EUROPEAN CENTRAL BANK

EUROSYSTEM

WORKING PAPER SERIES

NO 1502 / DECEMBER 2012

DO FIRMS USE THE TRADE CREDIT CHANNEL TO MANAGE GROWTH?

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Acknowledgements
We are grateful to two anonymous referees and to the participants in the ECB internal seminar, the IFABS 2011 Conference in Rome and the EEA-ESEM 2011 Conference in Oslo for useful comments. We also want to thank Frederic Boissay, Ioannis Ganoulis, Matthieu Darracq Paries, Koen Schoors, Sietse Bracke and Marijn Verschelde for helpful discussions. The views expressed in this paper are only the ones of the authors and do not necessarily represent those of the European Central Bank.

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ISSN 1725-2806 (online)

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Abstract

While many theories of accounts payable and receivable are related to firm performance, there has not been a direct test whether firms actively use them to manage their growth. We argue that it is not just the accounts payable but also the accounts receivable that matter. While the former help to alleviate imperfections in the financial market, the latter do so in the product market. Using over 2.5 million observations for 600.000 firms in 8 euro area countries in the period 1993-2009, we show that firms use the trade credit channel to manage growth. In countries where the trade credit channel is more present, the marginal impact is lower, but the total impact is still bigger. Further, firms that are more vulnerable to financial market imperfections, and therefore more likely to be financially constrained, rely more on the trade credit channel to manage growth. Finally, we show that also the overall conditions of the financial market matter for the importance of the trade credit channel for growth.

Keywords: firm performance, trade credit, accounts payable, accounts receivable

JEL classification: C23, E44, G32, L25

Non-technical summary

During the recent financial crisis there has been an increase in the use of trade credit, in particular from mid-2009, likely to compensate the strong decline in short-term bank loans. Interestingly, the decline in the annual growth of trade credit payable and receivable between non-financial firms has been less pronounced than that in nominal GDP growth, which may indicate that trade credit between companies has played a buffer role in the recent crisis.

In the presence of financial market imperfections it is crucial for firms to receive trade credit from their suppliers in order to prefinance production, but it is also important to extend trade credit in order to sell goods to their constrained customers. In this paper we argue that it is not just the accounts payable or just the accounts receivable that matter, but the sum of the two, which works as a credit channel of trade. Further, we assume that firms do not need to finance their accounts receivable with internal funds, but that firms may have a contract with a financial intermediary which allows them to draw on short term liabilities to finance a large portion of their accounts receivable. As such, the trade credit channel could be interpreted as the total amount of short term finance used by the firm that is directly related to the magnitude of its trade. Another interpretation is that this trade credit channel variable gives an idea of how much of the firm's operations are independent of frictions or imperfections in the financial market. In this perspective, our paper also adds to the revived literature on the link between the financial sector and the real economy.

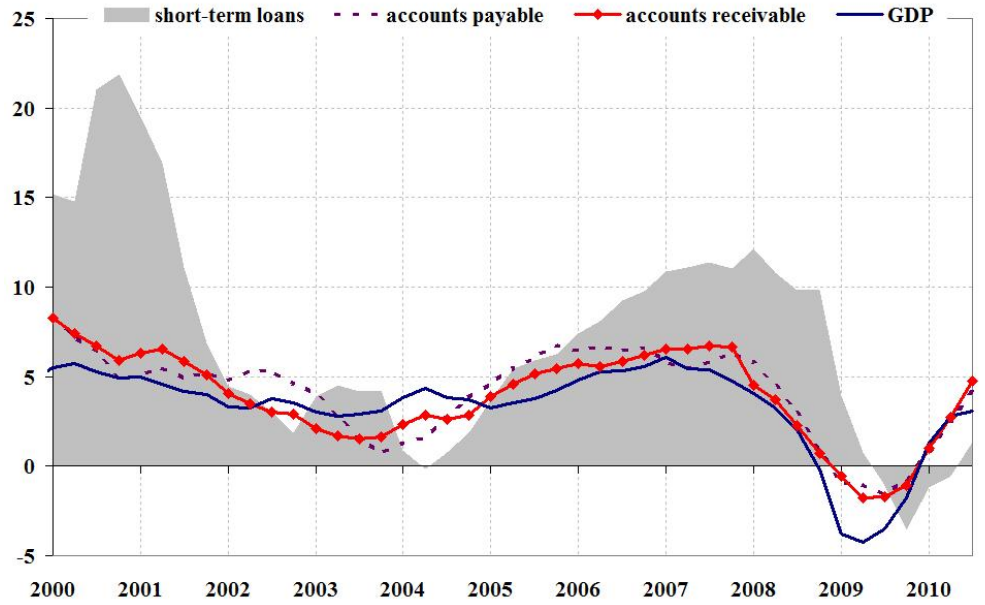
Using over 2.5 million observations for 600.000 firms in 8 euro area countries in the period 1993-2009, we show that firms use the trade credit channel to finance growth. In countries where the trade credit channel is more present, the marginal impact is lower, but the total impact is still bigger. Further, firms that are more vulnerable to financial market imperfections and therefore more likely to be financially constrained (i.e. young or small firms), rely more on the trade credit channel to manage growth. Finally, we show that also the overall conditions of the financial market matter for the importance of the trade credit channel for growth, even after controlling for regulation in the product market.

1 Introduction

Trade credit is an important source of finance for firms, especially when firms find it difficult to obtain external funding via credit institutions. Over recent years, trade credit in the form of accounts payable and receivable of euro area non-financial firms has moved broadly in line with the business cycle. This confirms the typically procyclical pattern of accounts payable and receivable, as they are closely linked to the exchange of goods and services and, hence, to economic activity (see Figure 1). In general, the flows of trade credit have remained a stable source of finance for euro area companies but tended to decline when bank credit was becoming easily accessible since 2005.

During the recent financial crisis there has been an increase in the use of trade credit, in particular from mid-2009, likely to compensate the strong decline in short-term bank loans, which can be seen in Figure 1. Interestingly, the fact that the decline in the annual growth of accounts payable and receivable between non-financial firms has been less pronounced than that in nominal GDP growth may indicate that trade credit between companies has played a buffer role in the recent crisis.

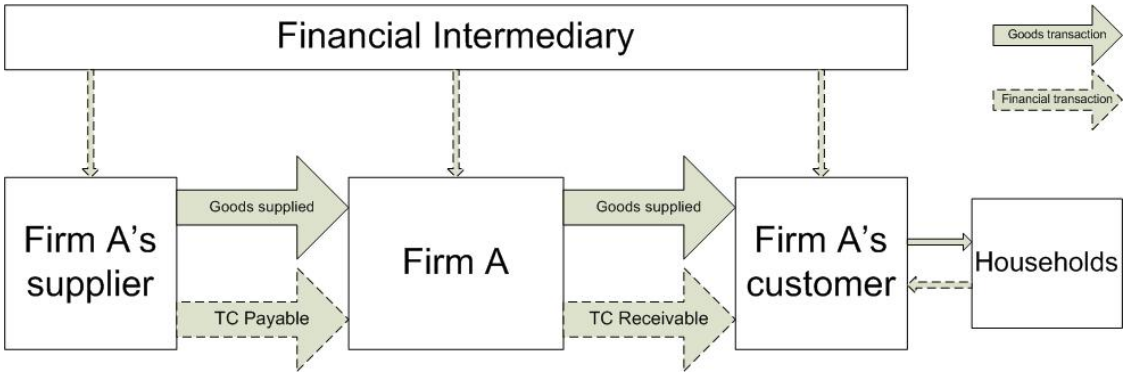
Figure 1: Trade credit, short-term loans and euro area GDP (annual percentage changes)



Source: ECB and Eurostat, euro area integrated accounts. Notes: Annual percentage changes are calculated as the four-quarter sum of transactions over the amounts outstanding four quarters earlier. Accounts receivable and payable are estimated by the ECB on the basis of partial information. The year-on-year percentage changes in euro area GDP are expressed in seasonally adjusted current prices.

