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Analysis of factors influencing managerial decision to use trade credit in construction sector

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ABSTRACT

Trade credit is one of the most flexible short-term funding sources for companies and covers a significant part of the financial resources used by firms. Trade credit received makes available financial resources to achieve other economic objectives of the company. The managerial decision to increase or reduce trade credit offered and received or the collection and credit period is influenced by the company's financial performance. The aim of this paper is to analyse the correlation between trade credit receivable/payable and collection/credit period and six measures of financial performance and find if these variables have any impact on the decision to use trade credit. To achieve this aim, we used a sample of 958 European firms from the construction sector which were analysed using correlation and OLS regression, separately on developed and emerging countries. The main results found are: trade credit offered/received is directly correlated with return on equity and firm size, and inversely correlated with return on assets; trade credit offered is directly correlated with current liquidity and long-term banking loans; trade credit received is directly correlated with liquidity ratio and inversely correlated with current liquidity and long-term banking loans; and trade credit offered is inversely correlated with liquidity ratio.

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1. Introduction

Trade credit provides one of the most flexible short-term financing sources for firms. Additional features of trade credit packages include the amount of loans that the firm could obtain if the amount paid is delayed into the account and if discounts are applicable for payments in advance. The duration of trade credit offered depends on the following factors: customs and industrial practice, relative bargaining power and the product type (Pike & Heale, 2006).

Trade credit designates a deferred payment granted by a supplier of goods or services to the customer. Although granting a commercial credit by the supplier implies, however, financial difficulties for him, a trade credit policy promoted by the firm has a particular importance in meeting its current operating needs. In developed

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economies, trade credit covers a significant part of the financial resources of companies. Although trade credit represents a large part of its balance sheet, it does not seem to be an important net source of funding, nor to either large or small companies (Petersen & Rajan, 1997). But trade credit can be an important source of funding for some firms, categories of firms, or sectors of industry (Zackrisson, 2003).

This paper investigates the factors that influence the use of trade credit by construction firms because it is an important source of funding for companies that presents many advantages: rapidity, availability and flexibility in use; providers do not usually require any guarantees, they being in practice more understanding than banks in terms of any overrun of maturity; it is more appealing to small and medium enterprises since, most often, they do not enjoy the same treatment from banks as large firms; it is conveniently obtained as a normal part of the company's operations, expanding of trade credit determining the development of contracts for the needs of the firm; it is a relatively cheap source of financing for current activity; it makes available financial resources to achieve other economic objectives; knowing payment due date allows a realistic cash flow to be developed, which is necessary to obtain other funding sources; providers have better prospects of monitoring and forcing the customer to pay debts than do financial institutions; providers may have relevant information about the financial position of the customer; the aim of the provider is not to make money from financial agreements but to make profit from the sale of goods; and finally, a provider may offer favourable terms of payment in order to maintain a long-term relationship with the customer.

We must not overlook the fact that there are some risks arising from the use of trade credit: increasing short-term debt will have negative effects on the creditworthiness of the company; there are risks both to the supplier and the customer in the case of not fulfilling the contracts and/or payments; and poor valorisation of inventories purchased through trade credit leads to complex financial difficulties.

All these advantages and risks affect the financial performance of companies and, in addition, the financial performance of these companies allows for a large use of trade credit offered because of their financial viability or provides an increase in trade credit received because of the trust between business partners.

The aim of the paper is to analyse the correlation between six selected measures of financial performance and the impact of these variables on the decision to use trade credit by companies selected from the construction sector. To achieve this aim, the data of a sample of 958 European firms acting in the construction sector between 2004 and 2013 were analysed using correlation and OLS regression. This study is the first approach that analyses the effect of a certain financial performance on the managerial decision to expand/reduce the use of trade credit or the collection and credit period, while the majority of studies have analysed the inverse effect of using trade credit on financial performance (Kapkiyai & Mugo, 2015).

The selected sample comprises companies acting in the construction sector because this is a sector that has been less studied in relation to the use of trade credit, the majority of studies being oriented to the manufacturing sector. Also, this is the sector where the downturn in activity within the E.U.-28 lasted longer than for industry. Despite occasional short-lived periods of growth, the E.U.-28 index of production for

construction fell from a peak in February 2008 to a low in March 2013, a decline that left construction output 26.2% lower than it had been. Construction output expanded by a total of 7.6% until April 2014 and in July 2015 output remained relatively stable (Eurostat, 2015).

The model proposed in this paper may be a useful tool for decision-making in extending or reducing trade credit or the collection/credit period used by construction companies as a function of their financial performance. The paper contributes to the managerial approach of trade credit and is organised as follows. Section 2 presents the literature review related to trade credit and financial performance useful for hypothesis development, while section 3 highlights the methodology and data analysis and correlations. Section 4 reflects the results and discussions of regression analysis and the final conclusions are presented in section 5.

2. Literature review

The concept of trade credit explains the relationships between a firm and its customers and suppliers. Seifert, Seifert, & Protopappa-Sieke (2013) realised an integrative review of trade credit literature, from micro and macroeconomic perspectives, and found that trade credit increases the economic order quantity and could serve as a buyer-supplier coordination mechanism, useful in managerial decision-making.

