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Product Innovation and Trade Credit Demand and Supply: Evidence from European Countries

Beiträge zur Jahrestagung des Vereins für Socialpolitik 2013: Wettbewerbspolitik und Regulierung in einer globalen Wirtschaftsordnung - Session: R&D and Innovation I, No. A10-V2

Provided in Cooperation with:

Verein für Socialpolitik / German Economic Association

Suggested Citation: Nielen, Sebastian (2013) : Product Innovation and Trade Credit Demand and Supply: Evidence from European Countries, Beiträge zur Jahrestagung des Vereins für Socialpolitik 2013: Wettbewerbspolitik und Regulierung in einer globalen Wirtschaftsordnung - Session: R&D and Innovation I, No. A10-V2

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Product Innovation and Trade Credit Demand and Supply: Evidence from European Countries

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Abstract

This study addresses the relationship between product innovation and the demand and supply of trade credit. Theoretical as well as empirical studies are used to derive the hypothesis of a positive link between product innovation and trade credit demand and supply. Using a sample covering SMEs from 24 European countries this relationship is tested empirically. Basically the estimation results confirm that introducing a product innovation is positively related with demand and provision of trade credit for SMEs. Innovative firms have a higher probability to face credit constraints and therefore have a higher probability to demand for trade credit. On the other hand suppliers have an incentive to provide trade credit especially to innovative customers because they have an easier access to information about the growth potential of innovative SMEs compared to banks.

JEL-Codes: G32, O31, L20
Keywords: trade credit, product innovation, bank loan availability

1 Introduction

When suppliers allow their customers to pay already delivered goods after a certain time they provide trade credit to them. For short-term finance trade credit is a very important source of finance (Petersen & Rajan, 1997). Trade credit demand and supply are already investigated by many theoretical as well as empirical studies. Regarding trade credit demand results of other studies suggest that firms facing credit constraints by banks increase their demand for trade credit (Schwartz, 1974; Biais & Gollier, 1997; Petersen & Rajan, 1997). With respect of trade credit supply the following is found in the existing literature. Firms may use trade credit as a mechanism to practice price discrimination among their customers since varying trade credit conditions could be used instead of direct price discrimination (Chee K. NG, Smith, & Smith, 1999). Moreover, suppliers may help their customers to cope with short-term liquidity problems because they have an interest in survival of their customers (Petersen & Rajan, 1997).

To the authors best knowledge empirical literature on the relationship of product innovation and the demand and provision of trade credit is rare.

This study contributes to the existing literature by analyzing the relationship between introducing a product innovation and trade credit demand and provision for European SMEs. It is argued that especially innovative small and medium sized firms resort to trade credit because they have to cope with fundamental financial constraints. Banks have problems to scrutinize the value of innovative SMEs and therefore restrict their credit provision to them. Moreover, innovative SMEs have relative high levels of intangible assets which cannot be used as a collateral for bank loans. From the supply side there are also arguments why trade credit is especially relevant for innovative SMEs. First, a supplier has an advantage in providing credit to innovative customers compared to banks because of a closer relationship with the customer. Therefore the supplier is able to gain information about the situation of the innovative firm in a cheaper way than a bank can. Second the supplier has an incentive to help its innovative customer to cope with short term financing problems via offering trade credit to them. Since the product innovation may lead to higher growth rates for the customer the supplier can profit from an increase in future demand. HIER noch ein satz zu positiven link zwischen inno und tc demand/supply

Using data from the Flash Eurobarometer on SME access to finance the expected positive link between product innovation and trade credit demand and

supply is tested empirically. In general the estimation results confirm both hypothesis. SMEs reporting the introduction of a product innovation have a significant higher probability to demand for trade credit. Moreover, firms implemented a product innovation have also a higher probability that the willingness of business partners to provide trade has increased. The results suggest that product innovations are positively related to trade credit demand as well as trade credit supply.

The remainder of the paper is structured as follows. In the second section relevant theories and empirical evidence regarding trade credit are presented. Using them the link between product innovation and trade credit demand and supply is explained and the hypothesis are derived. Section three introduces the data set, the variables that are used and provides some descriptive statistics. The estimation results are purpose of the fourth section and the last section concludes.

