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Bank-lending constraints and alternative financing during the financial crisis: Evidence from European SMEs

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Abstract: The financial crisis has brought to the fore concerns regarding small- and medium-sized enterprises' (SMEs) capacity to access traditional bank lending. Using European firm-level data on SME access to finance since the onset of the financial crisis, we find that bank-lending constrained SMEs are significantly more likely to avail of alternative forms of external finance, controlling for firm-level and country-level characteristics. We then determine the implications that usage of alternative forms of finance can have for certain economically desirable business activities. In particular, we find that using alternative finance substantially reduces the likelihood of business fixed investment. This effect is not evident for business innovation.

Key words: Financial Crisis, Credit Constraints, Bank Lending, Trade Credit

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1. Introduction

The nature of the financial crisis has brought to the fore concerns regarding small- and medium-sized enterprises' (SMEs) capacity to access traditional bank lending. Previous research has examined the determinants of bank-lending constraints (Artola and Genre (2011); Ferrando and Greisshaber (2011); Holton et al (2012)) and the role that financial development, through traditional bank lending, can have in terms of wider economic activity (Allen et al., (2012); Levine (2005); Beck (2012); Aghion et al. (2010)). However, little work has been done on the relationship between bank lending and alternative sources of finance and on the effect of alternative financing on business outcomes. Taking firm-level data on SME access to finance from the ECB SAFE survey for the financial crisis period, we build on this research in two ways. First, we determine whether bank-lending constrained SMEs are more likely to avail of alternative forms of external finance. We then determine the implications that availing of alternative forms of finance can have for business fixed investment and innovation.

A concern behind this study is that potentially profitable investment opportunities may fail to materialise if constrained firms are forced to seek alternative forms of financing that are more expensive, more limited in amount or that may have other negative implications for firm performance. In the absence of standard forms of bank credit, for example, the development of long-term relationships between firms and credit institutions, the facilitation of corporate control mechanisms and the access to funding for start-up firms may be impaired, causing potentially negative impacts on wider economic growth (Allen et al., 2012). This is particularly salient in the context of the current European economic and financial crisis, which has refocused the attention of both academics and policymakers on SMEs' capacity to maintain existing, and develop new, funding lines in a period when bank credit availability is tight.

A number of studies have considered the relationship between alternative finance and traditional bank lending. Research by Carbó et al. (2012) find increased dependence on trade credit for firms that are credit constrained using Spanish data. Building on this work, an opportunity exists to complete a cross-country evaluation of this relationship and to look at other alternative financing technologies, aside from trade credit. Other research in this area (Brealey et al. (2010); Chavis et al. (2010)) looks at the importance of alternative financing. They find that firms in low income economies and younger firms typically demonstrate a greater dependence on traditional financing, without bringing clarity to the specific implications that a greater reliance on alternative finance can have. This paper fills the gap by identifying the channels through which wider economic activity may be influenced when firms, unable to access bank credit, seek to avail of alternative sources of external finance. It

also extends the sample to include all Eurozone economies within the crisis period. These alternatives take the form of trade credit, non-bank lending (from friends, family, shareholders or other businesses) and the use of leasing and factoring (invoice discounting). The use of such financing may negatively affect firm performance as discussed above.

Our findings suggest that firms are between 18 per cent and 26 per cent more likely to apply for alternative financing when bank-lending constrained, (depending on the definition of constraints used). The findings are statistically-significant and the positive relationship is robust to controlling for a variety of country-level variables and firm characteristics. We also find that firms in economies where the stresses related to the financial crisis have been particularly acute (Spain, Ireland and Italy) appear to be more likely to use alternative sources of finance even controlling for bank-lending constraints.

Having ascertained the presence of this financing-switching behaviour, we then examine the implications for business performance. Our findings suggest that those firms that are more likely to report an increased usage of alternative lending channels are also less likely to have reported having undertaken any fixed investment expenditure. Again, these findings hold when we control for a variety of firm-level characteristics and country-level variables; the results provide strong evidence of the role that alternative finance can have in terms of firm-level outcomes. We do not find any evidence that using alternative finance has a particularly detrimental effect on innovation. This may be due to the fact that innovation activities differ from traditional fixed-investment spending, and consequently have different risk-return profiles and require different funding structures.

The rest of this paper is structured as follows: section 2 provides background and context within the current literature. Section 3 outlines the methodology and the data. Section 4 presents the empirical results and section 5 concludes.

2. Background and context

Our research is linked to two related literatures: a) examining the presence of financing constraints in Europe during the recent financial crisis; and b) looking at the relative merits of bank-based and alternative external financing for firms, especially in times of crisis.

In relation to the presence of financing constraints in Europe, there have been a number of relevant studies that find such constraints and attempt to explain the determinants of their existence. Artola and Genre (2011) use firm-level data on access to finance from the ECB Survey on Access to Finance for SMEs to estimate the determinants of financing constraints. They find that, since the onset of the financial crisis, perceptions of a deteriorating financing position for firms are widespread, with small and young firms suffering disproportionately. Ferrando and Greisshaber (2011) estimate firm-level determinants of financing obstacles in eurozone countries and find that only age and ownership (family firms) are valid predictors of financial obstacles. Holton et al (2012) focus on disentangling the effects of the economic, financial and sovereign debt aspects of the recent crisis on firm's access to bank lending.

They simultaneously find evidence of a bank balance sheet channel as well as a severe negative effect of debt overhang on SME access to finance.

While these papers are related to our work, our main focus is on investigating the effect of bank lending constraints on alternative finance usage. In terms of the economic implications of reduced access to traditional forms of credit, a vast body of literature finds that the relationship with growth does point to some negative outcomes in this respect. Levine (2006) reviews multiple theoretical models in this field that predict faster rates of economic growth where higher levels of financial development exist. Surveying the literature to date, Beck (2012) also concludes that financial deepening, specifically the availability of external finance, is indeed a critical part of a country's overall development process. Aghion et al. (2010), also show that private credit provision by financial systems can alleviate the liquidity constraints on firms, facilitating long-term investment with reduced volatility and higher mean growth. Further research noting the importance of traditional bank lending is provided by Beck et al. (2005). They confirm previous findings showing a significant, positive relationship between financial development (i.e. private sector lending by financial intermediaries to the private sector scaled by national GDP) and economic growth using data on 44 countries and 36 industries in the manufacturing sector.[1] Their findings lend support to the idea that financial development is the driving factor rather than growth.

Alternative arguments have been posed to suggest that traditional bank lending can come with its own disadvantages. Allen et al. (2012) note that this form of lending often requires better information on firms' potential liquidity and solvency problems. It also entails the imposition of more stringent lending conditions and higher monitoring costs. Chava and Purnanandam (2011) find that firms which are heavily reliant on banks for capital are typically more vulnerable to banking crises, suffering greater losses in value and subsequent declines in capital expenditure and profits, when compared to firms that avail of greater access to alternative sources. The procyclicality of traditional bank (and market) financing can mean that as these sources dwindle during a downturn or financial crisis, alternative sources of finance become more important to firms until such time as traditional bank lending re-emerges to displace these.

Reduced availability of credit lines and bank loans, in particular, can influence a firm's ability to tide over regular business operations and its ability to proceed with viable new investment projects (see, for example, Aghion et al., 2010). Such lending constraints, if they exist, may prompt businesses to abandon certain desirable activities. It may also force them to consume existing assets or to turn towards alternative forms of financing, which may be more expensive, available in more limited amounts and may lack beneficial characteristics attached to more traditional forms of bank lending where stricter monitoring roles exist. This behaviour may also hinder the long-run viability of firm's operations. It must be noted

[1] Arguably, average growth over 1980-89 might be the cause of financial development rather than the reverse. In order to control for reverse causation, they focus on only the first year of data on financial development while looking at average growth thereafter. In addition, they also stress that the positive association between private credit and economic growth is not due to reverse causality by using the legal origin of countries as instrumental variables.

that, especially in the current environment with heightened uncertainty, banks must thoroughly review borrowers' positions and proposals and possibly reject loan applications. Such rejections, following a proper monitoring and evaluation are essential for efficient allocation of capital in the economy. However, if banks are rejecting without due cause, this results in profitable investment opportunities being foregone by firms.