Related to the use of trade credit by firms by using panel data regressions the main findings were: firms are using a mix of trade credit and bank loans (Yang, 2011); trade credit can be a substitute for loans for firms that were shut out of formal credit markets (Cull, Colin Xu, & Zhu, 2009); trade credit can be both a substitute for and a complement to bank credit (Chant & Walker, 1988; Yang, 2011); trade credit is a complement to bank credit (Ono, 2001); trade credit reduces treasury uncertainties (Brennan, Maksimovic, & Zechner, 1988); and trade credit offers control benefits in the early stages of a venture (Huyghebaert, 2006). For firms in poorly developed financial markets, borrowing in the form of trade credit may provide an alternative source of funds (Fisman & Love, 2003).

There is no fixed level of accounts receivable and payable that firm should have, this level being affected by many factors: suppliers' willingness to price discriminate; information asymmetry between suppliers and customers; market structure; stages of business cycles; and customers' creditworthiness (Altunok, 2011) as well as performance. Usually, both financial and commercial motives explain the credit behaviour of firms, and suppliers act as financial intermediaries in favour of companies with a limited access to bank credit (Delannay & Weill, 2004).

Thus, firms with better access to credit offer more trade credit (Petersen & Rajan, 1997) and larger firms, with better access to alternative internal and external financing and with a lower cost, use less credit from suppliers (García-Teruel & Martínez-Solano, 2010a). When lending becomes less severe, the allocation of lending becomes more efficient, and the amount of trade credit extended by private firms declined (Cull et al., 2009). Also, Nilsen (2002) found that: the reasons large firms use trade credit are financial in nature; small firms increase trade credit, a substitute credit, indicating a strong loan demand; and trade credit is widely used by small firms suffering loan decline.

The research developed by Fisman and Love (2003) shows that industries with higher dependence on trade credit financing exhibit higher rates of growth in countries with weaker financial institutions, and that most of the effect reported comes from growth in the size of pre-existing firms, consistent with barriers to trade credit access among young firms.

Firms use the trade credit channel to manage growth, and companies that are more vulnerable to financial market imperfections and are therefore more likely to be financially constrained, rely more on the trade credit channel to manage growth (Ferrando & Mulier, 2013). Also, firms prefer to delay collection from their customers then demand long-term trade credit from their suppliers and firms that present high levels of days of sales outstanding and a high probability of insolvency use more trade credit (Bastos & Pindado, 2013).

The use of trade credit played an important role in the relative performance of firms (Coulibaly, Sapriza, & Zlate, 2013). Financial performance for construction companies was often evaluated with a composite indicator, which usually incorporates measures such as profitability, value added and financial autonomy (Horta, Camanho, & Moreira da Costa, 2012), liquidity (Gurbuz, Aybars, & Kutlu, 2010; Horta et al., 2012), ownership structure and risk management (Mirza & Javed, 2013; Saliha & Abdessatar, 2011), capital structure (Mirza & Javed, 2013), debt (Saliha & Abdessatar, 2011), size (Love & Rachinsky, 2007) or sales (Forbes, 2002; Shah & Jan, 2014). Also, the four most well-known web-based benchmarking programmes that focus on construction companies' performance measurement were carried out in Brazil, Chile, the United Kingdom and the United States (Costa, Formoso, Kagioglou, Alarcon, & Caldas, 2006; Lee, Thomas, & Tucker, 2005; Ramirez, Alarcon, & Knights, 2004).

In this paper we investigate the influence of some financial performance measures (related to profitability, liquidity, degree of debts and firm size) on the decision to use trade credit for firms acting in the construction sector. This is an interesting topic, that was studied previous for many sectors, by using other financial variables. In the literature we found some models that try to determine influences or estimates of trade credit receivable and payable in different countries, such as: a model that identifies the response of accounts payable and accounts receivable to changes in the cost of inventories, profitability, risk and liquidity – this influence operating through a production channel (Bougheas, Mateuț, & Mizen, 2009) or an asset pricing model in which firms in different countries are connected by trade credit links that offer stronger predictability during periods of high credit constraints and low uninformed trading volume (Albuquerque, Ramadorai, & Watugala, 2015).

This paper is, however, distinguished from previous studies by the independent variables selected; by using a sample of firms acting in construction sectors in both developed and emerging countries in order to see if there are differences in the influence of using trade credit; and by using four indicators as dependent variables for trade credit. So, expressing the financial performance with the six indicators used in the literature, we try to investigate if there is a correlation between trade credit indicators and financial performance. We argue that financial performance alters the managerial decision to extend and receive trade credit through four categories of variables: profitability, liquidity, long-term funding and firm size.

Thus, according to the main findings in the literature, we proposed five hypotheses to test the relationship between trade credit receivable/payable and collection/credit period (as dependent variables) and some measures of financial performance (as independent variables), in order to substantiate the decision-making of extending/reducing the use of trade credit in the function of financial performance of the firm, measured by profitability, liquidity, degree of debt and size of firm.

2.1. Hypothesis development

Return on assets (ROA) and return on equity (ROE) are the most important profitability measures, and express the compensation for the capital invested by shareholders and financial creditors. A business that has a high return on equity is more capable of generating profit (Ongore & Kusa, 2013) and cash internally. Also, a higher return on assets indicates company management's efficiency of generating profits from the company's overall resources (Khrawish, 2011).

Usually, the literature studied whether changes in trade credit have an influence on financial performance. For example, Kroes and Manikas (2014) found that reductions in days of sales outstanding lead to improved company financial performances, whereas changes in the cash conversion cycle did not actually relate to changes in a company's performance.