If so, it is important to know through which mechanism trade credit plays this role. Trade credit is usually provided when there is a delay between the delivery of goods and services and the payment for them. While early trade credit theories relate the use of trade credit to the presence of information asymmetries and the monitoring advantage that suppliers have over banks, more recent analyses focus on the importance of trade credit (mainly in the form of accounts receivable) as a cash management tool. As illustrated in Figure 2, the use of trade credit of a firm is indeed twofold and is interlinked with the need to finance production. A firm can be seen as a supplier and therefore its accounts receivable (TCR) are a proxy for how much it lends to customers. However, a firm is also a customer and its accounts payable (TCP) are its borrowing from suppliers. Moreover it is often shown that firms that receive trade credit from their own suppliers are more likely to extend trade credit to their customers.

Figure 2: Firm performance and the financial environment



Notes. Figure based on Petersen and Rajan (1997).

In this paper we argue that it is the combination of both aspects of trade credit (accounts payable and receivable) that is important for a firm's performance. First, because firms manage both their accounts payable and accounts receivable to optimize their firm performance. And second, because in our view there is an interaction between the financial market and this trade credit channel. In the textbook example, all firms in a production chain finance their production through a financial intermediary, and so, every firm is paid for his goods at the moment of delivery. If, for some reason, these financial intermediaries do not (or no longer) provide sufficient means to finance production, firms might deliver the goods to their costumers down the chain without requiring immediate payment. Hence each customer, as seen in Figure 2, will receive trade credit (TCP) from his supplier and in turn he will extend trade credit (TCR) to his own customers. This

chain continues until the final firm sells his goods to the households, after which the final goods firm repays his trade credit and, after that, every firm up the production chain.

Overall, it is thus crucial for a firm to receive trade credit from its suppliers in order to finance production, but it is also important to extend trade credit in order to sell its goods to its constrained customers. We argue that firms do not need to finance these amounts receivable with internal funds fully, but that firms may have a contract with a financial intermediary which allows them to draw on short term liabilities to finance a large portion of their accounts receivable. Mester et al. (2001) cite such a contract between a small-business borrower and a Canadian bank:

> *"Total outstandings are not to exceed 75% of good accounts receivable, excluding accounts over 90 days and inter-company accounts plus 50% of inventory, up to a maximum of $5 million dollars, including raw material, work in process and finished products, less priority claims."*

Basically, such contract implies that most of a firm's accounts receivable do not affect the firm's working capital and that the bank is indirectly financing the firm's customers, while it is still the firm (and not the bank) that is bearing the monitoring costs and the default risk.[1] This mechanism, where receivables are partially self-financing, has not received much attention in the literature, although it has been noted by few authors (Stowe et al., 1980; Mian and Smith, 1992; Mester et al., 2001; Burkart and Ellingsen, 2004).

In order to protect their accounts receivables from credit risk related to losses, firms can purchase credit insurance. Moreover, firms with insured receivables will be more likely to get a bank contract that allows them to draw on short term liabilities with receivables as pledged collateral. According to the International Credit Insurance and Surety Association (ICISA) in 2010 its members insured trade credit in excess of 1,6 trillion euro. This popular form of protection thus enables suppliers to significantly increase their overall sales turnover, reduce credit risk related losses and improve the profitability of their business.[2]

The balance sheet data used in this paper (see below) provide some 'smoking gun' evidence of the mechanism. Looking at Table 1, the first two columns show the mean of accounts receivable scaled by total assets and the mean of short term liabilities, excluding

[1] As argued in the literature, there are many economic reasons why a firm would perform these tasks rather than a financial intermediary.

[2] See for instance Jones (2010) or "Credit Insurance for European SMEs: A Guide to Assessing the Need to Manage Liquidity Risk" published by the European Commission in 2003.

accounts payable, scaled by total assets. The table reveals that they are similar in magnitude and therefore does not reject the hypothesis that firms draw on short term liabilities to finance a large part of their receivables rather than using cash. More importantly, column 3 of Table 1 shows the correlation between the flow of accounts receivable and the flow of short term liabilities, where the flow is measured as the year-on-year change and both flows are scaled by total assets. We find that increases in accounts receivable are strongly related to increases in short term liabilities, moreover, the fourth column of Table 1 shows that increases in accounts receivable are much less related to decreasing cash balances. The correlations in columns 3 and 4 can be seen as further evidence of the mechanism just explained. Even though the destination of these additional short term liabilities is fixed, namely to be invested in sales, the mechanism gives the firm more freedom to invest its cash, its accounts payable or other short term loans, and ultimately it favours growth in addition to boosting the firm's sales.

Table 1: Descriptive statistics: correlations

	$\frac{TCR}{totalassets}$	$\frac{ST\ liabilities}{totalassets}$	$Corr(\frac{\Delta TCR}{totalassets}, \frac{\Delta ST\ liabilities}{totalassets})$	$Corr(\frac{\Delta TCR}{totalassets}, \frac{\Delta Cash}{totalassets})$
BE	0.35	0.29	0.40***	-0.01
DE	0.20	0.25	0.13***	-0.03***
ES	0.39	0.27	0.50***	-0.04***
FI	0.17	0.29	0.31***	-0.03***
FR	0.31	0.34	0.36***	-0.06***
IT	0.37	0.32	0.34***	-0.05***
NL	0.35	0.34	0.52***	-0.04***
PT	0.34	0.35	0.28***	-0.12***

Source: AMADEUS, Bureau van Dijk Electronic publishing, authors' calculations. Notes. TCR are accounts receivable, $ST\ liabilities$ are short-term liabilities excluding accounts payable. $Cash$ is cash and cash equivalent. *** indicates significance at 1% level.

There are several reasons why we choose to sum accounts receivable and payable into what we call 'the trade credit channel'. First, both types of trade credit are an indication of how much of the firm's operations are shielded from developments in the financial sector, either from the firm's own financing perspective or that of its customers. Taking the sum thus gives an idea of how much of the firm's operations are independent of frictions or imperfections in the financial market. In this perspective, our paper also adds to the revived literature on the link between the financial sector and the real economy. Secondly, because we are interested in the implications of the total trade credit channel on firm growth, we want both accounts payable and receivable simultaneously in the

analysis. Unfortunately, as they are strongly correlated with each other, in the regression analysis this would give rise to multicollinearity problems. Therefore, we take the sum to see the total impact of trade credit on firm growth. The drawback of this approach is that we are unable to capture whether both types of trade credit are equally important in this relation. Furthermore, since via the mechanism stated in the previous paragraph, accounts receivable result in short term finance, the trade credit channel can be interpreted as the total amount of short term finance used by the firm that is directly related to the magnitude of its trade. Therefore, the trade credit channel could be particularly important for firms located in countries where the financial intermediary sector is not sufficiently developed, or within a country for firms that typically suffer more from financial market imperfections, e.g. young or small firms. These hypotheses are respectively elaborated in section 4.3 and section 4.2.

