

Don't Stop Me Now:  
The Impact of Credit Market Segmentation on Firms'  
Financing Constraints\*

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**Abstract**

This paper investigates how the withdrawal of banks from their cross-border business has impacted on firms' borrowing costs since the recent crisis. We combine aggregate information on total and cross-border credit with firm-level survey data. We find that the decline in cross-border lending has led to a deterioration in the borrowing conditions of SMEs. In countries with more pronounced reductions in cross-border credit inflows, the likelihood of an increase in firms' external financing costs has increased. This result is mainly driven by the interbank channel, which has played a crucial role in transmitting shocks to the real sector across borders.

*JEL-Classifications:* F34, F36, G15, G21.

*Keywords:* International banking, firm finance, credit constraints

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# 1 Introduction

This study aims at contributing to a better understanding of the impact of changes in international credit market integration on the real economy. Previous literature has shown that financial integration alleviates financing constraints of firms (e.g. Harris et al. 1994, Gallego and Loayza 2001), and some studies find that especially small firms can benefit from credit market liberalization (Gelos and Werner 2002, Laeven 2002). Given that the global financial crisis has led to a considerable retrenchment in international capital flows, our goal is to investigate how the reduction in cross-border bank lending has affected the access to finance of small and medium-sized enterprises (SMEs) in the euro area.

Several studies show that credit markets have become more fragmented since the crisis (Cetorelli and Goldberg 2011, Bruno and Shin 2013, Milesi-Ferretti and Tille 2011, Lane 2013, 2014a,b), and that the decline in cross-border bank lending has been particularly pronounced and persistent in the euro area. According to Wehinger (2013), SMEs have been particularly affected by financial fragmentation.<sup>1</sup> Overall, new bank credit to small firms has declined by 35 percent between 2008 and 2013 in the euro area, and SMEs have reported deteriorating credit availability in many euro area countries (Figure 1). Regarding SMEs' costs of funding, even though average loan rates for firms have decreased since 2012, spreads between loan rates for small and large loans have significantly increased, and especially so in the countries most hit by the crisis (Figures 2 and 3).

Owing to the fact that firms in the euro area are highly dependent on bank financing, tight credit market conditions can importantly limit their access to external finance. As SMEs make up for more than 98 percent of non-financial firms in the EU, 58 percent of gross value added, and 67 percent of employment, their credit conditions play an important role for investment, innovation, and growth in the euro area.

Combining firm-level with macroeconomic data, we run probit regressions to test different channels through which credit market fragmentation affects the financing constraints of SMEs. External financing costs are measured using micro-level data from the *Survey on Access to Finance of Enterprises in the Euro Area* (SAFE). The SAFE data is available from 2009 onwards at semi-annual frequency and contains information on borrowing conditions and business characteristics of European SMEs. Aggregate credit data comes from the *International Banking Statistics* and from the *Statistics on Credit to the Private*

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<sup>1</sup>Reasons for the borrowing limits faced by small firms include their opaqueness and hence the larger information asymmetries between banks and small firms compared to larger, listed firms for which hard information is readily available.

*Sector* provided by the Bank for International Settlements.

The data reveal that access to finance was indeed among the most pressing problems for SMEs in the euro area in the aftermath of the crisis (Figure 4). However, there are pronounced differences across countries. Not surprisingly, access to finance has been particularly problematic in the periphery countries. In contrast, only about 5 percent of German firms listed access to finance as their most pressing problem at the end of 2013. These differences across countries potentially point to a strong fragmentation of credit markets in the euro area, with capital not necessarily flowing to where it can be employed most fruitfully. Our regression analysis examines this issue in more detail by looking at the impact of changes in cross-border capital flows on firms' financing costs.

Our estimation results indicate that stronger reductions in cross-border bank lending make loan rate increases for SMEs more likely. The negative link between cross-border credit growth and financing costs of SMEs seems to be driven primarily by the interbank lending channel and not by direct cross-border lending from banks to firms.

Credit market segmentation can affect firms' access to finance through different channels. First, a decline in credit inflows from abroad can increase financing costs because of reduced direct cross-border lending to firms (at arms-length or through foreign affiliates). As shown by firm-level survey-data from the EFIGE project for seven European countries<sup>2</sup>, on average, about 8 percent of SMEs used foreign bank credit in 2008/09. However, there is a considerable degree of heterogeneity across countries. Whereas nearly 15 percent of French SMEs used services by foreign banks, less than 5 percent of German SMEs did so.

Second - even if firms do not have any direct relationship with foreign banks - a decrease in foreign credit inflows has indirect effects on firms' financing conditions through its impact on the domestic credit market. On the one hand, contestability and hence competitive pressures in the domestic banking sector decrease due to fragmentation - with potentially adverse effects on the retail credit market. Consequently, banks may charge higher lending rates to their clients (Bremus 2015, de Blas and Russ 2013). On the other hand, credit market fragmentation can reduce domestic lending if the (wholesale) funding conditions of domestic banks deteriorate (Feyen et al. 2014, Brei 2007) as cross-border interbank credit gets scarce.

However, credit market fragmentation not only means that credit inflows from abroad

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<sup>2</sup>Austria, France, Germany, Hungary, Italy, Spain, United Kingdom. For more details, see Altomonte and Aquilante (2012).

decrease, it also implies that domestic banks reduce their foreign activities and may concentrate more on their home market. Credit outflows could be reduced, for example, due to a "flight home effect" (Giannetti and Laeven 2012): domestic banks withdraw money from abroad and shift their portfolios towards the domestic economy, no matter how risky domestic borrowers are. Due to the ongoing deleveraging and potential financial protectionism, this focus on domestic credit markets may persist in the aftermath of the crisis. Hence, credit market fragmentation could be - at least partially - counteracted by increased domestic credit. This would alleviate firms' financing constraints.

The remainder of the paper is structured as follows. In the next Section, we discuss how our study is related to previous literature. Section 3 gives a detailed overview of the data employed and the empirical methodology used. Section 4 presents the regression results, and Section 5 concludes.

## 2 Related Literature

Our analysis is related to two main strands of literature. First, we contribute to the literature on external financing constraints of small firms. Several studies use survey information on the perceived and actual financing obstacles reported by firms, e.g. from the World Business Environment Survey (Beck et al. 2006, Beck et al. 2008, Coluzzi et al. 2012), from the Business Environment and Enterprise Performance Survey (BEEPS) or, more recently, from the SAFE.

Using the SAFE data for the period 2009-2011, Ferrando and Mulier (2015) present evidence that less productive, more levered, and younger SMEs have been more likely to face external financing constraints. The authors argue that the global financial crisis is a good starting point to study external financing constraints, as SMEs in the euro area were likely to experience increased financing obstacles during the post-crisis period. In addition, the subsequent debt crisis in the euro area and the structural changes, especially in the crisis-hit periphery countries, have impaired the availability of external financing, especially for the more opaque SMEs. Artola and Genre (2011) use panel data from the SAFE for the period 2009-2010 in order to study which firm characteristics affected the access to finance of SMEs during the crisis. Their estimation results reveal that especially young and small firms have experienced credit constraints. In a cross-sectional analysis for the year 2009, Ferrando and Griesshaber (2011) find that age and ownership are important drivers of perceived financing constraints: older firms and firms owned by shareholders or other firms have been less financing constrained. Holton et al. (2014)

explore the impact of the recent crisis on credit supply and demand using SAFE data for the period 2009-2011 for the EU. They show that banks tightened lending standards, but that credit demand by SMEs was reduced as well.

In a recent study relying on the BEEPS data for Eastern Europe and the Caucasus, Beck et al. (2014) present evidence that banks' lending techniques matter for credit constraints of SMEs. They show that relationship lending reduces financing constraints in cyclical downturns, but not in booms. Iyer et al. (2014), using confidential micro-data on Portuguese banks and firms, look at the effect that the drying up of the interbank market had on loan availability for firms. They find that especially smaller firms had problems in accessing finance due to reductions in interbank lending. Furthermore, small firms were not able to substitute banks loans with other sources of finance.

Apart from survey data, a large set of studies exploits firm balance sheet information to measure financing constraints by the sensitivity of investment to cash-flow. The idea is that financially constrained firms are more cash-flow sensitive than unconstrained firms. That is, constrained firms have to rely more on internal funding (Fazzari and Petersen 1993). Yet, cash-flow sensitivity has been criticized as a measure of financing constraints (Kaplan and Zingales 1997, Kaplan and Zingales 2000).

Following Almeida et al. (2004), several papers have alternatively measured firms' financing obstacles by the cash flow sensitivity of cash - a measure more focused on the financial situation of the firm than the cash-flow sensitivity of investment. Based on the cash-flow sensitivity of cash, Baum et al. (2011) find that the financial architecture is important for reducing the financing constraints of small firms: bank-based systems tend to provide better access to finance for SMEs than market-based systems in normal times. However, the authors point out that the results may differ in crisis times. We contribute to this literature by addressing the question of how changes in the degree of credit market integration affect the credit costs of SMEs in the euro area.

A second - but smaller - strand of the literature has been devoted to the link between cross-border banking and the external financing constraints of small firms. While, among others, Berger et al. (2001) and Mian (2006) show that foreign banks avoid lending to small and opaque firms in developing countries, Clarke et al. (2001) and Clarke et al. (2005) find that foreign banks lend to small firms in developing and emerging economies at least as much as domestic banks do. Other studies point into the same direction: After financial liberalization, the cash-flow sensitivity of investment has been reduced in Chile (Gallego and Loayza 2001), Indonesia (Harris et al. 1994), and for small firms in Mexico (Gelos and Werner 2002). Laeven (2002) studies the impact of financial liberalization on firms'

access to finance using a panel of 13 developing countries over the period 1988-1998. After liberalization, small listed firms' investment gets less sensitive to changes in cash-flow, i.e. firms become less financially constrained. However, large firms get more constrained after liberalization - possibly due to preferential treatment before liberalization. In a similar vein, Forbes (2007) presents evidence that smaller listed companies are more hurt by the introduction of capital controls than larger ones.

Beck et al. (2011) explore bank-level survey evidence for the year 2006 to analyze to what extent and under which conditions foreign and domestic banks lend to SMEs. Their sample includes 11 large banks operating in advanced economies and 80 large banks operating in developing countries. Against the conventional view that small, domestic banks are more likely to give credit to SMEs, the authors present evidence that foreign banks lend as much to SMEs as domestic ones. Yet, foreign banks use different lending techniques and organizational structures.