Return on equity measures the profitability of shareholders' capital that is the financial investment made by shareholders when buying shares in the enterprise and is influenced by the way of asset securing and, thus, by the financial structure of the enterprise (La Bruslerie, 2002). Return on equity quantifies the remuneration of capital invested by shareholders, including the net profit at the disposal of the enterprise for self-financing (Lumby & Jones, 2003). Return on equity is the most relevant variable, ensuring the best predictions of performance, a fact demonstrated also by Zmijewski (1983) in a study performed on 72 enterprises filing for bankruptcy, and 3,573 non-bankrupt enterprises. For owner, this is the most expressive parameter for measuring the result as it is superior (as compared to owner's concern) to economic profitableness, to expenses or turnover (Bărbuță-Mișu, 2009).

Return on assets shows the profitability of a company, relative to its total assets, that is, how efficient management is at using its assets to generate earnings. So, return on assets is distinguished from return on equity, with the difference attributed to leverage (Nissim & Penman, 2001).

Although, regarding the relationship between profitability and trade credit use, Cull et al. (2009) mention that profitable firms are more likely to extend trade credit than unprofitable ones. By increasing their investment in receivables, managers can improve a firm's profitability, that means a positive linear relationship between trade credit and firm profitability, this effect being greater for larger, more liquid firms, firms with volatile demand, and for firms with more market share (Martínez-Sola, García-Teruel, & Martínez-Solano, 2014). Conversely, Vaidya (2011) found a negative relationship, and stated that highly profitable firms are found to both give and receive less trade credit.

Also, shorter credit periods than the industry mean reduced firm profitability (Martínez-Sola et al., 2014) while longer credit periods help customers facing liquidity problems, which may facilitate future sales (Hill, Kelly, Lockhart, & Washam, 2010). We know that firms operating in competitive markets are forced to offer industry credit terms. In effect, SMEs are forced to grant trade credit despite the costs associated with it, because not granting trade credit would lose sales, and decrease profitability (Cheng & Pike, 2003).

Related to the specificity of construction sector, we consider the first hypothesis:

Hypothesis 1: *Trade credit extension (receivable and payable, both as share in total assets or time period) is directly correlated with firm profitability.*

That means firms with high profitability increase/extend trade credit offered and receive more trade credit. We will check if this hypothesis is available for both forms considered for expressing profitability, that is, ROE and ROA, and for both developed and emerging countries.

Current liquidity ratio measures the capacity of cash flow of the enterprise that is short-term solvency and reflects the degree in which the turning into cash flow of circulating activities can satisfy the current payment obligations (Bărbuță-Mișu, 2009). Liquidity ratio that measures the current assets excluding inventories and trade credit extended over turnover (that means cash and cash equivalents scaled by turnover), is included in the analysis because the supplier's incentive to shift goods to the customer via trade credit is limited only by its need to obtain liquidity to meet its own obligations (Mateuț, Mizen, & Ziane, 2015).

Firms with a high ratio of current assets to total assets use more trade credit (Niskanen & Niskanen, 2006), and firms react by increasing the credit they grant in an attempt to stem falling sales. Ng, Smith, and Smith (1999) argue that trade credit is given by firms with high liquidity to firms with low liquidity. Holdings of liquid assets have a positive influence on both accounts receivable and accounts payable (Vaidya, 2011).

Furthermore, larger firms, with greater growth opportunities and a greater investment in current assets receive more finance from their suppliers (García-Teruel & Martínez-Solano, 2010b; Ono, 2001).

Hypothesis 2: *Firms with high current liquidity offer more trade credit or high collection terms and receive less trade credit or reduced credit terms.*

That means companies that have high values of current liquidity sell more on credit, having high values of accounts receivable because incentives to increase turnover, granting long terms of payments for sales on credit, or what is worrying, the weak policy to a poor debt recovery policy. Under these conditions, for safety, a company may decide in the next period to reduce the trade credit accorded and focus on debt recovery.

At the same time, a firm that had high values of current liquidity uses less trade credit payable. To increase the use of trade credit payable, the following managerial decisions could be made: negotiating of extended terms for trade credit received by the supplier or finding new suppliers that grant large credit terms. Thus, decision makers will try to balance high differences between current assets and current

liabilities, using more trade credit payable and/or reducing the use of trade credit receivable. Also, Peterson and Rajan (1997) and Bougheas et al. (2009) found a negative relationship between liquidity and trade credit extended.

Hypothesis 3: *Firms with a high liquidity ratio offer less trade credit or reduced collection terms and receive more trade credit or high credit terms.*

This hypothesis shows that companies with high liquidity ratio sell less on trade credit (offer less trade credit), preferring to sell on cash or use trade credit over a very short term. This means that in the future managers may decide to extend the trade credit offered or extend the period of trade credit in order to attract new clients by this facility and increase turnover.

The effect of financial deepening on the relationship between trade credit and cash holdings show that firms in regions with higher levels of financial deepening hold less cash for payables, while substituting more receivables for cash. Firms may have a high liquidity ratio when they receive more trade credit or benefit from a longer term of trade credit, allowing them to use cash for other investment opportunities and a more highly developed financial sector helps firms to better use trade credit as a short-term financing instrument (Wu, Rui, & Wu, 2012). These companies may decide to repay debt to reduce some costs and/or to benefit from the discount offered by the supplier.

The access to long-term financing plays an important role in trade credit extended or received. Long-term financing may be a substitute or complement of trade credit as we have already presented. The amount of long-term bank loans and the access to this external funding is influenced by firm profitability, liquidity and ownership (Fabbri & Klapper, 2016; Ge & Qiu, 2007; Guariglia & Mateuţ, 2013). These banking loans represent sources of finance that might allow firms to offer trade credit while continuing trading activity (Mateuţ et al., 2015). Otherwise, firms subject to loan restructurings use more trade credit payable (Niskanen & Niskanen, 2006).