This paper differs from the existing literature in several important ways. First, while many theories of accounts payable and accounts receivable are related to firm performance, there have been very few direct tests on whether firms actively use them to manage their growth. By our knowledge, only the work of Fisman and Love (2003) tries to investigate this link. Their work resembles our paper the most, but Fisman and Love's data are on industry level. By contrast, this paper uses approximately 2.5 million firm level observations, which consist mainly of small and medium sized enterprises, to test whether firms depend on the trade credit channel for growth. Secondly, we use a dynamic growth model as empirical specification in contrast to a static model as used by Fisman and Love (2003). Our findings thus shed some additional light on the robustness of their results. And thirdly, we argue that it is not only the accounts payable, but also the accounts receivable that are important for a firm's performance. Moreover, we show that firms that are more likely to be financially constrained, i.e. young or small firms, rely more on the trade credit channel to manage growth. Our analysis focuses on 8 euro area countries, which are characterised by some degree of heterogeneity in their financial systems. The econometric results indicate that the overall conditions of the financial market matter for the importance of the trade credit channel for growth. Also noteworthy, in countries where the trade credit channel is more present, the marginal impact is lower, but the total impact remains bigger. The remainder of the paper is structured as follows: section 2 reviews the relevant literature with a focus on the link between trade credit and firm performance. Section 3 presents the dataset used in the analysis and some stylized facts based on them. Section 4 introduces the empirical approach and the econometric results. Also the implications for firm performance related to firm heterogeneity and country

heterogeneity will be discussed. Some conclusions are given in the final section.

2 Literature

The Trade Credit Channel and Firm Performance

In a model without bank loans, Bougheas et al. (2009) show that, for a given liquidity, an increase in production will require an increase in trade credit. A higher production is associated with a higher production cost which, for a given (insufficient) amount of liquidity, implies that the firm will need to take more trade credit. So trade credit works as an alternative mean to finance production. Also Cuñat (2007) argues that fast growing firms may finance themselves with trade credit when other types of finance are not sufficiently available. Fisman and Love (2003) extend the analysis to link trade credit substitutability for institutional financing and the overall development of the financial sector. They find evidence that industries that use more trade credit grow relatively faster in countries with poorly developed financial markets. More empirical support of a link between trade credit and firm performance comes from Boissay and Gropp (2007), who show that firms that are confronted with a liquidity shortage (shock) try to overcome this distressed situation by passing on one fourth of the shock to their suppliers by taking more trade credit.

In addition to taking credit from their suppliers, firms simultaneously offer trade credit to their customers. In fact, most firms have higher amounts of accounts receivable than accounts payable (See Figures 5 and 6 in the Appendix). Firms use trade receivables as a tool for implicit price discrimination across suppliers, in cases where it is not possible, for instance on account of legal restrictions, to discriminate directly on the basis of prices (Meltzer, 1960). In such cases, firms with a stronger market position may choose to make greater recourse to accounts receivable, selling to customers on credit with a view to enhancing their competitive position in the market. Petersen and Rajan (1997) showed that firms with high profit margins, i.e. those that would benefit most from making additional sales via price discrimination, indeed have higher accounts receivable. More recent, Bougheas et al. (2009) argue that accounts receivable are important for the performance of inventory management. For a given aggregate demand, higher production increases inventories in their model; and minimization of the (inventory) costs implies that firms will increase accounts receivable offered in order to sell more and consequently hold less

inventories. Furthermore, accounts receivable are proven to be a useful tool when there is considerable uncertainty about the quality of a firm's product among potential customers. The firm can increase its sales by allowing delayed payments, such that the customer can witness the quality before paying (Ng et al., 1999; Deloof and Jegers, 1996). Finally, firms provide more trade credit to customers that are in temporary distress. This also enhances their sales, since otherwise the distressed customer would not be able to buy the goods. Firms will however only offer additional trade credit when they believe there is a future surplus of having a long-lasting relation with that customer (Cuñat, 2007).

Although the above stated theories of accounts receivable are positively related to firm performance, they seem to be in contrast with the idea that accounts payable are used to finance the firm. On first sight, one could argue that each euro of accounts payable cannot be used to finance the activities when the firm provides that same euro as accounts receivable to a customer. Actually, as stated in the introduction, the main reason why this is not so, and probably also why firms are willing to offer so much accounts receivable, is because banks are willing to provide loans once the accounts receivable are pledged as collateral. This is especially the case when firms insure their receivables against the probability that the customer defaults.

3 Data

Our firm level data is taken from AMADEUS, a commercial database provided by Bureau van Dijk Electronic Publishing. This is a comprehensive, pan-European database containing financial information on over 10 million public and private companies. We select non-financial firms in the euro area between 1993 and 2009 that have reported non-negative accounts payable and receivable in their balance sheets. Due to different accounting reporting practises for Spain, we restricted our sample to companies having strictly positive instead of non-negative accounts payable. After performing some data filtering in order to clean the data (see the Appendix), we obtain an unbalanced panel of approximately 600.000 firms and 2.5 million observations. The final sample contains data for eight euro area countries (Belgium, Germany, Spain, Finland, France, Italy, Netherlands and Portugal) for which we have enough observations to run our econometric analyses. As shown in table 2, in spite of the large number of observations, the coverage differs a lot across countries. French companies cover almost half of the entire sample

while on average the percentage of SMEs is around 90% but ranging from less than 40% in the Netherlands to more than 98% in Spain (See Table 8 in the Appendix). Firms are also on average relatively mature and SMEs are mostly the youngest.

Table 2: Descriptive statistics: sample means

	$growth^{av}$	$growth^{s}$	$log(size)$	age	$TC^{channel}$	TCP^{days}	TCR^{days}	# obs	# $firms$
BE	0.08	0.04	8.97	25.2	0.35	54	73	77,172	10,705
DE	0.08	0.09	8.58	27.2	0.15	21	33	56,683	23,448
ES	0.09	0.06	9.11	20.3	0.45	63	103	174,725	28,569
FI	0.11	0.08	6.24	16.0	0.14	21	31	109,828	23,204
FR	0.06	0.04	6.70	17.4	0.30	48	60	1,171,282	211,584
IT	0.09	0.06	7.69	17.5	0.52	83	103	590,612	181,457
NL	0.09	0.06	10.78	34.8	0.27	27	69	14,651	3,178
PT	0.08	0.04	6.00	15.9	0.44	57	101	329,395	108,052

Source: AMADEUS, Bureau van Dijk Electronic publishing, authors' calculations. Notes. The Table shows the sample means of the regression variables for each country. $Growth^{av}$ is defined as the rate of growth of real added value; $growth^{s}$ as the rate of growth of real sales; size is measured by total assets; age is the age of firms in years; $TC^{channel}$ is the sum of accounts payable and receivable divided by sales. TCP^{days} and TCR^{days} is the average maturity of accounts payable and receivable in terms of days.