2 Theoretical framework

In this section theories about trade credit demand and supply as well as results of empirical studies are presented. The focus is on theories can be used to explain how product innovation and trade credit demand and supply are related. Afterwards the discussed theories and empirical studies are used to explain the relationship between product innovation and trade credit demand and supply and derive the hypothesis.

Demand for trade credit

Asymmetric information in financial markets may lead to adverse selection resulting in credit rationing by banks (Stiglitz & Weiss, 1981). Firms receive less bank loans than they wanted or they got no external finance form banks. As pointed out by a theoretical study of Emery (1984) firms facing credit constraints increase their demand for trade credit. Empirical support for this relationship is found by Atanasova and Wilson (2003), Danielson and Scott (2004) and Nilsen (2002). They report that firms facing credit rationing try to overcome them by using trade credit.

Another important influence for trade credit demand is firm growth. Firms with high growth rates tend to use more trade credit (Cunat, 2007; Tsuruta, 2008). The reason for this is that fast growing firms need extra money to finance

their growth. Moreover, Howorth and Reber (2003) report that fast growing firms tend toward habitual late payment of trade credit. A high level of intangible assets is also positively related to firms use of trade credit (Tsuruta, 2008).

Trade credit demand and product innovation

Findings of theoretical and empirical studies show that credit constraints increase demand for trade credit. Innovative SMEs are especially affected by credit rationing for two reasons. First, Banks have problem to scrutinize the value of an innovative firm because of high levels of intangible assets. Empirical evidence for the relationship between credit constraints and innovation is reported by Guiso (1998), Hyytinen and Toivanen (2005) and Ughetto (2009). Second, small firms in general are more likely to face credit constraints independent whether they are innovative or not (Beck, Demirgc-Kunt, & Maksimovic, 2005; Aghion, Fally, & Scarpetta, 2007; Jaramillo, Schiantarelli, & Weiss, 1996). Moreover, the existing literature also suggest that trade credit demand is positively linked to firms growth. Several empirical studies point out that innovative firms have higher growth rates (Almus & Nerlinger, 1999; Coad & Rao, 2008). Roper (1997) reports product innovation and output growth are positively related. Brouwer, Kleinknecht, and Reijen (1993) find that employment growth is influenced by product innovations in a positive way. Putting both lines of argumentation together leads to the first hypothesis.

Hypothesis one: *SMEs introduced a product innovation have a higher probability to demand for trade credit.*

Provision of trade credit

In this subsection two theories about trade credit supply are discussed: financing advantage theory of trade credit and price discrimination theory of trade credit. Regarding financing advantage theory it is argued that suppliers have an advantage in providing credit to their customers compared to banks (Schwartz, 1974). These advantage has three sources: advantage in information acquisition, advantage in controlling the buyer and advantage in slaving value from existing assets (Petersen & Rajan, 1997). Because of a closer relationship with their customers suppliers are able to gain information about the situation of their customers in a cheaper and easier way. Moreover, suppliers also have the opportunity to seize

delivered goods when the customer does not pay.

According the price discrimination theory of trade credit providing trade credit is used as a form of price discrimination. Instead varying prices among customers terms of trade credit are varied. Empirical evidence for the use of trade credit to practice price discrimination is found by Pike, Cheng, Carvens, and Lamminmaki (2005) and Chee K. NG et al. (1999). Petersen and Rajan (1997) list two reason why trade credit could be used to price discriminate. First, in the short run suppliers may have an incentive to provide trade credit to customers with a more elastic demand. Second, suppliers have an incentive to help customers to overcome financial problems via providing trade credit to them, because in the long run the supplier can profit from increasing demand of these customers.

