To further enhance our results, we conduct the same exercise by excluding the financial crisis, as this may be a period where lending terms change, thereby affecting the DID weights.

Our final identification challenge relates to a selection issue, namely the possibility that firms with certain characteristics self-select in or out of the syndicated loan market following corporate tax changes. Given that the syndicated loan market is not accessed by the universe of U.S. firms, this activity might imply that unobserved firm characteristics could correlate with corporate tax changes. We overcome this challenge by employing Heckman's (1979) two-stage regression model where, in the first stage, we estimate the probability that all firms listed in Compustat access the syndicated loan market. We discuss the details below in the relevant section.

5. Empirical results

5.1. Baseline results

Table 5 reports the results (coefficient estimates and t-statistics) from the estimation of equation 1. We cluster standard errors by borrower's state (the cross-sectional unit of *Tax increase* and *Tax decrease*). We report the number of banks and firms from which we obtain identification in the corresponding estimations in the lower part of each table.

As shown in each column, we sequentially introduce different fixed effects. Column 1 includes loan type, loan purpose, year, bank, firm, and borrower's state fixed effects. This

[9] Baker, Larcker and Wang (2022) review the literature on the issue and highlight another two relevant solutions, from respective models by Callaway and Sant'Anna (2021) and Sun and Abraham (2021). Both models cannot be effectively applied in our setting because they assume a panel dataset and only one change in the cross-section, while for some states (and thus treated firms), we observe more than one. Moreover, the first model cannot accommodate multiple fixed effects, which are very important in our analysis.

specification allows both the loan demand channel and the loan supply channel to be operative. In column 2, we add bank × year fixed effects, which is a first important control for time-varying supply-side explanations of the findings. Specifically, the bank × year fixed effects essentially saturate the model for bank-year changes in loan-pricing decisions, leaving the equivalent firm-year decisions to be operative. In column 3, we introduce industry × year fixed effects to control for time-varying developments that affect all firms in each industry. In column 4, we include bank × quarter fixed effects, thereby further saturating our model from short-term supply-side explanations of our findings.

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, indicating that the effects of corporate tax changes on the price of loans are asymmetric. There are two potential explanations for this finding. First, competitive loan markets (e.g., the syndicated loan market) can mitigate the effects of a tax increase if banks avoid losing established relationship lending, especially for firms with access to alternative sources of financing (e.g., use of retained earnings, low leverage, access to the bond market).[10] Similar implications can emerge if banks are largely heterogeneous in their levels of capital and liquidity. For example, high-capital and/or -liquidity banks can more easily mitigate the effects of contractionary fiscal policy (whereas the effect of a tax decrease should be negative). Our finding is distinct from that analyzed by Heider and Ljungqvist (2015), where tax increases (as opposed to tax decreases in our study) are the key policy change affecting firm leverage (as opposed to credit costs in our study).

Importantly, the similarity of the estimates on *Tax decrease* between the first column and the rest of the columns (which include either bank × year or bank × quarter fixed effects) shows that our results are predominantly driven by the demand side (the *credit-supply effect*

[10] In contrast, after a tax decrease all banks in competitive loan markets will most likely reduce lending rates.

does not seem to be particularly potent). Moreover, the results provide clear evidence against a strong *credit-demand effect*, which predicts a positive coefficient on *Tax decrease*. Overall, the *debt-restructuring effect* is the most probable driver of our results. We further disentangle and analyze the mechanisms driving these results in the next section.

According to the results in column 2, the coefficient on *Tax decrease* shows that a corporate tax cut in the borrowing firm's state decreases *AISD* by an average of 5.7 basis points or 2.6% (= 5.7 basis points ÷ 216.6 basis points for the average loan in our sample). Given that the average loan size is USD 314 million, firms in states with tax cuts save approximately USD 0.18 million (= USD 314 million × 5.7 basis points) per year in reduced interest payments, which represents approximately USD 0.71 million in interest savings over the loan's duration for an average loan maturity of 3.9 years.[11] Moreover, each borrowing firm in our sample receives on average 1.7 loans per year, thereby raising the overall savings realized from the average firm's total borrowing operations to a substantial USD 1.21 million (= USD 0.71 million × 1.7 loans).

[Insert Table 5 about here]

The size and magnitude of coefficients on the control variables in Table 5 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 loan amount and maturity. Imposition of collateral causes an increase in *AISD*, as these loans are generally deemed to be riskier. Loans are also more competitively priced when more performance provisions are included. The limited importance of bank-level variables in column 1 (and in comparison with results with column 2) results from inclusion of multiple fixed effects (especially bank and firm fixed effects in this case). Estimates on firm-level variables are largely anticipated, i.e., larger

[11] 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).

firm size and returns on assets are associated with decreasing *AISD*, while leverage increases loan spreads.

5.2. Sample-selection bias

In this section, we address the possibility of selection bias because firms affected by a tax decrease are more likely to access the syndicated loan market. We follow Dass and Massa (2011) and employ Heckman's (1979) two-stage model. In the first stage, we estimate a probit model (at the firm-year level) of firms' loan-taking decisions within a fiscal year. During this stage, our sample includes all U.S. companies in Compustat. In the second stage, we include Heckman's lambda (inverse mills ratio) as an additional control variable.

We assume that a company's decision to access the syndicated loan market is a function of the main determinants of the decision to borrow (Dass and Massa, 2011). Consequently, our probit regression includes firm-level characteristics and variables reflecting macroeconomic and general economic conditions in the firm's state. We report results from this exercise in columns 1-4 of Appendix Table A3. Probit estimates in Panel A indicate that larger firms with more tangible assets are more likely to seek syndicated loan financing. Moreover, firms are more likely to access the syndicated loan market when they are headquartered in states with a Republican administration, although they may do so in any phase of the political cycle. Such access is further driven by macro and fiscal conditions at the state level, as reflected in the gross product level and unemployment rate, respectively. Most importantly, estimates from the second-stage regressions in Panel B confirm the strong negative impact of *Tax increase* on *AISD*.

5.3. Placebo tests

We conduct three placebo tests to check that our results are not spuriously led by unobserved characteristics changing at the same time as corporate tax rates. First, we estimate our baseline regression by sequentially changing the borrowers in our treatment and control groups. In column (1) of Table 6, we replace all borrowers operating in states with no tax change in our sample period (control group) with non-US borrowers without a tax change. If tax changes are not significant for firm credit costs, neither of our tax-change indicators should have any effect on loan spreads. Similar to our baseline results, we observe that the coefficient on *Tax decrease* retains its negative and statistically significant value, although tax hikes do not affect *AISD*.

[Insert Table 6 about here]

In column (2), we employ a different treatment group, whereby we replace all borrowers in states with at least one tax change in our sample period (treatment group) with non-US borrowers with no tax change. Since treated firms are not subject to tax changes, their borrowing behavior (and consequently borrowing costs) should have followed the same pattern as control firms and, as such, loan spreads should be similar between the two groups for a given tax change. Our estimates confirm that no tax indicator exerts a significant effect on *AISD*.

Third, in column (3) we change the timing of tax changes by replacing our tax-change indicators with their lagged values, i.e., indicators for tax changes in the year prior to the loan facility year. This constitutes an alternative placebo test to show that the period when tax changes go into effect is what matters and that anticipation effects do not drive our results. We indeed find that both our lagged tax-change indicators are statistically insignificant.

5.4. Treatment heterogeneity

In this section, we address possible issues arising from treatment heterogeneity in the presence of variation in treatment timing in the context of staggered DID models, such as the one estimated so far (Barrios, 2021; Goodman-Bacon, 2021; Baker, Larcker and Wang, 2022).

Specifically, we conduct an event study where we group all loans in a (-2, +2) year window around each tax change. We then estimate a DID, where we examine the evolution of *AISD* for firms subject to a tax change (treated firms) relative to those of firms not subject to a change (control firms).

We report results in Table 7, where we conduct this exercise separately for corporate tax increases and tax decreases (columns 1 and 2 respectively).[12] According to our estimates, loan spreads remain unresponsive to tax hikes (the insignificant coefficient on *Treated firm (increase)* × *Post-tax increase* in column 1), while they fall in response to tax cuts (the negative and statistically significant coefficient on *Treated firm (decrease)* × *Post-tax decrease* in column 2). Moreover, we replicate specifications 1 and 2 by excluding the period of the financial crisis, as this may have resulted in an abrupt change in loan terms and consequently, in the DID weights; results in columns 3 and 4 mirror those of columns 1 and 2. Taken together, these results are fully consistent with our baseline, reflecting that treatment heterogeneity is not an important problem in our sample.

[Insert Table 7 about here]

5.5. Other robustness checks

We perform several additional robustness tests to confirm the validity of our baseline estimates. First, we relax our definition of corporate tax changes to include all types.[13] Column 1 of Table 8 reports the results. Again, the coefficient on corporate tax decreases is the only statistically insignificant one, with the effect being stronger compared to our baseline: A corporate tax cut

[12] The sample for this exercise includes the construction of non-overlapping 5-year windows for each state, each with a unique tax change (states with multiple tax changes within the 5-year window are excluded); this results in a drop in the number of observations relative to our baseline specification. We separate tax increases from tax decreases, because comparing windows for opposite tax changes is obviously wrong.

[13] 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.

lowers spreads by 6.4 basis points. In column 2, we replace our binary tax-change indicators with actual changes in marginal tax rates. Results show once again 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 small decreases in the tax rate also lower *AISD*, although loan spreads react more strongly to large tax cuts.