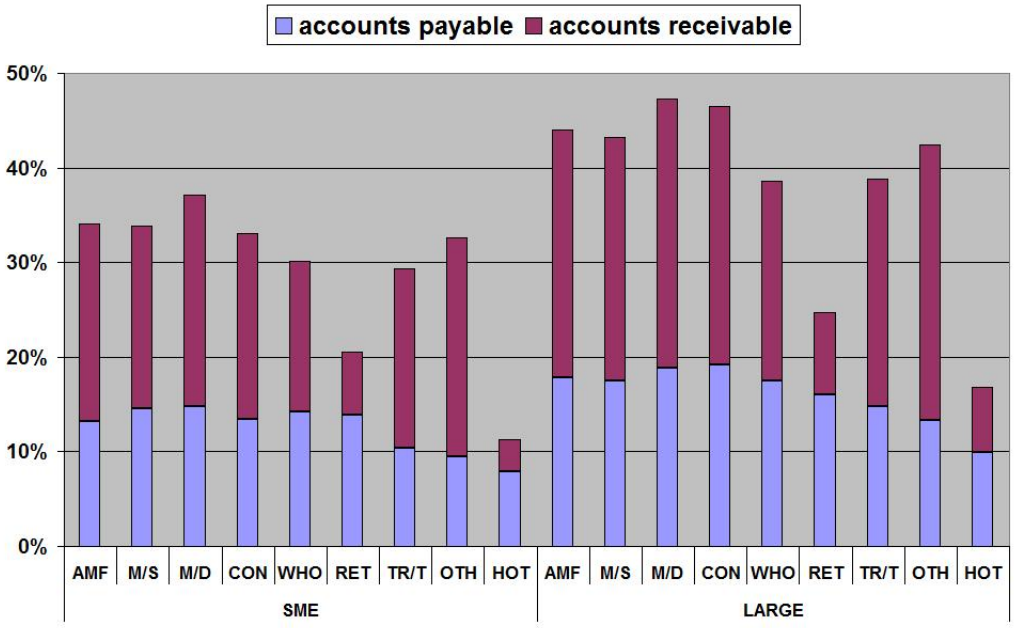
Looking at our variables of interest, it is evident that the use of trade credit differs a lot across euro area countries, sectors of activity and size. In general, firms appear to have more accounts receivable than payable on their balance sheets. Only 36% percent of the firms in our sample take a 'positive net position' in the market of the trade credit channel. Moreover, trade credit (payable and receivable) is relatively more prevalent in Mediterranean countries. In general, country differences may be accounted for by the heterogeneous institutional structures and trade credit payment conditions. A possible explanation for this is that trade credit should be more important than bank credit when creditor protection is weaker, because cash is easily diverted, while this is more difficult in the case of inputs, and the illiquidity of inputs facilitates trade credit.[3] This is found to hold true for French Civil Law countries (BE, FR, IT, NL, PT and ES), which are characterised by weaker legal protection.[4] Effective payment periods are longer in Mediterranean countries. In Germany and Finland, the average maturity of trade credit payable and receivable is around one month. For countries like Spain, Italy or Portugal the average days of outstanding trade credit payables is well over fifty days, while for trade credit receivables it is even more than hundred days. These differences are in line with the evidence provided by Cayssials and Kremp (2010) who use data from two dif-

[3]Burkart and Ellingsen (2004); Demirguc-Kunt and Maksimovic (2002)

[4]La Porta et al. (1998)

ferent databases.[5] Country differences are mainly attributed to the characteristics of the underlying contracts. As explained by Marotta (2005), the initial terms of payment are usually longer for instance in Italy, Spain and Portugal with respect to Nordic countries, the availability of discounts is more limited and often there are no penalties for late payments in the former group of countries. Another stylized fact derived from our dataset is that trade credit is more diffused in sectors where there is a physical good involved, although it relates also to provisions of services (Figure 3). Furthermore, as in Giannetti et al. (2011), the use of trade credit is higher for manufacturers of differentiated goods than for those of standardized goods.

Figure 3: Trade payables and trade receivables across sectors and firm size (% of sales)



Source: AMADEUS, Bureau van Djik Electronic publishing and own calculations. Notes. Based on an unbalanced panel of 600.000 companies that are reporting the use of trade credit. Average period:1993-2009. AMF: agriculture, mining and fishing; M/S: manufacturing/standardized goods; M/D: manufacturing/differentiated goods; CON: construction; WHO:wholesale trade; RET: retail trade; TR/T: transport and telecom, OTH: other business activities; HOT: hotels and restaurants.

Viewed in terms of firm size, trade credit is particularly important for SMEs, in particular in times of financial strains, when firms find it difficult to obtain external funding

[5]Cayssials and Kremp (2010) use data from the European BACH (Bank for the Accounts of Companies Harmonised) and ESD (European Sectoral references Database) databases.

from credit institutions. Early trade credit theories relate the use of trade credit to the presence of information asymmetries and the monitoring advantage that suppliers have over banks.[6] More specifically, the line of reasoning is usually as follows: some firms (typically small firms with little collateral) are unable to obtain bank loans because it is too costly for the bank to monitor them. For suppliers of those firms, by contrast, monitoring and bargaining costs may be lower in the context of an established long-term relationship, since they frequently conduct business with the small firms and may also have the power to cut off the supply to such firms or to repossess the goods in the event of defaulted repayment. The aforementioned informational and bargaining advantages that a supplier has over a bank might provide the supplier with an opportunity to extend credit to the buyer, even if that buyer does not seem creditworthy to the bank.[7] Nonetheless, as our data show, trade credit is also widely used by large firms, but mainly as a cash management tool: by delaying payments, firms may be better able to match their cash flow to their needs. Firms that receive trade credit from their own suppliers are more likely to extend trade credit receivables to their customers and thus to 'match maturity' between their payables and receivables.

4 Empirical Approach

4.1 The baseline specification

Our econometric model follows Coluzzi et al. (2012) who use an augmented version of the law of proportionate effect (LPE), as proposed by Goddard et al. (2002), to estimate the impact of financing obstacles on firm performance. The basic intuition of Gibrat's law (equation (1)) is that firm growth is mean reverting to its optimal industry size. Coluzzi et al. (2012) add economic meaning to the simple LPE specification through the inclusion of economic variables (X_{ikt-1}) that are believed to deterministically affect growth. Although our paper is most closely related to the work of Fisman and Love (2003), we do not follow their empirical strategy because we believe that growth is a dynamic process. Therefore, we prefer a simple dynamic growth model rather than the static model of Fisman and Love (2003).

[6] See Petersen and Rajan (1997) for a review of the literature and Fisman and Love (2003).

[7] See Petersen and Rajan (1997); Frank and Maksimovic (2005).

$$
\begin{aligned}
growth^{av}_{it} &= \alpha_0 + \alpha_1\ growth^{av}_{it-1} + \alpha_2\ TC\ Channel_{it-1} + \alpha_3\ growth^{sales}_{it-1} \\
&\quad + \alpha_4\ log(size)_{it-1} + \alpha_5\ log(age)_{it-1} + \upsilon_i + \upsilon_t + \upsilon_{jt} + \epsilon_{it} \qquad (1)
\end{aligned}
$$

Where the growth of added value ($growth^{av}$) is calculated as the difference between the real[8] added value and lagged real added value, divided by the lagged real added value. Added value is defined as the sum of profit (loss) for the period and minority interest, taxation, cost of employees, depreciation and interest paid. The trade credit channel is constructed as the sum of accounts payable and accounts receivable, scaled by total sales. The error term consists of four components: an unobserved firm specific component υ_i, a time component to filter out business cycle effects υ_t, a time component which varies over industries accounting for industry specific effects υ_{jt} and finally an idiosyncratic component ϵ_{it}.

Since many of the determinants of the trade credit channel can also be thought to have an impact on growth, it will be important to control for this. We try to account for firm opportunities by including sales growth, which is the growth rate of real total sales, in specification (1). Furthermore, by taking the log of total assets and the log of age into account we ensure that any impact of the trade credit channel on growth is not driven by firm size or age.

All specifications are estimated with the first difference General Method of Moments (GMM) estimator developed by Arellano and Bond (1991). The first difference GMM estimator is appropriate since it controls for biases due to unobserved firm-specific effects and the possible endogeneity of explanatory variables. Blundell and Bond (1998) showed that adding instruments in levels to estimate the differenced equation considerably improves the efficiency of the first difference estimator in smaller samples. Given the size of our sample we use the first difference GMM.

