

Leitner, Sandra M.; Stehrer, Robert

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## What Determines SMEs' Funding Obstacles to Bank Loans and Trade Credits?

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# What Determines SMEs' Funding Obstacles to Bank Loans and Trade Credits?

A Comparative Analysis of EU-15 and  
NMS-13 Countries

Sandra M. Leitner and Robert Stehrer





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SANDRA M. LEITNER

ROBERT STEHRER

Sandra M. Leitner is Research Economist at the Vienna Institute for International Economic Studies (wiiw). Robert Stehrer is wiiw Deputy Scientific Director.



# Abstract

This paper analyses bank credits and trade loans as the two most important sources of external finance of firms and identifies particular firm and country characteristics that determine the ease with which both external funding sources can be accessed. It focuses on SMEs in EU Member States and uses ECB/EU SAFE microdata, which differentiate between various degrees of external funding constraints. The results show that innovators of both products and processes have a harder time raising sufficient funds from banks. Further, smaller and younger firms and firms that are part of an enterprise are more likely to face stronger obstacles from banks. Moreover, it points to the important role previous bank loan and trade credit histories plays for successful application processes and demonstrates that banks and suppliers respond asymmetrically to changes in a firm's financial and economic situation. Finally, it points to the importance of the state and structure of a country's banking sector for successful bank loan and trade credit application processes.

Keywords: funding obstacles, bank loans, trade credits, small and medium-sized enterprises

JEL classification: G21, G23, O16



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# 1. Introduction

The pecking order theory of financing postulates that due to financial market imperfections, external financing is more expensive than internal financing. Hence, firms prefer internal financing to debt financing and, finally, to equity financing. By and large, empirical evidence corroborates this financing hierarchy but also shows that firms appear to adhere to a particular ordering in debt financing, with bank finance dominating as the single most important external financing source, followed by trade credits and leasing finance. In this respect, Beck et al. (2008) shed light on firm-level financing patterns and show for a large set of developed and developing countries that firms use internal resources to finance a large part of their investment. Moreover, they stress that the use of external sources strongly depends on the country's level of financial and legal development and that firms' most common source of external finance is bank finance followed by supplier credit.

However, as emphasised by Cuñat and Garcia-Appendini (2012) bank credits and trade credits differ in many respects. First, trade credit is a credit extended by suppliers of intermediate goods or services to buyers who do not have to pay immediately but may delay payment for some (short) time upon pre-specified terms and conditions. Hence, through delayed payment, suppliers are funding their customers with short-term debt. Second, as such, trade credits are credits in kind as suppliers rarely lend cash but offer delayed payment only, at zero extra cost. Third, in contrast to, for instance, bank loans, trade credits are not based on pre-specified, formal contracts between the parties involved but on terms and conditions set by the supplier the buyer may accept or not. Finally, trade credits are offered by non-financial firms that, unlike banks, do not specialise in the provision of financial means. By putting different theories to test, a rich strand of literature has emerged which tries to explain why trade credits exist. Partly due to data issues or different methodological approaches pursued, this strand of literature, however, did not provide a clear-cut answer yet.

But, some firms have more difficulties in accessing external finance than others. For instance, small and medium-sized enterprises (SMEs) are found to face strong financing obstacles<sup>1</sup> which stymies their growth. This is important, since SMEs play a significant role in the EU economy. In 2012, they accounted for 99.8% of all non-financial enterprises, provided around 67% of jobs and generated almost 60% of the gross value added in the non-financial business economy (EC, 2013). Moreover, SMEs are important in terms of knowledge generation and research and innovation performance.

Additionally, the ease with which firms can access external funds strongly depends on the particular macroeconomic context and the state and the structure of the banking sector. For instance, there is strong evidence that access to external funds tends to be easier for firms located in countries with higher levels of financial intermediary development, better stock market development, more efficient legal systems or higher GDP per capita levels (Beck et al., 2006). Furthermore, the particular structure of the banking sector is found to matter. Due to easier access to credit, firms greatly benefit from the strong presence of foreign bank (Clarke et al., 2001; Leitner and Stehrer, 2013). On the contrary, high bank concentration tends to be obstructive to easy access to bank financing (Beck et al., 2003). However, the

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<sup>1</sup> See e.g. Álvarez and Crespi (2011); Beck et al. (2005); Beck and Demirgüç-Kunt (2006); Beck et al. (2006).

level of institutional, economic and financial development of a country helps reduce some of the negative effect of high bank concentration.

Despite impressive economic and institutional catching-up with and rapid economic and financial integration of the new Member States into the EU, both macroeconomic context and the structure of the banking sector still differ significantly today between the EU-15 and the new Member States (henceforth referred to as NMS-13). On average, real GDP per capital levels are still significantly lower in the NMS-13, despite high annual real growth in the course of transition. Furthermore, the collapse of communism at the end of the 1980s quickly ushered in a period of reform and transition, paving the way for more market-oriented, efficient and transparent banking sectors. Today, the banking sector in the NMS-13 is characterised by the strong presence and dominance of foreign banks, particularly from the EU-15, domestic banks tend to be small and geographic outreach of commercial banks is still slightly lower than in the EU-15. While the overall performance improved significantly over the last two decades as evidenced by rapidly expanding lending to the private sector or continuously declining non-performing loans, banks in the NMS-13 still lag behind those in the EU-15.

Against this backdrop, the analysis in this paper focuses on bank credits and trade loans as the two most important sources of external finance of SMEs and seeks to shed light on particular firm and country characteristics that render access to both external funding sources of SMEs more or less likely. It uses a unique dataset that differentiates between four degrees of external funding constraints of SMEs located in the EU-28 – determined by the extent of financing received relative to the sum requested – ranging from (i) no constraints, (ii) minor constraints, (iii) major constraints, finally to (iv) most severe constraints. The analysis takes a comparative approach and analyses countries in the EU-15 and the NMS-13<sup>2</sup> separately to account for and shed light on differences in macroeconomic context and banking sector structure and performance for the ease with which external financing can be accessed. Methodologically, an ordered probit approach with sample selection is applied to account for the selection issue inherent in the analysis, since funding constraints are only observable for SMEs that actually applied for external funds.

As such, the analysis adds to the literature in several ways: firstly, it uses a unique firm-level data which allows differentiating between different degrees of funding obstacles, therefore providing a deeper insight into the complex nature of approval processes for external funds. Secondly, it identifies determinants of funding constraints of SMEs' two major external funding sources. To the best of our knowledge, this is the first study that systematically addresses obstacles to and identifies factors inhibiting access to trade credits, thereby filling a gap in the literature. Finally, it pursues a comparative approach, analysing obstacles and determinants thereof separately for SMEs located in the EU-15 and the NMS-13, thereby identifying differences in determinants across country-groups.

The results point to strong differences across types of external funding sources and country samples in what determines the extent of funding obstacles of SMEs and show that innovators of both products and processes in EU-15 and NMS-13 countries have a tougher time raising sufficient funds from banks. Moreover, results demonstrate that in the EU-15, banks consider small size, young age and group-membership of SMEs a liability, rendering them more likely to impose stronger obstacles. In the NMS-13, probably because of more sufficient private property banks can resort to, firms that are owned by

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<sup>2</sup> The group of EU-15 countries comprises all old EU Member States while the group of NMS-13 comprises all new Member States, included Croatia.

families or several entrepreneurs are also less likely to face stronger obstacles when applying for bank loans. Furthermore, both banks and suppliers consider previous experience with external funding sources an advantage, however, they tend to discriminate between the particular type of external funds considered, which is reflective of their decision processes. Similarly, banks and suppliers tend to respond asymmetrically to changes in a firm's financial and economic situation: SMEs face higher obstacles if their situation deteriorates but fail to enjoy lower obstacles should their situation improve. Finally, there is evidence that the state and structure of a country's banking sector matter and that SMEs located in EU-15 countries that seek funds from bank are less likely to face higher obstacles if they are located in more rapidly growing economies or in economies with healthier banking sectors that also more strongly engage in relationship lending.

The rest of the paper is structured as follows: section 2 provides a brief overview of the related literature and generally highlights that bank loan constraints are associated with particular firm characteristics. Section 3 discusses observable differences in the structure and performance of banking sectors in the NMS-13 and the EU-15 and the likely consequences for the presence of funding obstacles. Section 4 discusses data sources and methodological approach taken to identify prevailing funding obstacles. Section 5 provides a thorough discussion of determinants of bank loan applications and trade credit requests, on the one hand, and of external funding obstacles, on the other. Finally, section 6 summarises and concludes.

## 2. Related literature

While following the seminal paper by Fazzari et al. (1988), firms' financing constraints were typically identified indirectly in terms of investment cash flow sensitivities across pre-specified sub-samples, the availability of better data allows for the direct measurement of financing constraints. This led to the emergence of a rich strand of empirical literature, which, in an attempt to isolate particular firm characteristics as well as economic, financial market and legal system characteristics, sheds light on key determinants of prevailing financing constraints. In this respect, the related empirical literature which predominantly focuses on credit constraints imposed by banks finds strong evidence that prevailing financing constraints are not independent of particular firm characteristics and highlights that in addition to firm size, age and trading status, business-group affiliation and ownership are important determinants of financing constraints. For instance, the role of firm size has been the subject of a long-standing debate on whether larger firms, which are considered to more easily generate internal funds, indeed face lower financing constraints. Generally, with few exceptions only, empirical evidence supports the notion that smaller firms face stronger funding constraints. For instance, Beck et al. (2006) emphasize that smaller firms indeed report significantly higher obstacles to financing than larger firms. They analyse a unique firm-level survey database covering 80 developed and developing countries and stress that this size-constraint nexus was however more important for middle- and low-income countries. Similar conclusions are also drawn by other studies (see e.g. Angelini and Generale, 2005; Hadlock and Pierce, 2010; Winker, 1999). In contrast, no significant relationship between firm size and credit constraints is found in the study on actual credit constraints and perceived financing constraints of firms located in the euro area by Ferrando and Mulier (2013).

On the contrary, there is consistent evidence that young age is a strong disadvantage for firms seeking bank credits. For instance, Beck et al. (2006) demonstrate that older firms face lower financing constraints but also stress that age was more important in high-income countries. Similarly, Winker (1999) uses a unique panel for West German manufacturing firms and demonstrates that older firms face a lower risk of being rationed on the credit market while Ferrando and Mulier (2013) find that younger firms consider access to finance as the most pressing problem and are more likely to face actual credit constraints.

In addition, a firm's trading status appears to be an advantage for firms seeking bank credits since exporters are found to face lower constraints (see, e.g., Greenaway et al., 2007; Silva, 2012) which suggests that, once the initial sunk cost of foreign market entry is covered, firms that enter export markets experience significant improvements in their financial health.

Moreover, ownership structure is a strong indication for the prevalence of credit constraints. In this respect, firms that are either part of a business group or foreign-owned and therefore enjoy more easy access to internal capital markets face lower financing obstacles (see e.g. Shin and Park, 1999; Schiantarelli and Sembenelli, 2000; Beck et al., 2006). Similarly, because of preferential treatment from state-owned financial institutions or because of budgetary support they received from the government, state-owned firms appear less financially constrained (Hericourt and Poncet, 2007).

While trade credit is well researched in the finance literature – particularly to test different hypotheses of trade credits – prevailing obstacles to trade credit and their determinants have so far been neglected, a gap the ensuing analysis seeks to fill. While to the best of our knowledge, no study has so far been undertaken which systematically identifies obstacles to and determinants of trade credits, the related empirical literature has found some robust relationships between the use of trade credits, on the one hand, and particular firm characteristics, on the other. For instance, in line with above discussion about determinants of credit constraints, size (typically proxied by total assets or the log thereof) emerges as an important factor. In particular, there is evidence of a positive relationship between size and accounts payable (and receivable) which highlights that larger firms – which are considered to be more credit worthy – receive (and give) more trade credit (see, e.g., Petersen and Rajan, 1997; Deloof and Jegers, 1999; Miwa and Ramseyer, 2005; Bougheas et al., 2009). By contrast, some authors also report a negative relationship between firm size and accounts payable (see, e.g., Rodriguez, 2006; Delannay and Weill, 2004) which suggests that if bank credits and trade credits are substitutes, larger firms which enjoy better access to bank credits, receive fewer trade credits.