Giannetti and Ongena (2009) study the effects of foreign bank entry on small and young listed and unlisted firms in Eastern Europe. Using a linked micro-macro dataset, they find that foreign bank presence fosters firms' use of loans and reduces their cost of debt. However, large firms benefit more from foreign bank entry than small ones. Based on survey data for a set of Eastern European countries in 2005 and 2008, Popov and Udell (2012) present evidence that during the crisis SMEs' financing constraints have been affected by the deterioration of the financial health of their banks. In addition, they show that the balance sheet weaknesses of foreign parent banks have translated into financing obstacles of SMEs.

We contribute to this literature by analyzing the implications of credit market fragmentation on SMEs in the euro area, while other studies have rather focused on developing or emerging economies. In contrast to previous studies, the question we ask here is whether the drop in foreign lending since the crisis - both in the form of direct cross-border credit and in the form of lending via foreign affiliates - has increased borrowing costs for firms.

### 3 Data and Empirical Methodology

In order to analyze the effects of the reduction in international bank lending on the financing conditions of SMEs since the crisis, we use a linked micro-macro dataset for 11 euro area countries over the period 2010W1–2013W2.<sup>3</sup>

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<sup>3</sup>Detailed information on the data used can be found in the Data Appendix.

### 3.1 Micro-Level Data

Firm-level information on financial conditions in the euro area is provided by the SAFE from the ECB. The survey covers a wide array of qualitative information on the access to finance for firms in Europe, and predominantly in the euro area. It is representative at the euro-area level, as well as for the four largest countries, namely Germany, France, Italy, and Spain.

The SAFE has been established in 2009 and is conducted at semi-annual frequency. While 'wave 1' of each survey year covers the second and third quarter of that year, 'wave 2' captures the fourth quarter of the year and the first quarter of the following year. The first survey rounds include data for more than 5,000 firms. The number of firms included in the sample has increased over time, with the second wave of 2013 covering about 7,500 firms. During the period under study, the survey has been conducted in so-called ECB waves and European Commission waves. The ECB waves cover a limited number of euro area countries, whereas the Commission waves cover all euro area countries and some surrounding countries.<sup>4</sup> Given that we want to make use of the time dimension in the data, we keep only those countries which are included in all waves. These are Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, the Netherlands, and Portugal. Table 1 provides an overview of the number of firms included in our regression sample by country and wave.

To achieve representativeness, the SAFE sample is stratified by country, firm size class, and economic activity. The sample covers the following size classes: micro (1-9 employees), small (10-49 employees), and medium-sized (50-249 employees) enterprises. For reasons of comparison, a sample of large enterprises (more than 250 employees) is included as well. In terms of economic activity, stratification is done along the one-digit level of NACE rev.1.1. Economic activities include the four broad categories Industry, Construction, Trade, and Services.<sup>5</sup>

Table 2 provides a detailed overview of the distribution of firms according to different characteristics. With respect to firm size, more than 3/4 of firms in the sample employ less than 50 workers, and about 50 percent of firms have an annual turnover of less than

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<sup>4</sup>For a detailed overview over the countries being covered in the different waves, see ECB (2014).

<sup>5</sup>Industry includes: mining and quarrying; manufacturing; electricity, gas, steam and air conditioning supply; water supply, sewerage, waste management and remediation activities), Trade: wholesale and retail trade; repair of motor vehicles, motorcycles and personal household goods, and Services: enterprises in transport and storage; accommodation and food service activities; information and communication; real estate activities; professional, scientific and technical activities; administrative and support service activities; arts, entertainment and recreation; other service activities.

2 million euros. The most important sectors are Services (37 percent of firms) and Trade (25 percent). Interestingly, even though the majority of firms is very small, nearly 80 percent of firms are more than 10 years old. Regarding ownership, more than 80 percent of firms belong to families or an individual person.

***Firms' credit costs.*** Our main focus is on changes in firms' cost of external financing. Figure 5 reveals that European SMEs frequently use bank loans as well as overdrafts and credit lines as a means of external funding. On average, about 40 percent of SMEs in the euro area rely on these bank-intermediated funding sources in our sample. Again, reliance on different financing instruments varies significantly across countries. Yet, bank credit and overdrafts rank among the most important external funding sources.

We make use of survey question Q10, which asks for the firm's change in loan rates, in order to measure changes in firms' incurred loan rates, applying a dummy variable that takes on the value of 1 if a firm experienced an increase in its loan rates on bank loans, overdrafts or credit lines over the previous six months, and zero otherwise. This measure covers all firms that have applied for or renewed bank loans over the previous six months. Thus, the SAFE allows us to concentrate on changes in the financing conditions of new loans. In addition, we construct a categorical variable that equals 1 if a firm experienced a reduction in its loan rates, 2 if the loan rate remained unchanged, and 3 if it went up.

Figure 6 provides information on firms' financing conditions by country and across time. Looking at the top panel, we can see that SMEs have been affected by rising loan rates quite heterogeneously across countries. While about 20 percent of German SMEs in our sample have reported loan rate increases during the period 2010 W2 - 2014 W1, nearly 80 percent of Spanish firms have done so. Overall, small firms in the GIIPS-countries have suffered much more from loan rate increases than SMEs in the remaining euro area countries. Regarding the evolution of credit conditions over time, the bottom panel of Figure 6 reveals that loan rates increased most broadly in 2011. Since then, less firms have experienced increasing loan rates. Still, more than 20 percent of firms in our sample have reported a deterioration in credit costs in the beginning of 2014.

## 3.2 Macro-Level Data

***Cross-border credit.*** To analyze the effects of credit market fragmentation on firm-level credit constraints computed from the SAFE, we need semi-annual data on credit inflows into the euro area countries. We retrieve quarterly data and assign the average of the second and third quarter to 'wave 1' for each year. The average across the fourth quarter of the current year and first quarter of the following year is assigned to 'wave 2', such

that both the firm-level and the macroeconomic information is timed equivalently.

In order to measure the *direct* effect of cross-border bank lending on the financing situation of firms, we need information on the inflows of credit to the private non-financial sector, and ideally to SMEs only, for each of the 11 euro area countries included in the sample. Unfortunately, sectoral breakdowns of cross-border banking data are still rather scarce (Lane 2014). The data closest to our needs are available from the *International Banking Statistics* by the Bank for International Settlements (BIS). A detailed description of all variables and sources is provided in the Data Appendix. We use quarterly country-level information on international bank claims to the non-bank private sector from the *Consolidated Banking Statistics*. These claims comprise loans and securities of all banks reporting to the BIS, consolidated across each bank. Hence, inter-office positions are netted out. The non-bank private sector includes private firms, but also private households, as well as non-bank financial institutions like special purpose vehicles, insurance companies, money market funds and the like. To the best of our knowledge, data on cross-border bank credit to non-financial firms is currently not publicly available for our sample period.<sup>6</sup> Thus, we take international bank claims against the private non-bank sector from the *Consolidated Banking Statistics* as a proxy.

Besides the direct effects of cross-border lending, a retrenchment in credit market integration can impact the financing conditions of firms *indirectly*, for example via the funding situation of lenders. In order to evaluate the effects of cross-border credit on financing constraints of SMEs in a broader sense, we use BIS data on total international bank claims, as well as international claims on banks from the *Consolidated Banking Statistics*. Total international bank claims comprise cross-border claims of all reporting banks against all counterparties (banks, non-bank private sector, public sector) in the destination country, plus local claims of banks' foreign affiliates in foreign currency. Given that the BIS-data is published in current USD, we transform the series into EUR using nominal exchange rates from the *International Financial Statistics* (IFS) and deflate using consumer price indexes from the IFS to obtain real cross-border bank claims.

***Domestic credit.*** Apart from cross-border credit, we use data on domestic lending as an explanatory variable. Giannetti and Laeven (2012) present evidence for a "flight home" effect during the global financial crisis: Banks withdrew capital from abroad and tilted their loan portfolio more towards domestic lending - independent of the fundamentals in the home country. Thus, the reduction in cross-border lending since the crisis may have been compensated in different euro area countries, at least partially, by increased

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<sup>6</sup>Yet, the BIS has started to provide such information for the most recent quarters.

domestic lending.

To control for such changes in the lending behavior of banks, we include domestic bank credit to the private non-financial sector from the BIS in the regression model. Again, this series includes domestic credit to private non-financial corporations, but also to private households and non-profit institutions serving households (NPISHs).

***Total credit to the private non-financial sector.*** In order to evaluate how changes in loan rates are affected by overall credit, we use *The Statistics on Credit to the Private Non-Financial Sector* by the BIS. The dataset provides information on total credit from all sources, i.e. independent of the type or country of origin of the lender. Total credit data is available for the entire private non-financial sector (non-financial corporations, households, and NPISHs), but also for private non-financial corporations at quarterly frequency.

Figure 7 plots the semi-annual growth rates of the different credit aggregates. In the aftermath of the crisis, (real) credit to the private sector has followed a downward trend, on average, in our sample of 11 euro area countries. The upper panel reveals that, on average, domestic banks have significantly reduced their lending to the private sector - the reductions, as measured by log-differences, have been more pronounced than the reductions in total credit to the private sector. When looking at the growth rates of cross-border credit, it appears that euro area credit markets have become increasingly segmented until the beginning of 2013. Especially cross-border claims on banks in the euro area economies were reduced. This decline in wholesale funding possibilities of euro area banks has contributed to the reduction in domestic bank credit. At the end of 2013, a modest increase in cross-border interbank lending could be observed.

### 3.3 Regression Model

In order to analyze how credit market segmentation in the euro area affects the external financing costs of SMEs, we proceed as follows. In a first step, we use a linked micro-macro dataset to estimate a pooled probit model where the dependent variable equals one if a firm has experienced an increase in its lending rates, and zero otherwise. Our explanatory variables of interest are different credit aggregates. We evaluate the effect of changes in total credit to non-financial firms, and then consider the effects of changes in domestic and cross-border bank credit separately. The correlogram of the different credit measures (Table 3) reveals that international bank credit and domestic bank credit to the private sector are positively (and statistically significantly) correlated in our sample of 11 euro area countries. This may be a first hint at the indirect channel of international

credit market fragmentation: a contraction in cross-border credit may come along with a contraction in domestic bank credit. Moreover, total international credit is more closely related to movements in cross-border credit to banks than to non-banks.