[Insert Table 8 about here]

In column 1 of Table 9, we control for pipeline risk, i.e., the risk faced by lenders who must retain larger shares in loans in which investors are less willing to participate than expected (Bruche, Malherbe and Meisenzahl, 2020). In fact, certain term loan facilities are structured specifically to appeal to institutional investors rather than to banks, i.e., within a loan package, the lending syndicates for Term Loans B, C, and higher usually include non-bank lenders (Lim, Minton and Weisbach, 2014; Nadauld and Weisbach, 2012). Importantly, these loans often feature weak covenants, longer maturities, and very low amortization, which 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 in column 1 confirm our baseline estimates, while providing no evidence of differential pricing of institutional term loans following the corporate tax cut (insignificant coefficient on *Tax decrease* × *Institutional term loan*).[14]

A typical feature of the US syndicated loan market is the participation of large banks, which are usually headquartered in different states than the borrowing firms. Moreover, although banks have branches in different states, due to their large size, syndicated loans are

[14] 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).

generally granted by the banks' headquarters.[15] Given that, a corporate tax change in the firm's state is not expected to directly affect the bank's profits, as the latter is not subject to the tax change. This is further evident in our sample, where we observe 33,316 loans between lenders and borrowers headquartered in different states, approximately 89.5% of our total number of loans. However, to alleviate any noise stemming from a change in the bank's after-tax profits, we interact our tax-change indicators with a binary variable that equals one if the bank and firm are headquartered in the same state. Estimates in column 2 confirm the easing effect of tax cuts on *AISD*, which is nevertheless independent of the location of the bank's headquarters (the negative and statistically significant coefficient on *Tax decrease* and the statistically insignificant coefficient on *Tax decrease* × *Same state* respectively).

[Insert Table 9 about here]

In columns 3 and 4, 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 greater risk, the asymmetric response of loan spreads to corporate tax changes might capture such risk differences induced by monetary-policy shocks. Moreover, low interest rates may increase firm credit demand through higher asset and collateral values (Kashyap and Stein 2000). To examine the role of monetary policy, we consider the shadow short rate (three-month average), which 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 (Delis, Hasan and Mylonidis, 2017; Paligorova and Santos, 2017). In

[15] As discussed in Section 5.1, the average loan size in our sample is USD 314 million.

either specification, the coefficients on our indicators for tax-rate changes are very similar to the baseline.

In column 5, we examine the effect of simultaneous corporate income-tax-rate changes at both state and federal levels. We observe that state-level tax cuts exert a consistently negative effect on loan spreads, equal to 6.35 bps (the coefficient on *Tax decrease*). This effect is reversed (reinforced) when complemented by a federal tax increase (decrease) in the same year (the coefficient on *Tax decrease* × *Federal tax*); a one-standard-deviation increase in the federal income tax rate (equal to 0.96) raises *AISD* by approximately 6.38 bps (= 6.65 basis points × 0.96 ×1.00) for a given state-level cut.

Lastly, we examine the role of relationship lending. Prior lending relationships allow lenders to acquire valuable information about the borrowing firm's operations and level of credit risk. We expect that asymmetric information is lower and lending terms will be more competitive if the firm has a long-lasting relationship with the lead bank (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 attributable 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 6, where we interact our tax-change indicators with an indicator on the existence of a prior lending relationship. While our estimates confirm the responsiveness of loan spreads to corporate tax cuts, they provide no evidence of differentially 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 loan and firm levels) and different standard-error clustering. We further examine the role of political conditions, as reflected in the timing of state gubernatorial elections and the Governor's party-political affiliation (Republican or Democratic). Finally, we control for

within-year developments in lender and borrower states, for bank and firm subsidiaries in borrower and lender states, respectively, as well as for firms headquartered in states with special corporate tax treatment (such as Delaware and South Dakota).

6. Mechanisms

Our results in section 5 are mainly consistent with the *debt-restructuring effect*. In this section, we delve more deeply into identifying key mechanisms that drive our results and further distinguish between demand and supply channels.

6.1. The loan-demand channel

In Table 10 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 more relevant for these firms compared to less-profitable ones (Faccio and Xu, 2015). As such, we expect that the loan spreads of profitable firms will be more sensitive to corporate tax changes. Moreover, corporate tax rates affect firms with higher cash holdings differently, especially during periods of tax uncertainty (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 a corporate tax cut is indeed more strongly 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 5.0

basis points (=0.29 × 17.4%) 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 firm use of debt, thereby making interest payments tax deductible. Thus, in theory, firms might take on more debt than necessary to take advantage of the favorable tax treatment. In practice, however, there is no consensus on whether changes in corporate income tax rates are linked to corporate capital structure (Graham, 2003; Fleckenstein, Longstaff and Strebulaev, 2020), although some evidence that corporate taxes are a first-order determinant of capital structure has been presented (Faccio and Xu, 2015; Heider and Ljungqvist, 2015).

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 result is important, since it shows that the negative effect of a decrease in corporate tax rates on loan spreads mainly derives from firms with greater reliance on debt. Therefore, our findings are fully in line with a potent *debt-restructuring effect* following a tax decrease.

6.2. The loan supply channel

To examine the potency of supply-side forces, we drop the bank × year fixed effects and include only bank fixed effects with all other fixed effects in previous specifications. In line with our theoretical considerations, our first test of potential supply-side explanations of our baseline findings concerns the role of bank competition. Column (1) of Table 11 includes the interaction of our tax indicators with the Lerner index, our measure of bank market power (Delis, Kokas and Ongena, 2017; Deli, Delis, Hasan and Liu, 2019). According to our results, greater levels

of competition (as reflected in lower values of the Lerner index) induce banks to provide lending at lower rates in response to a corporate tax cut (the positive and statistically significant coefficient on *Tax decrease* × *Bank Lerner index*). Moreover, this effect is persistent when we control for the monetary-policy stance through triple interactions with the shadow rate (column 3). These findings are consistent with a modest *credit-supply effect*, which operates through bank competition. This effect is less potent than the equivalent demand-side effect, as the main term lowers *AISD* by 14 basis points, whereas the mediation effect via the Lerner index equals 4.12 basis points.

[Insert Table 11 about here]

Based on the theoretical implications of a relatively inelastic credit supply (Figure 1), and combined with the debt-restructuring effect, the rightward shift in the loan-supply curve should produce an even lower loan spread that counterbalances the decrease in the equilibrium loan quantity. We investigate this further in columns 3-6, where we interact our tax-change indicators with a measure of bank capital adequacy (*Bank capital*). The fact that well-capitalized banks buffer policy shocks (Thakor, 1996; Gambacorta and Mistrulli, 2004; Ivashina and Scharfstein, 2010; Cornett, McNutt, Strahan and Tehranian, 2011) allows us to further assess whether the credit-supply effect is contingent on the ability of banks to provide loans.

Estimates from column (3) confirm the lower *AISD* in response to corporate tax cuts (the negative and statistically significant coefficient on *Tax decrease*). We further observe that loan spreads exhibit no differences when we differentiate between better- and less-capitalized banks (the statistically insignificant coefficient on *Tax decrease* × *Bank capital*). This finding supports our premise that the credit-supply effect is indeed weak. In column (4), we examine the effect of tax changes on the quantity of loans, by replacing *AISD* with loan amount as the dependent variable. We find that, although the coefficient on the main term of *Tax decrease* is

positive (consistent with an increase in aggregate loan supply), it remains below the conventional levels of statistical significance.

If the overall loan amount remains unchanged, banks may only adjust their share in each loan; in this case, better-capitalized banks would assume a higher stake in the loan at the expense of less-capitalized ones. We investigate this possibility in the next two specifications, by employing as dependent variables the lead bank's share in the loan (column 5) and the degree of concentration within the syndicate (column 6). We observe that better-capitalized banks increase their loan share and form a more concentrated syndicate for a given cut in the corporate income tax rate (the positive and statistically significant coefficient on *Tax decrease* × *Bank capital* in columns 4 and 5 respectively). In our context, this differential effect of tax cuts for banks with different capital levels points to an operative *credit-supply effect*. While the credit-supply effect is less potent than is the demand-side debt-restructuring effect, it has the potential to further decrease the loan spread while counterbalancing the negative pressure of the debt-restructuring effect on the loan quantity.

6.3. Loan maturity and other loan characteristics

In this section, we consider the effect of tax changes on loan maturity and other loan characteristics and whether this effect is susceptible to the demand-side forces identified in Section 6.1.[16] We sequentially estimate our baseline specification with each of the remaining loan terms as dependent variables (and including *AISD* in our set of control variables). We present results in Table 12, where in column (1) we observe that the asymmetric effect of corporate tax changes also extends to loan maturity. Specifically, a tax cut reduces *Maturity* by approximately 2.2%, while tax hikes appear to be insignificant. This inverse relationship is not

[16] The effects of tax-rate changes on other loan characteristics are statistically insignificant, and thus do not add to our theoretical considerations. Therefore, we include them in Table A6 of the Appendix.

surprising, as firms may exhibit decreased demand for loans (reflected in lower spreads), unless they are granted for longer time periods.