It is also important to note that various alternative sources of finance can serve vital complementary roles to traditional bank lending even in the absence of financial instability. For example, internally generated funds frequently appear as the single most important source of capital across economies, surpassing external market-based finance, bank finance and other alternatives. With respect to the latter, Brealey et al. (2010) note that other alternatives, on average, are found to be just as important as bank finance, although large firms in higher income economies show a greater prevalence of traditional financing compared to those in low income economies. Firm age is also significant, with Chavis et al. (2010) using World Bank surveys to show that younger firms typically rely more on other financing alternatives than on bank finance for both short-term (working capital) and long-term (new investment) needs. Older firms, by contrast, rely more on bank finance than other financing alternatives, particularly for long-term projects. In part, these findings are likely to reflect the higher risk attached to smaller firms and the uncertainty of their growth prospects as well as the difficulty and cost of monitoring small-firm loans. Reflecting the risks attached to smaller firms and the lack of access to traditional lending more generally, Allen et al. (2005; 2012) show that, in China and India, non-state, non-listed firms rely more on alternative financing channels such as trade credits and funds from family and friends in order to finance activity.

Substitution between the two forms of financing discussed here has been formally documented. Carbó et al. (2012) examine firm-level panel data on over 40,000 Spanish SMEs during 1994-2008 and find that credit constrained SMEs depend on trade credit, but not bank loans, to finance capital expenditures. They also find that this dependence increases when financing constraints are more intense. Their results imply that trade credit acts as a substitute for bank lending when funding investment projects in times of financial stress.

Clearly, an ideal environment would enable firms to access some blend of traditional and alternative sources of finance as meets their individual needs. What is of interest for this particular research paper is the likely economic outcomes resulting from situations where firms become increasingly dependent on alternative sources of finance such as in times of financial crisis. Allen et al. (2012) point to the prevailing view in the literature, as discussed above, which suggests that, despite the limited supply in developing countries, bank and market finance is still the preferred form over alternative finance, with empirical investigation of the determinants of growth rates appearing to support this preference. However, they also note that very little research has emerged on other forms of alternative financing channels, with trade credit an exception. With this in mind they argue that an important question for this field of research is whether alternative finance, typically backed by governance mechanisms outside of the legal system, is as supportive of wider economic

growth as bank or market finance, which is based on formal contracts enforced by the legal system.

This paper builds on preliminary work by Duffy et al. (2012) that investigates the increased usage of alternative financing in the Irish context following the financial crisis, before discussing the possible implications of this increased usage. Our paper formalizes this analysis and bridges the gap in earlier empirical literature by attempting to provide evidence which enlightens questions concerning both the impact of bank lending constraints on a) firm use of or reliance on alternative sources of external finance and b) the wider implications resulting from increased use of these alternatives.

3. Data and methodological approach

3.1 Data and measuring financial variables

To test our main hypotheses, we use the Survey on Access to Finance for Small- and Medium-sized Enterprises (SAFE) collected by the European Central Bank (ECB) on a bi-annual basis and the European Commission (EC) for a wider sample on a biennial basis. Beginning in 2009, this survey is designed to capture timely and accurate information on the financing of firms and their interaction with, and usage of, different financing technologies. Its main aim is to provide input into ECB monetary policy decision making and ensure effective monitoring of transmission mechanisms across the Eurozone. The survey contains information on the general characteristics of the firm, on the use of bank, market or other external financing, and their views on the general economic and credit outlook.[2]

Importantly for our research, the SAFE survey contains detailed information on the use of specific alternative external financing technologies. For our analysis, we define two variables that capture different aspects of alternative finance usage. These are presented in table 1. The first variable, 'AF_New', we have defined as 1 if the firm applied to use alternative financing in the past six months while also indicating that they do not regularly use these financing technologies. In essence, this measure captures potential new entrants into alternative financing. We do not give firms a value of 1 in this case if they state that alternative finance is always part of their usual financing mix. We use AF_New as the dependent variable in testing whether or not bank credit constraints affect alternative finance usage. AF_New is defined in this manner to better identify if firms that are bank-lending constrained seek alternative finance as a replacement.

The second indicator of alternative finance, AF_Use, is more general. It takes the value of 1 if firms used one of a number of specific types of non-bank, non-market financing in the past six months. This variable is used to link the use of alternative financing to investment and innovation.

[2] For more information see ECB SAFE Questionnaires available on www.ecb.int or see Oswiewicz & Perez-Duarte (2010).

Table 1: Definition of Alternative Finance Variables	
Indicator	Definition
Apply Alterative Finance (AF_New)	Indicator = 1 if firms applied to use either trade credit or other external finance (non-bank loans, factoring, dept, equity or leasing) in the past 6 months and who indicate that they do not regularly use these financing technologies. Indictor = 0 otherwise.
Alternative Finance Usage (AF_Use)	Indicator = 1 if firms used trade credit, non-bank lending (from friends or family, shareholders or other businesses), factoring or leasing in the past 6 months. Indictor = 0 otherwise.

Source: Author's calculations using ECB SAFE data

Having developed indicators of alternative finance usage, the next step is to identify whether or not firms face binding financing constraints. A major difficulty stemming from the wider literature on estimating credit constraints concerns the identification of constrained firms. While the literature draws on a number of methodologies to identify constrained firms,[3] a number of papers use direct survey questions concerning the firms' perceptions of credit constraints and their experience in accessing external credit (Clark et al (2006); Beck et al (2006)). In recent years, the final category is becoming more established due to concerns about the correctness of identification using different methods (See Kaplan and Zingales (1998) for a critique of this approach) as well as the increasing availability of large representative survey datasets with direct access to finance information.

In this paper, we are concerned with the final category of credit constraint identification. Using data from the SAFE survey, we follow the approach in Bigsten et al (2003), Byiers et al. (2010), Hansen and Rand (2011) and O'Toole (2012) and attempt to directly identify firms with difficulties accessing formal bank credit. Table 2 outlines our definitions of credit constraints which are drawn from a number of different SAFE questions. The main question we draw on relates to loan applications and denials. Firms are asked if they applied for bank loans and if so were they a) rejected outright, b) given between 75 per cent and 99 per cent of the application c) given between 1 per cent and 74 per cent of the credit or d) rejected the offer due to the interest offer rate being excessive. Our benchmark constraint (CC1), follows both Byiers et al (2010) and O'Toole (2012) and identifies firms as constrained if they applied for and were denied credit as defined by a or c above. As in previous research, we do not classify firms as constrained if they report refusing loans on the basis that the interest rate offered was too high as this may indicate that they do not have positive net present value (NPV) investment projects that can be undertaken profitably at the current market cost of capital.

Building on this main constraint definition, we develop two similar constraints: First, where firms are denied finance for business investment (CC2). We develop this constraint by

[3] Other methodologies are as follows: first, estimating the relationship between measures of internal funds (such as cash stock or cash flow) and outcome variables (investment, inventory management or firm growth) (Fazzari et al (1988); Chirinko (1993); Hubbard (1998); Love (2003); Guariglia (2008); O'Toole & Newman (2012)) second, using wider financing information on borrowings, net worth, and liquidity management to proxy for the financial position of the firm (Bond et al (1993), Whited (1992), Whited and Wu (2005)).

limiting CC1 to those firms that only undertake some business fixed investment. These firms can be seen as active investors whom, despite the fact they are credit constrained, have undertaken some investment. This indicates that they have some positive NPV opportunities that they are willing to commit to in the current environment. Second, we define firms as constrained for working capital financing only (CC3). In this case we limit the application criteria to firms that applied and were denied for bank overdrafts, credit lines or credit card overdrafts.

The final constraint indicator deals with firms that did not specifically apply for bank loan facilities (CC4). These discouraged borrowers are an important category of credit rationed firms that are not captured by CC1-3. We define firms as constrained if they stated that they did not apply for new bank loans as they believe the applications would be rejected and also subsequently noted that banks had altered their existing financing facilities by a) decreasing the available maturity b) lowering the size of the loan c) increase the non-interest cost, or d) increase the collateral requirement. We assume that a, b, c, and d are indicators of banks rationing credit away from the firm.

