

Trade credit versus bank credit: a simultaneous analysis in European SMEs

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Abstract Trade credit and bank credit constitute two of the most important external sources of finance for small firms. The purpose of this paper, first and foremost, is to explore the complementary or substitutive relationship between trade credit and bank credit by considering the joint determination of both resources on small and medium-sized enterprises (SMEs), and second, it analyses how the country institutional factors affect these two resources. Specifically, we introduce the efficiency of the legal system and the development of the financial sector. For the empirical analysis, we use a simultaneous equations model across a sample of 60,377 SMEs operating in 12 European Union countries over the period 2008–2014. The results suggest that two resources, trade credit and short-term bank credit, are simultaneously determined and negatively related in SMEs. The results also suggest that trade credit and bank credit depend on country institutional factors.

Keywords Trade credit · Bank credit · Legal system · SMEs · Financial development

JEL G21 · G32 · K4 · L26

1 Introduction

The study of the relationship between trade credit and bank credit is a key issue in corporate finance research. Since the appearance of the seminal work of Meltzer (1960), many studies have confirmed that companies use more trade credit when faced with difficulties in accessing bank financing (Brechling and Lipsey 1963; Jaffee and Modigliani 1969; Schwartz 1974; Garcia-Appendini and Montoriol-Garriga 2013). In the financial literature, this has commonly been referred to as the substitution hypothesis between trade credit and bank credit.

An alternative hypothesis can also explain this relationship. Biais and Gollier (1997) argue that, in theory, trade credit and bank credit move in the same direction, in that they either both increase or both fall. In this case, unlike the previous hypothesis, trade credit is not considered as simply a helping hand when bank loans fall. This suggests that trade credit and bank credit are complementary financial resources. Since then, many studies seem to have confirmed this hypothesis of complementarity (Kohler et al. 2000; Kling et al. 2014).

Bearing this in mind, the type of relation between trade credit and bank credit becomes even more

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significant for small and medium-sized enterprises (SMEs). SMEs are more dependent on trade credit and bank credit, since they have limited access to financial markets (Chant and Walker 1988; Berger and Udell 1998). Furthermore, they suffer more restrictions for credit; their inherent lack of transparency and lack of appropriate collateral exacerbate information asymmetries, resulting in severe credit rationing (Stiglitz and Weiss 1981).

Empirical studies on SMEs have paid particular attention to this relationship in periods of crisis due to the added difficulties of these firms in obtaining funding during these times. The results of this evidence are of a mixed nature with regard to the substitutive or complementary relationship between trade credit and bank credit. From among this evidence, which carried out on European SMEs, this draws particular interest because cross-country studies that analyse similar areas and similar periods (the recent times of crisis) have revealed divergent results. While some authors observe a substitutive effect (Casey and O'Toole 2014; McGuinness et al. 2017), others observe a complementary effect (Illueca-Muñoz et al. 2016; Andrieu et al. 2018). These mixed results lead us to consider that more in-depth research and analysis into the relationship between trade credit and bank credit are certainly required. Specifically, two issues are taken into account in this article.

Firstly and foremost, we face a major challenge in studying the relation between bank credit as short-term debt and trade credit. Most previous empirical studies have only considered the effect of bank credit on trade credit and not vice versa. This implies the assumption that a company determines its financial resources separately. Therefore, the results of previous evidence are likely to be conditioned by this assumption. Following Yang (2011), we consider these two resources as being simultaneously determined. This allows us to handle the endogeneity (that is, not only does bank credit influence trade credit, but that trade credit also influences bank credit) and the potential bias. Moreover, unlike Yang (2011), who performed his study on a sample of US listed companies, we focus on European SMEs, in which, as we have previously mentioned, mixed empirical results have been observed.

Secondly, we consider the institutional environment in which firms do business because trade financing and bank financing choices are determined by a combination of factors that are related, not only to firm characteristics,

but also to the geographical area (Demirgüç-Kunt and Maksimovic 2001; Burkart and Ellingsen 2004; Palacín-Sánchez et al. 2013). However, there are no studies that consider institutional factors to jointly analyse trade credit and bank credit in SMEs, with the exception of Deloof and La Rocca (2015) and McGuinness et al. (2017) which research only the effects of institutional factors on trade credit at regional and national level, respectively. Two institutional factors are therefore introduced into our simultaneous equations model to appreciate the role of these factors on bank credit and trade credit: first, the legal system, which influence financial decisions (La Porta et al. 1997), and second, the degree of development of the financial sector, which is also relevant in the decisions on trade credit and bank credit (Demirgüç-Kunt and Maksimovic 2001).

Our empirical analysis uses a large sample of European Union SMEs over the period 2008–2014. It should be borne in mind that, in Europe, SMEs are the predominant companies, representing 99.9% of all businesses (Eurostat n.d.). Moreover, the EU countries considered (Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, the Netherlands, Portugal and Slovenia) present the advantage that they have a certain degree of homogeneity due to their single currency, and it is therefore easier to identify the institutional factors that influence trade credit and bank credit across these areas (Ziane 2008). Our results show that trade credit and bank credit as short-term debts are simultaneously determined and negatively related in SMEs. Moreover, this substitution effect between these two short-term resources is confirmed in most countries and for every year considered. In addition, the institutional factors under consideration significantly affect trade credit and bank credit. Specifically, while a developed financial sector makes it easier to obtain short-term resources, such as trade credit and bank credit, a more efficient legal system leads both to a lesser use of short-term resources and to a greater use of long-term resources. All these results not only help to explain how SMEs deal with their specific financing problems since firms can obtain more financing from suppliers or banks if there is a fall in bank credit or trade credit, respectively, but could also help policymakers in their design of better solutions.

The rest of the article is organised as follows. We review the financial literature of this investigation and formulate the hypotheses of our study in Section 2.

Section 3 presents the sample of companies, the variables to be studied, the descriptive statistics for all variables considered and the model and methodology to be followed in our research. Section 4 presents our empirical results, and Section 5 concludes.

2 Literature review: theory and empirical evidence

2.1 The relation between trade credit and bank credit

Research into the relationship between trade credit and bank credit started with the macroeconomic model by Meltzer (1960). This establishes that in periods of monetary contraction, firms with greater liquidity extend trade credit to those that have restricted access to bank loans, thereby mitigating credit rationing. Many studies have since related these two financial resources by considering the effect of bank lending over trade credit, regardless of monetary policy. On the one hand, the substitution hypothesis shows that firms tend to employ trade credit to a greater degree when credit from financial institutions becomes constricted. The explanation for this hypothesis is that suppliers are able to lend when banks cannot, acting as financial intermediaries, due to certain advantages obtained during the course of their business. Among these advantages, we can highlight the greater speed and lower costs in acquiring customer financial information due to the asymmetric information financial theory (Smith 1987), greater control over the customer due to the potential threat of cutting off the supply (Cuñat 2007) and the ability to recover unpaid goods supplied to the customers (Mian and Smith 1992). To sum up, supplier may be better than banks in terms of being aware of the financial situation of their customers and regarding the management of credit payment (Petersen and Rajan 1997).