Likewise, age emerges as an important factor in trade credit considerations of buyers. Again, evidence of the role of size on trade credit demand is mixed. On the one hand, some studies find a positive relationship between firm age and accounts payable, which highlights that older firms receive more trade credits (see, e.g., Petersen and Rajan, 1997; Giannetti et al., 2008 or Rodriguez, 2006). On the other hand, some authors point to a negative size-trade credit nexus. For instance, Ellihäusen and Wolkens (1993) emphasise that older firms that are more credit worthy and probably more strongly rely on bank loans are less likely to demand trade credits while Huyghebaert (2006) in her study on start-up businesses shows that older start-ups receive less trade credits. Hence, given their lacking reputation with banks and lower credit worthiness, trade credits become a crucial external funding source of newer firms.

In a similar vein, a firm's profitability matters for its decision to buy on credit. More specifically, empirical evidence points at a negative relationship and suggests that firms tend to buy less on credit as its ability to generate internal funds increases. This negative profitability-trade credit nexus is corroborated, among others, by Deloof and Jegers (1999). In contrast, Bougheas et al. (2009) find a positive relationship between profitability and accounts payable, highlighting that firms that are more profitable tend to buy more on credit while Vaidya (2011) finds no significant relationship for a large set of large, publicly listed Indian manufacturing firms.

Furthermore, empirical evidence stresses that bank loans and trade credits are not independent from each other. Generally, however, there is no consistent evidence that bank loans and trade credits are either complements or substitutes. As suggested by Burkart and Ellingsen (2004), a bank's willingness to lend may increase if it observes that a firm receives a trade credit from a supplier, rendering bank loans and trade credits complements. This is corroborated by findings of Vaidya (2004) or Giannetti et al. (2008). On the contrary, some authors stress that bank loans and trade credits are substitutes since trade credit compensates for unavailable bank credits (see, e.g., Petersen and Rajan, 1997; Deloof and Jegers, 1999; Demircuc-Kunt and Maskimovic, 2001 or Bougheas et al., 2009). While others (e.g. Cunningham, 2004) emphasise that whether bank loans and trade credits are either substitutes or complements is conditional on firms' wealth: while trade credit and bank credit are substitutes for medium wealth firms, they are complements for low wealth firms.

### 3. The banking sectors in the NMS-13 and the EU-15

Despite major changes in the structure and functioning of financial markets in the new Member States, today banking sectors in the EU-15 and the NMS-13 still differ significantly. In particular, when communism collapsed at the end of the 1980s, the situation in the financial sector was bleak. The sector comprised of a few institutions only: a monobank as the most important financial institution and a few specialised institutions with monopolies in collecting deposits from the public, providing all the foreign trade financing, and opening accounts for individuals. The role of banks was limited to funding planned production as determined by the State Planning Commissions. Starting in the 1990s, with the implementation of reforms, banking sectors in the new Member States underwent a fundamental transformation, particularly in the process of EU accession: banking sectors adopted common EU legislation and regulation and implemented far-reaching structural and institutional reforms (Kosak et al., 2009). As a result, banks developed a strong capacity for effective prudential regulation and supervision and, in the course of a strong push towards privatisation, the structure of the banking sector changed dramatically.

Today, the banking sector in the NMS-13 is dominated by foreign banks, predominantly from the neighbouring region, rendering the banking sector of the NMS-13 strongly integrated into the EU banking sector: in 2012, more than 70% of bank assets in the NMS-13 were foreign-owned, ranging from more than 90% in Latvia, Estonia and the Czech Republic to around 34% in Cyprus and 30% in Slovenia. In the EU-15, only around 30% of bank assets were foreign owned, ranging from 88% in Luxembourg to less than 5% in France and Germany (ECB Consolidated Banking Data). The strong presence of foreign-owned banks in the NMS-13 is expected to add to stability and to provide expertise, adding to convergence with western standards. Furthermore, the banking sector in the NMS-13 is dominated by big foreign-owned banks but small domestic banks. In particular, in 2012, around 52% of domestic bank assets in the NMS-13 were owned by small banks. In the EU-15, on the contrary, domestic banks tend to be bigger and in 2012, only around 3% of domestic bank assets were owned by small banks. The strong dominance of small domestic banks is of particular importance for the availability of SME financing since smaller banks tend to be more willing to engage in relationship lending than their larger counterparts. In addition, the banking sector in the NMS-13 is characterised by slightly lower geographical outreach of commercial bank branches, which makes the physical access to banks and bank loans harder for both consumers and producers. In particular, in 2012, there were on average 37 commercial bank branches per 100,000 adults in the NMS-13, compared to 40 in the EU-15 (World Development Indicators).

Furthermore, the overall performance of the banking sector in the NMS-13 improved significantly. As a result of the rapidly changing and expanding banking sector in the NMS-13, the level of bank intermediation in terms of lending to the private sector increased significantly (WB WDI). However, despite non-negligible improvements, the level of financial intermediation is still low in countries of the NMS-13 relative to those in the EU-15. In general, a distinction needs to be made between Cyprus and Malta, on the one hand, which show extremely high levels of lending to the private sector and the

remaining new Member States on the other. In 2005, the ratio of private sector lending to GDP stood at 210% in Cyprus and 106% in Malta compared to 121% for the EU-15. In 2012, this ratio climbed to 305% in Cyprus and 128% in Malta, relative to 148% in the EU-15. In the remaining new Member States, private sector lending (as a per cent of GDP) also increased sizeably. While the ratio of private sector lending to GDP was still relatively low in 2000 with 28%, on average, it increased to 46%, on average, in 2005 and reached 64%, on average, in 2012. However, the increase in the ratio of private sector lending to GDP was not uniform across the group of new Member States. Between 1995 and 2012, the ratio of private sector lending increased the most in Latvia from initially 8% to 68% and in Estonia from 16% in 1995 to 77% in 2012.

Furthermore, as evidenced by continuously declining non-performing loans (as a per cent of total loans), banks in the NMS-13 developed a strong capacity for effective prudential regulation and supervision. However, the NMS-13 is still lagging behind the EU-15 in this respect. In 2000, bank non-performing loans in the NMS-13 amounted to around 11%, on average (WB WDI). Five years later, in 2005, bank non-performing loans were down by half and reached as low as 3%, on average, in 2007. With the onset of the Global Financial Crisis, however, bank non-performing loans jumped to 8% in 2009, continuously increasing to 11% in 2012. On the contrary, in 2000 and 2005, bank non-performing loans in the EU-15 only amounted to 3%, on average. In the wake of the Global Financial Crisis, however, bank non-performing loans increased slightly to 4% in 2009, to 5% in 2011 and to around 7% in 2012. In the NMS-13, the effect of the Global Financial Crisis had different effects on the performance of banks in terms of non-performing loans, however. By far, with almost 20% in bank non-performing loans in 2012, Cyprus, Romania and Bulgaria fared the worst, while with 2.6%, Estonia fared the best, followed by the Czech Republic, Poland and Slovakia with 5.2% each. The more pronounced increase in non-performing loans in the NMS-13 may render banks more reluctant to lend more to reduce exposure to more risky loans.



## 4. Data source and methodological approach

### 4.1. DATA SOURCE

The analysis uses company-level data from the EC/ECB Survey on the Access to Finance of Small and Medium-sized Enterprises in the euro area (SAFE) collected in the EU on behalf of the European Central Bank (ECB) and the European Commission (DG Enterprise and Industry). The survey predominantly uses telephone interviews among top-level executives to collect information on financing conditions of SMEs (relative to large firms). It has been carried out since 2009 on a bi-annual basis in a number of selected euro-area countries. A more comprehensive survey on all EU members plus some accession and neighbouring countries is carried out every second year. Since 2013, the more comprehensive survey is conducted on a yearly basis. The latest comprehensive survey (2013H1), conducted between August and October 2013, is used for the ensuing analysis which, however, focuses on the group of EU-28 Member States only.

The companies in the sample represent a random draw from the Dun and Bradstreet database of firms. Samples in the dataset are stratified by firm size class, economic activity and country. Size-related stratification is conducted along the following lines: micro-firms (with 1-9 employees), small firms (with 10-49 employees) and medium-sized firms (with 50-249 employees). Furthermore, the dataset also includes a sample of large firms (with more than 249 employees) to render a comparative analysis between SMEs and large firms possible. Furthermore, economic activity is captured by the four largest sectors, according to NACE Rev.1.1<sup>3</sup>

The SAFE microdataset is unique as it allows differentiating between different degrees of external funding constraints, determined by the extent of financing received relative to the sum requested. In particular, to shed light on the presence and size of funding obstacles of SMEs, the following question was posed: *'If you applied and tried to negotiate for this type of financing over the past 6 months, did you: receive all the financing you requested; received only part of the financing your requested; refuse to proceed because of unacceptable costs or terms and conditions; or have you not received anything at all?'* From this question, four constraints were derived, namely: (i) 'no constraints' if all of the financing requested was received (ii) 'minor constraints' if between 75% and 99% of the requested sum was received, (iii) 'major constraints' if only between 1% and 75% of the requested sum was received and, (iv) 'most severe constraints' if nothing was received. The option 'refused to proceed' was excluded given the analysis' focuses on externally imposed constraints. This is in contrast to previous studies, which were only able to differentiate between 'approval', on the one hand, and 'rejection', on the other.

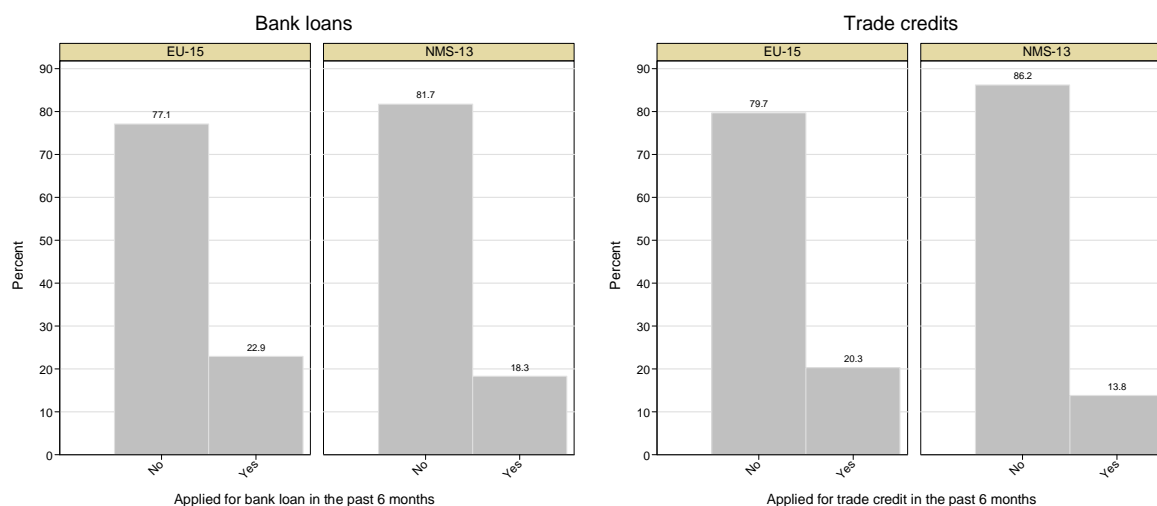
<sup>3</sup> The four largest sectors refer to *industry* (mining and quarrying – C, manufacturing – D, electricity, gas and water supply – E); *construction* (construction – F); *trade* (wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods – G); *services* (hotels and restaurants – H, transport, storage and communication – I, real estate, renting and business activities – K, education – M, health and social work – N, and other community, social and personal service activities – O). Agriculture, hunting and forestry – A, fishing – B, financial intermediation – J, public administration – L, activities of households – P, extra-territorial organisations and bodies – Q, holding companies – 74.15 are excluded from the sample.

As such, this unique dataset provides a more detailed insight into the more complex bank and credit application and approval processes.

Overall, 14,859 firms were interviewed for the latest survey (2013H1), of which 13,855 are located in the EU-28, while the remaining 1,004 are located in accession and neighbouring countries. Around 32% of all firms in the EU-28 sample are micro-firms, 32% are small firms, around 27% are medium-sized while the remaining 9% are large. For the purpose of the analysis, only funding obstacles of SMEs in the EU-28 are analysed, which restricts the total sample to 12,666 SMEs, of which 30% are located in the NMS-13 while the remaining 70% are located in the EU-15.

