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CREDIT STANDARDS AND CAPITAL ALLOCATION
IN A LOW INTEREST RATE ENVIRONMENT

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RESUME

I dette arbejdspapir præsenteres en analyse af de senere års udvikling i kreditgivningen til danske virksomheder baseret på regnskabsdata og data fra spørgeskemaundersøgelser på virksomhedsniveau. Analysen indikerer, at det lave renteniveau og den øgede konkurrence blandt kreditinstitutterne ikke har ført til betydelige lempelser i de mindre kreditværdige virksomheders lånevilkår. Institutternes kreditvurdering giver stadig i stor udstrækning anledning til, at lånekapitalen går til de mest solide og produktive virksomheder. Endvidere indikerer analysen, at danske virksomheders låneefterspørgsel er forholdsvis afdæmpet, og at de har relativt god adgang til finansiering i sammenligning med virksomheder i andre lande.

ABSTRACT

Using firm-level data from surveys and financial statements, this paper presents an analysis of credit standards, capital allocation and financial conditions of non-financial enterprises in Denmark since the beginning of the financial crisis. The analysis indicates that low interest rates and increased competition among financial intermediaries have not lead to significant easing of credit standards for the least creditworthy firms. The current credit standards to a large extent still contribute to allocating loan capital to the most solvent and productive firms. Furthermore, the analysis indicates that Danish firms' credit demand is relatively limited, and that they have relatively good access to finance in comparison with firms in other countries.

KEYWORDS

JEL CLASSIFICATION

ACKNOWLEDGEMENTS

1. INTRODUCTION

It has been a common concern that the extraordinarily low interest rates, which – not least in Denmark – have prevailed during the past few years, may have induced excessive risk taking and search for yield among financial intermediaries. A relaxation of the tighter credit standards brought about by the recent crisis may increase credit risk and thereby imply threats to financial stability, but it may also have important macroeconomic implications. For example, the low interest rates may 'artificially' keep low-productive firms alive, meaning that a proper allocation of capital by the banking sector may be even more important in a low interest rate environment than in times with higher interest rates.

This paper analyses credit standards, capital allocation and financial conditions of Danish firms using two different approaches, namely a survey based and an indicator based approach. We find that banks' credit standards to a large extent contribute to allocation of loan capital to the most solvent and productive firms. Credit standards were relaxed somewhat from 2010 to 2014, but only for the more creditworthy firms. The relatively tight credit standards which were implemented in the wake of the financial crisis were maintained towards the least creditworthy and least productive firms. In addition, we find that credit demand has been limited in the period since the beginning of the financial crisis. This may reflect the large positive savings surplus in the corporate sector since the beginning of the financial crisis, and in addition that Danish firms to a large extent use internal financing in the beginning of an economic upturn. Finally, our results demonstrate the importance of taking into account characteristics of firms applying for credit (e.g. creditworthiness) when assessing aggregate survey-based evidence of financial constraints, such as the Survey of Access to Finance for Small and Medium Sized Enterprises conducted by the European Commission and the ECB.

In the survey based part of the paper, we merge firm-level responses surveys of financial conditions for small and medium sized enterprises in Denmark with register based firm-level information, mainly retrieved from financial statements. The surveys contain data for 2007, 2010 and 2014. In the two latest survey rounds, we find a clear relation between the creditworthiness of a firm and the probability that the bank accepts a loan application from that firm. Our econometric approach takes into account that the decision to apply for a bank loan is not random, but rather correlated with firm characteristics. We also find that only a limited share of firms apply for bank loans in a given year, reflecting a relatively low credit demand in the period since the beginning of the financial crisis.

The indicator-based approach utilizes an indicator of financial constraints based on the evolution of firm-level financial statements. The compilation of the indicator follows the methods and procedures outlined by the Competitiveness Research Network coordinated by the ECB. An international comparison shows that relatively few Danish firms were financially constrained, both at the peak of the crisis as well as in the early recovery period. Furthermore, we modify the indicator to take into account that Danish firms to a large extent use retained earnings as a financing source. We demonstrate that it is important to take this into account in the Danish context, in particular when assessing financing conditions of larger firms.

2. A BRIEF REVIEW OF EXISTING LITERATURE

The paper is most closely related to a growing body of research which has focused on identifying financial constraints and characteristics of financially constrained firms.[1] One approach has been to use balance sheet data to assess the link between investment and financial characteristics (e.g. Fazzari et al., 1988a, 1988b; Carpenter and Petersen, 2002). However, most recent papers use survey based evidence, sometimes supplemented with balance sheet data for similar firms using e.g. matching approaches (e.g. Canton et al., 2012; Coluzzi et al., 2015; Ferrando and Griesshaber, 2011; Gaiotti, 2013; Kuntchev et al., 2013; Rottmann and Wollmershäuser, 2013; Siedschlag et al., 2014; Thomadakis, 2016). It is widely established that smaller firms are more likely than other firms to be financially constrained. The evidence regarding a link between firm age and financial constraints is more mixed, while it is often argued that newly founded firms could be expected to be more financially constrained than more established firms due to larger information asymmetries and lack of a proven track record.

Going beyond background characteristics such as age and size, a few studies merge survey responses with firm-level information, and are thereby able to reliably assess the link between firm performance and access to finance (Lawless and McCann, 2012; Abildgren et al., 2013). For Denmark, Abildgren et al. (2013) find that banks tightened their credit standards from a loose level before the crisis. In 2010, there was a relation between a firm's solvency and profitability and the outcome of a firm's loan application, whereas this was not the case before the financial crisis in 2007. Abildgren et al. (2014) demonstrate that similar results are found when considering productivity measures instead of solvency and profitability. As an alternative to survey based measures, a few studies use indicators of financial constraints based on financial statements along the lines of the indicator based approach used in the last part of this paper. Studies along this line include Pal and Ferrando (2010) and Ferrando and Ruggieri (2015).

This study contributes to the literature in a number of respects. First, by combining survey evidence on financial constraints with high-quality financial information on the surveyed firms obtained from administrative registers, we are able to reliably assess the link between firm performance and financial constraints. As noted above, this approach has only been used by a few other studies, since it requires that the identity of surveyed firms is known.

Second, while a few studies have used a similar approach for Denmark before and during the crisis, this paper extends the analysis to include a period of very low interest rates. By comparing credit conditions in 2014 to those before the crisis and during the peak of the crisis, we are able to assess whether there has been any sign of search for yield and increased risk taking in the banking sector as a consequence of low interest rates.

Third, the availability of panel data allows us to modify the balance sheet based indicator of financial constraints used by the Competitiveness Research Network to take into account that firms may prefer internal financing to external financing. We demonstrate that results using the modified indicator are more credible, at least in the Danish context.

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[1] For a survey of this literature, see Silva and Carreira (2012).

3. CONTEXT AND BACKGROUND

The majority of Danish firms' debt is owed to commercial banks and mortgage banks. In the period leading up to the financial crisis, firms increased their debt level substantially. In the period since the beginning of the financial crisis, corporate debt has been almost unchanged, cf. chart 3.1 (left). This should be seen in light of firms having had a high savings surplus in the period since 2009. Reduced demand and increased uncertainty may have reduced investments. In addition, some firms may also have preferred to hold back investment and reduce their leverage in order to increase their resilience to future shocks and to retain flexibility in future financing choices. This was in particular the case for highly leveraged firms, cf. Kuchler (2015). In addition, Danish firms are traditionally capable of covering most of their financing needs in the beginning of an economic upturn through retained earnings (see, e.g., Petersen and Risbjerg, 2009).

An increasing share of firm debt is debt to mortgage banks. Since the crisis, obtaining uncollateralised loans from commercial banks has become less common as the banks tightened their collateral requirements. For firms with available collateral, this has made collateralised mortgage debt more attractive, all else equal. Another phenomenon likely contributing further to this development is the increased interest rate differential between loans from commercial banks and mortgage banks, cf. chart 3.1 (right). However, commercial banks are still an important financing source for many firms partly because mortgage loans require real property as collateral. Therefore, firms in industries with little property ownership are to a larger extent than other firms relying on financing through commercial banks. In addition, loans from commercial banks are often used for short and medium term financing needs in contrast to mortgage loans, which are of a more long term nature.

According to the Bank Lending Survey conducted by Danmarks Nationalbank, both commercial banks and mortgage banks tightened their credit standards considerably in the beginning of the financial crisis from a loose level before the crisis, cf. chart 3.2. The tightening was particularly implemented in the form of price increases and higher collateral requirements. In addition, banks indicate that they have increased the degree of price differentiation. Since the beginning of 2014, commercial banks have gradually eased their credit standards and pricing policies somewhat again. The easing has in particular been in the form of price reductions for the most creditworthy firms, and is mainly a consequence of increased competition among banks.

The Bank Lending Survey also indicates that demand for credit from mortgage banks has increased slightly since 2012, cf. chart 3.3. For commercial banks, demand for loans from existing customers has been decreasing in most quarters since 2012. In the same period, banks have eased their credit standards slightly. Since the group of existing customers is likely to be larger than the group of new customers, the evidence from the Bank Lending Survey overall indicates that the weak growth in credit from commercial banks over the past few years in particular is driven by low credit demand. This was also the case during the crisis, cf. Kuchler (2012).

Loans and interest rates towards non-financial enterprises

Chart 3.1

Loans

Kr. billion

Average interest rates

Per cent

Legend:
- Commercial banks
- Mortgage banks
- Total
- Commercial banks
- Mortgage banks
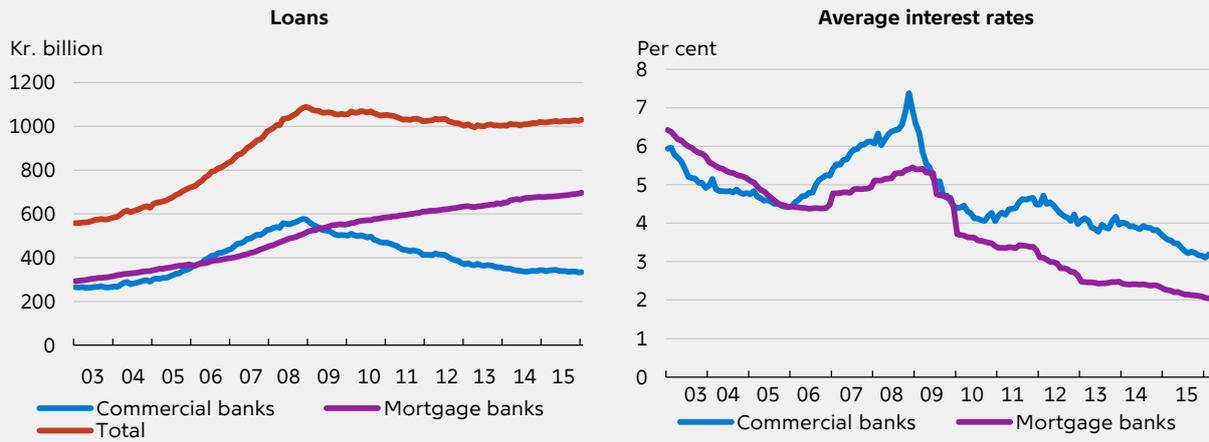
Note: Left: Loans are at nominal value and seasonally adjusted. Right: Average interest rates on outstanding loans.
Source: Danmarks Nationalbank.

Change in credit standards and prices

Chart 3.2
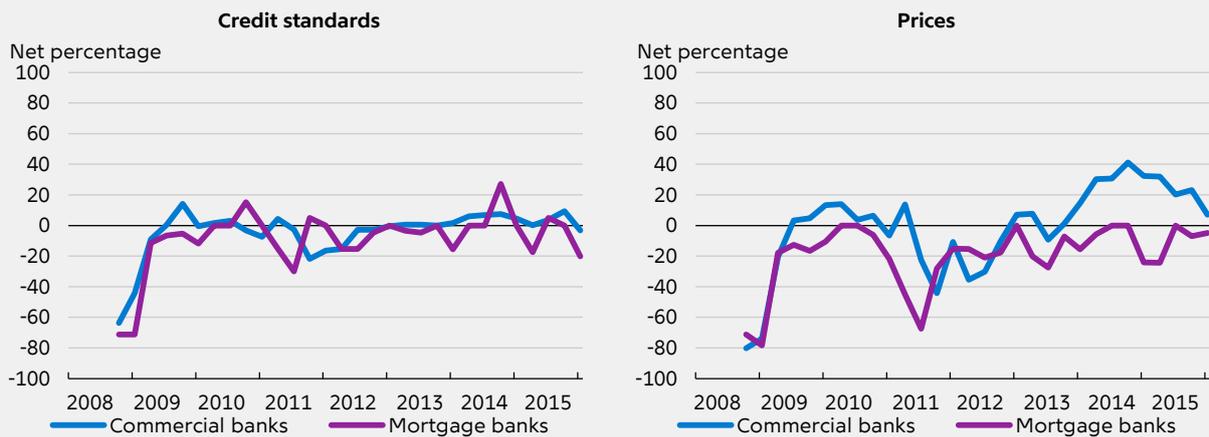
Credit standards

Net percentage

Prices

Net percentage

Legend:
- Commercial banks
- Mortgage banks

Note: The bank lending survey is based on responses from the largest commercial and mortgage banks. Each response is given a value of -100, -50, 0, 50 or 100, and the net percentage is calculated as a weighted average using each bank's share of total lending as a weight. The net percentage can therefore vary between -100 and 100. A negative number indicates a tightening and a positive number an easing of credit conditions.
Source: Danmarks Nationalbank.