Table 3 shows the results for the first difference GMM estimation of the baseline specification. The statistics in the penultimate column of the table, $m2$, provides no indication that the instruments would be correlated with the error term. The null hypothesis of no second order serial correlation cannot be rejected in all the regressions. We also report the results of the Sargan test of overidentifying restrictions J as a test for instruments

[8] A variable in real terms is calculated as the variable in nominal terms divided by the GDP deflator.

Table 3: Baseline estimation: Growth of added value (specification (1))

	$growth^{av}$	$TC^{channel}$	$growth^{s}$	$log(size)$	$log(age)$	$m2$	J	$\#\ obs$
BE	-0.104***	0.346***	0.076***	0.001	-0.173***	0.14	0.09	77,172
DE	-0.050**	0.387***	0.044***	0.145	-0.181***	0.42	0.88	56,683
ES	-0.094	0.328**	0.131**	-0.292***	-0.086***	0.40	0.22	174,725
FI	-0.123***	0.908***	0.069***	-0.207**	-0.159***	0.81	0.33	109,828
FR	-0.321***	0.774***	0.587***	-0.291***	-0.005	0.68	0.08	1,171,282
IT	-0.105***	0.266***	0.129***	-0.248***	-0.076***	0.39	0.00	590,612
NL	-0.152***	0.683***	0.093***	-0.242**	-0.044	0.78	0.36	14,651
PT	-0.102***	0.456***	0.070***	-0.340***	-0.144***	0.62	0.00	329,395

Notes. The Table shows the output for the GMM first difference estimation of specification (1). The estimates are robust to heteroscedastic standard errors. All specifications were estimated with time dummies and time dummies interacted with industry dummies. m2 shows the p-value of the test of serial correlation in the error terms, under the null of no serial correlation. Values presented for the J-statistic are p-values of the test of overidentifying restrictions of the instruments, under the null of instrument validity. * indicates significance at, the 10% level; ** and ***, respectively at the 5% or 1% level. For the definition of the variables see notes of Table 2.

validity, although Blundell et al. (2000) report Monte-Carlo evidence that this test tends to over-reject, especially when the data are persistent and the number of time-series observations large. According to the information derived from the $m2$ statistics and the Sargan test, we used different sets of lagged instruments across countries, ranging from instruments starting in $t-2$ for Belgium and The Netherlands till instruments starting in $t-6$ in France. For each country we chose the lag structure that best fitted the $m2$ and J tests. We believe that different growth dynamics of firms between countries could be driving this, and so we need different lag structures to take this into account. As the results across countries are not coming from estimations with identical instruments, we focus more on the economic and statistical significance of the independent variables.

Starting from the estimated coefficients of past firm growth rates, they are negative and significant in most countries, thus rejecting the LPE hypothesis of growth not depending on past performance. Further, the implication of the LPE that initial size should also not affect growth is not supported by the results, namely larger firms grow significantly slower and firms that have grown a lot in the previous period are more likely to grow slower this period. Firms with better opportunities -proxied by sales growth- grow faster in many countries, although the coefficients are not always statistically significant. Next, the stylised fact that younger firms tend to grow faster is confirmed as age is negatively

related to firm growth. More importantly, the parameter on the trade credit channel is positive and significantly different from zero in all countries investigated, confirming the hypothesis that firms use the trade credit channel to manage their growth.

A useful exercise is to compare the quantitative impact of the trade credit channel within each country. In order to draw meaningful cross-country conclusions from this exercise, it is necessary that the results are drawn from identical estimations for each country. For this reason, and also to check whether the results in Table 3 are robust to the estimation technique used, we show in Table 9 in the Appendix the fixed effects (FE) estimation results for the baseline specification (1). The results appear to be very robust.

The first two columns of Table 4 report the FE parameter estimates and the average size of the trade credit channel within each country. Interestingly, if these figures are compared, it appears that the sensitivity of growth to the variation in the channel is largest for countries where the trade credit channel itself is smaller, like Germany or Finland, but also in the Netherlands. In countries where the trade credit channel is intensively used, like Spain, Italy or Portugal, the marginal impact of the channel on growth is smaller. However, when we quantify the overall impact we find that this is still bigger in countries where the trade credit channel is large. In the third column of Table 4 the difference in the growth rate of added value is calculated, keeping all other things equal, between a firm of the 25th and 75th percentile of the trade credit channel. In countries where the total value of accounts payable and receivable is less than one fourth of the value of total sales, the difference in firm growth between firms in the 25th and 75th percentile of the trade credit channel is more or less 10%. In countries where almost half of the total sales is sold and bought on credit, this difference in growth is more than 15%. The last column of Table 4 displays the impact of a one standard deviation increase in the trade credit channel on firm growth, measured in units standard deviation of growth of added value. One standard deviation is measured, for each country, as the mean of all the firm level standard deviations. In countries where the trade credit channel is less present, a one standard deviation increase in the channel leads -ceteris paribus- to a 0.11-0.14 standard deviation increase in firm growth. In Portugal and Spain, where goods are commonly bought and sold on credit, a one standard deviation change in the trade credit channel implies a 0.16-0.18 standard deviation change in firm growth.

Table 4: Quantitative impact of the trade credit channel within countries

	FE	$TC^{channel}$		(25 vs 75)	(1 std.dev.)
BE	0.42***	0.35		9%	0.11
DE	0.56***	0.15		7%	0.11
ES	0.53***	0.45		16%	0.16
FI	0.92***	0.14		11%	0.14
FR	0.54**	0.30		14%	0.15
IT	0.41***	0.52		15%	0.15
NL	0.55***	0.27		9%	0.11
PT	0.47***	0.44		19%	0.18

Notes. The Table first shows the output for the parameter on the trade credit channel in the fixed effects (FE) estimation of specification (1). The total output of these estimations can be found in Table 9 in the Appendix. The estimates are robust to heteroscedastic standard errors. The specifications were estimated with time dummies and time dummies interacted with industry dummies. The second column gives the mean of the trade credit channel, i.e. $\frac{TCP+TCR}{sales}$. The third column gives the -ceteris paribus- percentage difference in growth induced by the TC Channel between a firm in the 25th percentile of the TC Channel and 75th percentile. The fourth column gives the -ceteris paribus- standard deviation difference in growth induced by a standard deviation in the TC Channel. * indicates significance at, the 10% level; ** and ***, respectively at the 5% or 1% level.

4.2 Implications of firm heterogeneity: size and age

As reported in the literature, small firms, which are characterised by a small amount of collateral relative to their liabilities, tend to have more problems to access external finance. In this respect, accounts payable could be particular important as alternative source of finance. At the same time, the cash management tool argument suggests that also large firms tend to use accounts payable but also accounts receivable. In order to test the behaviour of firms with different sizes, we construct a dummy variable -SMALL- where firms are classified according to their total assets falling below the 25th percentile.[9] Table 5 reports the country estimations of our baseline model (1) augmented by the interaction of the trade credit channel variable with the size dummy. The estimations confirm that the trade credit channel is important for firm growth in general, but the magnitude of its impact is higher for smaller firms in each country, and significantly so in six out of eight countries. For small firms it is thus more important to manage growth via the trade credit channel than for large firms.

[9]The dummies are constructed per year and per sector. A firm i is for instance small in year t when its total assets are in the 25th percentile of all the firms in that year t in the same sector.