[Insert Table 12 about here]

We further examine whether this finding is attributable to the *debt-restructuring effect*, owing to the notion that short-term debt intensifies potential shareholder and bondholder conflicts, thereby leading to higher credit risk (see Billett, King and Mauer, 2007; He and Xiong, 2012; Wang, Chiu and King, 2020). Arguably, these conflicts are less intense for profitable firms and more intense for leveraged ones. As such, we expect that, in contrast to the former, the latter may opt for longer-term debt as an attempt to ease concerns about their credit risk. We examine this expectation in columns (2) and (3) by interacting our tax indicators with variables reflecting the borrowing firm's profitability and capital structure.

Indeed, estimates in column (2) show that *Maturity* decreases for more profitable borrowers (as reflected in greater levels of retained earnings) in response to a tax-rate cut. This result mirrors those in Section 6.1 and our findings that tax cuts, and the consequent increase in liquidity, induce firms to use their own funds to finance operations, thus leading to a decrease in loan demand; as the negative coefficient on *Tax decrease* × *Firm retained earnings* shows, this finding is further reflected in their willingness to obtain loans of shorter maturity. Importantly, however, as the positive coefficient on *Tax decrease* × *Firm leverage* reveals, highly leveraged firms change their capital structure towards longer-term debt in response to a corporate tax cut. These results reflect the interplay between corporate tax changes and firm capital-structure decisions in shaping demand for loan financing.

6.4. Secondary loan market

Our last exercise considers the effect of corporate tax changes on the secondary market for loans. This market is important as it allows banks to more easily off-load loans to third parties,

thereby converting their illiquid assets into liquid and sharing the risk of their loans with a wider group of investors. In fact, our examination period coincides with the exponential rate of growth in the secondary market for bank loans (see Altman, Gande and Saunders, 2010; Allen, Gottesman and Peng, 2012; Gande and Saunders, 2012; Kamstra, Roberts and Shao, 2014; Li, Saunders and Shao, 2015); as such, the effect of corporate tax changes on syndicated loan spreads documented in the previous sections may further extend to loans trading in the secondary market.

The secondary loan sales market is often segmented by distinguishing between "distressed" loans (loans selling at below 90% of face value) versus "par" loans (loans selling at 90% or more of face value). As such, our examination considers whether corporate tax changes matter for this segmentation and the associated terms of credit. To conduct this examination, we estimate our baseline specification by replacing our set of loan characteristics at loan origination (primary market) with corresponding loan terms from the secondary market; these include an indicator on whether the loan sells below 90% of its face value (*Distressed loan*), the average price quote across dealers for a given loan (*Quote*), the average bid-ask spread (*Bid-ask spread*) and the total number of quotes (*Number of quotes*).

Initially, we consider the effect of corporate tax changes on the probability that a loan sells below 90% of face value in the secondary market. Results in column (1) of Table 13 show that while tax hikes are not significant, tax cuts lower this probability by approximately 6.6%. Next, we examine whether corporate tax changes affect liquidity conditions in the secondary market. To this end, in specification (2) we replace our dependent variable with *Bid-ask spread*, which constitutes a proxy for secondary market liquidity. However, none of our tax-change indicators appears with a statistically significant coefficient. Taken together, these results suggest that tax cuts convey moderately positive signals to the market, which are mainly reflected in secondary loan prices.

[Insert Table 13 about here]

We further examine the heterogeneity of these signals with respect to certain firm traits, by interacting our tax-change indicators with relevant borrower characteristics, namely the firm's size and leverage (column 3 and 4 respectively). Estimates from column (3) provide moderate evidence that the loans of larger firms are less likely to classify as distressed following a tax cut (the negative and statistically significant coefficient on *Tax decrease* × *Firm size*). Moreover, this probability increases for leveraged firms (the positive and statistically significant coefficient on *Tax decrease* × *Firm leverage*). These findings are not surprising, as larger firms with less reliance on debt require less monitoring, thereby making their loans more attractive for investors. We conclude that corporate tax changes exert a modest positive effect on secondary loan markets, which is contingent on the need for further monitoring of the borrowing firm.

7. Conclusion

This study examines the sensitivity of firm borrowing costs to corporate income tax changes. We consider a quasi-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 asymmetric effects on the pricing of more than 37,000 syndicated loans during the 1988-2015 period.

We find that loan spreads decrease by approximately 5.7 basis points in response to a cut in the corporate tax rate in the borrowing firm's state but are insensitive to corporate tax increases. This spread decrease represents USD 0.74 million of interest savings for the average loan or USD 1.21 million for the average firm's total borrowing operations. Our results remain strong in an array of robustness tests and are mostly due 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 their own funds.

We further show the prevalence of a modest credit-supply effect that works primarily via bank market power and, to a lesser extent, bank capital. This effect places further downward pressure on loan spreads and potentially reverses the negative demand-driven effect on the equilibrium quantity of loans. Overall, and consistent with the theoretical premise that the loan-supply curve is relatively inelastic, tax cuts have a negative and significant effect on bank lending rates, but the simultaneous demand- and supply-side forces leave the equilibrium quantity of loans largely unaffected.

Finally, we show that the effect of corporate tax changes is further extended to the secondary loan market. In this regard, tax cuts are perceived as moderately positive news by the market, lowering the probability that the loan will sell as distressed. This is particularly the case for loans granted to larger and less-leveraged firms, as these require less monitoring after the loan is issued in the primary market.

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Figure 1. Loan demand and loan supply curves

The figure shows the shape of the loan demand and loan supply curves and possible respective shifts following tax rate decreases.

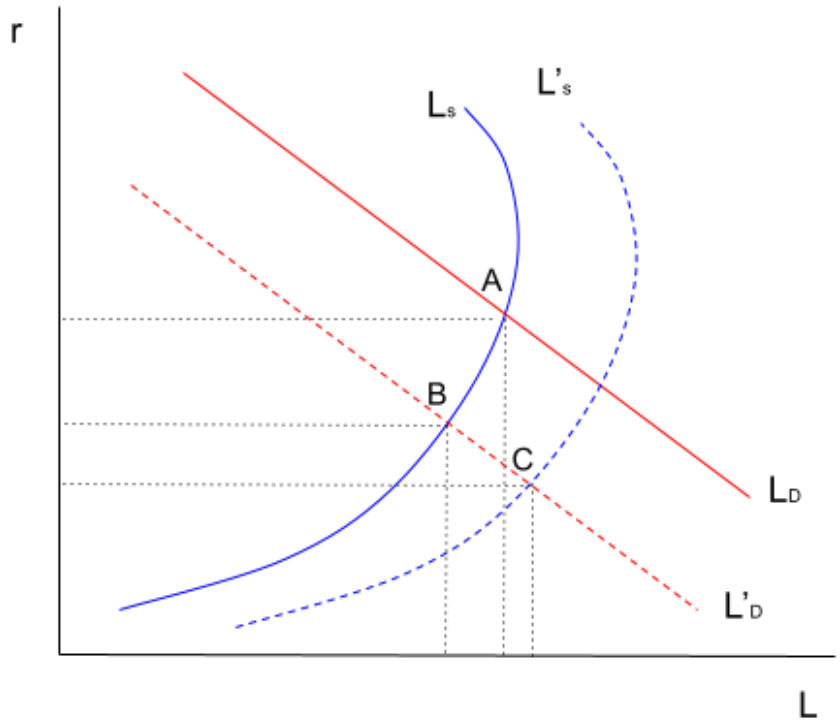
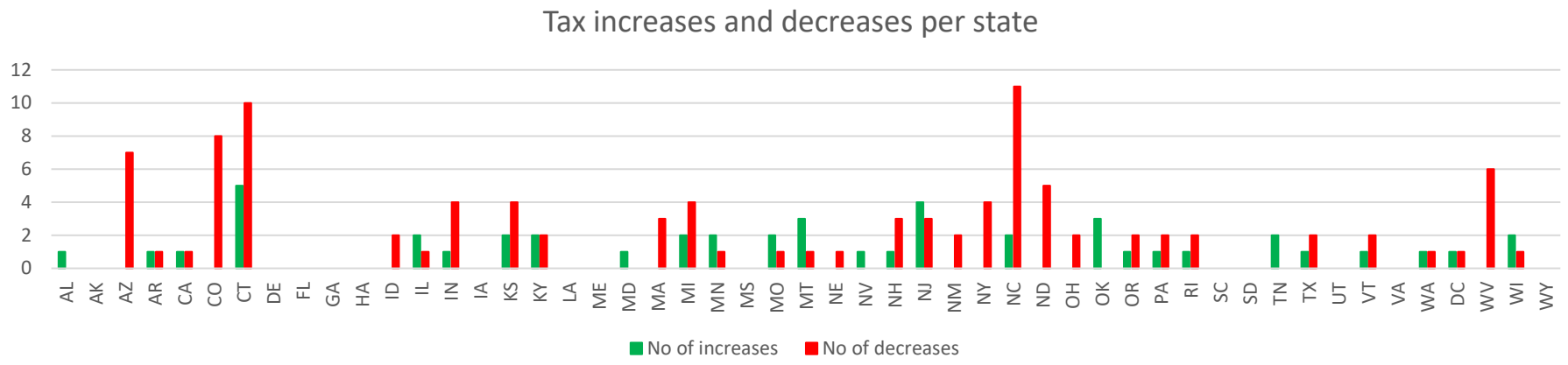


Figure 2. Number and average level of tax increases and tax cuts per State and per year