Table 2: Credit Constraint Definitions

Constraint	Definition
Denied Finance (CC1)	Firms are defined as constrained if they applied for either bank loans or bank overdrafts, credit lines or credit card overdrafts but were refused finance or received less than 75 per cent of the amount sought.
Denied Finance for Investment (CC2)	Firms are defined as constrained if they applied for bank loans but were refused finance or received less than 75 per cent of the amount sought and have indicated that they undertook some investment in the period.[4]
Denied Finance for Working Capital (CC3)	Firms are defined as constrained if they applied for bank overdrafts, credit lines or credit card overdrafts, but were refused finance or received less than 75 per cent of the amount sought
Did Not Seek Bank Finance (CC4)	Firms are defined as constrained if they stated that they did not apply for new bank loans due to possible rejection and they noted that on existing financing facilities either a) the available maturity was decreased by the lending b) the size of the loan was lowered, c) the non-interest cost increased, or d) the collateral requirements were increased.

Source: Author's calculations using ECB SAFE data

Finally, we define two variables to capture investment and innovation. These are outlined in Table 3. Both variables are binary.

Table 3: Investment and Innovation

Investment	Firms are defined as active investors (Indicator =1) if they indicated that they undertook some fixed investment expenditure during the last six months. Indicator = 0 otherwise.
Innovation	Firms are defined as undertaking innovation if, in the last 12 months, they either introduced a) a new or significantly improved product or service to the market or b) a significantly improved production process or method. Indicator = 0 otherwise.

Source: Author's calculations using ECB SAFE data

3.2 Summary statistics

To test the effects of bank lending constraints on alternative finance usage, we focus our attention on the Eurozone.[5] The SAFE survey was conducted in various waves since 2009.[6] The same firms were re-surveyed across countries where possible. This provides us with a panel data set of firms across the various survey waves. However, the firm identifiers are not currently available for waves six and seven. In this regard, our analysis is limited to the five waves over the period January 2009-September 2011. The number of firms across each of the Eurozone countries is presented in Table A1 in Annex 1. It can be seen that the survey contains more observations for the bigger economies and is designed to be representative for these countries. Germany, Spain, France and Italy each account for about 15 per cent of the total. The coverage for the smaller Eurozone nations is more limited, but there are still over 1,000 observations for Austria, Belgium, Finland, Greece, Ireland, Netherlands and Portugal. The number of observations for the smaller Eurozone countries improves for waves four and five.

In all our analysis, we have included the firms that answered don't know to questions on alternative finance and applications for lending facilities. This is included for statistical purposes due to the fact that as we are dealing with very small sample sizes, removing these firms may have a particularly detrimental effect on the representativeness of the data. We have therefore decided to include these in the analysis as not reporting lending constrainedness or applications for alternative finance.[7]

Figure A1 in Annex 1 presents a breakdown of the number of firms by size and sector for the first five waves of the SAFE data. Over 37 per cent of firms are in the services sectors (business services, transport and real estate), 27 per cent in the wholesale and retail trade, 24 per cent in Industry and the remainder in construction. The sample also contains a majority of small- and medium-sized firms (less than 250 employees). Over 34 per cent of firms in the sample are micro-enterprises of less than 9 employees. Circa 33 per cent are small firms with between 10 and 49 employees. Medium-sized firms (employee numbers between 50 and 250) accounted for approximately 26 per cent of the observations. Only 8 per cent of firms have over 250 employees. Given the weighting towards SMEs, the SAFE survey provides a very good basis to test the effects of firm financing obstacles. The international literature (Beck et al., 2006) highlights the fact that SMEs are the most vulnerable firm grouping in terms of being exposed to domestic credit constraints.

The ECB SAFE survey asks firms what is the most pressing problem facing their business. Figure A2 in Annex 1 provides an overview of the responses. In general, firms across the Eurozone noted that finding customers is the single biggest challenge to their ongoing

[5] A robustness check of our main findings on the wider EEA is also conducted and discussed in the empirical results section.

[6] The survey waves are wave 1 (Q1,Q2 2009), wave 2 (Q3,Q4 2009), wave 3 (March-Sept 2010), wave 4 (Sept 2010-Feb 2011), and wave 5 (April to Sept 2011).

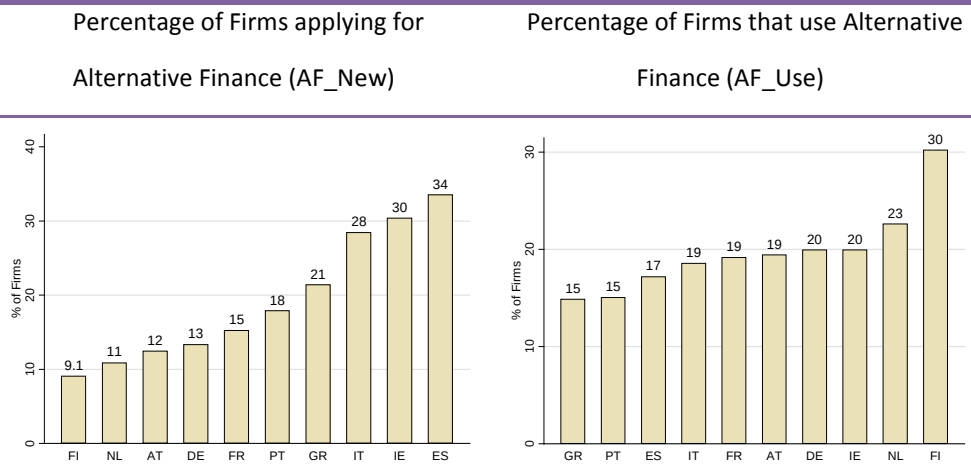
[7] However, it could be argued that these firms should be omitted. We therefore repeat out analysis with these firms removed as a robustness check. The results and summary charts are presented in Annex 2. The results are virtually identical to those if these firms remain.

success; 25 per cent of firms gave this response on average across the waves. A lack of customers is reflective of the subdued nature of domestic demand across many of the Eurozone economies, in particular those economies where large government budgetary imbalances are being unwound through contractionary fiscal policies.

Both access to finance and competition are joint as the second most important issues facing firms. As this research focuses on firms external financing needs, it is noteworthy to highlight the fact that 16 per cent of firms state that access to finance is the greatest problem that they face.

Having provided a general review of the data, we now focus on the measures of alternative external finance. Figure 1 presents the mean value across countries for waves four and five[8] of both indicators a) firms applying for alternative financing having not used it in the past six months and b) the share of firms who use alternative finance. Statistics are presented for selected Eurozone core and periphery economies.

Figure 1: Firms Applying for and Using Alternative Finance



Source: Author's calculations using ECB SAFE data, Note: Data covers mean of waves four and five.

The country with the highest level of new applications for alternative finance by firms that do not regularly use it is Spain at 34 per cent. This is followed by Ireland at 30 per cent, Italy at 28 per cent, Greece at 21 per cent and Portugal at 18 per cent. Both Spain and Ireland have suffered major banking sector crises which have required significant recapitalization through state intervention. A main aim of this paper is to see if economies where banking sector stresses have been more severe have witnessed an increased firm-dependence on alternative finance. Italy, Greece and Portugal have also had difficulties in sovereign financing markets with the latter two currently in official government financing programmes. The country with the lowest share of alternative finance applications is Finland

[8] We present the charts for using alternative finance and bank lending constraints for only waves four and five due to the small sample sizes for some Eurozone countries. However, all data from waves one to five of the SAFE survey pertaining to these countries are included in the regressions analysis.

at 9 per cent. A lower rate of firms requiring a switch to alternative finance could be expected in Finland as the economy has weathered the economic and financial crisis relatively better than other economies.

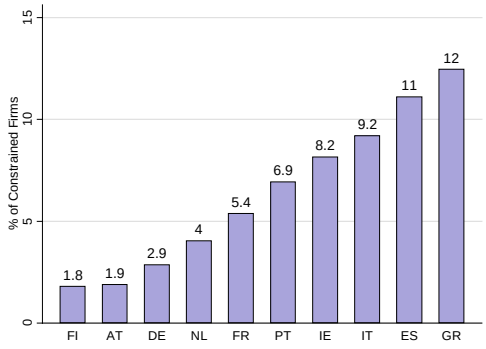
The second graph shows the percentage of firms in each country that use alternative finance in their day to day operations. We see that Finland is actually the highest in this case at 30 per cent of all firms. Why Finland has such a high level of alternative finance usage, but a low level of new applications for such funding technologies can be explained by a high level of initial diversification across external financing sources. The Netherlands is the second highest user of external finance at 23 per cent, followed by the Ireland and Germany at 20 per cent.

In general, the charts suggest that firms in economies most affected by the sovereign debt and banking crises seem to be increasing their rate of usage of alternative finance. However, this may be more a convergence to the levels used in more stable economies.