Trade credit supply and product innovation

In this study it is argued that both theories regarding trade credit supply are especially relevant for SMEs introduced a product innovation. The advantage for suppliers in providing credit compared to banks is more relevant for innovative firms. A supplier may be able to evaluate the potential of a product innovation and therefore is willing to offer credit even if banks do not. Suppliers may help especially innovative customers to cope with financing constraints because innovative firms have higher growth rates and this will lead to an increase in future demand for the supplier. The suppliers interest that the customer survives is higher if the customer has introduced a product innovation. Therefore innovative firms a more likely to gain help from their suppliers via offering trade credit. This leads to the second hypothesis.

Hypothesis two: *SMEs introduced a product innovation have a higher probability to be offered trade credit from business partners.*

3 Data

3.1 Sample

This study uses data from the Flash Eurobarometer on SME Access to finance among in the European Union and other European countries. The survey is con-

ducted on behalf of the Directorate General for Enterprise and Industry of the European Commission and the European Central Bank. Aim of this survey is to get information which kind of finance European firms use and what problems they have to obtain their finance. Therefore the dataset contains information for firms from all 27 countries which are a member of the European Union. Furthermore Iceland and Finland are also included. Because of a perfect correlation with at least one dependent variable Estonia, Latvia, Hungary, Croatia, Malta and Norway have to be excluded from the analysis. This study focuses on the relationship between product innovation and trade credit demand and supply for small and medium sized firms which make financial decisions by their own. Therefore all firms have the following characteristics. Number of employees for each firms is less than 250 and the owner is an individual or a family. All firms are not publicly listed or owned by a government or state. Largest shareholder or owner is not a domestic company, foreign company, bank or investment fund. All firms were surveyed in 2009. The final sample comprises 2698 firms.

3.2 Measurement of variables

Dependent variables

In this study the relationship between product innovation and trade credit demand and supply is investigated. Therefore two different dependent variables are calculated. In the questionnaire firms were asked whether they applied for different kinds of finance or not. For trade credit demand a dummy variable is created that takes the value of one if a firm applied for trade credit within the past six month and zero otherwise. Firms were also asked whether the availability of different sources of finance has improved, remained unchanged, deteriorated or were not used over the past six month. For trade credit supply a dummy variable is created that takes the value of one if the availability of trade credit from business partners has increased within the past six month and zero otherwise.

Product innovation

In the questionnaire firms are asked about their innovation activities. Four different kinds of innovations are distinguished: product innovation, process innovation, organization innovation, and marketing innovation. Since the focus of this study is the relationship between product innovation and trade credit demand

and supply, a dummy variable is created taking the value of one if a firm introduced a new or significantly improved product or service to the market during the past year and zero otherwise.

Bank loan availability

The questionnaire includes a question regarding the availability of bank loans in the past six month. Possible answers are that the availability of bank loans had increased, was unchanged, had deteriorated or the firm did not want to use bank loans or they were not applicable. For each of the possible answers a separate dummy variable was created which takes the value of one if the firm give the respective answer and zero otherwise.

Further control variables

Another group of dummy variables covers turnover growth over the past six month. Three different scenarios are possible: turnover increased, remained unchanged or decreased. For each scenario a separate dummy variable was created taking the value of one if the firm reports the respective scenario and zero otherwise. Further control variables are the logarithm of age and the logarithm of number of employees as a proxy for firm size. Additionally a dummy variable for ownership is included. This dummy variable takes the value of one if a firm is owned by a family and zero otherwise. The respective reference category is a dummy variable for single person owned firms. Trade credit demand and supply may also be affected by macro economic effects. The role of trade credit is different in countries with highly developed financial markets compared to countries with less developed ones (Fisman & Love, 2003). Moreover, monetary policy and its transmission channels also affect trade demand and supply (Nilsen, 2002; Mateut, 2005; Atanasova & Wilson, 2003). To capture these effects country specific fixed effects are included in all models. Chee K. NG et al. (1999) find that there is less variation within industries but more between in using trade credit. To take this into account industry specific fixed effects are included as controls.

3.3 Descriptive statistics

Table 1 shows the number of observation for each country and the share in total sample. Most SMEs in the sample are located in Poland followed by the United

Kingdom and Germany. Table 2 contains the number of observations for each industry and the respective share in total sample. Most firms operate in the sector wholesale and retail trade followed by real estate, renting and business activities. The third largest industry is manufacturing.