On the other hand, Biaisi and Gollier (1997) challenge this traditional view, arguing that banks may agree to lend if suppliers also lend to their customers. This complementary relation implies that the use of trade credit acts as a signal and reveals suppliers' information to the banks, which cannot always assess the financial quality of a firm when information on the firm appears opaque. Therefore, the application of trade credit reduces the information asymmetry between the firm and the bank, thereby improving the reputation and access to loans for the firm (Alphonse et al. 2006) and making a

complementarity hypothesis between trade credit and bank credit possible.

It is worthy of note that the relationship between trade credit and bank credit becomes an overriding question in SMEs, due to their opacity which exacerbates information asymmetries and results in credit rationing (Stiglitz and Weiss 1981) and to their very limited possibilities for access to alternative financing other than bank credit and trade credit, such as financial markets (Berger and Udell 1998).

The empirical research showing the relationship between trade credit and bank credit, especially in terms of short-term debt, in SMEs worldwide has paid special attention to periods of crisis (Table 1). The substitution hypothesis is confirmed in various single-country studies. Nilsen (2002), regarding the severe 1979–1982 recession in the USA, shows that when banks restrict loans, then small firms increase trade credit as a substitute and less desirable alternative. In Spain, Carbó-Valverde et al. (2016) provide evidence that the substitution between the two resources has been more intense during the recent crisis. Moreover, in Spain (Canto-Cuevas et al. 2016) and in Ireland (McGuinness and Hogan 2014), this relation has been confirmed in a period that includes growth and crisis years. With regard to cross-country studies, Casey and O'Toole (2014) and McGuinness et al. (2017) have also supported this hypothesis in the European Union during the recent crisis.

Notwithstanding, the complementarity hypothesis is confirmed mainly in single-country studies. In Japan, regarding different banking crises such as those of the 1990s and early 2000s, Fukuda et al. (2007) and Taketa and Udell (2007) find that bank loans and trade credit contracted simultaneously and therefore trade credit and financial institution lending shifted in the same direction; additionally, Tsuruta (2015) observes, in the recent global financial crisis, that trade payables increase if bank loan availability enhances. Further single-country studies in Europe during the recent crisis can be found. In a sample of Italian SMEs, Deloof and La Rocca (2015) suggest that trade credit complements the bank financing at the local level, and Agostino and Trivieri (2014) observe that trade credit appears to positively affect bank financing. Psillaki and Eleftheriou (2015), in French smaller firms, and Yazdanfar and Öhman (2017), in Swedish SMEs, show that trade credit is complementary to bank credit, which amplifies the negative effect of the reduction of bank financing. With respect to

Table 1 Studies showing the relation between trade credit and bank credit on SMEs worldwide during a period of crisis

Empirical relation between trade credit and bank credit	Study	Cross-country versus single-country study	Geographical area
Substitute	Nilsen (2002)	Single-country	USA
	Carbó-Valverde et al. (2016)	Single-country	Spain
	McGuinness and Hogan (2014)	Single-country	Ireland
	Canto-Cuevas et al. (2016)	Single-country	Spain
	Casey and O'Toole (2014)	Cross-country	European Union
	McGuinness et al. (2017)	Cross-country	European Union
Complementary	Fukuda et al. (2007)	Single-country	Japan
	Taketa and Udell (2007)	Single-country	Japan
	Agostino and Trivieri (2014)	Single-country	Italy
	Tsuruta (2015)	Single-country	Japan
	Deloof and La Rocca (2015)	Single-country	Italy
	Psillaki and Eleftheriou (2015)	Single-country	France
	Yazdanfar and Öhman (2017)	Single-country	Sweden
	Love and Zaidi (2010)	Cross-country	Emerging countries
	Illueca-Muñoz et al. (2016)	Cross-country	European Union
	Andrieu et al. (2018)	Cross-country	European Union

cross-country studies, Illueca-Muñoz et al. (2016) observe that the complementary relationship becomes more likely in the European Union, a relationship that is also shown by Andrieu et al. (2018) between the probabilities of obtaining bank credit and trade credit regarding countries in similar geographical areas. Love and Zaidi (2010) also confirm this hypothesis in four East Asian countries (Thailand, Korea, the Philippines and Indonesia) during the financial crisis of 1998.

The empirical results in Table 1 are of a mixed nature, even when analysing the same period and/or geographical area, as is the case of the studies focused on the European Union during the recent economic crisis. This underlines the need to continue studying the true nature of the relationship between trade credit and bank credit (Psillaki and Eleftheriou 2015). All studies in Table 1 assume that companies determine their financial resources separately, and the effect of bank credit on trade credit is specifically analysed. However, following Yang (2011), who focuses on US listed companies, we allow trade credit and short-term bank credit in SMEs to be simultaneously determined and causality between them to run in both directions. This is crucial to ascertain how these resources are related and to avoid spurious

correlations of other studies that do not consider this possibility.

Overall, on the one hand, the effect of bank credit on trade credit, more commonly analysed in empirical literature, first, under the assumption of a substitutive relation, implies that less bank credit leads to more trade credit and that more bank credit leads to less trade credit, due to the capability of suppliers to lend when banks cannot, thereby acting as financial intermediaries (Petersen and Rajan 1997), and second, under the assumption of a complementary relation, this implies that more bank credit leads to more trade credit and that less bank credit leads to less trade credit, whereby in this case, bank credit provides confidence to suppliers and facilitates access to trade credit (Tsuruta 2015). On the other hand, the effect of trade credit on bank credit implies, first, under the assumption of a substitutive relation, that less trade credit leads to more bank credit and that more trade credit leads to less bank credit. In this case, the limitations on trade credit faced by SMEs due to the problems that suppliers experience in offering financing (McGuinness and Hogan 2014), or the unwillingness of suppliers to offer trade credit because they are not interested, for instance, in increasing their sales

(Choi and Kim 2005), could be offset by financial intermediaries. Second, under the assumption of a complementarity relation, this implies that more trade credit leads to more bank credit and that less trade credit leads to less bank credit, because trade credit acts as a signal and reveals suppliers' knowledge to the banks, which cannot always assess the financial quality of a firm when information on the firm appears non-transparent (Alphonse et al. 2006; Psillaki and Eleftheriou 2015).

Consequently, our first two hypotheses show the relationship between trade credit and short-term bank credit by considering that the causality between them runs in both directions, and since the aforementioned substitution effect and the complementary effect remain commonly observed in the previous empirical evidence on SMEs, especially in the European case, then each of these hypotheses is divided into two as follows:

H1a: Less short-term bank credit leads to more trade credit, and more short-term bank credit leads to less trade credit.

H1b: Less short-term bank credit leads to less trade credit, and more short-term bank credit leads to more trade credit.

H2a: Less trade credit leads to more short-term bank credit, and more trade credit leads to less short-term bank credit.

