

Part III

Investing in competitiveness

Chapter 7

Financial Frictions and Sources of Finance for European Firms¹

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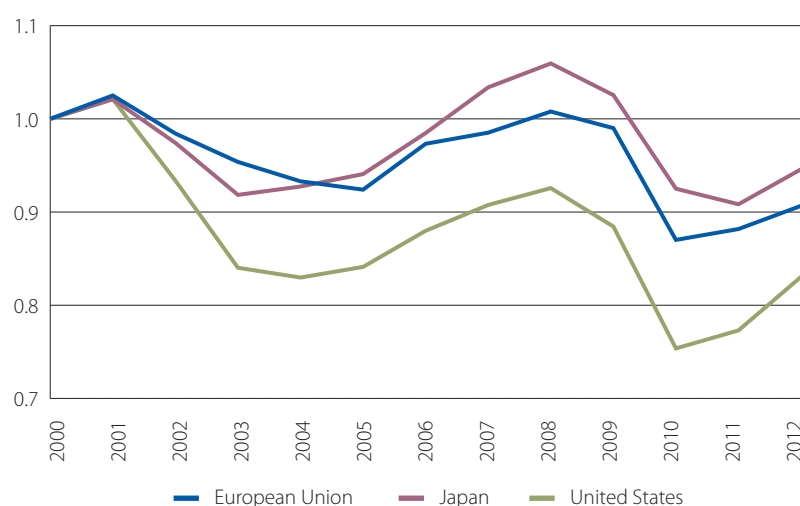
Chapter at a glance

- *This paper documents the evolution of sources of financing for non-financial firms in Europe and the effects of changes in these financing sources on firms' real outcome dynamics before and after the European crisis.*
- *I rely on unique pan-European firm-level data that encompasses the balance sheets and income statements of privately held firms, including a large and representative number of small and medium-sized enterprises (SMEs).*
- *I find that firms in the euro area accumulated more financial debt than non-euro area firms during the 2000s. This debt came in the form of short-term bank loans and long-term debt, whereas other forms of financing such as equity and retained earnings increased only slightly during the deleveraging process of the crisis years.*
- *These results are mainly driven by SMEs in the periphery countries, where such firms financed themselves more with loans and with trade credit. Long-term debt is accumulated relatively more by large firms in the core countries.*
- *In terms of investment, profits and sales, firms that accumulated more debt have experienced declining investment and sales both before and after the crisis, whereas firms that financed themselves with trade credit, equity and retained earnings have experienced the opposite outcome.*
- *Profits have a negative correlation with trade credit and a positive correlation with debt before the crisis but do not correlate with any form of financing during the crisis.*

7.1. Introduction

The recent global financial crisis has renewed attention on the macroeconomic effects of changes in financial market conditions. One important link between financial markets and the real economy is through firms' financing of their productive activities via external funds obtained through financial markets. A common feature of the global financial crisis on both sides of the Atlantic is the decline in credit to non-financial corporations. This decline in external finance to NFCs is also accompanied by a decline in investment. While investment has recovered to some extent in the US and Japan, this is not the case in Europe (see Figure 1). To understand these differences in investment patterns and hence the differences in the speed of recovery from the recession, we need to understand the factors that led to the decline in credit to firms in Europe. These factors will relate to both the reduced supply of finance by banks since many banks collapsed and needed to be bailed out, but also to the reduced demand for credit by firms given the lack of good investment opportunities during the recession. The economic uncertainty is also a big contributing factor to the decline in credit demand since households have reduced their demand for goods and services produced by firms.

Figure 1 Corporate Investment
Gross Investment by Non-Financial Corporations (% of GDP, Year 2000 = 1)



Source: Eurostat, Cabinet Office, and Bureau of Economic Analysis.

The existing explanations for low investment in Europe have so far emphasised the role of low aggregate demand and financial frictions. Financial frictions can operate via banks, where banks' balance sheet problems prevent them from lending to any borrower, or via firms, where firms with deteriorating balance sheets become risky borrowers. I would argue that the capital structure of firms' balance sheets and how this structure has changed over time in terms of different financing sources is key to explaining the financial frictions operating via firms' balance sheets. To put it differently: if the sluggish recovery were all about low consumer demand and/or weak banks, we would not see differences in investment and in speeds of recovery from the recession across different countries, since these factors are common to several countries in general. As I show in this paper, firm heterogeneity in terms of firm size and how firm size is correlated with firm financing behaviour over time has important implications in terms of explaining the differences in the performance of the aggregate economy for different countries.

I start by documenting the changes in the sources of financing for NFCs in Europe, using a detailed pan-European firm-level dataset. Without an understanding of how firms' balance sheet structures for liabilities and assets change by firm size and over time, we cannot have an understanding of the different patterns of investment by different sized firms that finance themselves differently. Focusing on European Union countries and mostly small privately held non-financial firms, as opposed

to the literature that has so far only focused on large listed firms, this paper can shed light on pressing policy issues such as which firms were unable to replace debt with equity financing in the midst of the crisis when weak banks cut the supply of credit.²

There is an active body of literature on the cyclical properties of debt versus equity financing. This literature focuses exclusively on the US using either aggregate data from the US Federal Reserve Flow of Funds database or firm-level data from the universe of listed firms as reported in Compustat. This literature has so far produced a puzzle. While both firm and issuance-level data suggest pro-cyclical equity financing and counter-cyclical debt financing, aggregate data-based papers suggest the opposite. Jermann and Quadrini (2006, 2012) document counter-cyclical equity financing using flow-of-funds data. Covas and Den Haan (2012) show pro-cyclical equity issuance and they model this with exogenous, counter-cyclical equity issuance costs. This is a reasonable explanation since Hennessy and Whited (2007) show that external financing costs differ during booms and recessions and also by firm size. Covas and Den Haan (2012) show that the largest listed firms have the opposite financing pattern to smaller listed firms over business cycles. In particular, they find that both debt and equity financing are pro-cyclical for listed US firms except for the top 1% of firms by asset size, which exhibit counter-cyclical equity issues. While the number of the top 1% of firms is small, their substantial size affects aggregate series, which explains the results of Jermann and Quadrini (2006, 2012).³ As a result, aggregate data will mask important heterogeneity in terms of the cyclical properties of firms' financing behaviour, which is critical in understanding the differences in aggregate investment patterns.

This issue is even more important in Europe. We do not have any evidence on the cyclical properties of equity versus debt financing in Europe, especially by firm size. Europe is very different to the US in many ways. First of all, small firms not only make up a big chunk of the economy but are also responsible for a big chunk of aggregate output. Given the fact that this is the more financially constrained group, Europe provides a perfect testing laboratory for the effects of financial frictions on the macroeconomy. According to the European Commission (2015), more than 98% of all non-financial firms in Europe are SMEs and account for 60% of value added and 67% of employment. Hence in Europe, SMEs matter a lot for aggregate investment and growth. If we wish to understand the effect of financial frictions on the macroeconomy, we have to understand the behaviour of SME financing over time in Europe.

Secondly, Europe is more of a bank-based system than a capital market-based system as in the US. From the supply side, SMEs also account for a big proportion of bank loans. New loans to SMEs represented 30% of all new loans to NFCs during the 2000s, and this figure was 40% for Italy and Spain.⁴ Of course one issue is why do SMEs in Europe not tap other sources of financing like in the US, such as angel investors and venture capitalists. SMEs in Europe are financed by banks three times more than their counterparts in the US.⁵ The consensus explanation for this problem is the lack of well developed equity markets in Europe compared to the US.

I find that firms in the euro area accumulated more financial debt than those in the non-euro area during the boom years. This result resonates with the large body of literature that shows the enhancing effects of the removal of currency risk on capital flows and increased borrowing in the euro area countries after 1999. As I demonstrate, this debt accumulation came in the form of short-term bank loans and long-term debt in these countries, whereas other forms of financing such as equity and retained earnings have decreased during normal times and increased only slightly during the deleveraging process of the crisis years. Hence for the euro area countries debt financing is pro-cyclical to a certain extent, although the deleveraging process is not yet complete. Equity financing is counter-cyclical, although the increase in equity financing during the recession years has been modest.

2 The database covers all countries in the European Union except Cyprus and Malta. Data quality for Romania before 2009 is poor and fails to convey pre- and post-crisis variation. Romania is therefore excluded from the sample.

3 Begenu and Salomao (2015) also show that in booms small firms acquire more funds through equity than through debt which is reasonable since small firms are more financially constrained.

4 See Navaretti, Calzolari, and Pozzolo (18 November 2015).

5 See Watson (2 November 2015).

These results are mainly driven by small and medium-sized firms (SMEs), as such firms financed themselves more with loans and trade credit during the boom years compared to large firms. Long-term debt is accumulated more by large firms both in Euro and non-euro area countries. These results suggest the importance of financial frictions in European capital markets, where small firms have a harder time in accessing long-term bank finance and equity finance so they either use trade credit or short-term bank loans to finance themselves. Gopinath, Kalemli-Özcan, Karabarbounis, and Villegas-Sánchez (2016) show that small firms are more financially constrained than larger firms in the periphery countries of the European Union, which led to the misallocation of capital to lower productivity firms and an aggregate TFP decline in the manufacturing sector during the boom years in Southern European countries.

