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**Working Paper**

## Collateral damage? On collateral, corporate financing and performance

ECB Working Paper, No. 1918

**Provided in Cooperation with:**

European Central Bank (ECB)

*Suggested Citation:* Cerqueiro, Geraldo; Ongena, Steven; Roszbach, Kasper (2016) : Collateral damage? On collateral, corporate financing and performance, ECB Working Paper, No. 1918, ISBN 978-92-899-2166-4, European Central Bank (ECB), Frankfurt a. M., <https://doi.org/10.2866/981745>

This Version is available at:

<https://hdl.handle.net/10419/154351>

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## Working Paper Series

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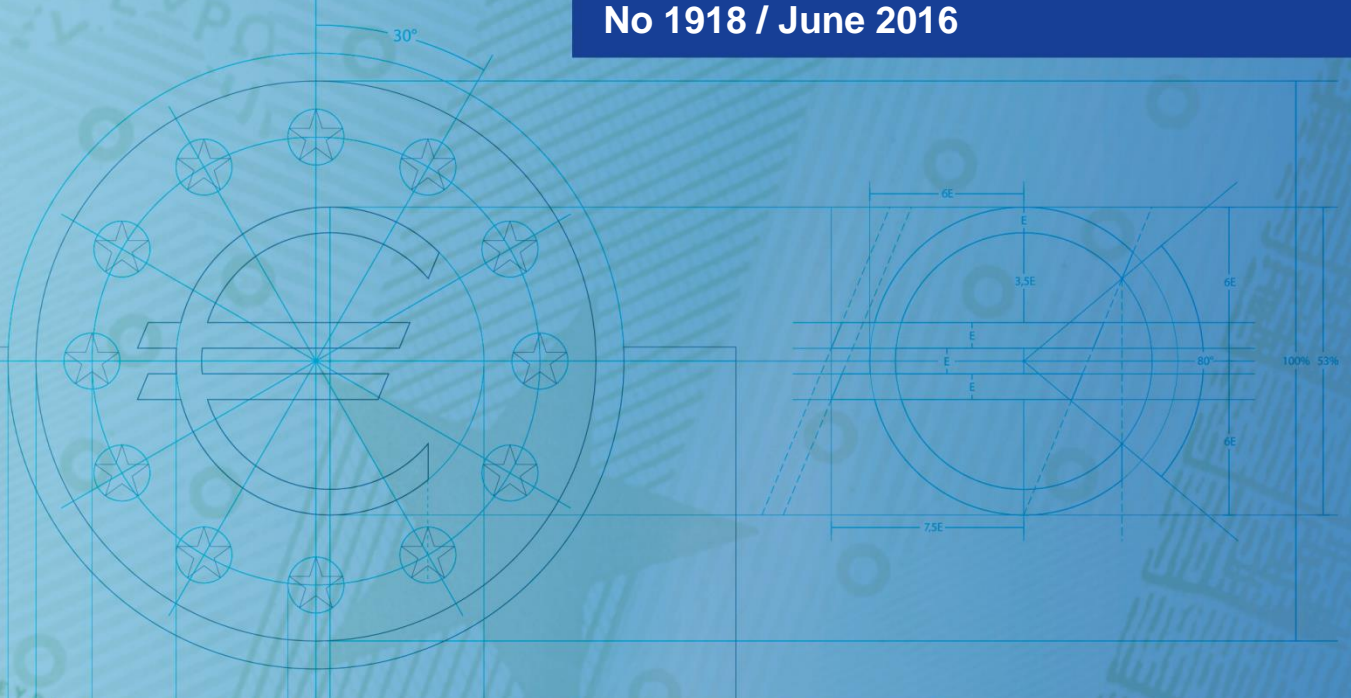
### Collateral damage? On collateral, corporate financing and performance

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No 1918 / June 2016



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## ABSTRACT

In this paper, we investigate the economy-wide effects of the collateral channel by exploiting: (i) a legal reform in Sweden in 2004 that reduced collateral values, and (ii) a dataset that covers all incorporated firms in Sweden over the period 2000-2006. We find that the loss in collateral value reduces both the amount and the maturity of firm debt and leads firms to contract investment, employment, and assets. The legal reform may distort investment and asset allocation decisions, as firms that reduce their holdings of assets with low collateralizable value and firms that hold more liquid assets consequently become less productive and innovative. Our results therefore document the potency of a collateral channel outside of a crisis.

**Keywords:** Collateral, investment, financial constraints, differences-in-differences, floating lien.

**JEL Classification:** D22, G31, G32

## Non-Technical Summary

Collateral is an important contractual device used by borrowers (firms) and lenders (banks) around the world. The term collateral refers to assets pledged by the firm to secure a loan. If the firm defaults on its debt obligation, the bank can seize these assets. The protection that collateral provides should therefore make it easier for firms to obtain loans and to finance their investments. On the other hand, a sudden drop in the value of collateralizable assets should hurt a firm's credit-worthiness and prevent it from funding all desired investments, deteriorating asset values even further and amplifying the downturn. This "collateral channel" is a powerful economic mechanism that many believe to be behind the severity of the Great Recession. In spite of the importance of the collateral channel, however, there is very limited evidence on its inner workings.

In this paper, we investigate the economy-wide effects of the collateral channel by exploiting: (i) a legal reform in Sweden in 2004 that reduced collateral values, and (ii) a dataset that covers all incorporated firms in Sweden over the period 2000-2006. Our methodology compares the impact of the reform on a group of firms that borrowed against collateral (and hence were affected by the reform) with a group of similar firms that were not affected by the reform. In particular, we exploit a legal change in 2004 that reduced the value of all floating liens, a security interest that enables companies to pledge their movable property (including inventories and receivables) as collateral. Before the legal change, a creditor holding a floating lien could seize a firm's property outside of bankruptcy and without court order. The 2004 law abolished such rights and, at the same time, it limited the fraction of assets covered by the floating lien from 100% to 55% of eligible assets.

Our results indicate that the reform may have had negative consequences for the real economy. We find that the loss in collateral value reduces both the amount and the maturity of firm debt. Following the reduction in debt capacity and maturity, firms reduce investments, employment, and assets. At the same time, firms appear to redirect investments towards assets with a higher collateralizable value. Finally, we find that the reduction in operating scale makes these firms less efficient and less innovative.

Our results establish the importance of the collateral channel and of financing frictions for the real economy outside of a crisis. We note, however, that our paper only provides a partial analysis of the impact of the reform. For instance, the main objective of the law was to avoid inefficient liquidation and to allow viable companies to enter reorganization. Our paper is silent about the impact of the law on the fate of companies in financial distress. The results in this paper thus do not necessarily imply that the 2004 law is a welfare destroying reform.

## 1. Introduction

Collateral enables individuals and companies around the world to raise debt financing. Economic theory motivates collateral as a contracting tool that alleviates agency problems in the credit market by disciplining both borrowers and lenders.<sup>1</sup> Although these micro-foundations of collateral are well understood, direct empirical evidence on its importance for the real economy is still scarce due to both a dearth of reliable identification opportunities and the lack of economy-wide detailed data. Some studies study episodes of financial stress during which asset values plummet (Gan (2007) and Chaney, Sraer and Thesmar (2012)). However, a drop in asset values means that the value of firms' equity and debt also decreases, implying that the firm is less creditworthy overall. Consequently, firms should face a reduction in credit availability and investment when their balance sheets shrink even in a world without collateral.

In this paper, we aim to take a step forward in identifying the role that collateral plays for corporate financing and investment. For this purpose, we exploit a legal reform in Sweden that only reduced the value of floating liens, a type of collateral recognized in many jurisdictions that allows firms to pledge their movable property.<sup>2</sup> The legal reform took place in a period of economic prosperity (it became

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<sup>1</sup> On the one hand, borrowers are induced to exert effort and to invest wisely (see Freixas and Rochet (2008) for a review). On the other hand, lenders have incentives to monitor the borrower and the assets pledged (Rajan and Winton (1995); Cerqueiro, Ongena and Roszbach (2015)). Collateral should thus increase the availability of credit and reduce its cost, and allow firms to finance investment.

<sup>2</sup> The floating lien is a general security interest that pertains to specific categories of assets. These assets are not individually identified, however, and the floating lien therefore carries over to the future assets present in these specific categories. For instance, suppose that a firm provides as collateral a security interest on its accounts receivable. The firm is allowed to freely dispose of the secured assets as long as it meets its debt obligations. As a result, the actual items in the claim will constantly change due to the turnover in accounts receivable. In the event of a default, the creditor obtains a claim on any of the then present accounts. Before 2004, floating liens were special priority claims that enabled creditors to seize a firm's property outside bankruptcy and without court intervention. The legal change on January 1<sup>st</sup>, 2004, abolished the special priority rights of all floating liens and in effect reduced the pool of eligible assets under them. The loss of the special priority rights implied that holders of floating liens could only seize the secured assets following a court order declaring the debtor's bankruptcy. Cerqueiro, Ongena and Roszbach (2015) for example find that a large Swedish bank responded to the

effective on January 1<sup>st</sup>, 2004). The timing of the reform is ideal for our purposes because it offers a shock to the pledgeable value of assets that is unrelated to their intrinsic value.

We combine this quasi-experimental setting with a comprehensive configuration of three matched economy-wide datasets. The Swedish Credit Bureau register contains accounting information on virtually all incorporated firms in Sweden for the 2000-2006 period of our investigation, resulting in 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 Registration Office. The unique legal reform combined with these economy-wide data sets enables us to directly identify if and how collateral valuation affects firm financing and investment in the Swedish economy during normal times.

We study the effects of the change in the law using a differences-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 not have been directly affected by the change. To ensure that 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. 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, our methodology filters out this shock to the extent that we compare

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2004 law by decreasing its internal valuation of floating liens held, by increasing the interest rates on the with-a-floating-lien collateralized loan contracts, and by tightening credit limits on the affected borrowers. These findings indicate that the 2004 law made it more difficult for many companies to borrow against this type of collateral.

treated firms with control firms in the “catering for hospitals” sector. Our exact matching procedure therefore 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.

The change in the law may have both volume and compositional effects on firm financing and investment. The resultant negative shock to collateral value may reduce corporate debt capacity and therefore firm investment and size. At the same time firms may invest less in movable assets (e.g., equipment and inventories that could be pledged under the floating lien) and more in real assets, potentially leading to distortions that could further reduce firm efficiency and growth.

We establish the following main findings, which we obtain comparing the same set of firms before and after the change in the law and after controlling for different trends between the treated and control firms.