H2b: Less trade credit leads to less short-term bank credit, and more trade credit leads to more short-term bank credit.

2.2 Institutional factors and trade credit and bank credit

Most empirical studies have analysed the relationship between trade credit and bank credit together with certain firm characteristics that can also influence the level of credit. However, a relevant line of research is also under development which covers how geographical areas and their institutional differences explain a firm's financing choices (Rajan and Zingales 1995; La Porta et al. 1998). Prevalent previous research has examined the effect of certain institutional factors on leverage by performing cross-country studies that have employed samples of large and listed firms (Demirgüç-Kunt and Maksimovic 1999; Booth et al. 2001; De Jong et al. 2008; López-Iturriaga and Rodríguez-Sanz 2008; González and González 2008; Fan et al. 2012; Kirch

and Terra 2012) and samples of SMEs (Giannetti 2003; Utrero-González 2007; Hernández-Cánovas and Koëter-Kant 2011; Jöeveer 2013). More recently, considerable attention has been focused on the study of the differences in trade credit across countries. Those worth mentioning include Demirgüç-Kunt and Maksimovic (2001), based on a sample of large and listed firms, and Casey and O'Toole (2014) and McGuinness et al. (2017) and Andrieu et al. (2018), who performed their study on a sample of SMEs.¹ However, there are no studies that consider institutional factors to jointly analyse trade credit and bank credit in SMEs. Two institutional factors are therefore considered, which could influence both resources.

Efficiency of the legal system The efficiency of a country's legal system is central to understanding the availability of external financing, including trade credit and bank credit (Demirgüç-Kunt and Maksimovic 1999). Given the agency problem described by Jensen and Meckling (1976), when the legal system fails to protect investors, external finance cannot work correctly and investors refrain from providing finance for firms. Empirical studies carried out in Europe, such as those by Giannetti (2003) and by McGuinness et al. (2017), have shown the relevance of the efficiency of the legal system in SME financing decisions regarding bank credit and trade credit, respectively.

On the one hand, this factor is usually positively related to bank loans, thereby providing evidence of a higher use of bank credit when investors' rights are well enforced by regulators and courts (Beck et al. 2008). Alternatively, it is possible that, in countries with weaker laws and enforcement mechanisms, companies tend to use more short-term bank credit, since this agreement requires less caution and are contractually easier to interpret in comparison with other financial resources (Fan et al. 2012). Along these lines, Hernández-Cánovas and Koëter-Kant (2011), in a sample of European countries, show that lenders are more likely to grant short-term loans in countries where laws for the control of borrowers are unreliable. The reason is that granting short-term debt forces banks to check the firm's performance more frequently and, if there is any problem, the

¹ In contrast to our research, the empirical studies of Casey and O'Toole (2014) and Andrieu et al. (2018) are based on the data of the SME Access to Finance survey carried out on behalf of the European Commission.

banks could modify the loan conditions or refuse to renew the loans. Since we focus specifically on short-term bank credit as is common in previous empirical literature on that topic, the third of our hypotheses can be formulated as follows:

H3: The level of efficiency of the legal system has a negative effect on short-term bank credit of SMEs.

On the other hand, the legal system also affects the ability of firms to obtain trade credit. All types of borrowing, including trade credit, are facilitated by a legal system that encourages the repayment of the loan (Demirgüç-Kunt and Maksimovic 2001). Thus, it could be expected that trade credit is positively related to the efficiency of a legal system. However, even though a weak legal system will affect both formal intermediaries and trade credit providers, trade credit can mitigate these problems better than formal lenders. This is because trade creditors may be able to intimidate customers, without the need to resort to the legal system, by threatening to halt deliveries; this effect suggests that trade credit is negatively related to the efficiency of the legal system (Demirgüç-Kunt and Maksimovic 2001; Fisman and Love 2003). Consequently, the fourth of our hypotheses can be stated:

H4: The level of efficiency of the legal system has a negative effect on the trade credit of SMEs.

Development of the financial sector The level of development of the financial sector (banking sector) of a country is an institutional factor that can influence trade credit and bank credit. This factor directly affects bank loans. A well-developed financial sector should help to solve asymmetric information problems between those firms that borrow funds and financial intermediaries, and this should imply easier access to bank credit, especially for SMEs, which are subject to more credit restrictions (Demirgüç-Kunt and Maksimovic 2001; Beck and Demirgüç-Kunt 2006). Furthermore, this factor indirectly affects trade credit. A developed financial sector could also favour a greater use of trade credit. The level of trade credit may be greater if suppliers have access to bank loans, since suppliers can act as agents for financial intermediaries, by channelling short-term funds from financial institutions into an economy for its greatest use. This effect has been observed in periods of economic growth (Demirgüç-Kunt and Maksimovic

2001; Beck et al. 2008; Wu et al. 2014; Deloof and La Rocca 2015) and in times of economic crisis (Love et al. 2007).

At European level, the banking system presents significant differences between countries that suggest the relevance of this institutional factor (Ayady et al. 2009). In this region, three studies can be highlighted: first, Giannetti (2003) finds significant country differences between their levels of debt, and therefore, the degree of financial development, *inter alia*, can be considered as responsible for these differences; second, McGuinness et al. (2017) observe a positive relation between the level of development of the financial sector and the level of trade credit, due to the fact that a more developed financial sector is more efficient at controlling borrower risk and would therefore grant more loans; and third, Andrieu et al. (2018) show that financial development is positively associated with the probability of obtaining bank credit and trade credit.

Therefore, our fifth and sixth hypotheses are formulated as follows:

H5: The level of development of the financial sector has a positive effect on the short-term bank credit of SMEs.

H6: The level of development of the financial sector has a positive effect on the trade credit of SMEs.

3 Data, variables and research methodology

3.1 Data

The sample of firms used for our study was obtained from the *Analyse Major Databases from European Sources* (AMADEUS). This is a European database, constructed by Bureau van Dijk, which contains financial information on over 13 million public and private companies. Specifically, we have selected those SMEs whose parameters lie within the European Commission definition for every year under consideration: number of employees between 10 and 250, sales between 2 million and 50 million euros and total assets ranging from 2 million to 43 million euros. Moreover, firms have not been required to be active for every year under consideration; firms pertaining to the financial sector were excluded.

Our SME sample covers 12 EU countries over the period 2008–2014. We have considered all the countries that were part of the Eurozone during the whole period analysed² (Austria, Belgium, Germany, Spain, Finland, France, Greece, Ireland, Italy, the Netherlands, Portugal and Slovenia).³ The Eurozone share a common currency; however, this area also shows heterogeneity, including the largest European economies and peripheral European economies and countries with differences in certain institutional factors that affect a firm's financing (La Porta et al. 1997; Casey and O'Toole 2014). Moreover, the data covers an extended period of 7 years with low or negative economic growth in the euro area.