[insert Table 1 about here]

[insert Table 2 about here]

Table 3 provides descriptive statistics for all dependent and independent variables. About 5,6 percent of all firms in the sample report that the availability of trade credit from business partners has increased in the past six month and about 13 percent applied for trade credit during the same period. The average age in the sample is about 19 years and the average size is about 16 employees. The share of family owned firms is about 59 percent, while the rest is owned by single person owners.

[insert Table 3 about here]

4 Results

In this section estimation results for trade credit demand and supply are presented. For both dependent variables separate probit models are estimated. Because they are easier to interpret marginal effects are reported instead of coefficients. First, for both dependent variables a model is estimated without including the control variables concerning bank loan availability and turnover growth. This is done because both variable groups are affected by product innovation as pointed out in section two. Including them as control variables may capture a part of the effect of product innovation on trade credit demand and supply. Second, models including all control variables are estimated to check weather there is still an effect for product innovations. Probit models for two different size classes (micro and small sized firms) are also presented. Furthermore separate models for manufacturing and service industries as well as for three different country groups are reported. Finally robustness checks are carried out to check the valitidy of the

results.

4.1 Trade credit demand

Table 4 provides the estimation results reporting marginal effects of a probit regression model for trade credit demand. The first column shows the results without including control variables that could be driven by the product innovation variable. The estimated marginal effect is about 2,5 percent and is significant at the five percent level. Including control variables that could be a function of the product innovation variable reduces the marginal effect to 1,8 percent which is significant at the ten percent significance level. The third column provides results only including micro sized firms and the fourth column only includes small firms excluding micro sized firms. In both models all control variables are included. Only in the sample consisting of only small firms the marginal effect is significant. The respective marginal effect is about 8,4 percent which is of economic importance.

[insert Table 4 about here]

Table number 5 provides estimation results on the relationship between product innovation and trade credit demand for different subsamples. The first column includes only manufacturing firms and the second one contains only service firms. The last three columns provide results for three different country groups. Column number three includes only central European SMEs, the fourth column only east European countries and the last one only SMEs located in PIGS (Portugal, Italy, Greece and Spain).

[insert Table 5 about here]

The estimated marginal effect for introducing a product innovation is relative high in magnitude for manufacturing SMEs and highly significant. For service SMEs the respective marginal is also positive as expected, but not significant. Within the different country groups only the marginal effect for the subsample including only central European SMEs provides a significant marginal effect for product innovation.

Regarding the control variables the following is found. Firms reporting in-

creasing turnover in the last six month have a higher probability to apply for trade credit compared to firms which report unchanged turnover (unchanged turnover is the reference group). The same is found for firms reporting decreased turnover. Deteriorated bank loan availability is highly positively related with the probability to apply for trade credit. The respective marginal effect is significant in all models. Age has a negative marginal effect in all models, but is only significant in the models using all firms. Size is positively related with the possibility to apply for trade credit. The marginal effect of the dummy variable owner family is positive in all models but not significant in any model.

In general a positive relationship between implementing a product innovation and trade credit demand is confirmed by the estimation results. Moreover, firms facing credit rationing by banks are also found to have a higher probability to apply for trade credit.

4.2 Trade credit supply

Table 6 shows the results for trade credit supply. Again marginal effects after probit models are reported. Column number one provides the estimation results without including control variables that could be affected by the product innovation variable. The estimated marginal effect is about 2,6 percent and is significant at the one percent level. Including all control variables leads to a smaller marginal effect of about 1,6 percent significant at the five percent significance level. For both size classes the estimated marginal effects are also positive as expected, but not significant.

[insert Table 6 about here]

Estimation results of the relationship between introducing a product innovation and trade credit supply for different subsamples are reported in table 7. Surprisingly the estimated marginal effect for product innovation is negative for the manufacturing subsample and for the subsample only including central european countries. But however, both are highly insignificant. For service industries as well as for SMEs located in eastern europe significant marginal effects are found. For the subsample covering only SMEs in so called Pig countries a positive but insignificant marginal effect is found.