Using the micro-macro data set described above, we model the probability of a firm seeing its loan rate increase as follows:

$$Pr[R_{isct} = 1] = \alpha_c + \theta_s + \lambda_t + \beta_1 ForCred_{ct} + \beta_2 DomCred_{ct} + \gamma Z_{ct} + \xi X_{ict} + \epsilon_{isct} \quad (1)$$

where  $R_{isct}$  is a dichotomous variable that equals one if firm  $i$  in country  $c$  and sector  $s$  reports a loan rate increase at time  $t$ ,  $ForCred_{ct}$  is the growth rate of cross-border credit, and  $DomCred_{ct}$  is the growth rate of domestic bank credit to the private sector.  $Z_{ct}$  is a set of macroeconomic control variables.  $X_{ict}$  is a set of firm covariates to control for observable firm-level heterogeneity

Following the literature, we control for borrower characteristics using information on firm size, age, turnover, and ownership structure from the SAFE. According to previous findings, we expect a negative link between credit costs and firm size, age, and turnover. Concerning ownership, firms that are owned by other firms or by shareholders are expected to be less credit constrained than those which are owned by an individual entrepreneur or a family.

As we are interested in the effect of a reduction in cross-border credit supply on firms' loan rates, one important challenge here is to control for changes in firms' loan demand. If loan demand of firm  $i$  increases and this is not controlled for, loan rates may increase and our estimates are biased upwards. By contrast, if loan demand is not controlled for and declines, loan rates tend to decline so that our estimates are biased downwards. Following Banerjee (2014), we include a control variable related to firms' loan demand, namely a dummy variable that equals one if a firm's most pressing problem is to find customers. The idea is that firms should have a lower demand for new credit - and hence a lower likelihood of seeing their credit conditions tightening - if they have difficulty in selling their products. We also include dummies indicating the sector the firm operates in (Construction, Industry, Services, Trade) in all regressions, because previous literature has shown the firms' need for external financing to vary significantly by sector (e.g. Rajan and Zingales 1998, Friedrich et al. 2013). In the robustness tests below, we also include sector-time dummies to control for changes in loan demand at the sector-level.

In terms of macroeconomic control variables, we add the ratio of total credit to the private sector relative to GDP to all regressions. These data are available at quarterly

frequency, so that we can adjust the timing according to the waves of the SAFE. Credit to GDP is often used as a measure of financial development in large country samples. Yet, it is also a measure of the degree of debt financing and hence leverage in an economy. As our sample comprises advanced economies with developed financial systems, we interpret credit to GDP as an indicator of the dependence on external credit financing.

We include aggregate deposit rates, countries' interbank dependence, net interest margins, and the change in the number of banks in order to control for common banking system characteristics. All these variables are retrieved from the ECB Data Warehouse. We expect a higher probability of a loan rate increase for firms in countries with higher deposit rates, a higher degree of interbank dependence, larger net interest margins and a larger reduction in the number of banks. Moreover, we add an indicator of economic and an indicator of financial risk. As banks have adjusted their risk perceptions in the realm of the crisis, this may imply that they charged higher risk premia and hence loan rates for SME loans. Data on these risk indicators at the country-level are available from the *International Country Risk Guide*, a proprietary database that is also used by firms and banks to assess their business risks. Table 4 presents summary statistics for all variables included in the regression sample.

In addition, country dummies and time dummies are included in each regression to control for time-invariant country characteristics and common time trends in the data. Note that we cannot include firm-level fixed effects as many firms report to the SAFE just once. Dropping all these firms would significantly reduce our sample size. We estimate Eq. (1) using a pooled probit approach.

One problem with this type of data and the non-linear regression model is determining the appropriate level at which to cluster standard errors. The observational unit in our data set is the firm, which is nested within sectors and countries. Ideally, we would like to cluster at the broadest level, i.e. the country level. However, cluster-robust estimation relies on the number of clusters going to infinity (Cameron and Miller 2015). As the number of countries in our sample is small (as is the number of sectors), we cluster at the firm level. Yet, in robustness tests, we check how the significance of our results is affected when clustering at the country level.

Running a simple probit model on firms' loan conditions means that we look at firms that actually applied for and were granted credit. This implies a non-random selection of firms into our regression sample, leading to potentially biased estimates. Firms that did not apply for a loan – either because they were discouraged or because they did not need a new loan – may have seen larger increases in loan rates than firms that got new credit, e.g.

due to high fixed costs of using bank credit. In order to take this potential downward bias of our estimates into account, we also estimate a probit model with Heckman selection.

Similar to Popov and Udell (2012) and Beck et al. (2014), we model a firm’s decision to participate in the credit market using a dichotomous variable that equals one if a firm has applied for a loan and zero otherwise. In the first-stage selection equation of the Heckman procedure, we regress this dichotomous loan application variable on all regressors included in the baseline Eq. (1), and on additional variables, as required by the exclusion restriction. The first additional variable equals one if a firm reports its most pressing problem to be competition, and zero otherwise. The second variable takes on a value of one if a firm’s most pressing problem is high labor input costs. For both variables we expect a negative relation with loan applications.

In addition to estimating Eq. (1) with the probit approaches discussed above, we analyze whether firms of different size are affected differently by credit market fragmentation. To that aim, we interact all credit variables with an indicator variable that equals one if a firm has more than 50 employees, and is hence classified as a medium-sized firm, and zero otherwise:

$$\begin{aligned} Pr[R_{isct} = 1] &= \alpha_c + \theta_s + \lambda_t + \beta_1 ForCred_{ct} + \beta_2 DomCred_{ct} \\ &+ \beta_3 ForCred_{ct} \cdot Size_{it} + \beta_4 DomCred_{ct} \cdot Size_{it} + \gamma Z_{ct} + \xi X_{ict} + \epsilon_{isct} \end{aligned} \quad (2)$$

Even if larger firms are expected to face more favorable financing conditions than smaller and thus more opaque and risky firms, credit market fragmentation may affect the larger firms in our sample more than smaller ones due to potential direct linkages to foreign banks or larger reliance on bank credit in general.

## 4 Estimation Results

### 4.1 Credit Growth and Financing Costs of SMEs

Before coming to the effects of credit market fragmentation on loan rate increases of SMEs, let us have a look at the first-stage selection equation. Table 5 reveals that larger firms (both in terms of employees and turnover) apply for a loan with a higher probability than smaller ones. As expected, firms that face strong competition, high labor costs or weak demand for their products are less likely to apply for credit. Turning to the macroeconomic control variables, we find that firms in countries with a smaller banking system (as measured by the credit to GDP ratio), lower net interest income as well as

higher economic and financial risk are more likely to send out a loan application. The same holds true for firms in countries with a positive development in the availability of total credit to firms.

Table 6 presents the regression results for the increase in loan rates as the dependent variable. Firms that are owned by shareholders and firms that have great difficulty in finding customers are less likely to experience loan rate increases. Older firms tend to be more likely to see loan rate increases. Regarding the macroeconomic drivers of firms' credit costs, firms from countries with larger banking systems are less likely to experience loan rate increases - possibly due to stronger competition between banks in the credit market. As expected, the higher the average deposit rate and hence bank's funding costs or the higher the economic and financial risk at the country-level, the higher the probability of a loan rate increase for a given firm. The larger the reduction in the number of banks serving a firm's home country, and hence the lower contestability in the credit market, the higher its probability of a loan rate increase.

Regarding the different credit measures, we find that larger reductions in total credit to non-financial firms make loan rate increases more likely - both in the probit model and in the model with Heckmann selection (columns 1 and 2). When considering domestic and cross-border credit separately, we find that both domestic credit growth and international bank credit growth have a negative impact on the likelihood of increasing loan rates for SMEs. Columns 5 and 6 reveal that the negative effect of cross-border credit is driven by cross-border bank loans: the stronger the reduction in cross-border credit to banks, the higher the probability of increasing loan rates. By contrast, changes in cross-border credit to non-banks do not seem to matter much for changes in the financing costs of SMEs. This may be due to the fact that direct foreign lending is less important for SMEs external financing situation than lending by domestic banks. Thus, credit market fragmentation in the interbank market seems to have a more detrimental effect on the financing costs of SMEs than the reduction in direct cross-border lending to firms. This finding is in line with the empirical results by Iyer et al. (2014) for Portugal.

Table 7 presents the regression results for interactions between the credit variables and a dummy variable that equals one for firms that have more than 50 employees. Again, the relation between credit growth and firms' likelihood of loan rate increases is negative. For the larger firms in our sample, the negative impact of a reduction in total credit, in total credit by domestic banks, and in total international credit is larger than for the smaller firms. Moreover, larger firms are more likely to experience higher borrowing costs the stronger the reduction in cross-border credit to their home country banks. The effects of credit market segmentation might be more pronounced for larger firms as the latter

typically receive more direct cross-border credit than the smaller firms.

## 4.2 Robustness Tests

We have run several alternative regressions in order to test the robustness of the results discussed above. First, dropping individual firm-level variables, adding a control group of large firms or including a set of sector-and-time dummies does not affect our results. Moreover, when clustering robust standard errors at the country level instead of at the firm level, our results remain statistically significant.

Second, we run ordered probit regressions where the dependent categorical variable is assigned a value of 1 if a firm's loan rate decreased over the past six months, a value of 2 if the loan rate was unchanged, and a value of 3 if the loan rate increased. The ordered probit regressions support our previous results that reductions in aggregate credit make loan rate increases more likely (and loan rate reductions less likely). Moreover, in this setup, the relationship between cross-border credit to non-banks and the likelihood of loan rate increases at the firm-level is negative and statistically significant. Hence, when differentiating between positive and negative loan rate changes, the estimation results suggest that fragmentation in the international market for credit to non-banks coincides with increased external financing costs for SMEs - even if direct foreign credit is not as important for SMEs as domestic credit.

Third, we aggregate the SAFE-data for each country at the sector-level and estimate the following aggregate version of equation (1) using a fractional probit model:

$$ShareR_{sct} = \alpha_c + \theta_{st} + \beta_1 ForCred_{ct} + \beta_2 DomCred_{ct} + \gamma Z_{ct} + \epsilon_{sct} \quad (3)$$

where  $ShareR_{sct}$  is the share of firms in sector  $s$  and country  $c$  at time  $t$  that reported a loan rate increase. All sector-specific factors are controlled for by sector-time fixed effects. Apart from this, we include the same country-level variables as in the baseline regressions.

While some of the macroeconomic control variables do not significantly affect the sectoral share of firms with higher financing costs, Table 8 confirms our previous results that a retrenchment, both in domestic and in international credit, leads to a deterioration of firms' borrowing costs. However, the aggregate version of the regression model does not lend support to our previous result that the significant effect of cross-border lending on firms' financing costs is driven by the interbank channel.

As our sample period includes the sovereign debt crisis in the euro area, we add sovereign CDS spreads to the baseline regressions in order to account for changes in

sovereign risk in more detail. Our results remain unaffected, and the sovereign risk variable has no statistically significant impact on firms' loan rate changes in our sample.