Finally, the sample contains 60,377 SMEs each year on average, and these provide an unbalanced panel with 422,639 observations over the 12 countries considered. Table 2 presents the number of observations per country, per industry (according to Standard Industrial Classification of Economic Activities 2009) and year. Moreover, this table also includes the statistics relating to number of firms, which reveals the distribution of firms in each country across the years.

3.2 Variables

3.2.1 Firm variables

In this study, we first need to define the two variables that should reflect trade credit and bank credit. It is necessary to emphasise that when trade payables are the dependent variable, then bank loans are included as an independent variable and vice versa. Trade credit (TCPAY) is defined as the ratio of trade payables to total assets (Petersen and Rajan 1997; Fukuda et al. 2007; García-Teruel and Martínez-Solano 2010; Yang 2011). In addition, regarding bank credit, we focus on short-term debts as is common in empirical studies on trade credit and bank credit (Love et al. 2007; McGuinness and Hogan 2014; among others) because a more intense relationship is expected between these two current liabilities. Short-term debt (STDEBT) is estimated as the ratio of short-term loans to total assets (García-Teruel and Martínez-Solano 2010; Huang et al. 2011).

Secondly, we also include classic firm determinants of trade credit and bank credit as control variables. In

accordance with previous empirical studies, we consider five characteristics of firms: size, collateral, liquidity, growth and profitability, which are defined as follows. Firm size (SIZE) is measured as the logarithm of the total assets (Petersen and Rajan 1997; Yang 2011; McGuinness and Hogan 2014). As collateral for trade credit, we consider the inventory of the firm (INVENTORY) which is measured as the ratio between inventories and total assets (Yang 2011; Kestens et al. 2012). As collateral for bank credit, we consider fixed assets (FIXEDAS) and this is defined as net fixed assets divided by total assets (Yang 2011; Bastos and Pindado 2013). Liquidity (CASH) is defined as the ratio of cash to total assets (Love et al. 2007; Yang 2011; Kestens et al. 2012). Growth (GROWTH) is defined as the annual sales growth percentage (Petersen and Rajan 1997; García-Teruel and Martínez-Solano 2010). Finally, the profitability of the firm (PROFIT) is proxy of the capacity of generating internal resources and is estimated as the ratio of earnings before interest and taxes to total assets (Love et al. 2007; Kestens et al. 2012; McGuinness and Hogan 2014).

According to the previous literature on trade credit, there is a relative consensus that supplier financing has a negative relation with size (Kestens et al. 2012), inventory (Taketa and Udell 2007), liquidity (Love et al. 2007) and profitability (García-Teruel and Martínez-Solano 2010; Canto-Cuevas et al. 2016). With regard to short-term bank credit, a negative relation is expected with size (Fan et al. 2012), fixed assets (Demirgüç-Kunt and Maksimovic 1999; Kirch and Renato 2012) and liquidity (Yang 2011).

3.2.2 Institutional variables

Two institutional factors are employed as independent variables. The proxy of the efficiency of the legal system (LEGALSYSTEM) is obtained from the World Bank for each country and year studied. This captures perceptions of the extent to which agents have trust in and abide by the norms of society and especially that of the quality of contract enforcement, property rights and the courts. Each country's score, in units of a standard normal distribution, ranges from approximately -2.5 , indicating a poor legal system, to 2.5 , where a country's legal system is efficient. This indicator has also been used in empirical studies such as Demirgüç-Kunt and Maksimovic (2001), Beck et al. (2008) and Hernández-Cánovas and Koëter-Kant (2011).

The development of the financial sector (PRIVCRED) is represented by the financial resources provided to the private sector by domestic money banks as a share of gross

² As in other empirical studies, Luxemburg, Malta and Cyprus are excluded due to their particular characteristics and residual relevance.

³ The countries are sorted alphabetically by their EU identifier in the text and in the tables.

Table 2 Number of observations per country, sector and year and the distribution of firms in each country across the years

Country	No. of observations	% of total	Mean no. of firms per year	Min no. of firms per year	Max no. of firms per year	Sector	No. of observations	% of total	Year	No. of observations	% of total
Austria	8243	1.95	1177.57	1047	1265	Agriculture, forestry and fishing	1289	0.3	2008	55,848	13.21
Belgium	31,778	7.52	4539.71	4383	4659	Mining and quarrying and energy	8429	1.99	2009	57,326	13.56
Germany	47,446	11.23	6778.00	5923	7992	Manufacturing	140,501	33.24	2010	59,036	13.97
Spain	69,233	16.38	9890.43	9019	10,627	Construction	27,634	6.54	2011	60,716	14.37
Finland	10,758	2.55	1536.86	1341	1747	Wholesale and retail trade	144,193	34.12	2012	62,434	14.77
France	96,769	22.9	13,824.14	13,075	14,862	Hotels and restaurants	7535	1.78	2013	65,060	15.39
Greece	8943	2.12	1277.57	1186	1361	Transport and communications	40,580	9.6	2014	62,219	14.72
Ireland	4626	1.09	660.86	556	757	Business services	34,586	8.18			
Italy	121,859	28.83	17,408.43	16,266	18,138	Education, health, social work	17,892	4.23			
Netherlands	2729	0.65	389.86	275	520						
Portugal	16,169	3.83	2309.86	2193	2403						
Slovenia	4086	0.97	583.71	528	616						
Total	422,639	100	5031.41	4649	5412	Total	422,639	100	Total	422,639	100

domestic product (GDP), because considering SMEs the development of the financial system is better to be measured in terms of banking development. This data is also obtained from the World Bank for each country and year studied and has been used in various studies, such as those by Demirgüç-Kunt and Maksimovic (1999), Beck et al. (2000), Beck et al. (2008) and Cassia and Vismara (2009).

On the other hand, we monitor the economic situation in each country under consideration by introducing the average annual growth rate in GDP per capita per country (GDPGROWTH), which is obtained from the World Bank. Following Demirgüç-Kunt and Maksimovic (2001); economic growth affects financing decisions since the growth of the economy is an indicator of the firms' financing needs.

3.3 Descriptive analysis

Table 3 presents the mean for all the variables of the study for each country; the mean value for the total

sample is also added, as are the median, minimum, maximum and standard deviation. All firm variables are winsorized at 1% and 99% to control for outliers in the data. Table 3 shows that EU SMEs make more use of trade credit than bank credit (on average, 22.5% of their resources are trade payables compared to 9.4% of short-term bank credit), with the only exception being that of Irish SMEs. This difference between trade credit and bank credit has also been observed in other studies carried out on European SMEs (García-Teruel and Martínez-Solano 2010). Moreover, bank credit and trade credit figures suggest differences between the countries, which could be explained by the great range of variation of the institutional factors across countries shown in Table 3.

Table 4 shows the correlations between all the variables of the study. The correlations among the independent variables are relatively low, which shows that multicollinearity is not a concern.

