The Collateral Channel: Real Estate Prices and Firm Leverage*

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ABSTRACT: Through the collateral channel, shocks to the value of real estate can have a significant impact on the firms' borrowing capacity. In this paper, I provide evidence on this mechanism by using LTV ratio caps on mortgages in a number of European countries as policy shocks that affect real estate prices. I conduct a difference-in-difference exercise using a unique and comprehensive micro panel data covering both large firms and SMEs. This allows me to better identify and quantify the effects of policy shocks to the value of firm collateral by distinguishing them from local demand shocks and local general equilibrium effects. I find a significant collateral damage on firms' balance sheets, a consequence of LTV policy shock, which in turn caused i) secured debt to decrease in firms with high collateral value more than in firms with low collateral value, and ii) trade credit use to increase in firms with high collateral value more than in firms with low collateral value. These findings document a new evidence on how firms adjust to shocks to the value of collateral through trade credit use. These findings also highlight that macroprudential policies in one sector–such as LTV ratio caps targeting household sector–might result in an unintentional consequence in another sector–such as collateral damage in corporate sector. This is an important caveat that policy makers should consider when implementing macroprudential policy.

JEL-Codes: D22, E58, G21, G28, G30, G32, R30
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1 Introduction

This paper investigates how firms' capital structure decisions respond to changes in collateral value, caused by real estate price shock. The contributions of this paper are twofold. First, using a unique and comprehensive firm-level data, I identify and quantify the impact of a change in the value of real estate assets on firms' debt financing decisions. Second, I provide new evidence on how firms' borrowing capacity, strongly associated with collateral pledging, determines firms' choice between secured and unsecured debt financing. Therefore, this paper assesses the role of collateral pledging in transmitting boom-bust cycles in real estate markets to the corporate sector.

Real estate booms have been often associated with economic and financial busts. As a consequence, academics and policy makers have been trying to understand how these booms are transmitted to the real economy. The relevant theoretical literature suggests that the "collateral channel" might have an important role in transmitting shocks in real estate markets to the real economy: the bursting of a real estate market bubble adversely affects the value of collaterizable real estate assets. Declining collateral values lead to higher cost of external financing which forces firms to decrease borrowing and lower investment leading to a decline in output (Kiyotaki and Moore (1997)). Although there is a significant body of theoretical literature that suggests the significance of the collateral channel, there has been a limited number of empirical studies that identifies and quantifies its economic impact. This paper is one of the papers that attempts to fill this gap in the literature.

In recent years, a number of European countries have experienced a huge increase in real estate prices associated with rapid credit growth and lax lending standards. They applied maximum loan-to-value ratios on mortgages (henceforth referred to as "LTV ratio caps") with the aim of damping credit growth and price inflation in housing markets.[1] Their policy experiment provides an ideal setting: it solves the endogeneity problem typically encountered in this type of study. Tightening of LTV ratio of mortgages led to a slowdown in price inflation in housing markets, a policy shock that is plausibly exogeneous to any individual firm. This policy shock has a general equilibrium effect through the demand and supply of houses on collateral values, and it is affecting firm financing decisions through collateral channel.

My hypothesis is that if LTV ratio cap is effective in curbing borrowers' demand by tightening borrowers' capacity to borrow, this will have a negative effect on real estate prices, then firms who had higher valued collateral pre-LTV policy shock should experience a bigger drop after-LTV policy shock in their secured borrowing relative to firms who had lower valued collateral pre-LTV policy shock. In order to test this hypothesis, I develop a difference-in-difference estimation with firm fixed effects. The estimation, by interacting firm collateral with a time dummy that separates the period before and after the LTV policy shock, captures before-after shock difference in secured borrowing of firms with similar collateral on their balance sheet prior the LTV policy shock. The inclusion of firm fixed effects is important because the LTV policy shock might affect different firms

[1] LTV ratio cap is a cap on the ratio of the value of the loan (L) relative to the value of the underlying collateral (V). LTV ratio caps impose a limit on borrowers' capacity to borrow on collateralized lending. LTV ratio caps are not harmonised under the Capital Requirements Directive (CRD)/Capital Requirements Regulation (CRR), but rather are implemented at national discretion. Therefore, LTV ratio caps can be viewed as a recommendation or restriction of credit standards that banks should follow when issuing loans. I provide further details about this policy in section 2.

differently due to unobserved firm characteristics. For example, if high risk taker firms hold less collateral on average, such firms might be affected differentially from the LTV policy shock. In the estimation, this average affect will be fully absorbed by firm fixed effects, and will not invalidate the identification. The identification will come from the timing of the policy shock interacted with predetermined value of firm collateral, which is not allowed to move with the policy shock.

Using a large sample containing non-financial non-real estate firms, I study the episodes of LTV ratio caps on mortgages in Europe (Bulgaria: 2004–2007, Hungary: 2010-present, The Netherlands: 2008-present, Norway: 2010-present, Sweden: 2010-present, and Turkey: 2010-present). In benchmark difference-in-difference estimation, I regress firm leverage (total debt to total assets) on its determinants where collateral is interacted with LTV dummy. Since this is a dummy that takes value 1 in the year(s) when the LTV ratio cap is place, it allows me to understand how the impact of collateral on firm leverage is affected by this policy shock through its effect on real estate prices. I find a significant collateral damage effect on firm leverage after the LTV ratio cap. This effect is different for firms with differential collateral values: the LTV ratio cap decreased leverage in firms with high collateral value by 0.9 percentage point more than in firms with low collateral value. The result is robust to different specifications.

This paper is related to the recent empirical studies by Gan (2007), Chaney, Sraer, and Thesmar (2012) and Cvijanović (2014) who used local variations in real estate price movements as shocks to the value of collateral to identify the causal impact of financial shocks on firms' decisions. Gan (2007) investigated Japan's land market collapse in early 1990's. Within a difference-in-difference like approach, she estimated pre-shock landholdings in 1989 as an exogeneous instrument to identify the effect of the bursting of real estate bubble on the average investment rate during five years after the shock, 1994 to 1998. She showed that land-holding Japanese firms were more affected by the shock than firms with no land. Chaney, Sraer, and Thesmar (2012) and Cvijanović (2014) focused on US real estate price boom between 1993–2006 that resulted in a large dispersion in real estate price movements between US states and cities. They followed an instrumental variables approach to isolate the variation in local real estate prices, which may be endogeneous to firms' decisions. They both showed that firms significantly change their decisions in response to collateral value appreciation.

My relative contribution is twofold. First, the difference-in-difference approach and the richness of data set I use allow me to better identify the effects of shocks to collateral values by distinguishing them from local demand shocks and local general equilibrium effects. One concern with the existing estimates is that the correlation between changes in collateral values and changes in firms' decisions might be observed due to a reverse causality problem: say, in response to increases in investment (accompanied by increases in borrowing), large publicly traded firms may have a significant impact on local real estate prices through increases in local business activity and demand for labor. Indeed, in the existing papers, focusing only on large publicly traded firms might be biasing the estimates. However, by using a comprehensive sample dominated by small firms, I minimize the possibility of such reverse causality problem in the estimation.

There is another concern with existing estimates that unobserved variation within a particular location and year might drive the results. To be precise, consider the possibility that real estate

price shocks are actually affecting the balance sheet of consumers, not of firms, and this might drive the results through the changes in local demand. I solve this by using four-digit sector-year fixed effects to control for demand. These effects will absorb the impact of changes in local demand for the four-digit sector that the firms operate in. I assume that most of the changes in local demand derive from narrowly defined sector-specific factors. The identifying assumption requires that firms with high collateral value are subject to similar local demand shocks as firms with low collateral value in the same four-digit sector and any remaining variation in firm specific demand conditions does not vary systematically by the collateral value. I am not the first to control for demand using sector fixed effects (e.g., Nanda and Nicholas (2014) and Acharya, Eisert, Eufinger, and Hirsch (2014)) but to the best of my knowledge, Kalemli-Ozcan, Laeven, and Moreno (2015) and this paper are the first to allow these effects to vary at a very fine level of sector classification.

Second, existing papers use only large publicly traded firms as in most of the papers studying investment and capital structure decisions in the literature. Being less financially constrained, such firms are least likely to pledge collateral when they borrow from financial institutions. This might lead to a downward bias of the effect of real estate price shock. However, I develop a unique and comprehensive data set that covers not only large publicly traded firms, but also small and medium private firms. The inclusion of small and medium firms is crucial given the structure of European economies. Europe consists of bank-dominant economies tilted toward externally dependent small and medium enterprises (SMEs), and among all sources of external financing, European firms typically prefer debt to finance working capital and/or investment (e.g., Kalemli-Ozcan, Laeven, and Moreno (2015)).[2,3] Tangible assets have been very often pledged as collateral in business lending, and European banks heavily prefer real-estate as collateral especially for SMEs.[4,5] Therefore, with the inclusion of SMEs, I can obtain more accurate estimates of collateral in the analysis of firms' debt financing decisions, then precisely link them to the actual changes in aggregate corporate debt movements.

Turning to the results, I find a significant collateral damage effect on firm leverage both at the micro level and at the aggregate level. The micro estimates I obtain from difference-in-difference estimation show collateral damage can explain around 16 % of the actual decline in aggregate corporate sector. Aggregate corporate debt patterns might mask how financing patterns of SMEs respond to real estate price shocks. However, financing patterns studied in this setting provide important insights: tightening of LTV ratios result in a significant collateral damage in firms'

[2]According to the recent report of European Commission, across the EU-28 in 2013, some 21.6 million SMEs (firms with less than 250 employees) in the non-financial corporate sector employed 88.8 million people and generated 3,666 trillion euro in terms of value added. In other words, 99 out of every 100 businesses are SMEs, as are 2 in every 3 employees and 58 cents in every euro of value added.

[3]Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015) shows how well the data used in this paper covers the universe of European firms compared to official statistics from Eurostat along several dimensions. See their paper for further statistics.

[4]One of the recent reports developed by International Finance Corporation states that while land and buildings are widely accepted as collateral for loans, the use of movable collateral (such as inventory, accounts receivables, crops, machinery and equipment) is restricted due to lack of functioning laws and registries to govern secured transactions. For further details, see Secured Transactions Systems & Collateral Registries Toolkit (2010).

[5]For instance, according to the World Bank Investment Climate Survey of 6,511 firms in 24 European countries, nearly 63% of the loans required collateral, and 77% of these loans are secured by real estate (land, buildings, houses owned by the entrepreneurs). For further details, see http://www.enterprisesurveys.org

balance sheets by lowering real estate prices. This in turn causes a bigger drop in secured lending of SMEs relative to large firms with similar collateral on their balance sheet prior the LTV policy shock.

The collateral channel also has important implications for the usage of trade credit.[6] According to the "balance-sheet channel," changes in monetary policy have potential impact on firms' ability to borrow by changing the value of collateral (Bernanke and Gertler (1995)). The empirical literature has found that trade credit usage changes as a response to monetary policy shocks and business downturns (e.g., Choi and Kim (2005), Mateut, Bougheas, and Mizen (2006), and Nilsen (2002)). To the best of my knowledge, this paper is the first to provide evidence on how the usage of trade credit responds to changes in collateral value, caused by real estate price shock. In this paper, I ask this specific question: Did firms that experience a collateral damage after the LTV ratio cap turn to trade credit as an alternative source of finance?

The sample used in this paper represents an ideal setting to answer this question. First, as will be shown later, with the exception of Hungary, trade credit accounts for at least roughly one-fourth of the total debt of a representative firm and about one-third of the short-term debt. Second, besides trade credit, alternative sources of finance are mostly unavailable to firms of the European countries that I focus on: the development of the stock and bond markets is modest.[7] Then, to the extent that credit to firms are more likely to be rationed by financial institutions, the impact of collateral damage (as a consequence of the LTV ratio cap) will be magnified, and the net impact will be determined by the extent to which trade credit use offsets financial credit. According to the results, collateral damage caused debt use on secured basis to decrease in firms with high collateral value by 1.2 percentage points more than in firms with low collateral value, whereas it caused trade credit use to increase in firms with high collateral value by 0.2 percentage points more than in firms with low collateral value. Thus, this result provides a new evidence on how the corporate sector adjusts to collateral shocks through unsecured lending: firms that experienced a collateral damage after the LTV ratio cap turned to trade credit, allowing the corporate sector to mitigate the effects of such shocks.

There is an extensive literature that analyzes the role of collateral in determining firms' borrowing capacity. However, due to data limitations, almost all papers in this literature preclude the analyses of SMEs. One of the contributions of this paper then is to incorporate firm heterogeneity in this analysis. Using a sample that consists of both large firms and SMEs, I estimate the effect of asset tangibility as proxy for collateral on firms' borrowing capacity separately for different size groups. According to the estimation results, the impact of asset tangibility on debt capacity is pronounced across all firms of different sizes, but less pronounced across very small firms (i.e., micro enterprises[8]).

[6] There is an extensive literature of both theoretical and empirical papers explaining the existence of trade credit. Some emphasize a transaction motive for trade credit, while others emphasize a financial motivation. There are also many papers that have analyzed whether trade credit and bank loans are substitutes or complements. See Giannetti, Burkart, and Ellingsen (2011), Love (2011), and Uchida, Udell, and Watanabe (2013) for comprehensive reviews of this literature.

[7] Figure 4 shows the composition of financial liabilities of corporate sector for some European countries I focus on. The percentages are based on official statistics I obtain from Eurostat. According to these percentages, two meaningful sources of external finance are financial loans and trade credit, whereas the proportion of bonds in firm finance is limited.

[8] Micro enterprises are firms with employees less than 10.

This finding suggests that the interpretation of the role of asset tangibility in determination of firms' borrowing capacity should be done with caution: asset tangibility does not inversely measure the extent of financing constraints, but rather measures firms' ability to pledge collateral. Firms' ability to pledge collateral increases firms' borrowing capacity to the extent that tangible assets on firms' balance sheet are liquid (e.g., Campello and Giambona (2013)).

There is also a growing literature that studies the effectiveness of macroprudential policies.[9] In this literature, there are several papers that provide evidence on whether LTV and DTI[10] ratio caps are effective in mitigating the negative effects of housing boom by controlling credit growth and asset price inflation (e.g., Crowe, DellAriccia, Igan, and Rabanal (2013), Kuttner and Shim (2013)). While suggestive, these studies come with many caveats. Due to data limitations and/or identification struggles, they are not able to clarify the channels through which an LTV cap reduces systemic risk. This paper highlights one micro-level mechanism through which LTV caps on mortgages limit the positive feedback between asset price inflation and firms' capacity to borrow. Doing so, this paper provides a new evidence on how macroprudential policies targeting one sector–such as LTV ratio caps in household sector–might result in an unintentional consequence in another sector–such as collateral damage in corporate sector. This is an important caveat that policy makers should consider when implementing macroprudential policy.

The paper proceeds as follows. Section 2 reviews the policy experiments with LTV ratios. Section 3 presents the details about data. Section 4 explains the methodology. Section 5 presents empirical analysis. Section 6 concludes.