Table 5: Firm heterogeneity: Size

	$growth^{av}$	$TC^{channel}$	$TC^{channel}_{small}$	$growth^{s}$	$log(size)$	$log(age)$	$m2$	J
BE	-0.288***	0.922***	0.423***	0.142**	-0.403***	-0.134***	0.14	0.02
DE	-0.049**	0.434***	0.042	0.042***	0.122	-0.174***	0.42	0.75
ES	-0.134***	0.495**	0.926*	0.142***	-0.413***	-0.071**	0.80	0.02
FI	-0.121***	0.828***	0.544***	0.069***	-0.163**	-0.167***	0.75	0.28
FR	-0.307***	0.756***	0.907***	0.554***	-0.309***	0.007	0.74	0.13
IT	-0.114***	0.245***	0.066***	0.126***	-0.223***	-0.088***	0.56	0.00
NL	-0.160***	0.710***	0.202	0.099	-0.260	-0.041	0.71	0.37
PT	-0.103***	0.467***	0.114***	0.070***	-0.372***	-0.134***	0.67	0.00

Notes. The Table shows the output for the first difference GMM estimation of specification (1) augmented with an interaction term. The estimates are robust to heteroscedastic standard errors. All specifications were estimated with time dummies and time dummies interacted with industry dummies. m2 shows the p-value of the test of serial correlation in the error terms, under the null of no serial correlation. Values presented for the J-statistic are p-values of the test of overidentifying restrictions of the instruments, under the null of instrument validity. * indicates significance at, the 10% level; ** and ***, respectively at the 5% or 1% level. $TC^{channel}_{small}$ is defined as the product of the trade credit channel and a size dummy identifying small companies (below 25th percentile of total assets). For the definition of the other variables see notes of Table 2.

Turning to age, Gertler (1988) was one of the first to argue that firm age is an important determinant of financial constraints. Because young firms are more likely to experience difficulties in raising external funds, we hypothesize that the trade credit channel should play a bigger role for young firms than for older firms. To test this, again we augment the baseline specification (1) by interacting the trade credit channel variable with a dummy for age -YOUNG. We defined young firms those firms that are less than 5 years old. Table 6 confirms once again that the accounts payable and receivable form an important channel to manage firm growth. Moreover, the younger a firm is, the more important this channel becomes. A straightforward finding since more mature firms are more likely to have successful track records and may enter repeated relations with lenders, which both mitigate the problem of information asymmetries and thereby relaxes the need for an alternative financing channel (Gertler, 1988). This appears to be true for most countries in our sample, although the impact of age interacted with the trade credit channel is not always significant.

Table 6: Firm heterogeneity: Age

	$growth^{av}$	$TC^{channel}$	$TC^{channel}_{young}$	$growth^{s}$	$log(size)$	$log(age)$	$m2$	J
BE	-0.125***	0.678***	0.333***	0.117	-0.412*	0.006	0.28	0.06
DE	-0.055**	0.281***	0.293**	0.037***	-0.008	-0.102***	0.44	0.18
ES	-0.241***	0.396**	0.117*	0.227***	-0.403***	-0.019	0.10	0.07
FI	-0.126***	0.855***	0.140*	0.078***	-0.261***	-0.083***	0.85	0.13
FR	-0.280***	0.787***	0.046*	0.553***	-0.360***	0.039**	0.68	0.05
IT	-0.114***	0.261***	0.082***	0.132***	-0.228***	-0.049**	0.42	0.00
NL	-0.155***	0.652***	0.085	0.095	-0.225	-0.037	0.78	0.55
PT	-0.102***	0.463***	0.037*	0.070***	-0.362***	-0.119***	0.63	0.00

Notes. The Table shows the output for the first difference GMM estimation of specification (1) augmented with an interaction term. The estimates are robust to heteroscedastic standard errors. All specifications were estimated with time dummies and time dummies interacted with industry dummies. m2 shows the p-value of the test of serial correlation in the error terms, under the null of no serial correlation. Values presented for the J-statistic are p-values of the test of overidentifying restrictions of the instruments, under the null of instrument validity. * indicates significance at, the 10% level; ** and ***, respectively at the 5% or 1% level. $TC^{channel}_{young}$ is defined as the product of the trade credit channel and the age dummy young, i.e. when firms are less than 5 years old. For the definition of the other variables see notes of Table 2.

4.3 Implications of country heterogeneity

It has recently been shown that developed and well functioning financial markets are important in promoting economic growth. Mainly because in such markets, financial intermediaries allocate sufficient funds until marginal revenues equalise marginal costs, without discriminating among borrowers. Thus, first of all, the size of the financial sector needs to be large enough, otherwise some firms would need to resort to other channels to finance their activities. Research has indicated that firms use more trade credit when access to credit institutions is difficult, either because financial markets are less developed (Fisman and Love, 2003) or when the financial market is not liberalised (Ge and Qiu, 2007). Secondly, even in developed financial markets, when monetary authorities are conducting a restrictive policy, the supply of external finance may decrease significantly, such that a sufficient allocation of funds to all demanding borrowers may no longer be possible, creating the need for alternative channels to finance growth. Several empirical studies have shown that firms substitute bank loans for trade credit in an effort to limit the impact of the traditional bank lending channel (Nilsen, 2002; De Blasio, 2005; Choi and Kim, 2005; Guariglia and Mateut, 2006) or, as shown in Figure 2, to limit the impact

of a financial crisis (Love et al., 2007).

Table 7: Country heterogeneity: financial market development

$growth^{av}$	$TC^{channel}$	$TC^{channel}_{CAP1}$	$TC^{channel}_{CAP2}$	$growth^{s}$	$log(size)$	$log(age)$	R^2	# *obs*
-0.267***	0.534***	-0.0005***		0.121***	-0.204***	-0.153***	0.11	2,524,348
-0.268***	0.485***		-0.0009**	0.121***	-0.204***	-0.152***	0.11	2,524,348

Notes. The Table shows the output for the fixed effects (FE) estimation of specification (1) augmented with the given interaction term indicating the level of market capitalisation, where $CAP1$ stands for $\frac{bankloans_{jt}}{GDP_{jt}}$ and $CAP2$ for $\frac{debtsecurities_{jt}}{GDP_{jt}}$. The estimates are robust to heteroscedastic standard errors. All specifications were estimated with time dummies and time dummies interacted with industry dummies. * indicates significance at, the 10% level; ** and ***, respectively at the 5% or 1% level.

Even though all eight countries in our euro area sample are considered to have well developed financial markets, they are still quite heterogeneous today and they have changed significantly throughout the last two decades, which is almost entirely covered by our sample period 1993-2009. When we consider the total amount of bank loans as a percentage of GDP, for instance, bank loan availability has increased more than 30 percentage points in Belgium and almost 150 percentage points in Spain over the sample period. The heterogeneity is even bigger in the debt securities market. The issuance of debt securities as a fraction of GDP was on average around 6 percent in 1993 and doubled in 2009 up to 12 percent of GDP. However, differences across countries remain large with the issuance of French firms at around 18 percent and that of Spanish firms still less than 2 percent. This gives us an opportunity to test whether there is an interaction between the state and evolution of the financial market on the one hand and the trade credit channel on the other hand. Based on the theories and previous empirical findings stated above, we expect a negative relation.