First, following the change in the law, firms suffer a reduction in the value of their collateral. For example, the ratio of collateral to total debt falls by almost 10% on average following the legal change. We confirm that the reduction in collateral value is caused by the 2004 law (and consequently by the loss in the value of floating liens), since we find no reduction in the value of other types of collateral (fixed liens).

Second, following the loss in collateral value, firms reduce both the amount and the maturity of their debt. In particular, treated firms reduce their debt levels by 9% and the fraction of long-term debt to total debt by 6%. 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 of important real effects of the change in the law. In particular, treated firms reduce on average their net investment (as a proportion of assets) by 8%, their employment by 2% and their total assets by 4.5%.

Fourth, the law also distorts firms' investment decisions and asset structure. Affected firms reduce their fraction of tangible assets by 2.5%. However, the reduction in investment on equipment and machinery (i.e., movable assets that are typically pledged via floating liens) appears to be larger than the reduction in investment on land and buildings. We also find a reduction in the fraction of inventories of 2.3% (recall that inventories can be pledged via floating liens), and an increase in cash-holdings of 1.4%.

Finally, following the change in the law, treated firms become relatively less efficient than control firms. We find a drop in sales per dollar of machinery and equipment of almost 5%, which outweighs the reduction in sales per dollar of labor costs (of less than 1%). We find no evidence that firms change their production technology (measured as the ratio of physical capital to labor). Our evidence thus suggests that the reduction in efficiency results from firms operating at less-than-optimal scale.

Our study provides new evidence on how firms' abilities to pledge collateral affect their debt capacity, corporate investment, growth, and performance. The studies closest to ours are Gan (2007) and Chaney, Sraer and Thesmar (2012)). They document that real estate prices influence the debt capacities and investments of firms through the so-called "collateral channel". Gan (2007) estimates that for every 10% drop in collateral value, investment by a representative corporate firm in Japan declined by about 0.8%. Chaney, Sraer and Thesmar (2012)) estimate for the 1993-2007 period an average elasticity of investment to real estate values of 6%.

We complement this literature in three important ways. First, we combine a unique experimental setting with comprehensive datasets that enable us to quantify the economic importance of the collateral channel during *normal times*.<sup>3</sup> Our identification strategy benefits from the fact that the shock in collateral values we study is unrelated to economic fundamentals (in contrast during times of crisis asset values change contemporaneously with many other economic fundamentals). The exogenous character of the legal reform also obviates the need for further instrumenting.

Second, not only does our sample contain all incorporated firms in Sweden, but the collateral we analyze also covers a broad set of business assets that virtually every firm owns. Our setting thus allows us to paint a more comprehensive picture regarding the economic importance of the collateral channel (prior studies study changes in real estate prices and the effects on listed companies). In particular, we quantify the economy-wide impact of the collateral shock, accounting also for the effects on smaller and privately-held firms, which tend to be more prone to problems of asymmetric information.

Third, we analyze several firm outcomes and provide more conclusive evidence on the channels through which the collateral channel affects firms. We study the effect of the legal change not only on debt capacity, but also on debt structure and maturity. We then uncover important collateral-damaging effects of the 2004 law in terms of corporate investment, employment and growth. Finally, we examine investigate whether and how the legal change distorts investment decisions and asset structure and gauge its effect on firms' technology, productivity, and innovation.

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<sup>3</sup> The Swedish economy performed well during the period of our analysis (2000 to 2006). On average GDP grew by 3.2% and gross investment by 4.2% per year during this period. In 2004 (the year the law became effective), GDP grew by over 4% and gross investment by almost 5%.

Our study is also related to a growing literature that studies the impact of changes in the contracting environment (e.g., von Lilienfeld-Toal, Mookherjee and Visaria (2012), Vig (2013), Calomiris, Larrain, Liberti and Sturgess (2015), and Campello and Larrain (2015)). While these papers focus on large-scale legal reforms undertaken in developing economies, we complement this literature by analyzing the effect on a developed economy of a reform that modified a well-defined legal system, with unexpected (and unintended) consequences it turns out. Moreover, we can better quantify the economy-wide effects of the change in the law, since our data covers the universe of firms in Sweden.

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 empirical methodology. Section 5 presents our results. Section 6 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 possessory form of collateral implies that the creditor has effective control over the asset pledged. Fixed liens are commonly used to pledge “immovable” property, such as land and buildings, and other fixed assets, such as ships and aircraft.

The second form collateral is the *floating lien* (or *floating charge*).<sup>4</sup> The floating lien is a security interest in pre-specified classes of “movable” property, such

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<sup>4</sup> A floating lien is a general security interest that is recognized in nearly all English-based jurisdictions, for example, the U.S., the U.K., and Australia. 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 U.K. works well as

as inventories or equipment, in which the individual assets are not specifically identified. The property underlying the lien can therefore change over time. The floating lien extends to any property that is acquired by the company while the debt is outstanding. For instance, a company can provide as collateral a general security interest in its equipment. The actual items of this property can change over time due to the purchase and disposal of equipment.

The floating lien is not attached to any particular asset. The borrower is allowed to use, collect, or dispose of the covered assets, and the floating lien automatically attaches to any new similar property item. The floating lien does not provide the creditor legal rights to the firm's existing assets until some "crystallizing event" occurs, for instance, the debtor files for bankruptcy. The floating lien then fixes itself (or "crystallizes") to the existing assets covered by the lien and the creditor takes control of these assets.

A company may apply for a floating lien certificate for a certain amount at the Swedish Companies Registration Office. Businesses pay a stamp duty of 1% of the certificate's face value plus a nominal fee upfront. The registration office does not have any responsibility to verify the degree of collateral coverage, and therefore the certificate does not guarantee that nominally sufficient collateral is present in the business. If a business has registered multiple floating liens, these claims have relative seniority ordering depending on the calendar date of their registration.

#### *b) The 2004 Act on Floating Liens*

Before 2004, floating liens enabled Swedish companies to pledge as collateral particular categories of movable property. "Real" property such as land and buildings,

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the basis of foreclosure of small and medium-sized companies while Djankov, Hart, McLiesh and Shleifer (2008) generalize this result to a broad set of countries. Banks in the U.K. manage to divert the direct costs of bankruptcy (to other creditors) and increase their recovery rate, by reallocating these direct costs from their (often-present) fixed to floating charges.

as well as financial assets such as cash, bank deposits, stocks, and bonds, could not be covered by floating liens before 2004. Moreover, floating liens were *special priority* claims that could be activated outside 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 in bankruptcy or reconstruction procedures, taxes, and most of the wage claims by employees (a limited part has 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.<sup>5</sup>

On January 1, 2004, the law that regulates floating liens (or, "the law") was changed. Floating liens granted after January 1, 2004 were immediately governed by the new rules, while those granted before that date legally converted by January 1, 2005. The conversion could occur anytime between January 1, 2004 and January 1, 2005, provided that the lender and the borrower agreed on the new contract terms.

The new law introduced two important changes. First, the special priority rights of floating liens were downgraded to general priority claims, implying that under the new regime lien holders can seize the debtor's assets only in bankruptcy. The new law reduced the liquidation payoff of lien holders, since the assets covered by the floating lien had to also satisfy other general priority claims, such as costs of bankruptcy or reorganization procedures, and taxes. Second, the new law reduced the share of total eligible assets that could be covered in a floating lien from 100% to 55% of a debtor's total eligible assets that remain after senior creditors have been paid. At the same time, the new law expanded the categories of assets that could be pledged in

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<sup>5</sup> Sweden adopted 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 U.S. Chapter 11.

the floating lien to comprise all asset types, including cash, bank deposits, financial assets, and real estate.

The change in the law had two explicit objectives (see Cerqueiro, Ongena and Roszbach (2015) for additional details). The first objective was to avoid inefficient liquidation and allow viable companies to enter reorganization. The second objective was to give incentives to creditors to screen and monitor their borrowers rather than rely excessively on collateral. The fact that many businesses experienced a decline in pledgeable assets, however, had unintended consequences. Using loan-level data from a large Swedish bank, Cerqueiro, Ongena and Roszbach (2015) find that the bank responded to the 2004 law by increasing interest rates and tightening credit limits. These results indicate that the 2004 law made it more difficult for many companies to borrow against this type of collateral. We now use the quasi-experimental setting this legal change provides to study the economy-wide effects of the 2004 law on corporate financing structure and investment decisions.

### **3. Data and Variables**

#### *a) Data Sources*

We obtain our data from three sources. The first and main source is the Swedish Credit Bureau, which contains annual accounting information for all incorporated firms in Sweden. Our sample comprises almost 200,000 firms, which we observe over the period 2000-2006. The total number of firm-year observations is around 1.3 million.

We obtain from this database the regular balance-sheet and income statement items, such as assets, liabilities, and earnings, as well as information about collateral. The credit bureau distinguishes between two types of collateral: Fixed liens and

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 an unspecified pool of assets that can vary over time. Eligible assets include: Machinery, equipment, inventories, and other personal property of the firm (see Section 2 for details). We observe the book value of outstanding pledges for each type of collateral.

From the credit bureau dataset we also extract information on credit lines, including the commitment values and amounts drawn, the number of employees, and information on whether the firm has any intellectual property, such as patents, copyrights, or trademarks.

We obtain investment data and industry codes from Statistics Sweden. 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 the U.S. 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 falls under “Hotels and restaurants” (code 55), “Canteens and catering” (code 555), and “Catering” (code 5552). Our data allows us to distinguish further between four separate catering activities: “Catering for the transport sector” (55521), “Catering for hospitals” (55522), “Catering for schools, welfare and other institutions (55523), and “Other catering” (55529). According to the 5-digit classification then there are 1,303 industries in our sample! In Table 1 we provide a breakdown of the sample by industries (based on two-digit codes) for 2003.

Finally, we determine the firm's age using the firm's date of registration from the Swedish Registration Office.

*b) Variables*

Table 2 lists the variables used in our empirical analysis, and displays some descriptive statistics for the year 2003. *Total collateral* is the total value of collateral claims of creditors on the firm's assets, which includes both fixed liens and floating liens. *Fixed liens* is the value of claims on the firm's real property, while *Floating liens* is the value of claims on the firm's personal property. We analyze these collateral variables as a proportion of the firm's assets and in levels using the logarithmic transformation (setting zero values equal to zero).

We compute several measures related to a firm's debt financing. We use the debt-to-assets ratio as our main measure of financial leverage, but we also analyze the level of debt using a logarithmic transformation. To analyze debt maturity we compute the ratio of long-term debt to total debt, but we also analyze separately the levels of long-term and short-term debt. We also consider alternative debt measures that include only bank debt (or loans). *Lines of credit limit* is the maximum credit limit on business lines of credit.