2 Policy Experiments with LTV Ratio Cap

In principle, macroprudential policies aim to limit the risk of widespread disruptions to the provision of financial services and thereby minimize the impact of such disruptions on real economy as a whole (Lim (2011)). Among others, LTV, LTI and DSTI caps have increasingly been implemented to reduce systemic risk generated by strong credit growth and credit-driven asset price inflation during boom-bust episodes. The caps are viewed as having macro-prudential impact through restricting the quantity of credit by limiting the funding available for certain borrowers to dampen growth in asset prices. In addition, they enhance the resilience of both the banks and their borrowers. Figure 1 depicts the transmission channels of a tightening of the LTV, LTI and DSTI limits.

The caps on LTV ratios are particularly popular in Asian and European countries. According to a survey conducted by the IMF in 2010, 20 out of 49 countries use caps on LTV ratios as a macro-prudential instrument. Specifically, among 20 countries, 11 countries set fixed caps while 9 countries adopt time-varying caps (Lim (2011)).

LTV ratio cap is a cap on the ratio of the value of the loan (L) relative to the value of the underlying collateral (V). LTV ratio cap imposes a limit on borrowers' capacity to borrow on collateralized lending. LTV ratios are not harmonised under the Capital Requirements Directive (CRD)/Capital Requirements Regulation (CRR), and rather are implemented at national discretion. Therefore,

[9] See Claessens (2015), Claessens et al. (2013), and Lim (2011) for a comprehensive review of existing studies.
[10] Debt to Income.

LTV ratio cap can be viewed as a recommendation or restriction of credit standards that banks should follow when issuing loans. Nevertheless, the explicit LTV limits vary both across types of loan within a country as well as across countries. The LTV limit in an individual country is usually related to the type of loan (commercial versus residential) and currency of the loan (domestic versus foreign currency) with foreign currency mortgages usually being subject to stricter LTV limits. Furthermore, the heterogeneity among countries also stems from differences in the coverage of institutions to which the explicit LTV limit is applied.

I undertake a detailed investigation for this particular policy action. The policy action data set used in this paper draws on a variety of sources. I use data sources from several studies developed by Borio and Shim (2007), Claessens, Ghosh, and Mihet (2013), Claessens (2015), Crowe, DellAriccia, Igan, and Rabanal (2013), Hilbers, Otker-Robe, Pazarbasioglu, and Johnsen (2005), Kuttner and Shim (2013), Lim (2011), Lim, Krznar, Lipinsky, Otani, and Wu (2013), and Srobona, Jaromír Benes, Lund-Jensen, Schmieder, and Severo (2011). Wherever available, I also use the official documents from central banks and supervisory & regulatory authorities including their annual reports and financial stability reports, press releases, email responses from these institutions. I use these secondary sources to cross-check them with the information given in the papers. Doing so, I obtain full and accurate information on relevant policy actions. The final data set allows me to precisely identify not only the coverage, but also the implementation date of LTV ratio policy in the sample of European countries: Bulgaria, Hungary, The Netherlands, Norway, Sweden, and Turkey.

I use Table 1 as reference to generate the dummy variable of difference-in-difference estimations, which captures the introduction and/or the tightening of LTV ratio cap on mortgages in the given country.

Table 1: LTV Ratio Policy Experiments

Country	Authority	Dates Active
Bulgaria	Bulgarian National Bank	June 2004–December 2007
Hungary	Magyar Nemzeti Bank	March 2010–present
Netherlands	Rijksoverheid (Dutch government)	2007–present
Norway	Norges Bank	March 2010–present
Sweden	Finansinspektionen & Sveriges Riksbank	2010–present
Turkey	The Central Bank of Republic of Turkey	December 2010–present

NOTES: Table 1 reports both the time period and the national authority that associated with the LTV ratio cap policies of the countries I study.

In the below, I briefly document the background that motivates LTV ratio policy action as well as the details regarding the implementation of this policy in the given country.

- **Bulgaria**: Credit to households grew rapidly during transition to EU accession. A credit boom was accompanied by a house price boom in early 2000s. Towards mid 2000s, while the credit risk in corporate sector stabilized, it continued to accelerate in consumers and mortgage segments. Thus, Bulgarian National Bank introduced LTV ratio caps on residential real estate mortgages. To be exact, in June 2004, it introduced of a 70% LTV ratio for mortgages risk-weighted at 50%; and in April 2006 the risk weighting for mortgage loans used in the

calculation of the capital adequacy ratio is effectively raised by lowering LTV ratio from 70 % to 50 %.

- **Hungary**: In 2010, a large share of mortgage loans was provided in foreign currency which made unhedged borrowers in the household sector vulnerable to exchange rate volatility. To address the excessive foreign exchange rate lending to households, the authorities took some LTV ratio policy actions. To illustrate, in March 2010, the maximum LTV ratio was set at 75, 60 and 45 % for forint, euro and other foreign currency loans, respectively. The relevant LTV limits are somewhat higher for vehicle financing loans and residential real estate leasing (80, 65 and 50 % respectively for forint, euro and other foreign currency loans). This limit applies to all institutions providing financial services in Hungary.

- **The Netherlands**: The recent Dutch housing-market slump follows a long period of very rapid growth in property prices. Between 1985 and 2007, house prices rose by a cumulative 228%, while consumer prices increased only 56%. Dutch demand for houses was also boosted by government policy. Traditionally, the Dutch government has pursued a policy of promoting home ownership. This limited access to social housing and continued rise in house prices encouraged households including low-income earners. Banks were quite willing to lend to this group, even at very high LTV ratios (the average LTV ratio was 114 % in 2007). Additionally, mortgage interest rate were very attractive. They declined from 7.12 % in 1995 to 4.82% in 2007. Market sentiment changed over the course of 2007, triggered by the sub-prime mortgage problems in the U.S. Dutch banks also started to question lending standards. Before 2007, banks had substantial leeway in their lending to households. However, in 2007, the banks signed up to "Mortgage Lenders' Code of Conduct." In 2011, for all financial intermediaries under this code-of-conduct supervision, the code was tightened introducing a LTV ratio of 104% (plus transfer tax) on mortgages. In combination, LTV limit for new mortgage loans decreases stepwise 1 percentage point per annum from 106% in 2012 to 100% in 2018.

- **Norway**: Household debt (mainly mortgages) reached a high level and was a key risk in Norway. Low unemployment and wealth effects from increases in oil prices helped to boost the accumulation of household debt. Lax lending standards and aggressive mortgage lending practices also played a key role. To address the problem of housing debt, in March 2010, Norges Bank set LTV limit at 90%. According to law, LTV ratios on home equity loans should generally not exceed 75 %. Further, in December 2011, the authority tightened the law by lowering LTV ratio on mortgages to 85%, and lowering LTV ratio on home equity loans to 70 %.

- **Sweden**: The Swedish mortgage market is large. Since the mid-1990s, housing prices in Sweden have risen and Swedish households' mortgage debts have increased substantially. In 2001, mortgages comprised 30 % of the Swedish banks total lending secured on housing. Even if Swedish housing prices and indebtedness of Swedish households temporarily dampened after the global financial crisis of 2008–2009, they have subsequently continued to rise. To address the risks of growing household indebtedness and rising housing prices, Sveriges Riksbank

introduced a mortgage cap in 2010. According to general guideline of Financial Stability authority (Finansinspektionen), LTV ratio is at 85 % of a property's value. It applies to all credit institutions providing mortgages, but only covers new loans.

- **Turkey**: After the global financial crisis, Turkey observed a rapid increase in domestic demand and credit growth, and increased foreign currency borrowing by banks. In late 2010, the Central Bank of Republic of Turkey applied limits on mortgages in order to curb credit growth and increase credit quality, LTV ratio cap of 75 % on housing loans to consumer, LTV ratio cap of 50% on purchases of commercial real estate.

Figure 2 shows that the introduction of LTV ratio cap on mortgages led to a slowdown in price inflation in housing markets of the countries I focus on. This policy shock also led to a slowdown in prices in commercial markets. For instance, Figure 3 shows before-after LTV ratio policy difference in commercial price index by regions of Sweden. According to this figure, price of commercial buildings decreased in all Swedish regions with the exceptions of Blekinge and Sdermanland after the introduction of LTV ratio cap in Swedish housing market. I observed such a correlation between the price movements of residential property and commercial property due to the fact that both commercial and residential property use and compete for the same fixed supply of land (DiPasquale and Wheaton (1996)). Therefore, the timing of LTV ratio cap in housing market presents an ideal source of identification to investigate how firms' debt financing decisions respond to price shocks to the value of firm collateral. I will discuss this in detail in section 4.

3 Data

3.1 Firm-level Data

In my analysis, I use cross-country firm-level data from ORBIS. ORBIS is a commercial data set compiled by Bureau Van Dijk (BvD) that provides administrative data on millions of firms in Europe. The financial and balance sheet information is initially collected by local Chambers of Commerce and in turn, is relayed to BvD through some 40 different information providers.

The data set has financial accounting information from detailed, harmonized balance-sheets, income statement and profit/loss accounts of financial and non-financial firms. This data set is crucially different from other data sets that are commonly-used in the literature such as COMPUSTAT for the United States, COMPUSTAT Global, and Worldscope databases, since 99 percent of the companies in ORBIS are private, whereas former data sets contain mainly information on large listed companies. In ORBIS, only less than 2 percent of the firms are publicly listed (which is also separately marketed under the product called OSIRIS). As stated in Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015), there are several inherent biases affecting the download process, and a number of irregularities in the raw data, which will result in large data loss unless they are dealt with. Then, I fully follow their detailed instructions in order to construct a database that is nationally representative with minimal missing information.

In order to show how representative the data I use in this paper is, I refer to Table 2.[11] This table shows how much of the official gross output data from Eurostat is covered by the firms in ORBIS–AMADEUS data for the total economy for a sample of European countries. These countries refer to the countries with policy experiments of LTV ratio cap on mortgages: Bulgaria, Hungary, The Netherlands, Norway, and Turkey. Each cell is the ratio of value of total output produced by the firms in ORBIS–AMADEUS data relative to value of total output produced as in the official data. For a given country-year, ratios are computed by taking the ratio of aggregated gross output values where aggregated gross output is computed by totalling gross output over common available sectors for which the gross-output related variable is available in both data sets.[12] Missing ratios still appear in some country-year due to missing Eurostat data. As shown in Table 2 with the exception of Netherlands, ORBIS–AMADEUS data can account more than 50 percent of the aggregate output in all countries.

The sample I use in this paper is mainly composed of micro (1–9 employees), small (10–49 employees) and medium (50–249 employees) enterprises that account for a significant fraction of economic activity in Europe and the majority of economic activity in the sample of selected European countries mentioned above. In Table 3, each cell corresponds to the share of indicated size category's number of firms in total economy from the relevant data source for the given country in 2010. Number of firms is summed over overlapping sectors with Eurostat SBS data. This table illustrates that the sample is broadly representative in terms of size distribution. This feature is an important difference of this paper relative to the literature that works with both financial and real variables at the firm level. Most of this literature focuses on listed firms that account for less than 1 percent of the observations in the sample.

The main financial variables used in the analysis are total assets, sales, tangible fixed assets, components of debt, cash holdings, inventory, and earnings before interest, taxes, depreciation, and amortization (EBITDA). I transform financial variables to real using CPI with 2005 base and converting to dollars using the end-of-year 2005 dollar/national currency exchange rate. The data set has detailed sector classification (up to four-digit NACE Rev. 2 industry classification). I drop financial firms, real-estate and government-owned firms, and use all the other sectors.[13]

I use two different samples in analysis: Full Sample and Permanent Sample. Full sample contains all firms that are present in the database for at least three years before LTV ratio cap policy, and one year when LTV ratio cap is in place. This sample includes unbalanced panels from the following countries with the relevant periods given in parentheses: Bulgaria (1997–2013), Hungary (1997–2012), Netherlands (1997–2012), Norway (2004–2013), Sweden (1998–2013) and Turkey (2003–2012). Permanent sample covers firms from the Full sample without non-consecutive yearly observations (i.e.,which appear, disappear and reappear in the sample). This sample includes balanced panels from the following countries with the relevant periods given in parentheses: Hungary (2004–2012),

[11] This table is reproduced from Table 6.1 and Table 6.2 of Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015).

[12] See Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015) for further details on the construction of percentages.

[13] I also drop firms operating in the sectors outside SNA production boundary (NACE Rev. 2 sectors T & U).

Netherlands (2000–2012), Norway (2004–2013), Sweden (1999–2012) and Turkey (2005–2012).[14]

Tables 5–6 (C.1–C.2) show the percentages of firms by firm type and country in the Full (Permanent) sample. The firms in each country's sample refer to ones with non-missing value of the variable on which the percentages are based. In the table, each cell corresponds to the share of indicated category's number of firms in total economy of the given country-period (%). In the first two panels, shares are constructed based on firm size, and firm size is measured by the logarithm of real total assets and the number of employees, respectively. In the bottom panel, firms are categorized based on firm age.

3.2 Variable Definitions

The measures of debt and firm controls that I examine in capital structure regressions are coming from the intersection of influential papers on the topic over the last two decades. In this section, I firstly provide a detailed discussion about the measures of debt, secondly I define the variables I use as firm controls in the empirical analysis.

There are differences in the composition of total debt, so the type of firm debt analyzed should base on the objective of the analysis. The objective of this analysis is to investigate how changes in firm collateral are related to changes in firm capital structure decisions. The components of debt have different relationship with firm collateral, for example trade credit use is higher in firms with low levels of pledgable assets whereas secured debt use is higher in firms with high levels of pledgable assets. The most appropriate way to analyze different debt measures would be firstly to separate total debt as "secured debt" and "unsecured debt." I do not have matched data at firm-bank level, but I can still make a plausible distinction between secured and unsecured debt. For example, "Loans" and "Trade Creditors," which are sub-accounts of current liabilities in the balance sheet can be treated as secured debt and unsecured debt, respectively. Because loans that are provided by financial institutions heavily require collateral, whereas trade credit that is provided by suppliers does not require collateral.

In addition, total debt includes items like income tax payable, social expenditure payable, pension fund provisions, which are used for other purposes rather than financing, so it may overstate the amount of financial debt. Such items are recorded in balance sheet under the account called "Other Liabilities." However, this account also covers other items such as "Other Short-term Debt," "Other Short-term Creditors," and "Other Long-term Non-Interest Bearing Debt," which are all used for financing purposes. Thus, excluding such types of debt from total debt might underestimate the amount of financial debt. None of these items are reported under "Other Liabilities" as in separate sub-accounts. Given this caveat in reporting of sub-accounts, therefore, in order to avoid any estimation errors, I use different alternative measures as follows: *TotDebt*: The sum of short-term and long-term debt; *FinDebtTOL*: Total debt excluding trade credit; *FinDebt*: Total debt excluding trade credit and other liabilities; *STFinDebt*: Short-term debt from financial institution; *STFinDebtSTOL*: Short-term Debt excluding trade credit, and *TC*: Trade Credit.[15]

[14] I apply different cleaning steps and quality checks before constructing these two samples. The details regarding all this procedure is available in the appendix.