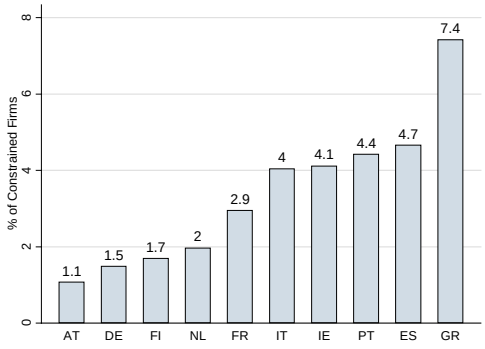
The final summary statistics we present relate to the indicators of bank financing constraints. The mean values across waves four and five for core and periphery economies are presented in Figure 2.

Figure 2: Summary of Bank Lending Constraint Measures

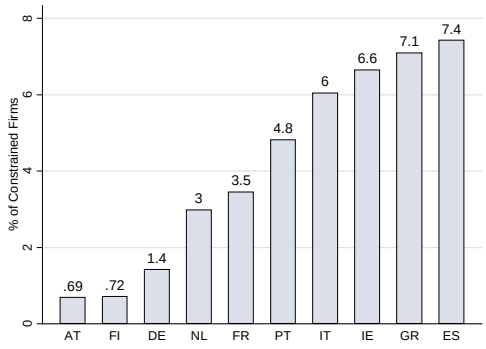
CC1 – Firms Denied Finance



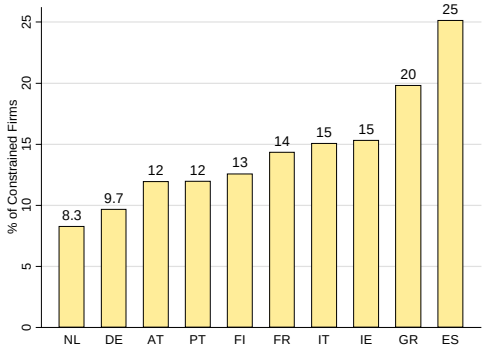
CC2 - Firms Denied Finance for Investment



CC3 – Firms Denied Working Capital Facilities



CC4 – Firms Did Not Apply



Source: Author's calculations using ECB SAFE data

Using the baseline constraint, CC1, we find that the highest level of financing constraints is in Spain and Greece at 11 and 12 per cent of all firms respectively. The figure for Ireland indicates that 8.2 per cent of firms face a bank lending constraint.[9] Italy, Portugal and France are at 9 per cent, 6 per cent and 5.4 per cent respectively. The country with the lowest level of bank lending constraints is Finland at less than 2 per cent of firms. Focusing on lending constraints for fixed investment (CC2), the picture is similar with the so called 'periphery economies' showing the highest levels: Greece is highest at 7.4 per cent, Spain is second at 4.7 per cent and Portugal third at 4.4 per cent. The mean values for the working capital lending constraint (CC3) also show a similar pattern. Spain is the highest at 7.4 per cent followed by Greece and Ireland. For both of these constraints, CC2 and CC3, Finland and Austria register the lowest values.

The final constraint measure, CC4, captures those firms that do not apply for finance due to perceived credit rationing. A similar pattern emerges with this measure as for CC1-3, although the magnitude is higher. By this measure, 25 per cent of firms are constrained in Spain, 20 per cent of firms in Greece, and 15 per cent of firms in Ireland. This is followed by France and Italy at 15 per cent and 14 per cent respectively.

Overall, the summary statistics for the bank lending constraint measures indicate that a high proportion of the firms in European peripheral nations face such constraints, with those economies where banking or sovereign stresses have been most intense following the financial crisis typically showing greater shares of firms constrained. It also demonstrates the considerable variation across countries in the Eurozone.

3.3 Empirical model and econometric considerations

In both of the main empirical equations we estimate, our dependent variables are binary, which requires the use of a probability choice model. We use a probit approach assuming a normal distribution for the functional form. Therefore, in the first case, we model the effect of bank lending on applications for alternative finance as for firm i, in country j at time t as:

$$\Pr\left(AF\_New_{ijt}\right) = \Phi\left(\theta CCX_{ijt} + \boldsymbol{\beta X}_{ijt} + \boldsymbol{\lambda Z}_{jt} + \kappa_j + c_i + \tau_t\right)$$

where CCX indicates one of the four proposed measures of credit constraints (with X = 1,..,4), $\boldsymbol{X}_{ijt}$ is a vector of firm-level controls, and $\boldsymbol{Z}_{jt}$ is a vector of country controls. We also include country and firm fixed effects and time effects in the error term.

Our main hypothesis concerns the coefficient θ on the constraint variable. Our a-priori expectations would suggest a positive effect ($\theta > 0$): if bank financing constraints increase, firms may turn to alternative non-bank finance.

The selection of the firm-level controls in $\boldsymbol{X}_{ijt}$ draws on existing research that estimates the determinants of firm financing choices (Love, 2003; Beck, 2006; Beck, 2008a; Beck, 2008b;

[9] In an Irish context, Holton and McCann (2012) indicate that 24 percent of Irish firms were rejected credit. Our definition of credit constraints using loan rejections reconcile with this data as we only look at those firms that are denied credit completely and exclude those firms which were denied credit due to the interest rate offer being too high. We also use a different time period.

O'Toole, 2012). This research suggests that much of the between-firm variation in financial structure can be explained by firm age, ownership, and size. We therefore include binary indicators for these factors in our firm control vector. To capture the effect of the firm's operating conditions on its demand for alternative finance, we include two controls for its view on the general economic outlook and its current profit growth. Outlook is measured a binary indicator for whether the firm believes the current outlook has improved and profit growth is a binary variable for firms who noted increased profit growth over the past six months. Sectoral controls are also included in all regressions.

In the vector $\boldsymbol{Z}_{jt}$, we include a number of macroeconomic factors that we believe may affect the credit environment and the requirement of the firm to turn to alternative finance. Following Holton et al. (2012), we include GDP growth, the ratio of private sector credit to GDP, the yield on the 10 year sovereign bond, and the CDS rate on the largest bank in each country. GDP is included to capture the effects of the overall macroeconomic investment climate and the potential existence of profitable investment opportunities for all firms in the economy. Credit to GDP is included to control for debt overhang, which, especially in the current crisis, could potentially reduce future investment and demand for finance by firms[10]. Sovereign bond yields and bank CDS levels are included to capture potential frictions and strains in financial markets. It is expected that countries in which financial markets are subject to greater strain and uncertainty may be more likely to have to turn to alternative financing.

As noted, the SAFE dataset contains a panel of firms within the Eurozone and a cross-section of firms for the Eurozone. In estimating the effect of bank lending constraints on alternative finance usage, we wish to exploit both the panel nature of the data to capture time-varying effects as well as controlling for firm-level heterogeneity.. We therefore run a panel probit model with random effects to control for firm heterogeneity on the sample of Eurozone countries.

We use cluster robust standard errors to control for potential heteroscedasticity and serial dependence across groups in the error structure. The selection of the clustering groups is specific to the particular regression undertaken and is indicated in the regression output.

The second stage in our analysis links alternative financing activity to investment and innovation. Considering firms' behaviour when undertaking capital investment or organisational and product changes suggests that investment and innovation decisions are made jointly with the applications for finance and the choice of the financing `mix' for the operation. In this context, the decision to use alternative finance and undertake investment and innovation is potentially endogenous in a contemporaneous setting. To produce consistent estimates for our parameters of interest, this reverse causality must be dealt with econometrically.

[10] For a review of the effects of debt overhang on investment see Hennessy (2004), Moyen (2007) and Hennessy et al. (2007).

Additionally, while in the first section of the analysis, we linked bank lending constraints to firms who applied for alternative financing having never used it before, for the link to investment and innovation we use a more general measure of alternative finance usage. We use the variable AF_Use which captures firms that use alternative finance regularly as part of their financial mix. We do this for the following reason. If a firm applies to use alternative finance to invest or innovate having not used it before, uses it for a specific period or project, then does not use it in the long term, we expect that the effect of the higher cost of capital alternative may not have such a detrimental effect on firms' long term viability as if they were to regularly use these products.[11] We therefore believe that the effect of interest is how investment and innovation is impacted by firms that regularly use alternative financing, not just those firms who switch into these financing sources in the short run.