Changes in inflation are not explicitly considered by firms reporting loan rate changes. In order to rule out that our results are driven by changes in inflation, we include CPI inflation as an additional regressor. As expected, the estimation results reveal that if inflation rises, nominal interest rates on new loans are more likely to rise as well. Still, the introduction of CPI inflation in the regression model does not alter our previous findings.

Finally, we take a look at endogeneity issues. Our findings point to a negative link between aggregate credit growth and the probability of loan rate increases at the firm-level. It is unlikely that this result is driven by reverse causality, because increasing loan rates in a destination country of credit should make it more attractive for banks to lend. Thus, we would expect the effect of loan rate increases on credit growth to be positive or insignificant.<sup>7</sup> Still, we re-run the baseline regressions using the first lags of all credit variables in order to further alleviate concerns about reverse causality. The results remain qualitatively unchanged when using lagged credit growth rates instead of contemporaneous ones.

## 5 Conclusions

The aim of this paper is to shed light on the real consequences of credit market fragmentation in the euro area since the crisis. SMEs in the euro area continue to receive special attention by policy makers, not least with regard to the design of the Capital Markets Union (CMU), as they have been hit the hardest by the credit crunch during the crisis.

So far, the literature on the financing constraints of firms in the euro area has concentrated on the importance of firm characteristics for credit conditions of firms. Yet, it has not been investigated how the recent structural changes in cross-border banking affect the access to finance of SMEs. This study attempts to fill this gap. Using a linked micro-macro panel data set, we examine the effects of the retrenchment in cross-border bank lending on the financing costs for SMEs in the euro area.

Our paper has three main findings. Firstly, our descriptive results show that access to finance was among the most pressing problems for firms in the euro area, and specifically

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<sup>7</sup>Moreover, individual firm-level developments should not drive aggregate variables (Langfield and Pagano 2015).

in the periphery countries. Although the share of firms reporting access to finance as their most pressing problem has decreased over time, it is still substantial in some of the most crisis-hit countries.

Secondly, we find that reductions in cross-border bank lending made loan rate increases for SMEs more likely.

Thirdly, the larger the retrenchment in cross-border lending to banks was, the higher the likelihood that SMEs saw their credit costs rise. Thus, the negative link between total cross-border credit growth and the financing costs for firms seems to be driven by the interbank lending channel. Yet, we do not find a significant effect of direct cross-border lending to non-banks on SMEs financing costs.

Overall, our results show that cross-border lending does indeed have an impact on the access to finance of SMEs, though mostly an indirect one through the interbank channel. To alleviate financing constraints for SMEs, one important factor is credit market integration. Thus, policy makers and regulators should promote an integrated European banking market in order to allow credit to flow to where it is needed the most.

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# Figures

Figure 1: Change in the availability of bank loans for SMEs

This figure plots the net weighted percentage of responses (increased - decreased). The data are available from the SAFE by the ECB.

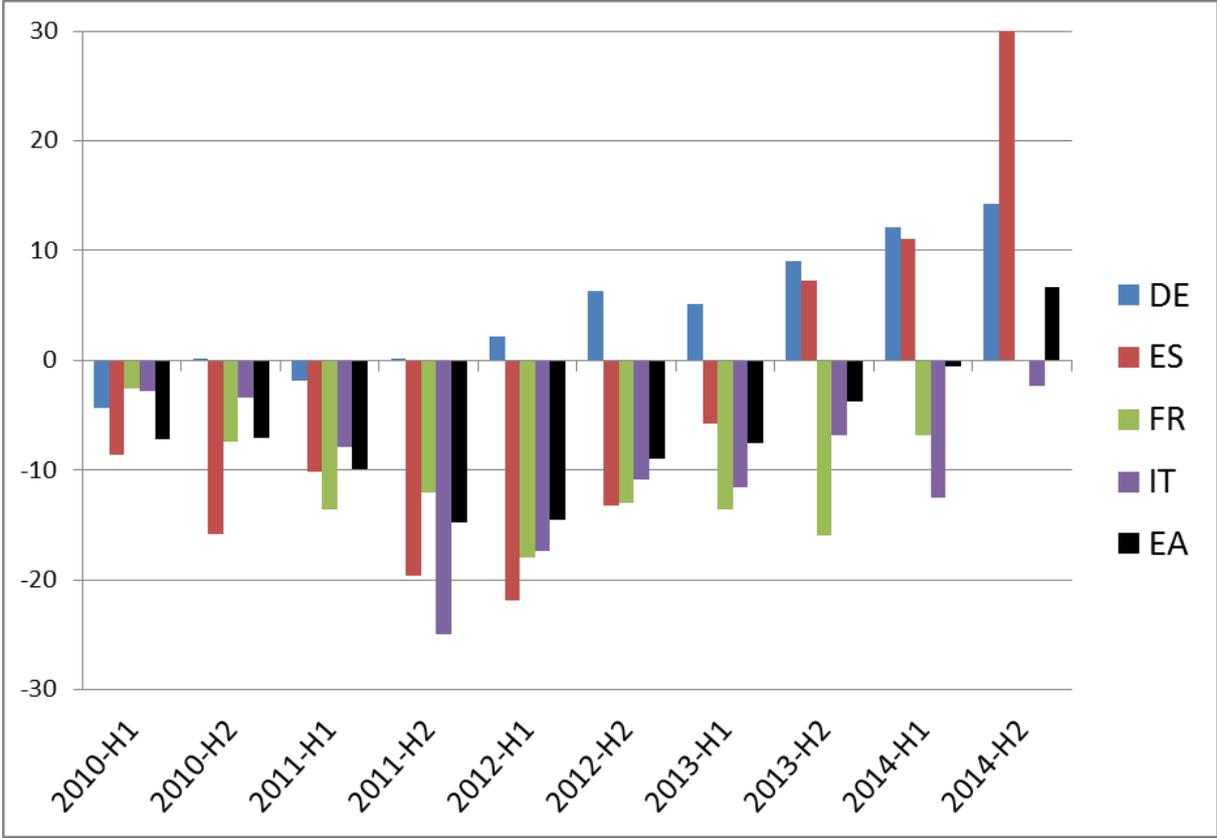


Figure 2: Loan rate spreads in the euro area

This figure plots the difference between interest rates on small and large loans (percentage points) in the euro area. The data are available from the MFI Interest Rate Statistics by the ECB.

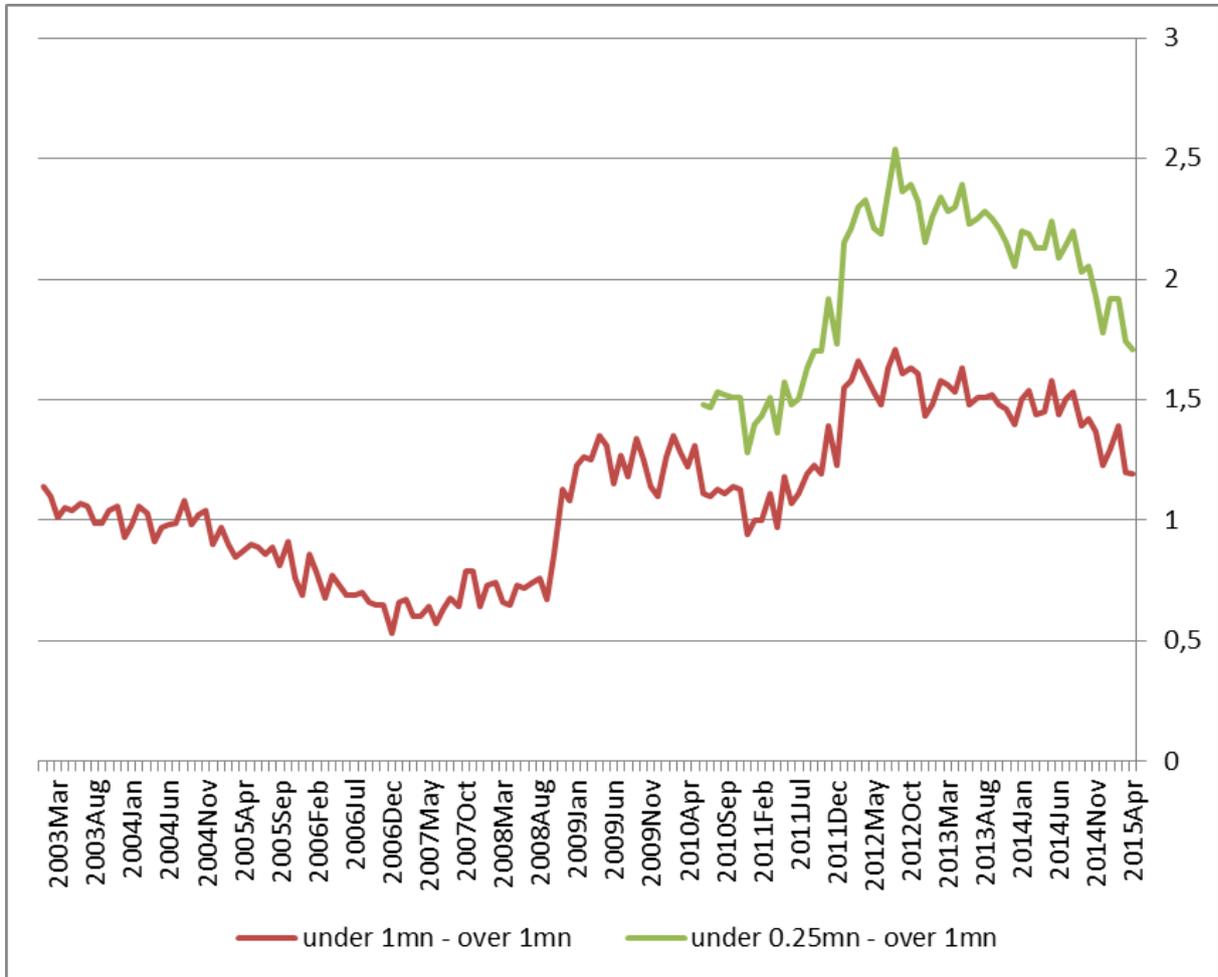


Figure 3: Loan rate spreads across countries

This figure plots the difference between interest rates on small and large loans (percentage points). Small loans: < 1 mn euros, large loans: > 1mn euros. The data are available from the MFI Interest Rate Statistics by the ECB.