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

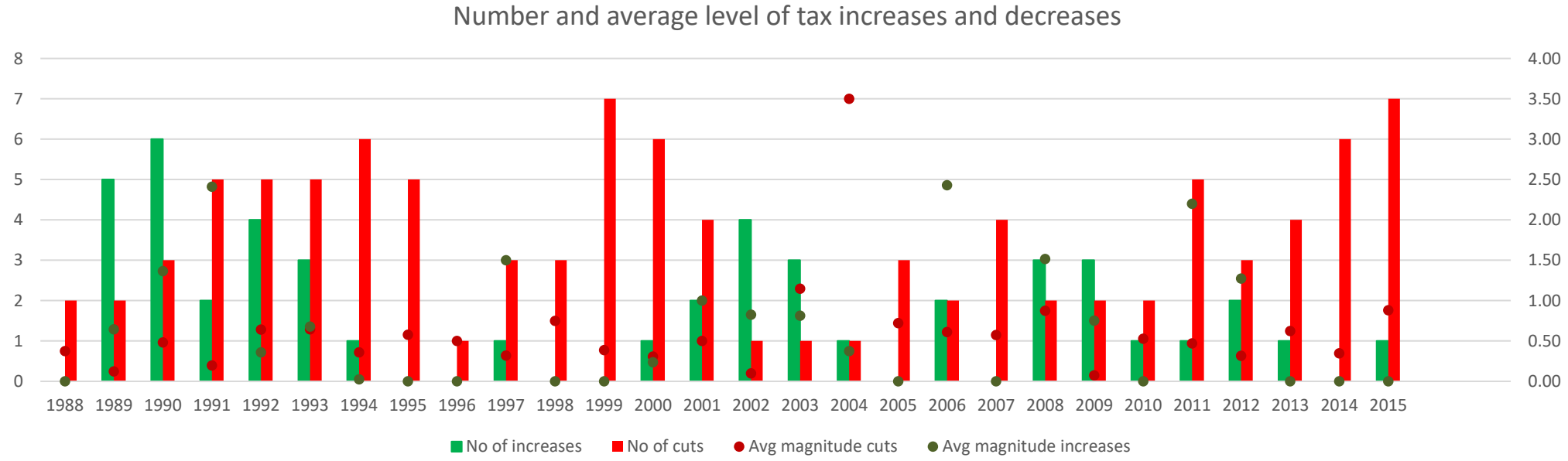


Table 1. Variable definitions and sources

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
Maturity	Loan duration in months.	DealScan
Bank share	The lead bank's share of the loan facility.	DealScan
Herfindahl	The Herfindahl index of the syndicate (a measure of the concentration of holdings within a syndicate). The Herfindahl index is calculated using each syndicate member's share in the loan. It is the sum of the squared individual shares in the loan, and varies from zero to 10,000, with 10,000 being the Herfindahl when a lender holds 100% of the loan. The variable is transformed into logarithmic form.	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
C. Explanatory variables: Loan characteristics		
AISU	All-in spread undrawn, defined as the sum of the facility fee and the commitment fee.	DealScan
Loan amount	Log of the loan facility amount in USD.	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
Institutional term loan	A binary variable equal to one if the loan facility is a non-amortizing term loan (Term Loan B or higher), and zero otherwise.	DealScan
Distressed	A binary variable equal to one if the loan is selling in the secondary market at below 90% of face value, and otherwise zero.	LSTA
Quote	The average price quote across dealers for the loan in the secondary market.	LSTA
Bid-ask spread	The average difference between the ask quotes and bid quotes for the loan in the secondary market.	LSTA
Number of quotes	The total number of quotes for the loan in the secondary market.	LSTA
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 ratio 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.	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 Tobin's Q	The log of firm's Tobin's Q.	Compustat
Firm retained earnings	The ratio of retained earnings to total assets (%).	Compustat
Firm KZ index	The Kaplan-Zingales index 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	0.42	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	3.50
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 share	37,199	40.48	35.78	0.09	100.00
Herfindahl	37,199	7.77	1.06	2.99	9.21
Bank size	20,169	13.10	1.50	5.73	14.70
Bank return on assets	20,169	1.28	0.56	-3.61	3.53
Bank NPLs	20,169	1.87	1.79	0.05	10.23
Bank Lerner index	20,026	0.25	0.15	0.00	0.50
Bank capital	17,007	12.71	1.60	10.15	30.90
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	37.87	26.05	0.00	307.23
Firm Tobin's Q	37,234	0.38	0.35	-1.59	1.61
Firm retained earnings	14,709	19.96	17.41	0.00	99.04
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	29,339	2.49	3.28	-5.20	6.54
Federal tax change	37,234	-0.12	0.96	-6.00	1.00

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	37,234	216.64	145.77	0.70	1,655.00
AISU	21,834	32.21	23.66	0.75	750.00
Loan amount	37,234	0.04	0.19	0.00	1.00
Maturity	37,234	0.08	0.28	0.00	1.00
Collateral	37,234	18.29	1.80	9.21	24.62
Number of lenders	37,234	47.32	24.70	0.00	396.00
Performance provisions	37,234	0.57	0.50	0.00	1.00
General covenants	37,234	7.63	8.80	1.00	176.00
Bank share	37,234	0.39	0.49	0.00	1.00
Herfindahl	37,234	1.43	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
Bank share	0.06	0.98	0.45	0.68
Herfindahl	0.01	0.03	0.00	0.02

Table 4. Determinants of state corporate income tax changes

The table reports summary statistics for variables reflecting political and economic conditions at the borrower's state-level and estimates from regressions on the determinants of corporate income tax changes in the borrower's state. All variables are defined in Table 1. The sample covers 51 U.S. states (including Washington D.C.) during the 1988-2015 fiscal years for a maximum 1,260 state-year observations (depending on the variable employed). Columns (1)-(3) report summary statistics for the explanatory variables, showing fractions or means (with standard deviations shown in italics underneath the means). Column (4) compares conditions in borrower states that increase tax rates to those in borrower states that decrease tax rates. Columns (5)-(6) present estimates from OLS regressions at the state-year level for the probability that a borrower's state increases or decreases corporate income tax rates. Column (7)-(9) present estimates from OLS regressions at the state-year level for the determinants of the magnitude of the tax rate changes (in percentage points). Specifications (5)-(9) include year and state fixed effects and standard errors are clustered by state. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	Summary statistics			Difference	Probability of …		Probability of …		
	Full sample	Tax increases	Tax decreases	(Tax inc. – Tax dec.)	Tax increase	Tax decrease	Tax change	Tax increase	Tax decrease
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Political conditions in year t-1									
Republican governor	0.52	0.52	0.55	0.03	-0.004	0.065**	-0.065**	-0.033**	0.047**
					[-0.341]	[2.095]	[-2.089]	[-2.106]	[2.093]
1 year to election					-0.031	-0.047	0.016	-0.011	-0.001
					[-1.015]	[-1.138]	[0.253]	[-0.630]	[-0.025]
2 years to election					0.006	-0.055	0.060	0.020	-0.019
					[0.213]	[-1.354]	[1.128]	[0.929]	[-0.583]
3 years to election					-0.028	-0.014	-0.013	-0.017	-0.015
					[-1.071]	[-0.331]	[-0.219]	[-0.575]	[-0.507]
Economic conditions in year t-1									
State budget balance	0.03	0.00	0.03	0.03			0.069		
	0.09	0.07	0.09				[0.188]		
State budget deficit	-0.01	-0.02			-0.184			-0.688	
	0.03	0.04			[-0.411]			[-0.744]	
State budget surplus	0.04		0.05			-0.402			-0.874
	0.08		0.07			[-1.254]			[-1.383]
State gross product growth	0.02	0.01	0.03	0.02**	-0.613**	0.445	-0.902	-1.344	0.556
	0.03	0.02	0.03		[-2.263]	[0.572]	[-1.071]	[-1.595]	[0.833]
State unemployment rate	0.06	0.06	0.06	0.01	-2.251**	2.407*	-4.765**	-0.809	0.960
	0.02	0.02	0.02		[-2.067]	[1.701]	[-2.610]	[-0.792]	[0.860]
Tax competition	-0.02	-0.02	-0.02	0.01	-1.657	2.269	-3.875	-5.829	4.096
	0.02	0.02	0.02		[-1.252]	[0.912]	[-1.543]	[-1.382]	[1.614]
Adj. R-squared					0.080	0.120	0.111	0.244	0.110