To test the hypotheses related to the development of the financial market, we append the data for all eight countries into one panel containing all countries and we generate two interaction variables. The first is $TC^{channel}_{ijt} * \frac{bankloans_{jt}}{GDP_{jt}}$, which interacts the trade credit channel of firm i in country j in year t with the total amount of bank loans as a fraction of GDP in that country j in that year t. In Table 7 this interaction is indicated as $TC^{channel}_{CAP1}$. Table 7 shows that euro area firms use the trade credit channel to finance growth, moreover, this channel is less important in years/countries where there is a bigger supply of bank loans. And while the estimate on the interaction seems rather small, it

is economically important. It implies that for Italy, everything else equal, the marginal impact of the trade credit channel declined by almost 15% between 1993 and 2009 because of the increase in bank loan availability.

Second, we generate $TC_{ijt}^{channel} * \frac{debtsecurities_{jt}}{GDP_{jt}}$, which interacts the trade credit channel of firm i in country j in year t with the total amount of debt securities issued as a fraction of GDP in that country j in year t. In Table 7 this interaction is indicated as $TC_{CAP2}^{channel}$. Table 7 provides evidence in favour of the hypothesis that the use of the trade credit channel to manage firm growth is more important in years/countries where firms issue less debt securities to finance themselves. Again, the interaction term is economically relevant. In 2009 using the trade credit channel to stimulate growth was 2% more important in Finland than in Portugal, because of a smaller debt securities market in Finland.

Finally, the evolution of the bank loan to GDP ratio might have a trend over the period, which could also capture developments in the regulation of the product market, which could also have reduced market imperfections and thus the role of trade credit. In an attempt to disentangle this additional factor, we include a variable that captures the deregulation process in the product markets that took place during the period.[10] Two interesting results pop up from Table 10 in the appendix. First, our previous findings concerning the financial market development still hold after controlling for product market regulation. Second, firms operating in higher regulated product markets seem to display lower growth levels, indicating that deregulation fosters growth. Moreover, the trade credit channel is more important for firms in higher regulated product markets. An in depth analysis of these results goes beyond the scope of this paper, but it is clear that they should be on the agenda for future research.

5 Conclusion

The use of trade credit of a firm is a twofold process in which a firm can receive trade credit from its suppliers (accounts payable) and, in turn, can extend trade credit to its customers (accounts receivable). While many theories of accounts payable and receivable are related

[10]The indicator used in the analysis measures the knock in effects of non-manufacturing regulation on the cost structures faced by firms that use the output as intermediate inputs in the production process (Nicoletti et al., 2000; Conway and Nicoletti, 2008). It is found that tight regulation of the product markets have a large negative impact on investment (Alesina et al., 2005) and profitability.

to firm performance, there has not been a direct test whether firms actively use both to manage their growth. In this paper we argue that it is not just the accounts payables or just the accounts receivable that matter, but the sum of the two, which works as a credit channel of trade. As a contribution to previous studies, we perform an augmented version of the Gibrat LPE to test whether the trade credit channel has a direct impact on firm performance after having taken into consideration the usual determinants of growth related to firms' opportunities and demographic variables.

The results show that the economic impact of the trade credit channel is indeed important and that this is particularly true for firms in those euro area countries where the trade credit channel is more present. Further, the richness of our dataset allows us to focus on two different types of heterogeneity: at country level as we analyse eight euro area countries, and at firm level as our analysis is based on 600.000 firms. Focusing on country heterogeneity, we find that the degree of development of the financial system matters. In those countries where the supply of bank loans is larger, the sensitivity of firm growth to the trade credit channel is smaller. Focusing on the heterogeneity across firms, we find that those firms that are more vulnerable to financial market imperfections (in terms of their size or related to their age) use the trade credit channel more intensively.

Our results also fit the revived literature on the link between the financial market and the real economy. Firm operations that make more use of the trade credit channel can be more shielded from developments in the financial sector. This would however only be valid under the assumption that firms' use of accounts receivable as collateral to draw on short term liabilities is still valid in periods of restricted credit supply. Future research in this direction is needed to validate our findings.

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Appendix

Both consolidated and unconsolidated annual accounts are available in AMADEUS and these are comparable across countries. AMADEUS also provides qualitative information as number of employees and if a firm is listed on a stock market. In our sample we are careful to consider firms with unconsolidated accounts (mainly small and medium-sized ones) only when they do not present consolidated accounts in Amadeus. We construct nine non-financial sectors[11]: 1) agriculture, mining and fishing; 2) manufacturing of standardized goods; 3) manufacturing of differentiated goods; 4) construction; 5) wholesale trade; 6) retail trade; 7) transport and telecommunications; 8) hotel and 9) other business activities. We exclude other non-financial sectors such as (utility firms, renting, leasing and holding companies) for which trade credit does not appear to be important. The original dataset contains financial information for the period 1990-2009; we drop the first three years because of poor coverage and we lose another year of observations to compute variables as first differences of the balance sheet items. We only use end of year data. Concerning our variables of interest, we apply a series of filters. We eliminate the observations of firms with errors in their financial statements (for instance when total assets are negative) and when their values are unreasonable (for instance when trade credit payables or receivables over total assets are greater than 1). Finally we eliminate 1% of the extreme values taking into consideration differences across sectors and countries and we consider only firms with at least 4 consecutive years of observations. The tables report the descriptive statistics for the sample that is finally used in the regressions.

Figure 4 provides some evidence of a positive relation between the trade credit channel and firm growth. The graph displays the mean growth rate of added value for all observations belonging to a percentile of the trade credit channel from 1993 to 2009 for all 8 euro area countries in our sample.

[11] Following Giannetti et al. (2011) we take the nature of the manufactured good into account: standardized good or differentiated good.

Table 8: sample distribution across firms size

	BE	DE	ES	FI	FR	IT	NL	PT
small	50%	49%	93%	89%	88%	83%	7%	91%
medium sized	37%	27%	6%	8%	9%	14%	34%	7%
large	13%	24%	1%	3%	3%	3%	59%	2%
# *obs*	77,172	56,683	174,725	109,828	1,171,282	590,612	14,651	329,395
# *firms*	10,705	23,448	25,569	23,204	211,584	181,457	3,178	108,052

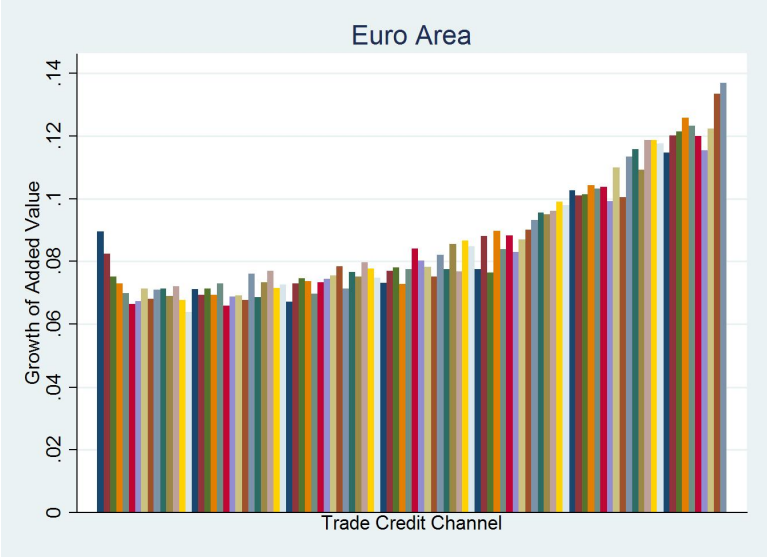
Source: AMADEUS, Bureau van Dijk Electronic publishing and own calculations.