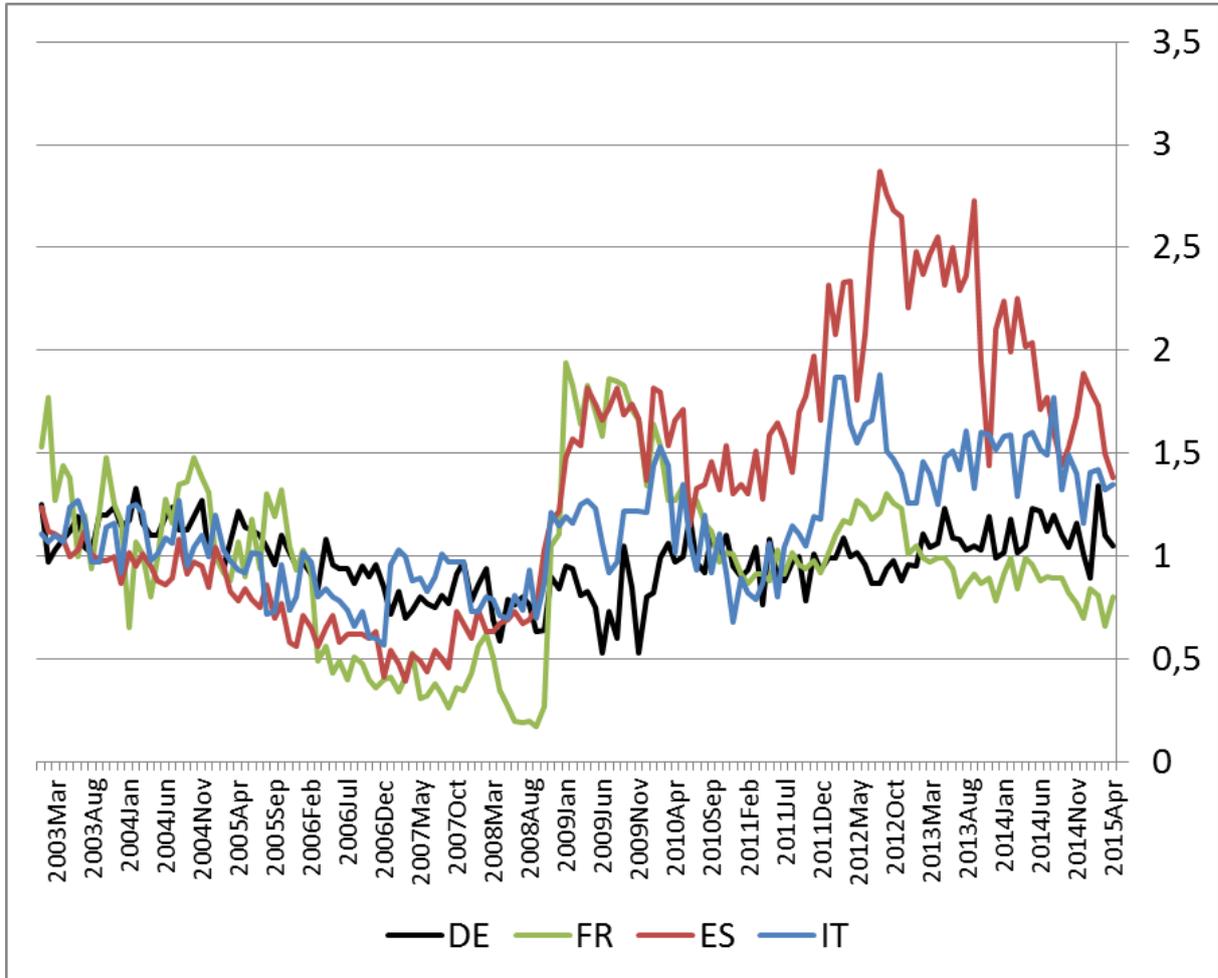


Figure 4: Firms' most pressing problem

This figure plots the most pressing problem named by firms in the SAFE (weighted). The euro area sample includes the 11 countries used in this paper. Representative country-level results are available for France, Germany, Spain, and Italy.

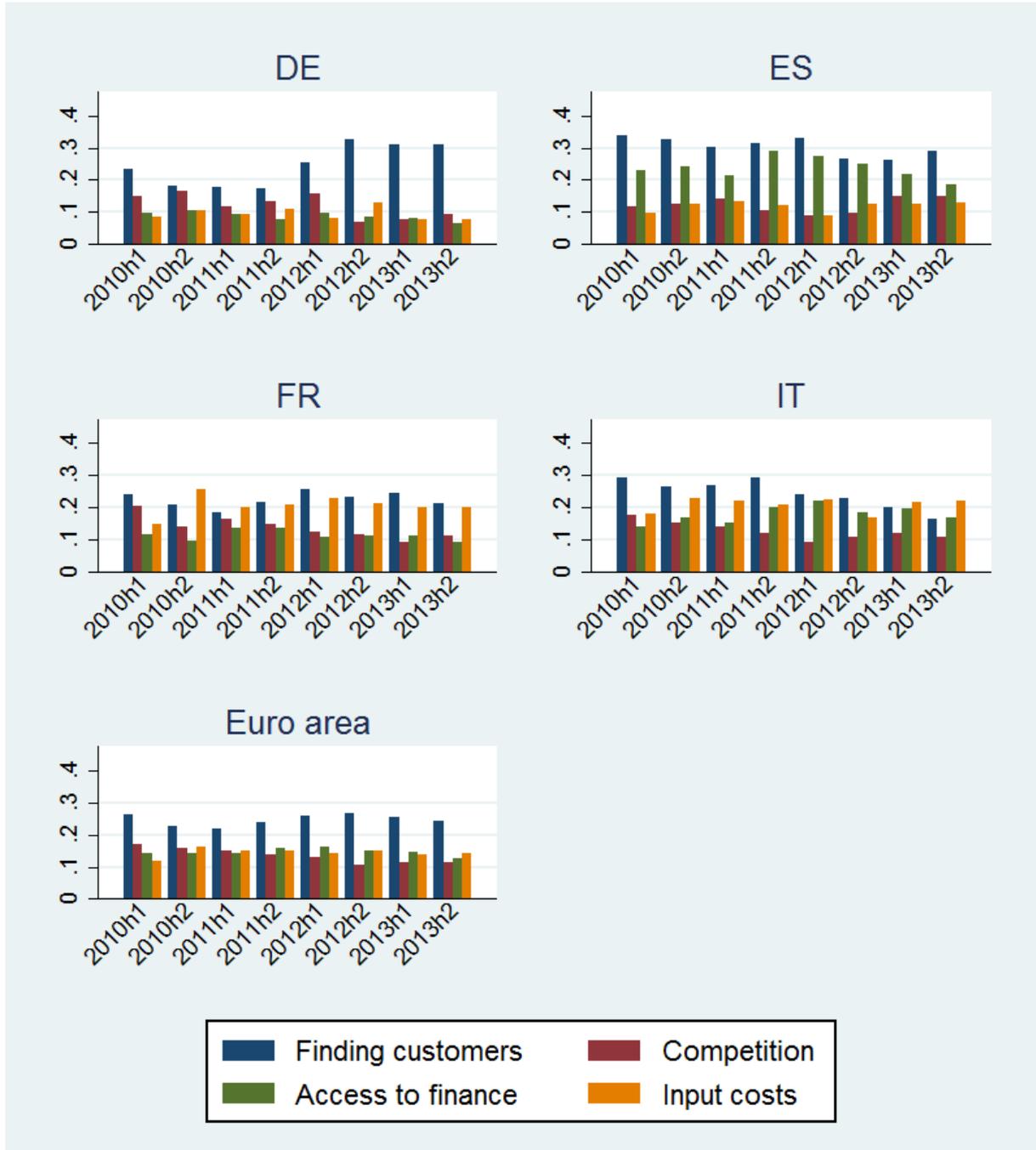


Figure 5: Firms' financing instruments used

This figure plots the financing instruments used by firms in the SAFE (weighted). The euro area sample includes the 11 countries used in this paper. Representative country-level results are available for France, Germany, Spain, and Italy.

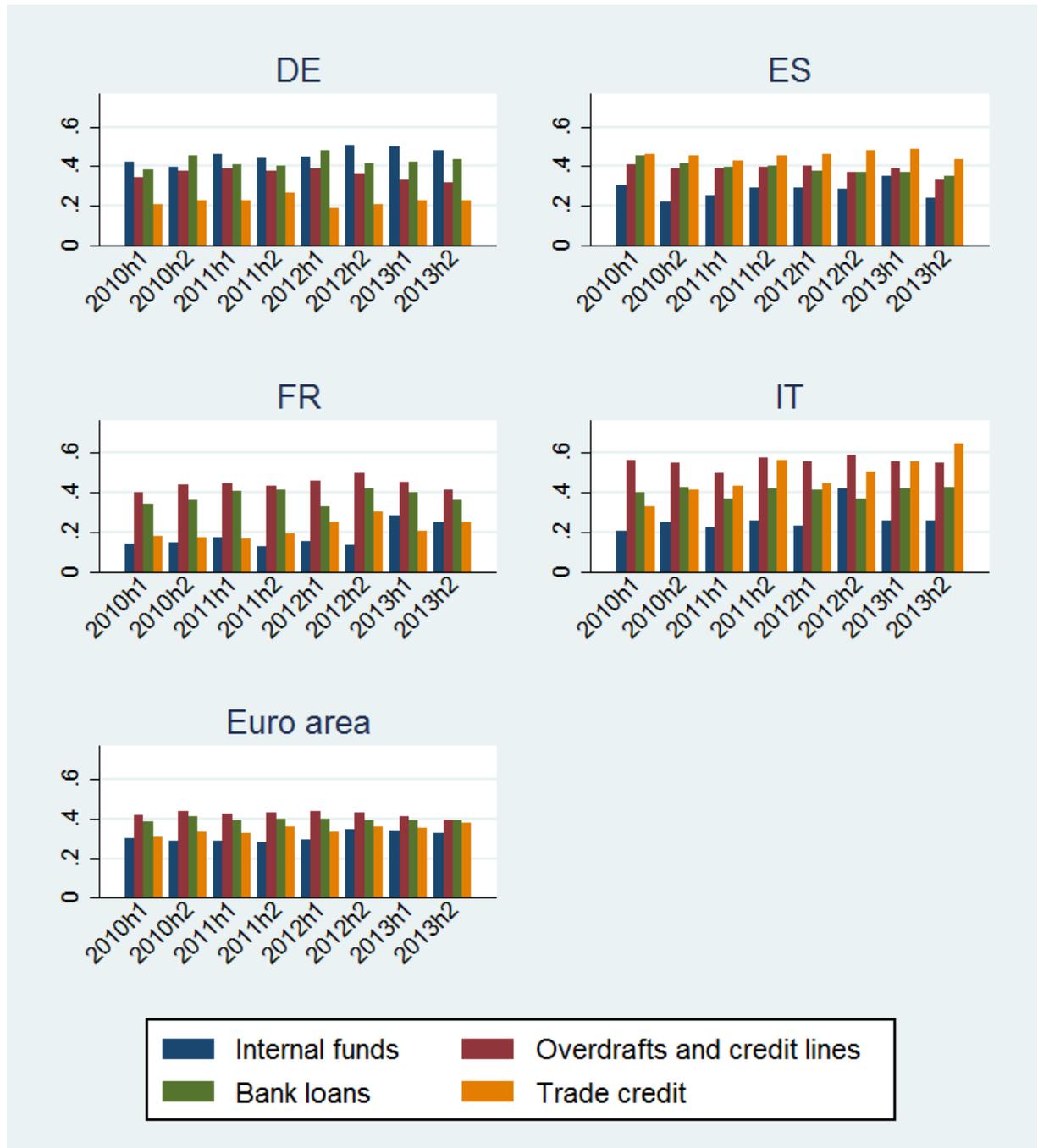


Figure 6: Loan rate increases

This figure plots the share of firms that experienced loan rate increases according to the SAFE by country and year. The euro area sample includes the 11 countries used in this paper.

