Collateral Damaged?

Priority Structure, Credit Supply, and Firm Performance

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ABSTRACT

A unique legal reform in 2004 in Sweden redistributed liquidation proceeds *from* banks holding floating liens *to* unsecured creditors. Using a country-wide panel of all registered firms, we document that the resulting reduction in collateral capacity contracts the amount and maturity of corporate debt and leads firms to slow investment and forego growth. Altering their allocation of assets, firms reduce particularly those assets with a low collateralizable value for banks and also hoard more cash. However, the reform has no impact on corporate capital intensity or efficiency, suggesting that under these newly binding credit constraints firms simply shrink their operations.

1. Introduction

A firm's debt capacity is determined by how much lenders can expect to recover if the firm defaults. When a firm is liquidated, creditors typically line up for a slice of the liquidation proceeds. How big a given creditor's slice is depends on two margins. The first is the total value of the liquidated assets, or "the size of the pie". A growing literature documents the importance of this balance sheet channel by showing for example that shocks to real estate values affect corporate debt and investment (Gan (2007) and Chaney, Sraer and Thesmar (2012)).[1] The second margin is the share of the liquidated assets that the lender is entitled to, or "the share of the pie". The latter, less studied, determinant of collateral capacity is the focus of our paper.

In particular, we use a unique legal reform in Sweden and country-wide granular data covering the universe of incorporated firms to investigate how an exogenous transfer of priority rights from banks to other creditors, which does not change the quantity or the value of firm assets, affects corporate financing, investment, and performance.

The legal reform in question reduces the liquidation payoff to floating lien holders in favor of unsecured claimants. The floating lien is a type of collateral that is recognized in many jurisdictions and that allows firms to pledge their movable property (mainly inventories, receivables, and equipment). Before 2004, floating liens were special priority claims in Sweden that enabled banks to seize a firm's property prior to bankruptcy and without the intervention of a court. This meant that a bank

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[1] Shocks to real estate values may also be important drivers of entrepreneurship (Adelino, Schoar and Severino (2015), Corradin and Popov (2015), Kerr, Kerr and Nanda (2015), Schmalz, Sraer and Thesmar (2017), and Ersahin and Irani (2018)).

could step in before a firm actually went into liquidation and seize that firm's movable property before other creditors were paid.[2]

A change in the law on January 1, 2004 introduced two important changes that affect the distribution of payoffs among creditors. First, the special priority rights of all floating liens were abolished, implying that banks can no longer seize a firm's property prior to bankruptcy. Under the new regime, a bank has to wait for a court-appointed liquidator to allocate its part of the liquidation proceeds. Second, the share of liquidation proceeds a bank is entitled to is now capped at 55 percent of the eligible movable assets. Since the legal reform had no direct impact on the underlying asset pool, the reform constituted a zero-sum transfer of control rights that lowered the liquidation payoff to banks while increasing the liquidation payoff to other creditors such as suppliers, employees, and the tax authorities.[3]

The transfer of control rights from banks to other creditors should in principle not to be neutral for the firm, because it reduces the amount of inside collateral that the firm can credibly pledge. While this reduction in collateral capacity limits how much a firm can borrow from banks, the debt obtained from other creditors should be fairly inelastic to the increase in expected recovery rates. On the one hand, it may be unsustainable for a firm to raise additional financing from employees by retaining their salaries or from tax authorities by delaying the payment of taxes due. On the other hand, trade credit is normally uncollateralized and there is no evidence that

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[2] Strömberg and Thorburn (1996) analyze a sample of Swedish firms that filed for bankruptcy between 1987 and 1991 and report ample variation in recovery rates across different classes of creditors. The median recovery rate for floating lien holders (banks) is 83 percent. For suppliers and employees the median recovery rate was 0 percent, and for the tax authorities 12.5 percent.

[3] Cerqueiro, Ongena and Roszbach (2016) analyze this legal reform on an existing set of contracts using loan-level data from one Swedish bank. They find that this particular bank responds to the fall in the value of its collateral by reducing both the credit it extends and its monitoring activities. Complementing their work, our firm-level analysis enables us to investigate the adjustment to a new equilibrium set of contracts post law change. Another salient innovation in the present paper is that we also study the *real* effects of the legal reform, including distortions—in corporate asset structure, investment, and employment—and effects on firm survival.

suppliers adjust their prices or maturities based on the presence of collateral.[4] Consequently, it will be difficult for the firm to replace the missing bank credit with additional financing sourced from these other stakeholders. And even if it were possible, the debt owed to employees, tax authorities, and suppliers typically has a shorter maturity, making it less suitable for financing investment.

Our empirical setting is uniquely suited to advancing our understanding of the micro-foundations of the collateral channel. While most prior studies exploit variation in the market value of assets ("the size of the pie"), we exploit variation in the fraction of the firm's assets that goes to lenders when the firm is liquidated ("the share of the pie"). Studying this second margin is not only important as a complement to previous studies, but it also offers two distinctive features that we exploit in our empirical analysis.

First, our setting provides exogenous variation in firms' collateral capacity that is unrelated to the value of their assets. To better understand why this matters, let us suppose we observe a drop in house prices. The debt capacity of the affected real estate owners should decrease, as creditors have less valuable assets to seize in the case of liquidation. But at the same time real estate owners also have lower net worth, which can by itself reduce the supply of credit (e.g., Bernanke and Gertler (1989), Kiyotaki and Moore (1997)). While the variation in asset prices makes it hard to disentangle these two supply effects, our legal reform provides exogenous variation in

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[4] While some jurisdictions allow suppliers to take back goods supplied if a firm fails to pay (see for example Fabbri and Menichini (2010)), this form of collateralization is not possible in Sweden. Jacobson and Von Schedvin (2015) state that in Sweden "according to the absolute priority rights, trade credit is classified as unsecured junior debt and has the lowest priority", and that although "Swedish law admits contracts of retained ownership with the trade creditor [in] practice, such contracts are of little consequence" (ibid., p. 1328).

the division of claims in the case of bankruptcy while keeping the size of the borrowers' balance sheets constant.[5]

Second, our setting enables us to more effectively disentangle credit supply from credit demand. While the previous example illustrates how real estate wealth affects the supply of credit, a decrease in house prices can also lead to borrowers *demanding* less credit due to the negative wealth effect (Mian and Sufi (2014)). Our legal reform "shuts down" the balance sheet channel, and hence mutes any demand effect accompanying other asset value shocks. We thus focus exclusively on how the supply of credit adjusts to a reduction in asset pledgeability. We are therefore uniquely able to analyze whether a redistribution of collateral rights, while keeping total collateral unaltered, has effects for the real economy.

We combine this quasi-experimental setting with a comprehensive configuration of three matched economy-wide datasets. We obtain accounting and collateral information from the Swedish credit bureau UC for the 2000–06 period of our investigation. These data originate from mandatory annual reports that all incorporated firms in Sweden must file with the Swedish Companies Registration Office, and offer us nearly full coverage and a total of 1.3 million firm-year observations. We augment this dataset with detailed investment and industry affiliation data from Statistics Sweden and the firm's date of registration from the Swedish Companies Registration Office. The unique legal reform in question, combined with these economy-wide datasets, enables us to directly identify whether

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[5] The following example illustrates why this is the case. Consider a debt-financed ski school that pledged to the lending bank a floating lien on all of its assets (skis and boots). The firm becomes insolvent due to abnormally warm weather. Under the old regime, the floating lien allows the bank to seize all of the firm's assets. Other stakeholders, such as ski instructors with unpaid wages or tax authorities with uncollected taxes get nothing. After the legal reform, the bank can keep for example only the skis, implying that the ski instructors and the tax authorities are left with the boots. Note that the combined value of the skis and boots is unaffected when we transit from one regime to the other because the movable collateral that underlies floating liens consists of tradable and liquid assets, the value of which is neither firm specific nor location specific.

and how collateral capacity affects firm financing and investment in the Swedish economy during normal times.

We study the effects of the change in the law using a difference-in-differences setup and compare a treated group of firms that pledged floating liens before 2004 with a control group of firms that did not. Since the change in the law only pertains to this particular type of collateral, borrowers that did not have floating liens outstanding before 2004 should be less affected by the change. To ensure our control group provides a good counterfactual, we select for each treated firm a set of control firms with the same age and economic activity at the 5-digit industry code level.[6] Our exact matching procedure therefore balances our sample and minimizes the possibility that our results might be driven by life-cycle patterns and/or by industry-specific shocks, such as shifts in investment opportunities.

We establish the following main findings, which we obtain by comparing the same set of firms before and after the change in the law and which are robust to the inclusion of separate linear trends for the treated and control firms.

First, following the change in the law, firms experience a reduction in the pledged amount of collateral. For example, the ratio of collateral to total debt falls by 5 percent on average following the change. We confirm that this drop in collateral use is caused by the 2004 law change, since we find no reduction in the use of other types of collateral, such as fixed liens.

Second, following the reduction in collateral capacity firms reduce both the amount of their debt and its maturity. In particular, treated firms reduce their leverage ratio by almost 1.5 percent and their fraction of long-term debt to total debt by 11

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[6] As an example of the level of detail of this industry classification, "catering for schools" and "catering for hospitals" are separate economic activities. If, for instance, the health sector is hit by a shock around the time of the law change, our methodology filters out this shock as we compare treated firms with control firms in the "catering for hospitals" sector.

percent. When focusing on debt from banks only, we find that treated firms face a reduction in credit line limits, which they partially compensate for with an increase in short-term borrowing.

Third, we find evidence that the legal reform affects investment decisions and asset structure. In particular, treated firms reduce—on average—their net investment (as a proportion of assets) by 7 percent. This reduction in investment applies both to machinery and equipment as well as to buildings and land. When analyzing asset structure, we confirm a significant reduction in the fraction of fixed tangible assets, of 3 percent. We also find a reduction in the fraction of inventories (which can be pledged via floating liens) of 4 percent and a 7 percent increase in cash holdings.

Finally, we find no significant effect of the law on the capital intensity or operating efficiency of firms. Our results instead suggest that following the legal change treated firms scaled down operations and experienced lower growth rates in terms of both employees and assets. The effect of the law on firm bankruptcy is negligible.

In sum, our setting provides a comprehensive and quantified picture of the importance of collateral rights, accounting also for the effects on smaller and privately held firms (which tend to be more prone to problems of asymmetric information). In this respect our paper complements Aretz, Campello and Marchica (2016), who study the impact of France's Ordonnance 2006-346—which eased the actual pledging of hard assets as collateral—based on Bureau van Dyck's Amadeus Top 250,000 database, which for France covers firms with revenues and assets of at least 15 million and at least 30 million euros, respectively, or at least 200 employees.[7] They find that firms with hard assets significantly increase leverage, and obtain reductions

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[7] The median firm in our dataset generates around USD 200,000 in revenues and has three employees.

in loan markups and increases in loan maturities, especially when those firms are relatively smaller, more profitable, or lower risk.

Our study is also related to a growing literature that studies the impact of changes in the contracting environment. Campello and Larrain (2016) for example analyze a legal reform in Romania that permitted movable assets to be pledged as collateral. They find that the reform broadened access to credit, resulting in higher employment and capital stocks, and they highlight the importance of debtors' ability to pledge "movable" assets as collateral. In contrast, our study highlights the importance of lender *seniority* over such movable assets, illustrating that the allocation of collateral rights in itself is important for economic development. Calomiris, Larrain, Liberti and Sturgess (2017) study how cross-country variation in the enforcement of movable collateral rights explains average loan-to-value ratios and aggregate sectorial activity.[8]

While work in this area focuses on large-scale legal reforms undertaken around the world, we complement this literature by analyzing a change in the law that modified (along the intensive margin) a well-defined legal system in a developed economy, and by analyzing its effects on the universe of registered firms (in Sweden). In particular, we study both the resulting impact on the asset and liability structure of the firm and a much wider range of firm outcomes in order to provide more conclusive evidence on the effects of the distribution of collateral rights.

The remainder of this paper is organized as follows. Section 2 describes the change in the law. Section 3 details the data and variables. Section 4 explains the

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[8] See also von Lilienfeld-Toal, Mookherjee and Visaria (2012), Vig (2013), Van Doornik and Capelletto (2015), Rodano, Serrano-Velarde and Tarantino (2016), Kulkarni (2017) and Anderson, Bahaj, Chavaz, Foulis and Pinter (2018).

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empirical methodology. Section 5 presents our results. Section 6 presents a number of robustness tests. Section 7 concludes.

2. Institutional Background

a) Secured Transactions in Sweden

The Swedish law recognizes two main types of security interests. The first method of pledging collateral is for the debtor to transfer a particular asset into the possession of the creditor via a *fixed lien (*or *fixed charge)*. This form of collateral implies that the creditor has effective control over the specific asset pledged. Fixed liens are commonly used to pledge *real* (i.e., *immovable*) property, such as land and buildings, and other fixed assets, such as ships and aircraft.

The second form of collateral, the *floating lien* (or *floating charge*), allows a business to pledge its *movable* (sometimes also referred to as "*personal*") property, which includes inventories, accounts receivable, equipment, machinery, and intangible assets.[9] While the floating lien provides a security interest on these classes of assets, it is not attached to any particular asset. Consequently, the pool of assets underlying a floating lien can change over time. For instance, suppose that a company pledges a floating lien to a creditor and assume that the only asset the firm possesses is equipment. The actual items of this property can change over time due to the purchase and disposal of equipment. The borrower is allowed to use, collect, or dispose of its movable property, and the floating lien automatically extends to any movable property that is acquired by the company while the debt is outstanding. The

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[9] Floating liens are recognized in nearly all English-based jurisdictions, including the US, the UK, Australia, and India. Gennaioli and Rossi (2013) show that in the presence of strong creditor rights, the optimal contractual resolution of financial distress involves the use of a floating lien. Franks and Sussman (2005) document that the floating charge in the UK works well as the basis of the foreclosure of small and medium-sized companies, while Djankov, Hart, McLiesh and Shleifer (2008) generalize this result to a broad set of countries.

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floating lien does not provide the creditor legal rights to the firm's existing assets until some "crystallizing event" occurs—for instance, the debtor defaults on the loan or files for bankruptcy (as is also the case for fixed liens). The floating lien then fixes itself (or "crystallizes") to the existing assets covered by the lien, which will be protected by a Bankruptcy Trustee, and the creditor obtains a prioritized claim on the liquidation value of these assets.

In Sweden a firm can register a floating lien certificate with a specific nominal value at the Swedish Companies Registration Office (SCRO). The registration office issues a "certificate" as proof of the registered floating lien and charges a nominal fee upfront (around USD 40 as of 2017) plus a stamp tax of 1 percent of the chosen nominal value. The registration office does not have any responsibility to verify the degree of collateral coverage, and therefore the certificate does not guarantee that the firm has sufficient assets to back the registered lien. Indeed, suppose a firm which pledged a floating lien of X would enter bankruptcy and the collateralized assets are sold with proceeds of V. The lender with the lien will then receive a senior claim payment equal to $min(V, X)$ and a junior claim of $max(0, X-V)$.[10] If a business has registered multiple floating liens, these claims have a relative seniority ordering that depends on the date of their registration.