[15] The details on the composition of liabilities are available in the appendix.

The determinants of firm financing decisions I use in the empirical analysis are the ones commonly used in the related literature. To proxy *Collateral*, I consider all types of pledgable assets that firms are able to post as collateral in loan/credit applications. In balance sheets, pledgable assets refer to total book value of tangible fixed assets ("PP&E") which are composite of net book value of land and building, net book value of machinery and equipment, and book value of other tangible assets such as plant and equipment in progress and leased assets. Thus, I define asset tangibility as the ratio of total book value of tangible fixed assets to total book value of assets and use this to measure collateral in leverage analysis. *Profitability* is the ratio of EBITDA to book value of total assets. This variable is used to measure internal finance. To proxy growth opportunities, I use *Sales Growth*, which is defined as the logarithmic difference of real sales (measured in 2005 constant dollars).[16] *Size* is logarithm of book value of total assets (measured in 2005 constant dollars). *Age* is the logarithm of (1+firm age) where firm age in period t is defined as t minus the date of incorporation plus one. To proxy firm liquidity, I use *Cash*, which corresponds to the ratio of cash and cash equivalents to book value of total assets. *Inventory* corresponds to total inventories (raw materials+in progress+finished goods), and is normalized by book value of total assets. Table 7 shows the descriptive statistics on all these variables used in the empirical analysis. In general there is a good deal of variation that allows me to show both economic and econometric inferences I study in this paper.

4 Identification

In this paper, I aim to investigate how firms' debt financing decisions respond to changes in collateral value. I focus on a sample of European countries with policy experiments of LTV ratio caps on mortgages (Bulgaria: 2004–2007, Hungary: 2010-present, The Netherlands: 2008-present, Norway: 2010-present, Sweden: 2010-present, and Turkey: 2010-present). Their policy experience provides an ideal setting for identification. Tightening of LTV ratios on mortgages affects house prices, a policy shock that is plausibly exogenous to any individual firm. This policy shock has a general equilibrium effect through the demand and supply of houses on collateral values, and it is affecting firm financing decisions through collateral channel.

My hypothesis is that if LTV ratio cap is effective in curbing borrowers' demand by tightening borrowers' capacity to borrow, this will have a negative effect on real estate prices, then firms who had higher valued collateral pre-LTV policy shock should experience a bigger drop after-LTV policy shock in their secured borrowing relative to firms who had lower valued collateral pre-LTV policy shock.

[16] Most studies in the related literature use Tobin's Q (measured as the ratio of market value of total assets to book value of total assets) to proxy profitable growth opportunities. Their analysis bases on large US firms who report their cash flow statements reported to COMPUSTAT, so those firms have information on market values. Here, I study capital structure of private firms of different sizes, and private firms do not have information on market values of assets/equity. Thus, Sales Growth is the most appropriate measure for private firms to proxy profitable growth opportunities. Similar to Sales Growth, the ratio of intangible assets to total assets can be considered as an alternative proxy for Tobin's Q. Intangible assets include R&D and advertising expenses and firms are more likely to increase such expenses when they have profitable growth opportunities. Given the limited number of firms reporting information on intangible assets in the data, I instead use Sales Growth in my empirical analysis.

In order to test this hypothesis, I develop a difference-in-difference estimation including country-year, sector-year, firm fixed effects. This estimation, by interacting firm collateral with a time dummy that separates the period before and after the LTV ratio policy shock, captures before-after shock difference in secured borrowing of firms with similar collateral on their balance sheet prior LTV policy shock. The inclusion of fixed effects is important. These absorb the impact on firms' debt financing decisions of changing country and sector conditions and factors driving both aggregate and local demand. In particular, firm fixed effects will control for unobserved, time-invariant firm characteristics. For example, if high risk taker firms hold less collateral on average, such firms might be affected differentially from LTV policy shock. In the estimation, this average affect will be fully absorbed by firm fixed effects, and will not invalidate the identification. Further, industry fixed effects at four-digit-level sector codes will absorb time-varying demand conditions, because most of demand fluctuations derive from country- and industry-specific factors, not from firm-specific factors. Any remaining variation in firm specific demand conditions does not vary systematically by the collateral value. The benchmark differences-in-differences equation is:

$$\begin{aligned} \mathrm{y}_{i,s,c,t} &= \beta_1 \mathrm{Collateral}_{i,s,c} \times \mathrm{LTV}_{c,t} + \beta_2 \mathrm{X}_{i,s,c,t} \\ &+ \mu_{c,t} + \mu_{s,t} + \mu_i + \varepsilon_{i,s,c,t}, \end{aligned} \tag{4.1}$$

where the indices i,s,c,t denote a firm, a sector, a country and a year, respectively. I use different debt measures as dependent variables: TotDebt, FinDebtTOL, and TC. X is a matrix containing standard control variables: Sales Growth, Profitability, Size, Inventory, and Cash (see section 3.2 for further details on the construction of variables).

Collateral is a dummy variable that equals one if asset tangibility is higher than the median of the distribution of this variable. I prefer using this variable as in the form of the dummy variable for two reasons. First, given the interaction specification, indicator variable makes the interpretation of the coefficient straightforward by identifying the group of interest clearly. Second, to avoid concerns about selection into becoming high collateral holder a consequence of the policy, Collateral is a predetermined firm-level dummy which bases on the value of asset tangibility three years prior to the application of LTV ratio cap.[17] $\mathrm{LTV}_{c,t}$ a dummy variable that equals to 1 in the year(s) when LTV ratio cap is in place in country c (see reference years given in Table 1). The interaction variable is the simple multiplication of these two dummy variables.

I include $\mu_{s,t}$ that captures country-year fixed effects, $\mu_{s,t}$ that controls sector-year fixed effects where sectors are classified according to four digit NACE Revision 2 codes. μ_i capture firm-specific effects, and $\varepsilon_{i,s,c,t}$ is the error term. By using firm fixed effects I will be identifying solely from firm changes over time. Therefore, I can not identify the main effect of Collateral which is absorbed by firm fixed effects because Collateral is a predetermined firm-level dummy variable. The level (direct) effect of policy shock to LTV ratio is absorbed by country-year fixed effects as other time

[17] Changes in collateral level from low to high in any years during LTV ratio cap is in place is 13 percent of observations. Collateral is a dummy variable that equals one if asset tangibility is higher than 0.15 at any time during three years prior to the application of LTV ratio cap. 0.15 corresponds to the median of the distribution of asset tangibility.

fixed effects. Both sector-year and country-year fixed effects will absorb the effects of any other industry and country level shocks as well as the effects of any year.

In this specification, the coefficient of interest is β_1. It captures the treatment effect of LTV ratio cap and equals the DD estimate. It multiplies the interaction term, which can be interpreted as dummy variable equal to one for the firms who are exposed to the treatment when LTV ratio cap is in place. Given the fact that the LTV ratio policy affects the firms with differential collateral values differently, the coefficient β_1 allows one to measure before-after shock difference in the corresponding debt measure in firms with high collateral value relative to before-after shock difference in firms with collateral value.

5 Results

5.1 Reconciling Results with Firm Capital Structure Literature

In this section, I first would like to verify that my results are consistent with those of existing papers studying the determinants of firm capital structure decisions. Using a comprehensive panel data that consists of both large firms and SMEs, I revisit stylized capital structure regressions. This exercise represents an important attempt because existing evidence bases mostly on the sample of large publicly traded firms operating in developed countries. Then, I estimate equation (4.1) without LTV interaction:

$$y_{i,s,c,t} = \beta_1 X_{i,s,c,t} + \mu_{c,t} + \mu_{s,t} + \mu_i + \varepsilon_{i,s,c,t}, \tag{5.1}$$

where the indices i,s,c,t denote a firm, a sector, a country and a year, respectively. I use different debt measures as dependent variables: TotDebt, FinDebt, FinDebtTOL, and TC. X is a matrix containing standard control variables: Collateral, Sales Growth, Profitability, Size, Inventory, Cash, and Age (see section 3.2 for further details on the construction of variables).

The above equation (4.1) includes fixed effects. Specifically, firm fixed effects will control for unobserved, time-invariant heterogeneity across firms. Industry-year fixed effects at four-digit-level sector codes will absorb time-varying sector specific conditions. Country-year fixed effects will absorb time-varying country specific conditions. As mentioned earlier, since most of the aggregate demand fluctuations derive from country- and industry-specific factors, not from firm-specific factors, country-, industry-year fixed effects will also absorb fluctuations in aggregate demand that might drive the relationship between firm debt financing decisions and any firm controls.

Table 10 reports the estimation results. In order to see whether unobserved heterogeneity drives the results or not, I firstly estimate equation 5.1 without firm- and industry fixed effects. I use standard leverage measure i.e., TotDebt in the regressions. Columns (1)–(3) show that the estimators pass "fixed-effects stress tests" of Lemmon, Roberts, and Zender (2008) because all firm-level controls are still statistically significant after the inclusion of fixed effects.[18] This result verifies

[18] Lemmon, Roberts, and Zender (2008) argue that the traditional firm-level controls in capital structure decisions become largely insignificant in explaining the variation in firm leverage when the model accounts for time invariant

that traditional determinants in capital structure decisions have ability in explaining the variation of leverage both in cross section and within the firm in the time series.

As noted in section 3.2, there are differences in the composition of total debt, so the type of firm debt analyzed should base on the objective of the analysis. The objective of this analysis is to investigate how changes in firm collateral are related to changes in firm capital structure decisions. The components of debt have different relationship with firm collateral, for example trade credit use is higher in firms with low levels of pledgable assets whereas debt use from financial institutions is higher in firms with high levels of pledgable assets. Therefore, I estimate equation 5.1 individually for different debt measures.

Column (3)–(6) correspond to debt measures i.e., total debt (TotDebt), total debt excluding trade credit (FinDebtTOL), total debt excluding trade credit and total other liabilities (FinDebt), and trade credit (TC), respectively. As dependent variables in the estimation, they are all normalized by total assets. Further details on the composition of debt measures are given in the appendix. [19]

The results mirror previous work on related literature. The positive and statistically significant coefficient on "Collateral" in Columns (3)–(5) suggest that if a large fraction of a firm's assets are tangible, those assets can be pledged as collateral diminishing the risk of agency costs on debt. Therefore, firms can issue more debt given the lenders be more willing to supply funds. On the other hand, negative coefficient on collateral in Column (6) suggests that trade credit use is lower in firms with higher levels of collateral.[20] Trade credit is an expensive form of finance, so firms with higher levels of collateral appear to use more from other sources of finance.

According to the results, more profitable firms have lower debt of any form, consistent with theoretical predictions in the literature. According to pecking order theory, firms prefer internal funds rather than debt since internal funds have no adverse selection problem (Myers and Majluf (1984)). In other words, highly profitable firms use less debt (more internal equity).

Further, I find a positive and statistically significant coefficient on Sales Growth, suggesting that growing firms use higher debt of all types in order to take advantage of investment opportunities they face. This finding follows Kalemli-Ozcan, Laeven, and Moreno (2015). Using a comprehensive sample of European firms,[21] they show that in the run-up to the crisis, a typical European firm increasingly issues debt to utilize profitable investment opportunities (proxied by Sales Growth). The relevant literature is not able to find such a positive relationship between investment opportunities and debt financing. The existing papers mostly utilize Compustat data, representing only a typical

firm effects.

[19] As it can be inferred from Table 7, there is a significant number of zero observations in terms of bank loans (both short-term and long-term financial loans i.e., STFinDebt, LTFinDebt). In case FinDebt is used as dependent variable in the estimation, the dependent variable is censored from left, and thus tobit model would be rather an appropriate one. However, within a tobit model, I can not control for μ_i and $\mu_{s,t}$ by means of a dummy variable approach (incidental parameters problem), and no tobit model analogous to the "fixed-effects" logit exists. Honoré (1992) has proposed a "fixed effects" tobit that does not impose distributional assumptions. However, it is hard to implement, and partial effects can not be estimated. I therefore do not try his approach. Alternatively, I estimate tobit model of benchmark leverage regression only with country dummies and compare it with simple pooled OLS. The inferences from these two models are similar.

[20] Trade credit is negatively correlated with collateral levels, supporting the implications of the theoretical model developed in Cunat (2007).

[21] The structure of their sample is similar to the one I use in this paper since their sample is constructed based on ORBIS–AMADEUS, as in this paper.

large publicly traded company in US, thus fail to provide evidence on SME finance.

Firm size has been empirically found to be positively related to capital structure. Most of the studies in the literature use cross-sectional variation and interpret the positive coefficient on "Size" as larger firms are highly leveraged. However, in this paper, I use within-firm variation and interpret the same coefficient as firms get bigger, they increase debt. The results show a positive coefficient for all types of debt except TotDebt and FinDebtTOL (Column (3)–(4)). As noted in section 3.2, these two measures are the most comprehensive debt measures due to the inclusion of total other liabilities (TOL). This account includes items like income tax payable, social expenditure payable, pension fund provisions, which are used for other purposes rather than financing, thus the extent of such items in these two measures might affect the relationship.

I also study the usage of trade credit within firms by including additional control variables. The result in column (6) shows that firms use more trade credit when they have higher level of inventories, reflecting a positive correlation between firm activity and trade credit use. The result on the "Inventory" variable also could be related to the use of inventories as collateral. The negative coefficient on "Cash" variable suggests that firms increase trade credit use when they face additional liquidity needs.[22]

The first two columns provide results where age is also an explanatory variable in benchmark capital structure equation. In all other regressions, age is not available because it is a firm specific linear time trend, and is absorbed by firm and year fixed effects. Given the caveat in interpreting the coefficient on age in the regressions without firm fixed effects, the negative coefficient on age suggests that as firms age, they issue more equity, but less debt.

The economic effects of firm-level determinants of capital structure decisions are reported in square brackets under standard errors in columns (3)–(6) of Table 10. The relevant percentages highlight the economic importance of firm controls as determinants of firm debt, indeed collateral (proxied by asset tangibility) appears to be the key determinant of debt of any form. For example, in column (4), the economic effect of collateral is displayed in terms of percentage change in debt to its sample mean as each regressor increases from the 25th to the 75th percentile (1-IQR change), while all other variables are kept at their sample mean. To be precise, a 1-IQR change in firm collateral leads debt (measured by FinDebtTOL) to increase by 0.089, which is a 17.43% increase relative to the sample mean debt of 0.51.

5.2 Collateral and Firm Leverage: The Impact of LTV Ratio Cap Policy

As discussed in section 4 in detail, my hypothesis is that if LTV ratio cap is effective in curbing borrowers' demand by tightening borrowers' capacity to borrow, this will have a negative effect on real estate prices, then firms who had higher valued collateral pre-LTV policy shock should experience a bigger drop after-LTV policy shock in their secured borrowing relative to firms who had lower valued collateral pre-LTV policy shock. In order to test this hypothesis, I estimate

[22] In unreported results, I rerun column (6) by including the measures of short-term financial debt (e.g., STFinDebt and STFinDebtSTOL). The negative coefficients on those measures show that firms use more trade credit when they have lower level of short-term finance in other forms i.e. bank loans, reflecting that trade credit can serve as a substitute for short-term financial debt.

equation (4.1).