Hypothesis 4: *Firms that use more long-term banking loans offer more trade credit or large collection terms and receive less trade credit or short credit terms.*

This hypothesis shows that companies with a high proportion of long-term debt in total liabilities offer more trade credit – an idea sustained also by Petersen and Rajan (1997) – to increase turnover and profit. Firms receive less trade credit because of their high degree of debt, and they have better access to alternative internal and external financing with a lower cost (García-Teruel & Martínez-Solano, 2010a), or because trade credit is a substitute of loans (Nilsen, 2002), especially when loans with lower costs are available.

Firm size affects credit extension choices directly by setting limits on the possibilities for economies of scale, but it also impacts indirectly by affecting the firm's access to finance and its bargaining strength with suppliers (Wilson & Summers, 2002).

Hypothesis 5: *Trade credit offered and received and collection/credit periods are directly correlated with firm size.*

This hypothesis shows that large firms offer and receive more trade credit than small firms. This hypothesis is sustained by the volume of activity developed in firms.

3. Methodology and data

3.1. Variables and their measurement

For this research we studied more than 20 indicators of trade credit and financial performance reflected by profitability, liquidity, gearing, financing, activity and firm size, and we selected six relevant variables to study the impact of financial performance on trade credit receivable and payable: profitability was analysed with return on equity and return on assets, liquidity analysed with current ratio and liquidity ratio, and financing analysed with long-term financing ratio and firm size. We selected these variables for financial performance study taking into account the following reasons: a low dependency between selected variables; variables well-known for studying firms' financial performance evaluation in various contexts; and the most representative indicator for the dimensions desired to be analysed – profitability, liquidity, degree of debts and firm size.

3.1.1. Dependent variables

The literature explored trade credit using as dependent variables: accounts payable/total assets, accounts payable/turnover, (accounts payable – accounts receivable)/total assets (Mateuț et al., 2015), (accounts payable – accounts receivable)/sales (Ge & Qiu, 2007); trade credit provided (trade receivables per sales), trade credit obtained (trade credit payables per cost of goods sold) and net trade credit (difference between trade receivables and payables scaled by sales (Alatalo, 2010), or trade receivables divided by total assets and trade payables divided by total assets (Grave, 2011). In our study we use as dependent variables: *Trade_Receiv* (trade receivable share) defined as the share of trade receivables (debtors) in total assets and calculated as trade receivables scaled by total assets; *Trade_Payab* (trade payable share) defined as the share of trade payables (creditors) in total assets and calculated as trade payables scaled by total assets; *Collect_period* (time period of trade credit offered) defined as the number of days granted for trade receivables collection and calculated as (trade receivables $\times$ 360) scaled by sales; and *Credit_period* (time period of trade credit received) defined as the number of credit days received for trade credit granted by suppliers and calculated as (trade payables $\times$ 360) scaled by sales.

3.1.2. Independent variables

Profitability is expressed by two rates: ROE defined as net income divided to shareholder funds and ROA defined here as net income divided to total assets. Woo and Willard (1983) stated that measures of profitability such as return on assets and return on equity are essential for the measurement of strategic performance. However, they have some limitations linked to the quality of data (for example, a negative net income and shareholder funds shows a positive ROE), or the use of a single ratio to measure performance reduces the quality of managerial decision-making or relevance of performance evaluation to a simple but unrealistic economic model, ignoring other valuable financial variables for managerial decision-making.

Liquidity is expressed by two rates: *Current_rat* (current liquidity ratio) defined as current assets scaled by current liabilities and *Liquid_rat* (liquidity ratio) defined as

current assets minus inventories and accounts receivable scaled by sales. In order to reflect the degree of long-term debt, the variable used in our study is *LT_bank_loan* that is defined as long-term banking loans scaled to total assets.

Firm size is expressed with the variable *Firm_size* that can be analysed related to sales or total assets. In our study we define firm size as natural logarithm of total assets.

3.2. Data and correlation analysis

Our main data source is the balance sheet and profit and loss accounts provided by Amadeus database (Bureau van Dijk Electroniques, 2015). Companies from the construction sector (buildings, bridges and tunnels, other civil engineering projects, roads and railways, underground railways) were selected between 2004 and 2013, from eight countries in the E.U.-28, grouped in the paper in developed countries (Belgium, Germany, France and Netherlands), and emerging countries (Romania, Bulgaria, Poland and Hungary), that is, countries where the average fluctuations of annual growth rates for construction was appropriate. The construction industry has been criticised for its underperformance, triggering a high need for performance improvement and measurement (Latham, 1994; Egan, 1998; Wegelius-Lehtonen, 2001). So, in this paper we want to establish if this performance determines an increase/decrease in trade credit receivable and payable or collection/credit periods used by firms.

In order to achieve this aim, we used a sample of 958 companies that have reported data in the interval analysed, resulting in 8,473 firm-year observations, organised as unbalanced panel data. Firms were chosen based on four criteria: they should have available data in the Amadeus database over the time period 2004–2013; they should have at least five years of data for the period 2004–2013; they should have registered debtors (trade receivable) and creditors (trade credit payable) in the period 2004–2013; and they should have more than 50 employees in the last available year of data in Amadeus database. As it was found that some firms from the database had missing or inconclusive values that were needed in the calculation of the indicators used in the study, finally only 7,240 valid firm-year observations were used, 55.55% from developed countries (4,022 observations) and 44.45% from emerging countries (3,218 observations).