The firm can pledge its floating lien simply by giving the certificate to a lender. The lender can register itself as the holder of that particular certificate at the SCRO, but is not obliged to do so. Irrespective of whether or not the lender registers the claim, the borrowing firm must report in its annual financial statement (as an off-balance sheet item) the pledged floating lien, giving its nominal value.

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[10] We refer to Section 3, footnote 14 and Appendix D for further details.

b) Floating Liens Before 2004

Before 2004, floating liens had *special priority* rights that could be activated prior to bankruptcy. In particular, the lien could be activated in the event that any other creditor seized the firm's property. Floating liens were therefore senior to: (1) *general priority claims*, which included costs incurred by bankruptcy or reconstruction procedures, taxes, and most of the wage claims of employees (a limited part had special priority rights); and (2) *ordinary claims*. The enforcement of both general priority claims and ordinary claims requires a court order declaring the debtor's bankruptcy.[11]

c) The 2004 Act on Floating Liens

On January 1, 2004, the law that regulates floating liens (or, "the law") was changed.[12] The new law introduced two important changes. First, the special priority rights of floating liens were downgraded and floating liens became general priority claims, implying that under the new regime lien holders can seize the debtor's assets only in the case of bankruptcy. The new law thereby reduced the liquidation payoff of lien holders, since the assets covered by the floating lien now also had to contribute to the costs of bankruptcy or reorganization procedures, and to taxes. Second, the new law reduced the share of total eligible assets that could be covered in a floating lien from 100 percent to 55 percent of a debtor's total eligible assets that remain after senior creditors have been paid. At the same time, the new law expanded the

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[11] Sweden has an auction bankruptcy system that requires the immediate sale of the company (Strömberg (2000), Thorburn (2000), Eckbo and Thorburn (2003)). Eckbo and Thorburn (2009) compare the Swedish auction bankruptcy system with US Chapter 11.

[12] The "Floating Liens Act" became part of Swedish Commercial Law and is closely related to the "Rights of Priority Act." The timeline for the making of the law was as follows: the final numerical details of the proposed bill were publicly announced in January 2003; the parliamentary term for amendments ended on March 6, 2003; and the bill became law (*Lagen om Företagsinteckning*, 2003:528) on June 6, 2003, and effective on January 1, 2004. This timeline, particularly the time available for commenting, was fairly compressed given the usually involved nature of law-making in Sweden (e.g., Ministry of Justice (2016)).

categories of assets that could be pledged in the floating lien to take in all asset types, thus including cash, bank deposits, financial assets, and real estate. Overall, the general assessment was that the assets available under the floating lien scheme shrank while increasing the assets available in liquidation to unsecured creditors.[13]

All elements of the policy change were "mandatory" in the sense that the parties involved in loan contracting could not avoid the consequences of the law by agreeing on a new contract that would give floating-lien holders the priority they would have obtained automatically prior to the reform.

d) Transition Period

The law became effective on January 1, 2004. Floating liens granted after this date were immediately governed by the new rules, while all floating liens granted before that date automatically converted by January 1, 2005. Between January 1, 2004 and January 1, 2005 creditors had the opportunity to reevaluate their exposures and to call in debtors to renegotiate terms, which could involve a request for additional collateral. If the lender and the borrower agreed on new contract terms, the existing floating lien would be converted to the new regime. If the lender and the borrower did not reach an agreement, the lender had the right to demand full repayment and terminate the lending agreement. The presence of a brief, fixed-term transition

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[13] During the consultation process, several bodies commented unfavorably on the proposed bill. For example, the Confederation of Swedish Enterprises "was concerned that the government did not consider an implementation [of the proposal to improve the possibilities for saving viable businesses] without a deterioration in the floating lien [and] a worsening of credit facilities for small and medium-sized enterprises." The Swedish Bankers Association (SBA) was "critical" and argued that "the starting point for the proposal should not have been the impact on insolvent firms, but rather the effects on the regular credit supply." The Association of Small Businesses argued that "it wants to safeguard banks' current priority rights [because it considers] the risk too big that additional difficulties will arise for small businesses' supply of credit." Only the Institute for Corporate Reconstruction (which promotes a "practical exchange of experience between all stakeholders affected by a company in an economic crisis") was more positive and did not share the SBA's opinion that the availability of credit for SMEs would deteriorate: "A company's repayment ability and not collateral should be decisive in the assessment of credit applications" and "banks' deep experience and skills with credit assessments should make the change irrelevant."

period—during which parties could renegotiate or terminate their existing contracts—ensured that old-regime contracts by default converted into new-regime contracts 12 months after the introduction of the new law. Our results should therefore not be driven by the short-term costs of adjustment of contracts, costs that delay the transition to a new equilibrium.

e) Objectives and Consequences of the Law

The change in the law had two explicit objectives. The first was to avoid inefficient liquidation and allow viable companies to enter a reorganization process. The second was to give incentives to creditors to screen and monitor their borrowers rather than rely excessively on collateral. The fact that the law change led to many businesses experiencing a decline in pledgeable assets had unintended consequences however. Using loan-level data from a large Swedish bank, Cerqueiro, Ongena and Roszbach (2016) find that the bank responded to the 2004 law change by increasing interest rates, tightening credit limits, and reducing its monitoring activities. These results indicate that the 2004 law made it more difficult for many companies to borrow against this type of collateral.[14] We now use the quasi-experimental setting this legal change provides to study the effects of the 2004 law on corporate financing structure and investment decisions.

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[14] Not surprisingly therefore the 2004 law was virtually reversed in 2009. While few confounding events occurred around 2004 (see our discussion on this issue below), the near reversal of the legal reform in 2009 cannot be confidently analyzed as it took place amid the incoming shocks of the financial crisis and vigorous national policy reactions to that crisis.

3. Data and Variables

a) Data Sources

We obtain our data from three sources. The first and main source is the Swedish credit bureau UC, which holds annual accounting information for all incorporated firms registered in Sweden. All firms registered in Sweden—including dormant companies and companies in liquidation—have to file a yearly report with the Swedish Companies Registration Office. Our sample comprises almost 200,000 firms, which we observe over the period 2000–06. The total number of firm-year observations is around 1.3 million.

We extract from this database the common balance sheet and income statement items, such as assets, liabilities, and earnings, as well as off-balance sheet information about nominally pledged collateral. The credit bureau collects information on two types of collateral: pledged fixed liens and pledged floating liens. A fixed lien is a claim on a specific asset of the firm, such as a particular building or plant. A floating lien is a claim on the firm's movable property (see Section 2 for further details). We observe the nominal value of outstanding pledges for each type of collateral.[15] Liens registered at the SCRO that have not been pledged are not reported in the financial statements.

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[15] To better understand the differences between alternative collateral value definitions, consider the following numerical example. A firm simultaneously registers two floating liens with nominal values of $100 and $50, respectively (see Section 2a for details of the registration process). The total value of *registered* floating liens for this firm is thus $150. The firm receives the two corresponding certificates (of $100 and $50, respectively). To avoid mixing up the loan and the collateral numbers, assume the firm obtains a $110 loan and gives the $100 certificate as collateral to the bank. Until the loan is fully repaid, *the firm must report at the end of each fiscal year the total value of floating lien certificates pledged, which equals—in this case—$100*. This is irrespective of the actual assets that are available to back up the $100 floating lien. If the firm would enter bankruptcy, and the collateral is sold with proceeds of V, then the lender has a senior claim equal to *min(V, $100)*. That is, if the firm holds collateralizable movable assets in surplus of the floating liens it pledged, the lien holders will receive the full nominal value of the lien as a senior claim payment. However, if the liquidation value V of the collateralizable movable assets is smaller than the pledged lien, then the lien holder receives a senior claim payment of V and obtains a junior claim of $(100-V)$. In the present paper we use the $100 as the

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From the credit bureau dataset we also extract information on credit lines, including commitment values and amounts drawn, numbers of employees, and information on whether the firm has filed for bankruptcy.

The second source of data is SCB (Statistics Sweden), from which we obtain investment data and industry codes. For each firm we obtain total net investment, net investment in machinery and equipment, and net investment in land and buildings. Industry classification is according to the 5-digit Swedish Standard Industrial Classification (SNI) codes, which is very similar to US industry classification systems. Importantly, the high degree of granularity provided by the 5-digit industry codes allows us to compare firms that share the same economic activity, and thereby ensures that observed differences between firms do not result from industry-specific shocks.

Figure 1 illustrates the industry classification system using catering services as an example. Catering services fall in the "Hotels and restaurants" sector (code 55), under "Canteens and catering" (code 55.5), and then "Catering" (code 55.52). Our data allows us to distinguish further between three separate catering activities: "Catering for the transport sector" (55.521), "Catering for hospitals" (55.522), and "Catering for schools". According to the 5-digit classification there are 1,303 industries in our sample. In Table 1 we provide a breakdown of the sample by industries, based on 2-digit codes for 2003.

Our third data source is the SCRO, from which we obtain the firm's date of registration, which we use to determine the firm's age.

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definition of the nominal value of floating liens (other types of collateral are similarly defined). We note that the receiving bank is likely to make an independent assessment of the actual value that the floating lien represents, for example by inspecting the assets currently owned by the firm. The lien could for example be valued at $75. This assessed value is the measure of collateral value used in Cerqueiro, Ongena and Roszbach (2016). In Appendix D we provide more general definitions of the different types of collateral measures.

b) Variables

Table 2 lists the variables used in our empirical analysis, and displays some descriptive statistics for the year 2003.[16] Total collateral is the total value of the nominal collateral claims of creditors on the firm's assets, which includes both fixed liens and floating liens. Fixed liens are defined as the nominal value of claims on the firm's real property, as opposed to floating liens, which denote the nominal value of claims on the firm's movable property. In our main specifications we analyze these collateral variables as a proportion of the firm's debt.[17]

We compute several measures related to debt financing. We use the debt-to-assets ratio as our main measure of financial leverage. To analyze debt maturity we compute the ratio of long-term debt to total debt. We also consider alternative debt measures that include only bank debt (or loans). The lines of credit limit variable is the maximum amount of credit a business can obtain under its lines of credit. We scale all bank debt variables by the firm's total debt.

We employ three measures of investment, which we analyze as a proportion of the firm's assets. Total net investment equals capital expenditures minus the proceeds the firm obtains from selling capital assets. We separately consider investments in movable property (machinery and equipment) and investments in real property (land and buildings). This distinction is important because the change in the law we are investigating reduces the value of collateral for holders of floating liens (without changing the nominal value of the liens or the value of the firm's assets) and thus the collateralizable value of movable property (relative to real property).

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[16] We provide definitions of our variables in Appendix A.

[17] In robustness tests we also analyze several of our variables in levels using a log-linear model (we set zero values equal to zero). We provide these results in Appendix B.

We decompose the asset structure of the firm into three parts: tangible assets (which include machinery, equipment, and land and buildings), inventories, and liquid assets (which include cash and equivalents). We scale these variables by total assets.

We employ proxies for technology and the efficiency of the firm following Cronqvist, Heyman, Nilsson, Svaleryd and Vlachos (2009). We measure the capital intensity of a firm as the combined value of machinery and equipment per employee. We compute firm operating efficiency as sales divided by the combined value of machinery and equipment.

We measure firm growth in terms of both employees and assets and calculate growth as the first difference of the natural logarithm of the variable of interest (either employees or assets). We truncate the growth variables at the 1st and 99th percentiles to remove the influence of outliers. We also provide descriptive statistics for two in-levels variables: the number of employees and firm assets (in logs).

Finally, we employ an indicator of whether the firm filed for bankruptcy during the book year.

4. Methodology

a) Empirical Model

Our identification strategy exploits the 2004 change in law that reduces the value of floating liens in Sweden. We examine the effects of that change using a difference-in-differences approach. This methodology compares the effect of the change in the law on two groups of firms. Firms that should be directly affected by the event are referred to as "treated" firms. We define treated firms as those with floating liens pledged before 2004. Since the change in the law focuses only on this particular type of collateral, firms that did not have floating liens outstanding before

2004 should be less affected by the change. We therefore assign these firms to the control group.[18]

To obtain difference-in-differences estimates for our variables of interest, we estimate, using OLS, the following baseline regression model:

$$y_{it} = \alpha_i + \lambda_t + \beta\left(Treated_i \times Post\text{-}law_t\right) + u_{it},$$

where i indexes firms, t indexes time, y_{it} is the dependent variable, α_i are firm fixed effects, λ_t are time fixed effects, $Treated_i$ is a dummy variable indicating the treated firms (that is, those firms with pledged floating liens before the change in the law became effective on January 1, 2004), $Post\text{-}law_t$ is a dummy variable indicating the period from 2004 to 2006, and u_{it} is an error term. The difference-in-differences estimate is given by β, which measures the differential effect of the change in the law between firms that had pledged and firms that had not pledged floating liens before 2004. We cluster standard errors at the firm level.[19]

Identification in a difference-in-differences model rests on two main assumptions. The first is that there are no confounding events taking place around the time of the event of interest. Fortunately, the law change we study took place during a period of economic stability in Sweden. Between 2000 and 2006 (our sample period), GDP grew on average by 3.2 percent and gross investment by 4.2 percent per year. In 2004 (the year the law became effective), GDP grew by over 4 percent and gross investment by almost 5 percent. Figure 2 provides additional evidence that our reform took place during "normal times". The figure plots total revenue generated by all the

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[18] In a robustness test that we discuss below, we define treatment based on whether a firm has floating liens pledged in 2000 (rather than in 2000–03). This alternative definition of treatment is even more predetermined to the 2004 law, but it yields quantitatively similar results.

[19] We also present regression results with the data collapsed into a cross-section in which each observation measures the "post" minus "pre" change in the average level of the outcome variables.

companies in the four main industries in Sweden (as shown in Table 1, they represent about two-thirds of the Swedish economy). Revenue in these sectors grew steadily during our sample period, indicating that the potential for confounding bias is fairly limited in our setting.

It is also important to rule out the possibility that other legislation of relevance for corporate lending was passed or enacted around the same time as the collateral reform we study. To address this concern, we carried out an exhaustive search of legislation that was discussed or enacted between 1998 and 2006 by the Swedish parliament. In particular, we searched all proposals that were dealt with in either the Finance Committee or the Committee on Civil Affairs, using the following keywords: "credit", "loan", "priority rights", "bankruptcy", "collateral", "lien", and "liquidation". None of these proposals or related reports discussed legal changes that might affect differentially our treated and control groups. In Appendix C we explain our search methodology and list the most relevant proposals found.

The second assumption necessary for a difference-in-differences model is that the treated and control firms would have behaved similarly in the absence of the legal change in question. We employ an exact matching procedure in order to obtain appropriate groups of control and treated firms. Specifically, we select for each treated firm a set of control firms that were established both in the same year and in the same industry (at the 5-digit industry code level). By matching firms on age, we ensure that we control for life-cycle effects, including potential differences in size, growth, and financing structure. Matching firms on industry implies that the treated

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and control firms should have similar exposures to shifts in demand, productivity shocks, regulatory changes, external shocks, and other aggregate shocks.[20]

To understand why our high level of industry disaggregation matters, suppose that in a given winter hospitals receive a very low number of patients due to abnormally good weather conditions. Firms that offer catering services for hospitals (code 55.522) are thus hit by a negative demand shock that could affect their financing and investment decisions. In a difference-in-differences setting, this demand shock might be confounded with the effects of the legal reform and bias our estimates if, for instance, we were to compare these firms with catering firms for schools (code 55.523). Our matching procedure filters out such confounding factors to the extent that we compare the effect of the legal reform across two groups of firms that provide catering services for hospitals.