Table 11 shows the main results. According to the results in column (1), I find a significant collateral damage effect on firm leverage (TotDebt) after LTV ratio cap. This effect is different for firms with differential collateral values: LTV ratio cap decreased leverage in firms with high collateral value by 0.9 percentage point more than in firms with low collateral value.

In order to fully assess the impact of collateral damage on firms' financing decisions, all sources of external finance must be considered. One type of lending might substitute for another type of lending, one type of lender might substitute for another type of lender. Trade credit usage is immanent. As shown in Table 4, with the exception of Hungary, trade credit accounts for at least roughly one-fourth of the total debt of a representative firm and about one-third of the short-term debt. Second, besides trade credit, alternative sources of finance are mostly unavailable to firms of the European countries that I focus on: the development of the stock and bond markets is modest. Then, did firms that experienced a collateral damage after LTV ratio cap turn to trade credit as an alternative source of finance?

To the extent that credit to firms are more likely to be rationed by financial institutions, the impact of collateral damage (as a consequence of LTV ratio cap) will be magnified, and the net impact will be determined by the extent to which trade credit use offsets financial credit. According to the results in columns (2)–(3), collateral damage caused debt use on secured basis to decrease in firms with high collateral value by 1.2 percentage points more than in firms with low collateral value, whereas it caused trade credit use to increase in firms with high collateral value by 0.2 percentage points more than in firms with low collateral value.

Columns (5)–(6) correspond to the debt measures divided by total debt as the dependent variable. The evolution of these variables show the relative changes with respect to other debt sources. The results suggest that LTV ratio cap decreased the proportion of secured debt use (FinDebtTOL) in total debt in firms with high collateral values by 0.5 percentage point more than in firms with low collateral values, whereas it increased the proportion of trade credit use (TC) in total debt in firms with high collateral values by 0.5 percentage point more than in firms with low collateral values. In combination, these results verify the predictions I just stated above.

Does the amount of cash on hand influence trade credit use in the years when LTV ratio cap is in place? If a firm views trade credit as an alternative but expensive source of finance, I should find cash-rich firms increase trade credit to a smaller extent. Therefore, I estimate equation (4.1) using cash as an indicator of liquidity to test this hypothesis. Cash is a predetermined firm-level dummy which bases on the ratio of cash holding to total assets three years prior to the application of LTV ratio cap.[23] The pre-LTV level of cash is absorbed by firm fixed effects, and thus I can only observe the differential responses to LTV ratio cap. The results reported in columns (4) and (7) suggest that cash-rich firms increase their reliance on credit from suppliers to a smaller extent in the years when LTV cap is in place.

As shown in Table C.6 in the appendix, results are not driven by entry and exit into the sample,

[23]Cash is a firm-level dummy variable that equals one if the ratio of cash holdings to total assets is higher than 0.34 at any time during three years prior to the application of LTV ratio cap. 0.34 corresponds to the 75th of the distribution of this variable.

and are robust to consider a continuous sample of firms (see section 3.1 for details on the construction of permanent sample). In Table 12, I also conduct a placebo test using years prior to LTV ratio cap as the policy years (Bulgaria: 2002–2003, Hungary: 2005–2006, The Netherlands: 2005–2006, Norway: 2008–2009, Sweden: 2005–2006, and Turkey: 2008–2009) and I can not find that firms change their debt financing decisions as they do after-LTV policy shock.

5.3 Collateral and Firm Leverage: Average Effects by Different Size Deciles

So far I work with a linear specification to identify the impact of asset tangibility on firm debt financing. This specification delivers useful insights for the average firm in the sample. However, there are issues I need to account for while studying firm capital structure. As mentioned earlier, the industrial structure of the economies studied in this paper are tilted toward SMEs (see e.g., Table 3) and SME finance is more complex than large firm finance (Berger and Udell (1998), Berger and Udell (2006)).[24] For this reason, I turn to a specification where the effect of firm collateral on debt is estimated nonlinearly. This is done with a regression of the form:

$$\begin{aligned} y_{i,s,c,t} &= \beta_1 \text{Collateral}_{i,s,c,t} + \sum_{k=2}^{10} \beta_k \times D_{k,t} \times \text{Collateral}_{i,s,c,t} + \sum_{k=11}^{20} \beta_k \times D_{k,t} \\ &+ +\beta_{11} X_{i,s,c,t} + \mu_{c,t} + \mu_{s,t} + \mu_{k,t} + \mu_i + \varepsilon_{i,s,c,t}, \end{aligned} \tag{5.2}$$

where the indices i,s,c,t denote a firm, a sector, a country and a year, respectively. X is a matrix containing standard control variables: Sales Growth, Profitability, Size. $D_{k,t}$ is a time-varying dummy variable that takes value 1 for all firms that fall in decile k of the size distribution in the given year t. In this way, collateral effect is estimated separately for each size class. Further, $D_{k,t}$ should be interpreted as size-year fixed effects will control for all the time varying differences between firms of different size.

Table 13 corresponds to dependent variables i.e. FinDebt, FinDebtTOL, and TC. Collateral is the ratio of tangible fixed assets to total assets. Collateral×size decile=k is the additional effect of collateral over and above the baseline effect for first decile firms captured by the variable collateral, and are reported in the first columns. Latter columns report the overall effect of collateral for a firm of decile k. The corresponding p-value from an F test with the null hypothesis that this effect is zero is given in the square parentheses in bold.

For secured debt obligations (FinDebt, FinDebtTOL), the results show that the impact of asset tangibility on debt capacity is pronounced across all firms of different sizes, but less pronounced across very small and large firms. This finding follows the conventional wisdom. Large firms are typically old, reputable, and less vulnerable to imperfections in credit markets, and hence they borrow with higher LTV ratios (lower collateral) in private debt markets since lenders generally consider

[24] For example, the finance of very small firms with no track record and no collateral rely on insider funds (from start-up team, family, friends), trade credit and/or angel finance. As firms grow and accumulate collateral and track record, they access to intermediated finance from both equity and debt markets (i.e venture capital and loans from financial institutions). Large firms of known risk and track record issue commercial paper and/or obtain funds from public equity and debt markets in addition to loans from financial institutions.

them as low-risk borrowers.[25] For example, Berger and Udell (1998, 1995) with US data show that loans to low-risk borrowers are less likely to be collateralized. Similarly, Jimenez, Salas, and Saurina (2006) with Spanish data provide direct evidence of negative association between collateral and a borrower's risk.

The results for very small firms[26] suggest that the interpretation of the role of asset tangibility in determination of firms' borrowing capacity should be done with caution: asset tangibility does not inversely measure the extent of financing constraints, but rather measures firms' ability to pledge collateral. Firms' ability to pledge collateral increases firms' borrowing capacity to the extent that tangible assets on firms' balance sheet are liquid (e.g., Campello and Giambona (2013)).

Finally, columns (5) and (6) correspond to unsecured debt obligations (TC). The results show that the impact of asset tangibility on debt capacity is pronounced across all firms of different sizes. However, I do not observe a strong cross-sectional variation as I do in case of secured borrowing. The results suggest that firm heterogeneity (captured by firm size) does not play a strong role in determining trade credit use in firms with similar collateral on their balance sheet. This finding can be explained by the possibility that trade creditors act as "relationship lenders." Trade creditors have proprietary information about their customers and they are better positioned to repossess and resell the supplied goods (e.g., Mian and Smith (1992) McMillan and Woodruff (1999))), thus trade creditors might have an advantage over other lenders in providing credit to firms of all sizes including SMEs.

5.4 Collateral and Firm Leverage: Heterogenous Responses to LTV Ratio Cap Policy

In light of the results I discussed in the previous section, my hypothesis is that if the impact of asset tangibility on debt capacity is less pronounced across very small and large firms, I argue that firms of medium size deciles ("SME") should experience a bigger drop in their secured borrowing relative to firms of bottom and top size deciles ("VerySmall–Large") who had similar collateral damage on their balance sheet after-LTV policy shock.

In order to test this hypothesis, I turn to a triple differences-in-differences specification. I justify this specification by the use of medium-year fixed effects that capture all time varying differences between "SME" firms and "VerySmall–Large" firms. The estimation:

$$\begin{aligned} \mathrm{y}_{i,s,c,t} &= \beta_1 \mathrm{SME}_{i,s,c} \times \mathrm{Collateral}_{i,s,c} \times \mathrm{LTV}_{c,t} \\ &+ \beta_2 \mathrm{Collateral}_{i,s,c} \times \mathrm{LTV}_{c,t} + \beta_2 \mathrm{X}_{i,s,c,t} \\ &+ \mu_{\mathrm{sme},t} + \mu_{c,t} + \mu_{s,t} + \mu_i + \varepsilon_{i,s,c,t}, \end{aligned} \tag{5.3}$$

[25] In the sample, on average, large firms are 28,5 years old whereas the others in the lower deciles are 14,6 years old. The difference between these means is significant at the 1 percent level.

[26] The firms in bottom deciles (up to 7th decile) correspond to the majority of micro enterprises (0–9 employees), whereas the firms in the middle deciles (7th–9th deciles) correspond to the majority of SMEs (10–249 employees) in the sample. Furthermore, the firms in the bottom deciles are on average younger (13,6 years old) than the firms in the middle deciles (18,5 years old). The difference between these means is significant at the 1 percent level.

where the indices i,s,c,t denote a firm, a sector, a country and a year, respectively. X is a matrix containing standard control variables (Sales Growth, Profitability, Size for TotDebt and FinDebt-TOL; Sales Growth, Profitability, Size, Inventory and Cash for TC). To avoid selection concerns, I also use predetermined firm-level dummy to define "SME" firms.[27] $\mu_{\text{sme},t}$ are sme-year fixed effects.

Triple interaction term in equation (5.3) turns out to be important for identification. To see why, I compare the interpretation of coefficients in equation (4.1) to those of equation (5.3). In equation (4.1), β_1 captures the treatment effect of LTV ratio cap for typical firm holding high level of collateral. This is not the case for β_1 in equation (5.3) because now this coefficient reflects the treatment effect *only* for a typical "SME" firm with similar collateral value. Therefore, to understand how the treatment effect of LTV ratio cap varies with firm size, one should the compare β_1 to β_2. For example, β_1 compared to β_2 would be the incremental effect of being "SME" firms during the year(s) in which LTV ratio cap is in place.

Table 14 reports the estimation results. The results verify the validity of the hypothesis stated above. For example, the results in column (1) show that LTV ratio cap decreased leverage in "SME" firms with high collateral value by 1.2 percentage points more than in "VerySmall–Large" firms with high collateral value. However, firms of different size did not behave differently in terms of trade credit use after they experienced a collateral damage (e.g., in column (3), β_2 is very small i.e., -0.0002). Table 15 shows that the results are not driven by "Large"[28] firms, and are robust to the exclusion of large firms.

5.5 Aggregate Implications

The results presented in the previous sections suggest a significant collateral damage effect on firms' debt financing decisions after LTV policy shock. In this section, I will conduct a back-of-envelope calculation to link micro estimates I obtained from the difference-in-difference estimation to the actual corporate leverage patterns observed in the aggregate data. Doing so, if there observed a decline in aggregate corporate leverage after LTV policy shock, I will thus be able to gauge how the collateral damage effect contributed to this decline.

To construct aggregate measures, I use official statistics from Eurostat. Eurostat provides country-level balance sheets that have information on non-financial assets, financial assets and financial liabilities. However, the accounts from Eurostat's balance sheets are structured differently than those I have from firm-level balance sheets. In order to precisely compare the firm-level measures from ORBIS–AMADEUS data with the aggregate measures from Eurostat data, I work on a detailed correspondence of the accounts from these two data sets.[29]

I cannot proceed with the analysis of aggregate implications of LTV policy using the pooled

[27] SME equals one if the given firm's size (measured by logarithm of real total assets) is between 75^{th}–95^{th} percentiles of the distribution at any time during the three years prior to the introduction of LTV ratio cap.

[28] "Large" firms refer to firms of top size deciles

[29] Statistics on financial balance sheets come from Eurostat. To construct "Total Financial Liabilities" for non-financial corporations, I sum of F3: "Securities other than shares," F4: "Loans," "F6:Insurance premiums", and F7: "Other accounts receivable/payable." This summation would correspond to "TotDebt" in ORBIS–AMADEUS. Next, to construct "Total Assets," I sum of F_AS: "Financial Assets," and T11: "Total Fixed Assets, (net)." This summation would correspond to "TOAS" in ORBIS–AMADEUS. See http://ec.europa.eu/eurostat/data/database?node_code=nasa_f_bs for further details

sample of six European countries since Eurostat does not provide full information for some countries in the pooled sample.[30] Then, I proceed with the analysis of Sweden, which has the better coverage in both data sets. I rewrite equation (4.1) using benchmark leverage measure i.e. TotDebt (the ratio of total debt to total assets):

$$\text{TotDebt}_{i,s,t} = \beta_1 \text{Collateral}_{i,s} \times \text{LTV}_t + \beta_2 \text{X}_{i,s,t} + \mu_i + \mu_{s,t} + \varepsilon_{i,s,t}, \tag{5.4}$$

where the indices i,s,t denote a firm, a sector and a year, respectively. X is a matrix containing standard control variables: Sales Growth, Profitability, Size.

In order to sum of collateral damage effect across all Swedish firms (without grouping them based on their collateral values), I first use Collateral as continuous firm-level variable, which is defined by the ratio of tangible fixed assets to total assets. Second, to avoid concerns that the share of tangible fixed assets in total assets might have been changed as a consequence of the policy, I compute firm-level average of this ratio for the 1998–2007 period that excludes all three years prior the introduction of LTV ratio cap in 2010. In the estimation, I cannot identify the main effect of Collateral because Collateral is proxied by the firm-level average ratio of tangible assets to total assets, which is absorbed by firm fixed effects. The level (direct) effect of policy shock to LTV ratio is absorbed by sector-year fixed effects as other time fixed effects. Sector-year fixed effects will absorb the effects of any other industry shocks as well as the effects of any year.

Third, I sort all firms in ascending order based on Collateral. I denote the before-after LTV policy shock difference in firm leverage as $\Delta\text{TotDebt}_{i,s}$. Then, based on equation (5.4), the difference in the before-after LTV policy difference in firm leverage in two consecutive firms is expressed in the below:

$$\Delta\text{TotDebt}_{i,s} - \Delta\text{TotDebt}_{i-1,s} = \beta_1(\text{Collateral}_{i,s} - \text{Collateral}_{i-1,s}), \tag{5.5}$$

Further, I define the aggregate effect of LTV policy shock as:

$$\Delta\text{TotDebt} = \sum_{i \geq 0} \omega_{i,s} \Delta\text{TotDebt}_{i,s}, \tag{5.6}$$

where $\omega_{i,s}$ indicates the share of tangible fixed assets of firm i in aggregate tangible fixed assets.[31] The empirical methodology I use estimates the differential effect of LTV policy shock across firms

[30] For instance, Eurostat does not provide information on non-financial assets for Bulgaria, Norway and Turkey, which prevents me from computing aggregate total assets.