In terms of investment, profits and sales, firms that accumulated more debt experienced declining investment and sales both before and after the crisis, whereas firms that financed themselves with trade credit, equity and retained earnings experienced the opposite outcome. This result hints at the importance of debt overhang on investment and sales.⁶ Profits have a negative correlation with trade credit and equity during normal times (a typical finding in the literature) and a positive correlation with debt before the crisis, but do not correlate with any form of financing during the crisis.

The paper proceeds as follows. Section 2 describes the literature. Section 3 presents the data. Section 4 shows the descriptive patterns in the cyclical properties of different forms of financing. Section 5 presents investment, sales growth and profit regressions as a function of changes in the sources of financing. Section 6 concludes with policy implications.

7.2. Literature

Firms' financial positions are important amplification mechanisms for understanding business cycle fluctuations. Bernanke and Gertler (1989) develop a neoclassical model and show that business downturns reduce borrowers' net worth, raise agency costs of financing, and lower real capital investment, which amplifies the downturn (vice versa for upturns). The term "financial accelerator" has been used to refer to the mechanism whereby adverse shocks to the economy may be amplified by worsening financial market conditions (see Bernanke, Gertler, and Gilchrist, 1999). Another seminal work by Kiyotaki and Moore (1997) models a dynamic economy in which borrowers' credit limits are affected by the prices of the collateralised assets on their balance sheet, and at the same time these prices are affected by the size of the credit limits. The dynamic interaction between credit limits and asset prices turns out to be a powerful transmission mechanism by which the effects of shocks are amplified.

Finance literature investigates what determines firms' balance sheet structures in terms of risk and return trade-offs. Macro-literature argues that, in the presence of financial frictions, an important determinant of firms' capital structure choices are macroeconomic conditions, since financing decisions depend on the business cycle through its effect on defaults. Korajczyk (2003) documents the fact that target leverage is counter-cyclical for relatively unconstrained firms, but pro-cyclical for relatively constrained firms. Jermann and Quadrini (2012) show that financial frictions and shocks that affect firms' ability to borrow are important for macroeconomic fluctuations. The tightening of firms' financing conditions has significant real effects as it contributes to the sharp downturn in GDP and labour.

Covas and Den Haan (2012) develop a model in which firms finance investment needs with both debt and equity. Since debt financing increases the likelihood of default, firms have an incentive to issue equity in order to avoid excessive leverage when they issue debt. Begenau and Salomao (2015) build a model in which small firms issue debt and equity pro-cyclically for a similar reason as in Covas and Den Haan (2012). However, the largest firms find debt financing much cheaper during expansion due to the lower credit constraints that these firms face.

⁶ For a detailed study on the effect of debt overhang on corporate investment see Kalemli-Özcan, Laeven and Moreno (2016), who use matched firm-bank data to separate the firm debt overhang effect on investment from the "weak bank, low credit supply" effect.

A separate but related body of work studies how the supply of finance varies with economic conditions, in particular shocks to the financial institutions. Beginning with the work of Peek and Rosengren (1997), several papers have studied whether bank supply shocks halt credit provision in the domestic economy. See, for example, Kashyap and Stein (2000), Khwaja and Mian (2008), Paravisini, Rappoport, Schnabl, and Wolfenzon (2015), Schnabl (2012) and Jiménez, Ongena, Peydró, and Saurina (2012). Kashyap, Stein, and Wilcox (1993) highlight the change in firms' composition of financing when they switched to commercial paper issuance from bank lending as a result of tighter credit conditions. A recent version of this early idea is the work by Adrian, Colla, and Shin (2012), which criticises the use of aggregate flow-of-funds data. They show, using micro-level data on loan and bond issuance, an increase in bond financing when there is a reduction in bank loan supply.

The evidence on firm-level real outcomes, such as investment and sales, is sparse. Duchin, Ozbas, and Sensoy (2010) investigate the effect of the 2008 crisis on the corporate investment of US listed firms. Their paper shows that firms with more collateral reduce investment less. Almeida, Campello, Laranjeira, Weisbenner et al. (2012) show that the investment outcomes of firms differed in their long-term debt maturity structure during the 2008 financial crisis. Acharya, Eisert, Eufinger, and Hirsch (2015) investigate the effects of a shock to GILPS banks on investment by firms that borrow from GILPS banks. Kalemli-Özcan, Kamil, and Villegas-Sánchez (2016) quantify the effect of the lending channel on investment simultaneously with the effect of the balance sheet channel on investment, since they trace the effect of shocks to banks on investment by firms that borrow from those banks at the same time as the effect of shocks to firms' own balance sheets. Finally, Kalemli-Özcan, Laeven, and Moreno (2016) match a pan-European firm-level dataset to banks and investigate the effect of firms' debt overhang on their low investment in the aftermath of the crisis, taking account of the fact that these firms may have also been borrowing from weak banks. They find that firms that entered the crisis with higher levels of debt ended up reducing investment more in the aftermath of the crisis. Firms who borrowed from weak banks also reduced their investment more. These authors define weak banks as those with high exposures to sovereign debt, especially the debt of periphery countries.

7.3. Description of the Data

Our data comes from the ORBIS-AMADEUS database, which is compiled by Bureau van Dijk Electronic Publishing (BvD). Administrative data at the firm level are initially collected by local Chambers of Commerce through business registers and, in turn, relayed to BvD. BvD complements the data via 40 different information providers. In Europe company reporting is a regulatory requirement in most countries through business registers and therefore firm coverage is relatively good.

The dataset contains financial accounting information from detailed harmonised balance sheets, income statements, and profit and loss accounts of firms. Roughly 99% of companies in the dataset are private. Our sample is mainly composed of small and medium-sized enterprises with fewer than 250 employees, and these firms account for almost 70% of the value added and employment in Europe, both in the manufacturing sector and in the aggregate economy.⁷ This crucially differentiates our data from other datasets commonly used in the literature such as Compustat for the United States, Compustat Global and Worldscope, which mainly contain information on large listed companies.

This paper will focus on financing variables reported on firms' balance sheets (see Figure 3). The main financial variables used in the analysis are equity, retained earnings, bank loans, trade credit, long-term debt, total liabilities and assets. Detailed definitions of variables are listed in Table 7. I transform nominal financial variables to real using CPI with a 2005 base and converting to dollars using the end-of-year 2005 dollar/national currency exchange rate. The dataset presents detailed sector classification. Using this classification, I drop financial firms and government-owned firms, and use firms (NFCs) in all the other sectors.

⁷ See Kalemli-Özcan, Sørensen, Villegas-Sánchez, Volosovitch, and Yeşiltaş (2015) for extra information on AMADEUS data.

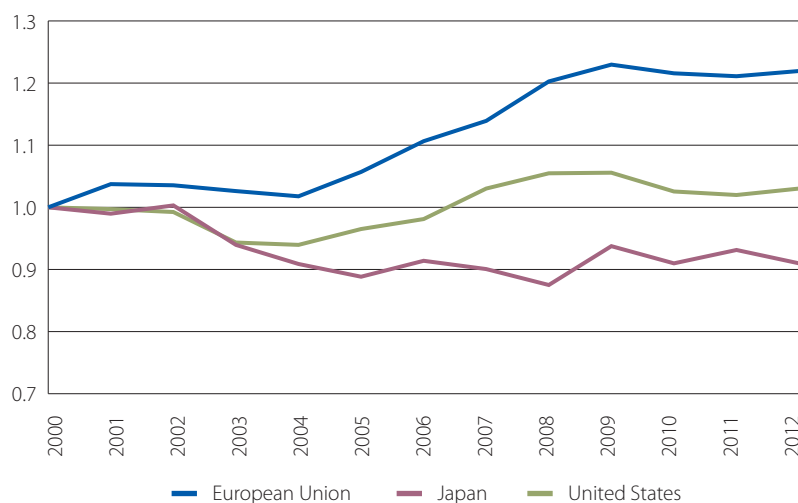
Tables A1 – A6 show the great coverage of the data since these tables report the percentage of missing observations for each financing item in the balance sheet.⁸ It is clear that there are few missing observations in few countries for the key financial variables that we are interested in.

Table 8, 9 and 10 report the descriptive statistics. It can immediately be seen that the standard deviations are big for each group of countries: euro area and non-euro area. The retained earnings category has a higher average across firms in the non-euro area, whereas the average levels of trade credits are generally similar between the two groups of countries.

7.4. Descriptive Results on Dynamics of Financing

Figure 2 shows an obvious increase in corporate debt to GDP for the countries in the EU, compared to the US and Japan. This is based on aggregate data and does not reveal which type of corporates has driven this increase. To be able to understand this we need to investigate the firms' balance sheet structure and dynamic changes to this structure at the firm level.