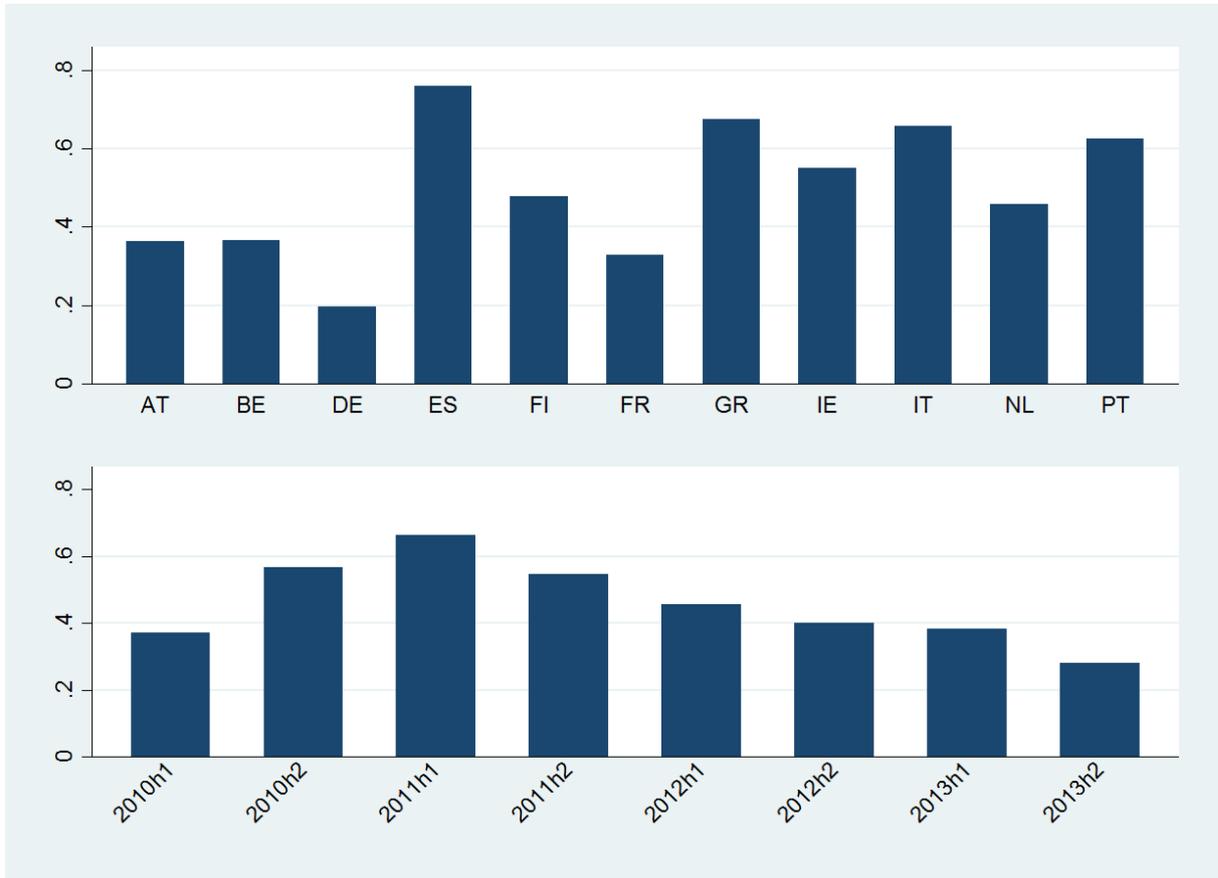
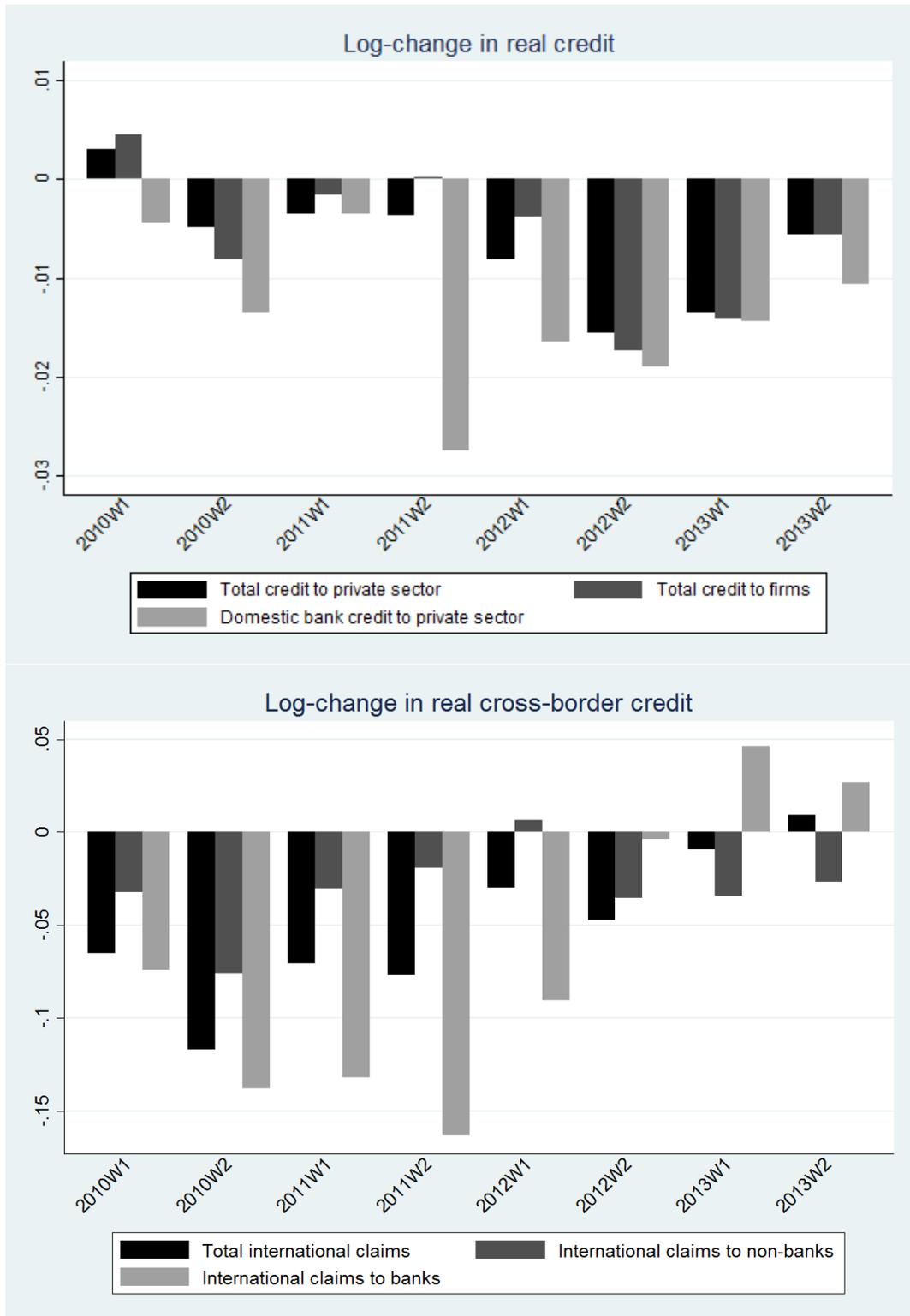


Figure 7: Log-changes in real credit

This figure plots the sample means of the change in total, domestic and cross-border credit. All credit series are available from the BIS. The timing of the variables corresponds to the waves of the SAFE.



# Tables

Table 1: SAFE country composition

This table gives the number of firms by year and wave in our sample.

Country	Year and wave							
	2010W1	2010W2	2011W1	2011W2	2012W1	2012W2	2013W1	2013W2
<b>Austria</b>	144	393	363	349	370	372	376	347
<b>Belgium</b>	142	410	399	414	395	402	397	414
<b>Germany</b>	793	792	661	683	711	641	649	644
<b>Finland</b>	76	432	442	416	349	384	373	371
<b>France</b>	793	784	774	760	767	736	762	783
<b>Greece</b>	135	362	418	397	361	356	325	362
<b>Ireland</b>	68	381	355	344	338	352	354	370
<b>Italy</b>	837	753	685	659	734	621	686	655
<b>Netherlands</b>	193	401	402	404	381	383	378	393
<b>Portugal</b>	199	400	406	399	394	410	383	347
<b>Spain</b>	730	721	706	699	709	699	705	699
<b>Total</b>	4,110	5,829	5,611	5,524	5,509	5,356	5,388	5,385

Table 2: Firm characteristics

This table gives the number of firms according to different firm characteristics provided by the SAFE.

	Frequency	Percent
<b>Employment (categories)</b>		
From 1 employee to 9 employees	15,906	37.24
From 10 employees to 49 employees	15,966	37.38
From 50 employees to 249 employees	10,840	25.38
<b>Main activity</b>		
Industry	10,792	25.27
Construction	4,544	10.64
Trade	11,758	27.53
Services	15,618	36.57
<b>Annual turnover</b>		
Up to €2 million	23,094	54.07
More than €2 million and up to €10 million	12,492	29.25
More than €10 million and up to €50 million	7,126	16.68
<b>Age of the firm</b>		
10 years or more	33,639	78.76
5 years or more but less than 10 years	5,755	13.47
2 years or more but less than 5 years	2,770	6.49
Less than 2 years	548	1.28
<b>Main owner of the firm</b>		
Public shareholders, as your company is	1,245	2.91
Family or entrepreneurs	24,174	56.6
Other firms or business associates	4,421	10.35
Venture capital firms or business angel	491	1.15
A natural person, one owner only	11,659	27.3
Other	722	1.69

Table 3: Correlogram: Log-change in credit measures

This table presents correlations between the log-difference of different credit measures. The first row of each credit measure reports the correlation coefficient. \* denotes statistical significance at the 5%-level. The second row shows p-values, while the third row reports the number of observations.