Related to the distribution per country of firms' observations we found that France (20.64%), Belgium (17.31%), Bulgaria (15.14%) and Romania (12.83%) are more represented in the sample than Poland (11.78%), Germany (11.23%) or Netherlands (6.37%), the lowest number of observations being registered by Hungary with 4.70%.

Descriptive statistics presented in Table 1 and 2 include the number of observations, mean, standard deviation, minimum and maximum values for dependent and independent variables, and for both developed and emerging countries. From Table 1 the results show that the share of accounts receivable in total assets in developed countries is 36.39% and the share of trade payable in total assets is 29.59%, while the share of accounts receivable in total assets in emerging countries is 31.05% and the share of trade payable in total assets is 27.08%. This means that firms from both developed and emerging countries offered more trade credit than received, but we can see higher shares in firms from developed countries. Also, the difference between

Table 1. Descriptive statistics – developed countries.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Trade_Receiv	4022	0.3639	0.1826	0.0006	0.9329
Trade_Payab	4022	0.2959	0.1633	0.0025	0.9874
Collection_period	4022	79.0954	52.8486	0.67	814.04
Credit_period	4022	63.2294	39.0943	0.901	447.683
ROE	4022	22.4088	57.3535	−893.463	898.747
ROA	4022	4.3524	6.6212	−52.969	96.133
Current_rat	4022	1.4370	0.6608	0.2330	9.1590
Liquid_rat	4022	0.1491	0.6065	0.0620	7.0030
LT_bank_loan	4022	0.2405	0.6345	0.0000	15.9479
Firm_size	4022	10.1812	1.0631	2.9460	14.5641

Source: Author calculation using data from Amadeus database.

Table 2. Descriptive statistics – emerging countries.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Trade_Receiv	3218	0.3105	0.5968	0.0002	0.9988
Trade_Payab	3218	0.2708	0.6030	0.0003	0.9971
Collection_period	3218	91.4730	92.0282	0.0560	934.355
Credit_period	3218	80.0561	86.9941	0.0780	965.539
ROE	3218	15.8191	51.8865	−894.643	224.891
ROA	3218	6.5636	11.9776	−93.411	83.493
Current_rat	3218	1.8704	2.2299	0.0130	59.167
Liquid_rat	3218	0.086	1.0944	0.0055	19.161
LT_bank_loan	3218	0.2232	0.3615	0.0000	5.4311
Firm_size	3218	8.8301	1.1878	2.5215	13.2023

Source: Author calculation using data from Amadeus database.

share of trade credit receivable and trade credit payable is higher in developed countries than in emerging countries, showing a net trade credit of 6.80% and respectively 3.97%, which means that firms from developed countries use more trade credit than those from emerging countries.

The average collection period is 79 days and the average credit period 63 days in developed countries, while in emerging countries these are higher – the average collection period is 91 days and the average credit period 80 days. This means that, in both groups of countries, firms collect receivables slower than they pay debts to suppliers, and firms act as creditors to business partners. We also observed higher periods for both collection and credit periods in emerging countries than in the developed countries, which shows a higher need for short-term funds in emerging countries than in developed countries.

Return on equity is 22.41% in developed countries and 15.82% in emerging countries, higher on average than return on assets, which is 4.35% and 6.56% respectively in developed and emerging countries. Data shows that the remuneration of shareholder funds is higher in developed countries than in emerging countries with 6.59%, but the remuneration of total capital invested is higher in emerging countries than in developed with 2.21%, especially because of high values of total assets in developed countries, as we can see from firms' size (in developed countries firms' size expressed as natural logarithm of total assets is higher than in emerging countries with 1.35).

Current liquidity ratio is on average 1.44 in developed countries and 1.87 in emerging countries which shows a higher capacity of current assets to pay debts in emerging countries. Liquidity ratio is 0.15 on average in developed countries and 0.08

in emerging countries, which means that companies have a reduced capacity to pay short-term debts with existent cash and cash equivalents, especially in emerging countries. Also, the low liquidity ratio shows a high use of trade credit receivable. Long-term debts represent an average 24.05% of total assets in developed countries, higher by 1.73% than emerging countries which is 22.32%, meaning that firms do not use long-term debts to finance their activity in a high proportion.

Tables 3 and 4 report the correlation tables for trade credit offered (trade credit receivable), trade credit received (trade credit payable), and collection and credit periods for firms from both developed and emerging countries. The coefficients are fairly low and statistically significant. Most of them show the expected association (positive or negative).

A simple pairwise correlation analysis highlights that there is a positive correlation between trade receivables and trade payables, as well as between collection and credit periods in both developed and emerging countries: this means that the increase in trade receivables or the collection period determines the increase in trade payables or credit period and, inversely, firms with high ROE use more trade receivables and payables, and firms with high ROA use less trade receivables and payables in both developed and emerging countries. In developed countries the collection and credit periods are directly correlated to ROE, while in emerging countries the collection period is directly correlated with ROE and the credit period inversely correlated with ROE which means an increase in credit period reduces a firm's financial profitability. Alternatively, the collection and credit periods are inversely correlated with ROA in both groups of countries, showing that granting long periods for trade credit reduces economic profitability. We observe that firms with high current liquidity use more trade receivable, granting long collection periods and use less trade payable, benefitting from shorter credit periods, while firms with high liquidity ratio use less trade receivable, granting shorter collection periods and more trade payable, benefitting from longer credit periods, which means firms collect receivables more quickly than they have to pay debt. Also, firms with long-term debts use more trade receivable, granting longer collection periods and less trade payable, benefitting from shorter credit periods, which means firms that use more long-term debts use less trade credit payable. Finally, the pairwise correlation shows that large firms use more trade receivable and payable, and use higher collection and credit periods.