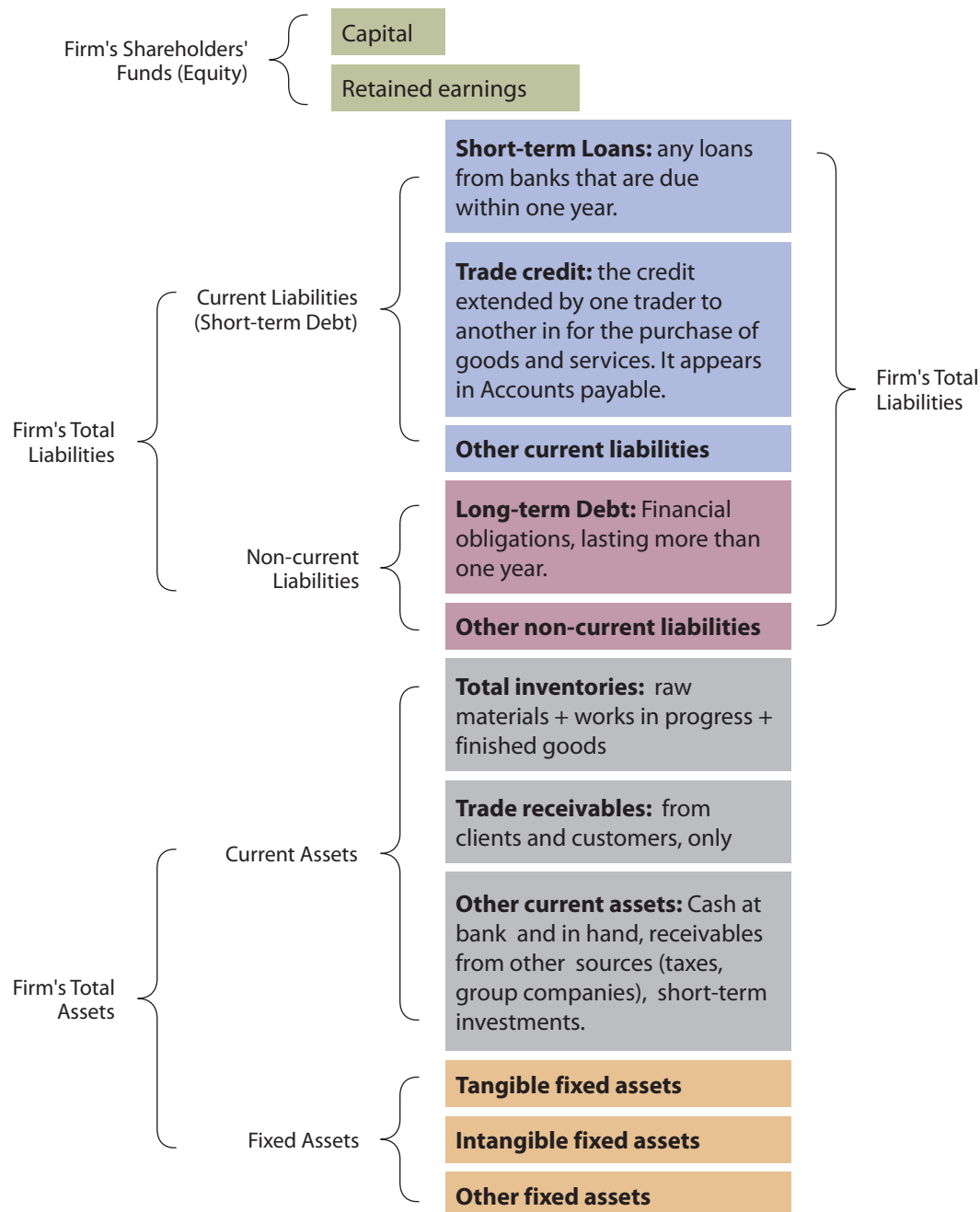
Figure 2 Corporate Debt
Debt of Non-Financial Corporations (% of GDP, Year 2000 = 1)



Source: Organisation for Economic Co-operation and Development, and World Bank Organization.

Figure 3 shows the typical balance sheet structure of an NFC. Firms' investments can be funded by both short and long-term external finance (debt and equity), and also by internal finance such as cash and retained earnings and intra-group debts. Cash and intra-group debts are reported under other current liabilities. The literature tends to model investment finance as only long term, but in reality this may not be the case. For external finance, firms can use short-term bank loans (short term refers to a maturity of less than 1 year at the loan origination) and trade credit, which is debt to suppliers and contractors. They can also use more long-term finance such as long-term debt (any financial obligation that has a maturity of longer than a year) and trade debt, which will be booked under other non-current liabilities. Note that trade credit that is short-term is reported under current liabilities but accumulated trade debt can be booked under non-current liabilities.

⁸ Tables are available in the online appendix to this chapter.

Figure 3 Breakdown of a Firm's Liabilities

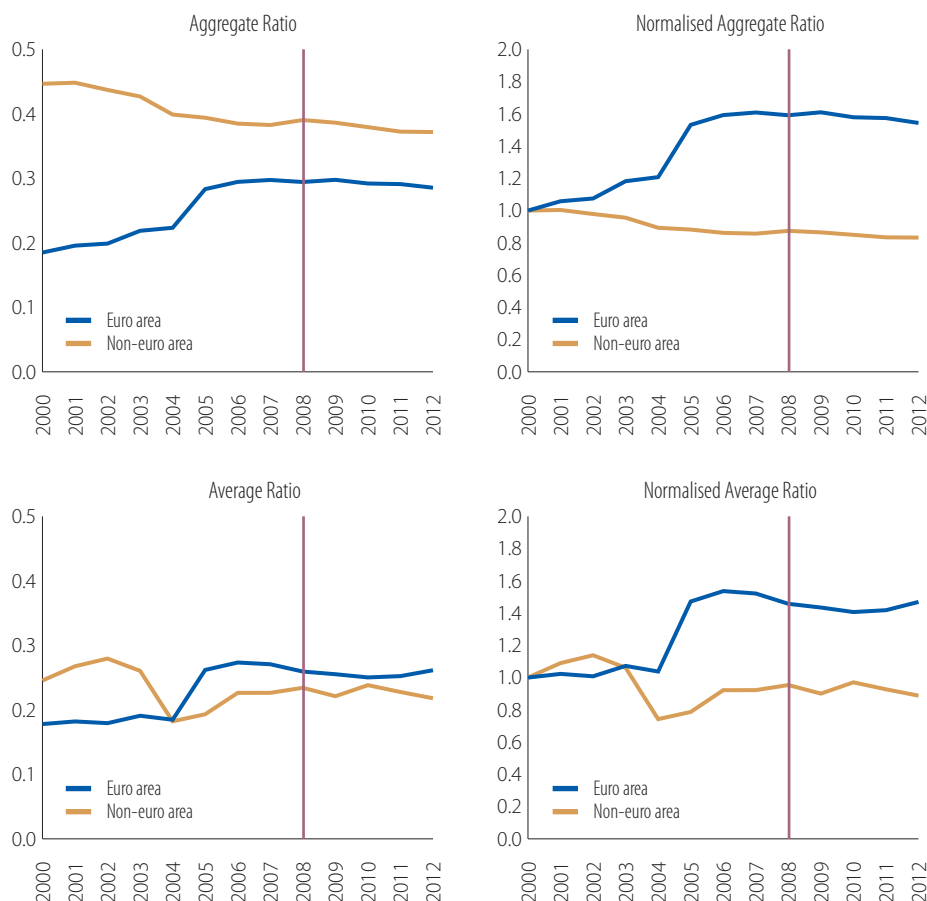
Long-term finance will offer protection from credit supply shocks, but firms with good growth opportunities might prefer short-term debt since they may wish to refinance frequently to obtain better loan terms. Most importantly, a stable political environment is a necessary condition for long-term finance and such an environment will go hand in hand with a well regulated banking system and developed capital markets. When lenders cannot rely on institutions to enforce contracts, they also prefer to lend short term.

Any equity financing will be booked under capital or retained earnings, as shown in Figure 3, where, in the case of private firms, such financing can come from private equity, angel investors, venture capitalists or other equity investors including foreign investors. Balance sheet data will not provide details on these. We would also not know from balance sheet data exactly what type of finance has financed what type of investment, since balance sheet data constitutes regulatory/voluntary reporting depending on the country and not a survey that asks a precise question on investment finance. The advantage of balance sheet data is that it is administrative and also longitudinal, as opposed to surveys where response rates can be low and most of the time not the same set of firms are followed over time.

The key point here is to understand, first and foremost, the behaviour of different financing sources over time as reported on balance sheets, before linking these dynamic changes in the balance sheet structure to changes in firms' real outcomes over time.⁹ This will have the advantage of capturing direct shocks to firms' balance sheets and hence the impact of financial frictions on firms' investment and sales/profits.

Figure 4 plots secured debt (financial debt) for two groups of countries in four panels. This debt is the sum of short-term loans and long-term debt as a ratio to total liabilities, so this ratio is only composed of the firms' interest-bearing financial obligations to financial intermediaries, both long term and short term, that are secured by collateral. In the top two panels, I plot the "aggregate ratio" in levels on the left and normalised by first year (2000) on the right, each by country groups, euro area and non-euro area. The aggregate ratio is calculated by adding up all short-term loans and long-term debt (financial debt) of the firms in the countries belonging to each country group and dividing by the sum of total liabilities. The bottom two panels plot the average ratio, that is the average of the ratios of all firms in these countries. The figures make it very clear that aggregate behaviour will be driven by large firms and average behaviour by small firms, and hence the two can deviate from each other if small and large firms have different balance sheet structures that vary over time differentially.