Change in credit demand

Chart 3.3
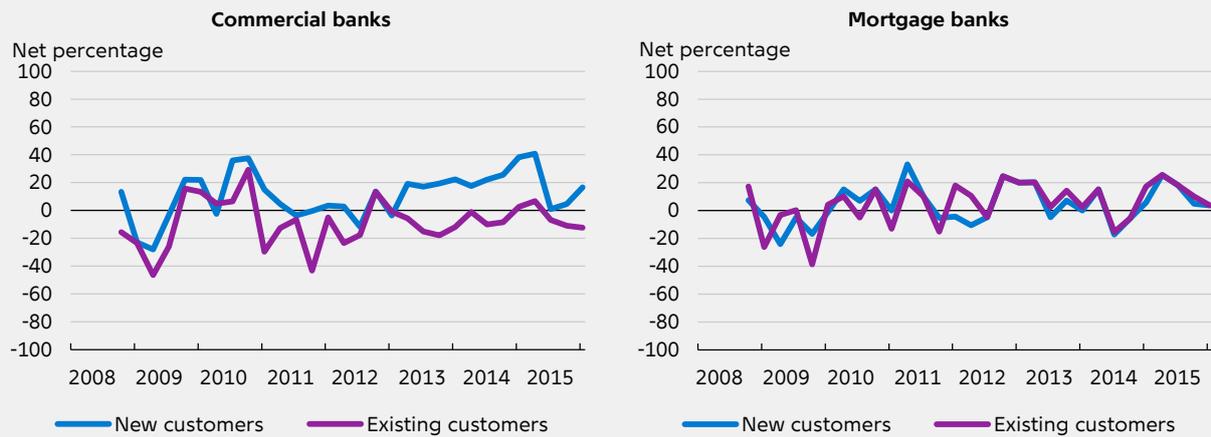
Commercial banks

Net percentage

—— New customers   —— Existing customers

Mortgage banks

Net percentage

—— New customers   —— Existing customers

Note: The bank lending survey is based on responses from the largest commercial and mortgage banks. Each response is given a value of -100, -50, 0, 50 or 100, and the net percentage is calculated as a weighted average using each bank's share of total lending as a weight. The net percentage can therefore vary between -100 and 100. A negative number indicates a decrease in demand while a positive number indicates an increase in demand.

Source: Danmarks Nationalbank.

Share of firms for which financial limitations limit production

Chart 3.4

Per cent

—— Manufacturing   —— Construction   —— Business services
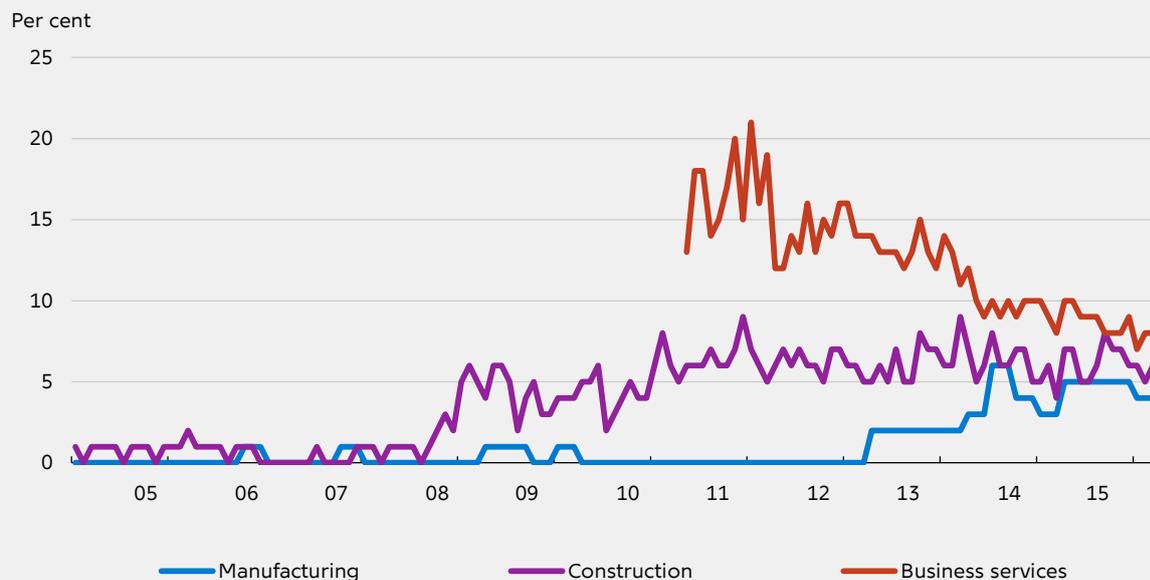
Note: The questionnaire has been redesigned in 1st and 2nd quarter of 2013, giving rise to a decrease in the response category "no production limitations" in favour of response categories stating production limitations. Data for manufacturing is quarterly, while data for other industries is monthly.

Source: Statistics Denmark.

Enterprises distributed according to whether they have applied for bank financing and the outcome of the application

Chart 3.5

Share of firms, which applied for bank financing

Per cent

- Did not apply - other reasons
- Did not apply - sufficient internal funds
- Did not apply - fear of rejection
- Applied

Outcome of loan application

Per cent

- Fully accepted
- Partly accepted
- Not accepted
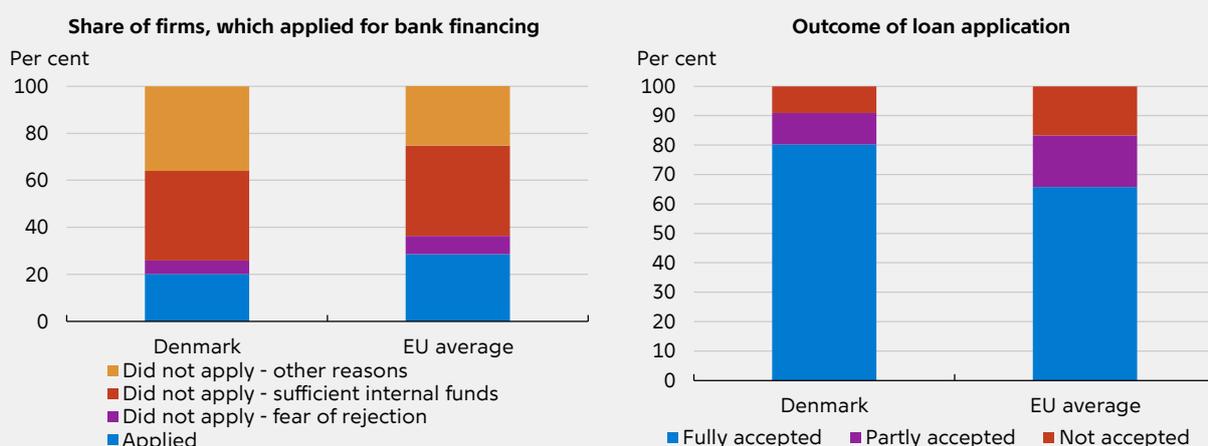
Note: The survey has been conducted in September and October 2014. The figure to the right only includes firms, which applied for a bank loan. The EU average has been calculated as a weighted average of all 28 EU member states. Firms, which have denied a loan offer due to the interest rate being too high, are classified as not accepted.

Source: European Commission and ECB: "Survey on Access to Finance for Small and Medium-sized Enterprises" (SAFE).

For commercial banks, credit demand from new customers has been increasing and has been more positive than credit demand from existing customers. This may indicate that firms to a larger extent than previously consider a change of bank or the use of more than one bank connection. This is also an indication of more intense banking sector competition.

The Bank Lending Survey provides an indication of firms' access to finance as seen from the perspective of the credit institutions. Firms' assessment of financial access is also regularly surveyed. The Business Tendency Surveys conducted by Statistics Denmark are based on surveys administered to firms within manufacturing, construction and business services. On average, only a limited share of firms have stated that financial limitations limit their production, cf. chart 3.4.

The Survey of Access to Finance for Small and Medium-sized Enterprises (SAFE), conducted by the European Commission and the ECB, regularly monitors the financing conditions of small and medium-sized enterprises (SMEs) in the European Union. According to the survey, a relatively low share of Danish SMEs applied for bank financing, cf. chart 3.5 (left). Among other factors, this reflect that, as previously noted, mortgage bank financing is important in a Danish context. According to the survey, 80 per cent of firms, which applied for a loan from a commercial bank, got their loan application accepted in full. The corresponding share in the average EU-country was 66 per cent. This indicates that Danish firms in an international comparison have relatively good access to finance.

In the remaining part of the paper, we consider access to finance and capital allocation by using two additional sources which have not been covered in this section. First, Statistics Denmark has conducted a survey of access to finance for small and medium sized enterprises covering the years 2007, 2010 and 2014. This survey is larger in terms of sample size and therefore enables a more detailed analysis of characteristics of firms applying for loans as well as the loan conditions offered by financial intermediaries than what is possible by the SAFE. Second, we explore the applicability of a balance sheet based indicator, the so-called Investment and Financing Indicator, which has been calculated in a comparable way, using firm-level data, in a number of European countries.

4. SURVEY-BASED EVIDENCE ON FINANCIAL CONSTRAINTS AND CAPITAL ALLOCATION

4.1 DATA SOURCES AND SAMPLE SELECTION

The data used in this section consists of 2,265 detailed firm-level responses to a 2010 mandatory survey by Statistics Denmark concerning the access to credit for Danish small and medium enterprise (SMEs) in 2007 and 2010, cf. Statistics Denmark (2010). A follow-up survey was conducted in 2014 on a new sample of 2,000 firms concerning the access to credit in 2014 for a new sample of SMEs, cf. Statistics Denmark (2015)[2]. In both surveys, the firms all had between 5 and 249 employees four years before the survey year and at least 5 employees one year before. Since the information regarding access to credit in 2007 was collected in the 2010 questionnaire, one should treat this set of information with care and in general keep in mind that survey responses are inherently subjective.

For most of the firms surveyed, we are able to obtain firm-level employment data and accounting data from Statistics Denmark's account and firm statistics. This information is acquired through the firms' reporting to the Danish tax authorities and includes turnover, result before financial items, equity, total assets etc.[3] We drop observations with imputed or missing accounting variables and end up with a total of 5,620 firm-year observations distributed over the years as 1,921 observations for 2007, 1,999 for 2010 and 1,700 for 2014. In the econometric analysis at the end of this section we need to drop more observations due to inclusion of additional variables which have imputed values. The key variables used in the analysis are defined in table 4.1.[4]

For some parts of the analysis, we look at the firms surveyed in 2014 and track them over the period 2000-2013 using the firm-level accounting data which is available for all years in the period[5]. The number of firms observed is generally about the same for the years 2006-2013. For the first years 2000-2005, there is more attrition, although the number of firms is never much below half of that in the full sample of surveyed firms in 2014. We do the same exercise for the firms surveyed in 2010 and find a similar pattern, although with less attrition.

Definition of key variables	Table 4.1
Solvency ratio	Capital and reserves as a ratio of total liabilities end of year
Profit ratio	Result before financial items as a ratio of turnover
Short-term debt ratio	Short-term debt as a ratio of total liabilities end of year
Liquidity ratio (narrow)	Cash and deposits etc. as a ratio of total assets end of year
Implied interest costs on gross debt	Interest costs etc. relative to total gross debt end of year
Number of employees	Number of full-time employees
Cash flow	Result after tax including depreciation end of year
Non-financial net investment	Non-financial net investment flow

[2]   In 2014, a total of 4,057 firms were surveyed. Of these, 2,057 were owned by another firm. These firms were dropped from further analysis in order to allow for direct comparison with the firms from the 2007/2010 survey which were all independent firms.
[3]   The firms with accounting data available through the Danish tax authorities are companies with a yearly turnover between 0.5 and 100 million DKK and between 0.3 and 25 million DKK for personally owned firms. Data on items such as short-term debt, total debt, interest costs and liquid assets are collected through surveys by Statistics Denmark's account statistics.
[4]   The data used in this section is broadly similar to that used in Abildgren et al. (2012) augmented with data for 2014.
[5]   We link loan application outcomes to firm balance sheet and income statement variables in the year before since this is the information which can reasonably be expected to have been available to the bank at the point in time when loan application decisions are made.

4.2 DESCRIPTIVE STATISTICS AND EXPLORATORY DATA ANALYSIS

To begin, we offer an overview of the data by dividing firms into five distinct groups for each of the survey years 2007, 2010 and 2014:

- Firms whose application for a commercial bank loan has been fully accepted
- Firms whose application for a commercial bank loan has been partly accepted
- Firms whose application for a commercial bank loan has not been accepted
- Firms which applied for other debt financing than commercial bank loans (e.g. mortgage bank loans)
- Firms which did not apply for debt financing

Most of the SMEs surveyed did not apply for any debt financing, cf. chart 4.1. The main reason for not applying is the lack of need for debt financing reported by around 70 per cent of the firms (these reasons will be investigated more at the end of this section). There is some variation in the share of non-applying firms across the years which may partly be attributed to sampling uncertainty.

Chart 4.2 depicts the relationship between the status of a firm application for debt financing in 2014 and the average solvency ratio among firms in this group calculated in the year before. It is clear that the firms not in need of debt financing are also on average the most solvent firms. The low demand for loanable funds should be seen in light of the large positive savings surplus in the corporate sector since the beginning of the financial crisis and in addition that Danish firms tend to finance themselves through retained earnings, in particular in the beginning of an economic upturn, e.g. cf. Petersen and Risbjerg (2009).