[31] Statistics on the components total non-financial assets come from Eurostat. They are disaggregated by industry based on NACE Revision 2. Before, summing the values over sectors, I exclude non-overlapping sectors that are not used in the analysis: K: " Financial and insurance activities," L: "Real estate activities," T: "Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use," and "U: Activities of extraterritorial organisations and bodies." To construct "Tangible Fixed Assets (Net)," I take the difference between T11: "Total Fixed Assets (Net)" and T112: "Intangible Fixed Assets." See http://ec.europa.eu/eurostat/data/database?node_code=nama_t20_21_c for further details.

with different collateral values. In order to pin down the level effect of this policy shock, I assume that the before-after LTV policy shock difference in firm leverage equals zero for the firm with the lowest collateral value. Then, I have this equality:

$$\Delta \text{TotDebt}_{i,s} \quad = \quad \beta_1(\text{Collateral}_{i,s} - \text{Collateral}_0) \quad \text{for i} > 0, \tag{5.7}$$

Thus, I find the lower bound of aggregate effect of LTV policy shock on firm leverage by estimating the below equation:

$$\Delta \text{TotDebt}_{i,s} \quad = \quad \beta_1 \sum_{i \geq 0} \omega_{i,s}(\text{Collateral}_{i,s} - \text{Collateral}_0). \tag{5.8}$$

According to the estimation results of equation (5.4), β_1 equals to -0.032 (see Table 16). Further, based on calculations, second term in RHS of equation (5.8) equals to 0.026. Then, aggregate effect of the LTV ratio cap in Swedish corporate sector is -0.08% (=-0.032*0.026).

Based on aggregate statistics from Eurostat, I compute the average before-after LTV policy shock difference in aggregate corporate leverage (i.e., the ratio of aggregate corporate financial liabilities to aggregate corporate assets[32]) over the 1998–2013 period. It equals to -0.5% (=0.351-0.356). Thus, the LTV ratio cap that resulted in collateral damage explains 16% (=0.08%/0.5%) of the decline in aggregate corporate leverage.

6 Conclusion

This paper investigates how firms' capital structure decisions respond to changes in the value of firm collateral, caused by real estate price shock. Through the collateral channel, shocks to the value of real estate can have a significant impact on the firms' borrowing capacity. I provide evidence on this mechanism by using LTV ratio caps on mortgages in a number of European countries as policy shocks that affect real estate prices. In the analysis, I conduct a difference-in-difference exercise using a unique and comprehensive micro panel data covering both large firms and SMEs. This allows me to better identify and quantify the effects of policy shocks to the value of firm collateral on debt financing by distinguishing them from local demand shocks and local general equilibrium effects. I find a significant collateral damage effect on firms' debt financing decisions: LTV ratio cap caused secured debt to decrease in firms with high collateral value more than in firms with low collateral value.

Further, I investigate how shocks to the value of collateral affect firms' choice between secured and unsecured debt financing. I find that firms that experienced a collateral damage after LTV ratio cap turned to trade credit as an alternative source of finance: collateral damage caused trade credit use to increase in firms with high collateral value more than in firms with low collateral value. These findings document a new evidence on how firms adjust to collateral shocks through trade

[32] See footnote 29 for details on the construction of this ratio

credit use.

I believe that this paper has important implications on the role of collateral pledging in transmitting boom-bust cycles in real estate markets to the corporate sector. The inclusion of SMEs in the analysis is crucial given the structure of European economies. Europe consists of bank-dominant economies tilted toward externally dependent SMEs. Among all sources of external financing, European firms typically prefer debt financing to fund working capital and/or investment. European banks heavily prefer real-estate as collateral especially for SMEs. In order to minimize dependency of SME finance on collateral pledging, and broaden SMEs' access to funding, policy makers should develop alternative policies. For example, SME loan guarantee schemes enable SMEs to borrow more than would otherwise be possible based on their collateral. They might help mitigating the aggregate effects of collateral damage caused by real estate price shock.

This paper also highlights that macroprudential policies in one sector–such as LTV ratio caps on mortgages targeting household sector–might result in an unintentional consequence in another sector–such as collateral damage in corporate sector. This is an important caveat that policy makers should consider when implementing macroprudential policy.

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7 Tables & Figures

Table 2: Coverage in Total Economy Based on Gross Output

YEAR	BG	HU	NL	NO	SE
1999		0.79	0.17	0.63	0.52
2000		0.84	0.21	0.63	0.56
2001		0.71	0.2	0.77	0.6
2002	0.57	0.73	0.22	0.79	0.63
2003	0.6	0.66	0.21	0.65	0.65
2004	0.79	0.76	0.22	0.67	0.67
2005	0.83	0.8	0.23	0.69	0.68
2006	0.84	0.81	0.25	0.67	0.71
2007	0.91	0.79	0.25	0.71	0.7
2008	0.94	0.75	0.28	0.59	0.73
2009	0.92	0.87	0.31	0.78	0.87
2010	0.96	0.76	0.35	0.79	0.88
2011	0.88	0.72	0.3	0.72	0.82
2012	0.88	0.82	0.28	0.67	0.76

Notes: Table 2 presents the ratios that are calculated based on gross output. The total sample consists of firms that report data with positive values of the corresponding measure (i.e. gross-output). The country codes within these classifications are as follows: BG (Bulgaria), HU (Hungary), NL (Netherlands), NO (Norway), HU (Hungary) and SE (Sweden). BvD provides firm-level information on gross-output for all sectors of a given European country between 1999–2012, however Eurostat SBS data provides information on gross output with the exceptions of some sectors. So, for a given country-year, total economy percentages are computed by taking the ratio of aggregated gross output values where aggregated gross output is computed by totalling gross output over these sectors for which gross-output related variable is available in both data sets. For further details on the construction of percentages, see Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015).

Table 3: Size Distribution in terms of Total Economy, 2010

	BG	HU	NL	NO	SE	TR
Panel A: Eurostat SBS						
Micro	91.2	94.6	93.6	91.6	94.5	n.a.
SMEs	8.6	5.2	6.2	8.2	5.4	n.a.
Large	0.2	0.1	0.2	0.2	0.2	n.a.
	BG	HU	NL	NO	SE	TR
Panel B: ORBIS–AMADEUS						
Micro	90.9	77.7	84.8	91.2	91.2	47.9
SMEs	8.9	21.6	14.7	8.2	8.2	46.4
Large	0.2	0.7	0.5	0.6	0.6	5.7

Notes: In Table 3, each cell corresponds to the share of indicated size category's number of firms in total economy from the relevant data source for the given country in 2010 (%). Number of firms is summed over overlapping sectors with Eurostat SBS data. In each panel, the first three rows report the percentages from ORBIS-AMADEUS and the next three rows are the same percentages from Eurostat's SBS data. Each column is a different country with the following codes: BG (Bulgaria), NL (Netherlands), NO (Norway), HU (Hungary), RO (Romania), SE (Sweden), and TR (Turkey). Micro corresponds to firms with employees less than 10, SMEs corresponds Small and Medium Enterprises with employees between 10 and 249, and Large corresponds to firms with 250 employees or more. For further details on the construction of percentages, see Kalemli-Ozcan, Sorensen, Villegas-Sanchez, Volosovych, and Yesiltas (2015).

Table 4: Relative size of Trade Credit (average over firms)

Country	Dataset	Trade credit/assets (%)	Trade credit/total debt (%)	Trade credit/Short term debt (%)
Bulgaria	ORBIS-AMADEUS	19	33	43
Hungary	ORBIS-AMADEUS	3	4	6
Netherlands	ORBIS-AMADEUS	12	19	27
Norway	ORBIS-AMADEUS	15	20	26
Sweden	ORBIS-AMADEUS	11	19	26
Turkey	ORBIS-AMADEUS	23	40	47
United States	NSSBF	17	35	50

Notes: ORBIS–AMADEUS, Bureau Van Dijk database contains data on firms of all sizes for the given European country; NSSBF, National Survey on Small Business Finance 4630 small and medium US firms. ORBIS–AMADEUS covers years 1997-2013 for Bulgaria and Hungary; 1997-2012 for Netherlands; 2004-2012 for Norway; 1998-2013 for Sweden; 2003-2012 for Turkey, and NSSBF is a 1998 cross-section

Table 5: Percentage of Firms in Full Sample-By Firm Type and Country

Country	Pooled	BG	HU	NL	NO	SE	TR
Period	1997-2013	1997-2013	1997-2013	1997-2012	2004-2012	1998-2013	2003-2012
Panel A: Total Assets							
All	285,204	7,924	54,772	5,212	75,302	137,829	4,165
Small	75.0	83.8	81.2	3.5	72.5	77.8	18.4
	(213,858)	(6,643)	(44,492)	(181)	(54,570)	(107,207)	(765)
Medium	20.1	13.5	15.5	26.4	23.6	19.4	44.3
	(57,338)	(1,069)	(8,508)	(1,376)	(17,740)	(26,798)	(1,847)
Large	4.9	2.7	3.2	70.1	4.0	2.8	37.3
	(14,008)	(212)	(1,772)	(3,655)	(2,992)	(3,824)	(1,553)
Panel B: Employment							
All	235,792	3,850	28,033	4,958	60,456	136,847	1,648
Micro	73.0	47.4	57.9	11.2	70.1	81.0	14.5
	(172,086)	(1,824)	(16,242)	(554)	(42,408)	(110,819)	(239)
SMEs	25.5	42.1	39.9	68.5	29.1	18.4	67.9
	(60,089)	(1,620)	(11,174)	(3,397)	(17,622)	(25,157)	(1,119)
Large	1.5	10.5	2.2	20.3	0.7	0.6	17.6
	(3,617)	(406)	(617)	(1,007)	(426)	(871)	(290)

To be Continued.

Table 6: Percentage of Firms in Full Sample-By Firm Type and Country

Country	Pooled	BG	HU	NL	NO	SE	TR
Period	1997-2013	1997-2013	1997-2013	1997-2012	2004-2012	1998-2013	2003-2012
Panel C: Age							
All	279,728	3,152	54,142	5,203	75,293	137,773	4,165
Infant	10.2	14.1	9.8	2.9	17.2	6.9	5.2
	(28,568)	(443)	(5,297)	(150)	(12,979)	(9,481)	(218)
Adolescent	11.4	21.5	13.5	4.5	12.5	10.1	6.9
	(31,833)	(677)	(7,310)	(235)	(9,409)	(13,915)	(287)
Middle-aged	69.6	49.0	76.7	43.7	70.2	68.0	67.5
	(194,745)	(1,543)	(41,519)	(2,272)	(52,870)	(93,731)	(2,810)
Old	8.8	15.5	0.0	48.9	0.0	15.0	20.4
	(24,582)	(489)	(16)	(2,546)	(35)	(20,646)	(850)

Notes: Tables 5–6 show the percentages of firms by firm type and country. The firms in each sample refer to ones with non-missing value of the variable on which the percentages are based. In both tables, each cell corresponds to the share of indicated category's number of firms in total economy of the given country-period (%). In Table 5, shares are constructed based on firm size, and firm size is measured by the logarithm of real total assets and the number of employees, respectively. In Table 6, firms are categorized based on firm age. In Table 5, firm size categories are constructed based on predetermined dummies that each equals one if the firm satisfies the criterion for the corresponding firm category at any time during the three years prior to the introduction of LTV ratio cap: Small equals one if the given firm's size is below 75^{th} percentile of the distribution, Medium equals one if the given firm's size is between 75^{th}–95^{th} percentiles of the distribution, and Large equals one if the given firm's size is above 95^{th} percentile of the distribution. Micro equals one if the given firm has employees less than 10, SMEs equals one if the given firm has employees between 10 and 249, and Large equals one if the given firm has employees higher than 250. In Table 6, Infant equals one if the given firm's age is between 0–2, Adolescent equals one if the given firm's age is between 3–4, Middle-aged equals one if the given firm's age is between 5–24, and Old equals one if the given firm's age is 25 or above. Numbers in parentheses refer to the total number of firms with non-missing value of the variable on which the percentages are based.

Table 7: Descriptive Statistics: Full Sample

Sample: Full
Period: 1997–2013
Countries: BG, HU, NL, NO, SE, TR

Variable	Mean	Median	Std. Dev.	25th Pct.	75th Pct.
TotDebt	0.62	0.61	0.36	0.4	0.8
FinDebt	0.13	0	0.2	0	0.22
FinDebtTOL	0.51	0.48	0.34	0.29	0.67
STFinDebt	0.022	0	0.058	0	0
STFinDebtSTOL	0.32	0.27	0.24	0.15	0.44
TC	0.11	0.057	0.13	0.0067	0.16
Collateral	0.26	0.15	0.26	0.035	0.43
Sales Growth	0.015	0.0079	0.47	-0.12	0.15
Profitability	0.12	0.12	0.19	0.038	0.22
Size	13	13	1.6	12	14
Cash	0.21	0.13	0.22	0.031	0.33
Inventory	0.16	0.05	0.22	0	0.25
Age	2.6	2.7	0.64	2.2	3

Notes: Table 7 reports descriptive statistics of main variables used in the empirical analysis for Full Sample. Debt measures are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit; FinDebt: Total debt excluding trade credit and other liabilities; STFinDebt: Short-term debt from financial institution; STFinDebtSTOL: Short-term Debt excluding trade credit, and TC: Trade Credit. Debt measures are all divided by total assets. Further details on the composition of debt measures are given in the appendix. Collateral is the ratio of total tangible fixed assets to total assets. Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Age is the logarithm of (1+firm age) where firm age in period t that is defined as t minus the date of incorporation plus one. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets.

Table 8: Composition of Liabilities-By Firm Type

Sample: Full Period: 1997–2013 Countries: BG, HU, NL, NO, SE, TR	All		Small		Medium		Large	
(% of Total Liabilities)	Mean	Median	Mean	Median	Mean	Median	Mean	Median
STFinDebt	0.03	0	0.023	0	0.045	0	0.063	0
TC	0.11	0.051	0.1	0.04	0.12	0.08	0.11	0.075
STOL	0.54	0.53	0.57	0.58	0.47	0.43	0.46	0.42
LTFinDebt	0.14	0	0.13	0	0.18	0	0.12	0
LTOL	0.11	0	0.11	0	0.095	0	0.16	0.051

Notes: Table 8 reports descriptive statistics of debt measures by different firm size groups. Debt measures are defined as follows. STFinDebt: Short-term debt from financial institutions; TC: Trade Credit, STOL: Other Short-term Liabilities, LTFinDebt: Long Term Interest Bearing Debt, LTOL: Other Long-term Liabilities, and TC: Trade Credit. Further details on the composition of debt measures are given in the appendix.