We employ three measures of investment, which we analyze both as a proportion of the firm's assets and in levels using the logarithmic transformation. *Total net investment* equals capital expenditures minus the proceeds the firm obtained from selling capital assets. We consider separately investments in movable or personal property (machinery and equipment) and investments in immovable or real property (land and buildings). This distinction is important because the change in the law we investigate reduces the value of floating liens and thus the collateralizable value of personal property (relative to real property).



We measure the size of the firm with the natural logarithm of the number of employees and the natural logarithm of the firm's assets. We also decompose the asset structure of the firm into three parts: *Tangible assets* (includes machinery, equipment, land and buildings; we also analyze the two first and the last items separately), *Inventories*, and *Liquid assets* (includes cash and cash equivalents).

We employ proxies for technology and productivity 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. To account for potential differences in skill among employees, we alternatively scale the value of machinery and equipment by the firm's labor costs. We measure firm productivity as sales divided either by labor costs or by the combined value of machinery and equipment.

Finally, we proxy for corporate innovation with a dummy that indicates whether the firm has any intellectual property, including patents, copyrights, and trademarks.

#### **4. Empirical Methodology**

Our identification strategy exploits the 2004 legal change that decreases the value of floating liens. We examine the effects of the legal change using a differences-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 the "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 not have been directly affected by the change. We therefore assign these firms to the control group.

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

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

where  $i$  indexes firms,  $t$  indexes time,  $y_{it}$  is the dependent variable,  $\alpha_i$  are firm fixed effects,  $\lambda_t$  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),  $Post-law_t$  is a dummy variable indicating the period from 2004 to 2006, and  $u_{it}$  is an error term. We cluster standard errors at the firm level. The differences-in-differences estimate is given by  $\beta$ , which measures the differential effect of the change in the law across firms that had pledged and firms that had not pledged floating liens before 2004.

The crucial assumption in the differences-in-differences model is that the treated and control firms would have behaved similarly in the absence of the legal change. Although we cannot test this “parallel trends” assumption perfectly, our empirical methodology builds on several features that should enhance its plausibility.

First, we employ an exact matching procedure to make sure that our control firms provide a good counterfactual. Specifically, we select for each treated firm a set of control firms that were created in the same year and in the same industry (at the 5-digit industry code level). Matching firms on age ensures that we control for life-cycle effects, including potential differences in size, growth, and financing structure (e.g., Cooley and Quadrini (2001), Albuquerque and Hopenhayn (2004) and Haltiwanger, Jarmin and Miranda (2012)). Matching firms on industry implies that the treated and

control firms should have similar exposure to shifts in demand, productivity shocks, regulatory changes, external shocks, and other aggregate shocks.<sup>6</sup>

To see why the high level of industry disaggregation matters, suppose that in a given year hospitals receive a very low number of patients due to abnormally good weather conditions. Firms that offer catering services for hospitals (code 55522) are then hit by a negative demand shock that could affect these firms' financing and investment decisions. In a differences-in-differences setting, this demand shock might be confounded with the effects of the legal reform and bias our estimates of the effect of the legal reform on corporate financing and investment. 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.

Second, we exploit the time-series variation in our data to investigate the dynamic behavior of the treated and control firms around 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 preview, the treated and control groups behave quite similarly before the change in the law, corroborating our identification strategy.

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

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<sup>6</sup> Recall that based on the 5-digit industry codes there are 1,303 different industries in our sample. Also recall the catering example illustrated in Figure 1. We retain 70% of the industries after the matching procedure.

downward bias should affect particularly more persistent variables, such as capital structure variables (Lemmon, Roberts and Zender (2008)).

Table 3 provides sample means of our main variables for the treated and control groups for the period 2000-2003 using the matched data. The Table also provides differences-of-means tests. Treated firms pledge more collateral and are more levered than control firms. The additional debt incurred explains why treated firms are larger by any measure. With respect to variables expressed in ratios, the differences between the treated and control firms are economically small. Both have similar investment rates and productivity measures.<sup>7</sup>

## 5. Results

### *a) Collateral Use*

The 2004 law abolishes the special priority rights of floating liens and reduces the pool of eligible assets under them. Figure 2 displays time series plots of the sample averages of the fraction of firms with floating liens pledged (top figure) and the ratio of floating liens pledged to a firm's assets (bottom figure).<sup>8</sup> The figures show that after the legal change there is a reduction in the use of floating liens along both the extensive and intensive margins. On the one hand, the fraction of firms that pledge floating liens decreases by about one percentage point (or 2.4% of the pre-law mean).

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<sup>7</sup> Our analysis focuses on the extensive margin of floating lien availability to allocate firms into the treated and control groups. One potential criticism to this approach is that firms without any floating liens might be fundamentally different from firms with floating liens. We note that our analysis already accounts for differences in "levels", since the firm fixed effects control for any time-invariant selection effects and since matching on age controls for birth conditions. Nevertheless, we also analyze the intensive margin by focusing only on the subset of firms with floating liens. The distribution across firms of the floating lien amounts scaled by total collateral is skewed. For almost 60% of the firms with collateral outstanding, floating liens is the only type of collateral they pledge. Therefore we compare firms that pledge only floating liens with firms that pledge floating liens plus other types of collateral. One limitation of this approach, however, is that the number of matched firms is substantially smaller due to the loss of observations. The results we obtain are qualitatively similar to those we present in the paper (the results are available upon request). Since our goal is to assess the economy-wide effects of the law, we prefer to present results that use the entire sample of firms.

<sup>8</sup> The sample used contains only firms that post some collateral during our sample period.

On the other hand, the value of floating liens pledged to total assets decreases also by one percentage point, corresponding to a 6% reduction relative to the pre-law mean.<sup>9</sup>

Next, we investigate how the legal change affected the use of collateral using a differences-in-differences approach. The treatment group contains firms with pledged floating liens before the legal change, while the control group contains firms with no floating liens pledged. Figure 3 plots separately for the treated and control firms the time-series of *Collateral/Debt* (top figure) and *Fixed Liens/Debt* (bottom figure), after accounting for firm-fixed effects and after matching treated and control firms on age and on 5-digit industry codes. We compute the dynamics of these variables using the year 2003 as reference.

Figure 3 shows that the two variables move roughly together before the legal change. Following the change in the law, treated firms suffer a steep and persistent reduction in their collateral-to-debt ratio that is not experienced by control firms. The collateral variable in the numerator includes both floating liens and fixed liens. The fact that we do not see a similar drop in the value of fixed liens shows that the reduction in collateral value is entirely driven by floating liens. The figures thus confirm that the 2004 law exogenously reduced the collateral capacity of treated firms via a loss in the value of the floating liens.

In Tables 4 and 5 we estimate difference-in-differences regressions to quantify the reduction in collateral value resulting from the change in the law. We present for each dependent variable 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-

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<sup>9</sup> We note that these numbers are likely to underestimate the actual drop in collateral value, since they are based on nominal amounts and may not reflect the more correct assessment of the creditors. Using loan-level data from a large Swedish bank containing timely assessments of these collateral values, Cerqueiro, Ongena and Roszbach (2015) find an average decrease in the collateral coverage ratio of 13%.

digit industry code. The third specification uses the same matched sample and additionally controls for differences in trends between the treated and control firms. All three specifications include firm and year fixed effects. The last row displays the predicted percent change in the dependent variables implied by the differences-in-differences estimates. When the dependent variable is a ratio, we compute the predicted percent change as the *Treated*  $\times$  *Post-law* coefficient divided by the sample mean of the dependent variable. When the functional form is log-linear, we display the exponential of the *Treated*  $\times$  *Post-law* coefficient minus one.

Table 4 presents estimates of the effect of the 2004 law on total collateral. We analyze collateral both as a percentage of firm debt (Columns 1-3) and in levels using a logarithmic transformation (Columns 4-6). The results show that the drop in collateral values experienced by treated firms is statistically significant and economically meaningful across all specifications. For example, the point estimate in Column 3 indicates that the treated group suffers on average a 9.5% decrease in *Collateral/Debt* following the change in the law. We note that this estimate may understate the actual reduction in collateral value, since firms may also reduce their level of debt. The estimates based on log-linear specifications (Columns 4-6) are also statistically significant and much larger than those based on ratios, even after controlling for differential trends.<sup>10</sup>

In Table 5 we analyze the effect of the 2004 law on fixed liens, which should not be affected directly by the legal change. The first two specifications of Table 5 show an increase in the value of fixed liens pledged by treated firms after the law, a result that holds for both *Fixed liens/Debt* (Columns 1 and 2) and *Log(Fixed liens)*

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<sup>10</sup> When we run a regression as in Column 6 using as dependent variable a dummy that indicates whether the firm has any collateral posted, we find that the fraction of treated firms with collateral drops by 12.5% after the change in the law.

(Columns 4 and 5). The increase in fixed liens may reflect an attempt to compensate the loss in the value of floating liens by pledging more valuable types of collateral. We note, however, that the increase in the value of fixed liens is no longer significant when we control for differential trends (Columns 3 and 6). More importantly, these results corroborate our identification strategy since they strongly suggest that our regressions are picking the effect of the 2004 law and not some other contemporaneous shock deteriorating collateral values.

#### *b) Debt and Debt Structure*

We next investigate how the shock to collateral values affects financial leverage and debt maturity. As before, we provide in Figure 4 a graphical snapshot of our main results. The top figure plots separately for the treated and control firms the time-series of *Debt/Assets*. The graph shows that the two groups behave identically prior to the 2004 law, confirming that our control firms provide a good counterfactual. Following the change in the law, however, treated firms experience a sharper reduction in the usage of debt relative to control firms. In Columns 1-3 of Table 6 we present the corresponding differences-in-differences estimates. The coefficient in Column 2 indicates that treated firms experienced a reduction in the leverage ratio of 1.6% relative to control firms. This estimate remains statistically significant but it becomes quantitatively smaller when we control for differential trends (Column 3), which is due to the high persistence of this variable. In Columns 4-6 we present results from log-linear specifications that provide larger economic effects. For instance, the differences-in-differences estimate in Column 6 indicates that the post-law reduction in debt is 9% larger for treated firms than for control firms, after controlling for different trends between the two groups.

The bottom graph of Figure 4 plots separately for the treated and control firms the time-series of *Long-term debt/Debt* and shows that treated firms experienced a substantial shortening of their debt maturity following the legal change. The differences-in-differences estimates in Table 7 indicate that the effect is economically meaningful. In particular, the estimate in Column 2 indicates that the reduction in debt maturity is about 14%. In Column 3 we see that this effect drops to 6% when we control for differential trends.