Table 5. 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	-0.796	1.199	1.353	2.827
	[-0.236]	[0.291]	[0.321]	[0.789]
Tax decrease	-6.735***	-5.726***	-5.857***	-4.798**
	[-2.866]	[-3.218]	[-3.137]	[-2.386]
Loan amount	-10.499***	-11.403***	-11.328***	-10.685***
	[-10.601]	[-16.663]	[-16.966]	[-16.938]
Maturity	-0.208***	-0.234***	-0.231***	-0.180***
	[-3.102]	[-4.821]	[-4.732]	[-3.454]
Collateral	31.416***	32.274***	31.597***	31.971***
	[10.613]	[15.752]	[14.734]	[18.757]
Number of lenders	-0.131	-0.030	-0.043	-0.081
	[-0.993]	[-0.288]	[-0.421]	[-0.855]
Performance provisions	-21.828***	-23.724***	-23.182***	-23.080***
	[-8.420]	[-11.341]	[-11.784]	[-11.251]
General covenants	3.291***	2.633***	2.765***	3.015***
	[3.148]	[3.403]	[3.632]	[3.691]
Bank size	-8.515			
	[-1.561]			
Bank return on assets	1.203			
	[0.470]			
Bank NPLs	-1.140			
	[-0.682]			
Firm size	-11.856***	-14.186***	-14.640***	-13.557***
	[-4.145]	[-6.873]	[-7.000]	[-6.013]
Firm return on assets	-1.578***	-1.191***	-1.199***	-1.205***
	[-9.793]	[-11.945]	[-13.898]	[-10.736]
Firm leverage	0.841***	0.803***	0.802***	0.831***
	[7.708]	[10.829]	[11.642]	[10.566]
Firm Tobin's Q	-26.600***	-31.055***	-31.766***	-32.620***
	[-6.586]	[-8.345]	[-8.003]	[-8.799]
Effective corporate tax rate	-3.191	24.031	2.226	
	[-0.028]	[0.330]	[0.031]	
Constant	580.274***	497.617***	508.170***	486.417***
	[7.867]	[14.851]	[15.391]	[28.513]
Observations	20,169	37,234	37,061	35,178
Adj. R-squared	0.722	0.733	0.733	0.752
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	136	726	716	675
Number of firms	3,669	6,352	6,292	6,032

Table 6. Placebo tests

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is a number of different placebo tests. 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 country (specifications 1-2) and borrower's state (specification 3). 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), all borrowers operating in states with no tax change in our sample period (control group) is replaced by foreign (non-US) borrowers. In specification (2), all borrowers in states with at least one tax change in our sample period (treatment group) is replaced by foreign (non-US) borrowers. In specification (3), the baseline tax increase and tax decrease indicators are replaced by their lagged values, i.e., binary variables that equal one for an increase and decrease respectively in the corporate income tax rate in the state of the borrower in the year before the loan, and otherwise zero. Specifications (1) and (2) include loan type, loan purpose, firm, lender's country, borrower's country, and bank times year fixed effect. Specification (3) includes 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	0.905	10.530	
	[1.592]	[0.419]	
Tax decrease	-2.387**	-17.216	
	[-2.266]	[-1.636]	
Tax increase (t-1)			-0.708
			[-0.167]
Tax decrease (t-1)			-1.293
			[-0.647]
Loan amount	-7.285***	-5.664***	-11.234***
	[-3.293]	[-3.857]	[-16.564]
Maturity	0.303***	0.327***	-0.244***
	[3.585]	[3.086]	[-4.976]
Collateral	12.853**	17.340**	32.673***
	[2.171]	[2.256]	[15.415]
Number of lenders	0.078	-0.221	-0.009
	[0.450]	[-0.852]	[-0.085]
Performance provisions	-16.104***	-8.284**	-24.101***
	[-2.719]	[-2.228]	[-11.512]
General covenants	1.920	2.336*	2.425***
	[1.455]	[1.891]	[3.148]
Firm size	-5.502	-3.943*	-14.900***
	[-1.337]	[-1.743]	[-7.339]
Firm return on assets	-2.220***	-2.328***	-1.290***
	[-3.561]	[-3.613]	[-12.674]
Firm leverage	0.272***	0.130	0.692***
	[2.848]	[1.032]	[9.208]
Firm Tobin's Q	-50.866***	-53.968***	-31.235***
	[-4.447]	[-5.026]	[-8.323]
Effective corporate tax rate			23.094
			[0.315]
Constant	372.172***	335.764***	508.403***
	[5.842]	[8.428]	[15.303]
Observations	18,625	17,317	37,234
Adj. R-squared	0.768	0.760	0.731
Fixed effects	Y	Y	Y
Number of banks	773	779	726
Number of firms	4,400	3,693	6,352

Table 7. DID event study

The table reports estimates from an event study, with a (-2, +2) year window around each corporate tax change. 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. In specification (1), *Treated firm (increase)* is a binary variable equal to one if the borrower belongs to the treatment group (i.e., is subject to a corporate tax increase), and zero otherwise, and *Post-tax increase* is a binary variable equal to one for the period after the corporate tax increase [i.e., when the window assumes values of 0 (the year of the tax change), +1 or +2], and zero otherwise. In specification (2), *Treated firm (decrease)* is a binary variable equal to one if the borrower belongs to the treatment group (i.e., is subject to a corporate tax decrease), and zero otherwise, and *Post-tax decrease* is a binary variable equal to one for the period after the corporate tax decrease [i.e., when the window assumes values of 0 (the year of the tax change), +1 or +2], and zero otherwise. Specifications (3) and (4) replicate specifications (1) and (2) respectively, by excluding the years of the financial crisis (i.e. from September 15, 2008 until December 31, 2009). 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 and loan purpose fixed effects. The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)	(3)	(4)
Treated firm (increase)	12.246*		10.689*	
	[1.821]		[1.688]	
Post-tax increase	11.259***		7.420***	
	[4.983]		[3.001]	
Treated firm (increase) × Post-tax increase	-3.692		-0.252	
	[-0.368]		[-0.027]	
Treated firm (decrease)		-8.833		-7.546
		[-1.350]		[-1.332]
Post-tax decrease		5.887***		7.613***
		[3.269]		[3.764]
Treated firm (decrease) × Post-tax decrease		-11.874***		-13.461***
		[-3.284]		[-3.163]
Loan amount	-19.299***	-21.903***	-19.664***	-21.966***
	[-14.825]	[-18.124]	[-14.503]	[-17.250]
Maturity	-0.490***	-0.408***	-0.415***	-0.357***
	[-5.836]	[-4.904]	[-5.366]	[-4.636]
Collateral	71.466***	72.934***	70.551***	71.384***
	[23.120]	[16.133]	[21.937]	[15.749]
Number of lenders	-0.440**	-0.292	-0.338	-0.215
	[-2.126]	[-1.097]	[-1.591]	[-0.839]
Performance provisions	-36.999***	-40.733***	-38.970***	-41.769***
	[-10.392]	[-14.870]	[-11.459]	[-14.884]
General covenants	1.617	1.027	1.948	1.293
	[1.102]	[0.738]	[1.421]	[0.934]
Firm size	-1.953*	-0.285	-2.926***	-1.411
	[-1.945]	[-0.187]	[-2.976]	[-0.914]
Firm return on assets	-1.697***	-1.685***	-1.648***	-1.612***
	[-14.817]	[-7.999]	[-12.846]	[-8.499]
Firm leverage	0.715***	0.686***	0.721***	0.679***
	[11.717]	[10.039]	[12.319]	[10.155]
Firm Tobins' Q	-25.465***	-22.666***	-22.948***	-21.642***
	[-6.908]	[-4.263]	[-6.374]	[-3.844]
Constant	558.717***	600.665***	566.343***	603.444***
	[25.743]	[26.010]	[24.494]	[26.224]
Observations	15,829	9,824	15,450	9,635
Adjusted R-squared	0.466	0.477	0.474	0.483
Fixed effects	Y	Y	Y	Y
Number of banks	781	636	772	625
Number of firms	4,521	2,899	4,471	2,861

Table 8. 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)	0.914		
	[0.252]		
Tax decrease (all types)	-6.444**		
	[-2.608]		
Tax increase (rate)		-0.223	
		[-0.132]	
Tax decrease (rate)		-3.996*	
		[-1.769]	
Large tax increase			-3.136
			[-0.602]
Small tax increase			2.804
			[0.456]
Large tax decrease			-4.737*
			[-2.007]
Small tax decrease			-5.845*
			[-1.714]
Loan amount	-11.398***	-11.410***	-11.402***
	[-13.973]	[-14.027]	[-13.970]
Maturity	-0.234***	-0.235***	-0.234***
	[-3.382]	[-3.383]	[-3.382]
Collateral	32.268***	32.264***	32.277***
	[12.701]	[12.725]	[12.689]
Number of lenders	-0.029	-0.030	-0.031
	[-0.252]	[-0.269]	[-0.273]
Performance provisions	-23.734***	-23.678***	-23.712***
	[-9.302]	[-9.312]	[-9.300]
General covenants	2.632***	2.623***	2.637***
	[3.013]	[2.993]	[3.015]
Firm size	-14.198***	-14.246***	-14.189***
	[-7.205]	[-7.215]	[-7.192]
Firm return on assets	-1.193***	-1.192***	-1.192***
	[-10.956]	[-10.966]	[-10.933]
Firm leverage	0.803***	0.804***	0.804***
	[8.350]	[8.340]	[8.331]
Firm Tobin's Q	-31.046***	-31.063***	-31.027***
	[-7.670]	[-7.652]	[-7.655]
Effective corporate tax rate	26.343	18.815	24.119
	[0.208]	[0.148]	[0.189]
Constant	496.943***	500.023***	497.546***
	[10.115]	[10.143]	[10.036]
Observations	37,234	37,234	37,234
Adj. R-squared	0.733	0.733	0.733
Fixed effects	Y	Y	Y
Number of banks	726	726	726
Number of firms	6,352	6,352	6,352