3.3. Model specification

Regression models are performed based on four dependent variables: trade credit receivable, trade credit payable, collection and credit periods. Independent variables are considered to be measures of financial performance: profitability with ROE and ROA, liquidity with current liquidity and liquidity ratio, long-term banking loan ratio and firm size.

The initial generalised regression model used in this study is:

$$TC_{it} = \alpha_i + \sum_{k=1}^{6} \beta_{kit} FP_{kit} + \varepsilon_{it} \tag{1}$$

where TC_{it} = dependent variables of trade credit: *Trade_receiv*, *Trade_payab*, *Collect_period* and *Credit_period*; t = time; $t = 1-10$, and

Table 3. Correlation table – developed countries.

	Trade_Receiv	Trade_Payab	Collection_period	Credit_period	ROE	ROA	Current_rat	Liquid_rat	LT_bank_loan	Firm_size
Trade_Receiv	1.000									
Trade_Payab	0.440***	1.000								
Collection_period	0.425**	0.193***	1.000							
Credit_period	0.310***	0.517***	0.433***	1.000						
ROE	0.083***	0.560***	0.084***	0.046***	1.000					
ROA	−0.095***	−0.093***	−0.110***	−0.116***	0.336***	1.000				
Current_rat	0.192*	−0.344***	0.207**	−0.327***	−0.025*	0.158***	1.000			
Liquid_rat	−0.055***	0.151***	−0.048***	0.170***	0.018	0.183***	0.349***	1.000		
LT_bank_loan	0.258***	−0.265**	0.191***	−0.218**	0.052***	−0.072***	0.046***	−0.027***	1.000	
Firm_size	0.138***	0.036***	0.200***	0.265***	0.035***	−0.170*	−0.087***	−0.112***	0.116***	1.000

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.
Source: Author calculation using data from Amadeus database.

Table 4. Correlation table – emerging countries.

	Trade_Receiv	Trade_Payab	Collection_period	Credit_period	ROE	ROA	Current_rat	Liquid_rat	LT_bank_loan	Firm_size
Trade_Receiv	1.000									
Trade_Payab	0.540***	1.000								
Collection_period	0.147***	0.002	1.000							
Credit_period	−0.005	0.144***	0.319***	1.000						
ROE	0.013*	0.082***	0.113***	0.004*	1.000					
ROA	−0.021*	−0.126***	−0.189***	−0.193***	0.410***	1.000				
Current_rat	0.036***	−0.107***	0.130***	−0.151***	0.006	0.125***	1.000			
Liquid_rat	−0.010*	0.263***	−0.165***	0.161***	0.014*	0.141***	0.346***	1.000		
LT_bank_loan	0.079***	−0.066***	0.003	−0.110*	0.052***	−0.143***	−0.053***	−0.066***	1.000	
Firm_size	0.111***	0.114***	0.249***	0.204***	0.054***	−0.136***	−0.047***	−0.062***	0.155***	1.000

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.
Source: Author calculation using data from Amadeus database.

Table 5. Variance inflation factor.

Dependent variables – developed countries			Dependent variables – emerging countries		
Variable	VIF	1/VIF	Variable	VIF	1/VIF
ROE	3.360	0.297619	ROE	7.257	0.137798
ROA	3.420	0.292398	ROA	7.765	0.128783
Current_rat	2.322	0.430663	Current_rat	3.004	0.332889
Liquid_rat	1.929	0.518403	Liquid_rat	2.856	0.350140
LT_bank_loan	1.074	0.931099	LT_bank_loan	1.083	0.923361
Firm_size	1.027	0.973710	Firm_size	1.049	0.953289
Mean VIF	2.19		Mean VIF	3.84	

Source: Author calculation using data from Amadeus database.

FP_{kit} = independent variables, which are measures of financial performance: *ROE*, *ROA*, *Current_rat, Liquid_rat, LT_bank_loan and Firm_size*, $k = 1-6$.

The normality of residuals was checked with Shapiro-Wilk W test for normality and we found that for all four dependent variables, regression models' p-values are between 0.619 and 0.894, higher in developed than in emerging countries. These values, being higher than 0.05, indicate that the null hypothesis is true and the residuals are normally distributed. Homoscedasticity of residuals was checked using Cameron & Trivedi's decomposition of IM-test and Breusch-Pagan/Cook-Weisberg test for heteroscedasticity. For these tests, all dependent variables regression models' p-values, for developed and emerging countries were higher than 0.05, as well as higher in developed countries than in emerging countries, indicating that the variance of the residuals is homoscedastic.

Multicollinearity for the four models was checked using Variance Inflation Factor (VIF). The results indicated that in the case of all the dependent variables (trade receivable and payable, collection and credit period) the mean of VIF is 2.19 in developed countries and 3.84 in emerging countries (Table 5). Hence, the mean of VIF for each model is lower than ten indicating thus that multicollinearity is not evident.

Regression analysis was performed after the checking of data for outliers and influential observations, the valid observations number being 4,022 for developed countries and 3,218 for emerging countries.