⁹ In most European countries, firms have to report full balance sheets regardless of their size.

Figure 4 Financial Debt/Total Liabilities, Evolution by Country Groups

According to the normalised ratios, there is a 60% increase in financial debt of NFCs in the euro area countries. This is much less in the non-euro area countries. In fact there is a slight decreasing tendency over time in the financial debt of those countries. 40% of aggregate total liabilities are represented by financial debt in the euro area, whereas for the average firm, this figure is around 20-25%.

Figure 5 plots major components of the balance sheet as shown in Figure 3, as a ratio to total liabilities if the component is a liability and as a ratio to total assets in the case of retained earnings and equity financing. These are ratios calculated on the basis of average firm-level data. I plot normalised ratios to get a better sense of time changes. The large increase over the boom years came in the form of bank loans and long-term debt for the euro area countries. In the non-euro area countries, however, this large increase is due to the increased share of other current liabilities financing, which mainly includes intra-group debt and is hence akin to trade credit. In the non-euro area countries, there is also an increase in retained earnings for the average firm right before the crisis. There is a dramatic collapse in retained earnings in the non-euro area countries during the crisis. It is not clear why this is the case, but since these countries are not subject to fiscal austerity programmes it is likely that firms smooth out the crisis shock using their savings. There is also a decline, though not as dramatic, in the average firm equity among these countries, which might be driven by the same considerations.

Figure 5 Financial Debt/Total Liabilities, Evolution by Country Groups

Figure 6 and 7 (in the Appendix) investigate the role of firm size in detail. Following Eurostat's official definition, I define firms with 1 to 249 employees as an SME and firms with 250 and more employees as large. Each row plots the normalised average ratio for a given financing item for Euro and non-euro area countries in the respective columns. Within each window I separate out SMEs and large firms. The key result is that SMEs in euro area countries increased loans and trade credit forms of financing during the boom years whereas SMEs in the non-euro area countries preferred other current liabilities as their key financing option. As shown in Figure 7, long-term debt has increased for the average firm in the euro

area countries for both the average SME and average large firm. Equity and retained earnings, on the other hand, slightly increased especially after the crisis for the average SME in the euro area countries. In the non-euro area countries, the average SME increased both equity and retained earnings during the boom years but these financing options quickly disappeared during the recession for SMEs in these countries.

It is worth noting that core and periphery countries in the euro area behave quite differently. Figures 8 to 11 (in the Appendix) break down the group of euro area countries in Figures 4 to 7 into the groups of core and periphery. Figure 8 shows that the substantial increase in the financial debt of NFCs in the euro area countries around the year 2005 was largely driven by the rapid accumulation of financial debt in the core countries. However, this debt ratio has been steadily increasing in the periphery countries from 20% to 30% while in the core countries it has been declining since 2007. This may reflect the attractiveness of risk premiums offered by peripheral markets.

Figure 9 plots major components of the balance sheet grouped by core, periphery and non-euro area countries. Compared with Figure 4, it shows that the increase of bank loans and trade credit over the boom years in the euro area countries all came from the periphery countries. The core countries even witnessed a decrease in these two types of short-term liability. In contrast, the core countries experienced a large increase in long-term debt in the boom years. This difference in debt maturities may be due to the low issuing costs of long-term debt in the core countries.

Figures 10 and 11 reveal how the dimension of firm size drives the patterns observed in Figure 9. In the periphery countries, SMEs contribute to the large increase in the share of bank loans and trade credit, and the substantial decrease in the share of other current liabilities in these countries. However, in the core countries, the increase in the share of long-term debt comes more from large firms than SMEs. The dip in equity and retained earnings' shares in total assets during the boom years was driven by SMEs in both groups, especially in the core countries.

7.5. Regression Analysis: Investment, Sales, Profit Dynamics

7.5.1. Regression Methodology

The previous section showed that there are important differences in the time paths of different sources of financing and that these differences also vary by firm size. To understand these differences in investment and other real outcome dynamics across firm types, financing sources and countries better, I run a standard investment regression, using our country-year-firm panel dataset, as a function of firms' financing sources. I also look at the effect of these financing sources and the dynamic changes in them on the firms' sales and profits. I run:

$$Y_{ict} = \alpha_i + \omega_{ct} + \beta_1 + Sales\ Growth_{ic,t-1} + \beta_2 Size_{ic,t-1} + \beta_3 \frac{Debt}{Total\ Assets}_{ic,t-1} + \epsilon_{ict}$$

where α_i is a firm-specific fixed effect and ω_{ct} is a country-year fixed effect and absorbs most of the country-wide recession and fall in demand. Sales growth is a standard variable that captures the growth opportunities of the firm. Notice that I cannot use a Tobin Q measure here, which is another growth opportunity variable, since this variable can only be calculated for listed firms and listed firms are only 1% of our sample. The size of the firm is measured with log (total assets) and the ratio of debt to total assets measures firm indebtedness, where I will use different financing sources from firms' balance sheets for this variable.

Y will be the ratio of investment to capital, *Sales Growth*, and the ratio of profits to capital in three different sets of regressions I run. I measure *capital*, K , with tangible fixed assets and *investment* as a ratio of the change in tangible fixed assets to capital, K . *Sales Growth* is measured as the change in *log Sales*.

I also run this regression by interacting all the variables with a $Crisis_{ct}$ dummy, where this dummy takes a value of one during the crisis years of 2008 and after depending on when each country enters the recession (it is a country-time specific crisis dummy).¹⁰ This regression will help us to understand whether the effect of financing resources on investment, profits and sales differs before and after the crisis and hence can inform us on the nature of the financial frictions. Hence I run:

$$Y_{ict} = \alpha_i + \omega_{ct} + \beta_1 Sales\ Growth_{i,c,t-1} + \beta_1 Sales\ Growth_{i,c,t-1} \times Crisis_{ct} + \beta_2 Size_{i,c,t-1} \times Crisis_{ct} + \beta_3 \frac{Debt}{Total\ Assets}_{i,c,t-1} + \beta_3 \frac{Debt}{Total\ Assets}_{i,c,t-1} \times Crisis_{ct} + \varepsilon_{ict}$$

7.5.2. Results

Table 10 in the Appendix presents descriptive statistics for the variables used in our regression. There is a high degree of variation in all our variables. The countries in the regression sample are: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, United Kingdom.

For most variables I have around 26 million firm-year observations with the exception of profit, a much less well reported variable on the balance sheet (since it is actually from the income statement and a flow variable, as opposed to the stock variables on the balance sheet).

Table 1 shows the results of the regression in equation (1). As expected, sales growth and investment are positively correlated and size (measured by log assets) and investment are negatively correlated. So firms with higher growth opportunities invest more and larger firms invest less. These results are standard in the literature.

Column (1) shows the results when the total debt to capital ratio is added as a regressor, and each additional column shows the effect of another form of debt/savings to gauge the effect of different forms of financing on investment. Each type of financing is positively related to investment, except bank loans and total debt. The largest positive economic impact is from equity, where a 1% increase in the equity to total assets ratio increases the investment ratio by 0.43 percentage points. Given the large standard deviation of equity, the effect is sizeable.

10 When sales growth is on the left hand side instead of the investment to capital ratio, I remove sales growth from the right hand side of the regression.

Table 1 Net investment/Capital, All Firms Sample

Dependent variable: (Net investment/Capital) _t					
	(1)	(2)	(3)	(4)	(5)
Independent variable	Total Debt	Trade Credit	Loans	Equity	Retained Earnings
Sales Growth _{t-1}	0.0916*** (55.26)	0.0898*** (54.08)	0.0894*** (53.80)	0.0892*** (51.35)	0.0870*** (50.11)
Size _{t-1}	-0.687*** (-249.45)	-0.663*** (-242.46)	-0.662*** (-242.09)	-0.686*** (-236.27)	-0.719*** (-242.34)
Total Debt _{t-1}	-0.436*** (-107.75)				
Trade Credit _{t-1}		0.176*** (29.07)			
Loans _{t-1}			-0.452*** (-58.38)		
Equity _{t-1}				0.430*** (86.48)	
Retained Earnings _{t-1}					0.427*** (90.35)
Observations	15,729,901	15,645,178	15,641,081	14,380,747	14,373,344
R ²	0.22	0.22	0.23	0.23	0.23
Firm FE	yes	yes	yes	yes	yes

t statistics in parentheses. Clustered errors at the firm level. Country-sector-year fixed effects are controlled.

Notes: Net investment is the % annual change in total fixed assets, at constant 2005 dollars. Right hand side variables are lagged with respect to net investment. Total Debt, Trade Credit, Loans, Equity and Retained Earnings are short names for Total Liabilities/Total Assets, Trade Credit/Total Assets, Short-term Loans/Total Assets, Equity/Total Assets and Retained Earnings/Total Assets respectively. Sales Growth is logarithmic change in real sales. Size is log(Total Assets).