Table 9. Robustness checks

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the inclusion of different variables as controls or as interactions with the tax increase and tax decrease indicators. 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 (2), we double-interact *Tax increase* and *Tax decrease* with *Same state*, i.e., a binary variable equal to one if the lender and the borrower are headquartered in the same state, and zero otherwise. In specification (3), we include as an additional control variable *Shadow rate*, i.e. the quarterly shadow short rate. In specification (4), we double-interact *Tax increase* and *Tax decrease* with *Shadow rate*. In specification (5), we double-interact *Tax increase* and *Tax decrease* with *Federal tax*, i.e., the change in the federal corporate income tax rate. In specification (6), 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)	(3)	(4)	(5)
Tax increase	2.317	1.656	1.921	3.570	0.994	-1.587
	[0.709]	[0.391]	[0.511]	[0.711]	[0.233]	[-0.379]
Tax decrease	-6.560***	-6.024***	-6.295**	-7.300***	-6.346***	-6.453**
	[-3.454]	[-2.957]	[-2.336]	[-2.732]	[-3.380]	[-2.546]
Tax increase × Institutional term loan	-9.698					
	[-0.972]					
Tax decrease × Institutional term loan	7.162					
	[1.208]					
Tax increase × Same state		-11.992				
		[-1.099]				
Tax decrease × Same state		1.583				
		[0.324]				
Shadow rate			-2.249*	-2.234*		
			[-1.871]	[-1.868]		
Tax increase × Shadow rate				-0.741		
				[-0.500]		
Tax decrease × Shadow rate				0.417		
				[0.541]		
Tax increase × Federal tax					0.344	
					[0.172]	
Tax decrease × Federal tax					6.650**	
					[2.330]	
Tax increase × Relationship lending						7.515
						[1.459]
Tax decrease × Relationship lending						-0.033
						[-0.007]
Observations	37,234	37,234	29,339	29,339	37,234	37,243
Adj. R-squared	0.733	0.733	0.732	0.732	0.728	0.720
Full set of controls	Y	Y	Y	Y	Y	Y
Fixed effects	Y	Y	Y	Y	Y	Y
Number of banks	726	726	545	545	726	726
Number of firms	6,352	6,352	5,108	5,108	6,352	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*. 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	-3.801	-2.377
	[-0.506]	[-0.379]
Tax decrease	-0.207	1.500
	[-0.060]	[0.345]
Tax increase × Firm retained earnings	-0.038	
	[-0.123]	
Tax decrease × Firm retained earnings	-0.293**	
	[-2.431]	
Tax increase × Firm leverage		0.099
		[0.595]
Tax decrease × Firm leverage		-0.193**
		[-2.078]
Observations	14,709	37,234
Adj. R-squared	0.748	0.733
Full set of controls	Y	Y
Fixed effects	Y	Y
Number of banks	443	726
Number of firms	3,535	6,348

Table 11. 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 noted in the second line of the table 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* respectively with *Bank Lerner index*. In specification (2), we double-interact *Tax increase* and *Tax decrease* respectively with *Bank Lerner index* and further interact each double-interaction with *Shadow rate*. In specifications (3) and (4) we double-interact *Tax increase* and *Tax decrease* respectively with *Bank capital*. All specifications include year, loan type, loan purpose, 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)	(4)	(5)	(6)
	AISD	AISD	AISD	Loan amount	Bank share	Herfindahl
Tax increase	1.188	0.060	0.497	-0.005	0.662	0.052**
	[0.188]	[0.018]	[0.142]	[-0.248]	[0.884]	[2.507]
Tax decrease	-14.074***	-7.546**	-5.822**	0.023	0.142	-0.003
	[-3.376]	[-2.587]	[-2.179]	[0.661]	[0.149]	[-0.113]
Tax increase × Bank Lerner index	-7.285	-23.009				
	[-0.329]	[-0.778]				
Tax decrease × Bank Lerner index	27.490*	26.874**				
	[1.905]	[2.196]				
Tax increase × Bank Lerner index × Shadow rate		-7.744				
		[-0.772]				
Tax decrease × Bank Lerner index × Shadow rate		5.432				
		[1.123]				
Tax increase × Bank capital			-1.920	-0.008	0.170	0.007
			[-0.690]	[-0.346]	[0.316]	[0.435]
Tax decrease × Bank capital			0.527	-0.011	0.974*	0.035**
			[0.379]	[-0.714]	[1.727]	[2.109]
Observations	20,026	18,325	17,011	17,011	17,007	17,007
Adj. R-squared	0.723	0.726	0.734	0.787	0.650	0.625
Full set of controls	Y	Y	Y	Y	Y	Y
Fixed effects	Y	Y	Y	Y	Y	Y
Number of banks	136	126	107	107	107	107
Number of firms	3,652	3,326	3,241	3,241	3,241	3,241

Table 12. The effect of corporate tax changes on loan maturity

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 *Maturity* 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 estimate Equation (1) with *Maturity* as dependent variable and *AISD* as control variable. In specification (2), we replicate specification (1) and further double-interact *Tax increase* and *Tax decrease* with *Firm retained earnings*. In specification (3), we replicate specification (1) and further double-interact *Tax increase* and *Tax decrease* with *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) Loan maturity	(2) Loan maturity	(3) Loan maturity
Tax increase	0.555	1.187	-0.713
	[0.637]	[0.880]	[-0.530]
Tax decrease	1.027**	1.478**	-0.894
	[2.290]	[2.333]	[-1.273]
Tax increase × Firm retained earnings		-0.021	
		[-0.491]	
Tax decrease × Firm retained earnings		-0.058**	
		[-2.663]	
Tax increase × Firm leverage			0.035
			[1.242]
Tax decrease × Firm leverage			0.052***
			[3.697]
Observations	37,234	14,709	37,234
Adj. R-squared	0.655	0.681	0.655
Full set of controls	Y	Y	Y
Fixed effects	Y	Y	Y
Number of banks	726	443	726
Number of firms	6,352	3,535	6,352

Table 13. The effect of corporate tax changes on the secondary loan market

The table reports coefficients and t-statistics (in brackets). The distinguishing feature is the examination of secondary loan market. The dependent variable is noted in the second line 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), the dependent variable is *Distressed loan*, i.e., a binary variable equal to one if the loan is selling in the secondary market at below 90% of face value, and otherwise zero. In specification (2), the dependent variable is *Bid-ask spread*, i.e., the average difference between the ask quotes and bid quotes for the loan in the secondary market. In specification (3), we replicate specification (1) and further double-interact *Tax increase* and *Tax decrease* with *Firm size*. In specification (4), we replicate specification (1) and further double-interact *Tax increase* and *Tax decrease* with *Firm leverage*. All specifications include 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)
	Distressed loan	Bid-ask spread	Distressed loan	Distressed loan
Tax increase	0.027	0.063	0.076	-0.015
	[0.512]	[0.637]	[0.297]	[-0.175]
Tax decrease	-0.066**	0.039	0.385*	-0.270***
	[-2.081]	[0.357]	[1.788]	[-3.319]
Tax increase × Firm size			-0.006	
			[-0.209]	
Tax decrease × Firm size			-0.055*	
			[-1.938]	
Tax increase × Firm leverage				0.001
				[0.332]
Tax decrease × Firm leverage				0.004***
				[3.389]
Quote	-0.027***	-0.101***	-0.027***	-0.027***
	[-3.574]	[-6.795]	[-3.563]	[-3.546]
Bid-ask spread	0.062*		0.063*	0.064*
	[1.837]		[1.897]	[1.932]
Number of quotes	-0.000	-0.000***	-0.000	-0.000
	[-0.297]	[-3.906]	[-0.267]	[-0.296]
Firm size	0.017	-0.106	0.030	0.036
	[0.616]	[-0.980]	[1.236]	[1.497]
Firm return on assets	0.002	-0.000	0.001	0.002
	[1.258]	[-0.019]	[1.141]	[1.170]
Firm leverage	0.002*	0.000	0.002**	0.002**
	[1.933]	[0.228]	[2.035]	[2.028]
Firm Tobin's Q	0.092**	-0.024	0.102**	0.099**
	[2.262]	[-0.106]	[2.565]	[2.454]
Effective corporate tax rate	0.894	-2.720	0.695	0.202
	[1.588]	[-0.652]	[1.268]	[0.322]
Constant	2.039*	12.734***	1.970*	2.099**
	[2.018]	[7.010]	[1.975]	[2.090]
Observations	1,168	1,168	1,168	1,168
Adj. R-squared	0.701	0.758	0.701	0.703
Full set of controls	Y	Y	Y	Y
Fixed effects	Y	Y	Y	Y
Number of banks	72	72	72	72
Number of firms	375	375	375	375

Internet Appendix
Corporate tax changes and credit costs

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 sample-selection model

The table reports the estimates from Heckman's (1979) sample-selection model. The dependent variable is in the second line of each panel and all variables are defined in Table 1. Panel A reports estimates from the first-stage probit model to estimate the determinants of the borrower's decision to access the syndicated loan market. The probit model is estimated at the firm-year level and includes observations for all companies in Compustat. The dependent variable in the first stage is *Syndicated lending*, i.e., a binary variable equal to one if the company obtains a syndicated loan in the year, and zero otherwise. Panel B reports estimates from the second-stage OLS model to estimate the effect of corporate tax changes on loan spreads. The OLS model is estimated at the loan-level. The dependent variable in the second stage is *AISD*. Each of the specifications in the second stage includes the inverse mills ratio (*Lambda*) from the corresponding first-stage specification. The estimation method in the first stage is maximum likelihood and in the second stage is OLS with standard errors clustered by borrower's state. 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 in Panel A include year, company and state fixed effects. All specifications in Panel B 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.