We further address the plausibility of the parallel trends assumption in two ways. First, we exploit the time-series variation in our data to investigate the dynamic behavior of the treated and control firms before and after the legal reform. More precisely, we plot—separately for the treated and control groups—year-by-year averages of the variables of interest after controlling for firm fixed effects. The time-series plots therefore offer a visual representation of our results. We use these plots to see whether pre-trends are parallel and to assess whether the adjustment of the outcome variables is economically sensible. By way of a preview, the treated and control groups behave quite similarly before the change in the law, corroborating our identification strategy.

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[20] Recall that based on the 5-digit industry codes there are 1,303 different industries in our sample. Recall also the catering example illustrated in Figure 1. We retain 70 percent of the industries after the matching procedure.

Second, we run augmented specifications of the above regression model that explicitly control for potentially different linear trends between treated and control firms. We note that these specifications may often underestimate the economic magnitude of the reform being studied, since the linear trends absorb part of the effect of interest.

b) Comparing Treated and Control Firms

Table 3 provides sample means of our main variables for the treated and control groups for the period 2000–03 using the matched data.[21] The table also provides the results of differences-of-means tests that show substantial differences between the treated and the control firms in terms of balance sheet structure and size. In particular, the treated firms are larger, more leveraged, hold more long-term debt, and have higher credit lines than the control firms. On the asset side, treated firms hold a smaller fraction of liquid assets than do the control firms. With respect to investment rates and efficiency measures, the differences between the treated and the control firms are economically small. Both have similar investment rates and efficiency measures.

Those differences in balance sheet structure and size actually stem from our definition of treatment. To understand this, consider the following example: Two identical entrepreneurs start (independently) a business at the same time and in the same sector (say, for example, each entrepreneur opens an auto repair shop). Suppose that, for exogenous reasons, one of the entrepreneurs has a floating lien registered (the treated entrepreneur) while the other does not (the control entrepreneur). This hypothetical setting offers the ideal experiment because: (i) treatment is random, and

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[21] The full sample contains 91,089 treated firms and 102,505 control firms (in total, 193,594 firms). The matched sample contains 80,431 treated firms and 88,055 control firms (in total, 168,486 firms).

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(ii) the two businesses are identical *ex ante*. However, note that the two businesses should be different *ex post* because the treated firm has a higher debt capacity. Since the treated entrepreneur can use the floating lien to obtain additional loans, the treated shop will be more leveraged than the control shop. These loans can then be used to finance additional assets, such as tools and inventories, and to hire more employees. Consequently, the treated shop will also be larger than the control shop.

The above example raises an important point as it shows that matching firms *on size and on their balance sheet* characteristics can be problematic because these characteristics could be endogenous to treatment in our setting.[22] At the same time, such differences may also result from the fact that firms selected themselves into the treatment group. It is therefore not plausible to assume that the effects of our change in the law are the same for firms that did or did not use floating liens beforehand. We therefore rely only on the parallel trends assumption and interpret the estimates obtained from our baseline regressions as average treatment effects on the treated (ATT).

In order to address any potential criticism that firms without floating liens might be fundamentally different from firms with floating liens, we also analyze heterogeneous treatment effects by exploiting cross-sectional differences among the treated firms in a triple differences setting.

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[22] Angrist and Pischke (2008) refer to such endogenous variables as "bad controls." Indeed, given our definition of treatment, the treated and control firms could be different in terms of balance sheet structure and size even if selection for treatment were random (of course, observing such differences ex post does not imply that selection for treatment was in fact random).

5. Results

a) Collateral Use

Figure 3 provides evidence on the use of floating liens in Sweden before and after the legal reform. The figure displays time-series plots of the sample averages of the fraction of firms with floating liens pledged (top panel) and the ratio of floating liens pledged to a firm's assets (bottom panel).[23] The figure shows that floating liens are economically important in Sweden. The top graph shows that more than 40 percent of all firms with some collateral outstanding pledge floating liens. The bottom graph shows that the ratio of pledged floating liens to total assets is around 16 percent during our sample period. Figure 3 also shows that after the change in the law there is a reduction in the use of floating liens both across and within firms. The fraction of firms that pledge floating liens decreases by about one percentage point, which corresponds to 2.4 percent of the pre-law change mean. In addition, the value of pledged floating liens to total assets also decreases by one percentage point, corresponding to a 6 percent reduction relative to the pre-law change mean.

In Table 4 we estimate difference-in-differences regressions to quantify the reduction in collateral use resulting from the change in the law. The treatment group contains firms with pledged floating liens before the law was changed, while the control group contains firms with no floating liens pledged before the law change. We present, for both dependent variables, results from three specifications. The first specification uses the entire sample of firms. The second specification uses the matched sample, in which a treated firm is compared with one or more control firms with the same age and 5-digit industry code (e.g., two firms that provide catering

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[23] The sample we use contains only firms that post some collateral during our sample period.

services for hospitals). The third specification uses the same matched sample and controls for differences in trends between the treated and the control firms. All three specifications include firm and year fixed effects. The last row of Table 4 displays the predicted percentage change in the dependent variables implied by the difference-in-differences estimates. We compute the predicted percentage change as the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable for the treated subsample.

Table 4 presents estimates of the effect of the 2004 law change on both total collateral (which includes floating liens and fixed liens) and fixed liens. We scale both variables by firm debt.[24] The results in columns 1–3 show that the drop in collateral use experienced by treated firms is statistically significant and economically meaningful. For example, the point estimate in column 2 indicates that the treated group reduces, on average, its collateral pledges by 5 percent following the change in the law.

In Columns 4–6 we analyze the effect of the 2004 law change on fixed liens, which should not be affected directly. The first two specifications show an increase in the use of fixed liens by treated firms after the law change. This increase in fixed liens may reflect an attempt to compensate for the loss in the value of floating liens by pledging more valuable types of collateral. We note, however, that the increase in the use of fixed liens is no longer significant when we control for differential trends (which we do in column 6). The fact that we do not see a drop in the use of fixed liens confirms that the observed reduction in collateral pledges is entirely driven by floating liens.

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[24] Results are similar if we scale these variables by assets. In the Appendix we provide results in levels using a logarithmic transformation.

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b) Debt and Debt Structure

We next investigate how the reduction in collateral capacity affects financial leverage and debt maturity. We provide, in Figure 4, a graphical snapshot of our main results. The figure plots separately for the treated and the control firms the time series of *Debt/Assets* (top panel) and of *Long-term debt/Debt* (bottom panel).[25] Both graphs show that the two groups behave identically prior to the 2004 law change, confirming that our control firms provide a good counterfactual. Following the change in the law, the treated firms become less leveraged and borrow more short term relative to the control firms.

In Table 5 we present the corresponding difference-in-differences estimates. Columns 1–3 focus on the leverage ratio. The coefficient in column 2 indicates that treated firms experience a reduction in their leverage ratio of 1.3 percent relative to control firms. This estimate remains statistically significant, but it becomes quantitatively smaller when we allow for different linear trends (column 3). The estimates in columns 4–6 indicate larger economic effects for debt maturity. For instance, the estimate in column 5 indicates that the reduction in long-term debt is about 11 percent.[26]

Before the change in the law floating liens were widely used to secure bank credit. For this reason, we examine—in Table 6—the effect of the law change on various types of bank financing. The three dependent variables analyzed, all of which are expressed as a fraction of total debt, are: long-term bank loans (columns 1–3),

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[25] We create these graphs by running separate regressions for the treated and the control firms on a set of year dummies (using 2003 as the omitted year) and controlling for firm fixed effects. The year-by-year point estimates obtained thus denote within-firm changes in the dependent variable relative to 2003. This approach removes differences in levels between the treated and control groups and facilitates the comparison of their dynamic behavior before and after the change in the law.

[26] We also analyze the effect of the legal reform on the level of firm debt and on its maturity components using a log-linear model. We report these results in the Appendix for brevity. The results in these regressions essentially confirm that the reduction in debt is mainly driven by a reduction in long-term borrowing.

short-term bank loans (columns 4–6), and the limits on lines of credit (columns 7–9). We find that as a result of the change in the law banks reduce long-term loans and line-of-credit commitments to treated firms. This decrease in the volume of long-term bank loans is particularly relevant, ranging between 8 and 18 percent of the pre-law change average amounts for the treated subsample. We also find that treated firms compensate for part of the reduction in long-term borrowing and liquidity through a significant increase in short-term borrowing.

The results so far offer a clear pattern. Firms can no longer use floating liens to promise priority to financiers with regard to their moveable property. As a consequence, these firms suffer a reduction in their debt capacity and are forced to borrow more short term to counterbalance the drop both in long-term funding and in access to lines of credit. The observed reduction in long-term debt complements the findings of previous studies by Giannetti (2003), Benmelech, Garmaise and Moskowitz (2005), Qian and Strahan (2007), Benmelech and Bergman (2009), and Vig (2013), who find that the strengthening of creditor rights is correlated with longer debt maturity. Next, we investigate whether these changes in corporate debt affect firms' investment decisions and performance.

c) Investment and Asset Structure

In this section, we investigate the effects of the law change on firm investment and asset structure. We first consider investment. Figure 5 plots—separately for the treated and the control firms—the time series of *Total net investment/Assets*. The figure shows that prior to the legal change the two groups displayed identical investment behavior. Following the change in the law, treated firms reduce their investment by more than control firms do, clearly showing that the legal change forced firms that were using floating liens to cut back on investment. The fact that we

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compare firms that have the same age and that operate in the same industry makes it unlikely that these results are reflecting differential shocks to investment opportunities. Columns 1–3 of Table 7 show that the drop in investment is economically relevant. For example, the difference-in-differences estimate in column 2 points to an average decline in net investment of 7 percent.[27]

In the subsequent columns of Table 7 we analyze the evolution of different types of investment capital. We examine investments in machinery and equipment (in columns 4–6) and investments in land and buildings (in columns 7–9). Machinery and equipment are typically pledged via floating liens, while land and buildings are pledged via fixed liens. Since the 2004 law change reduces only the value of floating liens, firms may in response shift their investments from movable asset towards real assets in order to maintain debt capacity (Almeida and Campello (2007)).[28]

We find that firms significantly reduce investment in both types of assets. The difference-in-differences point estimates indicate that the drop in investment in machinery and equipment is in absolute terms four to five times larger than the drop in investment in land and buildings. However, in percentage terms the economic effects are similar for both types of investment (i.e., close to 7 percent).

Next, we analyze the effect of the law change on asset structure. We distinguish between three types of assets, which we analyze as a proportion of total assets: fixed tangible assets (which include machinery, equipment, buildings, and land), inventories, and liquid assets (cash and equivalents). Figure 6 plots the time-series averages of these variables for the treated and the control firms, and Table 8 displays the difference-in-differences estimates.

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[27] This corresponds to a drop in investment by the average treated firm of around USD 3,700.

[28] On the other hand, Rampini (2016) argues that credit-constrained firms distort their investment decisions toward less durable assets that are easier to finance upfront. If this mechanism is at play, we should see firms shifting their investments from real assets toward movable assets.

In all three panels of Figure 6, the patterns for treated and control firms approach each other closely before the law change. Following the law change, treated firms experience a sharper decrease in tangible assets and inventories, and a larger increase in cash holdings. The decrease in tangible assets corroborates our earlier findings for investment. The estimated coefficient points to an average decline in the fraction of tangible assets of treated firms of 3.2 percent. In unreported results, we also decompose this effect into the part accounted for by machinery and equipment and the part accounted for by land and buildings, and find that most of the effect is driven by the former. These additional tests corroborate our finding, above, of a sharper drop in investment in machinery and equipment.

The drop in inventory holding is also economically significant. The difference-in-differences estimate in column 5 of Table 8 indicates that the post-law-change reduction in inventories is 4.1 percent. Inventories are an important component of floating liens. Part of this effect, however, may be due to the lower access to credit, which forces treated firms to reduce their working capital requirements, as in Carpenter, Fazzari and Petersen (1994) and Carpenter, Fazzari and Petersen (1998). The observed increase in treated firms' cash holdings corroborates this view and is consistent with the evidence in Almeida, Campello and Weisbach (2004), who find that financially constrained firms save more cash. The difference-in-differences estimates indicate that treated firms increase their holding of liquid assets by 6.7 percent relative to control firms. It thus appears that treated firms increase the liquidity of their balance sheets to compensate for lower credit availability.

d) Capital Intensity and Efficiency

The reduction in collateral capacity decreases firms' ability to borrow and reduces their holdings in movable assets, including machinery and equipment. We

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now investigate whether there are any changes in the capital intensity and operating efficiency of firms. Finding a decline in capital intensity following the law change would be consistent with Garmaise (2008), who show that financially constrained firms use relatively more labor than physical capital.

Figure 7 plots—separately for the treated and the control firms—the time series of the value of machinery and equipment per employee (top graph) and of sales per dollar of machinery and equipment (bottom graph). Both graphs show that there are no differential effects of the 2004 law change. The treated and the control firms reduce their capital intensity and increase their productive efficiency at the same rate throughout the period analyzed. In Table 9, we confirm that the effect of the law change on these two variables is both statistically and economically negligible. Our evidence therefore suggests that following the change in the law treated firms are scaling down the level of their operations—rather than changing their production technology—and maintaining their efficiency levels.

e) Firm Growth

We next investigate the effect of the 2004 law change on firm growth. Figure 8 displays the time series of the growth rates of both employment (top graph) and assets (bottom graph). We compute the growth rate as the annual change in the logarithm of the variable. Before the law change, the treated firms experience slightly higher growth rates than their control peers. However, growth rates of treated firms plunge relative to the control firms following the change in the law. We assess the economic significance of these effects in Table 10. The difference-in-differences estimates in columns 2 and 5 indicate, respectively, a reduction in the growth rate of employment of 1.8 percentage points and a reduction of 2.7 percentage points in the

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growth rate of assets. [29] We note that the reduction in the asset growth rate is not only driven by the lower investment rates we documented in Table 7, but also by a reduction in other balance sheet items such as inventories (Table 8). These meaningful effects underline the importance of credit availability for firm growth.

f) Did the 2004 Law Reduce Bankruptcy Rates?

One of the intentions of the 2004 law change was to reduce creditors' incentives to liquidate financially distressed companies. The abolishment of their special priority rights effectively reduced the liquidation payoff to lien holders, since after the law change the assets backing a floating lien had also to satisfy other claims, such as the costs of bankruptcy or reorganization procedures, and taxes. On the one hand, this should reduce the ex-ante incentives of floating lien holders to push firms into bankruptcy. On the other, the resulting reduction in credit availability could also mean that firms become more likely to experience financial distress following the law change. How the 2004 law affects bankruptcy is thus an empirical question.

We provide a visual representation of our results in Figure 9 and display the corresponding regression results in Table 11. The figure shows that the two groups behave identically prior to the 2004 law change, confirming once again that our control firms provide a good counterfactual. For example, the identical pre-trends address the concern that our results might be due to differences in risk. The graph does not clearly show whether treated firms become more or less likely to file for bankruptcy after the change in the law. Although the difference-in-differences estimates in Table 11 indicate a decline in bankruptcy rates, the effects on matched samples are statistically insignificant.