	Total credit to private sector	Total credit to firms	Domestic bank credit to private sector	Total international claims	International claims to non-banks
Total credit to firms	<b>0.95*</b> 0.00 88	<b>1</b>  88			
Domestic bank credit	<b>0.47*</b> 0.00 88	<b>0.27*</b> 0.01 88	<b>1</b>  88		
Total international claims	<b>0.21</b> 0.05 88	<b>0.14</b> 0.20 88	<b>0.26*</b> 0.02 88	<b>1</b>  88	
Int. claims to non-banks	<b>0.07</b> 0.50 88	<b>0.02</b> 0.87 88	<b>0.1</b> 0.36 88	<b>0.40*</b> 0.00 88	<b>1</b>  88
Int. claims to banks	<b>0.12</b> 0.27 88	<b>0.07</b> 0.50 88	<b>0.21</b> 0.52 88	<b>0.80*</b> 0.05 88	<b>0.00</b> 0.97 88

Table 4: Summary statistics

This table gives summary statistics for the baseline regression sample.

Variable	Obs	Mean	Std. Dev.	Min	Max
Firm size	15988	2.03	.78	1	3
Firm age	15988	3.71	.63	1	4
Turnover	15988	1.74	.77	1	3
Ownership	15988	.14	.34	0	1
Most pressing pb: Finding customers	15988	.21	.41	0	1
Most pressing pb: Labor cost	15988	.14	.35	0	1
Competition	15988	.11	.31	0	1
Deposit rate, %	15988	2.48	.64	1.03	4.51
Interbank dependence, % of assets	15988	14.47	6.36	6.64	31.14
Growth in number of banks	15988	-3.94	6.61	-32	2.5
Net interest income, % of total assets	15988	1.36	.45	.49	2.71
Economic risk	15988	-35.27	3.62	-42	-26.5
Financial risk	15988	-35.92	2.84	-42	-29.79
Total credit / GDP	15988	6.96	2.21	4.39	13.23
Total credit to firms, %-change	15988	-.01	.02	-.07	.05
Total credit by domestic banks to private, %-change	15988	-.01	.03	-.14	.06
Total international credit, %-change	15988	-.05	.09	-.32	.24
International credit to non-banks, %-change	15988	-.03	.07	-.37	.13
International credit to banks, %-change	15988	-.07	.19	-.92	1
<hr/>					
Firm size	42712	1.88	.78	1	3
Firm age	42712	3.7	.65	1	4
Turnover	42712	1.63	.75	1	3
Ownership	42712	.15	.36	0	1
Most pressing pb: Finding customers	42712	.24	.43	0	1
Most pressing pb: Labor cost	42712	.13	.34	0	1
Competition	42712	.14	.34	0	1
Deposit rate, %	42712	2.46	.66	1.03	4.51
Interbank dependence, % of assets	42712	14.89	6.71	6.64	31.14
Growth in number of banks	42712	-4.02	6.77	-32	2.5
Net interest income, % of total assets	42712	1.32	.46	.49	2.71
Economic risk	42712	-35.61	3.87	-42	-26.5
Financial risk	42712	-36.1	2.97	-42	-29.79
Total credit / GDP	42712	7.11	2.25	4.39	13.23
Total credit to firms, %-change	42712	-.01	.02	-.07	.05
Total credit by domestic banks to private, %-change	42712	-.01	.03	-.14	.06
Total international credit, %-change	42712	-.05	.09	-.32	.24
International credit to non-banks, %-change	42712	-.03	.07	-.37	.13
International credit to banks, %-change	42712	-.07	.2	-.92	1

Table 5: Determinants of loan application

This table reports estimation results (average marginal effects) from the first-stage estimation of a probit with selection. The dependent variable equals 1 if a firm has applied for a loan. A set of country, industry and time dummies is included in each regression. Robust standard errors are clustered at the firm-level.

	(1)	(2)	(3)
Firm size	0.070*** (0.005)	0.070*** (0.005)	0.070*** (0.005)
Firm age	-0.006 (0.004)	-0.007 (0.004)	-0.006 (0.004)
Turnover	0.021*** (0.005)	0.021*** (0.005)	0.021*** (0.005)
Ownership	-0.080*** (0.007)	-0.080*** (0.007)	-0.080*** (0.007)
Most pressing pb: Finding customers	-0.096*** (0.006)	-0.096*** (0.006)	-0.096*** (0.006)
Most pressing pb: Competition	-0.114*** (0.007)	-0.114*** (0.007)	-0.114*** (0.007)
Most pressing pb: Labor cost	-0.060*** (0.007)	-0.060*** (0.007)	-0.060*** (0.007)
Total credit / GDP	-0.057*** (0.003)	-0.057*** (0.003)	-0.056*** (0.003)
Deposit rate, %	-0.002 (0.009)	-0.006 (0.010)	-0.006 (0.010)
Interbank dependence, % of assets	0.002 (0.001)	0.004*** (0.001)	0.004** (0.001)
Growth in number of banks	-0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
Net interest income, % of total assets	-0.070* (0.031)	-0.103** (0.032)	-0.092** (0.034)
Economic risk	0.020*** (0.002)	0.018*** (0.002)	0.019*** (0.002)
Financial risk	0.022*** (0.003)	0.022*** (0.003)	0.022*** (0.003)
Total credit to firms, %-change	0.698*** (0.167)		
Total credit by domestic banks to private, %-change		-0.067 (0.137)	-0.068 (0.140)
Total international credit, %-change		-0.055 (0.040)	
International credit to non-banks, %-change			-0.041 (0.042)
International credit to banks, %-change			-0.004 (0.014)
Country dummies	yes	yes	yes
Sector dummies	yes	yes	yes
Time dummies	yes	yes	yes
Observations	42712	42712	42712
No. of firms	28768	28768	28768
Pseudo R-squared	0.062	0.061	0.061

Table 6: Determinants of loan rate increases

This table reports estimation results (average marginal effects) from pooled probit regressions, with and without a Heckman selection approach. The dependent variable equals 1 if a firm reports an increase in its loan rate. A set of country, industry and time dummies is included in each regression. Robust standard errors are clustered at the firm-level.

	(1)	(2)	(3)	(4)	(5)	(6)
Firm size	0.003 (0.007)	-0.014 (0.008)	0.003 (0.007)	-0.014 (0.008)	0.003 (0.007)	-0.014 (0.008)
Firm age	0.012* (0.006)	0.013* (0.006)	0.012* (0.006)	0.013* (0.006)	0.012* (0.006)	0.013* (0.006)
Turnover	0.007 (0.007)	0.002 (0.007)	0.007 (0.007)	0.002 (0.007)	0.007 (0.007)	0.002 (0.007)
Ownership	-0.036*** (0.011)	-0.015 (0.012)	-0.036*** (0.010)	-0.014 (0.012)	-0.036*** (0.010)	-0.015 (0.012)
Most pressing pb: Finding customers	-0.026** (0.009)	-0.008 (0.010)	-0.028** (0.009)	-0.009 (0.010)	-0.028** (0.009)	-0.009 (0.010)
Total credit / GDP	-0.029*** (0.005)	-0.014* (0.006)	-0.036*** (0.004)	-0.021*** (0.006)	-0.035*** (0.005)	-0.020*** (0.006)
Deposit rate, %	0.097*** (0.013)	0.094*** (0.013)	0.107*** (0.014)	0.104*** (0.014)	0.098*** (0.014)	0.096*** (0.014)
Interbank dependence, % of assets	0.001 (0.002)	0.000 (0.002)	-0.001 (0.002)	-0.003 (0.002)	-0.002 (0.002)	-0.003 (0.002)
Growth in number of banks	-0.002 (0.001)	-0.001 (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004** (0.001)	-0.003** (0.001)
Net interest income, % of total assets	0.040 (0.053)	0.052 (0.051)	0.013 (0.053)	0.034 (0.052)	0.028 (0.057)	0.045 (0.055)
Economic risk	0.025*** (0.003)	0.019*** (0.003)	0.019*** (0.003)	0.013*** (0.004)	0.022*** (0.003)	0.016*** (0.004)
Financial risk	0.030*** (0.005)	0.023*** (0.005)	0.031*** (0.005)	0.024*** (0.005)	0.031*** (0.005)	0.024*** (0.005)
Total credit to firms, %-change	-1.194*** (0.260)	-1.301*** (0.252)				
Total credit by domestic banks to private, %-change			-0.716** (0.224)	-0.668** (0.221)	-0.597** (0.229)	-0.556* (0.226)
Total international credit, %-change			-0.304*** (0.066)	-0.275*** (0.066)		
International credit to non-banks, %-change					-0.102 (0.070)	-0.086 (0.067)
International credit to banks, %-change					-0.060* (0.023)	-0.056* (0.023)
Country dummies	yes	yes	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes
Observations	15988	15988	15988	15988	15988	15988
No. of firms	11954	11954	11954	11954	11954	11954
Pseudo R-squared	0.166	0.287	0.167	0.287	0.166	0.286

Table 7: Determinants of loan rate increases, interactions with firm size

This table reports estimation results (average marginal effects) from pooled probit regressions, with and without a Heckman selection approach. The dependent variable equals 1 if a firm reports an increase in its loan rate. A set of country, industry, and time dummies is included in each regression. Robust standard errors are clustered at the firm-level.