Table 9: Fixed effects estimation of the baseline specification

	$growth^{av}_{t-1}$	$TC\ Channel_{t-1}$	$growth^{s}_{t-1}$	$log(size)_{t-1}$	$log(age)_{t-1}$	R^2	# *obs*
BE	-0.240***	0.421***	0.140***	-0.117***	-0.132***	0.076	77,172
DE	-0.204***	0.557***	0.043**	-0.158***	-0.207***	0.064	56,683
ES	-0.242***	0.525***	0.151***	-0.185***	-0.128***	0.097	174,725
FI	-0.253***	0.919***	0.100***	-0.258***	-0.142***	0.120	109,828
FR	-0.268***	0.541***	0.166***	-0.193***	-0.108***	0.115	1,171,282
IT	-0.285***	0.411***	0.096***	-0.215***	-0.232***	0.099	590,612
NL	-0.264***	0.552***	0.156***	-0.179***	-0.092***	0.102	14,651
PT	-0.301***	0.467***	0.113***	-0.322***	-0.321***	0.157	329,395

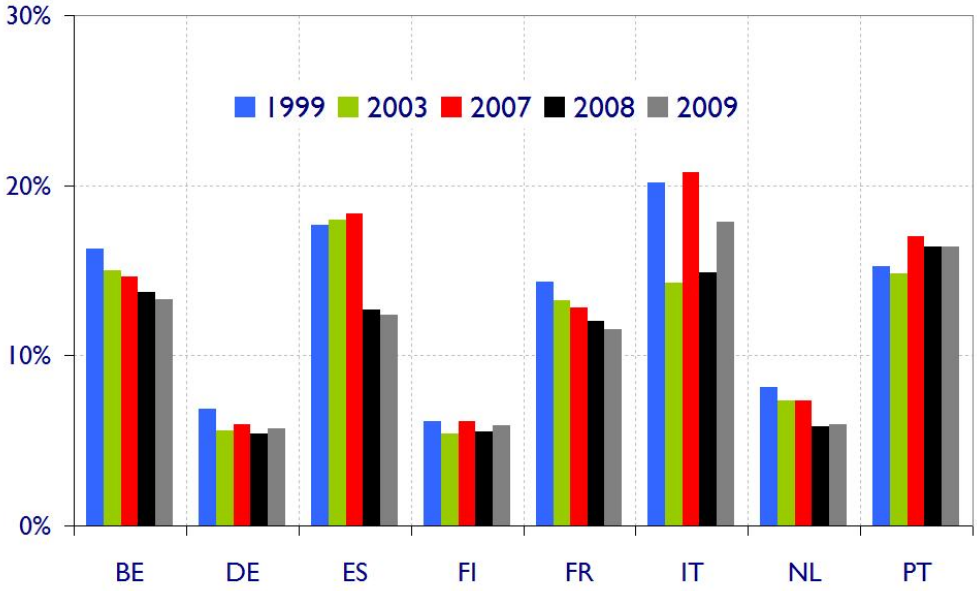
Notes. The Table shows the output for the fixed effects (FE) estimation of specification (1). The estimates are robust to heteroscedastic standard errors. All specifications were estimated with time dummies and time dummies interacted with industry dummies. * indicates significance at, the 10% level; ** and ***, respectively at the 5% or 1% level. For the definition of the variables see notes of Table 2.

Figure 4: Firm growth and the trade credit channel



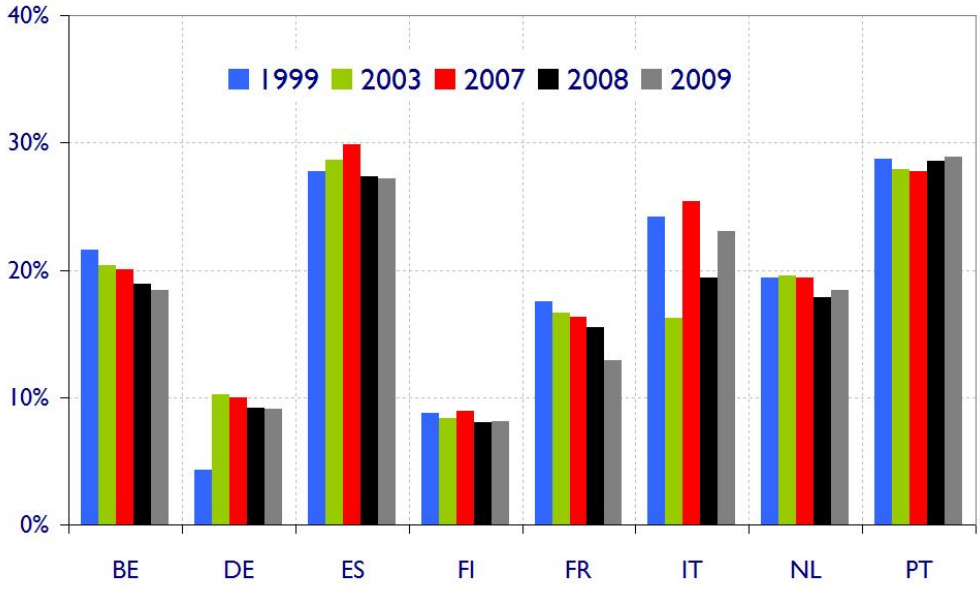
Source: AMADEUS, Bureau van Djik Electronic publishing and own calculations. Notes. The Figure shows mean growth rates of added value for the observations belonging to each percentile of the trade credit channel in our sample.

Figure 5: Accounts payable as percentage of total sales



Source: AMADEUS, Bureau van Dijk Electronic publishing and own calculations.

Figure 6: Accounts receivable as percentage of total sales



Source: AMADEUS, Bureau van Dijk Electronic publishing and own calculations.

Table 10: Country heterogeneity: financial market development (controlled for product market regulations)

$growth^{av}$	$TC^{channel}$	$TC^{channel}_{CAP1}$	$growth^{s}$	$log(size)$	$log(age)$	PMR	R^2	$\#\ obs$
-0.268***	0.540***	-0.0006***	0.121***	-0.204***	-0.152***	-0.435***	0.11	2,524,348
$growth^{av}$	$TC^{channel}$	$TC^{channel}_{CAP2}$	$growth^{s}$	$log(size)$	$log(age)$	PMR	R^2	$\#\ obs$
-0.268***	0.483***	-0.0006*	0.121***	-0.204***	-0.151***	-0.246***	0.11	2,524,348
$growth^{av}$	$TC^{channel}$	$TC^{channel}_{PMR}$	$growth^{s}$	$log(size)$	$log(age)$	PMR	R^2	$\#\ obs$
-0.268***	0.464***	0.0649**	0.121***	-0.204***	-0.151***	-0.300***	0.11	2,524,348

Notes. The Table shows the output for the fixed effects (FE) estimation of specification (1) augmented with the given interaction term indicating the level of market capitalisation, where $CAP1$ stands for $\frac{bankloans_{jt}}{GDP_{jt}}$ and $CAP2$ for $\frac{debtsecurities_{jt}}{GDP_{jt}}$. The OECD indicator of Product Market Regulation (PMR) is a variable that measures the degree to which policies promote or inhibit competition in areas of the product market where competition is viable. The indicators cover formal regulations in the following areas: state control of business enterprises; legal and administrative barriers to entrepreneurship; barriers to international trade and investment. The indicator varies across sectors, countries and time. Data are available until 2007. The estimates are robust to heteroscedastic standard errors. All specifications were estimated with time dummies and time dummies interacted with industry dummies. * indicates significance at, the 10% level; ** and ***, respectively at the 5% or 1% level.