Panel A: The syndicated loan-taking decision by the firm

	(1) Syndicated lending	(2) Syndicated lending	(3) Syndicated lending	(4) Syndicated lending
Firm size	0.225***	0.271***	0.248***	0.294***
	[144.338]	[106.080]	[125.763]	[88.731]
Firm return on assets	-0.000	-0.000	-0.000*	-0.003**
	[-1.564]	[-1.601]	[-1.762]	[-2.380]
Firm debt	0.001	0.001	0.000***	0.003*
	[1.230]	[1.288]	[2.854]	[1.938]
Firm Tobin's Q	-0.000	-0.000	-0.000	-0.002*
	[-0.638]	[-1.035]	[-0.037]	[-1.880]
Firm tangibility		0.383***		0.582***
		[26.320]		[32.218]
Firm return on equity		0.000		0.000
		[0.395]		[0.777]
Firm cash		-0.060***		-0.059***
		[-26.632]		[-20.457]
Firm retained earnings		-0.000**		-0.000
		[-2.367]		[-0.335]
Republican governor	0.067***	0.057***	0.063***	0.030***
	[9.820]	[7.925]	[7.314]	[3.298]
1 year to election	0.010	0.015	-0.010	-0.003
	[1.075]	[1.541]	[-0.826]	[-0.268]
2 years to election	0.023**	0.024**	0.001	0.002
	[2.369]	[2.422]	[0.098]	[0.165]
3 years to election	-0.006	-0.011	0.014	0.011
	[-0.674]	[-1.082]	[1.203]	[0.914]
State gross product growth			-0.017***	0.009*
			[-3.425]	[1.728]
State unemployment rate			1.793***	1.747***
			[7.546]	[6.969]
Constant	36.563***	29.673***	55.940***	51.481***
	[39.841]	[30.433]	[38.257]	[33.097]
Observations	212,895	198,301	144,245	133,527

Panel B: The effect of corporate tax changes on syndicated loan spreads

	(1) AISD	(2) AISD	(3) AISD	(4) AISD
Tax increase	0.401	-0.788	1.248	0.523
	[0.094]	[-0.169]	[0.279]	[0.111]
Tax decrease	-5.497***	-5.505***	-10.053***	-9.701***
	[-2.927]	[-2.883]	[-2.896]	[-2.710]
Loan amount	-11.242***	-11.299***	-10.519***	-10.780***

	[-18.046]	[-17.065]	[-12.901]	[-12.509]
Maturity	-0.221***	-0.239***	-0.100	-0.143*
	[-4.685]	[-4.829]	[-1.339]	[-1.791]
Collateral	31.839***	32.302***	25.448***	25.924***
	[17.109]	[16.362]	[9.421]	[10.008]
Number of lenders	-0.038	-0.058	-0.194	-0.230*
	[-0.376]	[-0.594]	[-1.387]	[-1.750]
Performance provisions	-23.997***	-23.862***	-26.238***	-26.552***
	[-11.616]	[-10.973]	[-10.475]	[-9.998]
General covenants	2.903***	2.831***	4.045***	4.150***
	[3.724]	[3.560]	[4.244]	[4.087]
Firm size	-0.303	-5.169*	-11.639	-1.865
	[-0.043]	[-1.987]	[-1.515]	[-0.500]
Firm return on assets	-1.143***	-1.170***	-1.380***	-1.421***
	[-11.524]	[-10.691]	[-9.337]	[-8.858]
Firm leverage	0.804***	0.857***	0.944***	1.024***
	[10.023]	[10.164]	[7.674]	[7.663]
Firm Tobin's Q	-31.153***	-31.563***	-32.458***	-32.394***
	[-8.889]	[-9.462]	[-7.321]	[-7.406]
Effective corporate tax rate	16.529	8.773	-40.296	-44.593
	[0.216]	[0.103]	[-0.429]	[-0.423]
Lambda	90.479**	65.195***	-0.092	59.167***
	[2.089]	[5.017]	[-0.002]	[4.160]
Constant	289.234**	358.112***	498.347***	365.584***
	[2.623]	[8.077]	[4.418]	[6.409]
Observations	34,239	32,645	22,723	21,531
	0.798	0.799	0.793	0.794
Number of banks	698	686	399	391
Number of firms	5,861	5,624	3,971	3,774

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 Kaplan-Zingales index and the credit rating category. All specifications provide estimates that are almost similar to that from our baseline regression.[17]

In Appendix Table A5, 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 A6 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 none of the remaining loan terms, namely loan amount, collateral, general covenants and

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

performance provisions, is responsive to corporate tax changes (columns 2-5). The effect of the tax decrease on the loan amount is interesting as it shows that there is a dominant loan demand effect and a secondary supply effect that together with the inelastic loan supply effect possibly renders the coefficient on tax decrease positive but insignificant (as in Figure 1). We pinpoint this effect in section 6.

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 A7, 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). Finally, column 6, reveals no differential effect when we interact either tax change with an indicator for Republican or Democrat administration in the borrower's state.

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 A8. 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 A9, 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 A10 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 OLS with standard errors clustered by borrower's state. 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	0.25	0.5	0.286	0.819	-4.629	-0.609	-3.172
	[0.058]	[0.120]	[0.068]	[0.190]	[-1.099]	[-0.108]	[-0.856]
Tax decrease	-5.952***	-5.526***	-5.857***	-6.321***	-6.504**	-7.536**	-6.437**
	[-3.160]	[-3.048]	[-3.195]	[-3.264]	[-2.620]	[-2.663]	[-2.144]
Loan amount		-12.609***			-8.660***	-11.091***	-10.381***
		[-17.936]			[-9.771]	[-15.362]	[-9.536]
Maturity		-0.247***			-0.274***	-0.224***	-0.214**
		[-5.318]			[-4.490]	[-4.320]	[-2.416]
Collateral			31.656***		30.447***	31.738***	29.430***
			[16.254]		[11.442]	[14.517]	[7.892]
Number of lenders			-0.467***		-0.076	0.07	-0.101
			[-4.727]		[-0.749]	[0.513]	[-0.720]
Performance provisions				-25.831***	-17.812***	-19.886***	-23.390***
				[-11.430]	[-6.857]	[-8.169]	[-10.220]
General covenants				4.683***	4.054***	1.787**	3.623***
				[5.534]	[5.445]	[2.373]	[3.844]
Firm size	-23.693***	-16.260***	-20.430***	-23.114***	-16.221***	-12.839***	-5.508*
	[-11.071]	[-7.734]	[-9.466]	[-11.088]	[-4.989]	[-5.385]	[-1.844]
Firm return on assets	-1.312***	-1.290***	-1.245***	-1.282***	-1.194***	-1.410***	-1.520***
	[-12.965]	[-12.817]	[-12.026]	[-13.173]	[-6.259]	[-9.036]	[-8.074]
Firm leverage	0.861***	0.883***	0.803***	0.844***	0.713***	0.877***	0.843***
	[11.411]	[11.749]	[10.745]	[11.429]	[8.364]	[7.837]	[7.371]
Firm Tobin's Q	-36.277***	-33.998***	-33.868***	-35.163***	-32.665***	-22.805***	-37.710***
	[-9.208]	[-8.794]	[-8.799]	[-9.088]	[-7.853]	[-7.074]	[-9.768]
Effective corporate tax rate	-20.929	7.347	0.897	-21.461	-150.175	-94.475	-133.287
	[-0.292]	[0.105]	[0.012]	[-0.291]	[-1.077]	[-1.116]	[-1.239]
Firm retained earnings					-0.06		
					[-1.373]		
Firm KZ index						0.792	
						[1.316]	
Firm rating category							26.241***
							[8.966]
Constant	373.712***	552.289***	329.172***	373.568***	523.945***	517.313***	397.994***
	[11.853]	[17.206]	[10.408]	[11.613]	[9.039]	[15.249]	[8.378]
Observations	37,234	37,234	37,234	37,234	14,709	27,009	15,487
Adj. R-squared	0.72	0.726	0.725	0.724	0.748	0.744	0.773
Fixed effects	Y	Y	Y	Y	Y	Y	Y
Number of banks	726	726	726	726	443	630	267
Number of firms	6,352	6,352	6,352	6,352	3,535	4,878	2,261