	(1)	(2)	(3)	(4)	(5)	(6)
Larger firms	-0.010 (0.011)	-0.021* (0.011)	-0.019 (0.011)	-0.029** (0.011)	-0.016 (0.011)	-0.026* (0.011)
Firm age	0.013* (0.006)	0.013* (0.006)	0.013* (0.006)	0.013* (0.006)	0.013* (0.006)	0.013* (0.006)
Turnover	0.01 (0.006)	-0.004 (0.007)	0.01 (0.006)	-0.003 (0.007)	0.01 (0.006)	-0.003 (0.007)
Ownership	-0.036*** (0.010)	-0.014 (0.011)	-0.035*** (0.010)	-0.013 (0.012)	-0.035*** (0.010)	-0.013 (0.012)
Most pressing pb: Finding customers	-0.026** (0.009)	-0.006 (0.010)	-0.027** (0.009)	-0.006 (0.010)	-0.027** (0.009)	-0.006 (0.010)
Total credit / GDP	-0.028*** (0.004)	-0.012* (0.006)	-0.037*** (0.004)	-0.020** (0.006)	-0.035*** (0.005)	-0.019** (0.006)
Deposit rate, %	0.097*** (0.013)	0.093*** (0.013)	0.107*** (0.014)	0.103*** (0.014)	0.097*** (0.014)	0.094*** (0.014)
Interbank dependence, % of assets	0.001 (0.002)	0 (0.002)	-0.001 (0.002)	-0.003 (0.002)	-0.002 (0.002)	-0.003 (0.002)
Growth in number of banks	-0.001 (0.001)	-0.001 (0.001)	-0.004*** (0.001)	-0.004*** (0.001)	-0.004** (0.001)	-0.003** (0.001)
Net interest income, % of total assets	0.04 (0.052)	0.053 (0.050)	0.01 (0.053)	0.034 (0.052)	0.024 (0.057)	0.044 (0.055)
Economic risk	0.025*** (0.003)	0.018*** (0.003)	0.019*** (0.003)	0.012*** (0.004)	0.022*** (0.003)	0.015*** (0.004)
Financial risk	0.030*** (0.005)	0.022*** (0.005)	0.031*** (0.005)	0.023*** (0.005)	0.031*** (0.005)	0.023*** (0.005)
Total credit to firms, %-change	-0.890** (0.282)	-1.029*** (0.271)				
Total credit to firms x Larger firms	-1.043** (0.374)	-0.912* (0.366)				
Total credit by domestic banks to private, %-change			-0.576* (0.234)	-0.564* (0.227)	-0.458 (0.240)	-0.457* (0.233)
Total credit by domestic banks x Larger firms			-0.572* (0.265)	-0.41 (0.276)	-0.533* (0.267)	-0.364 (0.278)
Total international credit, %-change			-0.232*** (0.070)	-0.202** (0.069)		
Total international credit x Larger firms			-0.276** (0.090)	-0.263** (0.089)		
International credit to non-banks, %-change					-0.058 (0.078)	-0.044 (0.074)
International credit to non-banks x Larger firms					-0.14 (0.103)	-0.127 (0.097)
International credit to banks, %-change					-0.035 (0.026)	-0.03 (0.024)
International credit to banks x Larger firms					-0.095* (0.040)	-0.102** (0.038)
Country dummies	yes	yes	yes	yes	yes	yes
Sector dummies	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes
Observations	15988	15988	15988	15988	15988	15988
No. of firms	28768	28768	28768	28768	28768	28768
Pseudo R-squared	0.167	0.285	0.167	0.285	0.167	

Table 8: Determinants of loan rate increases, sector level

This table reports estimation results from fractional probit regressions. The dependent variable is the share of firms in sector  $s$ , country  $c$  at time  $t$  that report an increase in loan rates. A set of sector-and-time, and country dummies is included in each regression. Estimations are conducted using robust standard errors.

	(1)	(2)	(3)
Total credit / GDP	-0.158 (0.085)	-0.291*** (0.081)	-0.274*** (0.082)
Deposit rate, %	0.173** (0.066)	0.196** (0.066)	0.154* (0.066)
Interbank dependence, % of assets	0.035* (0.015)	0.025 (0.015)	0.023 (0.015)
Growth in number of banks	-0.011 (0.006)	-0.017** (0.005)	-0.014** (0.005)
Net interest income, % of total assets	0.288 (0.244)	-0.002 (0.258)	0.089 (0.266)
Economic risk	0.078*** (0.019)	0.061** (0.023)	0.071** (0.022)
Financial risk	0.058* (0.023)	0.078*** (0.023)	0.072** (0.022)
Total credit to firms, %-change	-3.378** (1.18)		
Total credit by domestic banks, %-change		-2.766** (0.904)	-2.163* (0.954)
Total international credit, %-change		-0.888** (0.281)	
International credit to non-banks, %-change			0.179 (0.334)
International credit to banks, %-change			-0.165 (0.095)
Sector-and-time fixed effects	yes	yes	yes
Country fixed effects	yes	yes	yes
Observations	351	351	351
No. of countries	11	11	11
Pseudo R-squared	0.132	0.133	0.132

# Data Appendix

Variable	Source	Description
<i>Costs of financing</i>		
Increase in lending rates	SAFE Q10, a): Have lending rates for your firms increased, decreased or remained the same over the past 6 months?	1: increased <b>missing:</b> DK/NA  0: otherwise
<i>Firm characteristics</i>		
Firm size	SAFE D1: How many people does your company employ(part- or full time)?	<b>Categorical variable</b> 1: 1-9 employees  2: 10 - 49 employees 3: 50 - 249 employees 4: 250 employees or more
Firm age	SAFE D5: In which year was your firm registered?	<b>Categorical variable</b> 1: less than 2 years  2: 2 years or more, less than 5 years 3: 5 years or more, less than 10 years 4: 10 years or more
Sector	SAFE D3: What is the main activity of your company?	<b>Categorical variable</b> 1: Construction  2: Industry (Mining, Manufacturing) 3: Services (Transport, Real Estate, Other Services) 4: Trade (Wholesale and Retail) <b>Missing:</b> D3>7
Turnover	SAFE D4: What was annual turnover of your company last year?	<b>Categorical variable</b> 1: up to 2 mio €  2: over 2 and up to 10 mio € 3: over 10 and up to 50 mio € 4: over 50 mio € <b>Missing:</b> DK/NA
Firm ownership	SAFE D6: Who are the owners of your firm?	1: Shareholders, other firms, other 0: family or entrepreneurs, venture capital firms, natural person, one owner only <b>missing:</b> DK/NA
Most pressing problem: finding customers	SAFE <i>Waves until 2012H1</i>  Q0: What is currently your most pressing problem?  <i>Waves as of 2012H2</i>	1: Finding customers 0: all other categories (Access to finance, competition, costs of production or labor, availability of skilled stuff or experienced managers, regulation, other) <b>missing:</b> DK/NA and missings from Q0

Construct Q0 from Q0b and Q0c		
Most pressing problem: input costs	SAFE <i>Waves until 2012H1</i>  Q0: What is currently your most pressing problem?  <i>Waves as of 2012H2</i> Construct Q0 from Q0b and Q0c	<b>1:</b> Costs of production or labour <b>0:</b> all other categories (Finding customers, competition, access to finance, availability of skilled stuff or experienced managers, regulation, other) <b>missing:</b> DK/NA and missings from Q0
Most pressing problem: competition	SAFE <i>Waves until 2012H1</i>  Q0: What is currently your most pressing problem?  <i>Waves as of 2012H2</i> Construct Q0 from Q0b and Q0c	<b>1:</b> Competition <b>0:</b> all other categories (Finding customers, access to finance, availability of skilled stuff or experienced managers, regulation, costs of production or labor, other) <b>missing:</b> DK/NA and missings from Q0
<i>Total credit</i>		
Total credit to <b>private non-financial sector</b> (non-financial corporations, households, NPISHs)	BIS, Statistics on credit to the private non-financial sector	Credit to non-financial corporations <b>from all sources</b> independent of the country of origin or type of lender. This includes eg securitized credits held by the non-bank financial sector or cross-border lending. The coverage of financial instruments includes loans and debt securities. Adjusted for breaks, billions of local currency (EUR), original frequency: quarterly
Total credit to private <b>non-financial firms</b>	BIS, Statistics on credit to the private non-financial sector	Credit to non-financial corporations <b>from all sources</b> independent of the country of origin or type of lender. This includes e.g. securitised credits held by the non-bank financial sector or cross-border lending. The coverage of financial instruments includes loans and debt securities. Adjusted for breaks, billions of local currency (EUR), original frequency: quarterly
<i>Cross-border credit</i>		
<b>Total international</b> cross-border bank claims	BIS, Consolidated Banking Statistics	Claims (amounts outstanding at quarter end) on destination country by all reporting countries, immediate borrower basis, in mio. USD, <b>international claims</b> (cross-border + local in foreign currency), original frequency: quarterly

International cross-border bank claims on <b>non-bank private</b> sector	BIS, Consolidated Banking Statistics	Claims on destination country by all reporting countries, immediate borrower basis, in mio. USD, international claims (cross-border + local in foreign currency), non-bank private sector includes claims against all non-banks (i.e. including financial non-banks and households), original frequency: quarterly
International cross-border bank claims on <b>banking sector</b>	BIS, Consolidated Banking Statistics	Claims on destination country banks by all reporting countries, immediate borrower basis, in mio. USD, foreign claims (cross-border + local in foreign currency), original frequency: quarterly
<i>Domestic credit</i>		
Domestic bank credit to <b>private non-financial sector</b> (non-financial corporations, households, NPISHs)	BIS, Statistics on credit to the private non-financial sector	Credit extended by domestic deposit-taking corporations except the central bank such as commercial banks, savings banks or credit unions and money-market funds, adjusted for breaks, billions of local currency (EUR), original frequency: quarterly.
<i>Other macroeconomic variables</i>		
Euro-Dollar nominal exchange rate	IMF, IFS	Euro per USD, end of period, original frequency: quarterly
Consumer price index	IMF, IFS	All items, index 2010 = 100, original frequency: quarterly
Gross domestic product	Eurostat	In current mio EUR, according to ESTV 2010, original frequency: quarterly
Deposit interest rate	ECB, MFI Interest Rate Statistics	Interest rate on deposits with agreed maturity, annualized agreed rate, counterpart sector: non-financial corporations and households, original frequency: monthly
Net interest income	ECB, Statistics on Consolidated Banking Data	Interest expenses minus interest payments relative to total assets (in %), original frequency: half-yearly
Interbank dependence	ECB, Statistics on Consolidated Banking Data	Interbank market dependence in % of total assets, domestic banks and foreign controlled subsidiaries and branches, original frequency: half-yearly
Number of banks	ECB, Statistics on Consolidated Banking Data	Total number of credit institutions, domestic banks and foreign controlled subsidiaries and branches, original frequency: half-yearly
Economic risk	International Country Risk Guide (ICRG), PRS Group	Economic risk rating, based on different risk components (GDP per capita, GDP growth, inflation, fiscal budget balance, current account balance), original frequency: yearly

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Financial risk	International Country Risk Guide	Financial risk rating, based on different risk components (foreign debt, exchange rate stability, net international liquidity, current account balance), original frequency: yearly
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