Given that our data availability differs for investment and innovation, we develop two different identification strategies which maximise the use of the panel structure of the data 1) the use of lagged data on alternative finance usage and 2) use a bi-variate probit model to jointly estimate probability equations for investment/innovation as well as alternative finance usage using lagged alternative finance usage as an instrument. Our indicators are binary so we use a standard probit model with random effects to estimate the firm-level propensity to invest (which has a panel element) and the innovation equation with a standard probit model on the cross section of data available. Even though the innovation data is for one wave and thus cross-sectional, we do observe the firms in the previous waves so we can apply the lagged value of alternative finance usage to the current innovation information as in the investment case. We can therefore apply both methods to innovation. Our first specification for investment is as follows:

$$\Pr\left(Invest_{ijt}\right) = \Phi\left(\lambda AF\_Use_{ijt-1} + \boldsymbol{\beta X}_{ijt} + \boldsymbol{\lambda Z}_{jt} + \kappa_j + c_i + \tau_t\right)$$

Innovation is modelled identically as:

$$\Pr\left(Innovate_{ijt}\right) = \Phi\left(\lambda AF\_Use_{ijt-1} + \boldsymbol{\beta X}_{ijt} + \boldsymbol{\lambda Z}_{jt} + \kappa_j + c_i + \tau_t\right)$$

The key parameter in our identification is λ, which we a-priori expect to carry a negative sign: using alternative financing decreases the propensity to invest/innovate due to the higher cost and lower volumes available. However, it is possible that alternative finance may actually be a complement to bank or market financing in which case the negative sign may be reversed. We argue that while this is plausible, for fixed investment, the large volumes of finance required are more likely to be cheaply financed by using bank or market methods. In this case, firms heavily reliant on alternative finance are less likely to undertake investment. The case is less clear for innovation. The vectors $\boldsymbol{X}$ and $\boldsymbol{Z}$ are as defined above with the exception that an indicator for whether or not the firm believes competition is a serious obstacle to expansion is included. In both the investment and innovation literatures,

[11] In our data, we observe a positive relationship between investment and new applications for alternative finance even controlling for endogeneity which would suggest a short run effect dominates in this context. It is therefore the use of alternative finance in the long run that we expect to be potentially detrimental to firms.

competition is seen as an important factor which motivates our inclusion of this control (Crepon et al, 1998; Castellacci, 2011).

To test the robustness of our findings, we apply a second approach using a bi-variate probit model. This model, solved in a system of equations, is equivalent to completing a two stage instrumental variables estimation to control for endogeneity and cross correlated errors. It can be solved in a system of equations once an exclusion restriction is included for the endogenous variable. In our case, we use the lagged values of alternative finance usage as instruments for the current period alternative finance usage in the model providing an instrument for the current level of usage. A bi-variate probit model is required as opposed to a standard probit IV strategy due to the fact that our instrument is a binary indicator (See Cameron & Trivedi (2008, p.522)). The underlying latent model for the investment equation is as follows:

$$I^*_{ijt} = \lambda AF\_Use_{ijt} + \boldsymbol{\beta X}_{ijt} + \boldsymbol{\lambda Z}_{jt} + \kappa_j + c_i + \tau_t + \varepsilon_{\mathrm{it1}}$$

$$\mathrm{AF\_Use}_{ijt} = \phi AF\_Use_{ijt-1} + \boldsymbol{\beta X}_{ijt} + \boldsymbol{\lambda Z}_{jt} + \kappa_j + c_i + \tau_t + \varepsilon_{\mathrm{it2}}$$

I* relates to the unobserved value of the level of firm investment. What we actually observe is the following:

$$I = \begin{cases} 1 \; if \; I^* > 0 \\ 0 \; if \; I^* \leq 0 \end{cases}$$

Where $\varepsilon_{\mathrm{it2}}$ and $\varepsilon_{\mathrm{it2}}$ are distributed joint normal with mean zero, constant variance and correlation coefficient ρ. The model is solved as a system of equations. The innovation equation is identical to investment other than the fact that the data the innovation equation has no time variation.

4. Empirical results

In this section, we present the main findings of our empirical research. We first test the effect of bank lending constraints on firms applying for alternative finance and second link alternative finance usage to a) the propensity to invest in fixed assets and b) the propensity to innovate.

4.1 Bank financing constraints and alternative finance usage

Table 4 presents the marginal effects from a random effects model across the panel of eurozone countries. The sample includes 26,380 firms across the first to fifth waves of the survey. In column one, we include our benchmark constraint (CC1) as an explanatory variable, in column two, we include CC2 which focuses on constraints for business fixed investment. Column three includes CC3, our working capital constraint and column four contains CC4, our constraint indicator based on firms that do not apply for finance. In all regressions, we include firm controls, country dummies, and time controls. Standard errors

are robust to heteroscedasticity and clustered at the country-wave level. Table 4 only shows constraint coefficients and selected country dummies. [12]

Table 4: Random Effects Probit Model - Regression Results – Eurozone Countries only

Y = Apply for alternative finance (AF_New)	Denied Finance (CC1)	Denied Investment Finance (CC2)	Denied Working Capital Finance (CC3)	Do not Apply (CC4)
	Column 1	Column 2	Column 3	Column 4
Constraint	0.235***	0.259***	0.24***	0.182***
	(0.020)	(0.010)	(0.026)	(0.018)
		Country Indicators		
		Periphery nations		
Spain	0.131***	0.138***	0.157***	0.112***
	(0.038)	(0.038)	(0.046)	(0.037)
Greece	0.048	0.050	0.081	0.040
	(0.069)	(0.068)	(0.085)	(0.069)
Portugal	-0.004	-0.004	0.010	-0.000
	(0.026)	(0.026)	(0.033)	(0.027)
Italy	0.096*	0.101*	0.100*	0.096*
	(0.051)	(0.051)	(0.057)	(0.050)
Ireland	0.122***	0.130***	0.136***	0.128***
	(0.038)	(0.040)	(0.043)	(0.041)
		Core nations		
Austria	-0.002	-0.004	-0.003	-0.009
	(0.035)	(0.035)	(0.038)	(0.034)
Finland	-0.054**	-0.057***	-0.058***	-0.057***
	(0.021)	(.020)	(.022)	(0.021)
France	0.009	0.011	0.018	0.004
	(0.033)	(0.032)	(0.037)	(0.034)
Netherlands	-0.037	-0.037	-0.033	-0.030
	(0.025)	(0.023)	(0.029)	(0.028)
Time, country controls	Yes	Yes	Yes	Yes
Firm controls[1]	Yes	Yes	Yes	Yes

Notes: N = 26,380, * p<0.05, ** p<0.01, *** p<0.001

1) Firm-level controls include outlook, profitability, sector, age, and ownership dummies. 2) Country dummies are based against Germany. Standard errors are robust to heteroscedasticity and clustered at the country-wave level.

Focusing on column 1, firms constrained as per CC1 are 24 per cent more likely to apply for alternative financing. Those firms defined as constrained as per CC2 in column 2 (applications for bank lending for investment financing) are 26 per cent more likely to apply for alternative external financing. The corresponding effect for those defined as constrained by CC3 for working capital lending is 25 per cent, and for CC4 is 18 per cent. Across all constraint definitions, we find that being financially constrained increases the probability of applying for alternative finance by between 18 and 26 per cent. We have also included three

[12] Additional regression output is available on request from the authors.

country-level variables as controls in additional regressions. These are the growth in GDP, the median level of bank CDSs, the country sovereign 10 year bond yield, and the volume of credit to GDP. Our main results hold on the inclusion of these variables which are nowhere significant.[13]

In Table 4 we also present the marginal effects coefficients for specific Eurozone core and periphery country dummies. The omitted category is German. This provides a cross-country snapshot of the heterogeneity in new applications for alternative finance. It is expected that firms in the countries who faced greater difficulties in their banking sectors would be much more likely to apply for non-bank external finance to replace withdrawn, reduced or withheld bank credit lines.

We find a positive and significant coefficient for Spain. The magnitude implies that firms in Spain are 13 per cent more likely to apply for alternative financing relative to German firms. The coefficient for Ireland is also positive and significant across three of the constraint definitions, implying a circa 12/13 per cent increase in the probability of applying for alternative financing. As the banking crises in Spain and Ireland have been particularly severe, following protracted lending booms, it is of no surprise that firms in these countries are more likely to be forced to move away from bank financing and use alternatives.