There is also a small group of firms not applying for debt financing because they expect rejection of their applications, undesirable terms on the loans or similar reasons. These firms are among the least solvent firms in the survey. Firms which see their loan applications accepted have on average a higher solvency ratio than those facing rejections. This holds true whether looking at loan applications for either commercial banks or mortgage banks. A similar pattern holds true when instead looking at the profit ratio, cf. chart 4.3.

The firms which get their loan applications rejected at a commercial bank or at a mortgage bank or which have not applied out of fear of rejection on average pay higher implied interest rates on their gross debt in 2014, cf. chart 4.4. The interest payments necessary to service a debt are usually lower for more creditworthy firms. So far, the findings therefore clearly indicate that more creditworthy firms are able to obtain the desired debt financing to a higher degree than less creditworthy firms.

Distribution of firms in the analysis

Chart 4.1

Per cent
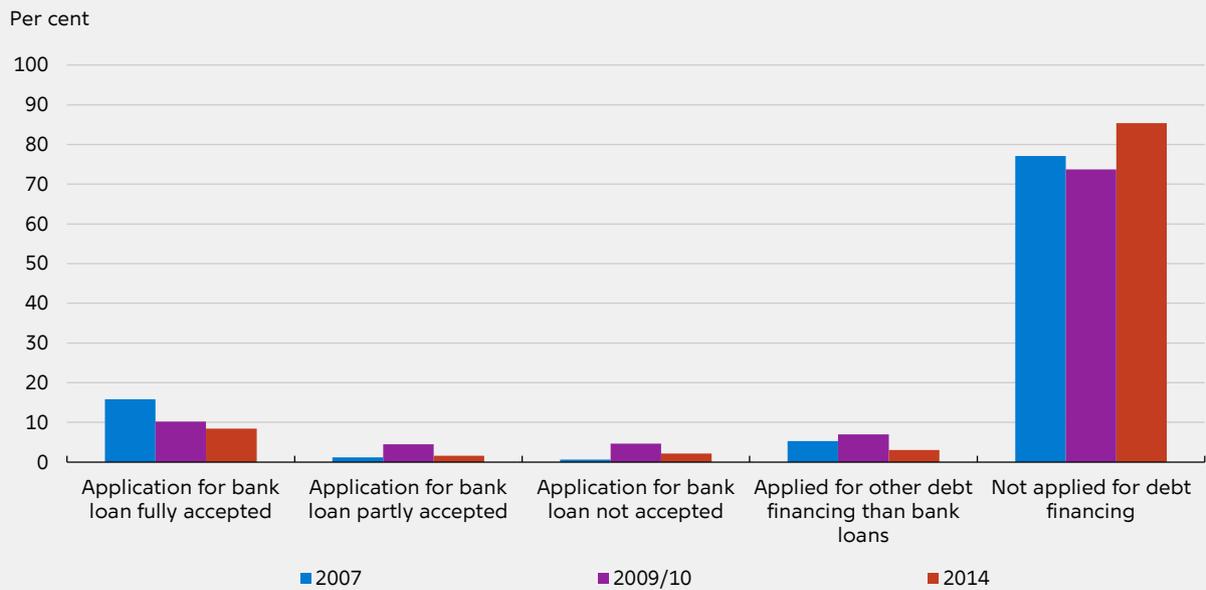
Notes: Bank loans do not include bank overdrafts. Other debt financing than bank loans includes e.g. loans from mortgage banks or firm
         owners or employees.
Source: Own calculations based on register data from Statistics Denmark.

Average solvency rates according to loan application status

Chart 4.2
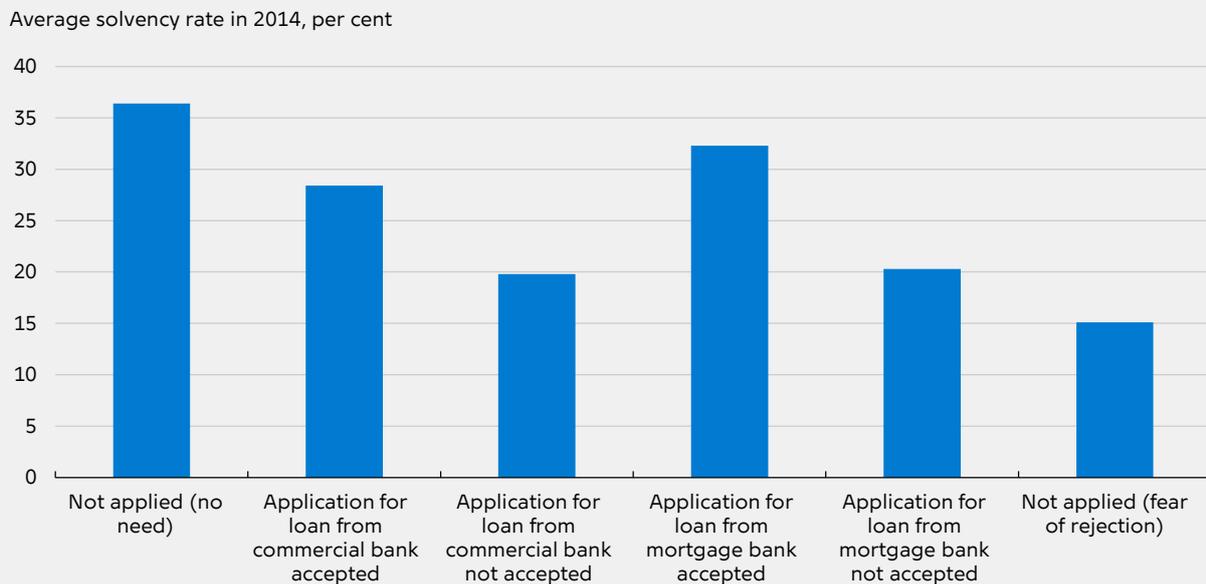
Average solvency rate in 2014, per cent

Note: Bank loans do not include overdraft facilities. The solvency rate is defined as the ratio of equity to total assets. A loan application has
         been classified as accepted if it has been accepted in full or in part.
Source: Own calculations based on register data from Statistics Denmark.

Average profitability according to loan application status

Chart 4.3

Average profit ratio in 2014, per cent
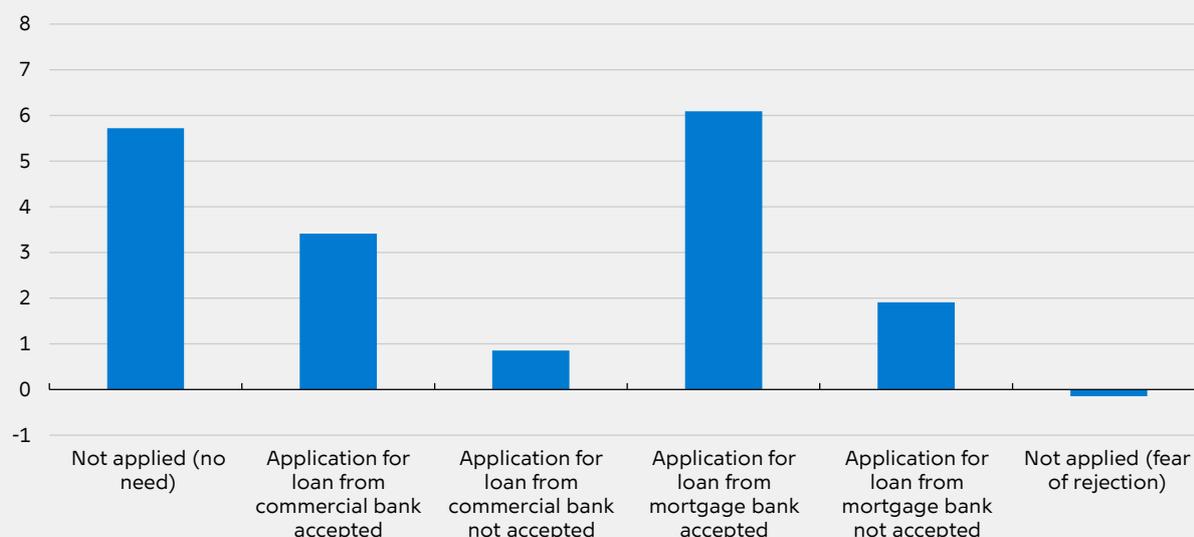
Note: Bank loans do not include overdraft facilities. The profit ratio is defined as the result before financial items divided by total turnover. A loan application has been classified as accepted if it has been accepted in full or in part.
Source: Own calculations based on register data from Statistics Denmark.

Average of implied interest costs according to loan application status

Chart 4.4

Average implied interest costs on gross debt in 2014, per cent
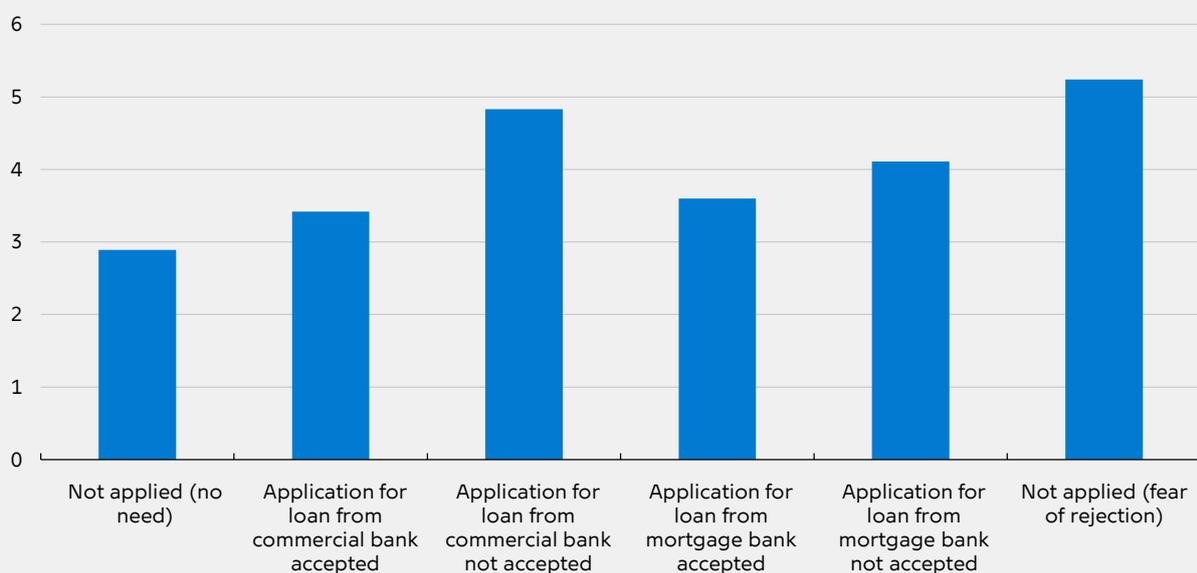
Note: Implied interest costs on gross debt are defined as the ratio of interest expenses to total debt at the end of the year. Bank loans do not include overdraft facilities. The solvency rate is defined as the ratio of equity to total assets. A loan application has been classified as accepted if it has been accepted in full or in part.
Source: Own calculations based on register data from Statistics Denmark.

Productivity and loan application status, 2014   Chart 4.5

Share of firms that applied for a bank loan   **Share of firms that got their application accepted**

Per cent

[Bar chart: Share of firms that applied for a bank loan]
Y-axis: 0 to 16 (Per cent)
Quartile 1: ~11.2
Quartile 2: ~12.2
Quartile 3: ~14.0
Quartile 4: ~11.0
X-axis: Quartile of total factor productivity (TFP)

Per cent

[Bar chart: Share of firms that got their application accepted]
Y-axis: 0 to 100 (Per cent)
Quartile 1: ~76
Quartile 2: ~73
Quartile 3: ~89
Quartile 4: ~93
X-axis: Quartile of total factor productivity (TFP)

Note: Only applications for loans (excluding overdraft facilities) in commercial banks are considered. A loan application has been classified
          as accepted if it has been accepted in full or in part. The right chart only includes firms which have applied for bank loans.
Source: Own calculations based on register data from Statistics Denmark.

The productivity level of a firm may likewise impact its decision to apply for debt financing and the outcome of the application. For this reason, we estimate total factor productivity (TFP) at the firm level using the method of Levinsohn and Petrin (2003) and Levinsohn, Petrin and Poi (2004). We do so for each of the groups of firms surveyed in 2007, 2010 and 2014 and include the full sample period 2000-2013. We use value added as the dependent variable and allow labour input to adjust freely while using energy consumption as a proxy for the covariation between input levels and unobserved firm-specific productivity. Labour input is measured by the number of full-time employed, while the capital stock is measured by the sum of tangible and intangible fixed assets.

Our results indicate that the productivity level of a firm is also related to the decision of applying for bank loans as well as the outcome of the application, cf. chart 4.5. Overall, a slightly larger share of the more productive firms apply for loans compared to the less productive firms. The most productive quartile of firms apply for loans to a lesser degree, though.

The productivity of a firm is often crucial for its ability to generate revenue and profitable investment prospects for expanding the activities of the firm. This may be part of the explanation for why the most productive firms tend to have their loan applications accepted to a higher extent than less productive firms.