*p<0.10, **p<0.05, ***p<0.001

Since I use firm fixed effects, I identify from within variation that consists of changes in firm level investment and changes in the sources of financing over time. Country-sector-year effects control for all the policy changes and also aggregate demand fluctuations at country-sector-year level. Hence I am very well positioned to evaluate the effect of the crisis conditional on aggregate demand fluctuations and industry-level demand fluctuations and using the crisis as a shock to firms' balance sheets, i.e. their financing sources.

Table 2 does exactly this by reporting results for the regression equation (2). The interesting result of this table is the fact that the effect of all sources of financing has smaller magnitudes during the crisis, meaning the total effect of different sources of financing during the crisis is still similar to their normal time effect in terms of their sign but smaller in magnitude. Hence, the total effect of all the variables is similar to Table 1. This might be due to the fact that our data ends at the end of 2012 and hence cannot capture the full effect of the crisis, which lasted well into 2015 in many countries.

In terms of partial effects, only trade credit has a positive sign during the crisis. In fact during the crisis, only firms with better growth opportunities (sales growth) and firms that financed investment with trade credit can increase their investment. Large firms can also increase their investment during the crisis given the positive partial effect but the total effect of size is still negative. In a similar vein, retained earnings have a partial negative effect on investment during the crisis, but the full effect is still positive. Hence the interpretation is similar to the other sources of financing, that is the positive effect of retained earnings on trade credit during the crisis is a smaller positive. This might be due to the fact that firms

with high retained earnings did not want to invest right away and preferred to adopt a “wait and see” approach.

These results shed light on the nature of financial frictions. Conditional on firm size and the time series patterns in the sources of financing shown in the previous section, it is clear that the trade credit result is driven by SMEs. SMEs are financially constrained to start with and become more financially constrained given the shortage of bank financing during the crisis and hence finance their investment with trade credit, which is a form of unsecured debt.

Table 2 Net investment/Capital, with Recession Indicator Interactions

Dependent variable: (Net investment/Capital) _t					
	(1)	(2)	(3)	(4)	(5)
Independent variable	Total Debt	Trade Credit	Loans	Equity	Retained Earnings
Post*Sales Growth _{t-1}	0.0228*** (6.93)	0.0247*** (7.47)	0.0268*** (8.13)	0.0253*** (7.34)	0.0261*** (7.59)
Sales Growth _{t-1}	0.0812*** (34.89)	0.0789*** (33.89)	0.0775*** (33.28)	0.0779*** (31.90)	0.0755*** (30.94)
Post*Size _{t-1}	0.0064*** (6.68)	0.0131*** (13.79)	0.0107*** (11.28)	0.0045*** (4.57)	0.0064*** (6.47)
Size _{t-1}	-0.692*** (-242.58)	-0.670*** (-236.39)	-0.668*** (-235.63)	-0.689*** (-229.31)	-0.723*** (-236.01)
Post*Total Debt _{t-1}	-0.0356*** (-8.17)				
Total Debt _{t-1}	-0.415*** (-83.30)				
Post*Trade Credit _{t-1}		0.0381*** (4.55)			
Trade Credit _{t-1}		0.162*** (22.34)			
Post*Loans _{t-1}			-0.0320*** (-2.79)		
Loans _{t-1}			-0.436*** (-45.50)		
Post*Equity _{t-1}				-0.0002 (-0.03)	
Equity _{t-1}				0.429*** (70.37)	
Post*Retained Earnings _{t-1}					-0.0237*** (-4.79)
Retained Earnings _{t-1}					0.441*** (74.82)
Observations	15,729,901	15,645,178	15,641,081	14,380,747	14,373,344
R ²	0.22	0.22	0.22	0.23	0.23
Firm FE	yes	yes	yes	yes	yes

t statistics in parentheses. Clustered errors at the firm level. Country-sector-year fixed effects are controlled.

Notes: Net investment is the % annual change in total fixed assets, at constant 2005 dollars. Post is a recession indicator which equals 0 between year 2000 and 2007, and 1 between year 2008 and 2012. Right hand side variables are lagged with respect to net investment. Total Debt, Trade Credit, Loans, Equity and Retained Earnings are short names for Total Liabilities/Total Assets, Trade Credit/Total Assets, Short-term Loans/Total Assets, Equity/Total Assets and Retained

Earnings/Total Assets respectively. Sales Growth is logarithmic change in real sales. Size is log(Total Assets).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Table 3 and 4 repeat the same exercise for profits. I use the profit to capital ratio now as the dependent variable instead of the investment to capital ratio. Total debt and loans are now positively correlated with profits (as opposed to investment) and equity and retained earnings negatively correlated. However, as shown in Table 4, the effects of different forms of financing do not change their sign during the crisis for the profit ratio. In fact during the crisis it does not matter in terms of profits what form of financing is used. This can be because profits were down for everyone given the recession regardless of the form of financing different firms use.

Table 3 Profit/Capital, All Firms Sample

Dependent variable: (Profit/Capital) _t					
	(1)	(2)	(3)	(4)	(5)
Independent variable	Total Debt	Trade Credit	Loans	Equity	Retained Earnings
Sales Growth _{t-1}	1.136*** (6.71)	1.057*** (6.23)	1.155*** (6.80)	1.010*** (5.66)	1.059*** (5.94)
Size _{t-1}	-3.526*** (-12.82)	-3.461*** (-12.59)	-3.526*** (-12.76)	-3.411*** (-11.75)	-2.776*** (-9.41)
Total Debt _{t-1}	6.593*** (11.10)				
Trade Credit _{t-1}		6.275*** (8.27)			
Loans _{t-1}			1.914** (2.20)		
Equity _{t-1}				-5.900*** (-9.53)	
Retained Earnings _{t-1}					-4.202*** (-7.58)
Observations	652,319	651,759	650,515	592,610	592,072
R ²	0.64	0.64	0.64	0.64	0.64
Firm FE	yes	yes	yes	yes	yes

t statistics in parentheses. Clustered errors at the firm level. Country-sector-year fixed effects are controlled.

Notes: Profit/Capital is the gross profit over real capital stock at constant 2005 dollars. Right hand side variables are lagged with respect to Profit/Capital. Total Debt, Trade Credit, Loans, Equity and Retained Earnings are short names for Total Liabilities/Total Assets, Trade Credit/Total Assets, Short-term Loans/Total Assets, Equity/Total Assets and Retained Earnings/Total Assets respectively. Sales Growth is logarithmic change in real sales. Size is log(Total Assets).

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

Table 4 Profit/Capital, with Recession Indicator Interactions

Dependent variable: (Profit/Capital),					
	(1)	(2)	(3)	(4)	(5)
Independent variable	Total Debt	Trade Credit	Loans	Equity	Retained Earnings
Post*Sales Growth _{t-1}	1.212*** (3.00)	1.091*** (2.69)	1.159*** (2.85)	1.339*** (3.20)	1.305*** (3.12)
Sales Growth _{t-1}	0.928*** (4.91)	0.869*** (4.59)	0.951*** (5.02)	0.762*** (3.82)	0.818*** (4.10)
Post*Size _{t-1}	-0.243 (-1.14)	-0.283 (-1.33)	-0.281 (-1.31)	-0.290 (-1.30)	-0.353 (-1.57)
Size _{t-1}	-3.504*** (-12.57)	-3.433*** (-12.32)	-3.496*** (-12.48)	-3.381*** (-11.50)	-2.731*** (-9.18)
Post*Total Debt _{t-1}	0.962 (1.13)				
Total Debt _{t-1}	6.341*** (9.93)				
Post*Trade Credit _{t-1}		2.479 (1.58)			
Trade Credit _{t-1}		5.811*** (7.30)			
Post*Loans _{t-1}			-1.617 (-0.90)		
Loans _{t-1}			2.235** (2.39)		
Post*Equity _{t-1}				-0.157 (-0.18)	
Equity _{t-1}				-5.829*** (-8.83)	
Post*Retained Earnings _{t-1}					0.960 (1.14)
Retained Earnings _{t-1}					-4.597*** (-7.28)
Observations	652,319	651,759	650,515	592,610	592,072
R ²	0.64	0.64	0.64	0.64	0.64
Firm FE	yes	yes	yes	yes	yes

t statistics in parentheses. Clustered errors at the firm level. Country-sector-year fixed effects are controlled.

Notes: Profit/Capital is the gross profit over real capital stock at constant 2005 dollars. Post is a recession indicator which equals 0 between year 2000 and 2007, and 1 between year 2008 and 2012. Right hand side variables are lagged with respect to Profit/Capital. Total Debt, Trade Credit, Loans, Equity and Retained Earnings are short names of Total Liabilities/Total Assets, Trade Credit/Total Assets, Short-term Loans/Total Assets, Equity/Total Assets and Retained Earnings/Total Assets respectively. Sales Growth is logarithmic change in real sales. Size is log(Total Assets).

*p<0.10, **p<0.05, ***p<0.001

Finally, Table 5 and 6 repeat the same exercise for sales growth as the dependent variable. For normal times, the results mimic the investment regression, except that now the equity is negatively correlated with sales growth. For crisis times, the results are quite different from investment results. Now the partial crisis effects are big enough that when the sign reverts, the total effect also reverts. As shown

in Table 6, only firms with enough equity, trade credit and retained earnings could have increased their sales growth during the crisis, since the total effects of these variables are positive. The partial effect of trade credit on sales growth is negative. This is probably due to the fact that a demand collapse affects sales and trade credit both negatively on impact. What is interesting is that the total effect of debt is negative, so firms with a lot of debt experience declining overall sales growth during the crisis.