Table 9: Cash and Collateral Holdings-By Firm Type

Sample: Full Period: 1997–2013 Countries: BG, HU, NL, NO, SE, TR	All		Small		Medium		Large	
(% of Total Assets)	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Collateral	0.26	0.15	0.25	0.13	0.28	0.18	0.27	0.2
Inventory	0.16	0.05	0.15	0.03	0.17	0.09	0.17	0.12
Cash	0.22	0.13	0.25	0.17	0.15	0.083	0.092	0.035

Notes: Table 9 reports descriptive statistics of cash and collateral holdings by different firm size groups. Collateral is the ratio of total tangible fixed assets to total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Debt measures are all divided by total assets.

Table 10: Firm Capital Structure Regressions

Sample: Full Period: 1997–2013 Countries: BG, HU, NL, NO, SE, TR						
Dep. Var.:	TotDebt (1)	TotDebt (2)	TotDebt (3)	FinDebtTOL (4)	FinDebt (5)	TC (6)
Collateral	0.156*** (0.002)	0.160*** (0.002)	0.157*** (0.003) [6.58%] **[10.00%]**	0.225*** (0.000) [11.47%] **[17.43%]**	0.281*** (0.002) [56.20%] **[85.38%]**	-0.080*** (0.001) [-18.91%] **[-28.15%]**
Profitability	-0.567*** (0.004)	-0.536*** (0.004)	-0.352*** (0.003) [-10.79%] **[-10.33%]**	-0.274*** (0.005) [-10.21%] **[-9.78%]**	-0.092*** (0.001) [-13.45%] **[-12.88%]**	-0.068*** (0.001) [-11.13 %] **[-11.31%]**
Sales Growth	0.074*** (0.001)	0.071*** (0.01)	0.043*** (0.001) [3.26%] **[1.87%]**	0.026*** (0.001) [2.40%] **[1.38%]**	0.003*** (0.000) [1.08%] **[0.62%]**	0.017*** (0.000) [7.11 %] **[4.17%]**
Size	-0.019*** (0.001)	-0.021*** (0.001)	-0.009*** (0.001) [-2.32%] **[-2.90%]**	-0.013*** (0.001) [-4.08%] **[-5.10%]**	0.032*** (0.002) [39.38%] **[49.23%]**	0.003*** (0.000) [4.36 %] **[5.45%]**
Inventory						0.034*** (0.002) [6.49%] **[7.73%]**
Cash						-0.042*** (0.001) [-8.40 %] **[-11.38%]**
Age	-0.050*** (0.002)	-0.049*** (0.001)				
Observations	1,555,196	1,555,196	1,581,186	1,581,186	1,581,186	1,513,978
R^2	0.17	0.21	0.82	0.77	0.81	0.77
Firm Fixed-Effects	no	no	yes	yes	yes	yes
Sector Fixed-Effects	no	yes	no	no	no	no
Country Fixed-Effects	yes	yes	no	no	no	no
Year Fixed-Effects	yes	yes	no	no	no	no
Sector×year Fixed-Effects	no	no	yes	yes	yes	yes
Country×year Fixed-Effects	no	no	yes	yes	yes	yes

Notes: Table 10 reports the results of the estimation of equation (5.1). The dependent variables are different debt measures i.e., TotDebt, FinDebtTOL, FinDebt, and TC. They are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit; FinDebt: Total debt excluding trade credit and other liabilities, and TC: Trade Credit. Debt measures are all divided by total assets. Further details on the composition of debt measures are given in the appendix. Collateral is the ratio of total tangible fixed assets to total assets. Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Debt measures are all divided by total assets. Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm, and are reported in parentheses. The first figures in square brackets under the t-statistics represent percentage changes in leverage relative to the sample as each continuous regressor increases by its standard deviation, while all other regressors are kept at their sample mean. In the same manner, the second figures in bold represent percentage changes in leverage relative to the sample mean as each continuous regressor increases from 25^{th} to the 75^{th} percentiles, while all other regressors are kept at their sample mean ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 11: The Impact of LTV Ratio Cap on Firm Debt Financing Decisions

Sample: Full
Period: 1997–2013
Countries: BG, HU, NL, NO, SE, TR

Dependent Variable:	TotDebt	FinDebtTOL	TC	TC	FinDebtTOL	TC	TC
		(divided by total assets)			(divided by total debt)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Collateral×LTV	-0.009***	-0.012***	0.002***	0.002***	-0.005***	0.005***	0.004***
	(0.002)	(0.001)	(0.000)	(0.000)	(0.001)	(0.001)	(0.001)
Cash×LTV				-0.001**			0.071***
				(0.000)			(0.002)
Firm Controls	yes	yes	yes	yes	yes	yes	yes
Number of observations	1,581,186	1,581,186	1,513,978	1,513,978	1,581,186	1,513,978	1,513,978
R^2	0.81	0.8	0.77	0.77	0.74	0.73	0.73
Firm Fixed-Effects	yes	yes	yes	yes	yes	yes	yes
Sector×year Fixed-Effects	yes	yes	yes	yes	yes	yes	yes
Country×year Fixed-Effects	yes	yes	yes	yes	yes	yes	yes

Notes: Table 11 reports the results of the estimation of equation (4.1). The dependent variables are different debt measures i.e., TotDebt, FinDebtTOL, and TC. They are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit, and TC: Trade Credit. Debt measures are divided by total assets and total liabilities in Columns 1–4 and Columns 5–7, respectively. Further details on the composition of debt measures are given in the appendix. LTV equals to 1 in the year(s) when LTV ratio cap is in place in the corresponding country. Collateral is a dummy variable that equals one if asset tangibility is higher than its median at any time during three years prior to the application of LTV ratio cap. Firm controls are defined as follows: Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 12: The Impact of LTV Ratio Cap on Firm Debt Financing Decisions

PLACEBO TEST
Sample: Full
Period: 1997–2013
Countries: BG, HU, NL, NO, SE, TR

Dependent Variable:	TotDebt	FinDebtTOL	TC	TC	FinDebtTOL	TC	TC
		(divided by total assets)			(divided by total debt)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Collateral×LTV	0.003**	0.002**	0.0004	0.0002	0.001	-0.001	-0.001
	(0.001)	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Cash×LTV				-0.001**			0.001
				(0.000)			(0.001)
Firm Controls	yes	yes	yes	yes	yes	yes	yes
Number of observations	1,133,583	1,133,583	1,102,027	1,102,027	1,133,583	1,102,027	1,102,027
R^2	0.79	0.75	0.76	0.76	0.73	0.72	0.72
Firm Fixed-Effects	yes	yes	yes	yes	yes	yes	yes
Sector×year Fixed-Effects	yes	yes	yes	yes	yes	yes	yes
Country×year Fixed-Effects	yes	yes	yes	yes	yes	yes	yes

Notes: Table 12 reports the results of the estimation of equation (4.1). The dependent variables are different debt measures i.e., TotDebt, FinDebtTOL, and TC. They are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit, and TC: Trade Credit. Debt measures are divided by total assets and total liabilities in Columns 1–4 and Columns 5–7, respectively. Further details on the composition of debt measures are given in the appendix. LTV equals to 1 in the year(s) when LTV ratio cap is in place in the corresponding country. Collateral is a dummy variable that equals one if asset tangibility is higher than its median at any time during three years prior to the application of LTV ratio cap. Firm controls are defined as follows: Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 13: Collateral and Firm Debt: Average Sensitivity by Deciles

Sample: Full
Period: 1997–2013
Countries: BG, HU, NL, NO, SE, TR

Dependent Variable:	FinDebt		FinDebtTOL		TC	
	(1)	(2)	(3)	(4)	(5)	(6)
Collateral	0.115***	0.115***	0.094***	0.094***	-0.036***	-0.036***
	(0.004)	**[0.00]**	(0.007)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 2	0.070***	0.185***	-0.002	0.092***	-0.017***	-0.053***
	(0.004)	**[0.00]**	(0.01)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 3	0.113***	0.228***	0.016**	0.110***	-0.031***	-0.067***
	(0.004)	**[0.00]**	(0.008)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 4	0.152***	0.267***	0.040***	0.134***	-0.042***	-0.078***
	(0.005)	**[0.00]**	(0.008)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 5	0.191***	0.304***	0.072***	0.166***	-0.051***	-0.087***
	(0.005)	**[0.00]**	(0.008)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 6	0.223***	0.336***	0.098***	0.192***	-0.055***	-0.091***
	(0.005)	**[0.00]**	(0.008)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 7	0.242***	0.355***	0.112***	0.206***	-0.059***	-0.095***
	(0.005)	**[0.00]**	(0.008)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 8	0.246***	0.359***	0.110***	0.204***	-0.061***	-0.097***
	(0.005)	**[0.00]**	(0.01)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 9	0.237***	0.350***	0.093***	0.187***	-0.057***	-0.093***
	(0.005)	**[0.00]**	(0.008)	**[0.00]**	(0.003)	**[0.00]**
Collateral×size decile = 10	0.147***	0.138***	0.006	0.100***	-0.035***	-0.071***
	(0.008)	**[0.00]**	(0.01)	**[0.00]**	(0.004)	**[0.00]**
Firm Controls	yes		yes		yes	
Number of observations	1,581,186		1,581,186		1,581,186	
R^2	0.77		0.72		0.77	
Firm Fixed-Effects	yes		yes		yes	
Sector×year Fixed-Effects	yes		yes		yes	
Country×year Fixed-Effects	yes		yes		yes	

Notes: Table 13 reports the results of the estimation of equation (5.2). The dependent variables are different debt measures i.e. FinDebtTOL, FinDebt, and TC. They are defined as follows. FinDebtTOL: Total debt excluding trade credit; FinDebt: Total debt excluding trade credit and other liabilities, and TC: Trade Credit. Debt measures are all divided by total assets. Further details on the composition of debt measures are given in the appendix. Collateral is the ratio of tangible fixed assets to total assets. Collateral×size decile=k is the additional effect of Collateral over and above the baseline effect for first decile firms captured by the variable Collateral, and are reported in the first columns. Latter columns report the overall effect of Collateral for a firm of decile k. The corresponding p-value from an F test with the null hypothesis that this effect is zero is given in the square parentheses in bold. The regression is run with decile specific time-varying time trends (an interaction of the size decile dummy and time trend). Firm controls are defined as follows: Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Debt measures are all divided by total assets. Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm. t-statistics are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm, and are reported in parentheses of the first column. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 14: Differential Impact of LTV Ratio cap

Sample: Full
Period: 1997–2013
Countries: BG, HU, NL, NO, SE, TR

Dependent Variable:	TotDebt	FinDebtTOL	TC	FinDebtTOL	TC
	(divided by total assets)			(divided by total debt)	
	(1)	(2)	(3)	(4)	(5)
SME×Collateral×LTV	-0.012***	-0.012***	-0.0002	-0.003**	0.003**
	(0.002)	(0.002)	(0.002)	(0.001)	(0.001)
Collateral×LTV	-0.006***	-0.010***	0.003***	-0.005***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm Controls	yes	yes	yes	yes	yes
Number of Observations	1,581,186	1,581,186	1,513,978	1,581,186	1,513,978
R^2	0.81	0.8	0.77	0.74	0.73
Firm Fixed-Effects	yes	yes	yes	yes	yes
SME×year Fixed-Effects	yes	yes	yes	yes	yes
Sector×year Fixed-Effects	yes	yes	yes	yes	yes
Country×year Fixed-Effects	yes	yes	yes	yes	yes
F-test					
Collateral×LTV	0.00	0.00	0.00	0.00	0.00

Notes: Table 14 reports the results of the estimation of equation (5.3). The dependent variables are different debt measures i.e., TotDebt, FinDebtTOL, and TC. They are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit, and TC: Trade Credit. Debt measures are divided by total assets and total liabilities in Columns 1–3 and Columns 4–5, respectively. Further details on the composition of debt measures are given in the appendix. LTV equals to 1 in the year(s) when LTV ratio cap is in place in the corresponding country. Collateral is a dummy variable that equals one if asset tangibility is higher than its median at any time during three years prior to the application of LTV ratio cap. SME equals one if the given firm's size (measured by logarithm of real total assets) is between 75^{th}–95^{th} percentiles of the distribution at any time during the three years prior to the introduction of LTV ratio cap. Firm controls are defined as follows: Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 15: Differential Impact of LTV Ratio cap

Sample: Full–**Excluding Large Firms**
Period: 1997–2013
Countries: BG, HU, NL, NO, SE, TR

Dependent Variable:	TotDebt	FinDebtTOL	TC	FinDebtTOL	TC
	(divided by total assets)			(divided by total debt)	
	(1)	(2)	(3)	(4)	(5)
SME×Collateral×LTV	-0.013***	-0.012***	-0.0007	-0.003**	0.003**
	(0.002)	(0.002)	(0.01)	(0.001)	(0.001)
Collateral×LTV	-0.006***	-0.010***	0.003***	-0.004***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Firm Controls	yes	yes	yes	yes	yes
Number of Observations	1,496,146	1,496,146	1,429,489	1,496,146	1,429,489
R^2	0.82	0.8	0.77	0.74	0.74
Firm Fixed-Effects	yes	yes	yes	yes	yes
SME×year Fixed-Effects	yes	yes	yes	yes	yes
Sector×year Fixed-Effects	yes	yes	yes	yes	yes
Country×year Fixed-Effects	yes	yes	yes	yes	yes
F-test					
Collateral×LTV	0.00	0.00	0.00	0.00	0.00

Notes: Table 15 reports the results of the estimation of equation (5.3). The dependent variables are different debt measures i.e., TotDebt, FinDebtTOL, and TC. They are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit, and TC: Trade Credit. Debt measures are divided by total assets and total liabilities in Columns 1–3 and Columns 4–5, respectively. Further details on the composition of debt measures are given in the appendix. LTV equals to 1 in the year(s) when LTV ratio cap is in place in the corresponding country. Collateral is a dummy variable that equals one if asset tangibility is higher than its median at any time during three years prior to the application of LTV ratio cap. SME equals one if the given firm's size (measured by logarithm of real total assets) is between 75^{th}–95^{th} percentiles of the distribution at any time during the three years prior to the introduction of LTV ratio cap. Firm controls are defined as follows: Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Table 16: The Impact of LTV Ratio Cap on Firm Debt Financing Decisions

Sample: Full Period: 1998–2013 Countries: Sweden					
Dependent Variable:	TotDebt	FinDebtTOL	TC	FinDebtTOL	TC
	(divided by total assets)			(divided by total debt)	
	(1)	(2)	(3)	(4)	(5)
Collateral×LTV	-0.032***	-0.059***	0.024***	-0.037***	0.032***
	(0.003)	(0.002)	(0.001)	(0.002)	(0.002)
Firm Controls	yes	yes	yes	yes	yes
Number of Observations	1,041,289	1,041,289	1,030,895	1,041,289	1,030,895
R^2	0.80	0.76	0.74	0.70	0.70
Firm Fixed-Effects	yes	yes	yes	yes	yes
Sector×year Fixed-Effects	yes	yes	yes	yes	yes
Country×year Fixed-Effects	yes	yes	yes	yes	yes
F-test					
Collateral×LTV	0.00	0.00	0.00	0.00	0.00

Notes: Table 16 reports the results of the estimation of equation (5.4). The dependent variables are different debt measures i.e., TotDebt, FinDebtTOL, and TC. They are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit, and TC: Trade Credit. Debt measures are divided by total assets and total liabilities in Columns 1–3 and Columns 4–5, respectively. Further details on the composition of debt measures are given in the appendix. LTV equals to 1 in the year(s) when LTV ratio cap is in place in the corresponding country. Collateral is constructed as firm-level average of the ratio of tangible fixed assets to total assets for the 1998–2007 period. Firm controls are defined as follows: Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.