In the same table we also investigate separately the levels of long-term debt (Column 4-6) and short-term debt (Column 7-9) using log-linear specifications. Focusing on Columns 6 and 9, which control for differential trends across groups, we find that the reduction in debt maturity is mainly driven by a big reduction in long-term debt. In particular, the differences-in-differences estimate in Column 6 indicates that the reduction in long-term debt is 34% higher for the treated than for the control group after 2004.

Before the legal change, floating liens were widely used to secure bank loans (Cerqueiro, Ongena and Roszbach (2015)). For this reason, we examine in Table 8 the effect of the law on bank debt. The three dependent variables analyzed are the log of long-term bank loans (Columns 1-3), the log of short-term bank loans (Columns 4-6), and the log of limits on lines of credit (Columns 7-9). We find that as a result of the loss in collateral value, banks reduce long-term loans and line of credit commitments to treated firms. The decrease in the volume of long-term bank loans is particularly relevant, ranging between 12% to almost 28% of the pre-law average amounts. We also find that treated firms are able to compensate part of the reduction in long-term borrowing and liquidity with a significant increase in short-term borrowing.



The results so far offer a clear pattern. Firms who face a sudden drop in the collateralization value of their assets suffer a reduction in their debt capacity and are forced to borrow more short term. The reduction in long-term debt we find complements 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 distort firms' decisions and performance. We examine three potential distortions caused by the 2004 law. First, we analyze its effects on real outcomes, including investment, employment, and size. Second, we analyze its effects on firms' investment policies and asset structure. Third, we analyze its effects on firms' technology, productivity, and innovation.

### *c) Investment, Employment, and Size*

In this section, we investigate some real effects of the legal change. Figure 5 plots separately for the treated and control firms the time-series of *Total net investment / Assets* (top figure) and *Log(Number of employees)* (bottom figure). The point estimates shown are obtained after accounting for firm-fixed effects and after matching treated and control firms on age and on 5-digit industry codes. As before, the coefficient estimates displayed are relative to the baseline year 2003.

The figures show that prior to the legal change the two groups moved together. Before 2004, investment fell while employment stayed fairly constant for both types of firms. Following the legal change, treated firms reduce their investment and employment by more than control firms (control firms actually increase employment relative to their pre-law levels). These plots clearly show that the legal change and the

consequent reduction in debt capacity have real negative effects on treated firms in terms of investment and employment.

In Tables 9 and 10, we examine the economic significance of these effects. In Table 9 we analyze the effect of the legal change on investment, defined both as a proportion of the firm's assets (Columns 1-3) and in logs (Columns 4-6). For example, the differences-in-differences estimate in Column 3 points to an average decline in investment by treated firms of almost 8%, after controlling for different trends across groups. In Table 10, we quantify the effect of the law not only on employment, but also on firm assets, with both variables measured in logs. We find that, after controlling for different trends across groups, treated firms reduced on average employment by 2% (Column 3) and asset size by 4.5% (Column 6). As expected, the estimated reduction in asset size is smaller than the drop in investment. The estimated reduction in employment seems also plausible, given the high level of protection given in Sweden to permanent workers.

Our evidence supports a “collateral damage” effect of the legal reform: The reduction in the value of floating liens reduces firms' ability to borrow, which in turn leads to lower investment rates, employment, and growth. We next investigate whether the 2004 law distorts firms' investment policies and asset structure.

#### *d) Investment Policies and Asset Structure*

The 2004 law shrinks the pool of eligible assets of the floating lien and abolishes the special priority rights of this claim. Besides reducing the value of this type of collateral, the law also reduces the collateralizable value of certain types of assets that are typically pledged via floating liens, such as equipment, inventories, and other movable property. Firms may therefore shift their investments from movable assets towards real assets whose value was not affected by the legal change in order to

increase debt capacity (Almeida and Campello (2007)). We examine this potential distortion in two ways.

First, we analyze the effect of the law on different types of investment capital. We distinguish between investments in machinery and equipment (assets typically pledged via floating liens) and investments in land and buildings (assets typically pledged via fixed liens). Figure 6 provides graphical evidence on the dynamic behavior of these two types of investment (both variables are scaled by assets). The figure shows that the two groups behave similarly before the legal change and that the relative decline in aggregate investment before 2004 we documented (see Figure 5) is driven by a reduction in investment in machinery and equipment. The figure confirms a noticeable larger drop in investment by treated firms relative to control firms following the legal change. Although the drop in investment holds for both types of investment, it appears to be sharper for investment in machinery than for buildings and land.

The differences-in-differences estimates we present in Table 11 corroborate the diagnosis in Figure 6: Following the change in the law in 2004, firms with outstanding floating liens suffer a sharper reduction in both types of investment. The estimated effects are similar across the specifications based on matched samples (Columns 2-3 for investment in machinery and equipment, and Columns 5-6 for investment in land and buildings). In line with the graphical evidence in Figure 6, the differences-in-differences point estimates indicate that the drop in investment in machinery and equipment is three to four times larger than the drop in investment in land and buildings. However, when we scale these point estimates by the sample means of the dependent variables, the economic effects become similar for both types

of investment.<sup>11</sup> As explained below, results are qualitatively similar when we analyze capital stocks instead of new investments.

Second, we analyze the effect of the law on asset structure. We distinguish between three types of assets, which we analyze as a proportion of total assets: tangible assets (includes machinery, equipment, buildings, and land), inventories, and liquid assets (cash and cash equivalents). Figure 7 plots the (within-firm) time series averages of these variables for the treated and control firms, and Table 12 displays the differences-in-differences estimates. In all three figures of Figure 7, the patterns for treated and control firms moved closely together before the legal change. Following the change in the law, treated firms experience a sharper decrease in tangible assets and inventories, and a larger increase in cash holdings. The fact that we compare firms that operate in the same exact industry makes it unlikely that these results pick shocks to investment opportunities.

The decrease in tangible assets corroborates our earlier findings. The estimated coefficient points to an average decline in the fraction of tangible assets of treated firms of 2.5%, after controlling for different trends across groups. In unreported results (available from the authors), we also decompose this effect into the part accounted for by machinery and equipment and the part accounted for by land and buildings. The estimated coefficients from specifications that control for different trends between groups indicate average reductions of 3% for machinery and equipment and 2% for buildings and land.

The effect on inventories we find is also economically meaningful. The differences-in-differences estimates indicate that the post-law reduction in inventories is 6.2% if we do not control for differential trends (Column 5). Controlling for

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<sup>11</sup> We obtain similar results when we scale the investment variables by fixed assets.

different trends reduces the effect to 2.3% (Column 6). Inventories are an important component of the value of floating liens. The reduction in inventory holdings indicates that affected firms may be adjusting their asset structure in order to optimize debt capacity (the collateral motive).

Part of this effect, however, may be due to the lower access to credit, which forces treated firms to reduce working capital needs (the precautionary motive). The increase in cash-holdings we find for treated firms corroborates this view and is consistent with the evidence in Almeida, Campello and Weisbach (2004), who find that financially constrained firms hoard more cash. The differences-in-differences estimates indicate that the post-law reduction in liquid assets is 4.5% if we do not control for differential trends (Column 8). Controlling for different trends reduces the effect to 1.4% (Column 9). It thus appears that treated firms increase the liquidity of their balance sheets to compensate for the lower credit availability and in particular for the loss in liquidity resulting from the reduction in credit line limits.

#### *e) Technology, Productivity and Innovation*

The reduction in collateral value decreases firms' debt capacity, investment, employment, and growth. Moreover, it distorts firms' investment decisions and asset structure. We now investigate whether these distortions affect the technology, productive efficiency, and innovation of firms.

First, we examine in Table 13 the effects of the legal change on capital intensity, which we measure as the combined value of machinery and equipment divided by either the number of employees (Columns 1-3) or the firm's total payroll (Columns 4-6). The finding of a decline in capital intensity after the legal change would be consistent with Garmaise (2008), who show that financially constrained firms use relatively more labor than physical capital. In Column 5, we obtain a

significant differences-in-differences estimate that indicates a 12% drop in the ratio of machinery and equipment to total labor costs. However, this effect disappears if we control for different trends between groups (Column 6).<sup>12</sup> Our evidence therefore suggests that treated firms are scaling down operations rather changing their production technology.

Second, we examine in Table 14 the productive efficiency of firms, measured by sales per dollar of labor costs (Columns 1-3) and sales per dollar of machinery and equipment (4-6). We find that treated firms are less productive (or efficient) following the change in the law, a result that holds if we control for different trends across groups.<sup>13</sup> The drop in sales per dollar of machinery and equipment is substantially larger (4.8% in Column 6) than the drop in sales per dollar of labor costs (0.6% in Column 3). The fact that firms do not alter much their capital intensity suggests that the reduction in efficiency results from firms operating at below-optimal scale.

Third, we examine in Table 15 the effect of the legal change on innovation. The dependent variable is a dummy that indicates whether the firm produces any intellectual property, including patents, copyrights, and trademarks. Based on the anecdotal evidence that floating liens are popular among high-tech firms, we expect that the loss in value of floating liens harms these firms' innovation activities. The results we obtain strongly support this view. Specifically, the differences-in-differences estimate in Column 3 points to an average decline in innovation by treated firms of almost 9%, after controlling for different trends across groups.

Our evidence thus reveals a strong “collateral damage” effect: The loss in collateral capacity induced by the 2004 law forced firms to scale down via a reduction

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<sup>12</sup> We obtain similar results if we log-transform the dependent variables in Table 13.

<sup>13</sup> We obtain similar results if we log-transform the dependent variables in Table 14. Our results also remain unchanged if we scale sales by the number of employees rather than by labor costs.

in investment and employment, distorts their asset structure, and reduces their operating efficiency and innovation.

## **6. Conclusion**

Collateral plays a key role in raising debt finance. Building on the idea that the availability of collateral affects financial capacity, the seminal paper by Kiyotaki and Moore (1997) shows that shocks to collateral values can affect investment and output via the so-called “collateral channel”. Recent research finds that changes in real estate collateral values affected corporate investment in Japan in the early 1990s (Gan (2007)) and more recently in the U.S. (Chaney, Sraer and Thesmar (2012)). These studies show that collateral can become especially critical during a crisis.