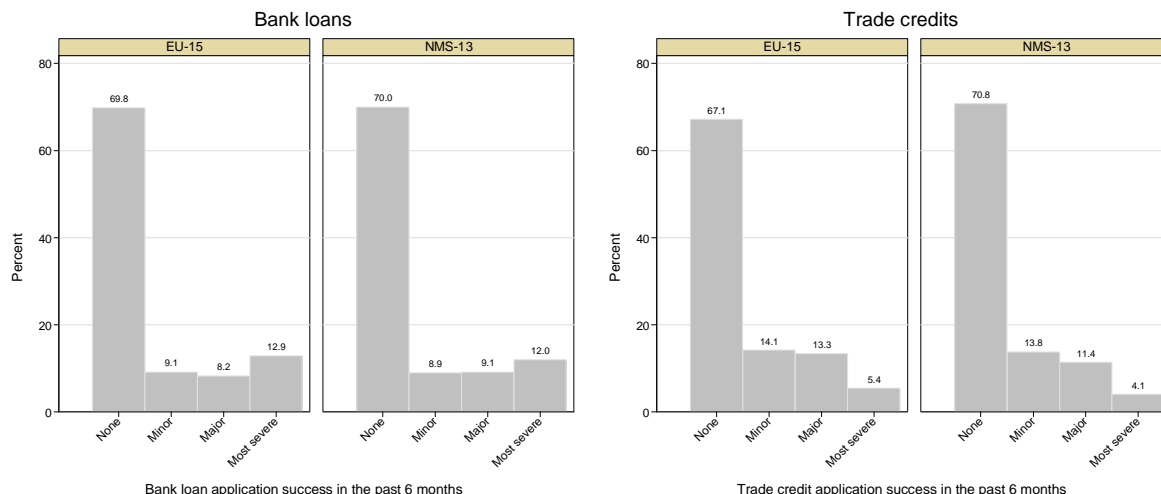
Generally, at first glance, the EU-28 sample-data point to interesting financing patterns of SMEs and show that SMEs more strongly rely on bank loans than trade credits, lending support to the pecking-order theory of financing which renders bank financing more important and sought after than trade credit financing (see Figure 1). Furthermore, the data point to interesting differences across country samples, highlighting that in the NMS-13, fewer firms applied for either bank loans or trade credits than in the EU-15, suggesting that in the NMS-13, SMEs more strongly use either internal funds or other external funding sources such as bank overdraft facilities, leasing or equity. In particular, in the NMS-13, around 18% applied for bank loans and 14% applied for trade credits while in the EU-15, around 23% of firms applied for bank loans and 20% applied for trade credits.

**Figure 1 / Application behaviour of SMEs by type of funding source and country sample**



Moreover, Figure 2 **Fehler! Verweisquelle konnte nicht gefunden werden.** shows that, irrespective of the external funding source used, of those who applied, in both the EU-15 and the NMS-13, around 30% of loan or credit applicants experienced some sort of funding obstacle while the remaining 70% remained unconstrained. In addition, it highlights that a rejection is more likely for applicants for bank loans than for trade credits, irrespective of the country sample considered. In particular, around 13% and 12% of applicants in the EU-15 and the NMS-13, respectively, experienced a rejection of their application for a bank loan, while, by contrast, only around 5% and 4% of applicants in the EU-15 and the NMS-13, respectively, experienced a rejection of their application for a trade credit.

**Figure 2 / Histograms representing different degrees of funding obstacles by type of external funding source and country sample**

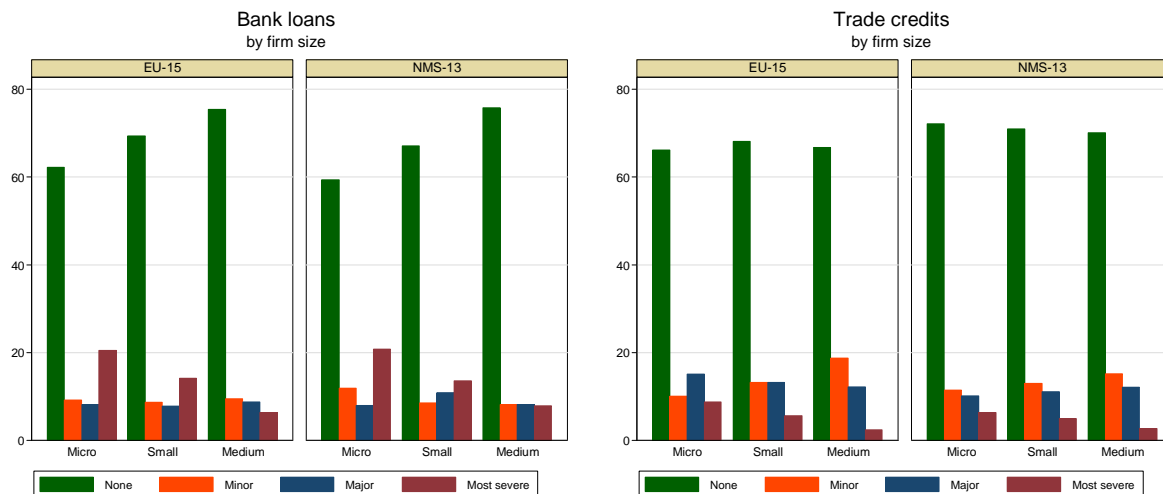


Note: 'None' refers to a situation where all of the financing requested was received (100%); 'Minor' to a situation where between 75% and 99% of the requested sum was received; 'Major' to a situation where only between 1% and 75% of the requested sum were received and 'Most severe' refers to a situation where nothing was received.

Furthermore, as has been highlighted above (see section 2), firm size and age play pivotal roles for the success of both bank loan and trade credit application processes. Hence, Figure 3 and Figure 4 below depict the prevalence of different external funding obstacles by firm size and age, respectively, and demonstrate that both small size and young age pose serious disadvantages in application processes for either bank loans or trade credits. Specifically, Figure 3 demonstrates that, firstly, irrespective of funding source, smaller firms are more likely to experience a rejection of their loan or credit application. Both, in the EU-15 and the NMS-13, 20% of micro-firms, 14% of small firms and around 7% of medium-sized firms experience a rejection of their bank loan applications. The size disadvantage is less pronounced for trade credits and weaker for firms located in the NMS-13. In the NMS-13, 6% of micro-firms, 5% of small firms and 3% of medium-sized firms experience rejections of their trade credit applications. In the EU-15, on the other hand, around 9% of micro-firms, 6% of small firms and 2% of medium-sized firms see their trade credit applications rejected.

Secondly, Figure 3 shows that firm size also matters for the degree of funding obstacles loan or credit applicants face in terms of major or minor constraints. Here, however, differences across type of funding source and country sample analysed emerge. With respect to bank loans, SMEs in the EU-15 are more likely to face minor constraints while in the NMS-13, micro-firms are more likely to face minor constraints, small firms are more likely to face major constraints while medium-sized firms are equally likely to face both minor and major constraints. As to trade credits, micro-firms are more likely to face major constraints, small firms are equally likely to face both minor and major constraints while medium-sized firms are more likely to face major constraints. A more consistent picture emerges for SMEs in the NMS-13, which are generally more likely to face minor constraints

**Figure 3 / Histograms representing different degrees of funding obstacles by type of external funding source, country sample and firm size groups**

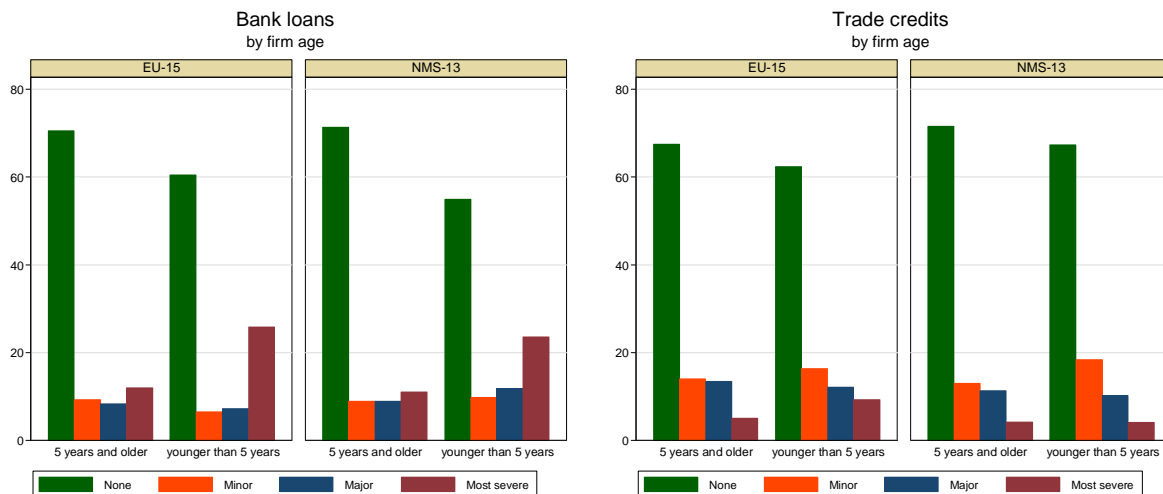


Note: Micro refers to firms with 1-9 employees, Small to firms with 10-49 employees and Medium to firms with 50-249 employees. 'None' refers to a situation where all of the financing requested was received (100%); 'Minor' to a situation where between 75% and 99% of the requested sum was received; 'Major' to a situation where only between 1% and 75% of the requested sum were received and 'Most severe' refers to a situation where nothing was received.

Similarly, Figure 4 depicts funding obstacles by firm age – differentiated between older SMEs (that are five years and older), on the one hand, and younger SMEs (that are younger than five years), on the other – and shows that, in general, older firms are more likely to be unconstrained, irrespective of funding source or country sample considered. Particularly, with respect to bank loans, in the EU-15, 70% of older SMEs – relative to only 60% of younger SMEs – are unconstrained while in the NMS-13, 71% of older SMEs – relative to only 55% of younger SMEs – remain unconstrained. For trade credits, a less pronounced situation is observable, however: in the EU-15, 67% of older SMEs – relative to only 62% of younger SMEs – are unconstrained while in the NMS-13, 72% of older SMEs – relative to only 67% of younger SMEs – remain unconstrained.

Additionally, Figure 4 demonstrates that age is crucial for the particular obstacle SMEs face in their bank loan or trade credit application processes. In particular, in both the EU-15 and the NMS-13, younger SMEs are more than twice as likely to experience a rejection of their bank loan applications as older SMEs. Moreover, in the EU-15, smaller SMEs are slightly less likely to face either minor or major constraints than older SMEs while the opposite is observable in the NMS-13, where younger SMEs are slightly more likely to either face minor or major obstacles than older SMEs. Again, a slightly less pronounced picture emerges in trade credit application processes. SMEs are again more likely to experience a rejection but this only holds for younger SMEs located in the EU-15 while those in the NMS-13 are equally likely to face a rejection than their older counterparts. Moreover, relative to older SMEs, younger SMEs in both the EU-15 and the NMS-13 are also more likely to face minor constraints.

**Figure 4 / Histograms representing different degrees of funding obstacles by type of external funding source, country sample and firm age groups**



Note: 'None' refers to a situation where all of the financing requested was received (100%); 'Minor' to a situation where between 75% and 99% of the requested sum was received; 'Major' to a situation where only between 1% and 75% of the requested sum were received and 'Most severe' refers to a situation where nothing was received.

Furthermore, for the ensuing analysis, SAFE-microdata are complemented by macro-level data to account and control for country-specific differences in income and growth, on the one hand, and the state of financial markets and banking sectors, on the other, that also affect the size of funding obstacles SMEs experience in application processes for external funding. In particular, information on real GDP per capita and real GDP growth stem from Eurostat, data on bank non-performing loans and the number of branches of commercial banks are taken from the World Bank World Development Indicators (WB WDI) while information on the state of the banking sector stem from the ECB Consolidated Banking Data (CBD) which provides information on the profitability, balance sheets and solvency of EU banks.