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[29] This corresponds to a reduction in the number of employees of 0.2 units.

6. Robustness Tests

a) Definition of Treatment

The treatment group contains firms with floating liens outstanding before the law change—that is to say, between 2000 and 2003. One way to make assignment to the treatment group more exogenous with regard to the 2004 law is to identify treated firms based on their having held floating liens comparatively earlier in this period. This is what we do in Table 12. More precisely, we define as treated firms those with floating liens already pledged in 2000. Firms that do not meet this criterion are categorized as control firms. The estimates in Table 12 are similar to those presented earlier, corroborating our empirical strategy.

b) Collapsing Data to a Cross-section

We present, in Table 13, regression results with the data collapsed to a cross-section in which each observation equals the "post" minus the "pre" change in the average level of the outcome variable. This specification addresses the concern in Bertrand, Duflo and Mullainathan (2004) regarding spurious correlations in difference-in-differences models. The results obtained are similar to those presented in the main tables of the present paper, in terms of both economic magnitude and statistical significance.

c) Cross-sectional Heterogeneity of Treatment Effects

One potential question regarding our analysis may query whether our results could be driven primarily by a particular subset of firms and thus whether the results may not be general. To address this, we also analyze heterogeneous treatment effects by exploiting cross-sectional differences among the treated firms in a triple-differences setting. We compare treated firms along four dimensions, all of which are

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measured in the period 2000–03: leverage ratio, share of long-term debt, share of liquid assets, and asset value (in logs). In particular, we convert each of these four variables into a dummy that equals one for firms with above-median values and zero otherwise (e.g., whether the firm has an above-median or below-median leverage ratio).

We present, in Table 14, the results from triple-difference regressions where the *Treated × Post-law* variable is further interacted with each of the four dummies that indicate whether the firm has an above-median leverage ratio (panel A), fraction of long-term debt (panel B), fraction of liquid assets (panel C), or firm asset size (panel D). We focus on four dependent variables: leverage ratio, the fraction of long-term debt, investment, and firm growth. We saturate the regressions with firm fixed effects and all possible second-level interactions.

Panel A shows that firms with more leverage were more negatively affected by the 2004 law change. In particular, these firms experience a sharper drop in their leverage ratio, fraction of long-term debt, and investment, and lower growth rates. These results are not surprising since firms with more leverage, while riskier, are likely to be more dependent on collateral securing their lending.

Panel B shows that treated firms that borrow long term are also more negatively affected by the 2004 law change. Recall that creditors were granted a one-year window to renegotiate contract terms and could demand full repayment of the loan if, for example, a borrower did not have additional collateral to post (see Section 2 for details). Since firms with a high share of long-term debt tend to have more illiquid asset structures, an unexpected renegotiation or termination of a lending

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agreement may force some affected firms to scale down more abruptly.[30] Consistent with this view, the results in panel C show that treated firms with higher cash holdings were relatively less affected by the change in the law.

Finally, the results in panel D show that larger firms were more negatively affected by the 2004 law. Floating liens require substantial monitoring efforts from the lender, including frequent assessment of the asset pool. Lending against floating liens is therefore only cost-efficient for a lender if a firm possesses substantial amounts of assets. Larger firms are therefore more inclined to floating lien borrowing and should therefore be more affected by the law change.

Overall, the heterogeneity of impact the law change had confirms our general finding that the change negatively impacted upon leveraged, long-term borrowing, or larger firms, while businesses with more liquidity were less affected.

d) Alternative Specifications

The dependent variables analyzed are expressed as ratios (as a percentage of total debt or assets). We also analyze the effect of the law change on the same variables using a log-linear model. We report these results in the appendix. The results in these regressions essentially confirm our main findings and conclusions.

7. Conclusion

Collateral plays a key role in the raising of debt finance. In the presence of contract incompleteness, collateral alleviates agency problems in the credit market by disciplining borrowers (Hart and Moore (1994)). Since collateral facilitates corporate

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[30] For example, Hart and Moore (1994) show that under limited enforcement firms match the maturity of their assets and their debts. In cross-sectional regressions that we do not report for reasons of brevity, we find strong evidence of maturity matching in our sample. In particular, firms that borrow more long term have a much higher share of illiquid assets, such as fixed assets and inventories, and a lower share of liquid assets, such as cash.

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borrowing, it also matters for investment and for aggregate economic activity. A large empirical literature has exploited shocks to real estate values to document the relevance of this so-called collateral channel. In particular, real estate values affected corporate investment in Japan in the early 1990s (Gan (2007)) and have done so in the US more recently (Chaney, Sraer and Thesmar (2012)). There is also evidence that the same collateral channel is an important driver of self-employment and job creation (Adelino, Schoar and Severino (2015), Corradin and Popov (2015), Kerr, Kerr and Nanda (2015), Schmalz, Sraer and Thesmar (2017), and Ersahin and Irani (2018)).

Using shocks to real estate prices to inform us about the role of collateral brings with it several empirical challenges. Suppose that the value of real estate increases. Individuals who own real estate become more creditworthy due to their higher net worth. On the one hand, this balance sheet channel can—operating alone— trigger an increase in the supply of credit (and investment) even if these assets cannot be pledged as collateral ex ante. On the other hand, this increase in net worth can also increase real estate owners' demand for credit and lead to higher investment rates.

In this paper, we exploit a unique legal reform in Sweden that enables us to address both these empirical challenges associated with, for example, the analysis of real estate collateral. In contrast to the literature that uses shocks to asset values as a measure of collateral, the legal reform we exploit reduces the fraction of assets that lenders are entitled to when a firm is liquidated. Since this legal reform redistributes collateral rights among different creditors without affecting either the quantity or the value of the borrowers' total assets, our shock provides exogenous variation in a firm's collateral capacity while keeping constant the size of its balance sheet. By assessing how a zero-sum transfer of collateral rights affects the credit supply,

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corporate financing, and investment, our study takes a step forward in identifying the role that collateral plays in the real economy.

Using a panel dataset that covers all incorporated firms in Sweden, we find evidence of this legal reform "collateral-damaging" businesses. The availability of movable collateral—and in particular the seniority structure and distribution of collateral rights—are quantitatively important in supporting corporate debt capacity. New and detailed evidence reveals the channels through which firms' ability to pledge movable collateral affects their overall debt capacity and debt structure. Collateral-supported debt capacity and composition drives both asset and liability composition at the firm level, and thereby corporate investment, growth, and performance.

The inability to post collateral to banks reduces both the amount and the maturity of firm debt. This in turn forces firms to cut back on investment, reduce inventories and employment, and grow at a slower rate. We also find evidence that a reduction in pledgeable movable collateral leads firms to reduce their holdings of assets with low collateralizable value and to hold more liquid assets.

Overall, our results establish how (movable) collateral alleviates financing frictions in the real economy by detailing its importance for the asset and liability structure of firms and its resulting impact on investment and growth.

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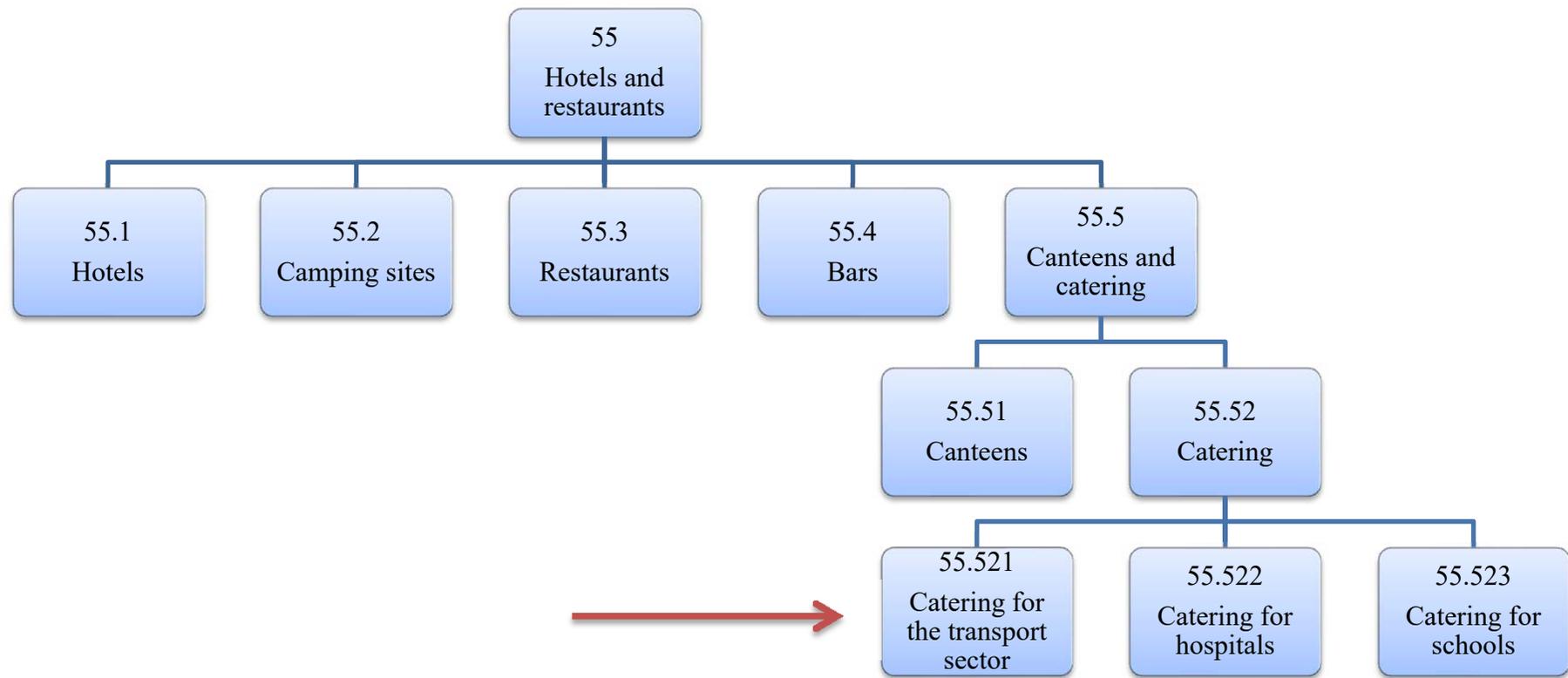
Figure 1 – Industry classification in Sweden
Industry classification is according to the 2002 Swedish Standard Industrial Classification (SNI). The arrow indicates the level of analysis used.

Total Revenue

Real estate, wholesale and retail trade, and construction sectors.
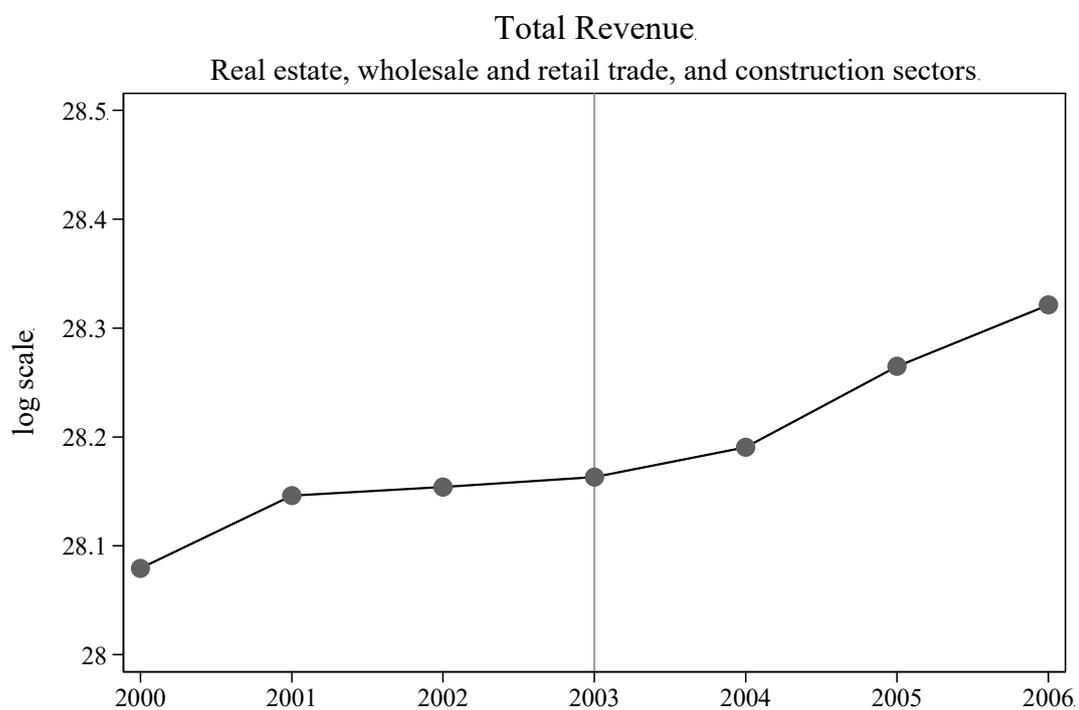
Figure 2 – Total revenue in the main economic sectors in Sweden.
The figure displays total revenue (in log scale) generated by firms in the four main sectors in Sweden: Real estate, wholesale trade, retail trade, and construction. Sample period is from 2000 to 2006.
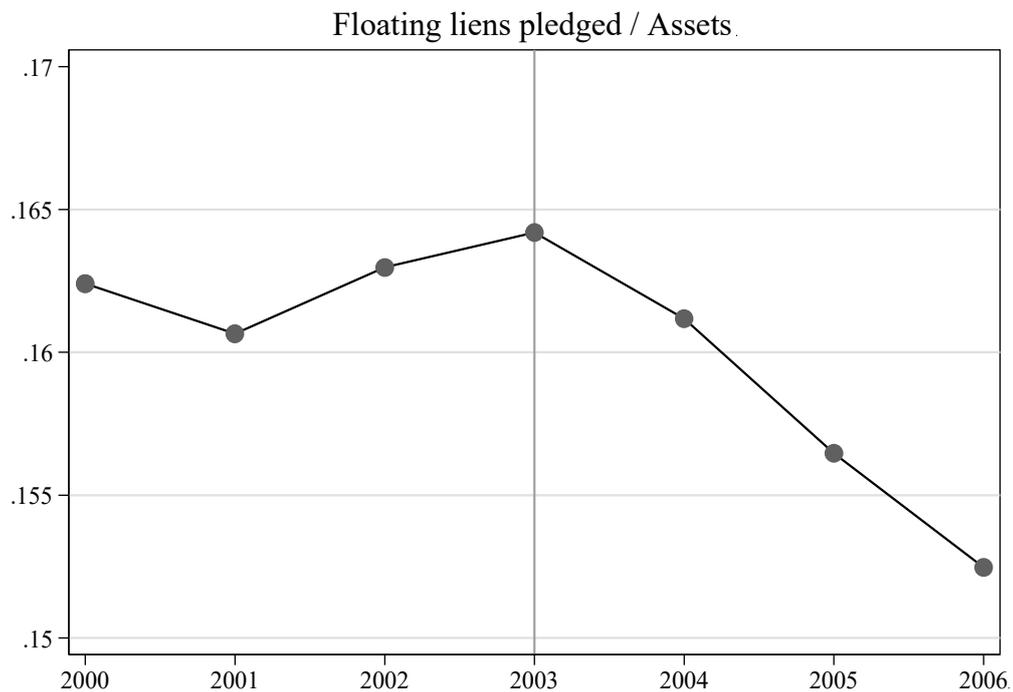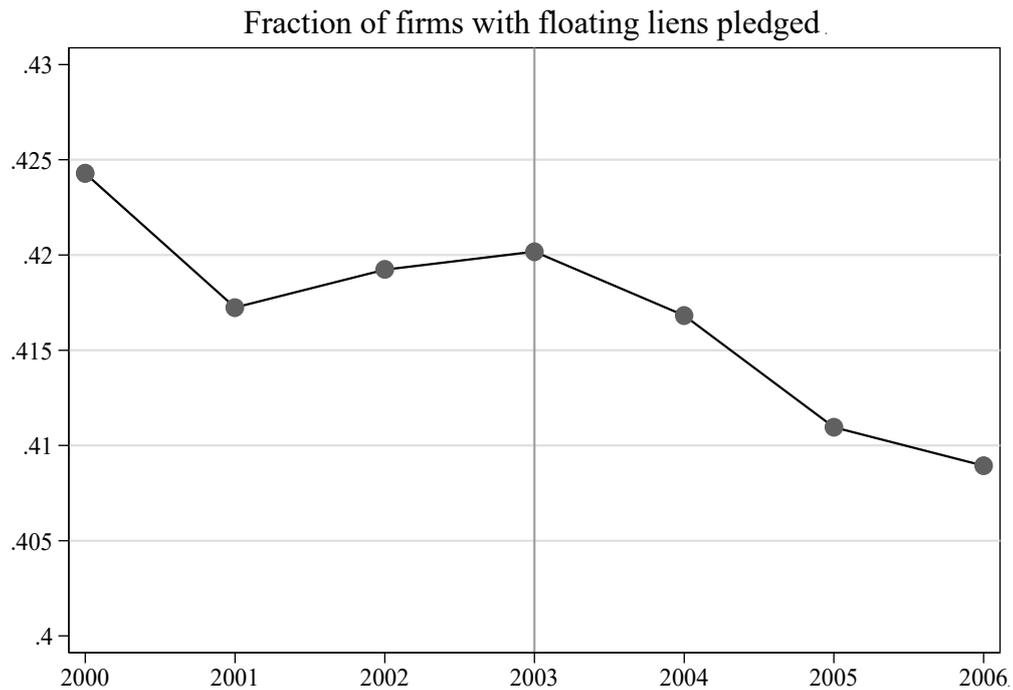
Figure 3 – Effect of the 2004 Law on collateral
The figure displays sample averages of the fraction of firms with outstanding floating lien pledges (top graph) and of the ratio of the value of floating liens pledged to total assets (bottom graph). Sample period is from 2000 to 2006.