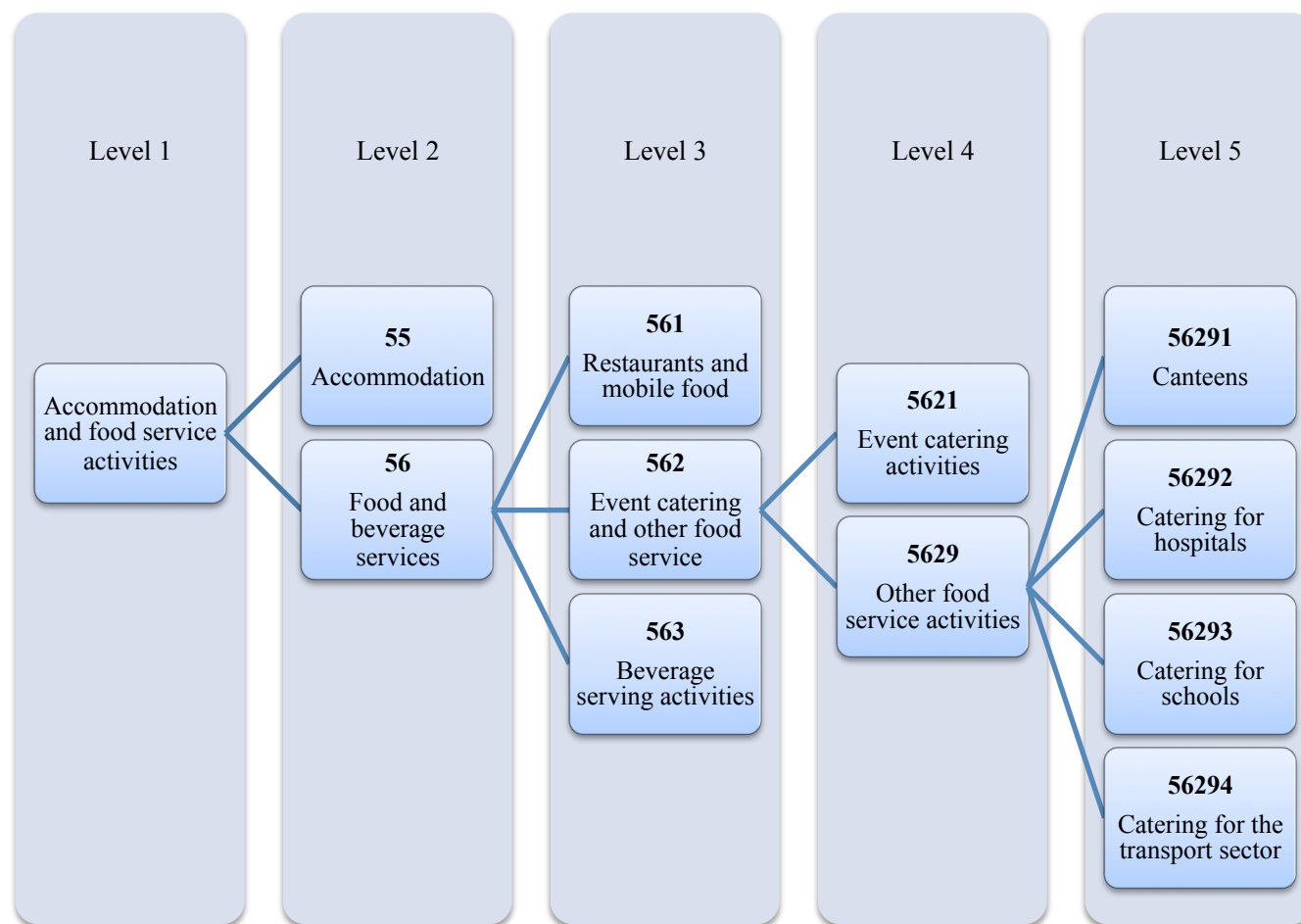
In this paper, we aim to take a step forward in identifying the role that collateral plays for corporate financing and investment. We exploit the combination of a legal reform in Sweden that exogenously reduced collateral values and a unique configuration of three matched economy-wide datasets to assess the economy-wide importance of the collateral channel. Our evidence points to “collateral damage” caused by the reform. The loss in collateral value reduces both the amount and the maturity of firm debt and forces firms to reduce investment, employment, and asset size. We also find evidence that the legal reform distorts investment decisions and asset structure. In particular, firms reduce holdings of assets with low collateralizable value and hold more liquid assets. Finally, these distortions make firms less productive and less innovative.

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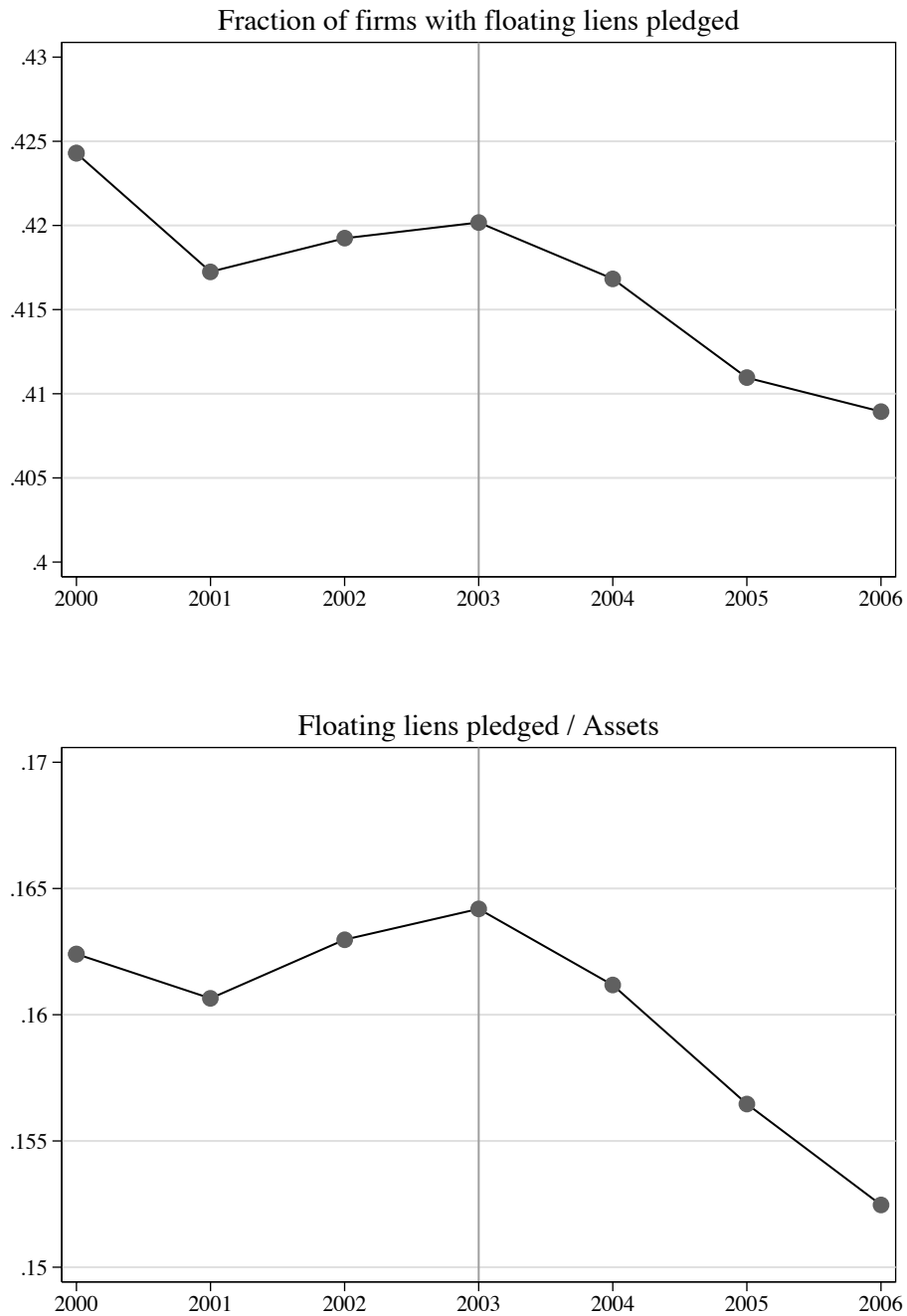
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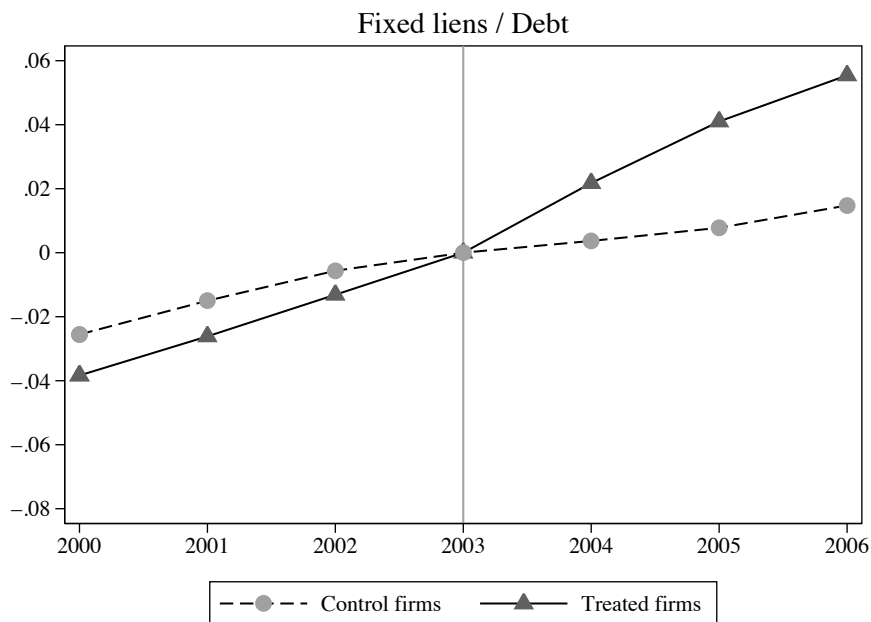
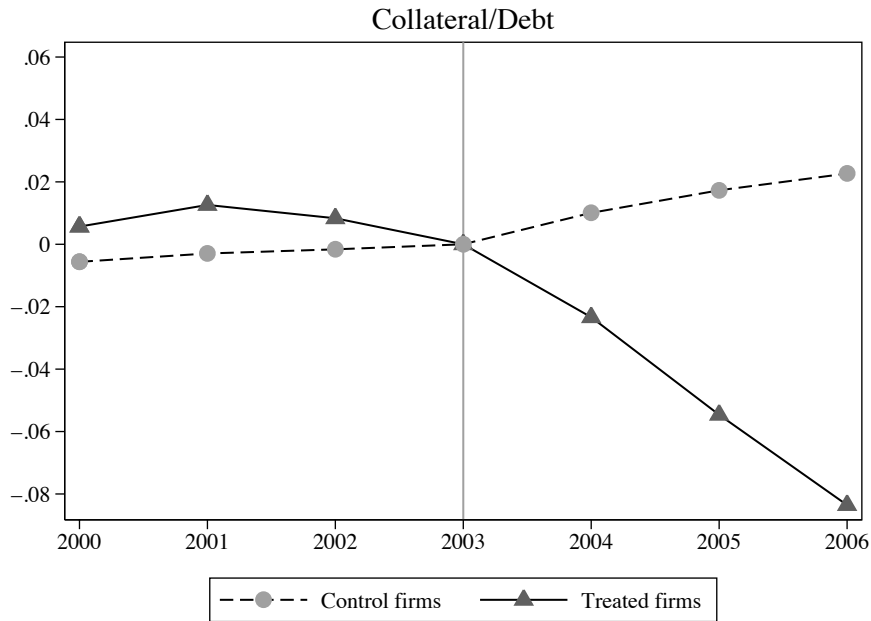