## 4.2. METHODOLOGICAL APPROACH

Methodologically, given the apparent presence of sample selection and the ordered nature of the dependent variable in both the bank loan and trade credit application processes, ranging from (i) 'no constraints' to (ii) 'minor constraints', (iii) 'major constraints' and (iv) 'most severe constraints', an ordered probit approach which accounts for sample selection is pursued, specified as follows:

$$y_{1ij}^* = x_{ij}\beta' + e_{ij} \quad (1)$$

$$y_{2ij}^* = z_{ij}\gamma' + u_{ij} \quad (2)$$

where equation (1) is the structural equation while equation (2) refers to the selection equation and  $i$  refers to firm  $i$  while  $j$  to country  $j$ . Importantly, the response variable  $y_{1ij}^*$  is only observable if  $y_{2ij}^* = 1$ , pointing towards the presence of sample selection in the model.

In the structural equation,  $y_{1ij}^*$  is an unobservable latent variable,  $x_{ij}$  refers to a set of control variables including firm characteristics (such as firm size, firm age, ownership status and ownership type, gender of the owner, type of innovator), variables which capture the financial and economic situation of the firm (such as previous experience with external funding sources and a number of variables capturing the changing financial and economic situation of the firm), country characteristics (such as GDP per capita, real GDP growth, the share of non-performing loans of banks, the number of commercial banks per 100,000 adults, the share of small domestic banks, the capital buffer and leverage ratio of domestic banks) and industry dummies.  $e_{ij}$  represents the error term, assumed to be normally distributed and independent of all control variables.

Observed responses are then determined by the following threshold model:

$$y_{1ij}^* = \begin{cases} 0 & \text{if } y_{1ij}^* \leq \alpha_0 \\ 1 & \text{if } \alpha_0 < y_{1ij}^* \leq \alpha_1 \\ 2 & \text{if } \alpha_1 < y_{1ij}^* \leq \alpha_2 \\ 3 & \text{if } y_{1ij}^* > \alpha_2 \end{cases}$$

with 'no constraints', 'minor constraints', 'major constraints' and 'most severe constraints' coded as 0, 1, 2, and 3, respectively and the  $\alpha$ 's as unknown parameters (cut-off points) that are estimated separately together with  $\beta$ . As defined above, the size of constraints is determined by the extent of financing received relative to the sum requested.

Moreover, equation (2) is the sample selection equation which determines whether firms apply for bank loans or request trade credits.  $y_{2ij}^*$  is an unobservable latent variable, while  $y_{2ij}$  is a dichotomous variable that is equal to 1 if  $y_{2ij}^* > 0$  and equal to zero otherwise.  $z_i$  refers to a set of control variables, including the full set of firm characteristics used in the structural equation (i.e. firm size and age, ownership status and type, gender of the owner, type of innovator), a number of variables which capture the financial and economic situation of the firm (such as previous experience with either bank loans or trade credits, whether the firm's own capital improved or deteriorated), several country characteristics (such as real GDP growth, the number of commercial banks per 100,000 adults or the share of small domestic banks) and industry dummies. In the selection equation, the following exclusion restrictions are used: dummies for whether a firm's profits improved or deteriorated and dummies for whether firms observe that the general economic outlook improved or deteriorated. Moreover,  $u_i$  is the error term, assumed to be normally distributed and independent of the control variables.

$x_{ij}$  in the structural equation contains a set of firm and country characteristics and industry dummies. Specifically, *firm size* is included to account for the role of size in any bank loan or trade credit application process. It is captured in terms of size dummies for small and medium-sized firms, separately, with micro-firms as reference group. Generally, in line with other research (see, e.g., Beck et al., 2006; Angelini and Generale, 2005 or Hadlock and Pierce, 2010), smaller firms are expected to be more likely to experience stronger external funding constraints.

Furthermore, a dummy for the age of the company is included, which is expected to negatively affect its success in acquiring external funding since younger firms lack reputation and experience with banks, suppliers, customers and competitors and are therefore more prone to failure, more likely to go bankrupt

and therefore less credit worthy. More specifically, a dummy for *young age* is included, which is equal to one if a company is younger than 5 years, and zero otherwise.

Moreover, a company's *ownership status* may also matter for the success of bank loan or trade credit applications. A dummy for *part of an enterprise* is included to test the hypothesis that the existence of internal capital markets or funds renders access to financing easier for firms that are part of a group, which can more easily resort to either internal funds to repay their loans or credits or access larger assets to liquidate their debts which renders them more credit worthy and less likely to face strong constraints. It is equal to one if a company is part of a profit-oriented enterprise in terms of e.g. a subsidiary or branch, not taking fully autonomous financial decisions, and zero otherwise. Moreover, dummies for four different *ownership types* are included, namely 'family' if the owner is a family or several entrepreneurs, 'private corporation' if owners are other firms or business associates, 'private natural' if the owner is a single natural person and 'other' in the case of venture capital firms, business angels or other owners. 'Public owner' (i.e. public shareholders) is used as the reference group. Similarly, loan and credit application processes may be characterised by discrimination against *female* owners. Hence, a gender dummy is included which is equal to one if the owner/director/CEO of the firm is female, and zero otherwise.

Given strong information asymmetries between investors and innovators, who are particularly reluctant to disclose sensitive firm and project-specific information to evade quick imitation of their innovations by competitors, innovators are more likely to face credit constraints (and are consequently less likely to conduct R&D (see, e.g., Mancusi and Vezzulli, 2010; Männasoo and Meriküll, 2011; Álvarez and Crespi, 2011 or Hajivassilou and Savignac, 2008) and tend to spend less on R&D (see, e.g., Mancusi and Vezzulli, 2010). Hence, to also account for the role played by different types of innovators in external funding application processes, the analysis differentiates between three types of innovators: *product innovators only* to describe firms which, during the past year, introduced a new or significantly improved product or service to the market only, *process innovator only* for firms which introduced a new or significantly improved production process/method only and *product and process innovator* for firms which introduced both a new or significantly improved product/service and production process/method. The reference group are non-innovators to describe firms, which did not introduce any product and/or process innovations during the previous year.

Furthermore, information is included to capture financing structures, strategies and experiences of firms. In particular, previous experiences with either bank loans or trade credits may be decisive for successful bank loan applications and trade credit requests. A dummy for a firm's *bank loan history* is included which is equal to one if a firm obtained a bank loan in the last two years and zero otherwise. Similarly, a dummy for a firm's *trade credit history* is included, which is equal to one if a firm used trade credits during the past 6 months and 0 otherwise. Generally, a positive effect of previous experienced with external funding is expected, lowering potential funding constraints. External funding obstacles may be lower as longer-standing debtor-creditor or supplier-buyer relationships help build trust and a sound reputation with outside creditors and suppliers who are more willing to lend additional resources. Similarly, suppliers (banks) may take previous experiences of their customers with bank loans (trade credits) as a positive signal: if banks with their more conservative and thorough screening processes considered SMEs credit worthy, suppliers may as well consider them worthy of trade credits. Similarly, if suppliers, which tend to enjoy better access to information of their customers, through e.g. frequent visits



and on-site inspections, considered SMEs worthy of partly substantial trade credits, banks may as well grant loans without imposing stringent funding constraints.

Furthermore, a firm's creditworthiness may be strongly affected by a firm's changing debt-to-asset ratio. Generally, as an indicator for a firm's financing structure, the debt-to-asset ratio shows how much of a firm's assets have been acquired by borrowed money, instead of being purchased through profits or investment by owners. Two dummies are included which capture whether, over the past 6 months, a firm's *debt-to-asset ratio increased* which should have negative effects on a firm's credit worthiness or *decreased* which, in contrast, should improve a firm's credit worthiness, with an unchanged debt-to-asset ratio as reference group. Similarly, a firm's changing economic situation or outlook may also affect the existence and degree of external funding obstacles it faces. In this respect, two dummies are included which capture whether a *firm's own capital improved* or *deteriorated* over the past 6 months (with unchanged own capital as reference group) and two dummies are included to capture whether a *firm's outlook* with respect to its sales and profitability *improved* or *deteriorated* over the past 6 months (with unchanged firm outlook as reference group).

In addition, a set of country characteristics is included to account for economic and financial differences across countries, which may affect the ease of accessing external funds. To capture the role of both, the role of living standards and annual growth, real GDP per capita and real GDP growth rates are included for each country. Both are expected to facilitate access to bank loans and trade credits.

In addition, the overall state of the financial market in general or the banking sector in particular is pivotal to firms' access to bank loans. Generally, a healthy banking sector, which relies on stringent risk assessment procedures to approve credits and is therefore hardly burdened by non-performing loans (NPL) or whose endowment with capital is sufficient to absorb negative demand or credit shocks, should show a higher willingness to finance private sector investments. However, in an unhealthy banking sector, banks' reluctance to grant more credits increases and, consequently, funding obstacles rise. In the analysis, the state of the banking sector is captured by the *ratio of bank non-performing loans to total gross loans*, the *capital buffer of domestic banks*, as a per cent of banks' total own funds for solvency purposes in total capital requirements and the *leverage ratio of domestic banks*, defined as total assets over total equity. The former indicator is taken from the WB WDI and highlights that, on average, banks in the NMS-13 are more strongly burdened by non-performing loans. The latter two indicators stem from the ECB Consolidated Banking Data (CBD) and highlight that with few exceptions only (i.e. Cyprus and Greece with negative buffers or Luxembourg with almost 20% capital buffers), domestic banks tend to have capital buffers in the range of 5% to 10%. Moreover, except for Cyprus (with almost 50%) and the Czech Republic (with around 20%), leverage ratios of domestic banks in the NMS-13 are lower at around 10% while those located in the EU-15 tend to have higher leverage ratios, ranging between 10% and 20%.

Furthermore, as has been highlighted in the literature, the banking market structure may also affect the availability of SME financing. In particular, SMEs may benefit from the stronger presence of smaller banks in the banking sector, which supposedly more strongly engage in relationship lending. To account for the potential benefits accruing to SMEs from the stronger presence of smaller banks in the banking sector, the *share of assets of small domestic banks in total assets of domestic banks*. This indicator is derived from the ECB Consolidated Banking Data (CBD) and shows that in 2012, in the NMS-13, a high share of domestic banks is small in size while in the EU-15, domestic banks tend to be large.



Similarly, the ease of accessing financial services matters for firms' funding obstacles. In particular, a high geographical outreach of formal financing services captured in terms of a strong penetration of commercial bank branches renders the physical access to banks easier for firms seeking bank loans. In this respect, the *number of branches of commercial banks per 100,000 adults*, which is taken from the WB WDI and reflects the average number of people served by each branch, is used as a proxy for banking sector outreach and as an indicator for the ease of physically accessing banking services. Generally, data show that among NMS-13 countries, bank outreach is particularly high in Cyprus or Bulgaria but rather low in Estonia or Hungary. Among EU-15 countries, bank outreach is particularly high in Spain and Luxembourg but rather low in Germany, Finland or Austria.

Finally, to account for industry-specific differences, industry dummies for industry, construction, trade are included, with services as reference group.

For summary statistics and correlation matrices see Table A2 to Table A4 in the Annex.

## 5. Findings

In what follows, the results of the analysis are discussed in a step-wise procedure. First, to account for apparent sample selection inherent in the analysis, the probability of applying for a bank loan or requesting a trade credit is analysed. This helps shed light on determinants of the probability of SMEs to apply for either a bank loan or a trade credit. Second, the set of factors is identified that determines whether SMEs that apply for external funds such as bank loans or trade credits face higher or lower funding obstacles. In particular, the role of a set of general firm characteristics, a firm's financial situation and relevant country characteristics for the presence and size of funding obstacles are identified. Results are presented separately for the EU-15 and the NMS-13 to shed light on potential differences of SMEs located in these two regions. Section 4.1 discusses results for bank loans, while section 4.2 discusses results for trade credits.

### 5.1. BANK LOANS

Results for bank loan financing are presented in Table 1 below for the EU-15 and the NMS-13 separately. Columns (1) and (3) report results on the probability of applying for bank loans while columns (2) and (4) report results on determinants of obstacles to bank loans.

#### 5.1.1. THE PROBABILITY OF APPLYING FOR BANK LOANS

In general, in both EU-15 and NMS-13 countries, a consistent positive size-effect emerges, rendering larger SMEs significantly more likely to apply for bank loans (see columns (1) and (3)). In particular, in the EU-15, small firms are 1.2 times and medium-sized firms are 1.4 times more likely to apply for a bank loan than micro-firms while in the NMS-13, small firms are 1.3 times and medium-sized firms are 1.5 times more likely than micro-firms to apply for a bank loan. This is in line with findings by, for instance, van der Zwan (2012) who uses the 2011 wave of the SAFE microdata and shows that larger SMEs in the EU are more likely to receive the requested bank loan.