Table 5 Sales Growth, All Firms Sample

Dependent variable: (Sales Growth) _t					
	(1)	(2)	(3)	(4)	(5)
Independent variable	Total Debt	Trade Credit	Loans	Equity	Retained Earnings
Sales Growth _{t-1}	0.134*** (250.73)	0.135*** (252.72)	0.135*** (252.08)	0.138*** (242.80)	0.136*** (235.13)
Size _{t-1}	-0.0006 (-0.65)				
Total Debt _{t-1}		0.174*** (122.88)			
Trade Credit _{t-1}			-0.162*** (-85.40)		
Loans _{t-1}				-0.0160*** (-15.29)	
Equity _{t-1}					0.0160*** (15.45)
Retained Earnings _{t-1}	15,729,901	15,645,178	15,641,018	14,380,747	14,373,344
	0.29	0.29	0.29	0.30	0.30
Observations	652,319	651,759	650,515	592,610	592,072
R ²	0.64	0.64	0.64	0.64	0.64
Firm FE	yes	yes	yes	yes	yes

t statistics in parentheses. Clustered errors at the firm level. Country-sector-year fixed effects are controlled.

Notes: Sales Growth is logarithmic change in real sales. Right hand side variables are lagged with respect to Sales/Capital. Total Debt, Trade Credit, Loans, Equity and Retained Earnings are short names for Total Liabilities/Total Assets, Trade Credit/Total Assets, Short-term Loans/Total Assets, Equity/Total Assets and Retained Earnings/Total Assets respectively. Size is $\log(\text{Total Assets})$.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.001$

{tc "10 Sales Growth, with Recession Indicator Interactions" \f t}

Table 6 Sales Growth, with Recession Indicator Interactions

Dependent variable: (Sales Growth) _t					
	(1)	(2)	(3)	(4)	(5)
Independent variable	Total Debt	Trade Credit	Loans	Equity	Retained Earnings
Post*Sales Growth _{t-1}	-0.0017*** (-8.29)	0.0025*** (12.16)	0.0007*** (3.23)	-0.0016*** (-7.22)	-0.0016*** (-7.17)
Sales Growth _{t-1}	0.134*** (245.21)	0.134*** (244.89)	0.135*** (245.57)	0.138*** (237.29)	0.136*** (230.98)
Post*Size _{t-1}	-0.0727*** (-70.49)				
Size _{t-1}	0.0403*** (35.64)				
Post*Total Debt _{t-1}		-0.0663*** (-35.69)			
Total Debt _{t-1}		0.204*** (127.87)			
Post*Trade Credit _{t-1}			-0.0388*** (-13.84)		
Trade Credit _{t-1}			-0.144*** (-64.57)		
Post*Loans _{t-1}				0.0774*** (70.71)	
Loans _{t-1}				-0.0622*** (-50.02)	
Post*Equity _{t-1}					0.0430*** (39.45)
Equity _{t-1}					-0.010*** (-8.24)
Post*Retained Earnings _{t-1}	15,729,901 0.29	15,645,178 0.29	15,641,018 0.29	14,380,747 0.30	14,373,344 0.30
Retained Earnings _{t-1}					-4.597*** (-7.28)
Observations	652,319	651,759	650,515	592,610	592,072
R ²	0.64	0.64	0.64	0.64	0.64
Firm FE	yes	yes	yes	yes	yes

t statistics in parentheses. Clustered errors at the firm level. Country-sector-year fixed effects are controlled.

Notes: Sales Growth is logarithmic change in real sales. Post is a recession indicator which equals 0 between year 2000 and 2007, and 1 between year 2008 and 2012. Right hand side variables are lagged with respect to Sales/Capital. Total Debt, Trade Credit, Loans, Equity and Retained Earnings are short names for Total Liabilities/Total Assets, Trade Credit/Total Assets, Short-term Loans/Total Assets, Equity/Total Assets and Retained Earnings/Total Assets respectively. Size is log(Total Assets).

*p<0.10, **p<0.05, ***p<0.001

Overall, our results indicate that financial constraints bind during crisis times more so for smaller firms, which have to use trade credit, equity and retained earnings if they want to continue operating and increase their investment and sales.

7.6. Conclusion and Policy Recommendations

I document the evolution of sources of financing for non-financial firms in Europe and the effects of changes in these financing sources on firms' real outcome dynamics before and after the European crisis. Using unique pan-European firm-level data that encompasses balance sheets and income statements of privately held firms, including a large and representative number of small to medium-sized enterprises (SMEs), I find that firms in the euro area accumulated more financial debt than non-euro area firms during the 2000s. This result shows the importance of the increase in the foreign capital flows within the euro area countries as a result of the removal of currency risk with the introduction of the Euro.

The financial debt is debt due to financial institutions and hence it is a secured (by collateral) form of debt. I show that this debt is accumulated in the form of both short-term bank loans and long-term debt, whereas other forms of financing such as equity and retained earnings increased slightly only during the deleveraging process of the crisis years. These results show that for the euro area countries debt financing is pro-cyclical and equity financing is counter-cyclical to a certain extent.

The results are mainly driven by small and medium-sized firms (SMEs), as such firms financed themselves more with loans and trade credit, especially in the periphery countries. Long-term debt is accumulated relatively more by large firms, more so in the core countries. For both SMEs and large firms debt financing is pro-cyclical. Equity financing registers more mixed results across SMEs and large firms and also across the Euro and non-euro area country firms. In the non-euro area countries equity financing is largely pro-cyclical for SMEs, a result that has also been found for small firms in the US. In the US only very large firms are able to issue equity during the recession. The US results are based on listed firms though, and in this paper the use of non-listed firms implies many other forms of equity financing. The finding that SMEs are able to raise equity financing only in the euro area countries during the recession points to two facts. First, the euro area banks were in a bigger trouble due to their high exposure to periphery country sovereign debt, compared to non-euro area banks, and hence bank financing collapsed more; and second, firms in the euro area were in a better position to raise foreign equity financing (such as FDI) given the higher degree of capital market integration compared to non-euro area country firms.

In terms of investment, profits and sales, firms that accumulated more debt have experienced declining investment and sales both before and after the crisis, whereas firms that financed themselves with trade credit, equity and retained earnings have experienced the opposite outcome. Profits have a negative correlation with trade credit and a positive correlation with debt before the crisis but do not correlate with any form of financing during the crisis.

The existing explanations for the sluggish recovery in Europe so far have emphasised the role of low aggregate demand and financial frictions. Financial frictions can operate via banks, where banks' balance sheet problems prevent them from lending to any borrower, or via firms, where firms with deteriorating balance sheets become risky borrowers. I show that the capital structure of firms' balance sheets and how this structure changed over time in terms of different financing sources is key to explaining the financial frictions operating via firms' balance sheets. Firm heterogeneity in terms of firm size and how firm size is correlated with firm financing behaviour over time has important implications in terms of explaining the performance of the aggregate economy.

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Appendix: Charts and Tables

Figure 6 Normalised Average Ratios by Country Group and by Firm Size
(SME: $1 \leq \text{employees} \leq 249$; Large: $\text{employees} \geq 250$)