**Figure 1 – Industry classification in Sweden**



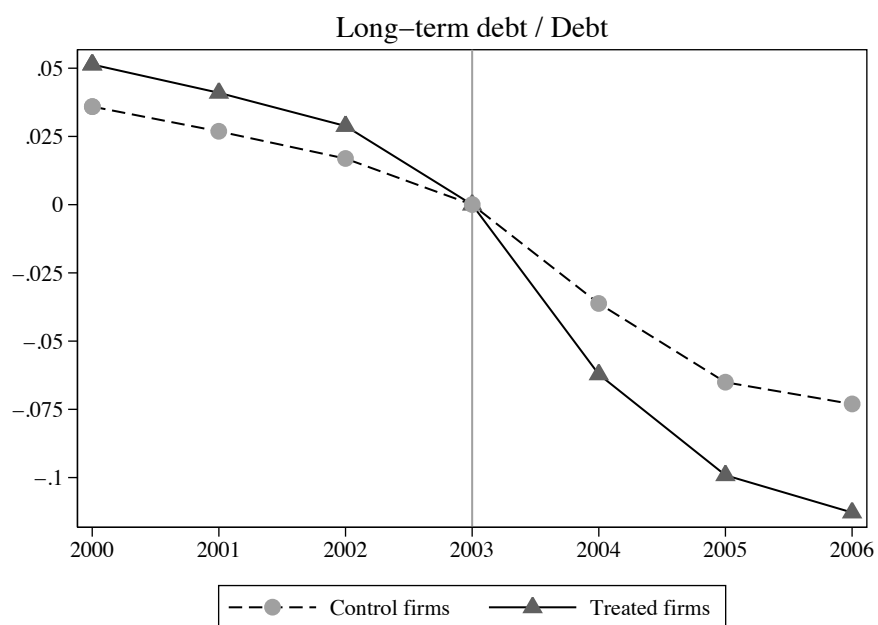
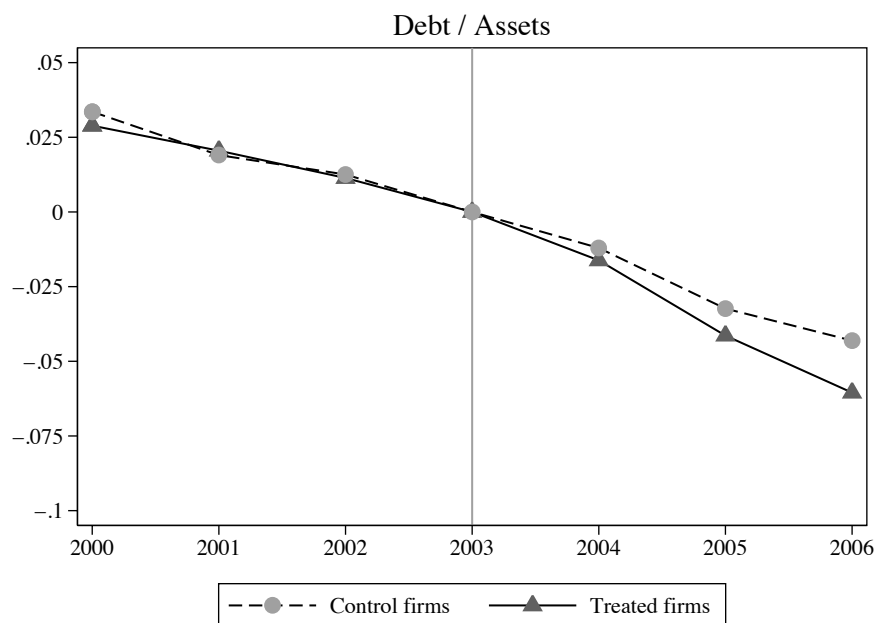
**Figure 2 – Effect of the 2004 Law on floating lien pledges**

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.



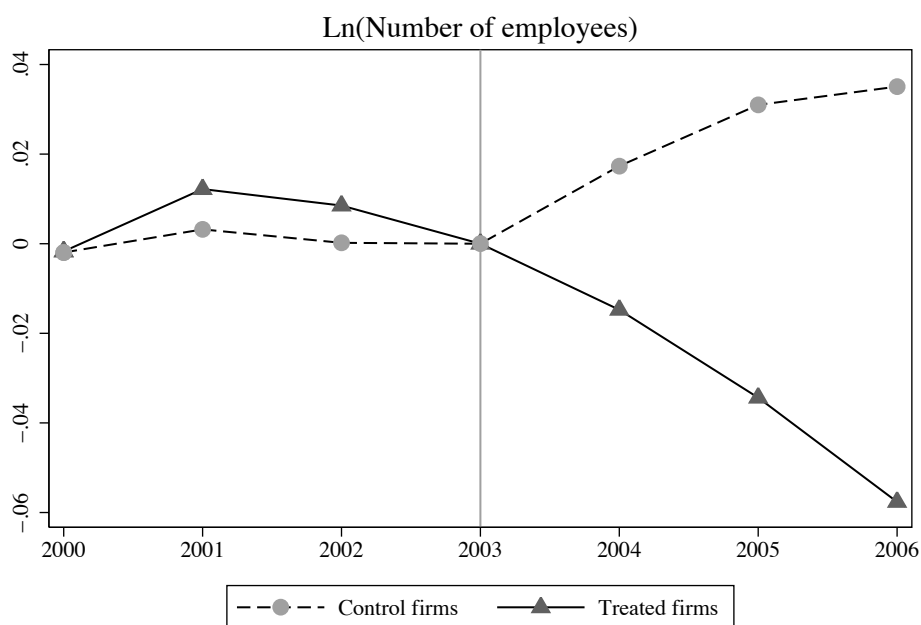
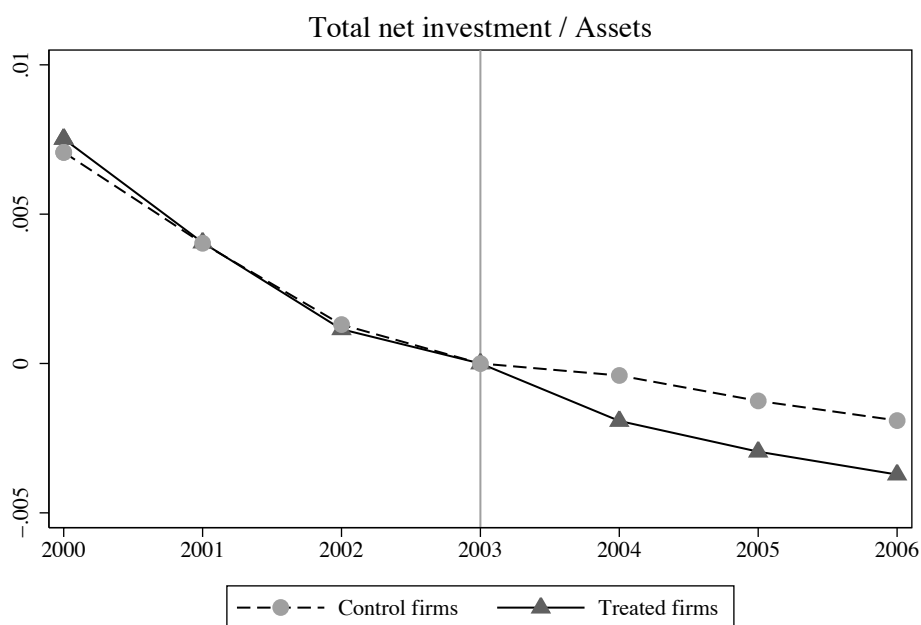
**Figure 3 – Effect of the 2004 Law on collateral**

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.