Furthermore, there is some supportive evidence of the 'internal-market hypothesis', which states that due to the presence of and easier access to internal capital markets, firms that are part of an enterprise less intensely rely on external funding sources to satisfy their capital needs. This finding, however, only holds for SMEs located in EU-15 countries, where they are around 20% less likely to apply for bank loans compared to SMEs that are not part of an enterprise.

Moreover, ownership also matters for the decision to apply for a bank loan, to a limited degree though. In the NMS-13, SMEs that are owned by a family or a number of entrepreneurs are around 40% less likely to apply for bank loans. This finding seems to suggest that relative to publicly owned enterprises, family-owned enterprises either more intensely use internal funds or credits from family and friends or more strongly rely on other external funding sources.

Furthermore, the decision to apply for a bank loan also depends on the SME's status as an innovator. In the NMS-13, SMEs that are both product and process innovators are found to be 1.2 times more likely to apply for bank loans than non-innovators. Hence, in an attempt to finance typically highly resource-intensive and costly but risky innovative activities, innovative SMEs tend to turn to banks to raise the necessary funds. On the contrary, in the EU-15, the decision of SMEs to apply for bank loans is unrelated to their status as innovator.

Results also point to a non-negligible role of a firm's financial and economic situation for its decision to apply for a bank loan. Particularly, previous experience with bank loans renders SMEs significantly more likely to apply for further bank loans: in both, the EU-15 and the NMS, SMEs with previous bank loan history are 3.5 and 3.3 times more likely, respectively, to apply for bank loans than SMEs without the respective experience. This finding suggests that longer-standing debtor-creditor relationships that help build trust and a sound reputation with creditors encourage debtors to apply for further resources. The decision to apply for bank loans is also affected by observable changes in an SME's own capital endowment. Results consistently show that SMEs whose own capital deteriorated are more likely to apply for bank loans. Furthermore, in the NMS-13, SMEs whose own capital improved are also more likely to apply for bank loans. Similarly, changes in the general economic outlook are found to matter for the decision of SMEs to apply for bank loans. In particular, SMEs located in the EU-15 are more likely to apply for bank loans if the general economic outlook deteriorated.

In addition, the results demonstrate that particular country characteristics and the structure of a country's banking sector are decisive for an SME's decision to apply for a bank loan. More specifically, probably due to larger internal resources because of stronger demand, higher turnover and profits, there is evidence that SMEs located in faster growing economies in the NMS-13 are less likely to apply for bank loans. Moreover, higher bank-outreach and the stronger presence of and easier access to banks are conducive to applications for bank loans: in the EU-15, SMEs are more likely to apply for bank loans if bank-outreach is high. Similarly, a stronger presence of small banks, which supposedly more strongly engage in relationship-lending with SMEs, affects SMEs' decision to apply for bank loans. Interestingly, the effect differs across country-samples: while SMEs located in EU-15 countries are more likely to apply for bank loans should the banking sector be characterised by a higher share of small domestic banks, those located in NMS-13 countries, on the other hand, are less likely to apply for bank loans should small domestic banks more strongly dominate the banking sector.

### 5.1.2. DETERMINANTS OF OBSTACLES TO BANK LOANS

Generally, we fail to find any consistent evidence across country-groups that small firm size is a disadvantage in a bank loan application process. In particular, in the EU-15, relative to micro-firms, medium-sized firms are almost 30% less likely to face higher obstacles to bank loan funding. This is in line with previous studies that highlight that smaller firms are more likely to face credit constraints. In contrast and more in line with findings by Ferrando and Mulier (2013), no significant size-effect is observable for SMEs in the NMS-13.

Similarly, age plays a non-negligible role in bank loan application processes, its role, however, differs across country samples. In line with Beck et al. (2006) for instance, young firms located in EU-15 countries – which have been operative for less than five years and therefore lack relevant reputation and

credit history – are more likely to face stronger credit constraints. In particular, relative to older firms, younger firms in the EU-15 are around 1.3 times more likely to face higher funding obstacles during their bank loan application processes. On the contrary, in the NMS-13, firm age is unrelated to obstacles to bank loan funding. Hence, in the EU-15, banks consider young age of SMEs a liability, too risky to provide extensive bank loans to while in the NMS-13 banks are less concerned about the age of SMEs when granting bank loans.

Furthermore, results highlight that ownership matters in bank loan application processes, to a limited degree though. For instance, in contrast to previous studies, we find that in the EU-15, being part of an enterprise renders SMEs more likely to face stronger obstacles, suggesting that despite the presence of and easier access to internal capital markets, SMEs that are part of an enterprise are less credit worthy and successful in bank loan application processes. However, no such effect is observable for SMEs in the NMS-13. Likewise, in the NMS-13, relative to public owners, SMEs that are owned by a family or several entrepreneurs are around 40% less likely to face higher obstacles in bank loan application processes. On the contrary, in the EU-15, legal ownership of SMEs is unrelated to funding obstacles. Furthermore, we fail to find any significant relationship between obstacles to bank loans and the gender of the owner, irrespective of country sample considered.

Moreover, results demonstrate that whether SMEs innovate or not matters for the presence of funding obstacles. In particular, in line with previous empirical evidence, there is consistent evidence that SMEs that are product and process innovators are more likely to face stronger constraints when applying for bank loans, irrespective of country sample considered. However, results suggest that the effect is slightly stronger in the NMS-13, where innovative SMEs are around 1.4 times more likely to face stronger constraints while those located in the EU-15 are only 1.2 times more likely to face stronger constraints. This finding suggests that a particular group of innovators – those that introduced both product and process innovations – has a harder time raising funds from banks which in turn is expected to negatively affect the extent of their future innovative activities and their innovation success. This is similar to findings by van der Zwan (2014) who shows that product innovators as well as process innovators are less likely to receive the requested bank loans, with process innovators, however, experiencing larger constraints.

Furthermore, we also find evidence that history matters such that previous experiences with external funding sources and the financial situation of a firm matters for a successful bank loan application process. For instance, the results show that a previous bank loan history is conducive to successful bank loan application processes, but this only holds for the EU-15, where SMEs which obtained a bank loan in the previous two years are almost 80% less likely to face stronger funding constraints when applying for another bank loan. This finding suggests that SMEs in the NMS-13 have a tough time building trust and reputation with banks that tend to disregard previous experiences with bank loans in their decisions to grant loans. However, results fail to show that previous experience with trade credits matters for the success of applications for bank loans, which suggests that, when granting loans, banks tend to disregard an applicant's previous trade credit history and the signal it conveys in terms of credit worthiness.

Table 1 / Determinants of bank loan funding obstacles, by country group

Variables	EU-15		NMS-13	
	Application (yes=1) (1)	Funding Obstacles* (2)	Application (yes=1) (3)	Funding Obstacles* (4)
<b>Firm characteristics</b>				
Size: small	1.196*** (3.86)	0.881 (-1.59)	1.301*** (2.90)	0.902 (-0.41)
Size: medium	1.428*** (6.89)	0.731*** (-3.41)	1.458*** (3.91)	0.986 (-0.05)
Young (<5 years)	1.029 (0.41)	1.251* (1.77)	1.009 (0.08)	1.246 (0.93)
Part of an enterprise	0.773*** (-3.78)	1.225* (1.65)	1.042 (0.41)	1.069 (0.33)
Owner: family/entrepreneurs	1.084 (0.75)	0.890 (-0.64)	0.960 (-0.25)	0.618* (-1.67)
Owner: private corporation	0.963 (-0.31)	0.825 (-0.93)	0.849 (-0.95)	0.643 (-1.43)
Owner: single private natural person	1.134 (1.13)	0.949 (-0.27)	0.927 (-0.46)	0.819 (-0.69)
Owner: other	1.117 (0.75)	0.896 (-0.46)	0.807 (-0.97)	0.929 (-0.18)
Female owner	0.972 (-0.50)	1.043 (0.46)	1.063 (0.65)	1.313 (1.43)
Product innovator only	1.041 (0.79)	1.131 (1.43)	0.962 (-0.45)	1.059 (0.32)
Process innovator only	0.968 (-0.51)	1.062 (0.57)	1.043 (0.34)	0.977 (-0.09)
Product & process innovator	1.069 (1.31)	1.187* (1.93)	1.238** (2.44)	1.383* (1.91)
<b>Firm financial situation</b>				
Bank loan history	3.535*** (32.32)	0.243*** (-12.23)	3.313*** (15.99)	0.602 (-0.59)
Trade credit history		1.047 (0.77)		0.929 (-0.53)
Debt-to-asset increased		1.139* (1.84)		1.103 (0.64)
Debt-to-asset decreased		1.094 (1.26)		1.062 (0.34)
Firm's own capital improved	1.071 (1.49)	0.870* (-1.79)	1.195** (2.24)	1.123 (0.67)
Firm's own capital deteriorated	1.194*** (3.50)	1.306** (2.18)	1.276** (2.46)	1.509** (2.21)
Firm outlook improved		1.055 (0.72)		0.888 (-0.70)
Firm outlook deteriorated		1.161* (1.90)		1.842*** (2.73)
Firm's profits improved	0.942 (-1.20)		0.879 (-1.48)	
Firm's profits deteriorated	0.982 (-0.41)		0.911 (-1.05)	
Economic outlook improved	1.059 (1.11)		1.118 (1.12)	
Economic outlook deteriorated	1.223*** (5.06)		1.088 (1.06)	
<b>Country characteristics</b>				
Real GDP per capita		1.000 (0.82)		1.000 (0.23)
Real GDP growth rate	0.997 (-0.25)	0.947* (-1.91)	0.948*** (-2.68)	1.065 (0.81)
Bank non-performing loans		1.007 (1.02)		0.996 (-0.15)
No of commercial bank branches	1.002** (2.43)	1.002 (0.79)	1.000 (-0.01)	1.005 (0.25)
Asset share of small domestic firms	1.016*** (3.42)	0.973*** (-2.84)	0.998** (-2.00)	1.001 (0.24)
Capital buffer: domestic banks		0.963** (-1.98)		1.107 (1.41)
Leverage ratio: domestic banks		1.003 (0.27)		1.034 (0.96)
<b>Industry dummies</b>				
Constant	0.131*** (-15.75)	0.245** (-2.22)	0.140*** (-9.21)	7.966 (1.21)
Constant		0.322* (-1.68)		10.871 (1.43)
Constant		0.453 (-1.10)		17.656* (1.80)
No of observations	7,260	7,260	2,629	2,629
Log likelihood	-4449	-4449	-1322	-1322

Note: odd ratios are reported. t-statistics in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

\*The dependent variable is the response to the following question: 'If you applied and tried to negotiate for this type of financing over the past 6 months, did you: receive (a) all the financing you requested; (b) received only part of the financing your requested; (c) refuse to proceed because of unacceptable costs or terms and conditions; or (d) have you not received anything at all?'. From this question, four obstacles were defined: (i) 'no constraints' if all of the financing requested was received (ii) 'minor constraints' if between 75% and 99% of the requested sum was received, (iii) 'major constraints' if only between 1% and 75% of the requested sum was received and, (iv) 'most severe constraint' if the loan was rejected and nothing was received.

Additionally, a successful bank loan application process also critically depends on changes – for the better or worse – of a firm’s financial and economic situation. In this respect, the results demonstrate that the deterioration of a firm’s indebtedness (relative to its assets) is a disadvantage in application processes for bank loans. In particular, SMEs in the EU-15, whose debt-to-asset ratio increases, are more likely to experience higher funding obstacles. On the contrary, a decrease in the debt-to-asset ratio is unrelated to funding obstacles, in both the EU-15 and the NMS-13.

Similarly, the success of application processes for bank loans also critically depends on whether a firm’s own capital endowment improved or deteriorated in the past 6 months. SMEs located in the EU-15, whose own capital endowment improved are almost 20% less likely to face higher obstacles to bank financing while those whose own capital deteriorated are 1.3 times more likely to encounter higher obstacles to bank financing. On the contrary, in the NMS-13, only the deterioration of a firm’s own capital matters for the presence and size of funding obstacles. Here, SMEs are 1.5 times more likely to encounter higher obstacles in response to their applications for bank loans if their own capital endowment worsened.