Debt / Assets

Long‑term debt / Debt
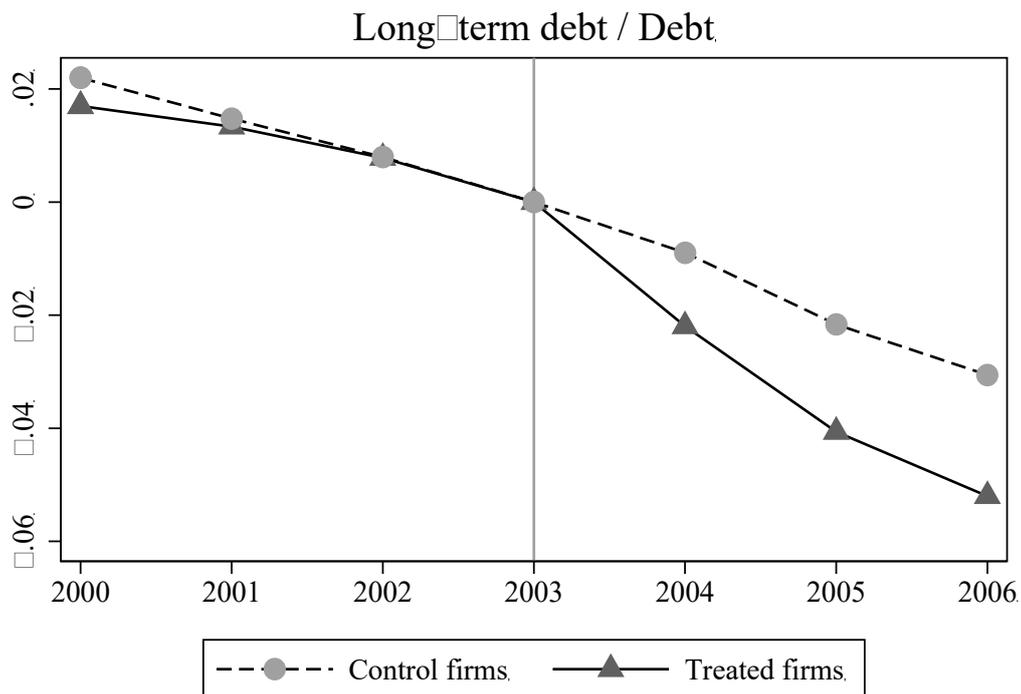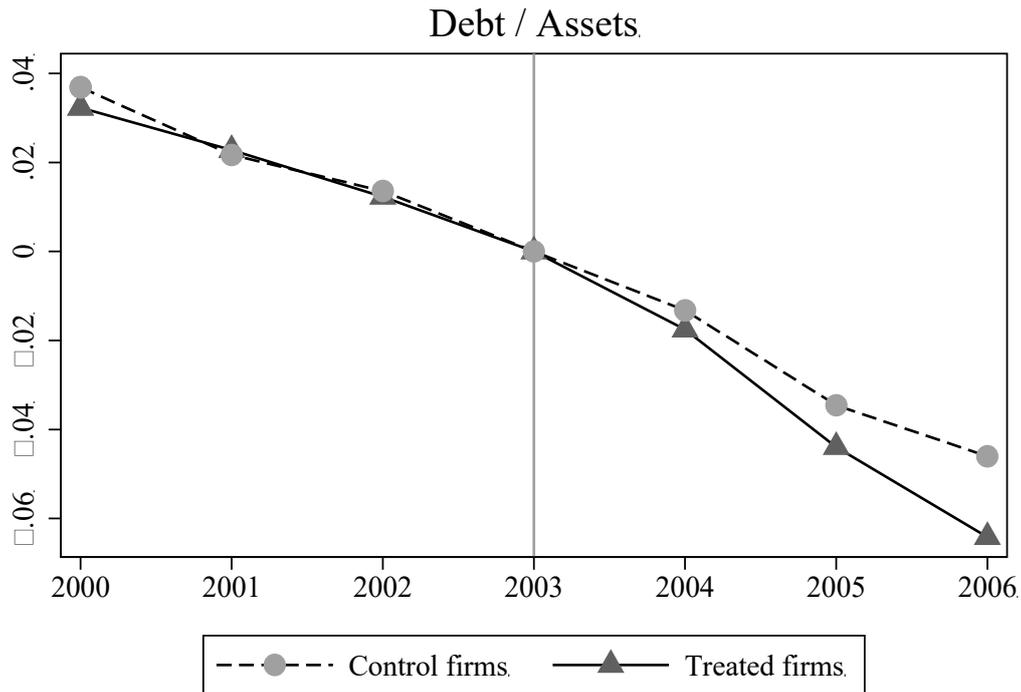
Figure 4 – Effect of the 2004 Law on firm debt and on debt maturity
We run separate panel regressions for the treated and control firms of the variables shown on a set of year dummies, controlling for firm fixed effects. The figures plot the coefficients obtained for the year dummies (2003 is the omitted year). The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. The treated and the control groups are matched exactly on industry (at the five-digit SNI level) and on firm age. Sample period is from 2000 to 2006.
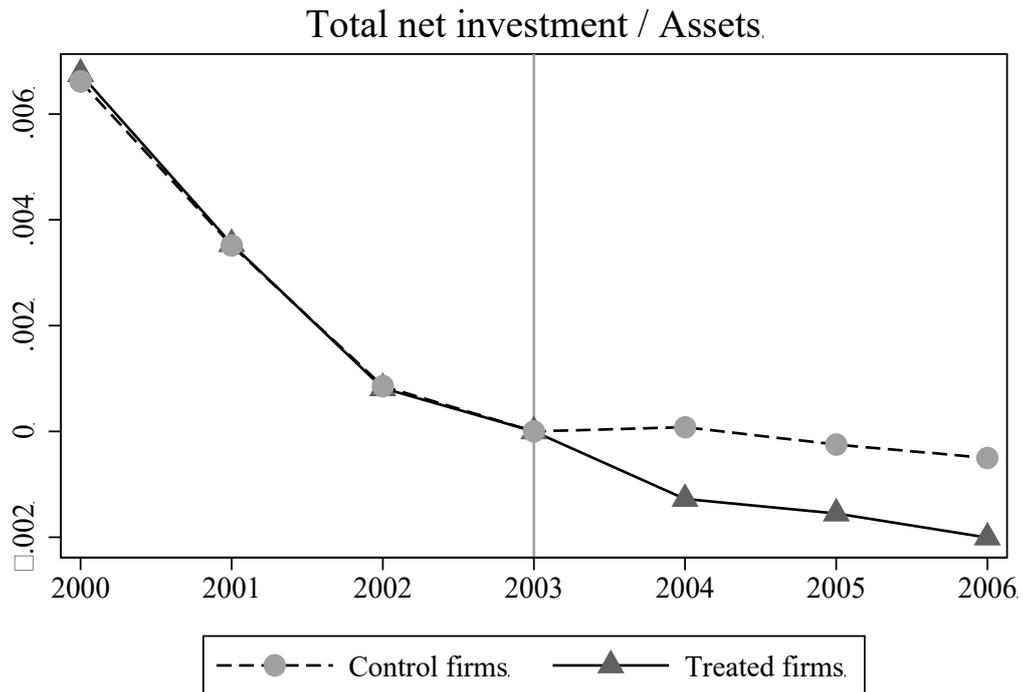
Figure 5 – Effect of the 2004 Law on firm investment
We run separate panel regressions for the treated and control firms of the variables shown on a set of year dummies, controlling for firm fixed effects. The figures plot the coefficients obtained for the year dummies (2003 is the omitted year). The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. The treated and the control groups are matched exactly on industry (at the five-digit SNI level) and on firm age. Sample period is from 2000 to 2006.

Fixed tangible assets / Assets

- - ●- - Control firms ——▲—— Treated firms

Inventories / Assets

- - ●- - Control firms ——▲—— Treated firms
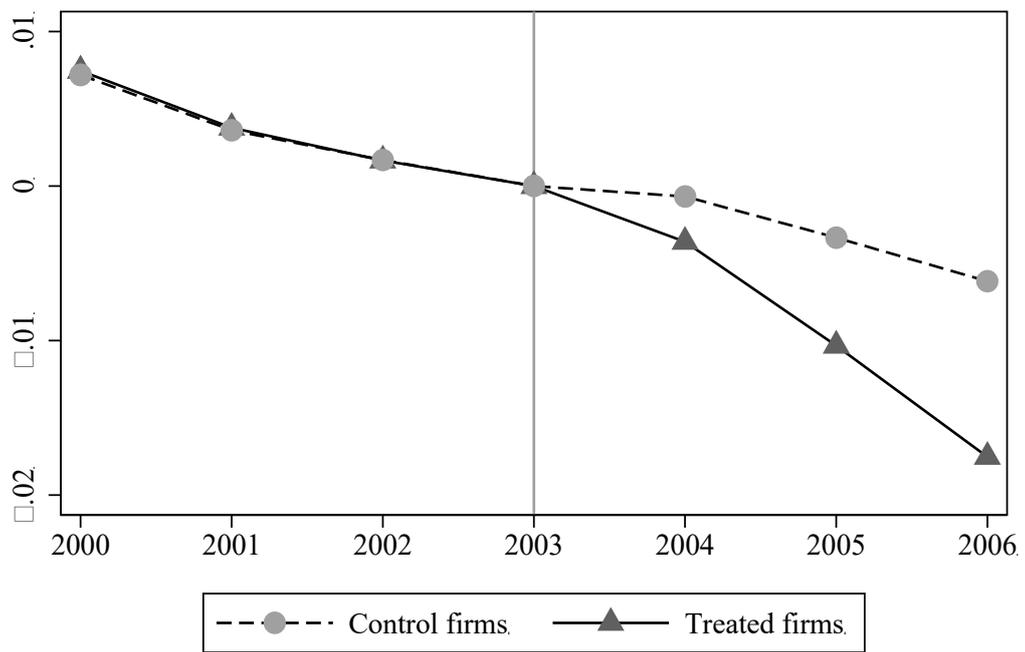
(Figure 6 continues on the next page)