Of the core Eurozone economies, the only country indicator that is significant is that for Finland which is negative and significant: firms in Finland are less likely to make new applications for alternative finance relative to German firms. This may reflect two factors. First, this may highlight the particular robustness of the Finnish economy which did not suffer from a domestic banking crisis or a protracted recession following the global economic downturn in 2009. Second, given the high share of firms in Finland that use alternative finance noted in section 3, it could simply be picking up the fact that, prior to the crisis, Finnish firms used a well diversified portfolio of external financing technologies.

To test robustness, we ran two further checks. First, in wave 5 of the SAFE survey, the data covers 38 economies across the EEA. We ran a cross-sectional probit model, using the same control variables, on this sample and our findings hold in all cases. Second, we re-estimated the panel model using a fixed-effects logit model replacing the random-effects probit. The fixed effects approach may be more appropriate if the covariates are correlated with the firm-level heterogeneity. Our main results are virtually identical using the logit model.[14]

4.2 Alternative financing and investment

Having established that bank lending constrained firms are more likely to avail of alternative sources of external financing, we now look at the implications that these alternatives can have for firm-level outcomes. Firstly, we estimate the marginal effects relating to the likelihood of firms to have reported undertaking some investment expenditure during the previous six months from a random effects model across the panel of eurozone economies

[13] The results are available on request from the authors.
[14] Results are available on request from the authors.

(see Table 5). In each column, we investigate the investment likelihood with 'AF_Use' as our explanatory variable representing firm usage of alternative finance. Other pertinent variables included here are those that relate to firm performance such as profit growth, firm outlook, competition, firm age as well as sectoral and ownership controls. We also include country dummies, and time controls.[15]

Table 5 shows that, for each estimation of investment studied here, the influence of AF is quite consistent. Those firms reported as having availed of alternative financing are shown to be significantly less likely to have reported undertaking business fixed investment. The marginal effects estimated here imply that when firms report having used alternative financing, this reduces the probability of firms undertaking investment by 8 per cent in the previous six-month period.

The negative impact of alternative finance is due to the fact that alternative finance is more costly and available in lower volumes that traditional credit. However, in our regression it could be the case that alternative finance is being used by firms with poorer investment opportunities available. To control for this, we include indicators of profit growth and general economic outlook to capture the potential profitability of the firms operations and its views on the profitability of committing capital in the current environment. Firm profitability has a positive and significant association with the likelihood of firms undertaking investment. Outlook does not appear to have an identifiable effect. We include controls for small and micro firms both of which are negative and significant is included here and is shown to be negative. This implies a reduced probability of investment in the order of 13 per cent and 20 per cent for small and micro firms respectively. Larger firms are significantly more likely to undertake more investment compared to small- and micro-sized firms. Age is not found to be a significant determinant of investment.

[15] While the country dummies were displayed in section 4.1 and not in the tables on investment and innovation, they are still included in the regression analysis as controls.

Table 5: Panel Probit Model with Random Effects – Marginal Effects				
Y = Invest	**Column 1**	**Column 2**	**Column 3**	**Bi-Probit**
AF_Use_{t-1}	-0.078***	-0.075***	-0.075***	
	(0.015)	(0.016)	(0.016)	
AF_Use_{t}				-0.022***
				(0.004)
Profit growth	0.026**	0.028**	0.029**	-0.000
	(0.012)	(0.014)	(0.013)	(0.010)
Outlook	0.026	0.028	0.027	-0.008
	(0.018)	(0.018)	(0.018)	(0.009)
Small	-0.137***	-0.134***	-0.132***	0.007
	(0.020)	(0.021)	(0.020)	(0.008)
Micro	-0.192***	-0.196***	-0.188***	-0.017
	(0.026)	(0.024)	(0.025)	(0.013)
Median Bank CDS		-0.000	-0.000***	-0.000
		(0.000)	(0.000)	(0.000)
Private Credit to GDP		-0.001		
		(0.002)		
GDP Growth		-0.028		
		(0.049)		
Sovereign Bond Yield		-0.012		
		(0.049)		
Country, sector, ownership controls	Yes	Yes	Yes	Yes
N	5,387	5,300	5,300	5,300

Notes: * p<0.05, ** p<0.01, *** p<0.001, 1) Standard errors are robust to heteroscedasticity and clustered at the country-wave level. Additional controls include indicators of competition and firm age.

4.3 Alternative financing and innovation

The focus of this section is to test the effect of using alternative financing on firm's innovation activity. The focus on innovation stems from the well established link between innovation and productivity (Crepon et al, 1998; Siedschlag, 2010; Castellacci, 2010). Investing in innovation, through product or process mechanisms, is costly with a high degree of project-specific risk and uncertainty relating to outcomes (Hall, 2009). In the presence of information asymmetries in capital markets, firms undertaking innovative activity therefore may find it more challenging to obtain external finance to fund such activities. In the context of the current European financial crisis, when external bank based financing may be difficult to procure, having to use alternative mechanisms may make innovation projects even more costly to undertake.

In this section, we focus on whether using alternative financing activities reduces the likelihood of firms to innovate. Our main innovation variable is as defined in Table 3. The innovation data is only available for a single wave (2011 Q2 & Q3). We use a probit model with clustered standard errors at country-level to test our main hypothesis. We first include only firm-level controls and country dummies using the lagged values of alternative finance usage. We then present the results of the bi-variate probit model. Our findings are presented in Table 6. Controlling for country specific effects and firm-level factors, across both models, we do not find a negative and significant effect of using alternative finance on innovation activity as was the case with investment. This suggests that using alternative

finance is not detrimental for innovation financing as we do find for fixed capital investment. However, the small sample size that we have available limits the power of our analysis and requires further more detailed research. Focusing on the other variables included, we find that firms with increased profit growth are circa 4 per cent more likely to innovate. Firms with a positive outlook on future growth prospects are also between 5 per cent more likely to innovate. We also find that small firms are less likely to innovate than medium-sized firms. This is in line with previous research (Cohen and Levin, 1989; Symeonidis, 1996; Ahn, 2002).

Table 6: Panel Probit Model with Random Effects – Marginal Effects

Y = Innovate	Cross Sectional Probit	Bi-Probit
AF_Use_{t-1}	-0.017	
	(0.016)	
AF_Use_{t}		-0.012
		(0.011)
Profit growth	0.036*	-0.001
	(0.021)	(0.005)
Outlook	0.049*	0.003*
	(0.028)	(0.005)
Small	-0.058**	-0.007
	(0.024)	(0.005)
Micro	-0.012	-0.009**
	(0.025)	(0.004)
Country, sector, ownership controls	Yes	Yes
N	1,510	1,510

Notes: * p<0.05, ** p<0.01, *** p<0.001, 1) Standard errors are robust to heteroscedasticity and clustered at the country-wave level. Additional controls include indicators of competition and firm age.

5. Conclusions

In this paper we test the effect of bank-lending constraints on the use of alternative (non-bank) finance. Using the ECB SAFE survey data between 2009 and 2011, we find there are signs that constrained firms are more likely to use either trade credit or other sources outside of traditional bank loans in order to finance both everyday working capital and investments projects. We find that firms that are bank-lending constrained are between 18 per cent and 25 per cent more likely to apply for alternative financing technologies. Additionally, our findings suggest that there is a higher incidence of SMEs availing of alternative sources of finance outside of the standard bank-lending channel in the 'peripheral economies'. This finding is robust when controlling for firm characteristics and macroeconomic factors including sovereign stress, bank stress, GDP growth and the extent of domestic private credit overhang.

As previously discussed, the overriding concern behind this research is that potentially profitable activities may fail to materialise if bank-lending constrained firms are forced to avail of alternative forms of financing that are more expensive and more limited in amount.

This may in turn impact economic activity through investment or other economic channels. Reflecting these concerns, we estimate the relationship between firms' usage of alternative financing and their propensity to invest in fixed assets. Controlling for a variety of firm-level characteristics and country-level variables, our results suggest a significant, negative relationship between the reported likelihood of firms having undertaken business fixed investment and having availed of alternative sources of external financing. On this basis, we suspect that there is reason to suggest that viable business opportunities in peripheral economies are being missed out on as a result of firms having to avail of these alternatives. We do not find any evidence that using alternative finance has a particularly detrimental effect on innovation. This may be due to the fact that innovation activities differ to traditional fixed-investment spending. Innovation investments may have different risk-return profiles and require different funding structures to traditional capital assets.