Furthermore, our results show that changes in a firm’s outlook – with respect to sales or profits – matter for successful application processes for bank loans, irrespective of whether the SME is located in the EU-15 or the NMS-13. While a worsened outlook renders SMEs more likely to face stronger funding constraints, an improved outlook does not appear to matter in application processes. Hence, banks seem to respond asymmetrically to changes of an SME’s outlook: while banks tend to punish a deterioration in terms of higher obstacles, an improvement, however, fails to produce an equivalent advantage in terms of lower obstacles.

The analysis also highlights that particular country characteristics and the state and structure of a country’s banking sector matter for successful bank loan application processes of SMEs. More specifically, as expected, a higher real GDP growth rate is conducive to bank loan application processes and SMEs located in countries with higher real GDP growth rates are less likely to either face higher funding obstacles.

Surprisingly, the extent of non-performing loans in the banking sector as well as bank outreach as captured by the number of commercial bank branches per 100,000 adults are unrelated to the presence and size of obstacles. Hence, banks burdened by a higher share of non-performing loans do not seem to pursue more conservative, careful and risk-free approval processes, thereby punishing loan applicants with smaller credit volumes. In a similar vein, while there is some evidence that bank outreach and the stronger physical presence of banks and easier accessibility of bank loans encourages SMEs’ application for bank loans, a higher bank outreach, however, fails to translate into significantly lower obstacles for SMEs.

On the contrary, there is some evidence of relationship lending of smaller banks to SMEs, but only for the EU-15. Particularly, only SMEs in the EU-15 are less likely to face higher funding obstacles should the share of small domestic banks in the banking sector be high which suggests that while small domestic banks in the EU-15 favour and more strongly cater to SMEs, those in the NMS-13 appear more reluctant to favour SMEs in their credit approval processes.

Finally, the presence and size of obstacles to bank loans appear to depend on the capital buffer of domestic banks. In the EU-15 only, SMEs are found to be less likely to encounter higher funding obstacles if domestic banks have larger capital buffers, which, in turn, renders them more resilient to bad loans and more willing to provide the full credit sum requested by applicants.

## 5.2. TRADE CREDITS

Table 2 below reports results for trade credit financing, separately for the EU-15 and the NMS-13. Again, columns (1) and (3) report results on the probability of applying for trade credits while columns (2) and (4) report results on determinants of obstacles to trade credits.

### 5.1.3. THE PROBABILITY OF APPLYING FOR BANK LOANS

Similar to findings for bank loans, there is consistent evidence of a positive size-effect, rendering larger firms more likely to request trade credits from their suppliers. In both EU-15 and NMS-13 countries, relative to micro-firms, small firms are around 1.2 times more likely while medium-sized firms are around 1.3 times more likely to request trade credits from their suppliers. This is in line with previous findings by, for instance, Petersen and Rajan (1997) who stress that larger firms with more substantial assets are more credit worthy and therefore buy more on credits from their suppliers.

Similarly, an SME's age matters for its decision to request a trade credit. In line with findings by, for instance, Petersen and Rajan (1997), who argue that due to their lack of reputation, young firms are more capital-constrained and therefore strongly inclined to purchase more on trade credit, young SMEs are found to be more likely to request trade credits from their suppliers. This finding, however, only holds for SMEs located in EU-15 countries while in the NMS-13, age plays no significant role in an SME's decision to request a trade credit.

Results also point to a limited role of ownership status and type on an SME's decision to request trade credits. Specifically, there is again weak evidence in support of the 'internal-market hypothesis', rendering SMEs that are part of an enterprise and therefore enjoy easier access to internal capital markets less likely to request trade credits. This finding, however, only holds for SMEs located in the NMS-13. In a similar vein, both SMEs that are either owned by a family or several entrepreneurs or by a single private natural person are more inclined to request trade credits. This finding, however, is only observable for SMEs located in the EU-15.

In line with the results for bank loans, the decision to request a trade credit also depends on an SME's status as an innovator whose innovative activities gobble up immense resources which renders alternative external funding sources highly attractive – even short-term sources such as trade credits. The results show that in the NMS-13 only, SMEs that are product innovators only are around 1.2 times more likely to request trade credits from their suppliers than non-innovators.

Similarly, there is again a non-negligible role of a firm's financial situation for its decision to request a trade credit from its suppliers. Again, previous experience with trade credits is conducive to further requests for trade credits since longer-standing buyer-supplier relationships that help build trust encourage buyers to request additional trade credits. The role of previous experience, however, differs



across country samples and tends to be stronger in the NMS-13, where SMEs with previous trade credit history are 7 times more likely to request a trade credit while in the EU-15, SMEs with previous trade credit are only around 6 times more likely to request a trade credit. Likewise, a change in a firm's economic and financial situation matters for trade credit requests of SMEs. Results consistently show that SMEs are more likely to request trade credits from their suppliers if their own capital endowment deteriorated. Somewhat surprisingly, SMEs in the NMS-13 are less inclined to request trade credits if their profits deteriorated. This finding may indicate that in anticipation of a rejection, SMEs whose profits deteriorated abstain from requesting trade credits from their suppliers. Moreover, a change in the general economic outlook affects an SME's decision to request a trade credit. Specifically, SMEs in both the EU-15 and the NMS-13 are more likely to request trade credits if the general economic outlook deteriorated. In addition, SMEs in the EU-15 that observe an improvement of the general economic outlook over the past 6 months are also more likely to request a trade credit from their suppliers.

Additionally, the results demonstrate that an SME's decision to request a trade credit also depends on the state of the economy and show that SMEs are less inclined to request trade credits from their suppliers should they be located in EU-12 economies with higher real GDP growth rates. This finding indicates that due to stronger demand for their products, higher profits and richer internal resources, SMEs have a lower need for and are therefore less likely to request trade credits.

#### 5.1.4. DETERMINANTS OF OBSTACLES TO TRADE CREDITS

Generally, results in Table 2 highlight that fewer and partly different factors matter for the presence and degree of obstacles to trade credits. For instance, our results indicate that firm size or age matter little for the presence and size of obstacles to trade credits of SMEs. More specifically, results suggest that suppliers do not consider small size or young age a major disadvantage, which would make a reduction of the sum provided relative to what is requested necessary. Hence, trade credits appear an attractive alternative to small and young SMEs whose access to bank loans is restricted.

Similarly, ownership structure plays only a limited role in trade credit application processes. In particular, in the EU-15, SMEs owned by a single private natural person as well as those owned by venture capital firms, business angels or other owners are almost twice as likely to face higher obstacles to trade credits as publicly owned SMEs. On the contrary, however, we fail to find that either the gender of the owner or group-membership matters for trade application processes. Hence, similar to findings for bank loans, SMEs managed by females are not discriminated against by their suppliers during approval processes for trade credits. Furthermore, there is no evidence that easy access to internal capital markets renders SMEs that are part of an enterprise more credit-worthy and therefore less likely to face lower obstacles to trade credits.

In contrast to the findings for bank loans, the presence and size of obstacles to trade credits are unrelated to whether an SME is innovates or not. This seems to suggest that innovators can more easily obtain trade credits than bank loans.



**Table 2 / Determinants of trade credit funding obstacles, by country group**

Variables	EU-15		NMS-13	
	Application (yes=1) (1)	Funding Obstacles* (2)	Application (yes=1) (3)	Funding Obstacles* (4)
<b>Firm characteristics</b>				
Size: small	1.204*** (3.60)	1.068 (0.65)	1.240** (2.07)	0.907 (-0.48)
Size: medium	1.247*** (3.79)	1.192 (1.54)	1.258** (2.13)	0.887 (-0.60)
Young (<5 years)	1.216*** (2.59)	1.230 (1.53)	1.089 (0.72)	1.128 (0.53)
Part of an enterprise	0.918 (-1.20)	1.049 (0.36)	0.782** (-2.00)	0.885 (-0.50)
Owner: family/entrepreneurs	1.350*** (2.60)	1.244 (0.98)	0.950 (-0.34)	0.810 (-0.82)
Owner: private corporation	1.221 (1.56)	1.330 (1.17)	1.014 (0.08)	0.706 (-1.18)
Owner: single private natural person	1.338** (2.37)	1.567* (1.90)	0.847 (-1.08)	0.769 (-0.94)
Owner: other	1.043 (0.25)	1.897** (2.05)	0.807 (-0.97)	1.026 (0.07)
Female owner	0.930 (-1.10)	1.026 (0.22)	0.947 (-0.50)	0.732 (-1.43)
Product innovator only	0.966 (-0.61)	1.001 (0.01)	1.176* (1.70)	1.062 (0.33)
Process innovator only	0.888 (-1.63)	1.028 (0.22)	0.904 (-0.68)	1.203 (0.63)
Product & process innovator	0.970 (-0.53)	0.944 (-0.58)	1.154 (1.43)	1.091 (0.46)
<b>Firm financial situation</b>				
Bank loan history		0.879* (-1.72)		0.754* (-1.94)
Trade credit history	5.676*** (37.47)	0.353*** (-2.70)	7.157*** (24.02)	0.297** (-2.11)
Debt-to-asset increased		1.223** (2.27)		0.974 (-0.17)
Debt-to-asset decreased		0.939 (-0.73)		0.965 (-0.22)
Firm's own capital improved	0.936 (-1.27)	1.014 (0.14)	1.160 (1.63)	0.853 (-0.98)
Firm's own capital deteriorated	1.166*** (2.73)	1.407*** (3.46)	1.269** (2.11)	1.126 (0.54)
Firm outlook improved		1.205** (1.98)		1.047 (0.28)
Firm outlook deteriorated		1.471*** (4.38)		1.578** (2.49)
Firm's profits improved	1.018 (0.30)		0.912 (-0.92)	
Firm's profits deteriorated	0.964 (-0.71)		0.786** (-2.54)	
Economic outlook improved	1.214*** (3.33)		1.139 (1.20)	
Economic outlook deteriorated	1.110** (2.15)		1.339*** (3.44)	
<b>Country characteristics</b>				
Real GDP per capita		1.000 (0.38)		1.000** (2.06)
Real GDP growth rate	0.920*** (-8.14)	0.912*** (-3.36)	1.011 (0.53)	1.054 (1.23)
<b>Industry dummies</b>				
Constant	0.086*** (-17.86)	1.328 (0.35)	0.092*** (-11.82)	0.325 (-0.95)
Constant		2.206 (0.96)		0.512 (-0.53)
Constant		5.056* (1.94)		1.106 (0.07)
No of observations	7,072	7,072	2,944	2,944
Log likelihood	-3689	-3689	-1054	-1054

Note: odd ratios are reported. t-statistics in parentheses \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

\*The dependent variable is the response to the following question: 'If you applied and tried to negotiate for this type of financing over the past 6 months, did you: receive (a) all the financing you requested; (b) received only part of the financing your requested; (c) refuse to proceed because of unacceptable costs or terms and conditions; or (d) have you not received anything at all?'. From this question, four obstacles were defined: (i) 'no constraints' if all of the financing requested was received (ii) 'minor constraints' if between 75% and 99% of the requested sum was received, (iii) 'major constraints' if only between 1% and 75% of the requested sum was received and, (iv) 'most severe constraint' if the loan was rejected and nothing was received.

However, the results indicate that similar to bank loans, an SME's previous experience with bank loans or trade credits and its financial situation plays a non-negligible role in successful trade credit approval processes. Interestingly, we find consistent evidence that previous experience with both bank loans and trade credits render SMEs less likely to experience higher obstacles when requesting trade credits from their suppliers. However, the effect is considerably stronger for trade credit history than bank loan history, highlighting that trade credit history matters more: in both the EU-15 and the NMS-13, SMEs with previous trade credit history are around 65% to 70% less likely to face high obstacles to trade credits. However, SMEs with previous bank loan history are only 20% to 25% less likely to encounter high funding obstacles when requesting trade credits. This suggests that suppliers also tend to take decisions of banks into consideration when granting trade credits to buyers and tend to take previous bank loan approvals as positive signals for high credit worthiness and low default risk, rendering them more willing to extend trade credits when banks were also willing to extend loans to their customers in the past. However, this is in contrast to banks' credit approval processes: as highlighted above (see section 4.1), banks tend to disregard trade credit approvals in their bank loan approval processes and solely take previous bank loan histories into account while suppliers rely on both bank loan and trade credit histories.