The role of the financial sector for capital allocation is particularly important in a period with extraordinarily low interest rates. The low interest rates may 'artificially' keep low-productive firms alive which could adversely affect the aggregate productivity of the economy. A proper allocation of capital by the banking sector is therefore crucial in such an environment.

We now look more closely at the development in credit standards across years. In the wake of the financial crisis, the commercial banks tightened their credit standards considerably, cf. chart 4.6. In 2007, about 80 per cent of the least solvent firms with a solvency ratio less than 10 per cent had their loan applications accepted. In 2010, this number was down to less than 50 per cent. A similar tightening of credit standards applied to more robust firms as well, although these firms generally tended to have their loan applications accepted more often.

Loan application status according to solvency rate

Chart 4.6
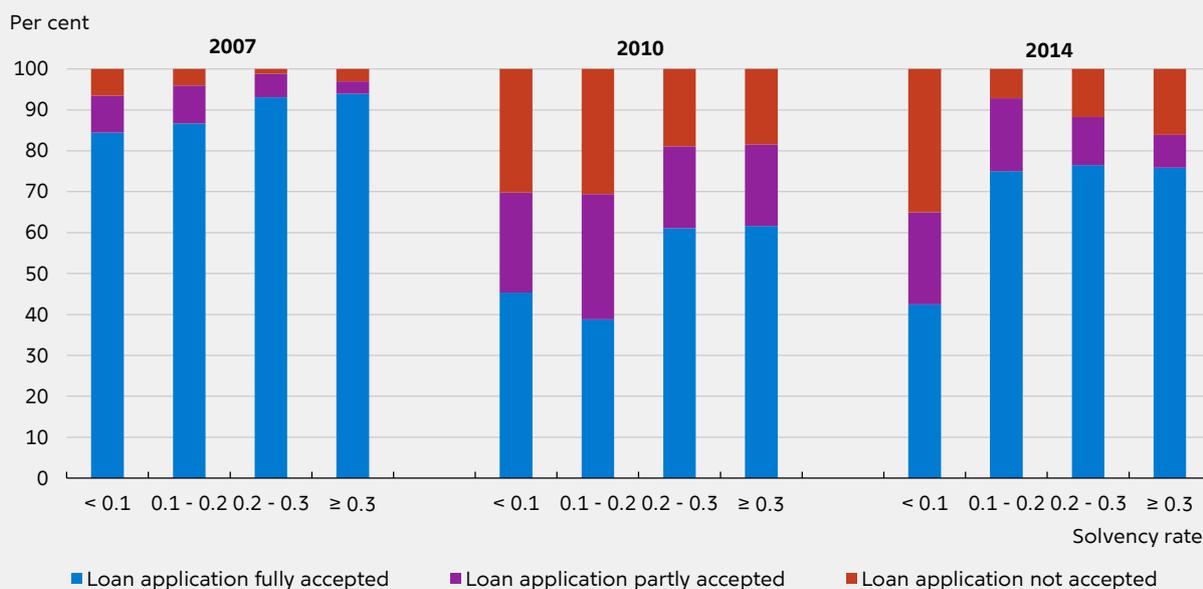
Per cent

Legend:
- Loan application fully accepted
- Loan application partly accepted
- Loan application not accepted

Note: Only applications for loans (excluding overdraft facilities) in commercial banks are considered. The solvency rate is defined as the ratio of equity to total assets.

Source: Own calculations based on register data from Statistics Denmark.

In 2014, we see a tendency towards somewhat more lax credit standards for the more solvent firms, especially for the group of firms with a solvency ratio in the interval 0.1-0.2. Here, the share of firms having their loan application accepted has risen from around 40 per cent to about 75 per cent. However, the credit standards remain tight for the firms with the lowest solvency ratios.

One concern may be that the smallest firms could have been disproportionally affected by the tightening of credit standards. The group of small firms may contain a relatively high concentration of start-up firms and so this could be hampering the long-run growth potential of the economy. However, we observe no clear indication of such an asymmetry in credit standards, cf. chart 4.7. Here, we see a tightening in 2010 as well as a partial easing of credit standards in 2014 for all firm size groups. As mentioned before, credit standards have been relaxed mostly for the most robust firms.

Loan application status according to firm size

Chart 4.7
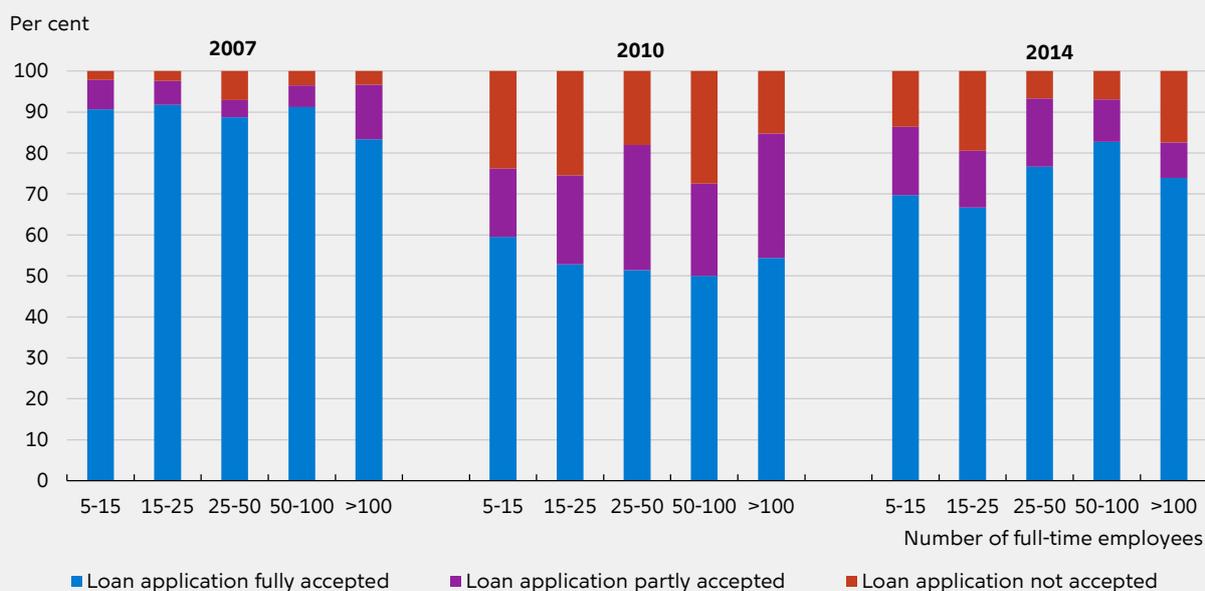
Per cent

Note: Only applications for loans (excluding overdraft facilities) in commercial banks are considered.
Source: Own calculations based on register data from Statistics Denmark.

Another concern might be that the overall picture of a tightening of credit standards after the crisis, followed by some degree of easing for the most solvent firms, is hiding asymmetric developments across industries. For example, the construction and real estate industries saw considerable loan impairment charges compared to other industries during the crisis years, cf. Abildgren and Damgaard (2012).

Chart 4.8 sheds some light on this by dividing the firms in the sample into three broad groups according to industry classifications[6]. For each year, we further divide the firms surveyed into two groups referring to either low or high solvency. For all industries, the numbers are roughly consistent with the overall pattern previously found. For example, the share of construction firms with a solvency ratio below 0.1 which got their loan application fully accepted dropped from around 65 per cent to 40 per cent following the crisis with only little return to pre-crisis level in the following years. On the other hand, the share rose from around 55 per cent to 80 per cent from 2010 to 2014 for the more solvent firms. In total, these findings confirm the general point that credit standards have been relaxed somewhat in the period leading up to 2014 but only for the most solvent firms.

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[6] The numbers in the following industry classification is based on the 10-digit standard grouping of industries ("DB07 standardgrupperinger"): Manufacturing: 2 (industri, råstofudvinding og forsyningsvirksomhed); Construction: 3 (bygge og anlæg); Trade and services: 4 (handel og transport mv.), 5 (information og kommunikation), 7 (ejendomshandel og udlejning), 8 (erhvervsservice).

Loan application status according to solvency rate – selected industries

Chart 4.8
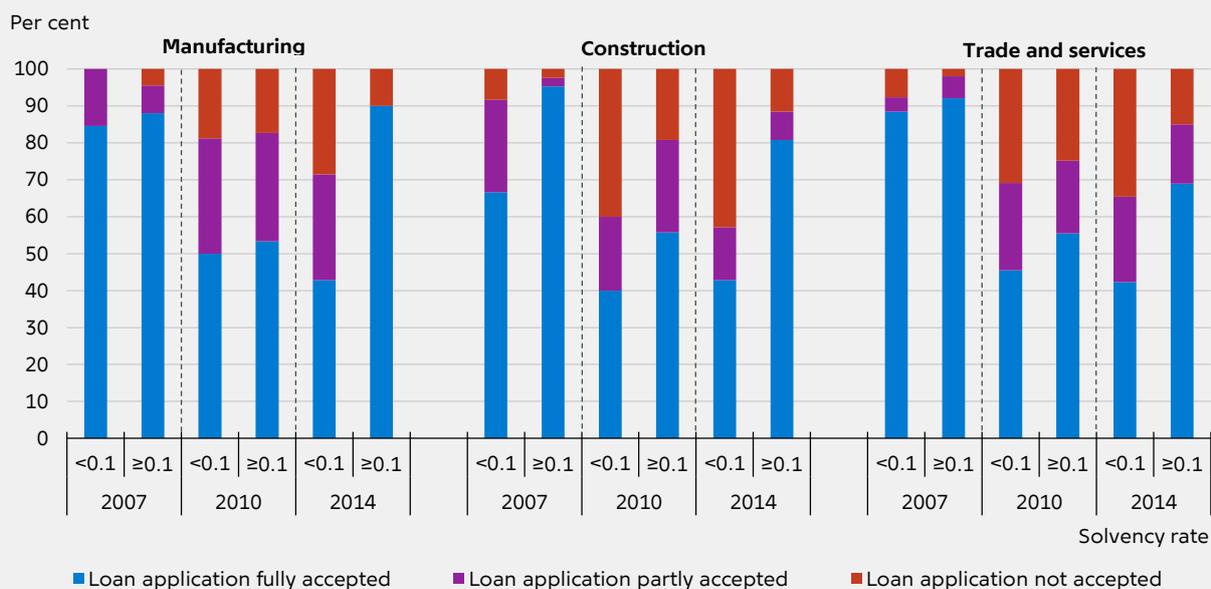
Note: Only applications for loans (excluding overdraft facilities) in commercial banks are considered. The solvency rate is defined as the ratio of equity to total assets.

Source: Own calculations based on register data from Statistics Denmark.

4.3 WHY DO FIRMS NOT APPLY FOR CREDIT?

As mentioned in the beginning of this section, the majority of the surveyed firms did not apply for debt financing. The reason is mostly a lack of need for debt financing, cf. chart 4.9. A small group of firms report that expected credit prospects were salient for their reluctance to apply. Around 20 per cent of the firms which did not apply for credit report that they applied for 'other financing sources', however. The most common of these other financing sources are bank overdraft facilities and leasing with around half of the firms in this category using either of these, cf. chart 4.10.

Following international definitions used in the survey, bank overdraft facilities are not counted as debt financing. However, it is reassuring that we obtain similar results for overdraft facilities as we did for bank loans, cf. chart 4.11.

Reasons for not applying for credit

Chart 4.9

Per cent
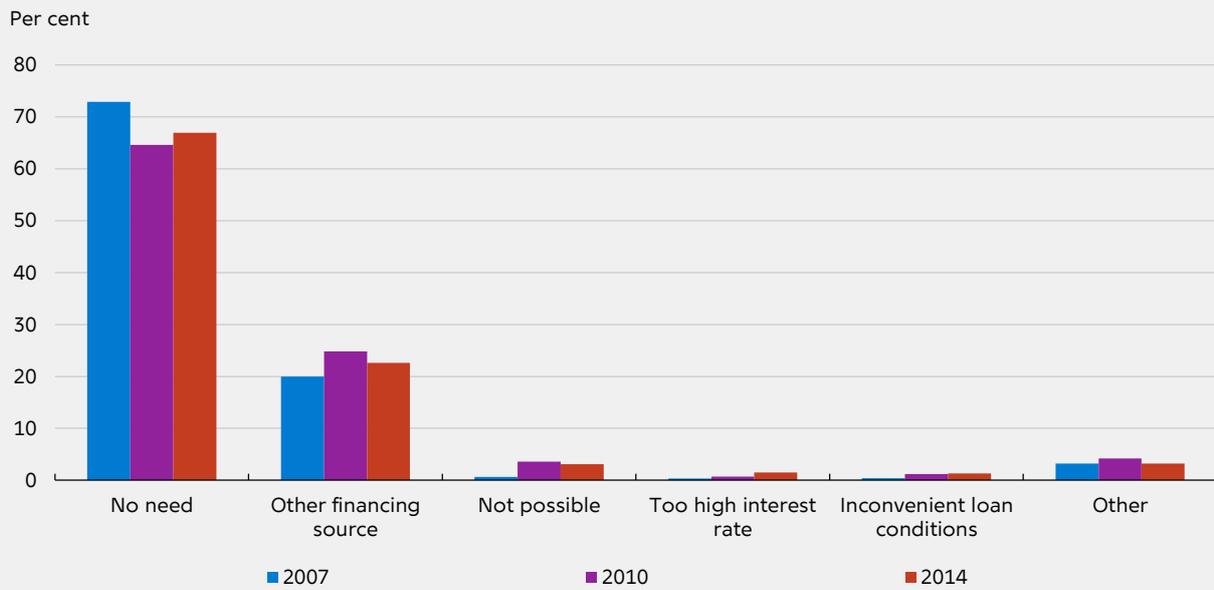
Note: More than one reason possible per firm. Not all firms indicated a reason for not applying for credit. The shares are calculated as the number of firms indicating a given reason out of the total number of firms not applying for credit.
Source: Own calculations based on register data from Statistics Denmark.