Table A5. 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	1.199	1.199	1.199	1.199	1.199
	[0.367]	[0.291]	[0.322]	[0.322]	[0.461]
Tax decrease	-5.726**	-5.726***	-5.726**	-5.726**	-5.726**
	[-2.408]	[-3.218]	[-2.436]	[-2.436]	[-2.074]
Loan amount	-11.403***	-11.403***	-11.403***	-11.403***	-11.403***
	[-15.470]	[-16.663]	[-13.981]	[-13.981]	[-11.842]
Maturity	-0.234***	-0.234***	-0.234***	-0.234***	-0.234***
	[-4.868]	[-4.821]	[-3.387]	[-3.387]	[-3.183]
Collateral	32.274***	32.274***	32.274***	32.274***	32.274***
	[16.341]	[15.752]	[12.690]	[12.690]	[11.324]
Number of lenders	-0.030	-0.030	-0.030	-0.030	-0.030
	[-0.351]	[-0.288]	[-0.263]	[-0.263]	[-0.281]
Performance provisions	-23.724***	-23.724***	-23.724***	-23.724***	-23.724***
	[-13.529]	[-11.341]	[-9.309]	[-9.309]	[-10.088]
General covenants	2.633***	2.633***	2.633***	2.633***	2.633***
	[3.720]	[3.403]	[3.016]	[3.016]	[3.451]
Firm size	-14.186***	-14.186***	-14.186***	-14.186***	-14.186***
	[-7.961]	[-6.873]	[-7.188]	[-7.188]	[-8.014]
Firm return on assets	-1.191***	-1.191***	-1.191***	-1.191***	-1.191***
	[-10.813]	[-11.945]	[-10.983]	[-10.983]	[-7.827]
Firm leverage	0.803***	0.803***	0.803***	0.803***	0.803***
	[12.674]	[10.829]	[8.352]	[8.352]	[8.344]
Firm Tobin's Q	-31.055***	-31.055***	-31.055***	-31.055***	-31.055***
	[-10.593]	[-8.345]	[-7.660]	[-7.660]	[-9.022]
Effective corporate tax rate	24.031	24.031	24.031	24.031	24.031
	[0.266]	[0.330]	[0.189]	[0.189]	[0.172]
Constant	497.617***	497.617***	497.617***	497.617***	497.617***
	[12.411]	[14.851]	[10.104]	[10.104]	[8.634]
Observations	37,234	37,234	37,234	37,234	37,234
Adj. R-squared	0.733	0.733	0.733	0.733	0.733
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 A6. 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 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. 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) Collateral	(4) General covenants	(5) Performance provisions
Tax increase	0.177	0.009	-0.007	-0.011	0.024***
	[0.509]	[0.373]	[-0.442]	[-0.312]	[3.588]
Tax decrease	-0.600	0.004	-0.002	0.028	-0.017
	[-1.294]	[0.187]	[-0.221]	[0.956]	[-1.456]
AISD	0.119***	-0.001***	0.001***	0.000***	-0.000***
	[19.090]	[-15.950]	[14.679]	[3.437]	[-11.720]
Loan amount	-0.334		-0.008**	0.001	0.023***
	[-1.572]		[-2.205]	[0.116]	[10.148]
Maturity	0.033**	0.005***	0.001***	-0.000	0.001***
	[2.340]	[13.277]	[3.634]	[-0.024]	[4.468]
Collateral	2.614***	-0.052**		0.534***	0.053***
	[4.923]	[-2.146]		[25.897]	[5.474]
Number of lenders	-0.014	0.019***	0.001	0.012***	0.006***
	[-1.047]	[15.862]	[1.396]	[8.509]	[9.797]
Performance provisions	-0.919***	0.121***	0.044***	0.879***	
	[-3.018]	[9.648]	[5.350]	[26.972]	
General covenants	0.123	0.001	0.064***		0.124***
	[0.896]	[0.116]	[25.212]		[29.974]
Firm size	0.096	0.463***	-0.054***	0.012	-0.012*
	[0.301]	[25.731]	[-8.392]	[0.428]	[-1.727]
Firm return on assets	-0.028	-0.001*	-0.002***	0.001	0.001*
	[-1.243]	[-1.813]	[-4.690]	[0.706]	[1.960]
Firm leverage	0.026**	0.002***	0.002***	-0.001	-0.000**
	[2.296]	[5.007]	[7.816]	[-1.335]	[-2.429]
Firm Tobin's Q	-0.945	0.078***	-0.047***	-0.057	0.018*
	[-1.486]	[3.992]	[-3.887]	[-1.287]	[1.813]
Effective corporate tax rate	-37.325*	1.383*	-0.557*	-1.337	-0.177
	[-1.864]	[1.740]	[-1.786]	[-1.292]	[-0.586]
Constant	30.202***	14.316***	1.036***	1.111**	-0.068
	[3.044]	[40.885]	[7.675]	[2.501]	[-0.459]
Observations	19,828	37,234	37,234	37,234	37,234
Adj. R-squared	0.711	0.827	0.635	0.705	0.556
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 A7. 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 *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 (4), 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 (5), 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. In specification (6), 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. 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)
Tax increase	1.815	1.855	0.391	0.920	1.852	4.443
	[0.501]	[0.395]	[0.094]	[0.199]	[0.395]	[0.789]
Tax decrease	-6.916***	-6.295***	-6.960***	-3.219	-6.083***	-8.706**
	[-3.323]	[-3.169]	[-3.575]	[-1.216]	[-3.084]	[-2.166]
Tax increase × Election year	-1.826					
	[-0.360]					
Tax decrease × Election year	3.923					
	[0.826]					
Tax increase × Election year lag		-2.467				
		[-0.469]				
Tax decrease × Election year lag		3.037				
		[0.609]				
Tax increase × 1 year to election			3.859			
			[0.573]			
Tax decrease × 1 year to election			5.116			
			[1.258]			
Tax increase × 2 years to election				1.481		
				[0.216]		
Tax decrease × 2 years to election				-10.911*		
				[-1.834]		
Tax increase × 3 years to election					-2.628	
					[-0.495]	
Tax decrease × 3 years to election					1.964	
					[0.399]	
Tax increase × Republican governor						-7.433
						[-1.119]
Tax decrease × Republican governor						4.252
						[0.865]
Observations	37,214	37,214	37,214	37,214	37,214	36,770
Adj. R-squared	0.732	0.732	0.732	0.732	0.732	0.732
Full set of controls	Y	Y	Y	Y	Y	Y
Fixed effects	Y	Y	Y	Y	Y	Y
Number of banks	726	726	726	726	726	723
Number of firms	6,346	6,346	6,346	6,346	6,346	6,303

Table A8. 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 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, and bank times year fixed effects. Specification (1) additionally includes borrower's state, and lender's state times year fixed effects. Specification (2) additionally includes borrower's state times year fixed effects The *, **, and *** marks denote statistical significance at the 10%, 5%, and 1% level, respectively.

	(1)	(2)
Tax increase	0.852	4.382
	[0.229]	[0.611]
Tax decrease	-3.920**	-9.366***
	[-2.123]	[-2.683]
Loan amount	-11.458***	-11.125***
	[-15.065]	[-16.136]
Maturity	-0.210***	-0.237***
	[-3.691]	[-4.793]
Collateral	33.257***	31.242***
	[15.432]	[14.104]
Number of lenders	-0.044	-0.027
	[-0.415]	[-0.280]
Performance provisions	-23.260***	-23.615***
	[-11.307]	[-11.215]
General covenants	2.178***	2.705***
	[2.953]	[3.473]
Firm size	-14.155***	-14.719***
	[-6.629]	[-6.788]
Firm return on assets	-1.209***	-1.164***
	[-10.277]	[-12.025]
Firm leverage	0.755***	0.801***
	[11.155]	[9.987]
Firm Tobin's Q	-30.186***	-31.342***
	[-8.337]	[-7.743]
Effective corporate tax rate	-23.900	16.412
	[-0.311]	[0.215]
Constant	513.684***	500.105***
	[14.987]	[14.598]
Observations	31,935	37,139
Adj. R-squared	0.733	0.738
Number of banks	325	725
Number of firms	5,518	6,338

Table A9. 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	1.639	2.460
	[0.387]	[0.586]
Tax decrease	-6.057***	-6.366***
	[-2.980]	[-3.134]
Tax increase × Bank subsidiary	-11.753	
	[-1.080]	
Tax decrease × Bank subsidiary	1.773	
	[0.371]	
Tax increase × Firm subsidiary		-20.796
		[-1.644]
Tax decrease × Firm subsidiary		3.148
		[0.626]
Bank subsidiary	-0.527	
	[-0.159]	
Firm subsidiary		1.567
		[0.561]
Observations	37,234	37,234
Adj. R-squared	0.733	0.733
Full set of controls	Y	Y
Fixed effects	Y	Y
Number of banks	726	726
Number of firms	6,352	6,352

Table A10. 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	1.169	1.187
	[0.296]	[0.284]	[0.288]
Tax decrease	-5.643***	-5.691***	-5.608***
	[-3.193]	[-3.208]	[-3.184]
Loan amount	-11.308***	-11.392***	-11.298***
	[-16.642]	[-16.671]	[-16.645]
Maturity	-0.238***	-0.235***	-0.239***
	[-4.887]	[-4.832]	[-4.897]
Collateral	32.038***	32.364***	32.128***
	[15.619]	[15.785]	[15.651]
Number of lenders	-0.031	-0.035	-0.036
	[-0.296]	[-0.335]	[-0.342]
Performance provisions	-23.784***	-23.751***	-23.812***
	[-11.241]	[-11.367]	[-11.266]
General covenants	2.620***	2.645***	2.632***
	[3.370]	[3.423]	[3.390]
Firm size	-14.504***	-14.174***	-14.492***
	[-7.104]	[-6.847]	[-7.078]
Firm return on assets	-1.188***	-1.192***	-1.189***
	[-11.875]	[-11.928]	[-11.858]
Firm leverage	0.803***	0.803***	0.804***
	[10.825]	[10.852]	[10.847]
Firm Tobin's Q	-31.114***	-31.035***	-31.095***
	[-8.326]	[-8.308]	[-8.289]
Effective corporate tax rate	26.234	33.543	35.764
	[0.357]	[0.465]	[0.492]
Constant	497.337***	493.506***	493.216***
	[14.708]	[14.867]	[14.722]
Observations	37,036	37,177	36,979
Adj. R-squared	0.733	0.733	0.733
Fixed effects	Y	Y	Y
Number of banks	726	725	725
Number of firms	6,315	6,341	6,304

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