Additionally, a successful trade credit request also critically depends on changes of SMEs' financial and economic situation, to different degrees though. Results generally highlight that suppliers tend to respond asymmetrically to SMEs' changing financial and economic situation. For instance, as above (see section 4.1.1), an increase in an SME's debt-to-asset ratio renders it also more likely to face higher obstacles to trade credits. In particular, SMEs located in the EU-15 whose debt-to-asset ratio increased are 1.2 times more likely to encounter higher obstacles than those whose debt-to-asset ratio remained unchanged. However, a decline of an SME's debt-to-asset ratio did not generate an equivalent positive effect, rendering SMEs less likely to face higher obstacles to trade credits.

Similarly, in the EU-15, SMEs whose own capital deteriorated are also 1.4 times more likely to face higher constraints than those whose own capital remained unchanged. Again, asymmetries become apparent since an improvement in an SME's own capital does not translate into significantly lower obstacles to trade credits.

Moreover, a change in a firm's outlook also matters for the presence and size of obstacles to trade credits. In both, the EU-15 and the NMS-13, an SME whose economic outlook deteriorated is around 1.5 and 1.6 times more likely to face higher obstacles to trade credits, respectively, than an SME whose economic outlook remained unchanged. Moreover, in the EU-15, an improvement in an SME's outlook is also associated with higher funding obstacles.

Furthermore, our analysis also demonstrates that particular country characteristics matter for successful trade credit requests. More specifically, in the EU-15, SMEs located in countries which grow faster – as proxied by real GDP growth rates – are less likely to face higher obstacles to trade credits. Hence, higher income and demand growth is conducive to successful trade credit requests.

## 6. Summary and conclusions

Micro-level financing patterns show that firms strongly rely on external sources to satisfy their capital needs, with bank finance dominating, closely followed by trade finance. However, getting access to external funds is not an easy task and not equally easy and possible for all firms. In particular, SMEs appear to experience strong financing obstacles which painfully limit their room for manoeuvre and stymie their growth. This is a major policy concern since SMEs play a significant role in many economies in terms of employment, income and knowledge creation or innovation performance.

Against that backdrop, the analysis focuses on bank credits and trade loans as the two most important sources of external finance of SMEs and identifies particular firm and country characteristics that determine the ease with which both external financing sources can be accessed. It uses a unique dataset that differentiates between different degrees of external funding constraints of SMEs located in the EU-28 and takes a comparative approach, analysing the EU-15 and the EU-13 separately to account for and shed light on differences in macroeconomic context and banking sector structure and performance for the ease with which external financing can be accessed.

Results point to partly strong differences across types of external funding sources and country samples in what determines the extent of funding obstacles of SMEs. This suggests that both types of external funds can be taken as alternatives such that SMEs that face higher obstacles in one source may still resort to the other source to fund their capital needs. In particular, entirely different firm characteristics are relevant for the ease with which either bank loans or trade credits can be accessed by SMEs located in either EU-15 or NMS-13 countries. With regard to bank loans, most consistently across country samples, in both the EU-15 and the NMS-13, innovators of both products and processes are found to have a harder time raising sufficient funds from banks which can be expected to impair their future innovative performance and growth prospects. In addition, in the EU-15, small size, young age and group-membership of SMEs are considered a liability by banks so that smaller firms, younger firms and firms that are part of an enterprise are more likely to face stronger obstacles. On the contrary, in the NMS-13, ownership matters such that, probably due to more sufficient private property banks can resort to, firms that are owned by families or several entrepreneurs are also less likely to face stronger obstacles when applying for bank loans. With regard to trade credits, results show that suppliers tend to consider particular types of ownership less credit-worthy. SMEs in the EU-15 that are either owned by a single natural person or by venture capital firms, business angels or others have a harder time getting the full amount of their trade credit requested from their suppliers.

In contrast, results are more consistent when it comes to the role played by the general financial and economic situation of a firm. Specifically, history matters such that both banks and suppliers consider previous experience with external funding sources an advantage and are therefore more willing to grant the full amount requested. Interestingly, however, banks and suppliers tend to discriminate between the particular type of external funds considered, which is reflective of their decision processes: while suppliers tend to take both bank loan and trade credit histories into consideration and therefore explicitly consider previous bank loan approvals as indication for their buyers' sufficient credit-worthiness, banks

tend to disregard previous experience with trade credits but solely rely on previous bank loan histories in their loan approval processes. Moreover, there is strong evidence that due to more conservative and cautious approval strategies, both banks and suppliers respond asymmetrically to changes in a firm's financial and economic situation. While a deterioration of a firm's situation is usually associated with stronger funding obstacles, an improvement rarely translates into equivalently lower obstacles.

Finally, the analysis demonstrates that particular country characteristics and the state and structure of a country's banking sector matter for successful bank loan and trade credit application processes of SMEs. However, effects differ across country samples. Only in the EU-15, SMEs that apply for bank loans are less likely to face higher obstacles if they are located in more rapidly growing economies or in economies with healthier banking sectors where banks hold higher capital buffers or in economies with banks that more strongly engage in relationship lending. The state of the economy is also decisive for the success of trade credit requests and while SMEs in faster growing EU-15 economies are less likely to experience higher obstacles, those located in richer NMS-13 economies are more likely to experience higher obstacles.

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## 8. Annex

**Table A1 / Variables used in the analysis**

Variable name	Definition	Source
<b>General firm characteristics</b>		
Small firms	Firms with 10-49 employees	SAFE
Medium-sized firms	Firms with 50-249 employees	SAFE
Part of an enterprise	Firms that are part of a profit-oriented enterprise not taking fully autonomous financial decisions	SAFE
Young age	Firms that are younger than 5 years	SAFE
Family owner	Firm that is owned by a family or several entrepreneurs	SAFE
Private corporate owner	Firm that is owned by other firms or business associates	SAFE
Private natural owner	Firm that is owned by a single natural person	SAFE
Other owner	Firm that is owned by venture capital firms, business angels or other owners	SAFE
Female owner	Firm that is owned by a female owner/director/CEO	SAFE
Product innovator only	Firm that introduced a new or significantly improved product/service to the market only	SAFE
Process innovator only	Firm that introduced a new or significantly improved production process/method only	SAFE
Product and process innovator	Firm that introduced both a new or significantly improved product/service and production process/method	SAFE
<b>Firm financing characteristics</b>		
Loan history	Firm that obtained a credit in the last two years	SAFE
Trade credit history	Firm that used trade credits during the past 6 months	SAFE
Debt-to-asset ratio increased	Firm whose debt-to-asset ratio increased over the past 6 months	SAFE
Debt-to-asset ratio decreased	Firm whose debt-to-asset ratio decreased over the past 6 months	SAFE
Own capital increased	Firm whose own capital improved over the past 6 months	SAFE
Own capital decreased	Firm whose own capital deteriorated over the past 6 months	SAFE
Firm outlook improved	Firm whose sales and profitability outlook improved over the past 6 months	SAFE
Firm outlook deteriorated	Firm whose sales and profitability outlook deteriorated over the past 6 months	SAFE
<b>Industry dummies</b>		
Industry	Industry dummy: industry	SAFE
Construction	Industry dummy: construction	SAFE
Trade	Industry dummy: trade	SAFE
<b>Country characteristics</b>		
Real GDP per capita	Real GDP per capita	Eurostat
Real GDP growth rate	Real GDP growth rate	Eurostat
Bank NPLs	Share of bank non-performing loans to total loans	WDI
Bank outreach	No of branches of commercial banks per 100,000 adults	WDI
Share of small banks	Asset share of small domestic bank in total domestic banks	CBD
Capital buffer	Capital buffer domestic banks: per cent of banks' total own funds for solvency purposes in total capital requirements	CBD
Leverage ratio	Total assets over total equity	CBD

Table A2 / Summary statistics by country sample

Variable	Obs	EU-15				NMS-13				
		Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Application	7260	0.26	0.44	0	1	2629	0.18	0.38	0	1
None	7260	0.70	0.46	0	1	2629	0.68	0.47	0	1
Minor	7260	0.09	0.29	0	1	2629	0.15	0.36	0	1
Major	7260	0.09	0.28	0	1	2629	0.13	0.34	0	1
Rejected	7260	0.12	0.32	0	1	2629	0.04	0.20	0	1
Size: small	7260	0.35	0.48	0	1	2629	0.31	0.46	0	1
Size: medium	7260	0.27	0.44	0	1	2629	0.34	0.47	0	1
Young	7260	0.08	0.26	0	1	2629	0.11	0.31	0	1
Part of enterprise	7260	0.13	0.34	0	1	2629	0.15	0.36	0	1
Owner: family	7260	0.56	0.50	0	1	2629	0.32	0.47	0	1
Owner: private corporation	7260	0.12	0.32	0	1	2629	0.21	0.41	0	1
Owner: single private person	7260	0.25	0.43	0	1	2629	0.33	0.47	0	1
Owner: other	7260	0.03	0.18	0	1	2629	0.06	0.23	0	1
Female owner	7260	0.12	0.32	0	1	2629	0.14	0.35	0	1
Product innovator only	7260	0.17	0.37	0	1	2629	0.20	0.40	0	1
Process innovator only	7260	0.09	0.29	0	1	2629	0.08	0.27	0	1
Product & process innovator	7260	0.17	0.37	0	1	2629	0.19	0.39	0	1
Bank loan history	7260	0.49	0.50	0	1	2629	0.57	0.49	0	1
Trade credit history	7260	0.41	0.49	0	1	2629	0.33	0.47	0	1
Debt-to-asset increased	7260	0.22	0.41	0	1	2629	0.22	0.41	0	1
Debt-to-asset decreased	7260	0.35	0.48	0	1	2629	0.31	0.46	0	1
Firm's own capital improved	7260	0.30	0.46	0	1	2629	0.28	0.45	0	1
Firm's own capital deteriorated	7260	0.18	0.39	0	1	2629	0.15	0.35	0	1
Firm outlook improved	7260	0.25	0.44	0	1	2629	0.26	0.44	0	1
Firm outlook deteriorated	7260	0.24	0.43	0	1	2629	0.22	0.41	0	1
Firm's profit improved	7260	0.28	0.45	0	1	2664	0.33	0.47	0	1
Firm's profit deteriorated	7260	0.43	0.50	0	1	2664	0.37	0.48	0	1
Economic outlook improved	7260	0.18	0.39	0	1	2664	0.15	0.36	0	1
Economic outlook deteriorated	7260	0.36	0.48	0	1	2664	0.36	0.48	0	1
Industry	7260	0.26	0.44	0	1	2629	0.27	0.44	0	1
Construction	7260	0.11	0.32	0	1	2629	0.13	0.34	0	1
Trade	7260	0.28	0.45	0	1	2629	0.29	0.46	0	1
Real GDP per capita	7260	30956.01	8736.21	15600	80700	2629	10504.28	3476.00	5500	20500
Real GDP growth rate	7260	-0.89	1.80	-7	0.9	2629	0.87	1.94	-2.5	5.2
Bank non-performing loans	7260	7.36	6.72	0.1	24.6	2629	10.91	5.56	2.6	18.6
No of commercial bank branches	7260	39.74	23.23	13.59	85.12	2629	34.81	17.13	16.04	96.98
Asset share of small domestic firms	7260	2.83	4.43	0	14.75	2629	46.84	37.92	2.42	100
Capital buffer: domestic banks	7260	6.52	2.81	-0.11	19.09	2629	7.80	3.49	-3.98	14.07
Leverage ratio: domestic banks	7260	18.14	3.50	10.75	23.87	2629	11.57	6.65	7.54	46.86