3.4 Methodology

For the estimation of the relationship between trade credit and bank credit, we employ a simultaneous equations model with trade credit and bank credit as dependent variables because trade credit and bank credit might be jointly determined (Yang 2011). In addition to variables that represent firm factors and institutional factors, the equations also include sector, country and time dummies. Firstly, the sector influences the level of trade credit and bank credit (Psillaki and Eleftheriou 2015); secondly, country dummies may capture certain institutional factors that are not shown by the country's other variables that are already considered (Palacín-Sánchez and di Pietro 2016); and thirdly and lastly, year dummies help to control out the effects of time in order to more accurately capture the primary effects. Therefore, the following equations are estimated in order to test our hypotheses:

$$\begin{aligned} \text{TCPAY}_{it} = & \alpha_0 + \alpha_1 \text{STDEBT}_{it} + \alpha_2 \text{SIZE}_{it} + \alpha_3 \text{INVENTORY}_{it} \\ & + \alpha_4 \text{CASH}_{it} + \alpha_5 \text{GROWTH}_{it} + \alpha_6 \text{PROFIT}_{it} \\ & + \alpha_7 \text{LEGALSYSTEM}_{jt} + \alpha_8 \text{PRIVCRED}_{jt} \\ & + \alpha_9 \text{GDPGROWTH}_{jt} + \text{sector dummies} \\ & + \text{country dummies} + \text{time dummies} + \varepsilon_{it} \end{aligned}$$

$$\begin{aligned} \text{STDEBT}_{it} = & \beta_0 + \beta_1 \text{TCPAY}_{it} + \beta_2 \text{SIZE}_{it} \\ & + \beta_3 \text{FIXEDAS}_{it} + \beta_4 \text{CASH}_{it} + \beta_5 \text{GROWTH}_{it} \\ & + \beta_6 \text{PROFIT}_{it} + \beta_7 \text{LEGALSYSTEM}_{jt} \\ & + \beta_8 \text{PRIVCRED}_{jt} + \beta_9 \text{GDPGROWTH}_{jt} \\ & + \text{sector dummies} + \text{country dummies} \\ & + \text{time dummies} + \xi_{it} \end{aligned}$$

where i is the firm, j is the country and t is the time period and ε_{it} and ξ_{it} represent the measurement errors.

In order to estimate the two equations, we use the generalised method of moments (GMM) which is the most common estimator in panel data analysis. This estimator enables the instrumental variables to be selected from within the model, lags of explanatory variable to be used as instruments and the problem of endogeneity to be managed.

The GMM estimator is not only robust for the distribution of errors (consistent estimator) but is also more efficient in the presence of arbitrary heteroscedasticity than estimators of the instrumental variables (IV), such as the two stages least square (2SLS) and three stages

least square (3SLS) estimators. The GMM estimator handles the spurious results generated by the OLS estimator and yields asymptotically correct estimates of the standard errors.

The Hansen test has been used to verify the validity of the instruments. Unlike most tests in econometrics, the Hansen test approves the instrument used when the null hypothesis that the instruments are appropriate cannot be rejected. In our study, the endogeneity variables are identified by the Durbin–Wu–Hausman test. The null hypothesis of exogeneity was rejected for the firm-variables: SIZE, INVENTORY, FIXEDAS, CASH, GROWTH and PROFIT.

4 Empirical results

Table 5 presents the regression results of the GMM that estimates the relation between trade credit and bank credit and vice versa, while controlling the determinants of the firm and country, sector and year dummies. These results show that trade credit and short-term bank credit are simultaneously determined. Furthermore, the sign of their relation is negative. That is, short-term debt negatively influences trade credit, and trade credit negatively influences short-term debt. Therefore, these two resources have a substitutive relation during the period of crisis studied, although bank credit is a more economically noticeable factor in the explanation of trade credit, while the effect of trade credit on bank credit is less. This verifies hypotheses H1a and H2a. On the one hand, the negative effect of short-term bank credit on trade credit could be interpreted to mean that SMEs use more trade credit when they suffer a decrease in short-term debt, since suppliers are able to lend and thereby can act as financial intermediaries. This effect has been observed in previous studies in similar areas and periods (McGuinness et al. 2017). On the other hand, the negative effect of trade credit on short-term debt may be due to a supply side effect of trade credit. In that context, suppliers are not able or are unwilling to offer trade credit, and SMEs compensate for this lack of supplier financing with bank credit. This effect has been observed in the USA by Yang (2011).

We subsequently investigate whether there is a different effect of bank credit over trade credit and vice versa, for each year and country considered. To this end, we use interaction variables in our equations model. Firstly, Table 6 shows the regression results including the

Table 3 Descriptive statistics

Variable	TCPAY	STDEBT	SIZE	INVENTORY	FIXEDAS	CASH	GROWTH	PROFIT	PRIVCRE	LEGALSYS	GDPGROWTH
Austria	0.075	0.072	9.075	0.174	0.279	0.111	0.170	0.051	93.785	1.867	0.968
Belgium	0.235	0.068	9.099	0.173	0.268	0.141	0.066	0.046	58.381	1.388	0.998
Germany	0.105	0.053	9.088	0.203	0.290	0.126	0.073	0.052	88.484	1.678	1.121
Spain	0.174	0.100	9.215	0.165	0.320	0.082	0.091	0.034	159.382	1.091	-0.432
Finland	0.129	0.047	8.931	0.219	0.275	0.115	0.120	0.051	86.496	1.969	-0.052
France	0.273	0.057	8.967	0.193	0.188	0.128	0.093	0.042	93.216	1.450	0.673
Greece	0.251	0.152	9.472	0.148	0.305	0.091	0.080	0.022	104.984	0.572	-3.370
Ireland	0.133	0.156	9.366	0.110	0.287	0.168	0.107	0.038	131.233	1.746	0.841
Italy	0.271	0.134	9.263	0.181	0.234	0.079	0.111	0.025	88.825	0.383	-0.916
Netherlands	0.125	0.002	9.414	0.148	0.229	0.151	0.055	0.056	115.976	1.835	0.487
Portugal	0.251	0.109	9.118	0.153	0.303	0.084	0.117	0.031	149.164	1.040	-0.595
Slovenia	0.287	0.137	9.156	0.170	0.409	0.053	0.109	0.040	75.200	0.988	0.330
Total sample											
Mean	0.221	0.092	9.165	0.180	0.256	0.103	0.097	0.035	103.074	1.091	-0.391
Median	0.186	0.027	9.172	0.135	0.192	0.049	0.032	0.024	93.180	1.166	0.490
Minimum	0.000	0.000	6.757	0.000	0.002	0.000	-0.501	-0.352	54.390	0.337	-9.132
Maximum	0.784	0.573	10.725	0.707	0.912	0.649	2.819	0.390	174.390	2.120	8.462
SD	0.180	0.129	0.793	0.178	0.226	0.134	0.397	0.096	30.758	0.521	2.368