Figure 1: Transmission channels of a tightening of the LTV, LTI and DSTI limits

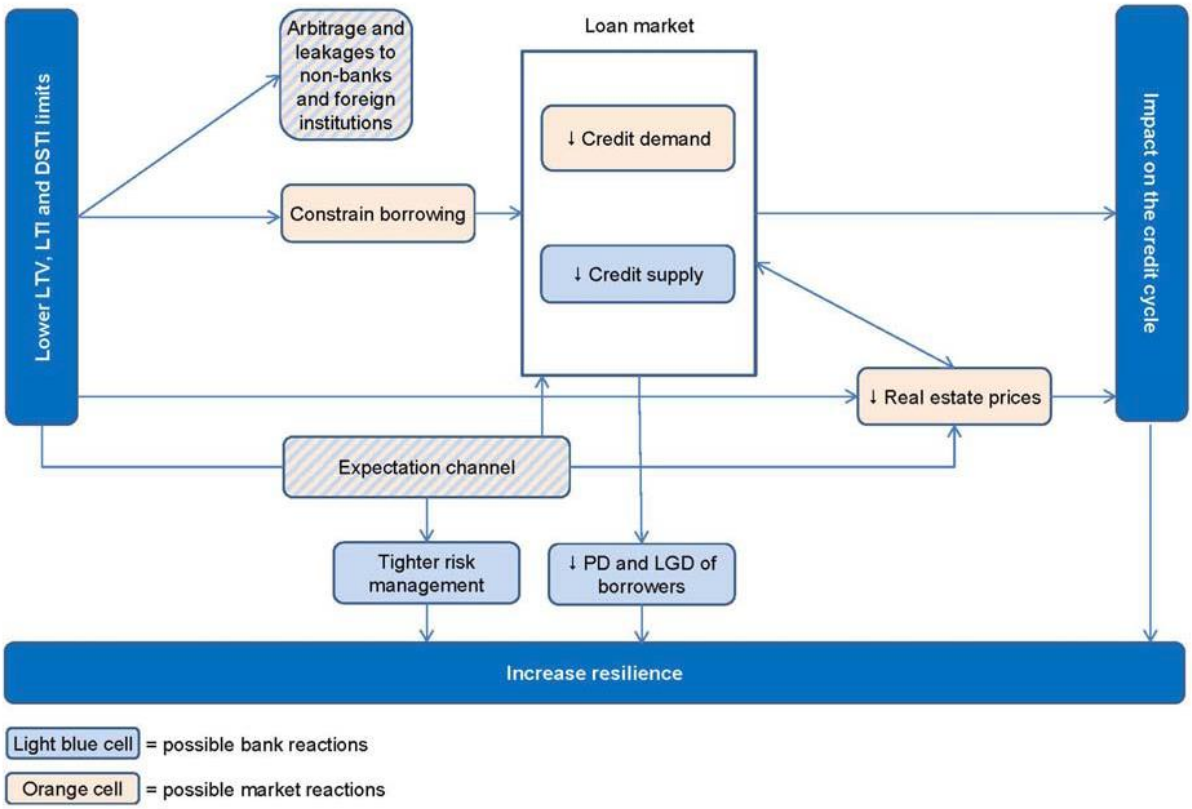
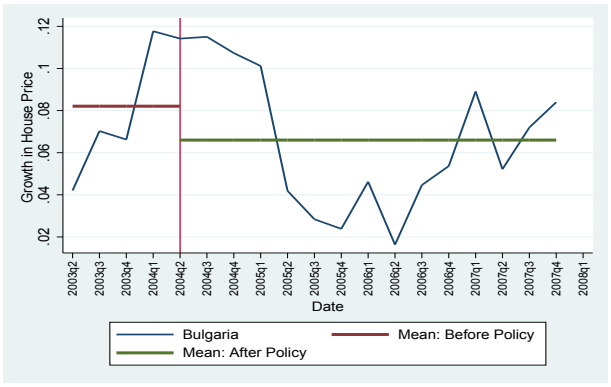
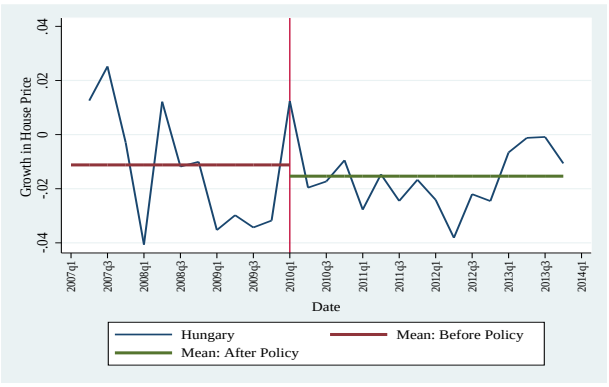


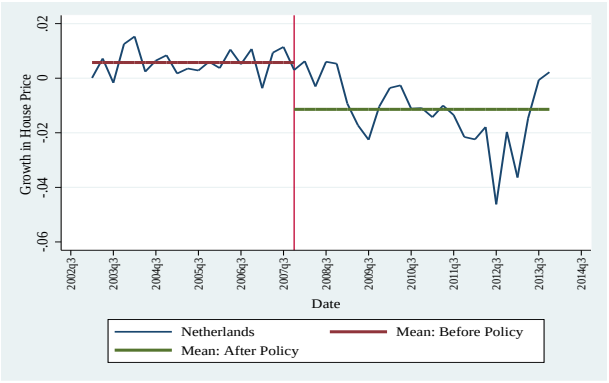
Figure 2: The Impact of LTV Ratio Cap on House Prices



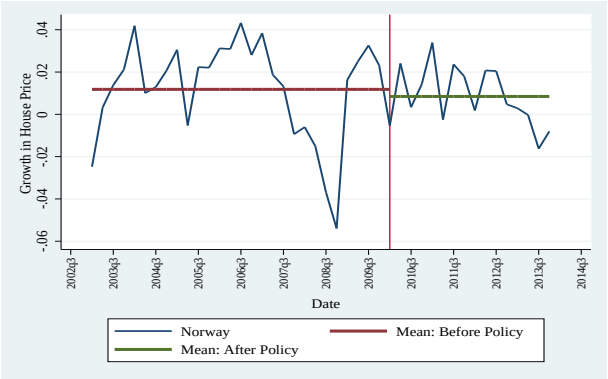
(a) **Source: National Statistical Institute**



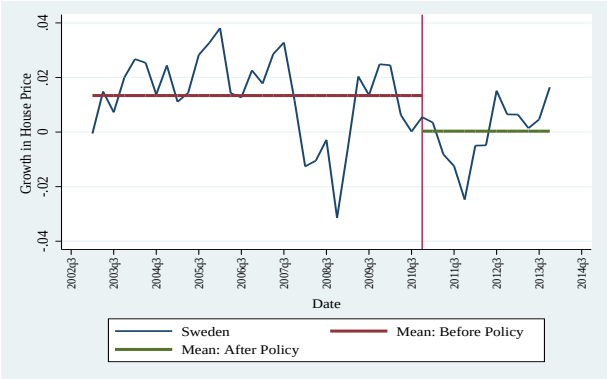
(b) **Source: OECD**



(c) **Source: OECD**



(d) **Source: OECD**



(e) **Source: OECD**

Figure 3: BEFORE-AFTER LTV RATIO POLICY DIFFERENCE IN COMMERCIAL PRICE INDEX BY REGION IN SWEDEN (SOURCE: STATISTICS SWEDEN)

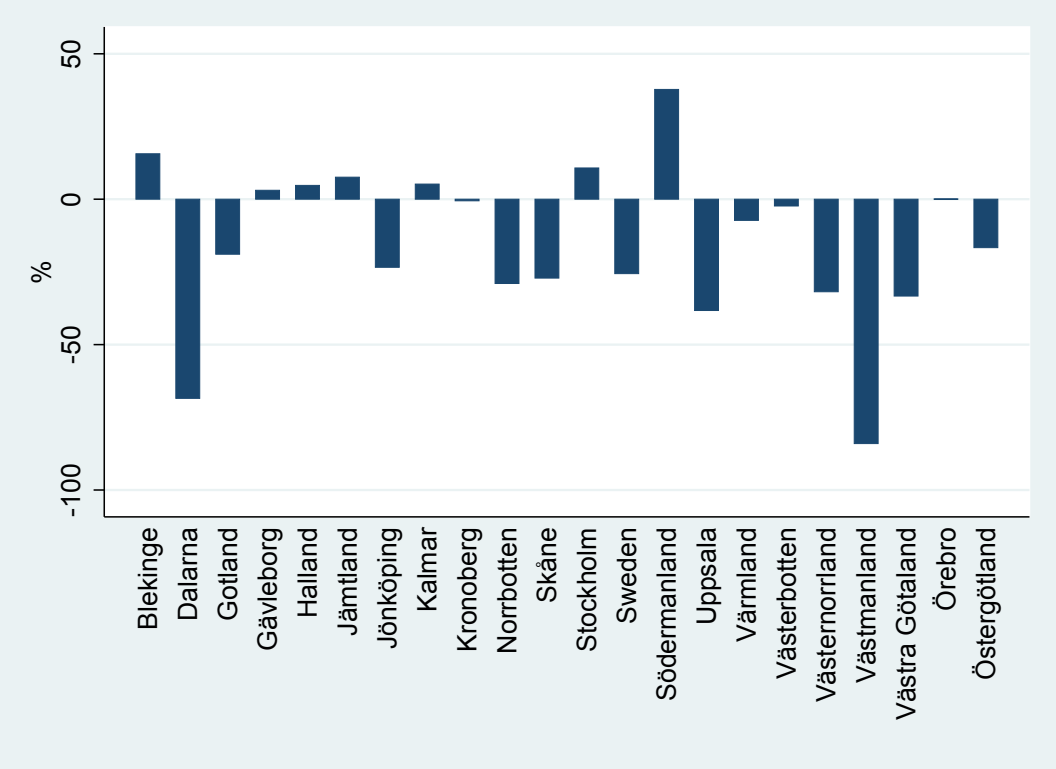
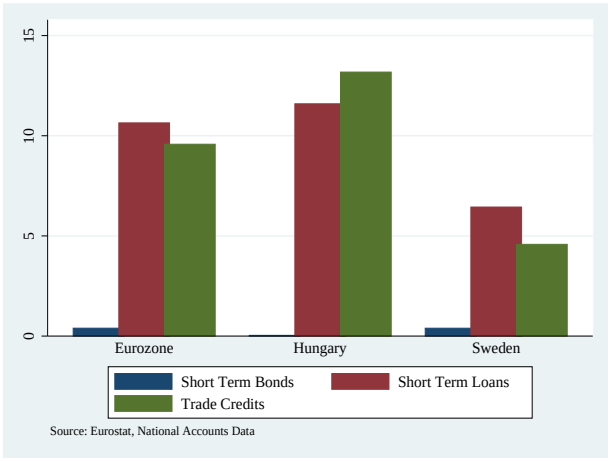
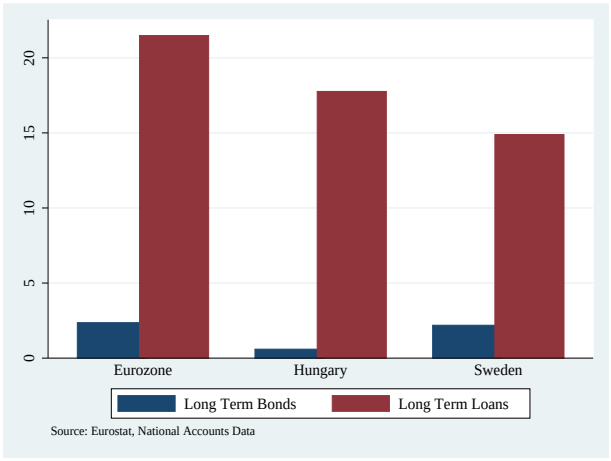


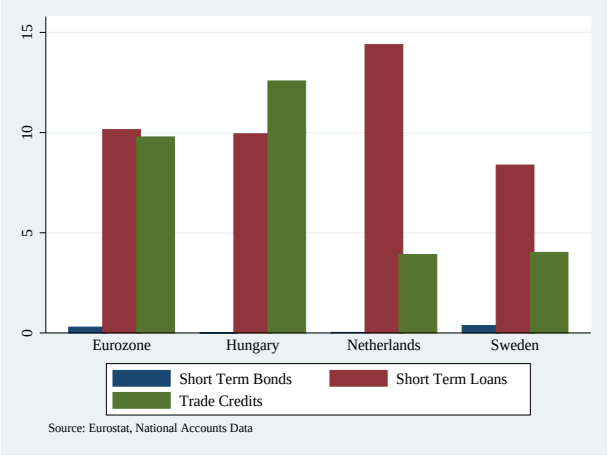
Figure 4: Composition of Firm Liabilities: Aggregated Data from Eurostat



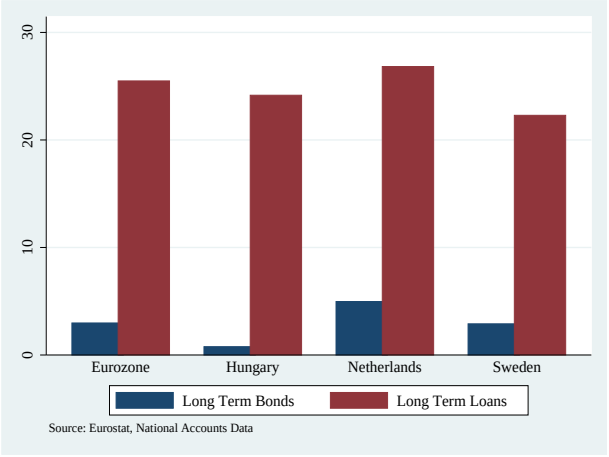
(a) **Short Term Liabilities–2006**



(b) **Long Term Liabilities–2006**



(c) **Short Term Liabilities–2011**



(d) **Long Term Liabilities–2011**

Appendix A Data Cleaning Process

The dataset I use in this paper combines firm-level information across different BvD products (ORBIS disk 2005, ORBIS disk 2009, ORBIS disk 2013, AMADEUS online 2010 fromWRDS, and AMADEUS disk 2014). I clean the data in four steps. First, I clean the raw data off basic reporting mistakes. Second, I restrict this data to the one I use in my analysis and verify the internal consistency of balance sheet information. Third, I apply further quality checks (paper specific cleaning steps) and construct two different samples: Full Sample and Permanent Sample. Lastly, in each of these samples, we winsorize the variables used in the analysis.