Table A3 / Correlation matrix: EU-15

	Small	Medium	Part	Young	Owner: family	Owner: private corp.	Owner: private pers.	Owner: other	Fem. Owner	Product only	Process only	Prod.&proc.	Debt increase	Debt decrease	Loan history	Capital improved	Capital deteriorated	Trade credit history	Firm outlook improved	Firm outlook deteriorated	Profit improved	Profit deteriorated	Econ.outlook improved	Econ.outlook deteriorated	GDP pc	GDP growth	NPL	No of branches	Dom.asset share	Capital buffer	Leverage
Small	1																														
Medium	-0.45	1																													
Part	-0.06	0.13	1																												
Young	-0.03	-0.09	-0.01	1																											
Owner: family	0.10	0.01	-0.19	-0.07	1																										
Owner: priv. corp.	-0.05	0.13	0.32	0.00	-0.41	1																									
Owner: private pers.	-0.03	-0.19	-0.12	0.09	-0.64	-0.21	1																								
Owner: other	-0.04	0.10	0.04	-0.01	-0.21	-0.07	-0.11	1																							
Fem. Owner	-0.03	-0.08	-0.06	0.05	0.03	-0.05	0.04	-0.02	1																						
Product only	0.00	0.02	0.02	-0.01	0.01	0.03	-0.04	0.01	-0.01	1																					
Process only	0.01	0.01	0.01	0.00	0.01	0.00	-0.01	0.00	-0.01	-0.15	1																				
Prod.&proc.	0.02	0.03	0.00	0.02	0.03	-0.02	0.03	0.00	0.01	-0.20	-0.14	1																			
Debt increase	0.00	0.00	-0.02	0.01	0.02	-0.02	-0.01	0.00	0.03	0.01	-0.01	0.03	1																		
Debt decrease	0.02	0.00	0.00	0.00	-0.01	-0.01	0.02	0.01	-0.04	0.01	0.04	0.02	-0.39	1																	
Loan history	0.03	0.08	-0.13	-0.05	0.11	-0.04	-0.07	-0.02	-0.01	0.01	0.02	0.03	0.12	0.03	1																
Capital impr.	0.01	0.08	0.02	0.03	0.00	-0.01	-0.02	0.02	-0.04	0.03	0.03	0.09	-0.10	0.23	0.01	1															
Capital deter.	-0.03	-0.07	-0.03	0.01	-0.02	-0.02	0.06	0.00	0.04	0.01	-0.03	-0.02	0.23	-0.10	-0.01	-0.31	1														
Trade credit history	0.00	0.06	-0.03	-0.01	0.14	-0.03	-0.13	-0.03	-0.05	0.01	0.01	0.03	0.04	0.00	0.08	-0.01	-0.01	1													
Firm outlook impr.	0.01	0.07	0.03	0.03	0.00	0.02	-0.05	0.02	-0.05	0.05	0.03	0.08	-0.05	0.16	0.03	0.37	-0.17	0.06	1												
Firm outlook deter.	-0.01	-0.04	-0.04	-0.04	0.01	0.00	0.01	-0.01	0.03	-0.01	-0.02	-0.02	0.16	-0.08	0.05	-0.22	0.34	0.03	-0.33	1											
Profit improved	0.01	0.06	0.07	0.02	-0.04	0.04	-0.03	0.03	-0.02	0.03	0.01	0.08	-0.11	0.20	-0.02	0.38	-0.22	-0.02	0.36	-0.25	1										
Profit deteriorated	-0.01	-0.03	-0.04	-0.04	0.04	-0.03	0.00	-0.02	0.03	-0.01	-0.01	-0.02	0.18	-0.15	0.03	-0.30	0.34	0.04	-0.29	0.39	-0.55	1									
Econ.outlook impr.	-0.01	0.07	0.03	0.01	-0.01	0.02	-0.02	0.01	-0.03	0.02	0.02	0.05	-0.05	0.11	0.01	0.24	-0.14	0.03	0.44	-0.22	0.27	-0.21	1								
Econ.outlook deter.	0.00	-0.05	-0.06	0.00	0.03	-0.02	0.01	-0.01	0.02	-0.01	-0.01	-0.01	0.14	-0.06	0.05	-0.17	0.26	0.03	-0.22	0.44	-0.20	0.28	-0.36	1							
GDP pc	0.00	0.00	0.10	0.05	-0.18	0.05	0.13	0.04	-0.01	0.01	0.00	-0.01	-0.07	0.05	-0.11	0.16	-0.06	-0.18	0.07	-0.09	0.13	-0.16	0.08	-0.08	1						
GDP growth	-0.03	0.04	0.11	0.04	-0.16	0.05	0.14	0.02	-0.01	0.01	0.01	-0.02	-0.06	0.05	-0.03	0.17	-0.09	-0.19	0.08	-0.09	0.15	-0.16	0.09	-0.10	0.63	1					
NPL	0.03	-0.05	-0.06	-0.04	0.17	-0.08	-0.11	-0.05	0.00	0.00	-0.01	0.01	0.05	-0.06	-0.01	-0.15	0.06	0.26	-0.03	0.03	-0.11	0.12	-0.03	0.03	-0.41	-0.61	1				
No of branches	-0.02	0.02	-0.08	-0.04	0.16	0.02	-0.16	-0.03	0.03	-0.02	0.00	0.04	0.08	-0.06	0.15	-0.17	0.06	0.12	-0.10	0.11	-0.16	0.16	-0.09	0.11	-0.46	-0.45	0.27	1			
Dom.asset share	0.02	-0.01	0.02	-0.04	-0.10	0.00	0.12	-0.02	-0.01	0.02	0.02	-0.01	-0.08	0.04	-0.02	0.13	-0.09	-0.16	0.03	-0.08	0.09	-0.13	0.01	-0.07	0.30	0.33	-0.38	-0.47	1		
Capital buffer	0.00	0.00	0.06	0.01	-0.11	0.00	0.11	-0.01	-0.02	0.01	0.01	0.01	-0.06	0.03	-0.06	0.16	-0.10	-0.12	0.09	-0.11	0.14	-0.15	0.10	-0.11	0.75	0.66	-0.37	-0.42	0.39	1	
Leverage	-0.02	0.04	0.06	0.03	-0.17	0.07	0.12	0.03	0.00	-0.02	-0.02	-0.08	-0.03	0.05	-0.02	0.11	-0.01	-0.22	0.03	-0.02	0.07	-0.07	0.06	-0.07	0.16	0.30	-0.44	-0.33	-0.02	0.09	1

Table A4 / Correlation matrix: NMS-13

	Small	Medium	Part	Young	Owner: family	Owner: private corp.	Owner: private pers.	Owner: other	Fem. Owner	Product only	Process only	Prod.&proc.	Debt increase	Debt decrease	Loan history	Capital improved	Capital deteriorated	Trade credit history	Firm outlook improved	Firm outlook deteriorated	Profit improved	Profit deteriorated	Econ.outlook improved	Econ.outlook deteriorated	GDP pc	GDP growth	NPL	No of branches	Dom.asset share	Capital buffer	Leverage
Small	1																														
Medium	-0.48	1																													
Part	-0.08	0.11	1																												
Young	-0.04	-0.13	-0.02	1																											
Owner: family	0.05	-0.01	-0.14	-0.08	1																										
Owner: priv. corp.	-0.06	0.13	0.30	-0.04	-0.38	1																									
Owner: priv. pers.	0.05	-0.15	-0.18	0.14	-0.51	-0.37	1																								
Owner: other	-0.02	0.05	0.04	-0.01	-0.17	-0.12	-0.17	1																							
Fem. Owner	-0.02	-0.10	-0.06	0.10	-0.01	-0.07	0.08	-0.01	1																						
Product only	0.01	0.00	-0.03	0.03	0.00	0.01	-0.01	0.03	0.03	1																					
Process only	-0.05	0.02	0.03	-0.01	0.01	-0.02	-0.02	0.02	0.00	-0.15	1																				
Prod.&proc.	-0.03	0.04	0.01	0.00	0.02	0.00	-0.01	-0.04	-0.03	-0.24	-0.14	1																			
Debt increase	0.00	0.02	-0.05	0.00	0.03	-0.03	-0.01	0.02	0.01	-0.01	-0.01	0.01	1																		
Debt decrease	-0.04	0.05	0.00	-0.03	0.02	0.03	-0.04	-0.02	-0.05	0.06	0.01	0.04	-0.35	1																	
Loan history	0.00	0.13	-0.08	-0.13	0.08	-0.02	-0.09	-0.01	-0.04	0.03	0.03	0.03	0.11	0.05	1																
Capital improved	-0.01	0.06	0.01	0.01	0.00	0.04	-0.03	0.00	-0.06	0.02	0.05	0.08	-0.07	0.22	0.07	1															
Capital deteriorated	-0.02	-0.06	-0.05	-0.01	-0.01	-0.02	0.05	-0.02	0.04	-0.04	-0.03	-0.03	0.17	-0.09	-0.01	-0.26	1														
Trade credit history	-0.05	0.11	-0.01	-0.07	0.04	0.02	-0.07	0.01	-0.02	0.06	0.01	0.03	0.13	-0.01	0.15	0.02	0.00	1													
Firm outlook impr.	-0.04	0.06	0.03	0.06	0.02	0.01	-0.03	-0.02	-0.03	0.04	0.06	0.10	-0.07	0.18	0.04	0.38	-0.19	0.03	1												
Firm outlook deter.	0.02	-0.04	-0.05	-0.06	0.04	-0.03	0.00	-0.02	0.03	0.00	-0.04	-0.09	0.17	-0.10	0.00	-0.22	0.39	0.07	-0.32	1											
Profit improved	-0.01	0.06	0.01	0.01	0.00	0.04	-0.03	0.00	-0.06	0.02	0.05	0.08	-0.07	0.22	0.07	1.00	-0.26	0.02	0.38	-0.22	1										
Profit deteriorated	-0.02	-0.06	-0.05	-0.01	-0.01	-0.02	0.05	-0.02	0.04	-0.04	-0.03	-0.03	0.17	-0.09	-0.01	-0.26	1.00	0.00	-0.19	0.39	-0.26	1									
Econ.outlook impr.	-0.04	0.05	0.04	0.00	0.01	0.00	-0.02	-0.02	-0.02	0.04	0.02	0.03	-0.01	0.16	0.05	0.22	-0.12	0.05	0.38	-0.17	0.22	-0.12	1								
Econ.outlook deter.	0.04	-0.08	-0.08	-0.03	0.02	-0.02	0.01	0.01	0.01	-0.03	-0.02	0.00	0.13	-0.10	0.07	-0.15	0.27	0.03	-0.21	0.40	-0.15	0.27	-0.31	1							
GDP pc	0.02	0.03	0.05	-0.11	0.10	0.01	-0.11	-0.05	-0.07	0.01	-0.02	0.02	-0.04	0.06	-0.01	-0.05	0.00	0.04	-0.05	0.11	-0.05	0.00	0.01	0.00	1						
GDP growth	-0.02	-0.01	-0.01	0.05	-0.08	-0.04	0.13	-0.02	0.07	0.02	0.03	0.00	-0.02	0.01	0.02	0.01	-0.09	0.08	0.08	-0.11	0.01	-0.09	0.10	-0.13	-0.24	1					
NPL	0.01	-0.03	-0.01	0.08	0.00	-0.05	0.01	0.05	0.01	-0.02	0.00	-0.03	0.03	-0.07	-0.06	-0.05	0.08	-0.14	-0.06	0.03	-0.05	0.08	-0.11	0.09	-0.39	-0.52	1				
No of branches	0.01	-0.02	-0.06	0.03	-0.04	-0.06	0.05	-0.02	0.01	-0.01	0.02	0.04	0.00	-0.09	0.03	-0.08	0.07	0.11	-0.03	0.05	-0.08	0.07	-0.07	0.10	-0.04	-0.11	0.39	1			
Dom.asset share	0.00	-0.01	0.04	0.02	-0.04	0.02	0.00	-0.01	-0.02	0.02	0.02	0.09	-0.03	-0.01	0.01	0.01	-0.08	-0.08	0.07	-0.12	0.01	-0.08	0.01	-0.04	-0.23	0.24	0.08	0.31	1		
Capital buffer	0.00	0.00	0.06	0.05	0.00	0.06	-0.03	0.03	0.00	0.00	0.00	0.01	0.01	0.00	-0.06	0.06	-0.06	-0.20	0.02	-0.11	0.06	-0.06	0.00	-0.08	-0.47	-0.04	0.28	-0.56	0.28	1	
Leverage	0.02	0.00	-0.01	-0.05	0.05	-0.04	-0.05	-0.04	-0.04	-0.01	0.00	-0.01	-0.01	-0.03	-0.03	-0.10	0.08	0.07	-0.10	0.14	-0.10	0.08	-0.06	0.07	0.65	-0.41	0.13	0.51	-0.35	-0.63	1



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