The findings in this paper have a critical bearing on the implications that strained financial systems can entail for firm-level outcomes. Increased usage of alternative financing is clearly shown to have strong and significant negative impacts on fixed investment. The findings fill a gap in the literature in relation to the potential role that being forced to use alternative external financing can have on firm-level outcomes, when compared to traditional bank lending. It also highlights the existence of an investment channel through which alternative financing can potentially influence wider economic activity.

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Annex 1 – Summary Statistics

Table A1: Breakdown of Firms by Country

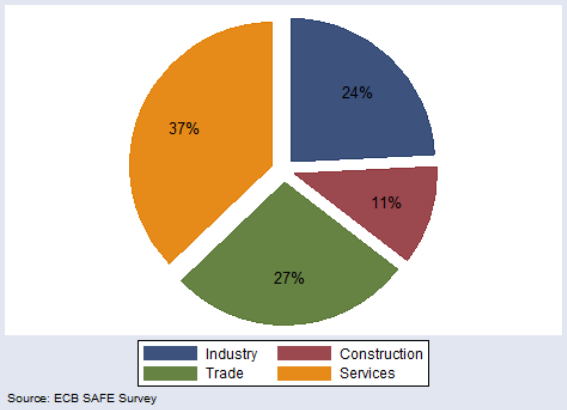
Country	Observations	% of Total	Cumulative %
AT	1,629	5.01	5.01
BE	1,642	5.05	10.06
CY	216	0.66	10.73
DE	5,010	15.41	26.14
ES	5,017	15.44	41.58
FI	1,311	4.03	45.61
FR	5,010	15.41	61.03
GR	1,620	4.98	66.01
IE	1,313	4.04	70.05
IT	5,011	15.42	85.47
LU	209	0.64	86.11
MT	206	0.63	86.75
NL	1,833	5.64	92.39
PT	1,840	5.66	98.05
SI	216	0.66	98.71
SK	418	1.29	100
Total	32,501	100	

Source: Author's calculations using ECB SAFE data

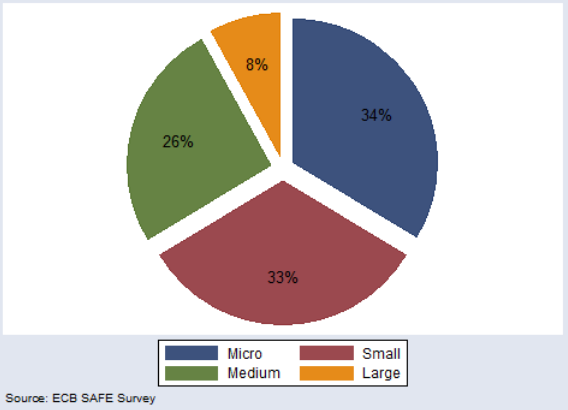
This section contains additional summary statistics that supplement section 3 presented above.

Figure A1: Breakdown of Firms by Size and Sector

Firms by Sector

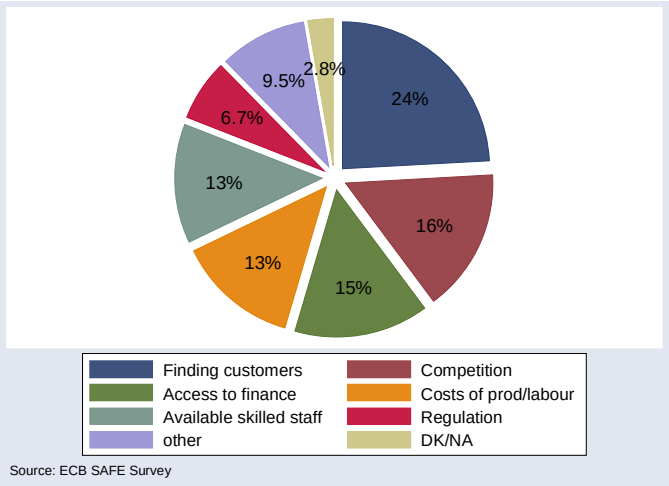


Firms by Size



Source: Author's calculations using ECB SAFE data

Figure A2: Perceived Problems for Eurozone Firms



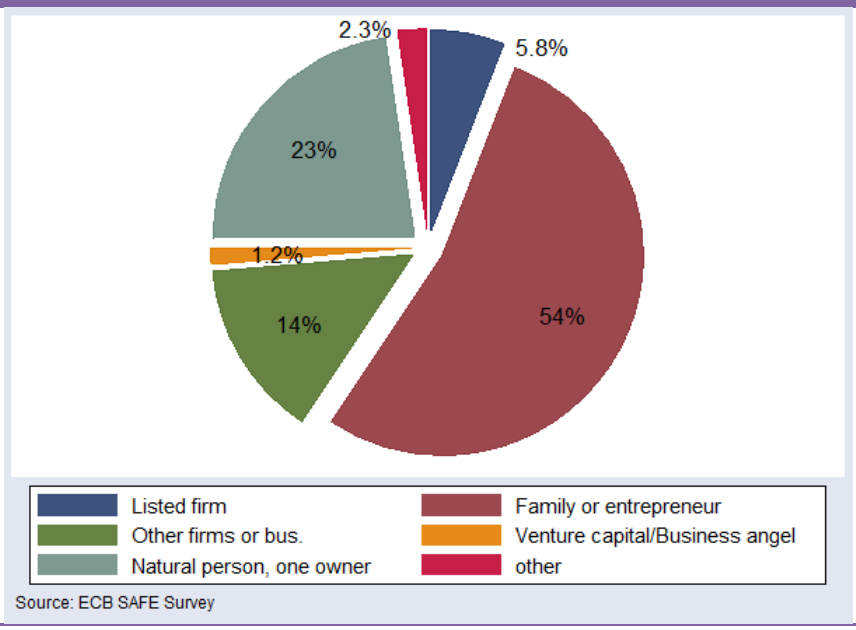
Source: Author's calculations using ECB SAFE data

Table A2: Summary of Country-Level Variables

Country	Credit as % of GDP	Gov. 10 Year Bond Yield	Median Bank CDS
AT	643.738	3.4358	139.379
BE	463.702	3.86651	255.289
CY	1224.97		
DE	516.916	2.95025	135.733
ES	921.019	4.50791	311.825
FI	396.005	3.1793	84.819
FR	518.522	3.34365	119.237
GR	554.558	11.1793	844.163
IE	905.105	8.14384	1030.22
IT	590.454	4.35643	171.391
LU	770.041	5.35	131.004
MT	606.299	4.49223	210.652
NL	846.596	3.26405	119.424
PT	806.735	6.54527	470.829
SI	369.481	4.5	
SK	254.165		191.16

Source: Datastream, Thomsons Reuters

Figure A3: Percentage of Firms by Ownership



Source: ECB SAFE Survey

Table A4: Summary of Country-Level Variables (%)

Country	Mean Investment	Mean Innovation
AT	69.5	13.5
BE	70.0	15.7
CY	56.3	13.0
DE	68.1	15.1
ES	63.7	21.9
FI	73.3	13.5
FR	89.7	15.3
GR	64.7	17.0
IE	66.6	19.5
IT	60.1	21.5
LU	72.4	13.8
MT	44.4	31.0
NL	70.7	17.0
PT	63.4	21.2
SI	82.8	29.8
SK	71.8	26.1

Source: ECB SAFE Survey

Table A5: No of Observations in Wave 5 for EEA Countries.			
Country	**Observations**	**% of Total**	**Cumulative %**
AL	102	0.67	0.67
AT	502	3.3	3.97
BE	500	3.29	7.25
BG	501	3.29	10.55
CH	100	0.66	11.2
CY	100	0.66	11.86
CZ	500	3.29	15.15
DE	1,006	6.61	21.76
DK	500	3.29	25.04
EE	100	0.66	25.7
ES	1,001	6.58	32.28
FI	500	3.29	35.56
FR	1,002	6.58	42.15
GR	500	3.29	45.43
HR	100	0.66	46.09
HU	500	3.29	49.38
IE	502	3.3	52.67
IL	100	0.66	53.33
IS	102	0.67	54
IT	1,001	6.58	60.58
LI	50	0.33	60.91
LT	300	1.97	62.88
LU	100	0.66	63.54
LV	200	1.31	64.85
ME	102	0.67	65.52
MK	100	0.66	66.18
MT	100	0.66	66.84
NL	500	3.29	70.12
NO	200	1.31	71.44
PL	1,000	6.57	78.01
PT	502	3.3	81.31
RO	541	3.56	84.86
RS	100	0.66	85.52
SE	500	3.29	88.8
SI	100	0.66	89.46
SK	300	1.97	91.43
SW	2	0.01	91.44
TR	301	1.98	93.42
UK	1,001	6.58	100

Source: ECB SAFE Survey

Table A6: No of Observations in Wave 5 for EEA Countries.