Other financing sources

Chart 4.10

Per cent
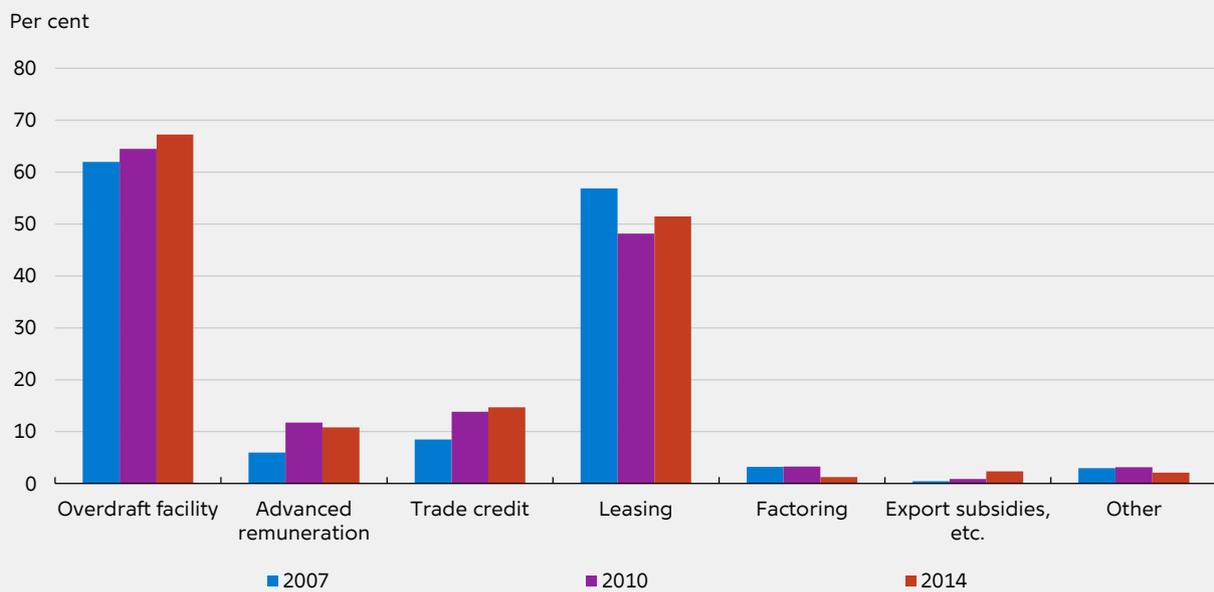
Note: More than one reason possible per firm. The shares are calculated as the number of firms indicating a given source out of the total number of firms applying for other financing sources.
Source: Own calculations based on register data from Statistics Denmark.

**Bank overdraft application status according to solvency rate**   Chart 4.11

Per cent

Loan application fully accepted ■ Loan application partly accepted ■ Loan application not accepted
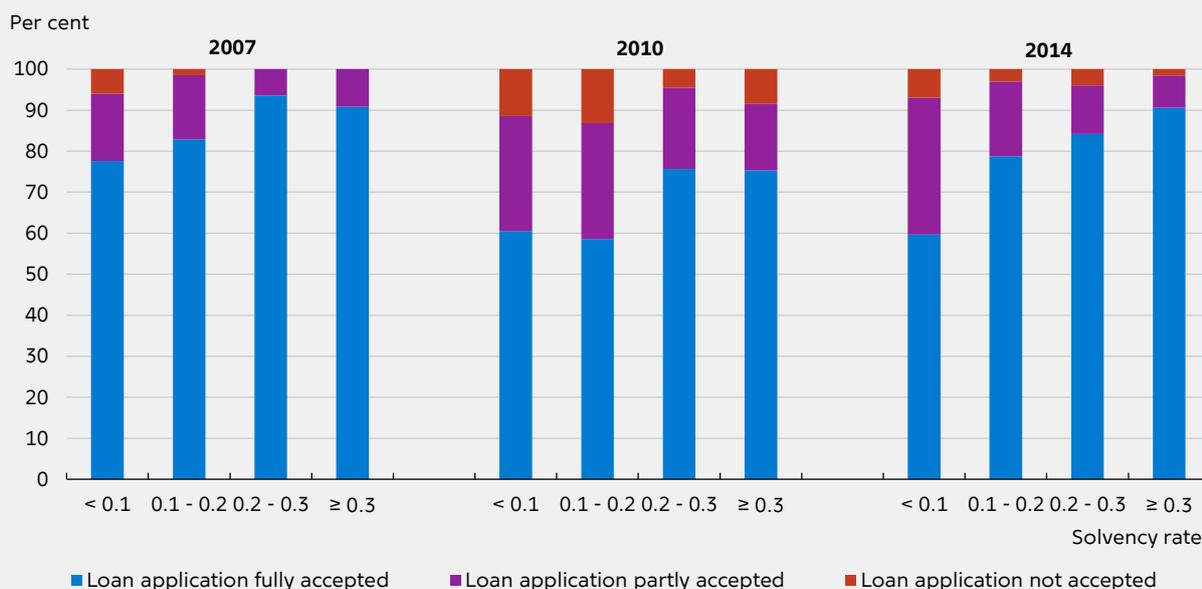
Source: Own calculations based on register data from Statistics Denmark.

Next, we track the firms from the 2014-survey by using accounting data for the entire sample period 2000-2013. We divide the firms into four categories depending on the status of their loan application in 2014 or their reason for not applying. It is clear from chart 4.12 that the firms without need for debt financing in 2014 have the highest average solvency rate for the entire period. The solvency rate is also high for the firms with loan acceptance in 2014, and the rates are fairly robust over time for both groups of firms.

On the other hand, the solvency rates are generally deteriorating for the firms experiencing rejections on their loan applications or for firms which did not apply out of fear of rejection. This is especially true in the period following the financial crisis and might reflect that the tightening of credit standards towards these weaker firms led to a gradual decline in activity for those firms. It may also reflect that the overall business conditions were worse for these firms in the period leading up to 2014 and so the firms were faced with banks unwilling to grant credit. In either case, these findings illustrate that the capital allocation has been working efficiently even in a period with several years of low interest rates.

This conclusion is supported by the fact that the two categories of less creditworthy firms had a lower degree of profitability relative to the more creditworthy firms over the entire period, cf. chart 4.13. The decrease in profitability was especially large during the crisis with average profit rates being negative for both groups in 2009 and 2010[7].

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[7] The conclusions in the above are robust to restricting the sample to only those firms observed in every year over the period 2000-2013.

Evolution of solvency for firms included in the 2014 survey

Chart 4.12

Average solvency rate, per cent

- Loan application accepted
- Loan application not accepted
- Not applied (no need)
- Not applied (fear of rejection)
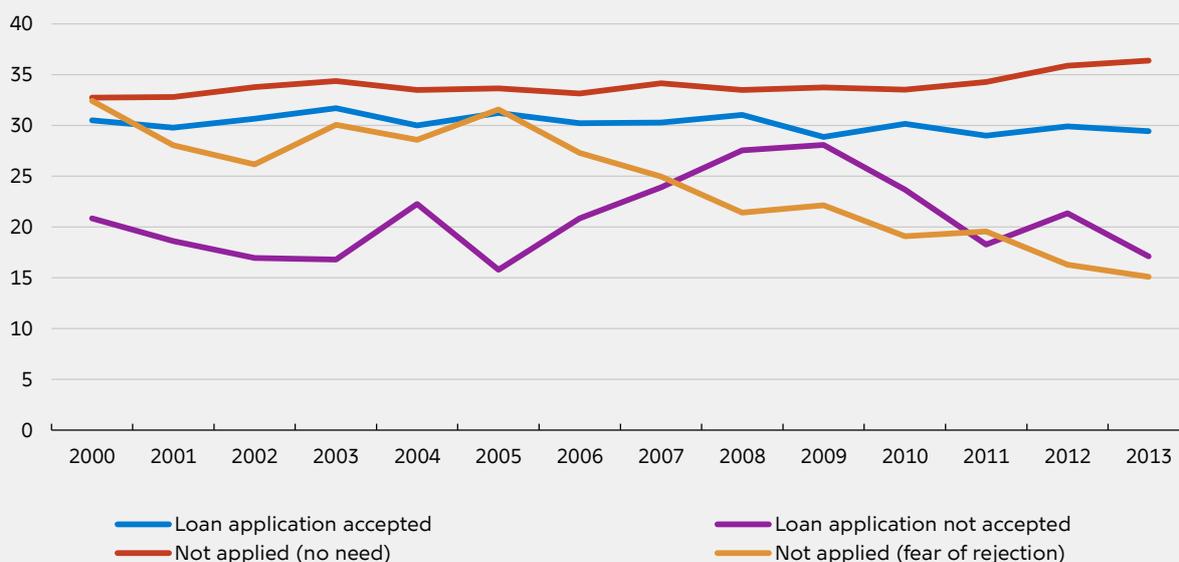
Note: The solvency rate is defined as the ratio of equity to total assets. Both loan applications in banks and mortgage banks are included.
Source: Own calculations based on register data from Statistics Denmark.

Evolution of profitability for firms included in the 2014 survey

Chart 4.13

Average profit rate, per cent

- Loan application accepted
- Loan application not accepted
- Not applied (no need)
- Not applied (fear of rejection)
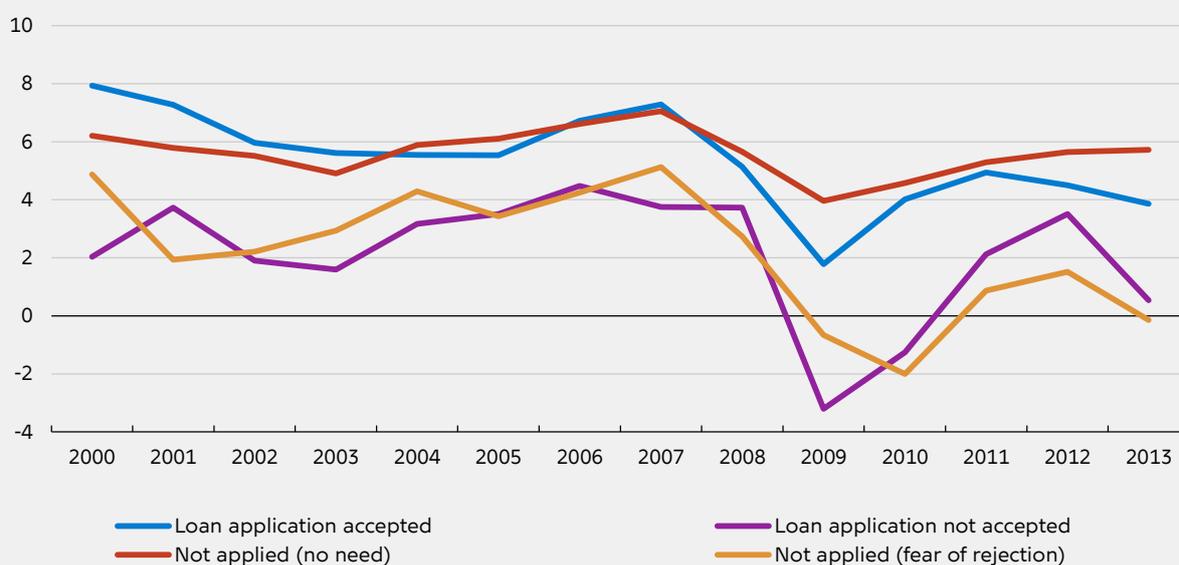
Note: The profit rate is defined as the result before financial items as a ratio of turnover. Both loan applications in banks and mortgage banks are included.
Source: Own calculations based on register data from Statistics Denmark.