[insert Table 7 about here]

Regarding the control variables the following can be stated. Increased turnover is not significant related to the probability that the willingness of business partners to provide trade credit has increased. The marginal effect of turnover decrease is negative in all models except the model for small firms, but only significant in both models for the two different size classes. In all models for trade credit supply all bank loan variables have negative marginal effects which are highly significant. Age, size measured by the number of employees and the variable owner family have no significant affect on the probability that the availability of trade credit from business partners has increased in the past six month in most of the models.

In general the expected positive link between product innovation and the provision of trade credit by suppliers is confirmed by the empirical results. In contrast to the results found for trade credit demand, deteriorated availability of bank loans is negatively related to trade credit supply.

4.3 Robustness checks

In this subsection two different robustness checks are carried out. First, coefficients of separate probit models for trade credit demand and supply are compared with coefficients of a bivariate probit model estimating the demand and supply equation simultaneously. This is done because there could be omitted variables influencing trade credit demand and supply and then both equations are not unrelated and should be estimated simultaneously. The second and last robustness check is only done for the trade credit supply model. Because only about 5,6 percent of all SMEs in the sample report that the avialability of trade credit from business partners has increased, coefficients of a logit model are compared with the coefficients resulting from a rare event logit. This rare event logit model takes into account rare events in the dependent variable. The results of the robustness checks are shown in table 8.

[insert Table 8 about here]

Both robustness checks confirm the results of our base line models. Estimating both equations simultaneously has only a very small effect on the coefficients

compared to the coefficients resulting from separate probit models for trade credit demand and supply. Therefore the reported marginal effects in our baseline results are not affected by that kind of bias. The same is found for the second robustness check. The coefficients of the rare events logit model are quite simular compared to the ones resulting from a standard logit regression model.

5 Conclusion

This study analyzes the relationship of product innovation and trade credit demand and supply. It is argued that innovative SMEs have a higher probability to demand for trade credit because they face credit constraints by banks. Suppliers may provide trade credit especially to innovative customers because they have an advantage in providing credit to them compared to banks. Moreover a supplier has an incentive to help innovative fast growing customers to cope with financing constraints because he can profit from an increase in future demand. Hence, trade credit provision from suppliers is also expected to be positively related with introducing a product innovation.

In general the empirical analysis confirms both hypothesis. Innovative SMEs are found to have a higher probability to demand for trade credit. Implementing a product innovation is also positively linked to the probability that the willingness of business partners to provide trade credit has increased. The result points out that trade credit is an important source of short term finance for innovative SMEs. Decreasing availability of bank loans is positively linked to the demand for trade credit, but negatively to the willingness of suppliers to provide trade credit.

But however, the results should be interpreted with caution. The estimation results are based on cross sectional data and are therefore not applicable for a causal interpretation. A purpose for further research could be to use panel data containing information about firms innovation activities and information about sources of short term financing (e.g. trade credit) to test for a causal relationship between product innovation and trade credit demand and supply. Moreover, it would be worthwhile to extend the analysis to other countries outside of Europe.

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Table 1: Countries: Number of observation for each country and share in total sample

Country	Freq.	Percent
Belgium	103	3.82
Czech Republic	113	4.19
Denmark	68	2.52
Germany	217	8.04
Greece	123	4.56
Spain	169	6.26
France	181	6.71
Ireland	46	1.70
Italy	163	6.04
Cyprus	61	2.26
Lithuania	32	1.19
Luxembourg	58	2.15
Netherlands	102	3.78
Austria	109	4.04
Poland	226	8.38
Portugal	163	6.04
Slovenia	69	2.56
Slovakia	67	2.48
Finland	71	2.63
Sweden	97	3.60
United Kingdom	220	8.15
Bulgaria	89	3.30
Romania	93	3.45
Iceland	58	2.15
Total	2698	100

Notes: Only small and medium-sized enterprises (SMEs)

Table 2: Industries: Number of observation for each industry and share in total sample