Liquid assets / Assets

Control firms   Treated firms

Figure 6 – Effect of the 2004 Law on asset structure
We run separate panel regressions for the treated and control firms of the variables shown on
a set of year dummies, controlling for firm fixed effects. The figures plot the coefficients
obtained for the year dummies (2003 is the omitted year). The treated group contains firms
that pledged floating liens before 2004. The control group contains firms that did not pledge
floating liens before 2004. The treated and the control groups are matched exactly on industry
(at the five-digit SNI level) and on firm age. Sample period is from 2000 to 2006.
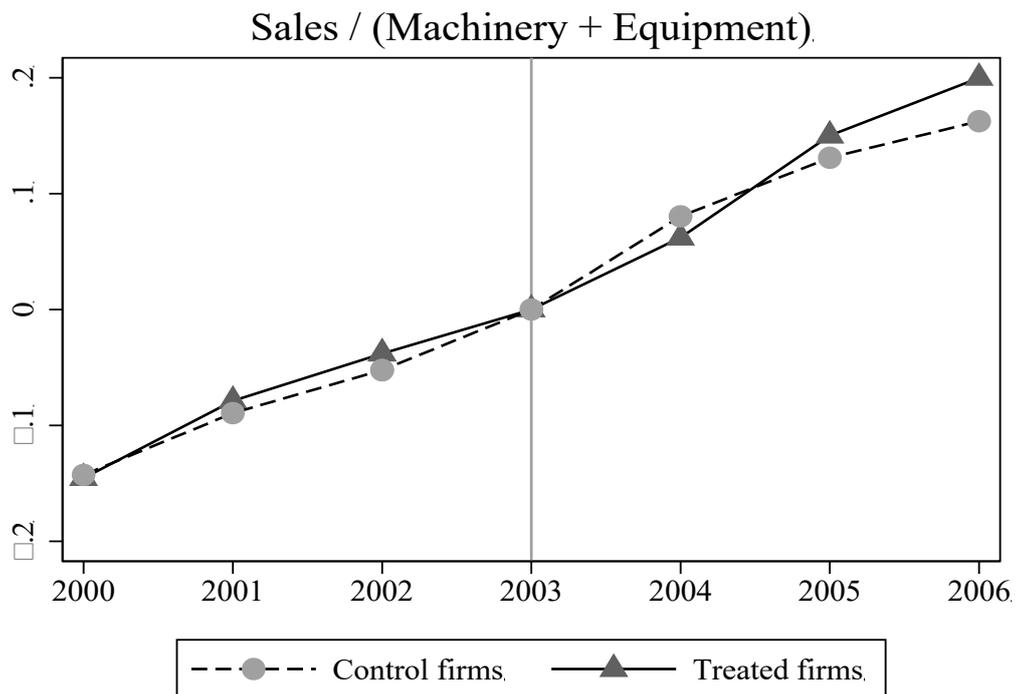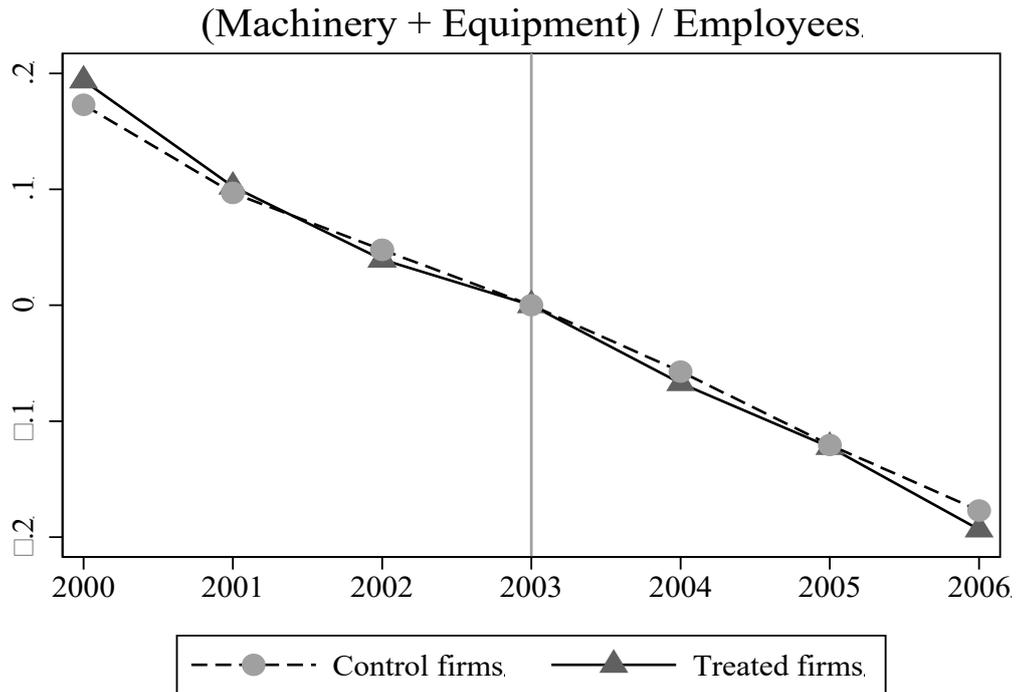
Figure 7 – Effect of the 2004 Law on capital intensity and productivity
We run separate panel regressions for the treated and control firms of the variables shown on a set of year dummies, controlling for firm fixed effects. The figures plot the coefficients obtained for the year dummies (2003 is the omitted year). The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. The treated and the control groups are matched exactly on industry (at the five-digit SNI level) and on firm age. Sample period is from 2000 to 2006.

Growth rate of employment
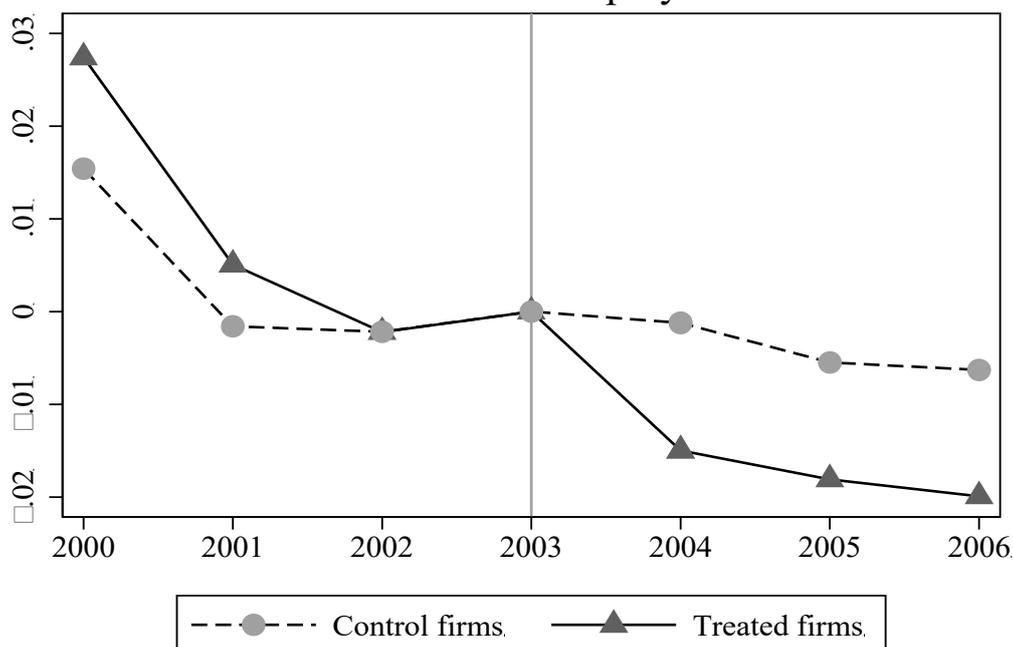
Growth rate of assets
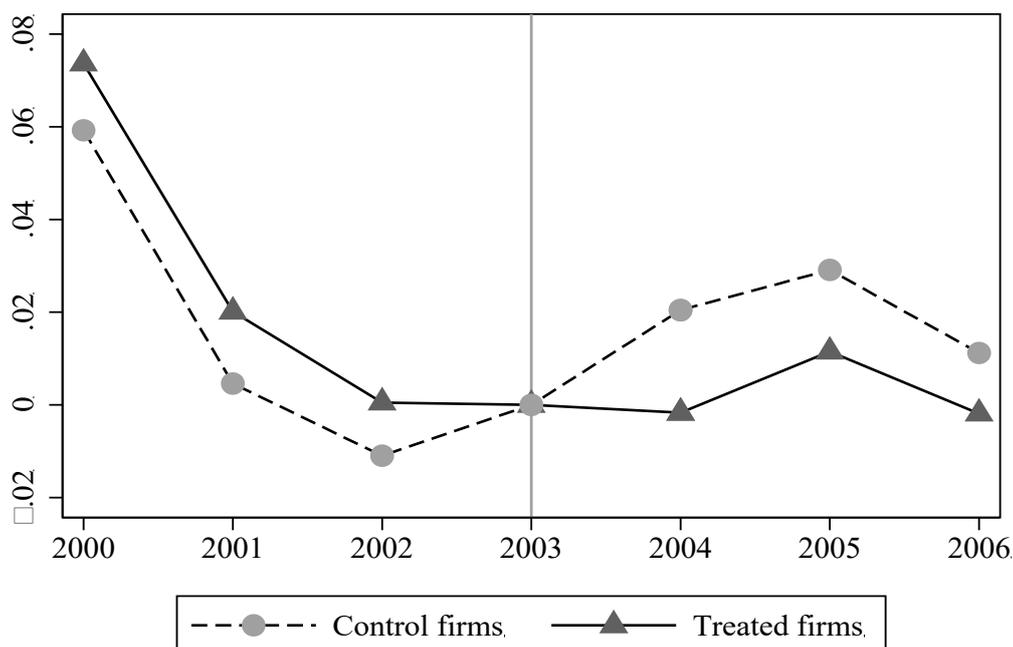
Figure 8 – Effect of the 2004 Law on firm growth
We run separate panel regressions for the treated and control firms of the variables shown on a set of year dummies, controlling for firm fixed effects. The figures plot the coefficients obtained for the year dummies (2003 is the omitted year). The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. The treated and the control groups are matched exactly on industry (at the five-digit SNI level) and on firm age. Sample period is from 2000 to 2006.

=1 if firm filed for bankruptcy
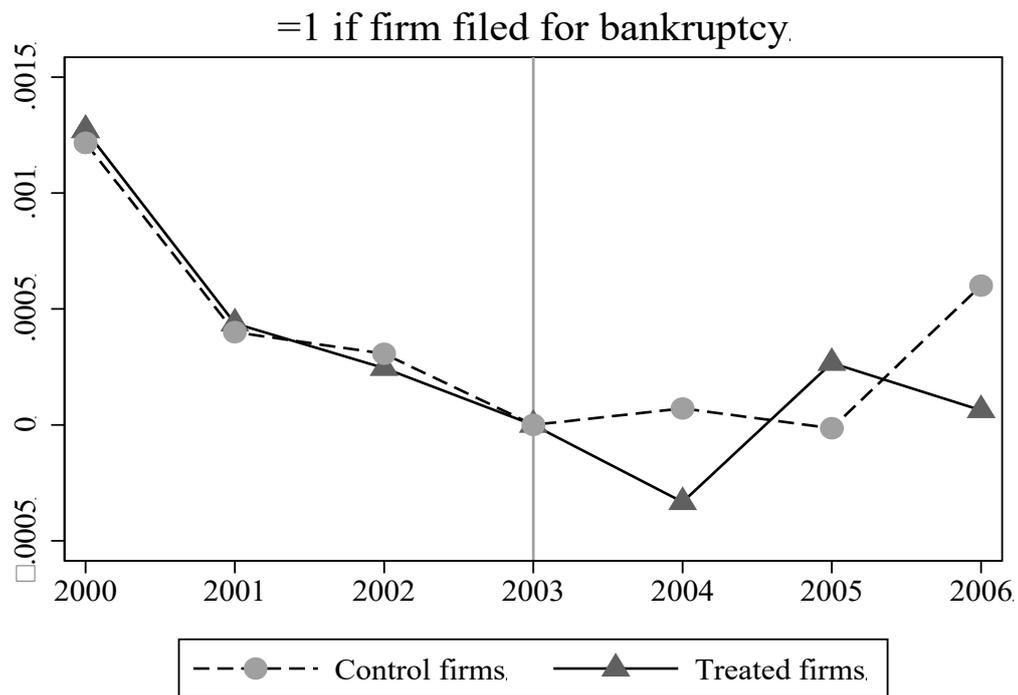
Figure 9 – Effect of the 2004 Law on firm bankruptcy
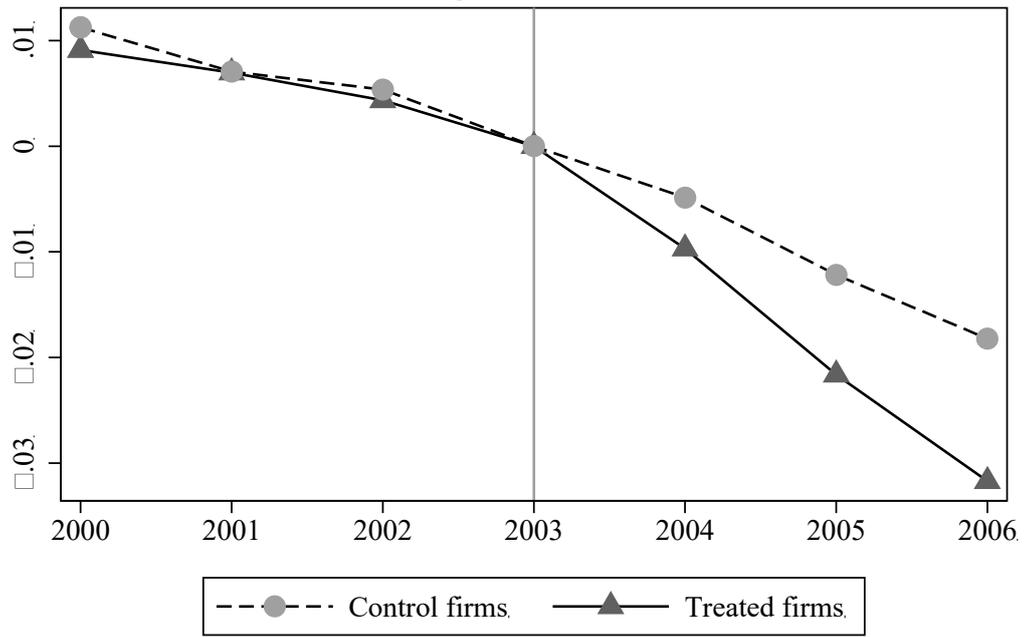We run separate panel regressions for the treated and control firms of the variables shown on a set of year dummies, controlling for firm fixed effects. The figures plot the coefficients obtained for the year dummies (2003 is the omitted year). The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. The treated and the control groups are matched exactly on industry (at the five-digit SNI level) and on firm age. Sample period is from 2000 to 2006.
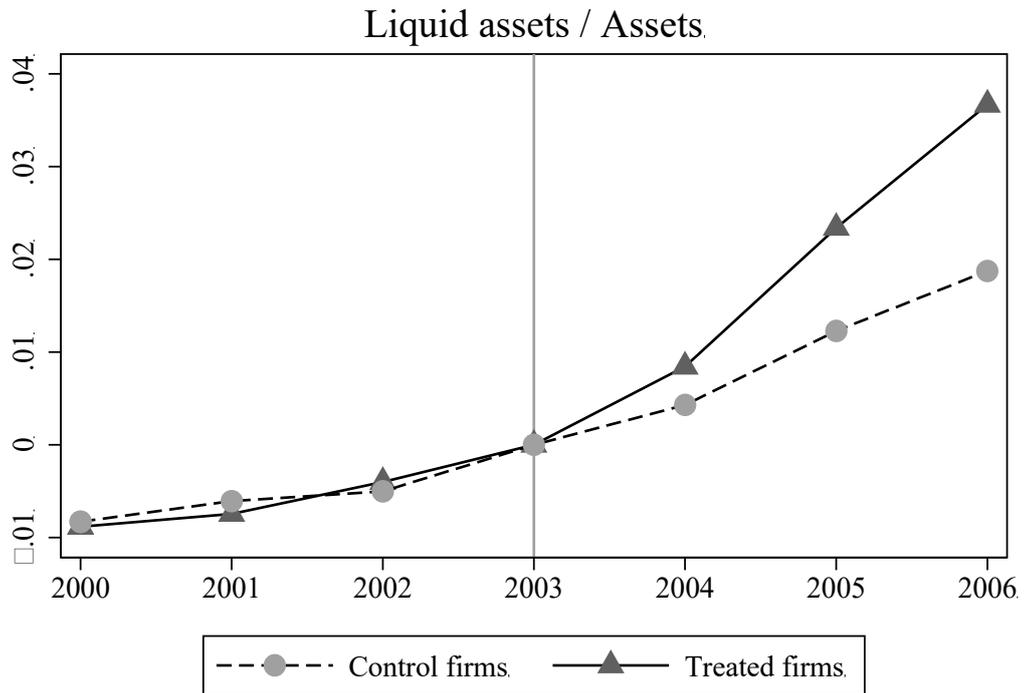
Table 1 – Industry composition in 2003

Industry classification is based on two-digit 2002 Swedish Standard Industrial Classification (SNI) codes.