Evolution of retained earnings, firms included in the 2014 survey

Chart 4.14

Median ratio of cash flow to non-financial net investment

Legend:
— Loan application accepted
— Loan application not accepted
— Not applied (no need)
— Not applied (fear of rejection)
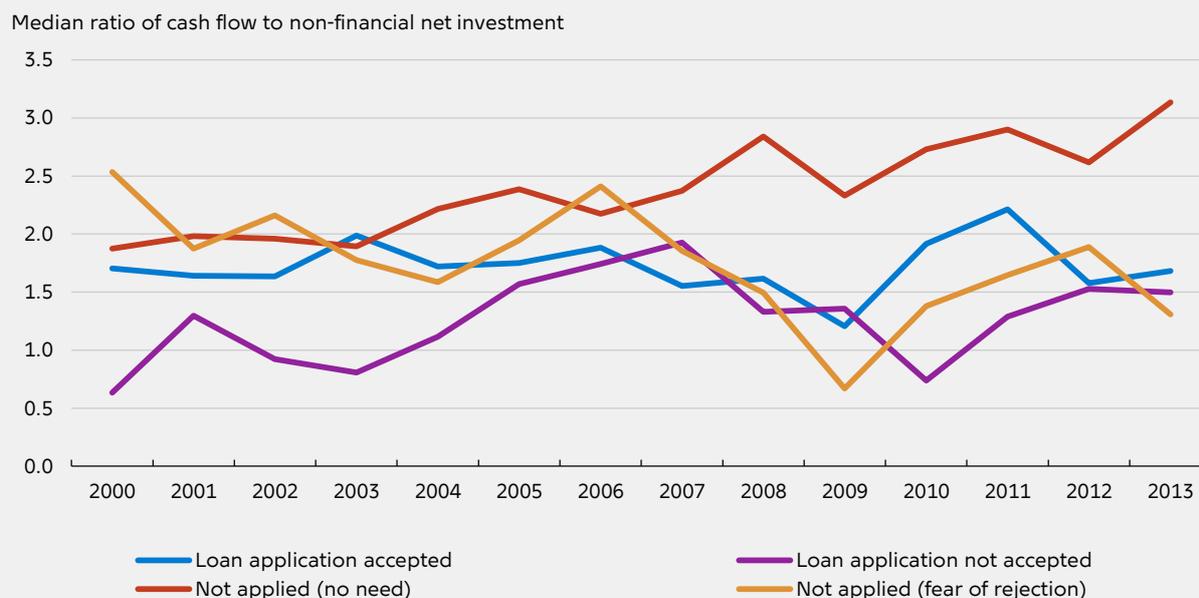
Note: Cash flow is defined as after-tax earnings plus depreciation. Both loan applications in banks and mortgage banks are included.
Source: Own calculations based on register data from Statistics Denmark.

We also investigate to which extent the different categories of firms finance themselves through retained earnings. We measure retained earnings as the ratio of a firm's cash flow to its non-financial net investment.

Since the buildup to the crisis and for the following period, the firms not in need of debt financing in 2014 have indeed been accumulating higher retained earnings on average than other groups of firms, cf. chart 4.14. This underlines the change in behavior for the stronger firms towards consolidation. It also suggests that these firms are likely to be able to finance desired investment projects without the need for additional debt financing at the moment. There might also be some suggestive indications that the remaining groups of firms have had a tendency to increase their levels of retained earnings following the tightening of credit standards in the years immediately following the crisis.

4.4 ECONOMETRIC ANALYSIS

In this section, we present a formal econometric analysis of the effect of firm characteristics on the probability of having an application for a bank loan accepted. We begin with a simple model where firm characteristics such as solvency and profit ratios explain the outcome of interest and estimate the model for each of the years 2007, 2010 and 2014. However, since it is not random which firms apply for bank loans, we then estimate a similar model corrected for sample selection. The results are generally robust to this sample selection correction.

The starting point in both cases is a standard probit model specification. The probit model can be conveniently cast as a latent variable model which is also useful for motivating the selection model investigated later on. To proceed, assume the following underlying model:

$$y_1^* = x\beta + u_1 \tag{4.1}$$

where y_1^* represents the creditworthiness of the firm from the perspective of the bank, x is a vector of firm-specific characteristics and u_1 is an unobservable error term which is assumed to be uncorrelated with the explanatory variables and following a standard normal distribution. To the econometrician, y_1^* is unobserved. Rather, we only observe whether the loan application is accepted or not, that is:

$$y_1 = 1[y_1^* > 0] \tag{4.2}$$

where $1[.]$ is an indicator function taking the value 1 if the expression in the square brackets is true and 0 otherwise. Given these assumptions, the probability of a firm having a loan application accepted conditional on firm-level observables becomes:

$$P(y_1 = 1|x) = P(x\beta + u_1 > 0|x) = \Phi(x\beta) \tag{4.3}$$

where Φ is the standard normal cumulative density function. From this expression, the likelihood function necessary for the probit model to be estimated by maximum likelihood is formed. This leads to the results listed in table 4.2.

The estimated coefficients first show no significant relation between the performance of the firm and the probability of obtaining a bank loan in 2007 before the crisis. In the wake of the crisis in 2010, more profitable firms are now preferred by the banks. In 2014, the solvency of the applicant is statistically significant. Overall, this signifies the tightening of credit standards which were introduced during and after the crisis and that the solvency and profitability of applying firms is at the core of the banks' credit allocation decision[8].

The analysis above was based only on the firms applying for bank loans. From the results presented earlier in this section, it is apparent that there could be an issue of self-selection. Some firms have high degrees of retained earnings and use those funds to finance their investment projects instead of applying for bank loans. Yet other firms are performing too weakly to anticipate a fruitful outcome of an application and refrain from applying for these reasons.

Results: Probit models of acceptance of bank loan application — Table 4.2

	2007		2010		2014	
	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.
Solvency ratio	0.365	0.062	0.488	0.194	**1.951	0.534
Profit ratio	-0.019	-0.003	**1.671	0.664	0.342	0.094
Implied interest rate	-1.024	-0.173	-2.556	-1.015	-4.448	-1.219
Liquidity ratio (narrow)	5.588	0.943	0.821	0.326	-2.671	-0.732
Short-term debt ratio	-0.912	-0.154	-0.149	-0.059	1.129	0.309
Log(no. of employees)	-0.110	-0.018	-0.052	-0.021	-0.119	-0.033
Constant	**1.973		0.253		0.416	
Observations	168		207		104	

Note: Coef. = Coefficient estimate; M.E. = Marginal effect of a unit change in the explanatory variable on the probability of having the application for a bank loan fully accepted. Marginal effects are evaluated at the mean of the values of the explanatory variables. ***p<0.01, **p<0.05, *p<0.10.

Source: Own calculations based on register data from Statistics Denmark.

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[8] It should be noted that the number of observations used in these estimations is relatively low. This might help explain why the explanatory power shifts from the profit ratio to the solvency ratio from 2010 to 2014.

Because of this problem of self-selection, we also estimate a model which takes selection into account. The method applied is a bivariate probit model with sample selection. It still rests on the equations (4.1)-(4.3) but is now explicit about the fact that y_1 is only observed when a firm has applied for a bank loan. Let y_2 be an indicator variable taking the value of 1 only when a firm in the given year has applied for a loan and 0 otherwise. This selection is also assumed to be captured in a probit model:

$$y_2 = 1[z\delta + u_2 > 0] \tag{4.4}$$

where z is a vector of firm-specific characteristics related to the decision to apply for a loan and u_2 is a normally distributed error term. The selection issue arises when the error terms are correlated, i.e. when $corr(u_1, u_2) = \rho \neq 0$.

In order to best identify the objects of interest, the model requires one or more exclusion restrictions, i.e. an explanatory variable which is included in the set of variables in the selection equation (z) but not in the outcome equation (x). We include a dummy for whether the firm has applied for debt financing from another source than a commercial bank. This is based on a hypothesis following Abildgren et al. (2013) that firms are likely to apply for loans from several sources if they have already decided to apply, but these other applications are not taken into account by the bank to a significant degree when deciding whether to grant a loan.

The results from the model with sample selection correction are shown in table 4.3. In the selection equation, we see how less liquid firms are more likely to apply for a loan in all years. This is not surprising, since liquidity constrained firms would want to take advantage of external funding if they believe to have promising investment projects at hand.

We also see how more solvent firms are less likely to apply for bank loans in both 2007 and 2010. This is in line with the findings listed previously in this section. In 2014, this relationship is less clear. The reason could be the following: As previously shown, the firms which do not apply for bank loans can be divided into two groups. Some firms are highly solvent with large retained earnings and therefore do not apply, while others are poorly performing firms discouraged from applying altogether. Since the middle group of firms with respect to solvency are the firms most likely to apply for a bank loan, this "inversed U-shape" relationship may confound the results and make it harder to establish a connection between solvency and probability of applying.

When comparing the results with and without the sample selection correction, the conclusions are mostly unchanged. One difference worth noting is the increased importance of firm profitability and liquidity in 2010 once selection is controlled for. In total, this highlights the connection between firm performance and the probability of having a bank loan accepted even when controlling for sample selection. This may not be surprising, although it is notable that the relation was not present before the crisis.

Results: Bivariate probit models with sample selection correction   Table 4.3

	2007		2010		2014	
	Coef.	M.E.	Coef.	M.E.	Coef.	M.E.
PROBABILITY OF FULL ACCEPTANCE OF BANK LOAN APPLICATION						
Solvency ratio	0.334	0.038	*0.865	0.203	**1.858	0.391
Profit ratio	-0.019	-0.002	**1.492	0.350	0.345	0.073
Implied interest rate	-1.088	-0.124	-1.963	-0.460	-5.297	-1.116
Liquidity ratio (narrow)	5.572	0.634	*1.589	0.373	-2.020	-0.426
Short-term debt ratio	-0.932	-0.106	0.347	0.081	1.109	0.234
Log(no. of employees)	-0.110	-0.013	-0.053	-0.012	-0.135	-0.028
Constant	*1.959		0.704		0.839	
SELECTION EQUATION (PROBABILITY OF A FIRM APPLYING FOR A BANK LOAN)						
Solvency ratio	**-0.723	-0.168	***-1.037	-0.274	-0.365	-0.080
Profit ratio	-0.001	0.000	*-0.196	-0.051	0.029	0.006
Implied interest rate	0.938	0.218	0.334	0.078	**5.543	1.216
Liquidity ratio (narrow)	***-2.371	-0.551	***-1.336	-0.349	***-2.095	-0.445
Short-term debt ratio	**-0.586	-0.136	***-0.695	-0.185	-0.366	-0.080
Log(no. of employees)	0.016	0.004	0.036	0.009	**0.162	0.035
Applied for loan (other source)	***1.082	0.344	***0.861	0.280	***1.519	0.505
Constant	-0.516		-0.375		***-1.431	
Rho	0.029		***-0.691		-0.278	
Observations	927		1,035		625	

Note: Coef. = Coefficient estimate; M.E. = Marginal effect of a unit change in the explanatory variable on the probability of having the application for a bank loan fully accepted. Marginal effects are evaluated at the mean of the values of the explanatory variables. The selection equation models the probability that a company applied for a bank loan. Rho is not directly estimated in the ML-estimation. The significance test reported is a test for atanh(rho)=0. ***$p<0.01$, **$p<0.05$, *$p<0.1$.

Source: Own calculations based on register data from Statistics Denmark.

5. EVIDENCE FROM A BALANCE SHEET BASED INDICATOR OF FINANCIAL CONSTRAINTS

5.1 THE INDICATOR OF FINANCIAL CONSTRAINTS

As an alternative approach to survey based measures of financial constraints, we in this section consider the applicability of a balance sheet based indicator, the so-called Investment and Financing (IFC) indicator.

We follow the approach used by the Competitiveness Research Network in defining the IFC indicator as a modified version of the approach suggested by Ferrando and Ruggieri (2015).[9] As a starting point, we define the financing gap of firm i as

$$F_{it} = I_{it} - CF_{it} \tag{5.1}$$

where I_{it} is net real investment in period t and CF_{it} is cash flow in period t, i.e. after-tax earnings plus depreciation. The financing gap may be seen as an indicator of a firms' savings surplus (with opposite sign). Firms with a positive financing gap need additional financing as they are unable to finance their investment through their current cash flow. Firms which have a positive financing gap but do not obtain any credit or raise additional capital from the stock market are classified as financially constrained. In addition, firms with a positive financing gap, which liquidate assets (i.e. firms which have negative net investment), are classified as financially constrained irrespective of whether they obtain external financing. The latter group of firms are considered financially constrained because they are assumed to be unable to raise sufficient external capital in order for them to be able to preserve their capital stock.

The approach used by the Competitiveness Research Network is to let t equal one year, and therefore, this is the basis for the international comparison. As we will demonstrate below, this may be too short a time frame in the Danish context, which is why we for the analysis of financial constraints in Denmark choose a longer time frame, namely three years.

5.2 FINANCIALLY CONSTRAINED FIRMS IN DENMARK

In this section, we use the indicator of financial constraints defined above to assess the prevalence of financial constraints among Danish firms. One weakness of the method is that it is implicitly based on an assumption that firms prefer external financing to internal financing. In other words, the method is unable to distinguish between firms which prefer internal financing and firms which prefer external financing but are constrained in their access. In particular in Denmark, firms make extensive use of retained earnings as a financing source, cf. Petersen and Risbjerg (2009). Firms have had a considerable positive savings surplus in the period since 2009, and therefore internal financing may have been even more important in the most recent years.

To take into account that internal financing is a widely used financing source in Denmark, we consider whether a longer time horizon than one year may be more informative regarding the presence of financial constraints. In particular, we calculate the IFC indicator using intervals of one, three and five years. While the advantage of a longer time horizon is mainly the ability to

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[9] In order to allow an international comparison, we define financially constrained firms in line with the definition used by the Competitiveness Research Network (Ferrando et al., 2015; Lopez-Garcia et al., 2015).

reduce the influence of internal financing on the results, the main disadvantage is the loss in the number of firms due to the longer time horizon, as well as the difficulty of assessing access to finance across different stages of the business cycle. It may also be argued that a long time horizon leads to underestimation of financial constraints due to the fact that firms, which prefer external financing for a given investment project, over a longer time horizon may be able to finance the project using internal financing at the cost of the project being delayed significantly. Such firms will not be classified as financially constrained when the time horizon is long. Therefore, the choice of time horizon is a trade-off between the advantages and disadvantages of a longer time horizon.