Industry	Freq.	Percent	Cum.
c. mining and quarrying	66	2.45	2.45
d. manufacturing	405	15.01	17.46
e. electricity, gas and water supply	11	0.41	17.87
f. construction	352	13.05	30.91
g. wholesale and retail trade; etc.	871	32.28	63.19
h. hotels and restaurants	165	6.12	69.31
i. transport, storage and communication	160	5.93	75.24
k. real estate, renting and business activities	457	16.94	92.18
m. education	28	1.04	93.22
n. health and social work	36	1.33	94.55
o. other community, social and personal	147	5.45	100
Total	2698	100	

Notes: Only small and medium-sized enterprises (SMEs)

Table 3: Descriptive statistics

Variable	Mean	Std. Dev.
trade credit supply	0.0560081	0.2299765
trade credit demand	0.1276307	0.3337348
product innovation	0.3577733	0.4794263
turnover increase	0.2345553	0.4237925
turnover same	0.2861507	0.4520374
turnover decrease	0.479294	0.4996559
bank loans increased	0.0841819	0.2777076
bank loans unchanged	0.3815343	0.4858457
bank loans deteriorated	0.3143245	0.4643251
bank loans not used	0.2199593	0.4142891
age	19.23557	22.52909
employment	15.87848	27.48351
owner: family	0.5933469	0.4912925

Notes: Only small and medium-sized enterprises (SMEs)

Table 4: Probit estimation results: relationship between trade credit demand, bank loan availability, and product innovation

Variable	(1)	(2)	(3)	(4)
product innovation	0.0247**	0.0187*	0.0105	0.0836***
	(0.0120)	(0.0113)	(0.0136)	(0.0290)
turnover increase		0.0558***	0.0344*	0.0804*
		(0.0188)	(0.0207)	(0.0455)
turnover decrease		0.0386***	0.0189	0.0734**
		(0.0137)	(0.0160)	(0.0340)
bank loans: unchanged		0.0172	0.0137	0.0672
		(0.0201)	(0.0240)	(0.0541)
bank loans: deteriorated		0.0732***	0.0805***	0.1494***
		(0.0241)	(0.0311)	(0.0612)
bank loans: not use		-0.0367*	-0.0189	-0.0543
		(0.0181)	(0.0225)	(0.0518)
log(age)	-0.0177**	-0.0120*	-0.0105	-0.0195
	(0.00714)	(0.0069)	(0.0087)	(0.0185)
log(employment)	0.0306***	0.0258***	0.0214**	0.0167
	(0.0048)	(0.0046)	(0.0099)	(0.0291)
owner: family	0.0172	0.0160	0.0078	0.0358
	(0.0118)	(0.0111)	(0.0131)	(0.0279)
Industry Fixed Effects	YES	YES	YES	YES
Country Fixed Effects	YES	YES	YES	YES
Pseudo R^2	0.1400	0.1711	0.1650	0.1580
Number of observations	2698	2698	1487	765

Notes: Marginal effects are reported. For binary coded variables, the result expresses the impact of a discrete change of the variable from 0 to 1. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Column (1): all SMEs are included; Column (2): all SMEs are included; Column (3): only micro firms; Column (4): only small firms.

Table 5: Probit estimation results: relationship between trade credit demand, bank loan availability, and product innovation