A.1 Steps to Clean Basic Reporting Mistakes

I implement the following steps to clean the raw data off basic reporting mistakes.

1. I drop firms if any detail of assets/liabilities/capital, and sales, operating revenue, wage bill and depreciation is negative in any year.

2. I drop firms if they report sales, operating revenue, total assets, the sum of shareholderfunds and liabilities, and shareholder's capital as zero in any year.

3. I drop firms if employment is either zero or if employment is negative or greater than 2 millions in any year.

4. I drop firms if any of total assets, total liabilities and shareholder funds is missing in all years they report data to BvD.

A.2 Steps to Construct the Main Sample

1. For a given firm ORBIS–AMADEUS provides financial statements regarding different consolidation codes i.e. C1, C2, U1 and U2.[33] Given this fact, I dropped C2 accounts to avoid double accounting in our analysis.[34]

2. I first drop firms with missing information regarding their industry of activity. Second, I drop financial, real-estate firms. I also drop firms operating in the sectors outside SNA production boundary (NACE Rev. 2 sectors T & U).

3. I drop state-owned firms.

4. I drop firms with missing information on the variables used in benchmark analysis.

5. I drop years with observations less than 1000 in a given country.

[33] C1: account of a company- headquarter of a group, aggregating all companies belonging to the group (affiliates, subsidiaries, etc.), where the company headquarter has no unconsolidated account, C2: account of a company-headquarter of a group, aggregating all companies belonging to the group (affiliates, subsidiaries, etc.) where the company headquarter also presents an unconsolidated account, U1: account of a company with no consolidated account, and U2: account of a company with a consolidated account.

[34] The number of firms with C1 accounts in the final sample is very limited.

A.3 Internal Consistency of Balance Sheet Information

I check the internal consistency of the balance sheet data by comparing the sum of variables belonging to some aggregate to their respective aggregate. I construct the following ratios:

1. The sum of tangible fixed assets, intangible fixed assets, and other fixed assets as a ratio of total fixed assets.
2. The sum of stocks, debtors, and other current assets as a ratio of total current assets.
3. The sum of fixed assets and current assets as a ratio of total assets.
4. The sum of capital and other shareholder funds as a ratio of total shareholder funds
5. The sum of long term debt and other non-current liabilities as a ratio of total non-current liabilities.
6. The sum of loans, creditors, and other current liabilities as a ratio of total current liabilities.
7. The sum of non-current liabilities, current liabilities, and shareholder funds as a ratio of the variable that reports the sum of shareholder funds and total liabilities.

After I construct these ratios, I estimate their distribution for each country separately, and exclude the outliers by dropping observations that are below the 0.1 percentile or above the 99.9 percentile of the distribution of ratios. In addition to these filters, I apply further checks:

1. In the balance sheet, the sum of the book value of shareholder funds and liabilities (`SHFUNDLIAB`) and that of total assets (`TOTASSTS`) should be equal to each other. In the same manner, the book value of shareholder funds (`SHFUNDS`) should be either equal or less than that of total assets. I drop firm-year observations if they don't satify this accounting rule.
2. In the income statement (profit & loss accounts), the monetary value of profitability measures such as netincome (`NETINCOME`), cash flow (`CFLOW`), EBIT (`EBIT`) and EBITDA (`EBITDA`) should be less than that of either operating revenue (`OPRE`) or sale (`SALE`). I drop firm-year observations if they don't satify this accounting rule.

A.4 Further Quality Checks

After I apply the basic cleaning steps listed above, I check the quality of the variables used in the analysis:

1. Age: I. construct the variable "age" of the firm as the difference between the year of the balance sheet information and the year of incorporation of the firm (`DATEINC`) plus one. I drop firms that report dates of incorporation that imply non-positive age values.
2. Total Liabilities: As opposed to listed firms, private firms do not report a separate variable "Liabilities." For these firms, there are three ways to construct liabilities:

(a) Taking the difference between the sum of shareholder funds and liabilities (`SHFUNDLIAB`) and shareholder funds or equity (`SHFUNDS`)

(b) Taking the difference between total assets (`TOTASSTS`) and shareholder funds or equity (`SHFUNDS`)

(c) Taking the sum of current liabilities (`CURRENTLIAB`) and non-current liabilities (`NONCURRLIAB`).

I follow first two options to construct "Liabilities." Either gives the same values. I could also have computed liabilities following the third option. However, I find that there are more missing observations if I follow this approach. Nevertheless, for those observations with non-missing information, I compare the values constructed following first two options with those constructed following the last option. I drop firm-year observations where the values are different from each other by 1,500 PPP dollars.

A.5 Winsorization

I winsorize at the 2 and the 98 percentile variables such as logarithm of real sales, logarithm of total assets, collateral, profitability measures, inventory, cash and all debt measures used in the empirical analysis.

Appendix B Composition of Debt Measures

1. Current Liabilities **(STDebt)**:
    - Loans **(STFinDebt)**: All short-term financial debts to credit institutions plus part of long term financial debt payable within the year
    - Trade creditors **(TC)**: All debts to suppliers and contractors (accounts payable)
    - Other Liabilities **(STOL):** Other Short-term debt plus other creditors plus income tax payable, social expenditure payable, dividends payable and other current liabilities
2. Non-current Liabilities **(LTDebt):**
    - Total Long Term Interest Bearing Debt **(LTFinDebt)**:
        - Loans: All long-term financial debts to credit institutions
        - Debentures and Convertible Debt
        - Lease Liabilities
        - Other Long-term Interest Bearing Debt
    - Other Non-current Liabilities **(LTOL)**
        - Other Long-term Non-Interest Bearing Debt
        - Provisions including pension fund provisions
        - Preferred Taxes
        - Deferred Revenue
        - Minority Interest

→ FinDebt=LTFinDebt+STFinDebt
→ FinDebtSTOL=LTFinDebt+STFinDebt+STOL
→ FinDebtTOL=LTFinDebt+STFinDebt+STOL+LTOL
→ TotDebt=STDebt+LTDebt
→ TOL=STOL+LTOL

Appendix C Tables

Table C.1: Percentage of Firms in Permanent Sample-By Firm Type and Country

Country	Pooled	HU	NL	NO	SE	TR
Period	1999-2013	2004-2012	2000-2012	2004-2013	1999-2012	2005-2012
Panel A: Total Assets						
All	40,016	5,532	191	716	32,895	682
Small	74.8	73.2	2.1	77.4	76.6	18.3
	(29,929)	(4,050)	(4)	(554)	(25,196)	(125)
Medium	19.9	21.1	16.2	17.7	19.3	44.4
	(7,983)	(1,168)	(31)	(127)	(6,354)	(303)
Large	5.3	5.7	81.7	4.9	4.1	37.2
	(2,104)	(314)	(156)	(35)	(1,345)	(254)
Panel B: Employment						
All	38,276	4,547	181	579	32,808	161
Micro	66.4	50.8	6.6	62.7	69.3	9.9
	(25,429)	(2,309)	(12)	(363)	(22,729)	(16)
SMEs	31.3	44.7	44.2	35.2	29.1	57.1
	(11,967)	(2,034)	(80)	(204)	(9,557)	(92)
Large	2.3	4.5	49.2	2.1	1.6	32.9
	(880)	(204)	(89)	(12)	(522)	(53)

To be Continued.

Table C.2: Percentage of Firms in Permanent Sample-By Firm Type and Country

Country	Pooled	HU	NL	NO	SE	TR
Period	1999-2013	2004-2012	2000-2012	2004-2013	1999-2012	2005-2012
Panel C: Age						
All	39,961	5,506	716	191	32,866	682
Infant	8.5	14.7	1.3	80.1	7.4	3.5
	(3,414)	(811)	(9)	(153)	(2,417)	(24)
Adolescent	11.9	14.6	1.1	49.7	11.6	6.0
	(4,759)	(803)	(8)	(95)	(3,812)	(41)
Middle-aged	65.2	70.7	11.6	245.0	64.5	60.0
	(26,036)	(3,890)	(83)	(468)	(21,186)	(409)
Old	14.4	0.0	12.7	0.0	16.6	30.5
	(5,752)	(2)	(91)	(0)	(5,451)	(208)

Notes: Tables C.1–C.2 show the percentages of firms by firm type and country. The firms in each sample refer to ones with non-missing value of the variable on which the percentages are based. In both tables, each cell corresponds to the share of indicated category's number of firms in total economy of the given country-period (%). In Table C.1, shares are constructed based on firm size, and firm size is measured by the logarithm of real total assets and the number of employees, respectively. In Table C.2, firms are categorized based on firm age. In Table C.1, firm size categories are constructed based on predetermined dummies that each equals one if the firm satisfies the criterion for the corresponding firm category at any time during the three years prior to the introduction of LTV ratio cap: Small equals one if the given firm's size is below 75^{th} percentile of the distribution, Medium equals one if the given firm's size is between 75^{th}–95^{th} percentiles of the distribution, and Large equals one if the given firm's size is above 95^{th} percentile of the distribution. Micro equals one if the given firm has employees less than 10, SMEs equals one if the given firm has employees between 10 and 249, and Large equals one if the given firm has employees higher than 250. In Table C.2, Infant equals one if the given firm's age is between 0–2, Adolescent equals one if the given firm's age is between 3–4, Middle-aged equals one if the given firm's age is between 5–24, and Old equals one if the given firm's age is 25 or above. Numbers in parentheses refer to the total number of firms with non-missing value of the variable on which the percentages are based..

Table C.3: Descriptive Statistics: Permanent Sample

Period: 1999–2013
Countries: HU, NL, NO, SE, TR

Variable	Mean	Median	Std. Dev.	25th Pct.	75th Pct.
TotDebt	0.57	0.58	0.25	0.38	0.76
FinDebt	0.14	0.0022	0.2	0	0.24
FinDebtTOL	0.46	0.45	0.24	0.28	0.63
STFinDebt	0.023	0	0.054	0	0.0093
STFinDebtSTOL	0.3	0.26	0.19	0.15	0.4
TC	0.11	0.068	0.12	0.017	0.16
Collateral	0.26	0.16	0.26	0.041	0.44
Sales Growth	0.038	0.023	0.35	-0.082	0.15
Profitability	0.15	0.14	0.15	0.063	0.23
Size	13	13	1.7	12	14
Cash	0.21	0.14	0.21	0.032	0.33
Inventory	0.15	0.05	0.2	0	0.24
Age	2.7	2.7	0.68	2.2	3.1

Notes: Table C.3 reports descriptive statistics of main variables used in the empirical analysis for Full Sample. Debt measures are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit; FinDebt: Total debt excluding trade credit and other liabilities; STFinDebt: Short-term debt from financial institution; STFinDebtSTOL: Short-term Debt excluding trade credit, and TC: Trade Credit. Debt measures are all divided by total assets. Further details on the composition of debt measures are given in the appendix. Collateral is the ratio of total tangible fixed assets to total assets. Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Age is the logarithm of (1+firm age) where firm age in period t that is defined as t minus the date of incorporation plus one. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets.

Table C.4: Composition of Liabilities-By Firm Type

Sample: Permanent
Period: 1999–2013
Countries: HU, NL, NO, SE, TR

	All		Small		Medium		Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
(% of Total Liabilities)								
STFinDebt	0.034	0	0.027	0	0.052	0	0.056	0
TC	0.11	0.067	0.096	0.052	0.14	0.11	0.12	0.088
STOL	0.52	0.51	0.56	0.56	0.44	0.39	0.44	0.4
LTFinDebt	0.17	0	0.17	0	0.18	0.032	0.13	0
LTOL	0.077	0	0.072	0	0.072	0	0.16	0.061

Notes: Table C.4 reports descriptive statistics of debt measures by different firm size groups. Debt measures are defined as follows. STFinDebt: Short-term debt from financial institutions; TC: Trade Credit, STOL: Other Short-term Liabilities, LTFinDebt: Long Term Interest Bearing Debt, LTOL: Other Long-term Liabilities, and TC: Trade Credit. Further details on the composition of debt measures are given in the appendix

Table C.5: Cash and Collateral Holdings-By Firm Type

Sample: Permanent
Period: 1999–2013
Countries: HU, NL, NO, SE, TR

	All		Small		Medium		Large	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
(% of Total Assets)								
Collateral	0.26	0.16	0.26	0.15	0.27	0.18	0.27	0.2
Inventory	0.15	0.05	0.13	0.02	0.19	0.14	0.17	0.14
Cash	0.21	0.14	0.24	0.18	0.13	0.07	0.078	0.028

Notes: Table C.5 reports descriptive statistics of cash and collateral holdings by different firm size groups. Collateral is the ratio of total tangible fixed assets to total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Debt measures are all divided by total assets.

Table C.6: Collateral and Firm Leverage: The Impact of LTV Ratio Cap

Sample: Permanent
Period: 1999–2012
Countries: HU, NL, NO, SE, TR

Dependent Variable:	TotDebt	FinDebtTOL	TC	TC	FinDebtTOL	TC	TC
		(divided by total assets)			(divided by total debt)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Collateral×LTV	-0.009***	-0.013***	0.003***	0.003***	-0.006***	0.005***	0.005***
	(-4.915)	(-7.760)	(3.945)	(3.895)	(-4.942)	(4.250)	(4.037)
Cash×LTV				-0.0001			-0.002
				(-0.052)			(-1.547)
Firm Controls	yes	yes	yes	yes	yes	yes	yes
Number of observations	357,622	357,622	348,109	348,109	357,622	348,109	348,109
R^2	0.82	0.79	0.78	0.78	0.75	0.74	0.74
Firm Fixed-Effects	yes	yes	yes	yes	yes	yes	yes
Sector×year Fixed-Effects	yes	yes	yes	yes	yes	yes	yes
Country×year Fixed-Effects	yes	yes	yes	yes	yes	yes	yes

Notes: Table C.6 reports the results of the estimation of equation (4.1). In the estimation, I use Permanent sample that covers the firms from Full sample without non-consecutive yearly observations. The dependent variables are different debt measures i.e., TotDebt, FinDebtTOL, and TC. They are defined as follows. TotDebt: The sum of short-term and long-term debt; FinDebtTOL: Total debt excluding trade credit, and TC: Trade Credit. Debt measures are divided by total assets and total liabilities in Columns 1–4 and Columns 5–7, respectively. Further details on the composition of debt measures are given in the appendix. LTV equals to 1 in the year(s) when LTV ratio cap is in place in the corresponding country. Collateral is a dummy variable that equals one if asset tangibility is higher than its median at any time during three years prior to the application of LTV ratio cap. Firm controls are defined as follows: Profitability is the ratio of EBITDA to total assets. Sales Growth is the logarithmic change of real sales. Size is the logarithm of real total assets. Cash is the ratio of cash and cash equivalents to book value of total assets. Inventory is the ratio of total inventories (raw materials+in progress+finished goods) to total assets. Sectors are classified according to four digit NACE Revision 2 codes. Standard errors are heteroskedastic-consistent errors adjusted for clustering across observations of a given firm, and are reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels, respectively.