Industry	Number of firms	Percent
Agriculture, hunting and forestry	5,769	2.98
Fishing	186	0.10
Mining and quarrying of energy producing minerals	168	0.09
Mining and quarrying of other minerals	313	0.16
Manufacture of food products, beverages, and tobacco	1,547	0.80
Manufacture of textile products	765	0.40
Manufacture of leather products	103	0.05
Manufacture of wood products	2,010	1.04
Manufacture of pulp and paper products	3,988	2.06
Manufacture of refined petroleum products	56	0.03
Manufacture of chemical products and fibers	572	0.30
Manufacture of rubber and plastic products	1,205	0.62
Manufacture of other non-metallic mineral products	631	0.33
Manufacture of metal products	5,476	2.83
Manufacture of machinery and equipment	2,899	1.50
Manufacture of electric and optical equipment	2,671	1.38
Manufacture of transport equipment	1,127	0.58
Manufacture of other goods	1,446	0.75
Electricity, gas and water supply	1,598	0.83
Construction	20,966	10.83
Wholesale and retail trade	44,972	23.23
Accommodation and food service activities	6,648	3.43
Transport, storage and communication	11,631	6.01
Real estate	62,455	32.26
Public administration	173	0.09
Education	2,242	1.16
Health and social work	5,454	2.82
Other social activities	6,523	3.37
Total	*193,594*	*100.00*

Table 2 – Summary statistics

Statistics are for the year 2003. The number of firms in the sample is 193,594. mSEK is millions of Swedish Kroner (8.5 SEK = 1 USD).

Variable	Mean	Standard deviation
Collateral		
Total collateral / Debt	0.370	0.416
Fixed liens / Debt	0.159	0.323
Debt and debt structure		
Debt / Assets	0.588	0.272
Long-term debt / Debt	0.260	0.327
Long-term loans / Debt	0.149	0.257
Short-term loans / Debt	0.020	0.070
Lines of credit limit / Debt	0.320	0.276
Investment		
Total net investment / Assets	0.014	0.030
Investment in machinery and equipment / Assets	0.012	0.025
Investment in land and buildings / Assets	0.003	0.014
Asset structure		
Tangible assets / Assets	0.219	0.279
Inventories / Assets	0.117	0.210
Liquid assets / Assets	0.241	0.277
Capital intensity and productivity		
(Machinery + Equipment) / Employees	0.697	2.565
Sales / (Machinery + Equipment)	2.799	1.698
Firm growth and size		
Employment growth	-0.007	0.185
Asset growth	0.013	0.660
Number of employees	10.598	127.539
Assets (log mSEK)	14.273	1.976
Bankruptcy		
Firm filed for bankruptcy	0.002	0.048

Table 3 – Sample means for control and treated firms

Sample averages are for the period 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. The treated and the control groups are matched exactly on industry (at the five-digit SNI level) and on firm age. Differences in means are assessed with the *t-test*. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Variable	Control	Treated	Difference
Collateral			
Total collateral / Debt	0.112	0.609	0.497***
Fixed liens / Debt	0.112	0.179	0.067***
Debt and debt structure			
Debt / Assets	0.534	0.701	0.167***
Long-term debt / Debt	0.208	0.309	0.101***
Long-term loans / Debt	0.075	0.221	0.146***
Short-term loans / Debt	0.009	0.027	0.017***
Lines of credit limit / Debt	0.224	0.316	0.092***
Investment			
Total net investment / Assets	0.016	0.020	0.004***
Investment in machinery and equipment / Assets	0.014	0.017	0.003***
Investment in land and buildings / Assets	0.003	0.003	0.001***
Asset structure			
Tangible assets / Assets	0.186	0.266	0.079***
Inventories / Assets	0.091	0.175	0.083***
Liquid assets / Assets	0.308	0.167	-0.141***
Capital intensity and productivity			
(Machinery + Equipment) / Employees (mSEK)	0.781	0.862	0.081***
Sales / (Machinery + Equipment)	2.736	2.861	0.125***
Firm growth and size			
Employment growth	0.004	0.022	0.009***
Asset growth	0.059	0.080	0.014***
Number of employees	8.50	9.37	0.875**
Assets (log mSEK)	13.94	14.48	0.543***
Bankruptcy			
Firm filed for bankruptcy	0.003	0.003	<0.001*
Number of firms	80,431	88,055	

Table 4 – Total collateral and fixed liens

Total collateral includes floating liens and fixed liens. Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Total collateral / Debt			Fixed liens / Debt		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	-0.0220***	-0.0295***	-0.0343***	0.0163***	0.0133***	0.00101
	[0.00105]	[0.00137]	[0.00141]	[0.000861]	[0.00116]	[0.00120]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes
Number of firms	191,385	167,261	167,261	191,385	167,261	167,261
Number of observations	1,303,505	1,144,023	1,144,023	1,303,494	1,144,016	1,144,016
R-squared	0.003	0.004	0.004	0.002	0.003	0.003
Predicted % change	*-3.62*	*-4.84*	*-5.64*	*9.12*	*7.45*	*0.56*

Table 5 – Leverage and debt maturity

Long-term debt is debt due in one year or more. Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Debt / Assets			Long-term debt / Debt		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	-0.00928***	-0.00940***	-0.00528***	-0.0345***	-0.0350***	-0.0151***
	[0.000809]	[0.00108]	[0.00112]	[0.000929]	[0.00124]	[0.00138]
Firm fixed effects	Yes	Yes	Yes			
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes
Number of firms	190,790	165,992	165,992	191,453	167,315	167,315
Number of observations	1,273,170	1,108,215	1,108,215	1,310,462	1,149,965	1,149,965
R-squared	0.047	0.053	0.053	0.014	0.013	0.014
Predicted % change	*-1.32*	*-1.34*	*-0.75*	*-11.17*	*-11.34*	*-4.89*

Table 6 – Bank loans and lines of credit

Long-term loans are loans with maturity of one year or more. Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Long-term loans / Debt			Short-term loans / Debt			Lines of credit limit / Debt		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated × Post-law	-0.0389***	-0.0407***	-0.0183***	0.0132***	0.0123***	0.00660***	-0.015***	-0.0126***	-0.0179***
	[0.000741]	[0.000941]	[0.00107]	[0.000320]	[0.000410]	[0.000501]	[0.00202]	[0.00290]	[0.00377]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes	–	–	Yes
Number of firms	191,453	167,315	167,315	191,453	167,315	167,315	116,934	103,024	103,024
Number of observations	1,310,374	1,149,888	1,149,888	1,310,423	1,149,933	1,149,933	530,308	468,300	468,300
R-squared	0.016	0.016	0.016	0.013	0.013	0.013	0.001	0.001	0.001
Predicted % change	*-17.57*	*-18.37*	*-8.26*	*49.43*	*45.97*	*24.70*	*-4.75*	*-3.99*	*-5.66*

Table 7 – Firm investment

Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Net investment / Assets			Investment in machinery and equipment / Assets			Investment in land and buildings / Assets		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated × Post-law	-0.0006***	-0.0014***	-0.0012***	-0.0006***	-0.0010***	-0.0011***	0.0001	-0.0002***	-0.0003**
	[0.0001]	[0.0002]	[0.0003]	[0.0001]	[0.0001]	[0.0002]	[0.0001]	[0.0001]	[0.0001]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes	–	–	Yes
Number of firms	184,700	163,332	163,332	184,746	163,360	163,360	184,735	163,361	163,361
Number of observations	1,101,582	984,189	984,189	1,104,224	986,176	986,176	1,136,470	1,018,512	1,018,512
R-squared	0.011	0.010	0.010	0.011	0.009	0.009	0.001	0.001	0.001
Predicted % change	-2.99	-7.04	-6.09	-3.72	-6.03	-6.22	2.73	-7.68	-9.88

Table 8 – Asset structure

Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Tangible assets / Assets			Inventories / Assets			Liquid assets / Assets		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated × Post-law	-0.0073***	-0.0084***	-0.0054***	-0.0111***	-0.0072***	-0.0027***	0.0134***	0.0113***	0.00337***
	[0.00066]	[0.00089]	[0.00092]	[0.00047]	[0.00065]	[0.00067]	[0.00079]	[0.0011]	[0.00126]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes	–	–	Yes
Number of firms	193,576	168,472	168,472	193,575	168,471	168,471	193,574	168,471	168,471
Number of observations	1,342,101	1,170,065	1,170,065	1,341,776	1,169,770	1,169,770	1,340,583	1,168,709	1,168,709
R-squared	0.013	0.013	0.013	0.005	0.006	0.006	0.007	0.008	0.008
Predicted % change	*-2.75*	*-3.18*	*-2.05*	*-6.37*	*-4.11*	*-1.55*	*8.05*	*6.74*	*2.02*

Table 9 – Capital intensity and efficiency
Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	(Machinery + Equipment) / Employees			Sales / (Machinery + Equipment)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	-0.0404***	-0.0137	0.00830	0.0368**	0.00369	-0.0231
	[0.00767]	[0.0105]	[0.0121]	[0.0181]	[0.0243]	[0.0272]
Firm fixed effects	Yes	Yes	Yes			
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes
Number of firms	193,051	168,026	168,026	27,228	24,248	24,248
Number of observations	1,299,839	1,135,551	1,135,551	105,352	93,531	93,531
R-squared	0.007	0.007	0.007	0.014	0.017	0.017
Predicted % change	*-4.69*	*-1.59*	*0.96*	*1.29*	*0.13*	*-0.81*

Table 10 – Employment and asset growth
Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Employment growth			Asset growth		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	-0.0185***	-0.0180***	-0.00735***	-0.0278***	-0.0278***	-0.0208***
	[0.00114]	[0.00148]	[0.00252]	[0.00246]	[0.00343]	[0.00687]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes
Number of firms	155,690	137,372	137,372	193,593	168,485	168,485
Number of observations	1,078,953	952,211	952,211	1,322,569	1,154,558	1,154,558
R-squared	0.002	0.002	0.002	0.002	0.001	0.001
Predicted % change	*-84.90*	*-82.74*	*-33.82*	*-34.75*	*-34.77*	*-25.93*

Table 11 – Firm bankruptcy

Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Firm filed for bankruptcy		
	(1)	(2)	(3)
Treated × Post-law	-0.000340**	-0.000228	-0.00010
	[0.000173]	[0.000233]	[0.000446]
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Matched samples	–	Yes	Yes
Treated × Trend	–	–	Yes
Number of firms	193,286	168,330	168,330
Number of observations	1,351,767	1,177,300	1,177,300
R-squared	0.000	0.000	0.000
Predicted % change	*-12.22*	*-8.19*	*-3.41*

Table 12 – Alternative definition of treatment: Floating liens outstanding in 2000

Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. *Treated* equals one for firms that pledged floating liens in 2000, and zero otherwise. The estimated regressions are similar to the second specification in Tables 4-11. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

PANEL A – Collateral, debt, and debt structure

Dep. variable:	Collateral / Debt	Fixed liens / Debt	Debt / Assets	LT debt / Debt	LT loans / Debt	ST loans / Debt	LOC Limit / Debt
Treated × Post-law	-0.0668***	0.0132***	-0.0178***	-0.0426***	-0.0488***	0.0106***	-0.0163***
	[0.00143]	[0.00119]	[0.00106]	[0.00124]	[0.000966]	[0.000410]	[0.00237]
Nr. of observations	1,135,407	1,135,400	1,098,532	1,141,208	1,141,133	1,141,176	471,909
R-squared	0.012	0.003	0.054	0.015	0.018	0.012	0.002

PANEL B – Investment and asset structure

Dep. variable:	Investment / Assets	Investment in M&E / Assets	Investment in B&L / Assets	Tangible Assets / Assets	Inventories / Assets	Liquid Assets / Assets
Treated × Post-law	-0.000388**	-0.000253*	-0.00008	-0.0123***	-0.0105***	0.0184***
	[0.000157]	[0.000130]	[0.00007]	[0.000907]	[0.000664]	[0.00104]
Nr. of observations	981,663	983,615	1,015,660	1,159,807	1,159,518	1,158,450
R-squared	0.009	0.009	0.001	0.013	0.007	0.009

PANEL C – Capital intensity, productivity, growth, and bankruptcy

Dep. variable:	Machinery + Equipment / Employees	Sales / Machinery + Equipment	Employment growth	Asset growth	Bankrupt
Treated × Post-law	-0.0171	-0.0111	-0.0107***	-0.00628**	-0.000004
	[0.0106]	[0.0231]	[0.00147]	[0.00320]	[0.000235]
Nr. of observations	1,126,218	93,567	951,732	1,145,426	1,166,393
R-squared	0.008	0.017	0.002	0.001	0.000

Table 13 – Cross-sectional results with collapsed data

For this table, we collapsed each firms' time-series into a cross-section where each observation equals the "post" (2004-2006) minus "pre" (2000-2003) change in the average level of the outcome variable. The table displays cross-sectional regressions of first differences ("post" minus "pre") for a range of firm variables. *Treated* equals one for firms that pledged floating liens before 2004, and zero otherwise. The treated and control firms are matched on industry (based on 5-digit SNI codes) and on firm age. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

PANEL A – Collateral, debt, and debt structure

Dep. variable:	Collateral / Debt	Fixed liens / Debt	Debt / Assets	LT debt / Debt	LT loans / Debt	ST loans / Debt	LOC Limit / Debt
Treated	-0.0303***	0.0131***	-0.0103***	-0.0354***	-0.0437***	0.0437***	-0.0547***
	[0.00137]	[0.00115]	[0.00111]	[0.00126]	[0.00454]	[0.00454]	[0.00483]
Number of firms	165,190	165,190	160,959	165,545	63,676	63,676	61,608
R-squared	0.004	0.001	0.001	0.008	0.004	0.004	0.007

PANEL B – Investment and asset structure

Dep. variable:	Investment / Assets	Investment in M&E / Assets	Investment in B&L / Assets	Tangible Assets / Assets	Inventories / Assets	Liquid Assets / Assets
Treated	-0.00153***	-0.00118***	-0.000378***	-0.00877***	-0.00724***	0.0116***
	[0.000173]	[0.000145]	[0.000100]	[0.000904]	[0.000653]	[0.00108]
Number of firms	156,384	156,569	156,203	168,166	168,158	168,138
R-squared	0.001	0.001	0.000	0.001	0.001	0.001

PANEL C – Capital intensity, productivity, growth, and bankruptcy

Dep. variable:	Machinery + Equipment / Employees	Sales / Machinery + Equipment	Employment growth	Asset growth	Bankrupt
Treated	-0.0196*	-0.00868	-0.0179***	-0.0296***	-0.000274
	[0.0108]	[0.0246]	[0.00153]	[0.00366]	[0.000242]
Number of firms	166,019	12,396	136,809	168,465	168,134
R-squared	0.000	0.000	0.002	0.001	0.000

Table 14 – Triple differences to study heterogeneity in effects due to leverage, debt duration, liquidity and size

Sample period is from 2000 to 2006. The table shows estimates of triple difference models in which the variable Treated × Post-law is interacted with indicators of whether the firm has an above-median: leverage ratio (Panel A), fraction of long-term debt (Panel B), fraction of liquid assets (Panel C), and firm asset size (Panel D). These sample medians are calculated after averaging the variables over the 2000-2003 period. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000 to 2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. The treated and control groups are matched exactly on industry (based on 5-digit SNI codes) and on firm age. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

PANEL A – Based on pre-law leverage ratio

Dependent variable:	$\dfrac{\text{Debt}}{\text{Assets}}$	$\dfrac{\text{LT debt}}{\text{Debt}}$	$\dfrac{\text{Investment}}{\text{Assets}}$	Asset growth
Treated × Post-law × High Leverage	-0.0322***	-0.0406***	-0.00262***	-0.0824***
	[0.000826]	[0.00101]	[0.000179]	[0.00284]
Firm fixed effects	Yes	Yes	Yes	Yes
Second level interactions	Yes	Yes	Yes	Yes
Number of firms	1,030,246	1,023,810	883,922	1,026,729
R-squared	0.772	0.764	0.324	0.140

PANEL B – Based on pre-law fraction of long-term debt

Dependent variable:	$\dfrac{\text{Debt}}{\text{Assets}}$	$\dfrac{\text{LT debt}}{\text{Debt}}$	$\dfrac{\text{Investment}}{\text{Assets}}$	Asset growth
Treated × Post-law × High % LT Debt	-0.00832***	-0.119***	-0.00378***	-0.0292***
	[0.000740]	[0.000805]	[0.000163]	[0.00334]
Firm fixed effects	Yes	Yes	Yes	Yes
Second level interactions	Yes	Yes	Yes	Yes
Number of firms	1,057,543	1,117,058	955,640	1,107,893
R-squared	0.767	0.763	0.318	0.118

Table 14 (cont.)