Three models were run based on *Trade_receiv*, *Trade_Payab*, *Collect_period* and *Credit_period*: Ordinary Least Squares regression (OLS), Fixed Effects (FE) model and Random Effects (RE) model. The results of each model for all dependent variables and for both groups of countries are presented in Tables 6 and 7.

4. Results and discussions

Tables 6 and 7 refer to *Trade_receiv, Trade_Payab*, *Collect_period* and *Credit_period* and we can see that the OLS model best approximates the real data points, compared to the FE model and RE model, R^2 being higher than 30%. Thus, in developed countries R^2 registered values between 36.06% (in the case of *Collect_period*) and 47.43% (in the case of *Credit_period)*, while in emerging countries between 30.75% (in the case of *Collect_period*) and 45.83% (in the case of *Trade_payab*). However, these results show us that there are many other financial or non-financial factors, not included in our model that may influence the managerial decision of an increase/

Table 6. Regression models – developed countries.

	Trade_receiv			*Trade_payab*			*Collection_period*			*Credit_period*		
Variable	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE
ROE	0.056639***	0.057372***	0.056744***	0.254118***	0.253766***	0.253961***	0.036415***	0.036050***	0.036415***	0.157328***	0.156515***	0.157072***
ROA	−0.107583***	−0.109206	−0.107811*	−0.263320	−0.266480	−0.264729**	−0.051219**	−0.058344	−0.051219*	−0.205297	−0.214004	−0.208407**
Current_rat	1.016429***	1.012982***	1.015928***	−0.921491***	−0.913314***	−0.917870***	0.951735***	0.935891***	0.951735**	−0.853288***	−0.832997***	−0.846163**
Liquid_rat	−0.966584***	−0.966306***	−0.966651***	0.657198***	0.661074***	0.658920***	−0.665405***	−0.671169***	−0.665405***	0.364041***	0.374159***	0.367537***
LT_bank_loan	0.156496***	0.156091***	0.156364***	−0.183342***	−0.182364***	−0.182908***	0.146157***	0.144418**	0.146157***	−0.171246***	−0.168897**	−0.170445***
Firm_size	1.585450***	1.587347***	1.585585***	1.288648***	1.242791***	1.268790***	0.885247***	0.959699***	0.885247***	1.273400***	1.392242***	1.313641***
_cons	2.314858***	2.315153***	2.315153***	0.967378***	0.865474***	0.924364***	2.176750***	2.010718***	2.176750***	0.632075***	0.367908**	0.545104***
N	4022	4022	4022	4022	4022	4022	4022	4022	4022	4022	4022	4022
R^2	0.434744	0.336518	0.249388	0.450127	0.354034	0.348798	0.360599	0.270757	0.260599	0.474270	0.378089	0.375952

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.
Source: Author calculation using data from Amadeus database.

Table 7. Regression models – emerging countries

	Trade_receiv			Trade_payab			Collection_period			Credit_period		
Variable	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE	OLS	FE	RE
ROE	0.216109***	0.225446***	0.221534***	0.347434***	0.341582***	0.345836***	0.113587***	0.128930***	0.124209***	0.241045***	0.241803***	0.241201***
ROA	−0.232614***	−0.228914	−0.229932*	−0.295607	−0.295845	−0.295539**	−0.263938**	−0.257290	−0.258582**	−323117*	−0.320774	−0.321633**
Current_rat	0.938025***	0.946275***	0.942875***	−0.617233***	−0.606694***	−0.614884***	0.408296***	0.429817**	0.422971**	−0.093590***	−0.096446**	−0.095017**
Liquid_rat	−0.961135***	−0.955488***	−0.957841***	0.035461***	0.035461***	0.035482***	−0.610670***	−0.604393***	−0.606097***	0.3381877***	0.383797***	0.382564***
LT_bank_loan	0.082293***	0.083855***	0.083263***	−0.101513***	−0.100093***	−0.101121***	0.028061***	0.0.030538**	0.029778**	−0.047332***	−0.046855**	−0.047026**
Firm_size	0.164741***	0.239282***	0.206025***	0.180405***	0.123540***	0.165921***	1.731675***	1.587442***	1.635514***	1.717889***	1.701954***	1.713044***
_cons	−1.241807***	−1.104463***	−1.177651***	−1.644903***	−1.756557***	−1.670527***	0.466680***	0.742540***	0.626080***	0.064963***	0.097688**	0.072956***
N	3218	3218	3218	3218	3218	3218	3218	3218	3218	3218	3218	3218
R^2	0.444834	0.352055	0.345920	0.458340	0.361314	0.352096	0.307530	0.220719	0.180063	0.429924	0.332805	0.328563

*$p < 0.05$.
**$p < 0.01$.
***$p < 0.001$.
Source: Author calculation using data from Amadeus database.

decrease in trade receivable/payable or collection/credit periods, such as: elasticity of demand and supply, degree of competition, macroeconomic factors (economic growth, rate of exchange), public governance, law, culture, access to credit, etc. in both developed and emerging countries.

In analysing the OLS model for *Trade_receiv* and *Collect_period* in both developed and emerging countries we found that there is a significant positive relationship between *Trade_receiv* and *Collect_period* and ROE (that means *H1* is accepted for ROE), current liquidity ratio (*H2* is accepted), long-term banking loan ratio (*H4* is accepted) and firm size (*H5* is accepted), and a negative significant relationship between *Trade_receiv* and *Collect_period* and ROA (*H1* is rejected for ROA) and liquidity ratio (*H3* is accepted).