The time horizon does indeed matter, cf. chart 5.1. We conclude that in the Danish context, the indicator based on year-to-year changes may overestimate the actual level of financially constrained firms. This is based on both the observation that the share of firms, which are classified as financially constrained, is lower when considering a longer time horizon, as well as the above mentioned considerations. Results in particular demonstrate that the one-year horizon is too short to reliably capture the financial constraints of large firms, cf. chart 5.1 (right). In the remainder of this section, we will use the three-year horizon, while in the international comparison in the subsequent section, we will use the one-year horizon as it is the only one available.

No matter which time horizon used, the share of firms classified as financially constrained is relatively low in Denmark. Using the three-year horizon, we find that this share varies between 2 and 8 per cent of all firms, cf. chart 5.1 (left). During the crisis, banks tightened their credit standards from a loose level before the crisis, and at the same time, firms started a consolidation process, among other things because of poorer investment opportunities and a worsened macroeconomic outlook. Both the demand for and supply of credit were reduced during the crisis (Kuchler, 2012). The share of firms classified as financially constrained increased from the pre-crisis period to the crisis period. There was no clear relation between firm size and financial constraints in the pre-crisis period, while the share of financially constrained smaller firms increased slightly faster during the crisis, cf. chart 5.2. In the most recent years, there have only been small differences across firm size.

Industry differentials in terms of demand outlook and degree of sensitivity to the business cycle may give rise to inter-industry differences in financial constraints. During the most recent years, some industries, such as trade and services, have had a larger share of financially constrained firms than other industries, cf. chart 5.3. Only relatively few firms in the construction and real estate industries were financially constrained in the pre-crisis years, while the tighter credit standards are reflected in the larger share of financially constrained firms in those industries in the most recent years, and, in particular during the crisis. The real estate industry is a good example of the importance of maintaining sound credit standards also during expansionary periods, since, following the years with very few financial constraints, the real estate industry was one of the industries which was hit the most by the financial crisis, with substantial spill-overs to other industries.

Financially constrained firms in Denmark using various time horizons

Chart 5.1

Financial constraints over time

Share of firms classified as financially constrained, per cent

t = 1 year   t = 3 years   t = 5 years

Financial constraints across firm sizes, 2009-2013

Share of firms classified as financially constrained, per cent

■ < 10 employees   ■ 10-20 employees
■ 20-50 employees   ■ ≥ 50 employees
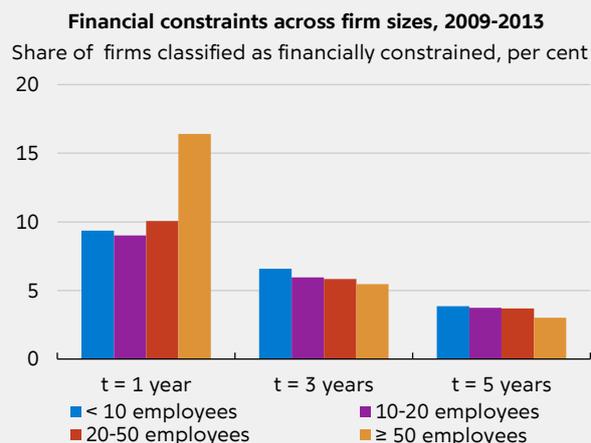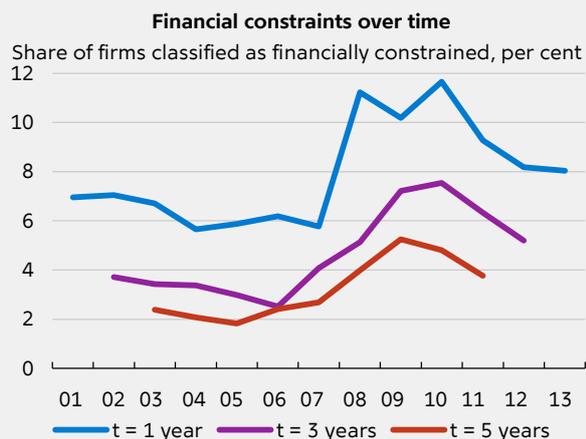
Note: The share of firms classified as financially constrained has been adjusted for imputed values. The adjustment implies that observations based on imputed values (both in the current and the previous year used in the calculation of the IFC indicator) are excluded and the resulting sample reweighted using population weights based on firm size and industry obtained from the full dataset. The time period to which the indicators based on t=3 and t=5 refers is the midpoint, e.g. the indicator calculated with t=5 over the years end-2008 to end-2013 are labelled 2011.

Source: Own calculations based on register data from Statistics Denmark.

Financially constrained firms by firm size

Chart 5.2
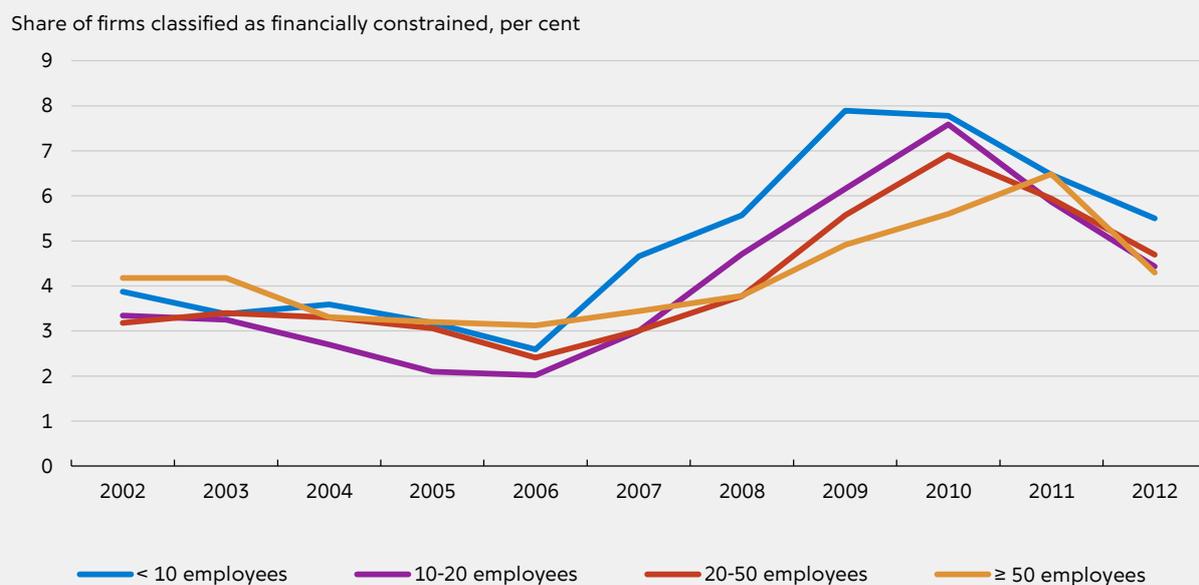
Share of firms classified as financially constrained, per cent

< 10 employees   10-20 employees   20-50 employees   ≥ 50 employees

Note: The IFC indicator is calculated using a time horizon of three years. The time period shown in the graph is the interval midpoint. For example, the indicator calculated over the years end-2010 to end-2013 is labelled 2012. The figures are corrected for imputed values (see note to chart 5.1).

Source: Own calculations based on register data from Statistics Denmark.

Financially constrained firms by industry   Chart 5.3

Share of financially constrained firms, per cent

■ 2002-2007   ■ 2008-2010   ■ 2011-2013
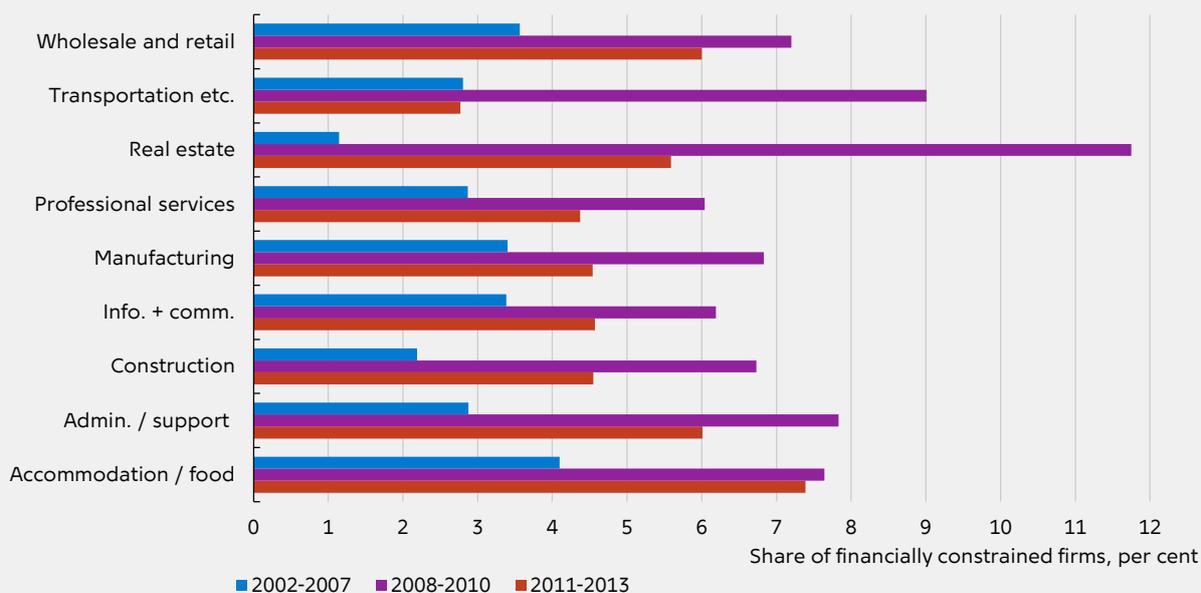
Note: The IFC indicator is calculated using a time horizon of three years. The figures are corrected for imputed values (see note to chart 5.1).
Source: Own calculations based on register data from Statistics Denmark.

In section 4, we demonstrated a relation between firm performance and financial constraints using survey based indicators. To assess whether such a relation is also present when measuring financial constraints using the IFC indicator, we estimate a series of linear probability models for a number of year groups representing different stages of the business cycle. The reason for using linear probability models is that it enables a more straightforward comparison of coefficients over time. Probit and logit models yield similar results.

We choose to rely on models for individual year groups instead of utilizing the panel dimension for two reasons. First, we can retain full flexibility of the coefficients for each of the different periods, which is important if the fundamental factors driving financial constraints differ over time. And second, inclusion of firm fixed effects is not possible, since identification in a fixed effects model comes from the variation over time within firms. The IFC indicator, which is used as outcome variable, is constructed using information on the change in outstanding debt, a fact which essentially gives rise to a mechanical relation between the inter-period change in leverage, which is an important explanatory variable, and the outcome variable.

As was the case in the survey based setting, we find that the probability of a firm being financially constrained increases with decreasing profit margins and increasing leverage and implicit interest rates, cf. table 5.1. The tightening of credit standards in the beginning of the financial crisis, as also found in the previous sections, is clearly seen in the higher R-squared for the regressions during the crisis than before. All coefficient estimates increase in absolute terms from the pre-crisis period to the crisis period. However, this is to be expected as the 'baseline' probability of a firm being financially constrained also increased between the two periods, cf. chart 5.1. In particular, the importance of liquidity increased from the pre-crisis to the crisis period, which is in line with the results presented in section 4 and the results found by Abildgren et al. (2013) and Kuchler (2015).

Linear probability models for being financially constrained			Table 5.1
	2005-2007	2008-2010	2011-2013
Profit margin	-0.187***	-0.343***	-0.311***
	(0.0103)	(0.0146)	(0.0124)
Leverage	0.0477***	0.122***	0.0819***
	(0.00451)	(0.00569)	(0.00477)
Implicit interest rate	0.113***	0.199***	0.131***
	(0.0176)	(0.0261)	(0.0230)
No. of obs	19,780	23,256	25,359
R^2	0.033	0.059	0.049

Note: In addition to the regressors included in the table, industry and size fixed effects are included. Only observations for which the IFC indicator is not based on imputed data are included. Standard errors in parentheses. Significance: *** p<0.01, ** p<0.05, * p<0.1.
Source: Own calculations based on firm-level data from Statistics Denmark.

Coefficient estimates are broadly similar for models based on data from 2008-2010 and 2011-2013, although slightly smaller in magnitude in the most recent period. This indicates that the tightening of credit standards, which was implemented during the first years of the crisis, was generally maintained in the subsequent years. In general, results are much in line with the survey based results.

Finally, in addition to the indicators of profitability and balance sheet conditions, we consider whether the most productive firms are less financially constrained than less productive firms, as the results from section 4 indicate. If this is the case, it is an indication that the credit allocation supports a positive productivity development. Indeed, we find this relation in all time periods, cf. chart 5.4. And perhaps more interesting, the increase in financially constrained firms during the financial crisis was mostly driven by firms with low labour productivity, whereas the share of financially constrained firms in the highest productivity quartiles only increased moderately. While fewer firms in the more productive groups have been classified as financially constrained over the last years in the sample, this is not the case for the least productive firms.

Overall, these results indicate that the tightening of credit standards, which took place during the crisis, was implemented in a way which supports financial stability as well the macroeconomic development. Furthermore, the low interest rates in the more recent years and the increased competition in the financial sector, has not lead to excessive easing of credit standards for low productive firms. Loan capital is still mainly allocated to the more productive and more creditworthy firms.