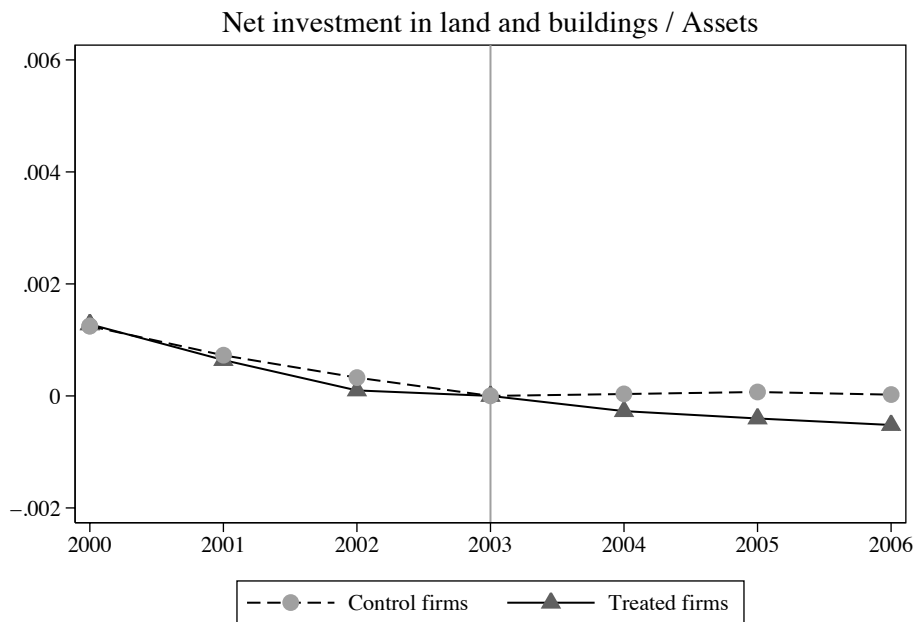
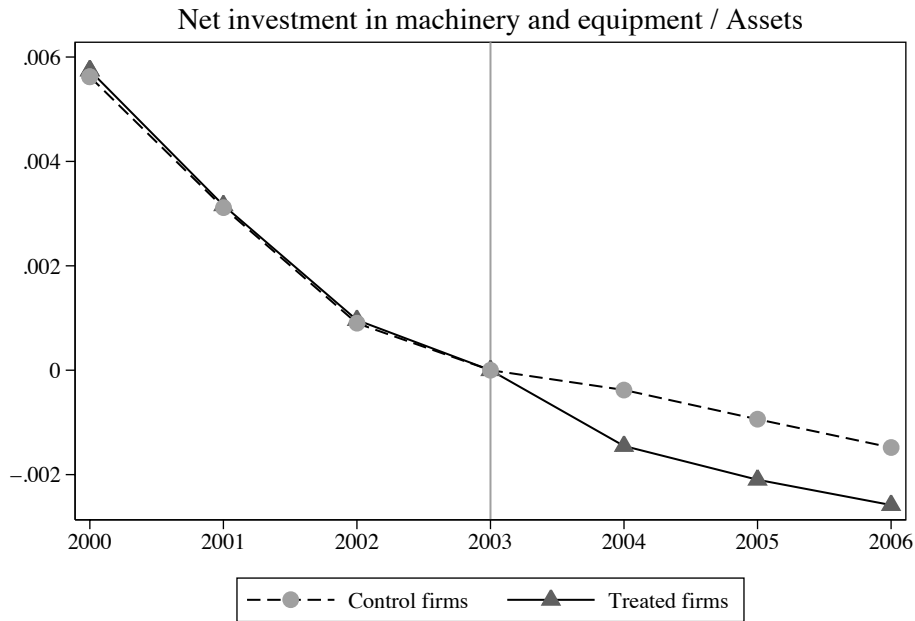
**Figure 4 – Effect of the 2004 Law on firm debt and on debt maturity**

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.



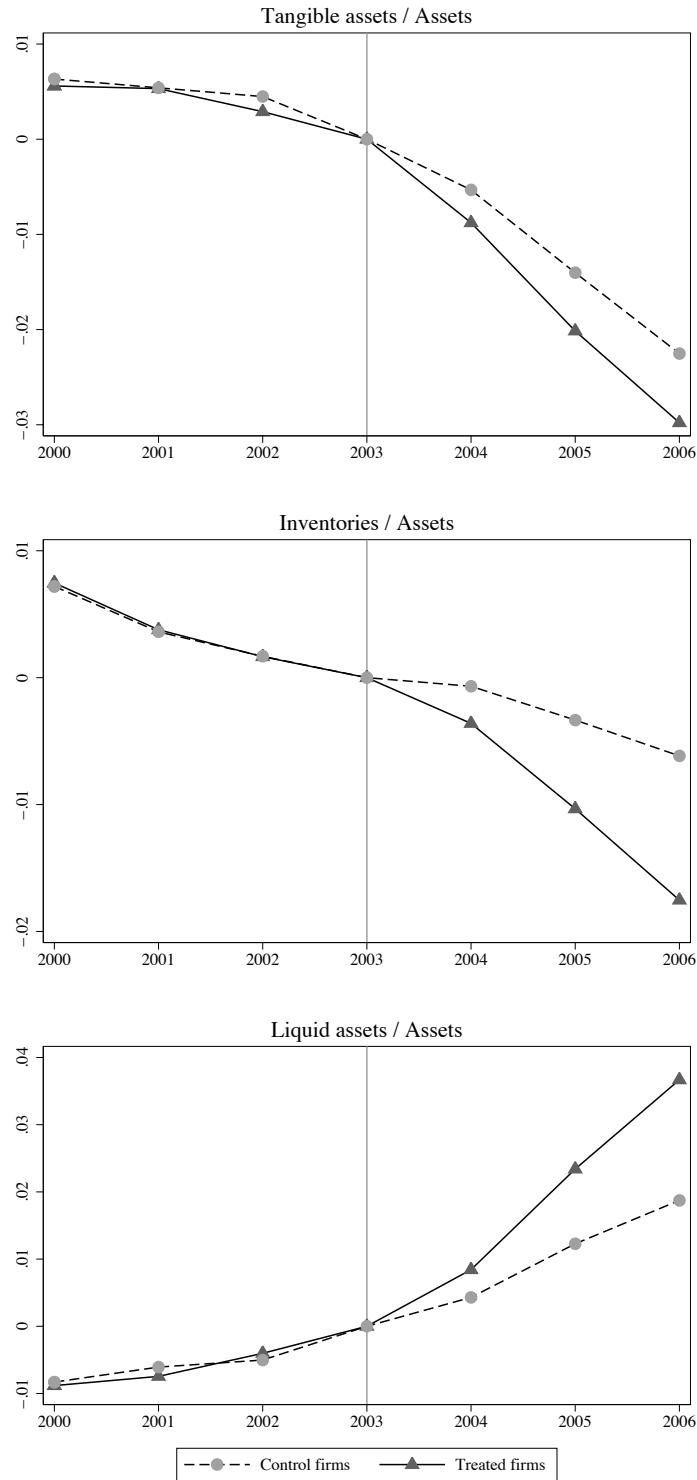
**Figure 5 – Effect of the 2004 Law on firm investment and employment**

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 6 – Effect of the 2004 Law on types of 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.



**Figure 7 – 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.



**Table 1 – Industry composition in 2003**

Industry classification is based on two-digit 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
<i>Total</i>	<i>193,594</i>	<i>100.00</i>

**Table 2 – Summary statistics**

Statistics are for the year 2003. The number of firms in the sample is 193,594.

Variable	Mean	Standard deviation
<i>Collateral</i>		
Total collateral / Debt	0.37	0.42
Log(Total collateral)	7.27	7.07
Fixed liens / Debt	0.16	0.32
Log(Fixed liens)	3.52	6.22
<i>Debt and debt structure</i>		
Debt / Assets	0.59	0.27
Log(Debt)	13.14	3.03
Long-term debt / Debt	0.26	0.33
Log(Long-term debt)	6.83	6.79
Log(Short-term debt)	12.58	3.03
Log(Long-term loans)	4.63	6.44
Log(Short-term loans)	2.06	4.58
Log(Lines of credit limit)	11.85	3.62
<i>Investment</i>		
Total net investment / Assets	0.01	0.03
Ln(Net investment)	6.53	5.02
Investment in machinery and equipment / Assets	0.01	0.03
Investment in land and buildings / Assets	0.00	0.01
<i>Employment and size</i>		
Ln(Number of employees)	1.17	1.08
Ln(Assets)	14.27	1.98
<i>Asset structure</i>		
Tangible assets / Assets	0.35	0.33
Inventories / Assets	0.12	0.21
Liquid assets / Assets	0.24	0.28
<i>Technology and productivity</i>		
(Machinery + Equipment) / Employees	11.96	2.23
(Machinery + Equipment) / Labor costs	0.34	1.26
Sales / Labor costs	1.63	0.86
Sales / (Machinery + Equipment)	0.89	1.41
<i>Innovation</i>		
Firm has intellectual property	0.02	0.12

**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
<i>Collateral</i>			
Total collateral / Debt	0.11	0.61	0.50***
Log(Total collateral)	2.25	12.47	10.22***
Fixed liens / Debt	0.11	0.18	0.07***
Log(Fixed liens)	2.25	4.43	2.18***
<i>Debt and debt structure</i>			
Debt / Assets	0.53	0.70	0.17***
Log(Debt)	12.66	13.91	1.25***
Long-term debt / Debt	0.21	0.31	0.10***
Log(Long-term debt)	5.03	9.26	4.23***
Log(Short-term debt)	12.16	13.37	1.21***
Log(Long-term loans)	2.13	7.56	5.43***
Log(Short-term loans)	0.79	2.98	2.19***
Log(Lines of credit limit)	7.59	11.98	4.39***
<i>Investment</i>			
Total net investment / Assets	0.02	0.02	0.00***
Ln(Net investment)	6.00	8.15	2.15***
Investment in machinery and equipment / Assets	0.01	0.02	0.01***
Investment in land and buildings / Assets	0.002	0.003	0.001***
<i>Employment and size</i>			
Ln(Number of employees)	0.94	1.52	0.58***
Ln(Assets)	13.94	14.48	0.54***
<i>Asset structure</i>			
Tangible assets / Assets	0.19	0.27	0.08***
Inventories / Assets	0.09	0.17	0.08***
Liquid assets / Assets	0.31	0.17	-0.14***
<i>Technology and productivity</i>			
(Machinery + Equipment) / Employees	11.75	12.13	0.38***
(Machinery + Equipment) / Labor costs	0.29	0.32	0.03***
Sales / Labor costs	1.60	1.74	0.14***
Sales / (Machinery + Equipment)	0.84	1.25	0.41***
<i>Innovation</i>			
Firm has intellectual property	0.01	0.02	0.01***

**Table 4 – Total collateral**

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*  $\times$  *Post-law* coefficient divided by the sample mean of the dependent variable (Columns 1-3) or the exponential of the coefficient minus one (Columns 4-6). 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			Log(Total collateral)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated $\times$ Post-law	-0.0220*** [0.00105]	-0.0295*** [0.00137]	-0.0343*** [0.00141]	-0.831*** [0.0167]	-0.966*** [0.0230]	-0.632*** [0.0225]
Constant	0.350*** [0.000470]	0.342*** [0.000600]	0.342*** [0.000599]	7.118*** [0.00771]	7.041*** [0.0102]	7.040*** [0.0102]
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 $\times$ Trend	–	–	Yes	–	–	Yes
Number of firms	191,385	167,261	167,261	193,548	168,448	168,448
Number of observations	1,303,505	1,144,023	1,144,023	1,337,966	1,166,778	1,166,778
R-squared	0.003	0.004	0.004	0.006	0.008	0.008
<i>Predicted % change</i>	-6.08	-8.14	-9.48	-56.44	-61.94	-46.85