The OLS model for *Trade_payab* and *Credit_period* in both developed and emerging countries show us a positive significant relationship between *Trade_payab* and *Credit_period* and ROE (*H1* is accepted for ROE), liquidity ratio (*H3* is accepted) and firm size (*H5* is accepted); while there is a significant negative relationship between *Trade_payab* and *Credit_period* and current liquidity ratio (*H2* is accepted) and long-term banking loan ratio (*H4* is accepted). Furthermore we found an insignificant negative relationship between *Trade_payab* and ROA, and a significant negative relationship between *Credit_period* and ROA, in both cases *H1* was thus rejected for ROA.

In this study no contradictory results were found between developed and emerging countries, all regression coefficients having the same sign for each independent variable. The only difference consisted of the value of regression coefficients, higher in developed countries for *ROA*, *Current_rat*, *LT_bank_loan* and *Firm_size*, and higher for emerging countries for *ROE* and *Liquid_rat*.

Thus, from the study we found a direct correlation between trade credit offered and *ROE* which means that firms with a high return on equity offer more trade credit as also found by Cull et al. (2009) and Martínez-Sola et al. (2014). So, firms with a high ROE can increase trade credit offered. The positive relationship between trade credit received and return on equity shows that firms with high return on equity receive more trade credit, because of the trustworthiness of suppliers in profitable clients. The positive relationship between trade credit received and ROE highlight that firms use trade credit for making profitable investments with resources made available by trade credit, and profitable firms are thus encouraged to increase trade credit payable.

The negative relationship between trade receivable and payable and ROA is not in accordance with the proposed hypothesis and shows that the firms studied in the construction sector use less trade receivable and payable when registering a high ROA, as was found by Vaidya (2011). The explanation may be in the variability of net income and total assets, when an increase in trade credit receivable/payable was registered. Our results for the relationship between *Collect_period* and ROA are consistent with the results of Kroes and Manikas (2014) who found the reductions in days of sales outstanding lead to improved company financial performances.

We detected a positive relationship between trade credit offered by construction sector firms and current liquidity ratio, as did Niskanen and Niskanen (2006), Vaidya (2011) and Garcia-Appendini and Montoriol-Garriga (2013) who found the firms

with higher levels of liquidity increased the trade credit extended to other firms in the financial crisis period, while cash-poor firms reduced trade credit. This is a similar result taking into account that the period studied in this paper is 2004–2013, which includes the period of financial crisis.

The inverse relationship between trade payable and current liquidity ratio is consistent with the findings of Ono (2001) and García-Teruel and Martínez-Solano (2010b), and opposite to the results of Vaidya (2011) who found a positive influence on both accounts receivable and accounts payable on liquid assets.

Our results of the hypothesis *H3* are confirmed by the negative relationship between firms' liquidity and their volume of credit sales found on the sample of firms from all sectors of non-financial activity by Petersen and Rajan (1997), Bougheas et al. (2009) and Mateuț et al. (2015).

Related to our sample, we found that firms rely on bank loans to finance activity in the proportion of 22–24%, on average. From this study the results show that there is a negative relationship between trade credit received and long-term banking loans ratio as was found by Niskanen and Niskanen (2006), which means that banking loans are an alternative source of finance that might allow firms to offer trade credit while continuing production (Mateuț et al., 2015) with customers and suppliers. Although we proposed a positive relationship between banking loans and trade credit offered, this means that firms with better access to banking finance may have incentives to increase trade credit offered (Cull et al., 2009; Petersen & Rajan, 1997).

Finally, we found that there is a positive relationship between firm size and trade credit offered and received, which means that large firms are easily credited by other companies and have the capacity to finance other customers by trade payable. Our results are consistent with Bougheas et al. (2009) and García-Teruel and Martínez-Solano (2010b) who found that larger firms receive more finance from their suppliers, and opposite to Niskanen and Niskanen (2006) who found larger, older firms and firms with strong internal financing are less likely to use trade credit.

5. Conclusions

The purpose of the present study was to analyse the correlation between trade credit receivable/payable and the collection/credit periods and six measures of the financial performance, and to establish the influence of these variables on the managerial decision by construction companies to use trade credit.

There were proposed five hypotheses built in function of the results found in the literature and values of financial position indicators of the companies included in the sample. Overall, companies in the construction sector offered on average 31–36% trade credit to their customers and received 27–29.5% trade credit from their suppliers, registered a good profitability reflected by their ROE and ROA, and faced few problems of liquidity. Also, construction companies used in a small measure long-term banking loans for funding activity as was found by Mateuț et al. (2015).

Our study suggests that managers need to pay more attention when deciding to extend trade credit use, and decision-making should only happen after a deep analysis of the financial performance of the company, taking into account that financial

viability is the sum of all internal and external factors that contribute to business development: the environment, and organisational motivations, capacity and performance. Business partners can benefit from this study because the extension or reduction of trade credit offered or received provides relevant information about the financial position of customers and providers.

We consider that this study contributes to the support of the hypothesis about trade credit extension tested by other researchers in studies conducted in other countries, other sectors (especially manufacturing) and another time horizon. The contribution of the paper to the knowledge consists in extending the research on trade credit in the construction sector, using a sample of firms from eight European countries, divided into two groups (high income and low income countries) and on an actual time horizon. For further research, the impact of financial performance on managerial decisions to use trade credit will be developed taking into account other measures of financial performance, and including in the sample companies acting in other sectors of activity on a new time horizon.

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