Financially constrained firms across quartiles of labour productivity　　　　Chart 5.4

Share of financially constrained firms, per cent
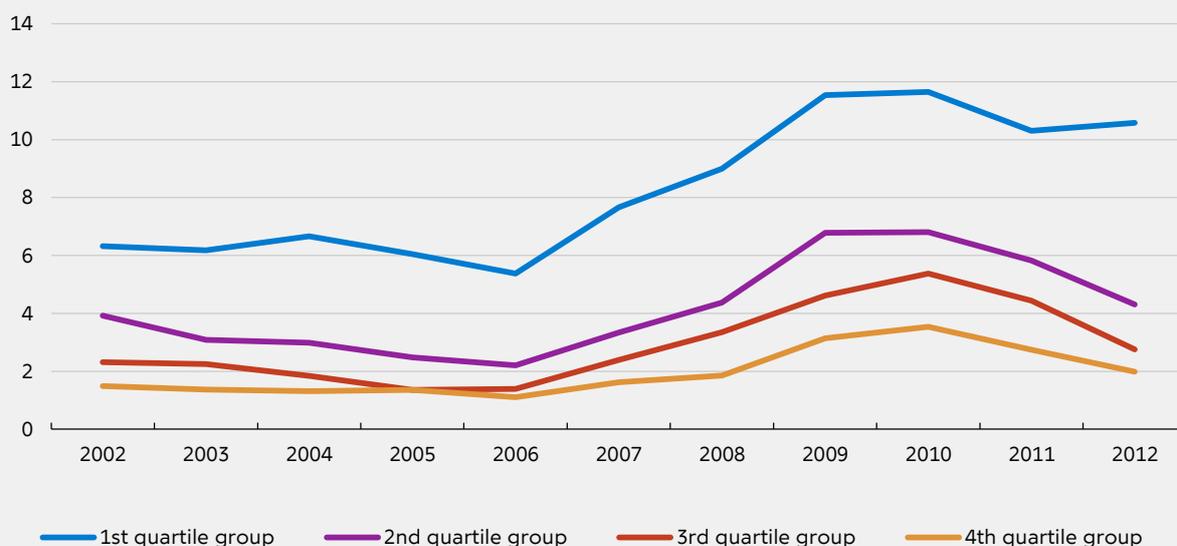
Legend: 1st quartile group — 2nd quartile group — 3rd quartile group — 4th quartile group

Note:　The IFC indicator is calculated using a time horizon of three years. The time period shown in the graph is the interval midpoint. For example, the indicator calculated over the years end-2010 to end-2013 is labelled 2012. The figures are corrected for imputed values (see note to chart 5.1).

Source:　Own calculations based on firm-level data from Statistics Denmark.

5.3 FINANCIAL CONSTRAINTS IN DENMARK AND OTHER EU-COUNTRIES

The IFC indicator is based on accounting data and therefore possible to implement in larger firm-level databases. Hence, sample sizes can be much larger than possible for typical survey-based measures of financial constraints. As part of the Competitiveness Research Network coordinated at the European Central Bank, the IFC indicator and derived distributionary statistics have been calculated in a variety of European countries using the same approach, therefore enabling an international comparison (Ferrando et al., 2015; Lopez-Garcia et al., 2015). Due to variation in data sources across countries, the comparisons are based only on firms with at least 20 full-time employees. We include most countries for which data is available, and we only focus on the period from 2007 and onwards as data from most countries is available in this period.[10] Finally, though the previous section demonstrated that calculation of the IFC indicator using a longer time horizon than one year is beneficial, at least in the Danish context, international comparisons are based on a one year time horizon.

Compared to other countries, relatively few Danish firms are classified as financially constrained, cf. chart 5.5. In the period leading up to the crisis, the relatively loose credit standards were clearly visible in comparison to other countries, while during the crisis period, banks tightened their credit standards, resulting in a larger fraction of financially constrained firms – but the level was still low compared to that of other countries. While the share of financially constrained firms increased somewhat in the South and Eastern European countries from 2010 to 2012, the share decreased in Denmark and other West European countries.

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[10] Data for Finland has been excluded due to the poor correspondence between financial constraints measured by the IFC index and survey-based approaches such as SAFE.

Financially constrained firms

Chart 5.5

Share of financially constrained firms, per cent
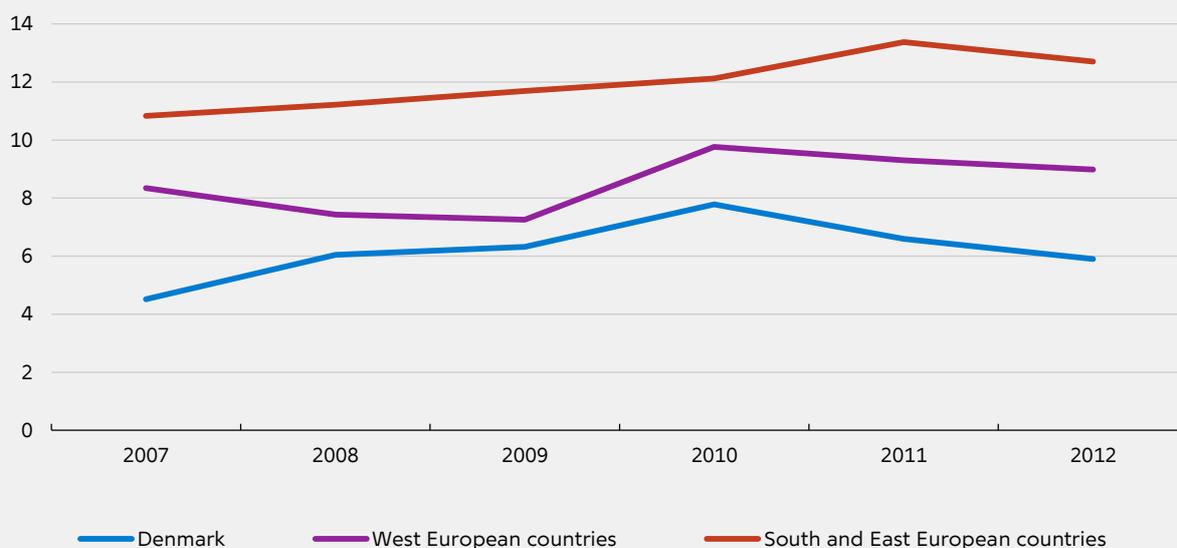
Note: Only firms with more than 20 employees are considered. The IFC indicator is calculated using a time horizon of one year. West European countries: Belgium, Germany and France, South and Eastern European countries: Estonia, Hungary, Italy, Lithuania, Portugal, Poland, Spain (from 2009) and Slovenia. Country results are weighted using GDP as a weight.

Source: Firm-level based database, Competitiveness Research Network, European Central Bank, and own calculations using data from Statistics Denmark.

Also when looking at individual industries, we see that the share of financially constrained firms increased somewhat more in Denmark than in other West European countries during the crisis period, cf. chart 5.6.[11] In spite of the increase, also within industries the share of firms classified as financially constrained was lower in 2012 in Denmark compared to that of other European countries. And finally, the relation between labour productivity and financial constraints in Denmark is comparable to the relation found in other European countries, cf. chart 5.7.

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[11] Due to the limited number of firms with more than 20 employees in some industries in Denmark, we only include the largest industries in the chart.

Financially constrained firms in Denmark and other European countries, selected industries

Chart 5.6

Share of financially constrained firms, per cent
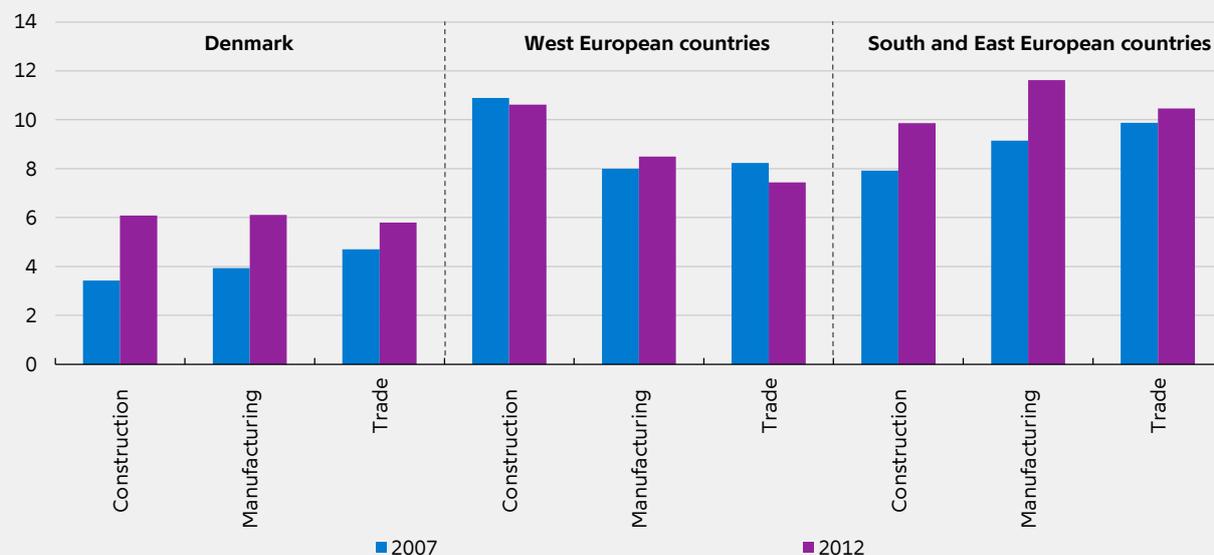
Note: Only firms with more than 20 employees are considered. The IFC indicator is calculated using a time horizon of one year. West European countries: Belgium, Germany and France, South and Eastern European countries: Estonia, Hungary, Italy, Lithuania, Portugal, Poland, Spain (from 2009) and Slovenia. Country results are weighted by GDP.

Source: Firm-level based database, Competitiveness Research Network, European Central Bank, and own calculations using data from Statistics Denmark.

Financial constraints and labour productivity

Chart 5.7

Share of financially constrained firms, per cent
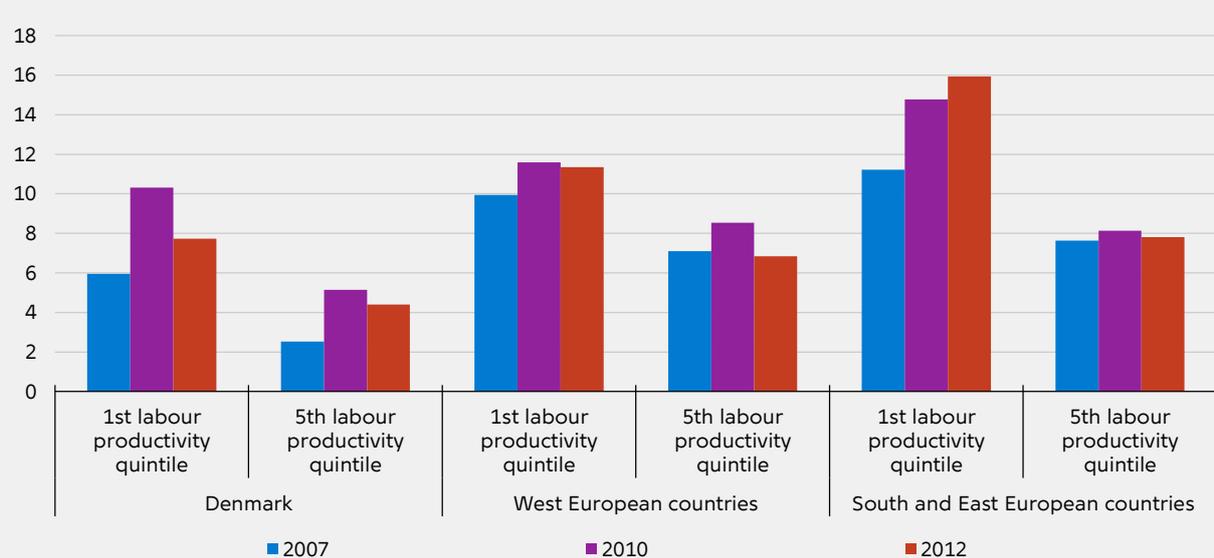
Note: Only firms with more than 20 employees are considered. The IFC indicator is calculated using a time horizon of one year. West European countries: Belgium, Germany and France, South and Eastern European countries: Estonia, Hungary, Italy, Lithuania, Portugal, Poland, Spain (from 2009) and Slovenia. Country results are weighted by GDP.

Source: Firm-level based database, Competitiveness Research Network, European Central Bank, and own calculations using data from Statistics Denmark.

6. CONCLUDING REMARKS

Based on firm-level data from surveys and financial statements, this paper has provided an analysis of credit standards, capital allocation and financial conditions of Danish firms during the financial crisis and in the more recent years. The analysis indicates that the low interest rates and increased competition among financial intermediaries has not lead to significant easing of credit standards for the least creditworthy firms. The current credit standards to a large extent imply that loan capital is allocated to the most solvent and productive firms. Furthermore, the analysis indicates that the credit demand of Danish firms is relatively limited, and that Danish firms have relatively good access to finance in comparison with firms in other countries.

The analysis raises a number of interesting issues, which could be subject to future research. For example, a comparison of the subsequent performance of firms which got their loan applications accepted and firms being rejected may increase our knowledge of the link between the financial sector and the real economy. As demonstrated in this paper, such an analysis should take into account differences between firms in the two groups, for example by employing a matching approach.

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