Table 4 Correlation matrix

Variables	1	2	3	4	5	6	7	8	9	10	11
1. TCPAY	1										
2. STDEBT	-0.007*	1									
3. SIZE	-0.259*	0.066*	1								
4. INVENTORY	0.145*	0.190*	-0.038*	1							
5. FIXEDAS	-0.344*	0.020*	0.252*	-0.278*	1						
6. CASH	-0.060*	-0.275*	-0.121*	-0.196*	-0.224*	1					
7. GROWTH	0.001	-0.001	0.000	-0.001	-0.002	-0.001	1				
8. PROFIT	-0.017*	-0.057*	-0.031*	-0.008*	-0.035*	0.059*	-0.001	1			
9. LEGALSYSTEM	-0.154*	-0.221*	-0.112*	0.032*	0.002	0.158*	-0.002	0.032*	1		
10. PRIVCRED	-0.105*	0.046*	0.021*	-0.051*	0.120*	-0.093*	-0.001	-0.011*	0.000	1	
11. GDPGROWTH	-0.019*	-0.091*	-0.018*	0.030*	-0.041*	0.076*	0.000	0.029*	0.351*	-0.206*	1

*Significance at the 1% level

interaction of year dummies with STDEBT (column 1) and the interaction of year dummies with TCPAY (column 2). The negative coefficients in all these interaction variables confirm that the substitutive relation has been maintained over the years giving robustness to the result previously observed in Table 5. Secondly, Table 7 reports the estimation results including the interactions of the country dummies with STDEBT and with TCPAY, respectively. The results show that the relations between

Table 5 Relationship between bank credit and trade credit

Variables	TCPAY	STDEBT
STDEBT	-0.188*** (0.023)	
TCPAY		-0.062*** (0.007)
SIZE	-0.088*** (0.004)	-0.009*** (0.002)
INVENTORY	0.080*** (0.014)	
FIXEDAS		-0.032*** (0.007)
CASH	-0.219*** (0.022)	-0.311*** (0.009)
GROWTH	0.000*** (0.000)	0.000*** (0.000)
PROFIT	-0.109* (0.060)	-0.120*** (0.028)
Constant	1.025*** (0.085)	0.219*** (0.040)
Country dummies	Yes	Yes
Year dummies	Yes	Yes
Sector dummies	Yes	Yes
Hansen	1.050	1.050
Observations	305,160	305,160

GMM regressions. Robust standard errors in parentheses. The instruments are the second lags of the endogenous variables. The Hansen null hypothesis is accepted

*10%, **5% and ***1% levels of significance, respectively

Table 6 Relationship between bank credit and trade credit by year

Variables	TCPAY	STDEBT
STDEBT*2008	-0.123*** (0.005)	
STDEBT*2009	-0.107*** (0.006)	
STDEBT*2010	-0.108*** (0.005)	
STDEBT*2011	-0.120*** (0.005)	
STDEBT*2012	-0.107*** (0.005)	
STDEBT*2013	-0.089*** (0.005)	
STDEBT*2014	-0.096*** (0.005)	
TCPAY*2008		-0.079*** (0.003)
TCPAY*2009		-0.065*** (0.003)
TCPAY*2010		-0.070*** (0.003)
TCPAY*2011		-0.077*** (0.003)
TCPAY*2012		-0.068*** (0.003)
TCPAY*2013		-0.050*** (0.003)
TCPAY*2014		-0.051*** (0.003)
Constant	0.650*** (0.008)	-0.181*** (0.011)
Firm variables	Yes	Yes
Country dummies	Yes	Yes
Sector dummies	Yes	Yes
Year dummies	Yes	Yes
Hansen	3.816	3.816
Observations	302,083	302,083

GMM regressions. Robust standard errors in parentheses. The instruments are the second lags of the endogenous variables. The Hansen null hypothesis is accepted. See Table 5 for the identification of firm variables considered

*10%, **5% and ***1% levels of significance, respectively

Table 7 Relationship between bank credit and trade credit by country

Variables	TCPAY		STDEBT	
STDEBT*Austria	0.004	(0.012)		
STDEBT*Belgium	-0.052***	(0.007)		
STDEBT*Germany	-0.167***	(0.008)		
STDEBT*Spain	-0.156***	(0.005)		
STDEBT*Finland	0.116***	(0.021)		
STDEBT*France	-0.060***	(0.005)		
STDEBT*Greece	-0.195***	(0.010)		
STDEBT*Ireland	-0.070***	(0.009)		
STDEBT*Italy	-0.046***	(0.003)		
STDEBT*Netherlands	-0.066	(0.218)		
STDEBT*Portugal	-0.114***	(0.009)		
STDEBT*Slovenia	-0.114***	(0.017)		
TCPAY*Austria			-0.066***	(0.011)
TCPAY*Belgium			-0.014***	(0.004)
TCPAY*Germany			-0.073***	(0.004)
TCPAY*Spain			-0.039***	(0.003)
TCPAY*Finland			-0.005	(0.010)
TCPAY*France			-0.051***	(0.002)
TCPAY*Greece			-0.124***	(0.006)
TCPAY*Ireland			-0.136***	(0.015)
TCPAY*Italy			-0.011***	(0.002)
TCPAY*Netherlands			-0.021	(0.023)
TCPAY*Portugal			-0.061***	(0.005)
TCPAY*Slovenia			-0.047***	(0.010)
Constant	0.740***	(0.008)	0.554***	(0.011)
Firm variables	Yes		Yes	
Country dummies	Yes		Yes	
Sector dummies	Yes		Yes	
Year dummies	Yes		Yes	
Hansen	4.791		4.791	
Observations	302,083		302,083	

GMM regressions. Robust standard errors in parentheses. The instruments are the second lags of the endogenous variables. The Hansen null hypothesis is accepted. See Table 5 for the identification of firm variables considered

*10%, **5% and ***1% levels of significance, respectively

trade credit and bank credit and vice versa are significant and negative in the majority of countries (with the exception of Austria, Finland and Netherlands).

Table 8 presents the regression results of the GMM that estimates the effect of institutional variables over trade credit and bank credit. The first institutional factor, that of the efficiency of the legal system (LEGALSYSTEM), is statistically significant in explaining trade credit and bank credit in the period under consideration. Moreover, the sign of its relationship with the two dependent variables is

negative. Therefore, hypotheses H3 and H4 are verified. The result for H3 suggests that a less efficient legal system favours a greater use of short-term debt, due to the fact that this agreement is easier to interpret and easier to reverse in a suspicious legal environment and therefore enjoys fewer legal problems. On the other hand, the result of H4 could be interpreted to mean that suppliers can grant credit in a less effective legal system because they may be able to solve problems with their customers by threatening them with a halt in deliveries, without the need to resort to legal