Variable	(1)	(2)	(3)	(4)	(5)
product innovation	0.1330***	0.0009	0.0323**	0.0024	-0.0070
	(0.0443)	(0.0127)	(0.0171)	(0.0241)	(0.0249)
turnover increase	0.1388**	0.0593***	0.0491**	0.1310***	0.0261
	(0.0778)	(0.0228)	(0.0236)	(0.0521)	(0.0422)
turnover decrease	0.0777	0.0240	0.0399**	0.0584*	0.0296
	(0.0547)	(0.0156)	(0.0201)	(0.0314)	(0.02846)
bank loans: unchanged	0.0574	0.0099	-0.0057	0.0183	0.0886*
	(0.0714)	(0.0241)	(0.0268)	(0.0406)	(0.0528)
bank loans: deteriorated	0.0185	0.0889***	0.0651**	0.0879**	0.1236**
	(0.0715)	(0.0308)	(0.0375)	(0.0484)	(0.0577)
bank loans: not use	-0.1091	-0.0398	-0.0086	-0.0855**	-0.0576
	(0.0556)	(0.0213)	(0.0277)	(0.0334)	(0.0451)
log(age)	-0.0181	-0.0040	-0.0242***	-0.0153	0.0171
	(0.0259)	(0.0084)	(0.0076)	(0.0234)	(0.0181)
log(employment)	0.0578***	0.0251***	0.0321***	0.0218**	0.0278***
	(0.0180)	(0.0056)	(0.0068)	(0.0102)	(0.0104)
owner: family	0.0226	0.0158	-0.0203	0.0486*	0.0620**
	(0.0423)	(0.0133)	(0.0164)	(0.0251)	(0.0236)
Industry Fixed Effects	NO	YES	YES	YES	YES
Country Fixed Effects	YES	YES	YES	YES	YES
Pseudo R^2	0.1789	0.1813	0.2106	0.1970	0.1418
Number of observations	339	1797	990	659	718

Notes: Marginal effects are reported. For binary coded variables, the result expresses the impact of a discrete change of the variable from 0 to 1. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Column (1): only manufacturing; Column (2): only service; Column (3): only central Europe; Column (4): eastern Europe; Column (5): only PIGS.

Table 6: Probit estimation results: relationship between trade credit supply, bank loan availability, and product innovation

Variable	(1)	(2)	(3)	(4)
product innovation	0.0258***	0.0159**	0.0135	0.00866
	(0.00928)	(0.00744)	(0.00938)	(0.00887)
turnover increase		0.0190*	0.01123	0.0166
		(0.0101)	(0.0117)	(0.0154)
turnover decrease		-0.00009	-0.0221**	0.0203*
		(0.00791)	(0.0101)	(0.0126)
bank loans: unchanged		-0.0842***	-0.0719***	-0.0607***
		(0.00943)	(0.0113)	(0.0144)
bank loans: deteriorated		-0.0626***	-0.0522***	-0.0397***
		(0.00757)	(0.00961)	(0.0105)
bank loans: not use		-0.0637***	-0.0637***	-0.0393***
		(0.00673)	(0.00957)	(0.0070)
log(age)	-0.00528	-0.00248	-0.00753	-0.00158
	(0.00522)	(0.00478)	(0.00605)	(0.00567)
log(employment)	0.00167	-0.00108	0.00101	-0.0128
	(0.00353)	(0.00300)	(0.00666)	(0.0101)
owner: family	-0.00586	-0.00227	-0.0097	0.01019
	(0.00876)	(0.00749)	(0.00869)	(0.00822)
Industry Fixed Effects	YES	YES	YES	YES
Country Fixed Effects	YES	YES	YES	YES
Pseudo R^2	0.0540	0.1518	0.1987	0.1912
Number of observations	2698	2698	1564	733

Notes: Marginal effects are reported. For binary coded variables, the result expresses the impact of a discrete change of the variable from 0 to 1. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Column (1): all SMEs are included; Column (2): all SMEs are included; Column (3): only micro firms; Column (4): only small firms.

Table 7: Probit estimation results: relationship between trade credit supply, bank loan availability, and product innovation