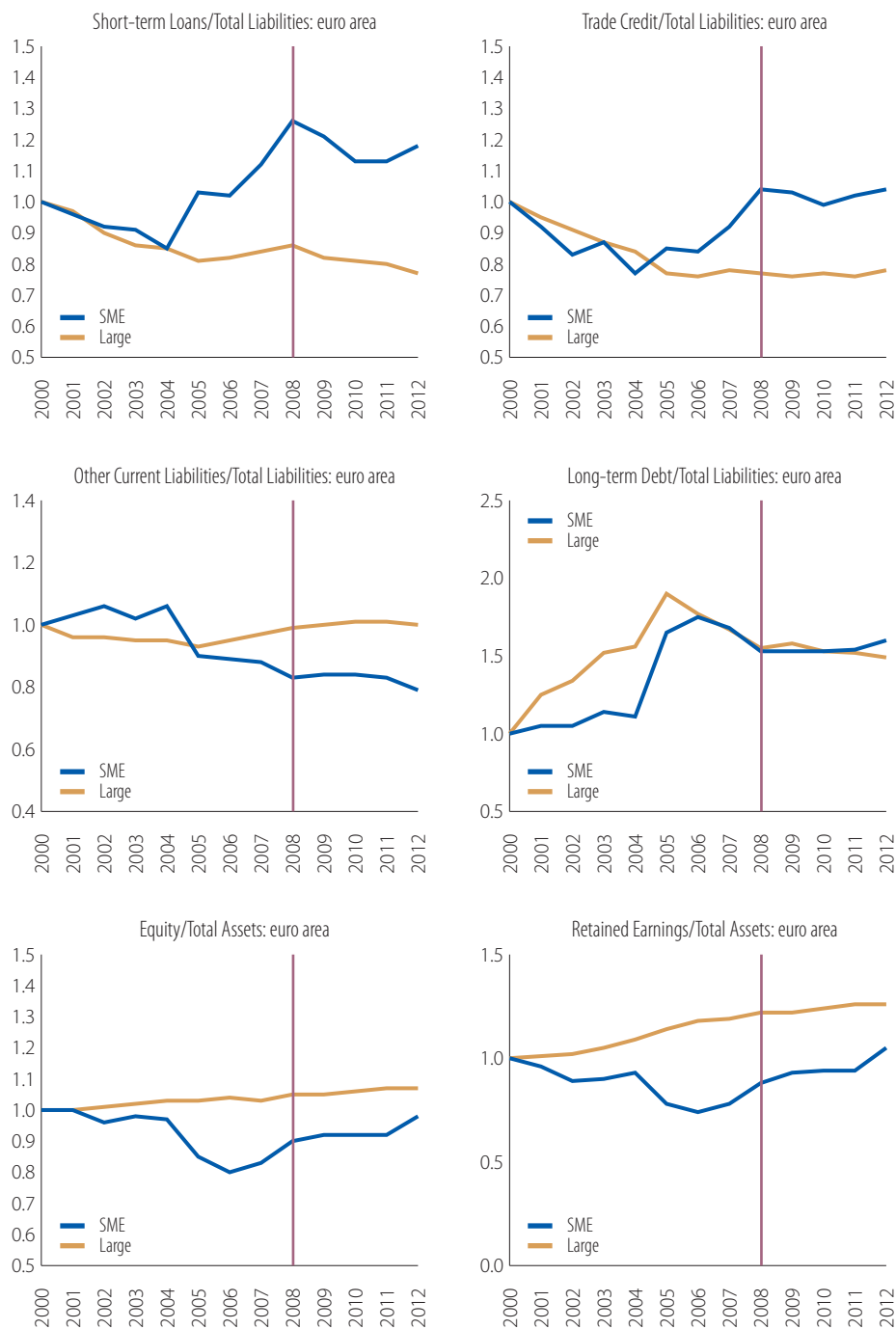


Figure 7 Normalised Average Ratios by Country Groups and by Firm Size (SME: 1 ≤ employees ≤ 249; Large: employees ≥ 250)



Figure 8 Financial Debt/Total Liabilities Evolution by Core and Periphery Countries

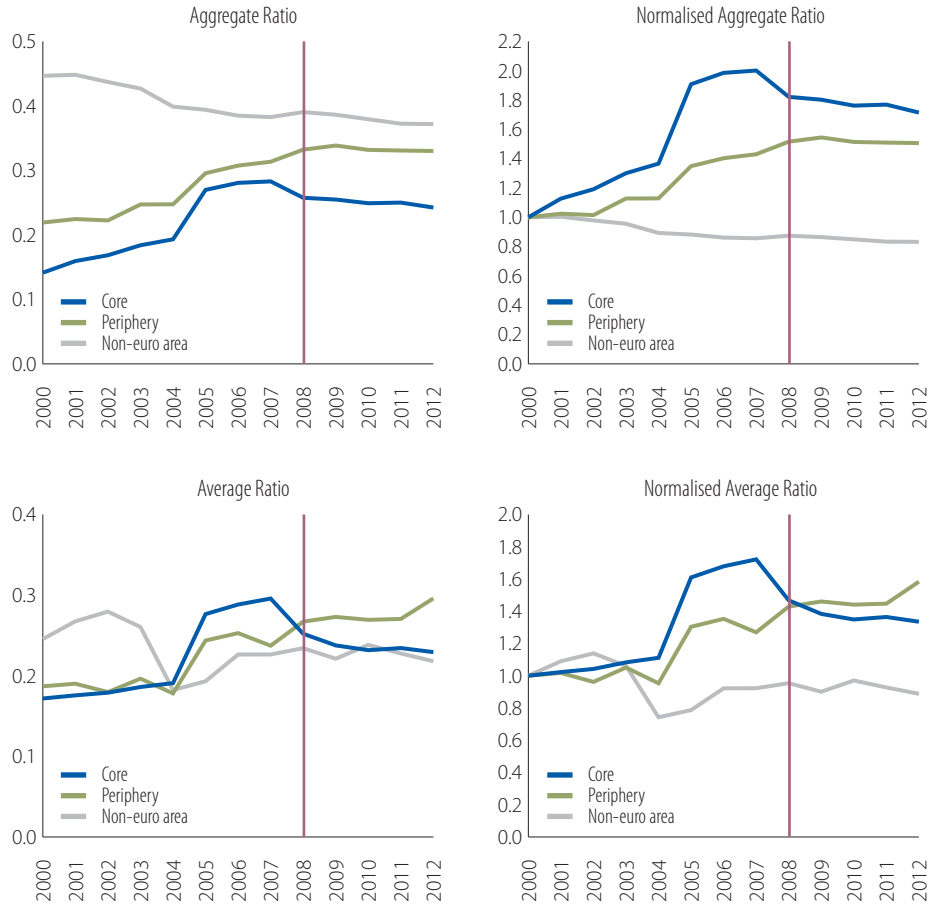


Figure 9 Normalised Average Ratios by Core and Periphery Countries
(averages of firm-level ratios and normalised at first year)

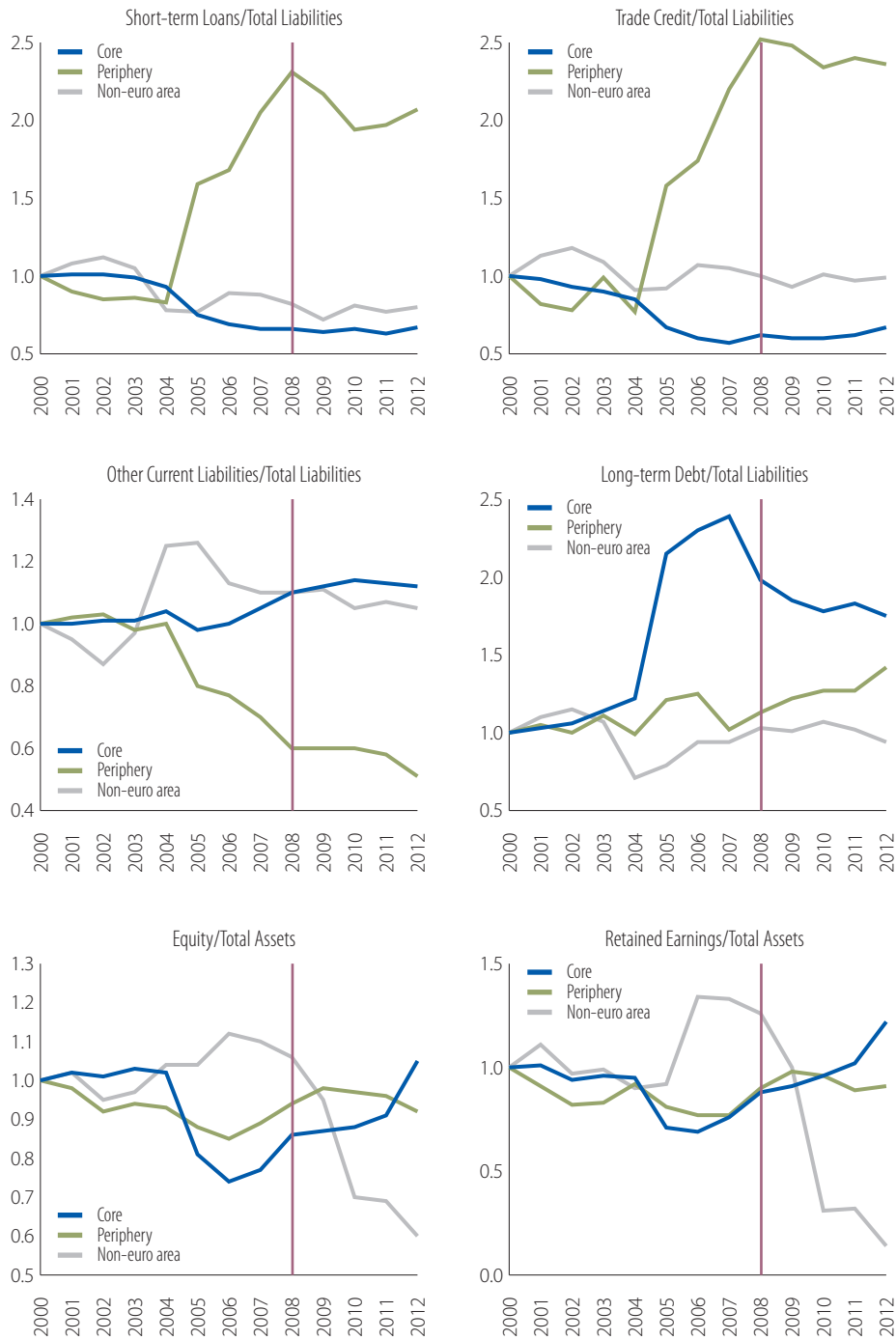


Figure 10 Normalised Average Ratios by Core and Periphery Countries and by Firm Size (SME: 1 ≤ employees ≤ 249; Large: employees ≥ 250)