Table 8 Influence of institutional factors on trade credit and bank credit

Variables	TCPAY		STDEBT	
STDEBT	-0.109***	(0.003)		
TCPAY			-0.059***	(0.002)
LEGALSYSTEM	-0.065***	(0.001)	-0.046***	(0.001)
PRIVCRED	0.001***	(0.000)	0.0001*	(0.000)
GDPGROWTH	0.001***	(0.000)	-0.002***	(0.000)
SIZE	-0.065***	(0.001)	-0.007***	(0.001)
INVENTORY	0.157***	(0.002)		
FIXEDAS			-0.045***	(0.001)
CASH	-0.092***	(0.003)	-0.300***	(0.002)
GROWTH	0.132***	(0.008)	-0.034***	(0.005)
PROFIT	-0.140***	(0.007)	-0.247***	(0.005)
Constant	0.950***	(0.008)	0.257***	(0.007)
Country dummies	Yes		Yes	
Sector dummies	Yes		Yes	
Year dummies	Yes		Yes	
Hansen test	1.668		1.668	
Observations	302,083		302,083	

GMM regressions. Robust standard errors in parentheses. The instruments are the second lags of the endogenous variables. The Hansen null hypothesis is accepted

*10%, **5% and ***1% levels of significance, respectively

procedures. These effects of the legal system on trade credit and bank credit have also been ascertained in previous studies carried out on listed and large firms (Demirgüç-Kunt and Maksimovic 2001; Fan et al. 2012). The second institutional factor, that of the development of the financial sector (PRIVCRED), presents a positive and significant effect on trade credit and bank credit, which means that SMEs in countries with highly developed financial intermediaries increase supplier financing and loans. This effect is due to the fact that greater development of the financial sector, even in a period of crisis, eases the flow of bank financing to companies. Moreover, in this context, SMEs can act more easily as financial intermediaries, by channeling short-term funds from banks to other firms. Therefore, hypotheses H5 and H6 are confirmed. Our findings are in line with previous studies over SMEs (such as those by Beck and Demirgüç-Kunt 2006 and by McGuinness et al. 2017, the latter only for trade credit).

With regard to control variables in Table 8, the annual growth rate in the GDP per capita of a country is significant and has a positive and a negative effect on trade credit and bank credit, respectively. This finding

suggests that the banks grant fewer short-term loans in times of economic growth, as is also confirmed by Fan et al. (2012), while firms also use more supplier financing, as is observed by Demirgüç-Kunt and Maksimovic (2001) and McGuinness et al. (2017). Finally, regarding the control variables of the firm, the sign of the relationships between both types of credit and firm factors is negative for size, cash, profit and the collateral for bank credit. These resulting signs are conditioned since our study is focused on short-term resources, and they mostly coincide with those in previous empirical studies.

4.1 Additional analyses

In order to check the robustness of the results, a set of additional analyses is run. Firstly, in our analysis of the relationship between trade credit and bank credit by considering the joint determination of both resources, we have focused on short-term debt. However, long-term debt could also be a substitute or a complement for trade credit (Yazdanfar and Öhman 2017; Fukuda et al. 2007; Deloof and La Rocca 2015) and vice versa, since a part of trade credit has the nature of permanent source of financing of the firm. The results (columns 1 and 2 in Table 9), when estimating the equations models using trade credit (TCPAY) and long-term debt (LTDEBT), (which is measured as the ratio of long-term loans to total assets), as dependent variables, show that trade credit and long-term debt are also simultaneously determined; however, both resources have a complementary relation. Thus, long-term bank credit positively affects trade credit, since suppliers may perceive the attainment of long-term debt from their customers as a positive signal. This relationship also operates in the opposite direction but is less economically significant. In this case, the availability of supplier credit might improve the reputation and access to long-term bank credit for the firm (Alphonse et al. 2006).

Secondly, the institutional variables are measured by other proxies (columns 3 and 4 in Table 9). On the one hand, the efficiency of the legal system is proxy by the Index Enforcing Contracts (ENFORCONT), which measures, on a scale from 0 to 100, the time and cost of resolving a commercial dispute through a local first-instance court and measures the quality of judicial processes, through the evaluation of whether each economy has adopted a series of good practices that promote quality and efficiency in the court system. This measure is highly significant since laws and regulations protect creditors only to the extent to which they are actually enforced (Giannetti

Table 9 Alternative measures of bank credit and institutional factors

Variables	TCPAY		LTDEBT		TCPAY		STDEBT	
LTDEBT	0.214***	(0.003)						
STDEBT					-0.102***	(0.003)		
TCPAY			0.026***	(0.002)			-0.056***	(0.002)
LEGALSYSTEM	-0.049***	(0.001)	0.020***	(0.001)				
PRIVCRED	0.0005***	(0.000)	0.0004	(0.000)				
ENFORCONT					-0.0001***	(0.000)	-0.0001***	(0.000)
DEPBANKAS/GDP					0.0004***	(0.000)	0.0003***	(0.000)
GDPGROWTH	0.002***	(0.000)	0.0005***	(0.001)	-0.002***	(0.000)	0.001***	(0.000)
SIZE	-0.059***	(0.001)	0.012***	(0.001)	-0.064***	(0.001)	-0.008***	(0.001)
INVENTORY	0.136	(0.002)			0.156	(0.002)		
FIXEDAS			0.220***	(0.002)			-0.045	(0.001)
CASH	-0.101***	(0.003)	-0.090***	(0.003)	-0.096***	(0.003)	-0.297	(0.002)
GROWTH	0.177***	(0.009)	0.165***	(0.008)	0.138***	(0.008)	-0.039	(0.005)
PROFIT	-0.174***	(0.008)	-0.246***	(0.007)	-0.144***	(0.007)	-0.249	(0.005)
Constant	0.876	(0.010)	-0.131***	(0.010)	0.800***	(0.008)	0.148	(0.006)
Year dummies	Yes		Yes		Yes		Yes	
Sector dummies	Yes		Yes		Yes		Yes	
Country dummies	Yes		Yes		Yes		Yes	
Hansen	1.25		1.25		1.545		1.545	
Observations	302,083		302,083		302,083		302,083	

GMM regressions. Robust standard errors in parentheses. The instruments are the second lags of the endogenous variables. The Hansen null hypothesis is accepted

*10%, **5% and ***1% levels of significance, respectively

2003). On the other hand, the development of the financial sector is measured by another variable used in previous empirical studies (Palacín-Sánchez and di Pietro 2016), DEPBANKAS/GDP, which represents the total assets held by money deposit banks as a share of GDP. The results using these two new proxies⁴ are similar to those shown above. Therefore, this finding lends robustness to the influence of institutional factors on trade credit and bank credit.

Thirdly, another model is applied to handle the endogeneity problems in order to assess the influence of the statistical method on the results (Table 10). Following Yang (2011), this is the two-stage least square within estimator (2SLS-fe). The new results

are similar to those shown above for Table 8. Therefore, this finding gives robustness to our previous results.⁵

Finally, Amadeus, the database used in this study, suffers from a problem of selection bias since the database clears inactive companies after 3 years. In order to check the robustness of our results to this survivorship bias, our regressions are estimated for a subsample which includes only the last 3 years. The new results are similar to those previously shown with the exception that PRIVCRED loses its significance but still maintains its positive sign.⁶

⁵ “Appendix Table 11” provides results using various econometric techniques: ordinary least squares (OLS), fixed effects (FE) and three-stage least squares (3SLS). The coefficients are in line with those estimated by GMM.