**Table 5 – 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 (Columns 1-3) or the exponential of the coefficient minus one (Columns 4-6). 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:	Fixed liens / Debt			Log(Fixed liens)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	0.0163*** [0.000861]	0.0133*** [0.00116]	0.00101 [0.00120]	0.201*** [0.0169]	0.163*** [0.0219]	-0.00702 [0.0224]
Constant	0.147*** [0.000379]	0.138*** [0.000515]	0.138*** [0.000516]	3.322*** [0.00755]	3.164*** [0.00994]	3.164*** [0.00996]
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	193,548	168,448	168,448
Number of observations	1,303,494	1,144,016	1,144,016	1,337,954	1,166,770	1,166,770
R-squared	0.002	0.003	0.003	0.002	0.002	0.002
<i>Predicted % change</i>	<i>10.4</i>	<i>8.48</i>	<i>0.64</i>	<i>22.26</i>	<i>17.70</i>	<i>-0.70</i>

**Table 6 – Corporate debt**

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 (Columns 1-3) or the exponential of the coefficient minus one (Columns 4-6). 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			Log(Debt)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	-0.00928*** [0.000809]	-0.00940*** [0.00108]	-0.00528*** [0.00112]	-0.0634*** [0.00790]	-0.0312*** [0.0107]	-0.0962*** [0.0111]
Constant	0.623*** [0.000360]	0.630*** [0.000479]	0.630*** [0.000480]	13.30*** [0.00334]	13.32*** [0.00443]	13.32*** [0.00445]
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	190,790	165,992	165,992	193,594	168,486	168,486
Number of observations	1,273,170	1,108,215	1,108,215	1,344,842	1,172,376	1,172,376
R-squared	0.047	0.053	0.053	0.001	0.002	0.002
<i>Predicted % change</i>	-1.59	-1.61	-0.91	-6.14	-3.07	-9.17

**Table 7 – Debt maturity**

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 (Columns 1-3) or the exponential of the coefficient minus one (Columns 4-9). 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 debt / Debt			Log(Long-term debt)			Log(Short-term debt)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treated × Post-law	-0.0345*** [0.000929]	-0.0350*** [0.00124]	-0.0151*** [0.00138]	-0.955*** [0.0197]	-0.932*** [0.0263]	-0.419*** [0.0291]	-0.0289*** [0.00808]	0.0155 [0.0109]	-0.0803*** [0.0117]
Constant	0.271*** [0.000429]	0.262*** [0.000568]	0.262*** [0.000569]	7.170*** [0.00907]	7.199*** [0.0122]	7.197*** [0.0122]	12.71*** [0.00358]	12.79*** [0.00466]	12.80*** [0.00467]
Firm fixed effects									
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	1,345,336	1,172,808	1,172,808	1,345,624	1,173,074	1,173,074
Number of observations	1,310,462	1,149,965	1,149,965	0.018	0.018	0.019	0.000	0.001	0.001
R-squared	0.014	0.013	0.014	193,594	168,486	168,486	193,594	168,486	168,486
<i>Predicted % change</i>	-13.60	-13.80	-5.96	-61.52	-60.62	-34.23	-2.85	1.56	-7.72

**Table 8 – Bank loans and lines of credit**

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 exponential of the *Treated × Post-law* coefficient minus one. 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*** [0.0188]	-1.256*** [0.0243]	-0.539*** [0.0279]	0.521*** [0.0161]	0.471*** [0.0198]	0.119*** [0.0227]	-0.395*** [0.0297]	-0.354*** [0.0423]	-0.278*** [0.0607]
Constant	4.876*** [0.00871]	4.811*** [0.0112]	4.809*** [0.0112]	1.693*** [0.00694]	1.663*** [0.00858]	1.664*** [0.00856]	11.59*** [0.00934]	11.54*** [0.0118]	11.54*** [0.0122]
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
<i>Predicted % change</i>	-70.68	-71.52	-41.67	68.37	60.16	12.64	-32.63	-29.81	-24.27



**Table 9 – 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*  $\times$  *Post-law* coefficient divided by the sample mean of the dependent variable (Columns 1-3) or the exponential of the coefficient minus one (Columns 4-6). 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			Log(Net investment)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated $\times$ Post-law	-0.000601*** [0.000117]	-0.00142*** [0.000158]	-0.00123*** [0.000296]	-0.0264* [0.0158]	-0.0782*** [0.0215]	-0.199*** [0.0362]
Constant	0.0217*** [0.000084]	0.0219*** [0.000107]	0.0219*** [0.000107]	7.484*** [0.00869]	7.429*** [0.0118]	7.430*** [0.0118]
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 $\times$ Trend	–	–	Yes	–	–	Yes
Number of firms	184,700	163,332	163,332	184,767	163,389	163,389
Number of observations	1,101,582	984,189	984,189	1,104,842	987,146	987,146
R-squared	0.011	0.010	0.010	0.016	0.014	0.014
<i>Predicted % change</i>	-3.80	-8.95	-7.74	-2.61	-7.52	-18.05

**Table 10 – Firm employment and size**

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 exponential of the  $Treated \times Post\text{-}law$  coefficient minus one. 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 $\times$ Post-law	-0.0313*** [0.00217]	-0.0132*** [0.00285]	-0.0217*** [0.00262]	-0.0420*** [0.00436]	-0.0239*** [0.00610]	-0.0467*** [0.00536]
Constant	1.192*** [0.00100]	1.234*** [0.00130]	1.234*** [0.00130]	14.26*** [0.00180]	14.19*** [0.00244]	14.19*** [0.00245]
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 $\times$ 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
<i>Predicted % change</i>	-3.08	-1.31	-2.15	-4.11	-2.36	-4.56

**Table 11 – Types of investment capital**

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*  $\times$  *Post-law* coefficient divided by the sample mean of the dependent variable. 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:	Investment in machinery and equipment / Assets			Investment in land and buildings / Assets		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated $\times$ Post-law	-0.000641*** [0.00009]	-0.00104*** [0.000131]	-0.00107*** [0.000248]	0.000087 [0.00006]	-0.000244*** [0.00007]	-0.000313** [0.000129]
Constant	0.0175*** [0.00006]	0.0184*** [0.00009]	0.0184*** [0.00009]	0.00405*** [0.00004]	0.00350*** [0.00004]	0.00350*** [0.00004]
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 $\times$ Trend	–	–	Yes	–	–	Yes
Number of firms	184,746	163,360	163,360	184,735	163,361	163,361
Number of observations	1,104,224	986,176	986,176	1,136,470	1,018,512	1,018,512
R-squared	0.011	0.009	0.009	0.001	0.001	0.001
<i>Predicted % change</i>	-4.93	-7.99	-8.24	2.88	-8.11	-10.40

**Table 12 – 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. 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*** [0.00066]	-0.0084*** [0.00089]	-0.0054*** [0.00092]	-0.0111*** [0.00047]	-0.0072*** [0.00065]	-0.0027*** [0.00067]	0.0134*** [0.00079]	0.0113*** [0.0011]	0.00337*** [0.00126]
Constant	0.229*** [0.000296]	0.229*** [0.000400]	0.229*** [0.000401]	0.123*** [0.000219]	0.135*** [0.000307]	0.135*** [0.000308]	0.236*** [0.000382]	0.236*** [0.000506]	0.236*** [0.000508]
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
<i>Predicted % change</i>	-3.39	-3.91	-2.53	-9.57	-6.18	-2.33	5.46	4.57	1.37

**Table 13 – Capital intensity**

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. 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 and equipment) / Employees			(Machinery and equipment) / Labor costs		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated × Post-law	-0.0372*** [0.00677]	0.00397 [0.00917]	-0.00257 [0.0104]	-0.0708*** [0.00418]	-0.0441*** [0.00513]	0.000814 [0.00665]
Constant	11.91*** [0.00322]	11.91*** [0.00403]	11.91*** [0.00405]	0.318*** [0.00195]	0.292*** [0.00232]	0.292*** [0.00233]
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	192,483	167,795	167,795	156,609	140,073	140,073
Number of observations	1,300,704	1,138,739	1,138,739	941,098	843,571	843,571
R-squared	0.001	0.000	0.000	0.003	0.002	0.002
<i>Predicted % change</i>	-0.31	0.03	-0.02	-19.90	-12.40	0.23

**Table 14 – Firm productivity**

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*  $\times$  *Post-law* coefficient divided by the sample mean of the dependent variable. 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:	Sales / Labor costs			Sales / (Machinery and equipment)		
	(1)	(2)	(3)	(4)	(5)	(6)
Treated $\times$ Post-law	-0.00921*** [0.00284]	-0.00165 [0.00352]	-0.0102** [0.00454]	0.000530 [0.00410]	-0.00547 [0.00544]	-0.0428*** [0.00740]
Constant	1.667*** [0.00131]	1.692*** [0.00156]	1.692*** [0.00156]	0.982*** [0.00206]	1.083*** [0.00274]	1.083*** [0.00275]
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 $\times$ Trend	–	–	Yes	–	–	Yes
Number of firms	156,857	140,189	140,189	193,067	168,143	168,143
Number of observations	942,861	844,486	844,486	1,309,801	1,143,818	1,143,818
R-squared	0.001	0.001	0.001	0.005	0.005	0.005
<i>Predicted % change</i>	-0.56	-0.10	-0.62	0.06	-0.61	-4.78

**Table 15 – Firm innovation**

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. 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 has intellectual property		
Treated × Post-law	-0.00154*** [0.000442]	-0.000817 [0.000526]	-0.00133** [0.000556]
Constant	0.0135*** [0.000196]	0.0123*** [0.000227]	0.0123*** [0.000227]
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Matched samples	–	Yes	Yes
Treated × Trend	–	–	Yes
Number of firms	193,594	168,486	168,486
Number of observations	1,355,158	1,179,402	1,179,402
R-squared	0.000	0.000	0.000
<i>Predicted % change</i>	-10.30	-5.48	-8.89

### Lamfalussy Fellowships

This paper has been produced under the ECB Lamfalussy Fellowship programme. This programme was launched in 2003 in the context of the ECB-CFS Research Network on “Capital Markets and Financial Integration in Europe”. It aims at stimulating high-quality research on the structure, integration and performance of the European financial system.

The Fellowship programme is named after Baron Alexandre Lamfalussy, the first President of the European Monetary Institute. Mr Lamfalussy is one of the leading central bankers of his time and one of the main supporters of a single capital market within the European Union.

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### Acknowledgements

We thank an anonymous referee for the ECB working paper series and seminar participants at the University of Porto for helpful comments. The contribution by Cerqueiro to this paper has been prepared under the Lamfalussy Fellowship Program sponsored by the European Central Bank.

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ISSN 1725-2806 (online)

ISBN 978-92-899-2166-4

DOI 10.2866/981745

EU catalogue No QB-AR-16-035-EN-N