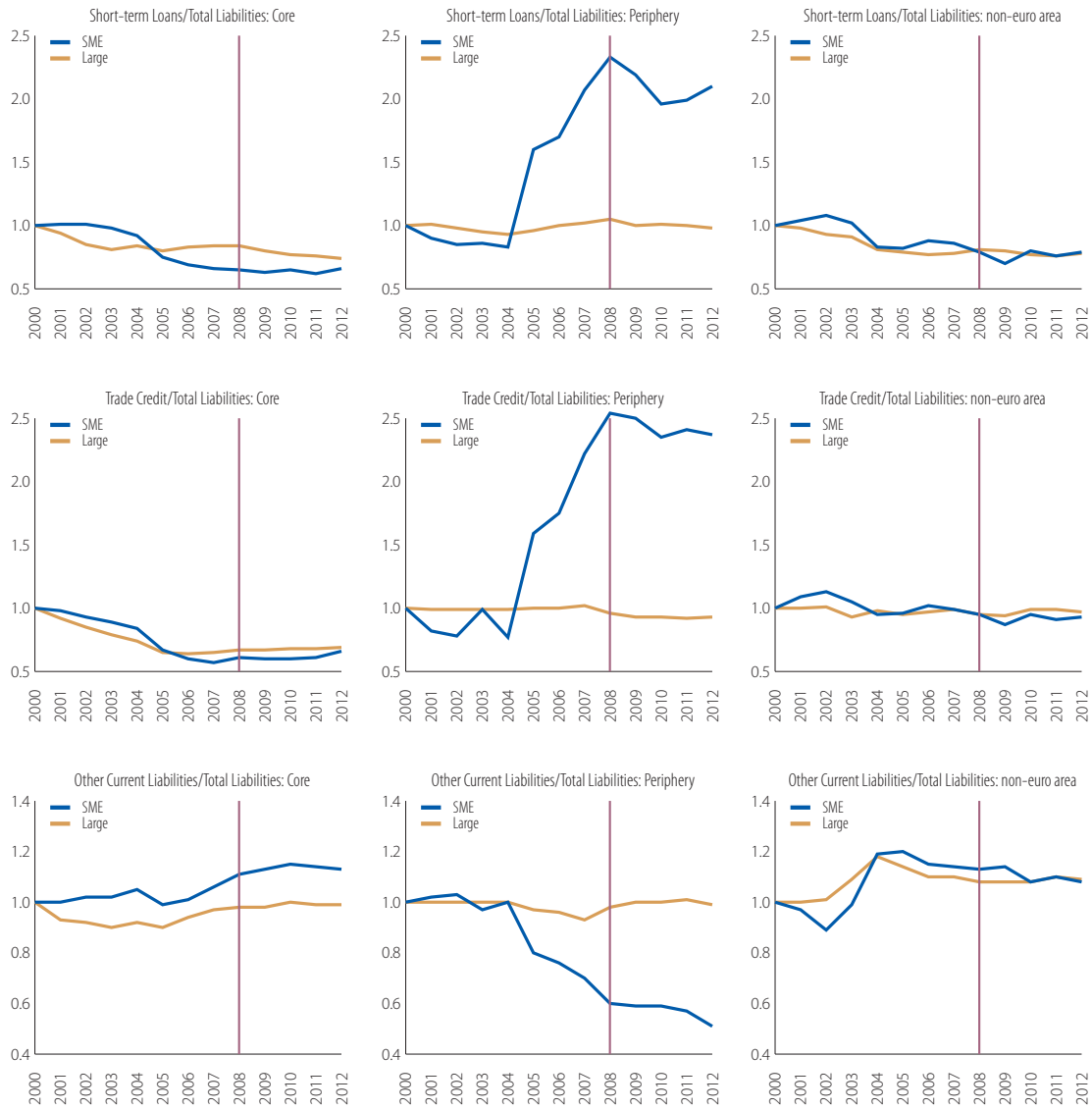


Figure 11 Normalised Average Ratios by Core and Periphery Countries and by Firm Size (SME: $1 \leq \text{employees} \leq 249$; Large: $\text{employees} \geq 250$)



Table 7 Definition of Variables

Variable	Definition
Equity	Shareholders funds or total equity (capital + other shareholders funds)
Retained Earnings	Other shareholders funds: all shareholders funds not linked with the issued capital such as reserve capital, undistributed profit, also include minority interests if any
Fixed Assets	Total amount (after depreciation) of non-current assets (intangible assets + tangible assets + other fixed assets)
Current Assets	Total amount of current assets (stocks + debtors + other current assets)
Total Assets	Fixed assets + current assets
Short-term Loans	Short-term financial debts (e.g. to credit institutions + part of long-term financial debts payable within the year, bonds, etc.)
Trade Credit	Debts to suppliers and contractors (trade creditors)
Other Current Liabilities	Other current liabilities such as pensions, personnel costs, taxes, intra-group debts, accounts received in advance, etc.
Short-term Debt	Current liabilities of the company (loans + creditors + other current liabilities)
Long-term Debt	Long-term financial debts (e.g. to credit institutions (loans and credits), bonds)
Total Debt	Short-term debt + long-term debt
Current Liabilities	Current liabilities of the company (loans + creditors + other current liabilities)
Non-Current Liabilities	Long-term liabilities of the company (long-term financial debts + other long-term liabilities and provisions)
Total Liabilities	Current liabilities + non-current Liabilities

Table 8 Euro area Countries: Summary Statistics

	Mean	St.Dev.	Min.	Median	Max.
Short-term Loans	0.157	0.761	0.000	0.000	45.10
Trade Credit	0.326	1.138	0.000	0.014	56.38
Other Current Liabilities	0.533	1.876	0.000	0.104	420.0
Long-term Debt	0.291	1.340	0.000	0.001	61.23
Total Debt	1.382	4.740	0.000	0.280	627.4
Total Liabilities	1.676	5.733	0.001	0.318	1134
Equity	0.740	4.311	-9.183	0.088	1436
Retained Earnings	0.484	2.870	-24.81	0.045	897.3
Equity/Total Assets	0.212	0.523	-5.998	0.238	0.982
Retained Earnings/Total Assets	0.097	0.483	-6.617	0.119	0.935
Short-term Loans/Total Liabilities	0.061	0.129	0.000	0.000	0.880
Trade Credit/Total Liabilities	0.194	0.237	0.000	0.091	0.992
Other Current Liabilities/Total Liabilities	0.466	0.323	0.000	0.416	1.000
Long-term Debt/Total Liabilities	0.177	0.264	0.000	0.004	1.000

Table 9 Non-euro area Countries: Summary Statistics

	Mean	St.Dev.	Min.	Median	Max.
Short-term Loans	0.620	6.808	0.000	0.000	146.7
Trade Credit	0.359	1.831	0.000	0.007	32.13
Other Current Liabilities	0.553	2.983	0.000	0.042	58.02
Long-term Debt	0.453	4.098	0.000	0.000	89.35
Total Debt	2.142	14.09	0.000	0.122	334.0
Total Liabilities	2.694	18.79	44.09	0.143	383.8
Equity	1.337	8.731	-14.28	0.059	170.7
Retained Earnings	0.809	6.050	-30.82	0.036	117.1
Equity/Total Assets	0.274	0.703	-15.40	0.339	0.994
Retained Earnings/Total Assets	0.122	0.827	-18.24	0.205	0.975
Short-term Loans/Total Liabilities	0.079	0.172	0.000	0.000	0.992
Trade Credit/Total Liabilities	0.204	0.257	0.000	0.088	1.000
Other Current Liabilities/Total Liabilities	0.449	0.351	0.000	0.375	1.000
Long-term Debt/Total Liabilities	0.147	0.256	0.000	0.000	0.995

Table 10 Summary Statistics for the Regression Variables

	Obs.	Mean	St.Dev.	Min.	Median	Max.
Net Investment/Capital ¹	26,083,665	0.368	6.808	2.235	0.000	146.7
Profit/Capital ²	2,182,844	15.94	1.831	57.20	0.007	32.13
Sales Growth ³	16,525,190	0.025	2.983	0.471	0.042	58.02
Total Assets ⁴	25,992,176	13.16	4.098	1.753	0.000	89.35
Total Liabilities/Total Assets ⁵	25,992,120	0.753	14.09	0.439	0.122	334.0
Trade Credit/Total Assets ⁶	25,643,836	0.144	18.79	0.194	0.143	383.8
Short-term Loans/Total Assets ⁷	25,637,015	0.051	8.731	0.114	0.059	170.7
Equity/Total Assets ⁸	23,963,413	0.240	0.503	-15.40	0.258	0.994
Retained Earnings/Total Assets ⁹	23,789,377	0.124	0.496	-18.24	0.138	0.975

Notes: ¹ Increase in real capital stock over lagged real capital stock. ² Real gross profit over real capital stock. ³ Logarithmic change in real sales. ⁴ Logarithm of real total assets. ⁵ Total liabilities over real total assets. ⁶ Trade credit over real total assets. ⁷ Short-term loans over real total assets. ⁸ Equity over real total assets. ⁹ Retained earnings over real total assets.