Country	Apply_AF	Use_AF	CC1
AL	3%	10%	4%
AT	20%	23%	3%
BE	15%	16%	3%
BG	15%	25%	5%
CH	16%	23%	3%
CY	31%	29%	5%
CZ	15%	19%	4%
DE	20%	24%	3%
DK	11%	19%	3%
EE	9%	35%	7%
ES	35%	19%	11%
FI	9%	38%	1%
FR	18%	18%	8%
GR	17%	11%	13%
HR	3%	17%	2%
HU	15%	23%	4%
IE	31%	22%	11%
IL	14%	14%	7%
IS	17%	21%	13%
IT	30%	19%	9%
LI	8%	26%	2%
LT	25%	16%	6%
LU	9%	15%	3%
LV	22%	29%	5%
ME	14%	20%	7%
MK	26%	19%	6%
MT	9%	14%	2%
NL	15%	22%	5%
NO	8%	28%	4%
PL	33%	24%	4%
PT	17%	18%	9%
RO	19%	29%	4%
RS	10%	16%	5%
SE	10%	36%	1%
SI	10%	13%	10%
SK	19%	23%	6%
SW	0%		0%
TR	37%	12%	11%
UK	34%	29%	5%

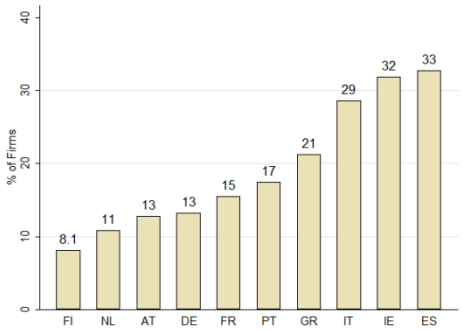
Source: ECB SAFE Survey

Annex 2 – Robustness Checks on Restricted Samples

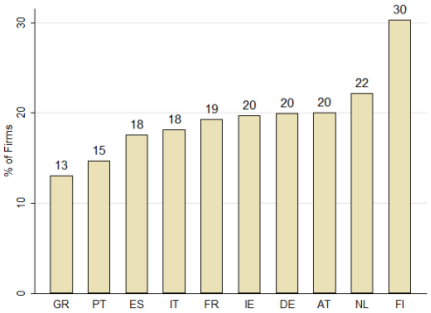
Table A7: Summary of Don't Know Answers – Waves 4 and 5		
Country	**Average Don't Know for Lending applications**	**Average Don't Know for Using alternative finance**
AT	3%	6%
BE	5%	10%
CY	6%	8%
DE	3%	4%
ES	3%	4%
FI	3%	5%
FR	1%	6%
GR	6%	6%
IE	5%	11%
IT	3%	8%
LU	6%	4%
MT	4%	10%
NL	6%	7%
PT	3.5%	5%
SI	3%	6%
SK	3%	5%
Source: SAFE		

Figure A4 - Firms Applying for and Using Alternative Finance – Excluding Don't Know Answers

Percentage of Firms applying for Alternative Finance (AF_New)



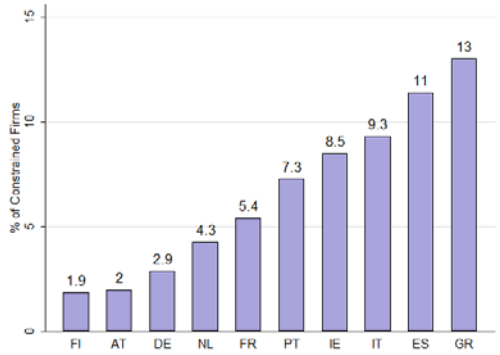
Percentage of Firms that use Alternative Finance (AF_Use)



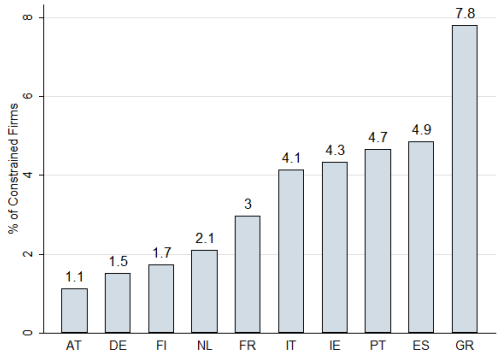
Source: Author's calculations using ECB SAFE data, Note: Data covers mean of waves four and five.

Figure A5 - Summary of Bank Lending Constraint Measures – Excluding Don't Know Answers

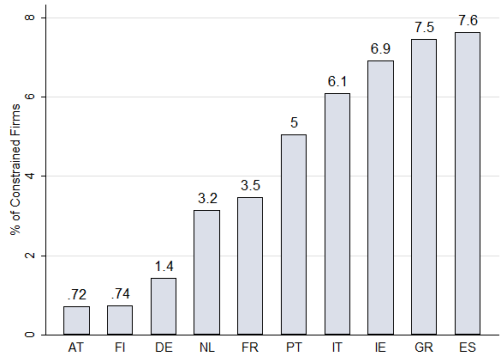
CC1 – Firms Denied Finance



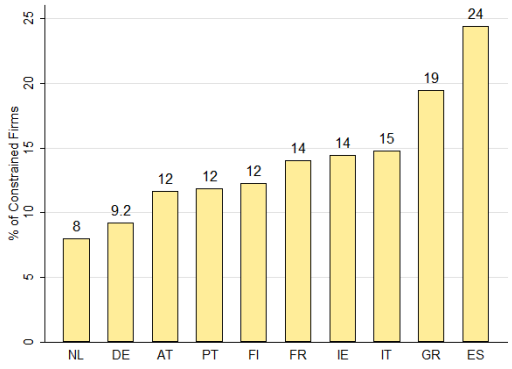
CC2 - Firms Denied Finance for Investment



CC3 – Firms Denied Working Capital Facilities



CC4 – Firms Did Not Apply



Source: Author's calculations using ECB SAFE data

Table 4: Random Effects Probit Model - Regression Results – Eurozone Countries only – Don't knows excluded

Y = Apply for alternative finance (AF_New)	Denied Finance (CC1)	Denied Investment Finance (CC2)	Denied Working Capital Finance (CC3)	Do not Apply (CC4)
	Column 1	Column 2	Column 3	Column 4
Constraint	0.246***	0.269***	0.253***	0.186***
	(0.023)	(0.033)	(0.026)	(0.019)
Country Indicators				
Periphery nations				
Spain	0.144***	0.156***	0.153***	0.129***
	(0.048)	(0.048)	(0.049)	(0.045)
Greece	0.069	0.072	0.081	0.063
	(0.086)	(0.086)	(0.085)	(0.085)
Portugal	-0.004	-0.004	0.005	0.010
	(0.026)	(0.026)	(0.034)	(0.033)
Italy	0.102*	0.108*	0.105*	0.104*
	(0.059)	(0.051)	(0.061)	(0.057)
Ireland	0.146***	0.157***	0.149***	0.144***
	(0.046)	(0.047)	(0.047)	(0.043)
Core nations				
Austria	-0.003	-0.005	-0.004	-0.008
	(0.035)	(0.035)	(0.036)	(0.034)
Finland	-0.055**	-0.062***	-0.060***	-0.061***
	(0.024)	(0.022)	(0.024)	(0.022)
France	0.022	0.024	0.022	0.015
	(0.039)	(0.038)	(0.039)	(0.038)
Netherlands	-0.035	-0.035	-0.035	-0.028
	(0.032)	(0.031)	(0.033)	(0.034)
Time, country controls	Yes	Yes	Yes	Yes
Firm controls[1]	Yes	Yes	Yes	Yes

Notes: N = 21,807, * p<0.05, ** p<0.01, *** p<0.001

1) Firm-level controls include outlook, profitability, sector, age, and ownership dummies. 2) Country dummies are based against Germany. Standard errors are robust to heteroscedasticity and clustered at the country-wave level.

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