Variable	(1)	(2)	(3)	(4)	(5)
product innovation	-0.00069	0.0173**	-0.00767	0.0401**	0.0157
	(0.0153)	(0.00826)	(0.00920)	(0.0189)	(0.0134)
turnover increase	-0.00390	0.0310***	0.0238*	-0.0095	0.0123
	(0.0234)	(0.0137)	(0.0144)	(0.0221)	(0.0213)
turnover decrease	0.0118	-0.00074	0.00357	0.00338	-0.00439
	(0.0208)	(0.00858)	(0.0127)	(0.0202)	(0.0134)
bank loans: unchanged	-0.0710***	-0.0730***	-0.0719***	-0.0852***	-0.0989***
	(0.0246)	(0.0107)	(0.0163)	(0.0177)	(0.0226)
bank loans: deteriorated	-0.0343*	-0.0480***	-0.0438***	-0.0841***	-0.0647***
	(0.0175)	(0.00815)	(0.0108)	(0.0176)	(0.0168)
bank loans: not use	-0.0140	-0.0579***	-0.0495***	-0.0860***	-0.0566***
	(0.0188)	(0.00731)	(0.0102)	(0.0167)	(0.0110)
log(age)	0.00216	-0.00377	-0.00512	0.0057	-0.0060
	(0.0124)	(0.00472)	(0.00477)	(0.0155)	(0.0104)
log(employment)	0.0095	-0.00385	0.00462	-0.0110	0.0023
	(0.00713)	(0.00302)	(0.00413)	(0.00803)	(0.0053)
owner: family	-0.0509***	-0.00278	-0.0102	-0.0095	0.0191
	(0.0245)	(0.00730)	(0.0108)	(0.0172)	(0.0120)
Industry Fixed Effects	NO	YES	YES	YES	YES
Country Fixed Effects	YES	YES	YES	YES	YES
Pseudo R^2	0.1877	0.1839	0.1737	0.1419	0.1979
Number of observations	255	1844	969	682	716

Notes: Marginal effects are reported. For binary coded variables, the result expresses the impact of a discrete change of the variable from 0 to 1. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1. Column (1): only manufacturing; Column (2): only service; Column (3): only central Europe; Column (4): eastern Europe; Column (5): only PIGS.

Table 8: Robustness checks

Model	bi-probit		probit		re-logit	logit
dependent variable	provision	demand	provision	demand	provision	provision
Variable	(1)	(2)	(3)	(4)	(5)	(6)
product innovation	0.185**	0.119*	0.184**	0.120*	0.361**	0.369**
	(0.087)	(0.071)	(0.087)	(0.071)	(0.181)	(0.184)
turnover increase	0.203*	0.324***	0.209*	0.327***	0.400*	0.421*
	(0.112)	(0.101)	(0.112)	(0.101)	(0.230)	(0.234)
turnover decrease	-0.006	0.244***	0.001	0.252***	-0.016	-0.008
	(0.104)	(0.089)	(0.104)	(0.089)	(0.224)	(0.227)
bank loans: unchanged	-1.145***	0.118	-1.152***	0.112	-2.134***	-2.207***
	(0.122)	(0.128)	(0.121)	(0.127)	(0.244)	(0.248)
bank loans: deteriorated	-0.955***	0.436***	-0.957***	0.431***	-1.717***	-1.781***
	(0.117)	(0.128)	(0.117)	(0.127)	(0.220)	(0.223)
bank loans: not use	-1.260***	-0.264*	-1.265***	-0.269*	-2.384***	-2.483***
	(0.149)	(0.149)	(0.149)	(0.149)	(0.320)	(0.325)
log(age)	-0.032	-0.081*	-0.030	-0.079*	-0.052	-0.053
	(0.058)	(0.045)	(0.058)	(0.045)	(0.122)	(0.124)
log(employment)	-0.012	0.172***	-0.013	0.170***	-0.022	-0.026
	(0.037)	(0.030)	(0.037)	(0.030)	(0.077)	(0.078)
owner: family	-0.022	0.109	-0.027	0.107	-0.091	-0.093
	(0.091)	(0.076)	(0.090)	(0.076)	(0.188)	(0.191)
Industry Fixed Effects	YES		YES	YES	YES	YES
Country Fixed Effects	YES		YES	YES	YES	YES
Pseudo R^2			0.1518	0.1711		0.1507
Number of observations	2698		2698	2698	2698	2698

Notes:Robust standard errors in parentheses (except column 5 where the robust option is not available). *** p<0.01, ** p<0.05, * p<0.1. Column (1):bi-probit results for trade credit provision; Column (2): bi-probit results for trade credit demand; Column (3): probit results for trade credit provision; Column (4): probit results for trade credit demand; Column (5): rare event logit results for trade credit provision; Column (6): logit results for trade credit provision.