⁶ These results are not included in the article but can be provided by the authors upon request.

⁴ Both variables are obtained from the World Bank.

Table 10 Alternative estimator

Variables	TCPAY	STDEBT
STDEBT	-0.132*** (0.009)	
TCPAY		-0.219*** (0.009)
LEGALSYSTEM	-0.112*** (0.018)	-0.295*** (0.049)
PRIVCRED	0.001*** (0.000)	0.002*** (0.000)
GDPGROWTH	0.010*** (0.001)	0.032*** (0.003)
SIZE	-0.637*** (0.004)	-0.036*** (0.005)
INVENTORY	-0.016** (0.006)	
FIXEDAS		-0.344*** (0.007)
CASH	-0.456*** (0.009)	-2.485*** (0.025)
GROWTH	-0.395*** (0.018)	0.423*** (0.039)
PROFIT	-0.723*** (0.019)	-1.474*** (0.046)
Constant	0.343*** (0.035)	0.950*** (0.106)
Year dummies	Yes	Yes
Sector dummies	Yes	Yes
Country dummies	Yes	Yes
R ²	-5.459	-85.347
F stat	934.55	30.82
Observations	302,083	302,083

2SLS-fe regressions. Standard errors in parentheses

*10%, **5% and ***1% levels of significance, respectively

5 Conclusions

This article focuses on trade credit and bank credit, two of the most important financial resources for SMEs, in an effort to clarify, first, the complementary and substitutive relation by considering the joint determination of trade credit and bank credit, and second, the role of institutional factors on these two resources. To this end, we have carried out a cross-country study on EU SMEs during the period 2008 to 2014.

Overall, we find that trade credit and bank credit, proxied by short-term debt, are simultaneously determined and negatively related, which not only provides evidence of the substitution hypothesis in EU SMEs in times of crisis, as has occurred in previous studies (Casey and O'Toole 2014; McGuinness et al. 2017), but also shows that this substitutive relationship may be caused by a lack of bank credit or by a lack of trade credit. Moreover, this substitution effect between trade credit and short-term bank credit is confirmed in the majority of the countries and for every year considered. However, when we consider long-term bank credit, we find that trade credit and long-term debt are also simultaneously determined but that the two resources have a complementary relationship.

As regards institutional factors, our results suggest that the institutional environment of a country helps to better explain both trade credit and bank credit in SMEs. Firstly, the efficiency of the legal system shows a significant and negative relation, which provides evidence of a greater use of these short-term financial resources where laws and their enforcement are poor. Suppliers and banks probably overcome any weaknesses in the legal system by using short-term contracts. Secondly, the development of the financial sector positively influences trade credit and bank credit, and, therefore, the more developed the bank sector, the higher the level of trade credit and bank credit. This finding suggests that the substitutive relation between trade credit and short-term bank credit in times of crisis works better in countries where the financial institutions are more efficient since companies are able to find funding via banks or suppliers, which act as financial intermediaries by channelling short-term funds from banks to SMEs.

These results should further the understanding of the relevance of the substitutive relationship between trade credit and short-term bank credit in the survival of SMEs in a period of crisis. In many cases, the financing problems experienced by SMEs have been resolved with trade credit or bank credit as their only, and therefore indispensable, possibility. In addition, policy-makers, at both an individual country level and at European level, should bear in mind how the institutional factors of a country can influence these two vital resources; consequently, they should also be aware that their regulations concerning the financial sector and/or legal system could accentuate the differences between individual EU countries in financing SMEs, which would damage the required homogenisation of SME financing conditions across European countries.

Finally, as future research along these lines, it will be of interest to introduce the following: first, the study of other financial resources in order to analyse their simultaneous relation with trade credit; second, the study of other institutional factors, such as innovation and national culture, to explain trade credit and bank credit; and third and last, investigation into the role of the institutional context both at national and local level, since SMEs have to face the local financial context in their day-to-day business.

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Appendix

Table 11 Results of the OLS, fixed effects and 3SLS models

Model	OLS			Fixed effects			3SLS		
	TCPAY	STDEBT		TCPAY	STDEBT		TCPAY	STDEBT	
STDEBT	-0.107*** (0.002)	-0.051*** (0.001)		-0.105*** (0.002)	-0.064*** (0.001)		-1.087*** (0.006)		
TCPAY									
LEGALSYSTEM	-0.006** (0.005)	-0.012*** (0.004)		-0.009** (0.004)	-0.005* (0.005)		-0.109*** (0.018)		-0.334*** (0.008)
PRIVCRE	0.0004*** (0.000)	0.0001 (0.000)		0.0004*** (0.000)	0.0001* (0.000)		0.001*** (0.000)		-0.035*** (0.007)
GDPGROWTH	0.002*** (0.000)	0.0001 (0.000)		0.002*** (0.000)	0.001*** (0.000)		0.011*** (0.001)		0.0001** (0.000)
SIZE	-0.055*** (0.000)	0.001* (0.000)		-0.059*** (0.001)	-0.001 (0.001)		-0.605*** (0.004)		0.004*** (0.000)
INVENTORY	0.080*** (0.002)			0.079*** (0.002)			-0.003 (0.005)		-0.192*** (0.006)
FIXEDAS		-0.037*** (0.001)			-0.034*** (0.001)				-0.007** (0.003)
CASH	-0.100*** (0.002)	-0.253*** (0.002)		-0.106*** (0.001)	-0.258*** (0.002)		-1.016*** (0.009)		-0.478*** (0.005)
GROWTH	0.024*** (0.001)	-0.005*** (0.001)		0.026*** (0.001)	-0.004*** (0.000)		-0.603*** (0.017)		-0.249*** (0.008)
PROFIT	-0.070*** (0.003)	-0.117*** (0.002)		-0.060*** (0.002)	-0.103*** (0.003)		-0.306*** (0.017)		-0.316*** (0.013)
Constant	0.563*** (0.011)	0.047*** (0.009)		-0.163*** (0.009)	-0.076*** (0.013)		6.376*** (0.055)		2.061*** (0.065)
Year dummies	Yes	Yes		Yes	Yes		Yes		Yes
Sector dummies	Yes	Yes		Yes	Yes		Yes		Yes
Country dummies	Yes	Yes		Yes	Yes		Yes		Yes
R ²	0.223	0.165		0.223	0.165		0.182		0.151
F stat	3117.70	2156.22		2628.44	1811.52				
Hausman				19,544.77***	19,544.77***				
χ ²									
Observations	302,083	302,083		302,083	302,083		302,083		302,083

Ordinary least squares (OLS) and fixed effects (FE); robust standard errors in parentheses. Three-stage least squares (3SLS); standard errors in parentheses
* 10%, ** 5% and *** 1% levels of significance, respectively

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