PANEL C – Based on pre-law fraction of liquid assets

Dependent variable:	Debt / Assets	LT debt / Debt	Investment / Assets	Asset growth
Treated × Post-law × High % Liquid assets	-0.00218***	0.0541***	0.00161***	0.0353***
	[0.000760]	[0.000914]	[0.000174]	[0.00317]
Firm fixed effects	Yes	Yes	Yes	Yes
Second level interactions	Yes	Yes	Yes	Yes
Number of firms	1,075,893	1,121,399	962,752	1,123,524
R-squared	0.767	0.758	0.317	0.134

PANEL D – Pre-law firm size (assets)

Dependent variable:	Debt / Assets	LT debt / Debt	Investment / Assets	Asset growth
Treated × Post-law × Large firm	-0.0129***	-0.00296***	-0.00140***	-0.107***
	[0.000787]	[0.000951]	[0.000182]	[0.00390]
Firm fixed effects	Yes	Yes	Yes	Yes
Second level interactions	Yes	Yes	Yes	Yes
Number of firms	1,081,137	1,129,284	968,202	1,131,561
R-squared	0.767	0.757	0.318	0.114

Internet Appendix

APPENDIX

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Appendix D – Collateral measures

Appendix A – Definition of variables

Table A.1 – Definition of variables (Data Source: official annual reports, filed at Swedish Company Registration Office; variable definitions provided by credit bureau UC)

Variable	Definition
Total collateral / Debt	Sum of pledged fixed liens and floating liens as a % of total liabilities
Fixed liens / Debt	Pledged fixed liens as a % of total liabilities
Debt / Assets	Total liabilities as a % of total assets
Long-term debt / Debt	Liabilities with maturity ≥ 1 year as a % of total liabilities
Long-term loans / Debt	Loans from financial institutions with maturity ≥ 1 year as a % of total liabilities
Short-term loans / Debt	Loans from financial institutions with maturity < 1 year as a % of total liabilities
Lines of credit limit / Debt	Lines of credit limit as a % of total liabilities
Total net investment / Assets	Total net investment as a % of total assets
Investment in machinery and equipment / Assets	Net investment in machinery and equipment as a % of total assets
Investment in land and buildings / Assets	Net investment in land and buildings as a % of total assets
Tangible assets / Assets	Tangible assets as a % of total assets
Inventories / Assets	Inventories as a % of total assets
Liquid assets / Assets	Cash and equivalents as a % of total assets
(Machinery + Equipment) / Employees	Sum of machinery and equipment (in mSEK) per employee
Sales / (Machinery + Equipment)	Total revenue as a % of the sum of machinery and equipment
Employment growth	Year-to-year change in the log of total employees
Asset growth	Year-to-year change in the log of total assets (mSEK)
Firm filed for bankruptcy	Indicates whether the firm filed for bankruptcy in the current year

Appendix B – Log-linear models

Table B.1 – Total collateral and fixed liens (in levels)

Total collateral includes floating liens and fixed liens. Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Log(Total collateral)			Log(Fixed liens)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	-0.831***	-0.966***	-0.632***	0.201***	0.163***	-0.00702
	[0.0167]	[0.0230]	[0.0225]	[0.0169]	[0.0219]	[0.0224]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes
Number of firms	193,548	168,448	168,448	193,548	168,448	168,448
Number of observations	1,337,966	1,166,778	1,166,778	1,337,954	1,166,770	1,166,770
R-squared	0.006	0.008	0.008	0.002	0.002	0.002
Predicted % change	*-6.66*	*-7.75*	*-5.07*	*4.54*	*3.69*	*-0.16*

Table B.2 – Debt and debt maturity (in levels)

Long-term debt is debt due in one year or more. Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Log(Debt)			Log(Long-term debt)			Log(Short-term debt)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated × Post-law	-0.0634***	-0.0312***	-0.0962***	-0.955***	-0.932***	-0.419***	-0.0289***	0.0155	-0.0803***
	[0.00790]	[0.0107]	[0.0111]	[0.0197]	[0.0263]	[0.0291]	[0.00808]	[0.0109]	[0.0117]
Firm fixed effects	Yes	Yes	Yes						
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes	–	–	Yes
Number of firms	193,594	168,486	168,486	1,345,336	1,172,808	1,172,808	1,345,624	1,173,074	1,173,074
Number of observations	1,344,842	1,172,376	1,172,376	0.018	0.018	0.019	0.000	0.001	0.001
R-squared	0.001	0.002	0.002	193,594	168,486	168,486	193,594	168,486	168,486
Predicted % change	*-0.46*	*-0.22*	*-0.69*	*-10.31*	*-10.06*	*-4.52*	*-0.22*	*0.12*	*-0.60*

Table B.3 – Bank loans and lines of credit (in levels)

Long-term loans are loans with maturity of one year or more. Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Log(Long-term loans)			Log(Short-term loans)			Log(Lines of credit limit)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated × Post-law	-1.227***	-1.256***	-0.539***	0.521***	0.471***	0.119***	-0.395***	-0.354***	-0.278***
	[0.0188]	[0.0243]	[0.0279]	[0.0161]	[0.0198]	[0.0227]	[0.0297]	[0.0423]	[0.0607]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes	–	–	Yes
Number of firms	193,594	168,486	168,486	193,594	168,486	168,486	118,233	103,812	103,812
Number of observations	1,345,417	1,172,887	1,172,887	1,345,624	1,173,074	1,173,074	532,723	469,937	469,937
R-squared	0.021	0.020	0.021	0.013	0.013	0.013	0.003	0.003	0.003
Predicted % change	*-16.24*	*-16.62*	*-7.14*	*17.50*	*15.81*	*3.99*	*-3.30*	*-2.96*	*-2.32*

Table B.4 – Firm investment (in levels)

Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Log(Net investment)			Log(Net investment in machinery and equipment)			Log(Net investment in land and buildings)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated × Post-law	-0.0264*	-0.0782***	-0.199***	-0.0427***	-0.0589***	-0.190***	0.0386***	-0.0122	-0.0297
	[0.0158]	[0.0215]	[0.0362]	[0.0152]	[0.0209]	[0.0354]	[0.0121]	[0.0151]	[0.0249]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes	–	–	Yes
Number of firms	184,767	163,389	163,389	184,815	163,419	163,419	184,808	163,424	163,424
Number of observations	1,104,842	987,146	987,146	1,107,551	989,191	989,191	1,139,787	1,021,532	1,021,532
R-squared	0.016	0.014	0.014	0.016	0.015	0.015	0.004	0.003	0.003
Predicted % change	*-0.32*	*-0.96*	*-2.45*	*-0.54*	*-0.74*	*-2.39*	*2.49*	*-0.79*	*-1.92*

Table B.5 – Firm employment and size (in levels)

Sample period is from 2000 to 2006. Post-law is a dummy that equals one in years 2004 to 2006, and equals zero in years 2000-2003. The treated group contains firms that pledged floating liens before 2004. The control group contains firms that did not pledge floating liens before 2004. "Matched samples" refers to the exact matching of treated and control firms on industry (based on 5-digit SNI codes) and on firm age. *Predicted % change* is the *Treated × Post-law* coefficient divided by the sample mean of the dependent variable in the pre-treatment period for the treated group, in percent. The standard errors shown in brackets are clustered at the firm level. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Dependent variable:	Log(Number of employees)			Log(Assets)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	-0.0313***	-0.0132***	-0.0217***	-0.0420***	-0.0239***	-0.0467***
	[0.00217]	[0.00285]	[0.00262]	[0.00436]	[0.00610]	[0.00536]
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Matched samples	–	Yes	Yes	–	Yes	Yes
Treated × Trend	–	–	Yes	–	–	Yes
Number of firms	193,511	168,418	168,418	193,594	168,486	168,486
Number of observations	1,314,706	1,148,287	1,148,287	1,345,399	1,172,873	1,172,873
R-squared	0.003	0.004	0.004	0.003	0.002	0.002
Predicted % change	*-2.05*	*-0.87*	*-1.43*	*-0.29*	*-0.17*	*-0.32*

Appendix C – Contemporaneous legislation in Sweden

Search methodology

We searched all the Reports (Swedish: "Betänkande") discussed in the Parliamentary Civil and Finance Committees during the period 1998-2006. A Report constitutes the Committee's official record on a proposal for a government bill. It will thus refer to the full proposal for a law text and contain a proposal for a possibly amended decision which is sent to the Floor of the Parliament. We started the search in 1998, i.e., two years before the start of our sample period to ensure that we capture laws that were discussed earlier but enacted with a substantial delay.

We selected those reports that: (a) appeared "potentially relevant", and (b) in which we at least once found the word "priority right", "bankruptcy", "collateral", "lien", or "liquidation". For "liquidation" we used four different synonyms in the Swedish text search. In selecting "potentially relevant" reports, we adopted a conservative approach and only eliminated documents that concerned topics such as: Government budget, budgetary limits, public procurement, Tobin tax, guidelines for economic policy, central bank issues, IMF participation, issuing electronic money, rejected modifications of law proposals, annual reports by public pensions funds and other public bodies, EU currency cooperation, municipal development and budgets, insurance intermediation, or deposit insurance fees.

Before applying these two selection criteria, our search resulted in 160 reports with unique titles in the two Committees; certain titles recur annually, for example, because they are related to the national budget process. Fifteen reports could be eliminated because they were not discussed in the committee until after the end of our sample period. After applying the above criteria and filtering out irrelevant reports we were left with 34 reports. Only one of them contained the word "priority right", while

nine contained "bankruptcy", 14 contained "lien" or "collateral", and six contained "liquidation". The union of these hits consisted of 14 reports.

We read through the text of these 14 reports to understand the context of the hits on the above key words. Many of these reports pertained to financial firms directly (which are absent from our sample) and none discussed legal changes that would have differentially impacted firms issuing floating liens versus other firms. To exemplify the contents of the reports we highlight what we think are the three most relevant outcomes (full information on all other search outcomes are available upon request).

Most relevant search outcomes:

1. Government Bill 2002/03:139, "Reformerade regler för bank- och finansieringsrörelse" (Revised rules for banks and financing companies)

This law introduced a possibility for finance companies to take deposits from the general public in order to promote competition. To create a level playing field, a general formulation that "banks should normally strive for collateralizing loans" was removed from the extant law because the act governing finance companies did not contain such a formulation. It was replaced by a provision stating that a financial institution "before a credit decision shall examine the risk that the obligation arising from the credit agreement cannot be fulfilled".

In practice all of this rewriting of the law had little impact on the collateral requirements imposed by banks (as the law had been vague enough to provide banks

with maximum discretion), and there was no differentiation between floating liens and other collateral.

2. Government Bill, 2004/05:30, "Finansiella sakerheter" (Financial collateral).

Implementation of an EU directive regarding financial collateral that allows professional market participants to sell collateral faster when an institution fails. This notion comes from the EU finality directive that aims for eliminating risks that institutions will have backward claims on financial assets when one financial institution defaults, thereby eliminating chain effects. The law only concerns professional actors on financial markets, under supervision of an FSA or active internationally, as well as government bodies – a restrictive approach in terms of which firms are covered by the exemption. The law was enacted May 1, 2005.

3. Government Bill, 2002/03:107, "Säkerställda obligationer" (Covered bonds).

This law creates priority rights for holders of covered bonds in case of an issuer's bankruptcy. The collateral for covered bonds consists of loans that were given for real estate or land. Those loans may be collateralized or uncollateralized. The law does not affect the underlying real collateral or the relationship between the bank and the firm that pledged collateral, only the relationship between the issuer and holder of a covered bond.

Appendix D – Detailed description of different collateral measures

The floating lien values that we use in the paper are nominal values of the collateral pledged that we obtain from the financial statement of each firm. To clarify what these values are exactly, we describe below the full set of events from the creation to the pledge of floating liens.

First, a firm (i) registers a floating lien (j) at the Swedish Company Registration Office. The lien certificate constitutes a transferable nominal claim on the assets eligible under the floating lien. Registering the floating lien constitutes no guarantee that the firm has sufficient assets, and hence there is no valuation element at this stage. The claim is nominal and not guaranteed. We will call this *FloatingLien#1(i, j)*. We will call the sum of all floating liens $j = 1,2, …, N$, registered by firm (i):

$$FloatingLien\#1(i) = \sum_{j=1}^{N} FloatingLien\#1(i, j). \tag{A4.1}$$

Second, a registered floating lien can be either pledged to a lender or kept in stock for future borrowing purposes. The subset of floating liens $k = 1,2, …, K$, where $K \leq N$ that was actually pledged to borrowers at the end of a firm's accounting year is reported in the financial statement. We will call this subset of registered floating liens that are outstanding:

$$FloatingLien\#2(i) = \sum_{k=1}^{K} FloatingLien\#1(i, k). \tag{A4.2}$$

There is no valuation element at this stage and that the claim is nominal and not guaranteed. Also note that by definition:

$$FloatingLien\#2(i) \leq FloatingLien\#1(i). \tag{A4.3}$$

Third, and assuming for simplicity that the firm only pledges floating liens to one single bank (s), the bank can hold a portfolio of floating liens pledged by firms m_s = 1,2, …, M. The total nominal value of floating liens pledged by firm (m) to bank (s) is:

$$FloatingLien\#3(s) = \sum_{m_s=1}^{M} FloatingLien\#2(m_s). \qquad (A4.4)$$

Fourth, define *FloatingLien#4(s)* as the bank's internal estimate of the value of the portfolio of floating liens *FloatingLien#3(s)*.

In this paper we use *FloatingLien#2(i)* in our analysis, while Cerqueiro, Ongena and Roszbach (2016) use *FloatingLien#4(s)*.

References to the Appendix

Cerqueiro, G., S. Ongena, and K. Roszbach, 2016, "Collateralization, Bank Loan Rates and Monitoring: Evidence from a Natural Experiment," *Journal of Finance* 71, 1295-1322.