UTS ePRESS

Construction Economics and Building

Vol. 17, No. 4
December 2017

Citation: Lafuente, E., Strassburger, F., Vaillant, Y., and Vilajosana, J. 2017. Organizational Resilience and Performance: An Analysis of the Relevance of Suppliers' Trade Credit and Bank Diversification in the Spanish Construction Industry. *Construction Economics and Building*, 17:4, 1-19. http://dx.doi.org/10.5130/AJCEB.v17i4.5704

ISSN 2204-9029 | Published by UTS ePRESS | ajceb.epress.lib.uts.edu.au

RESEARCH ARTICLE

Organizational Resilience and Performance: An Analysis of the Relevance of Suppliers' Trade Credit and Bank Diversification in the Spanish Construction Industry

Esteban Lafuente[1]*, Felipe Strassburger[1], Yancy Vaillant[2], Jordi Vilajosana[1]

[1] Department of Management, Universitat Politècnica de Catalunya (UPC Barcelona Tech) EPSEB, Av. Gregorio Marañón, 44–50, 2da planta. 08028. Barcelona. Spain

[2] Departamento de Gestión Organizacional, Universidad de la Costa Calle No 58, 55-66. Barranquilla, Colombia and Department of Strategy and Entrepreneurship. Toulouse Business School (TBS) 1 Place Alphonse Jourdain, 31068 Toulouse Cedex 7, France

***Corresponding author:** Esteban Lafuente,Department of Management, Universitat Politècnica de Catalunya (UPC Barcelona Tech) EPSEB, Av. Gregorio Marañón, 44–50, 2da planta. 08028. Barcelona. Spain; esteban.lafuente@upc.edu

DOI: http://dx.doi.org/10.5130/AJCEB.v17i4.5704
Article History: Received 20/08/2017; Revised 25/10/2017; Accepted 28/10/2017; Published 07/12/2017

Abstract

The objective of this study is to determine the effect of relevant variables related to strategic sources of financial resources—in our case, suppliers' trade credit and use of financial institutions—over performance among Spanish construction firms. To test the proposed hypotheses, we employ panel-data techniques on a large dataset that includes information for 3590 Spanish small (1723), medium-sized (1616) and large (251) construction businesses during 2004-2011. The results of the longitudinal analysis reveal that trade credit granted by suppliers constitute a relevant source of liquidity and financial resources that positively impacts economic performance. During the period of economic downturn that affected Spain after 2008, those construction firms that benefited from longer average payment periods from their suppliers reported superior performance levels. Additionally, we find that bank diversification is conducive to performance but only during the crisis period: performance is significantly higher in businesses that work with a greater number of financial institutions.

DECLARATION OF CONFLICTING INTEREST The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article. **FUNDING** This research was supported by funding from the Swiss National Science Foundation.

Keywords

Trade credit, suppliers, bank credit, performance, construction industry

Introduction

This study investigates the role of different sources of financial resources - namely suppliers' trade credit and financial institutions - on the economic performance of Spanish construction businesses in periods of growth and economic decline. The relevance of this study flows from the recognition that the negative repercussions of the financial crisis that hit Spain after 2008 mostly resulted from the burst of a housing bubble. According to the Spanish Statistics Office (INE, 2017), these negative effects are most evident in a drastic reduction of the construction sector's economic output, which fell from 16.74% of Spain's GDP in 2006 to 7.85% in 2012.

The growing awareness of the importance of a controlled revitalization of the construction sector has led European governing bodies to adopt specific policies within the EU 2020 strategic plan aimed at stimulating the development and consolidation of the industry based on sustainable practices (European Commission, 2016).

In the specific case of Spain, the crisis in the construction sector has been primarily associated with a combination of factors that include fast growing housing supply in the short-term, high expectations for supply and demand, and high leverage allowances on production and home purchase by financial institutions (Fernández-López and Coto-Millán, 2015; Kapelko, Lansink and Stefanou, 2014).

From an organizational perspective, the identified negative consequences of the decline of the construction industry were mostly linked to credit rationing problems that followed the 2008 housing bubble burst which constrained many organizations' operations (Horta et al., 2013). Notwithstanding the relevance of credit for the construction industry, financial institutions are not the only suppliers of finance for the industry (Cuñat, 2007). As a reaction to organizational changes - i.e., downsizing and bankruptcy - derived from the economic downturn that started in 2008, scholars have recently focused their efforts on analysing the effect that the financial strategy of construction firms has on performance. In this regard, special attention is paid to the effects on organizational performance of the management of liquidity levels (Bigelli and Sánchez-Vidal, 2012); the management of suppliers and the role of the trade credit granted by them (Cuñat, 2007; Garcia-Appendini and Montoriol-Garriga, 2013); and the dependence on financial institutions as a source of capital (Chava and Roberts, 2008; Kahle and Stulz, 2013).

The analysis of the relationship between strategic variables related to the financing (in our case, access to credit from suppliers and financial institutions) and performance of Spanish construction businesses is the focus of this study.

Prior studies analysing the situation of the Spanish construction sector during the crisis period have adopted a productive approach in which the allocation of resources and operational efficiency are key aspects of the analysis (e.g., Fernández-López and Coto-Millán, 2015; Kapelko, Lansink and Stefanou, 2014). The analysis of how construction businesses use suppliers' trade credit as a source of financial recourses and how this strategy impacts their performance level has been largely sidelined in prior research.

In line with recent contributions in the field of economics (see e.g., Burkart and Ellinsen, 2004; Cuñat, 2007; Garcia-Appendini and Montoriol-Garriga, 2013), this study focuses on the role of suppliers' trade credit, as opposed to financial suppliers, as an alternative source of finance for credit-constrained businesses in the construction sector. In our approach, in periods of economic downturn and credit rationing, businesses modify their financial strategy-making in the short-term, and the longer payment periods granted by commercial suppliers, who represent a potential substitute form of credit, may play a decisive role on performance.

The empirical application uses a sample of 3590 Spanish businesses operating in the construction sector between 2004 and 2011. The Spanish setting is attractive because it offers the opportunity to analyse how businesses in the construction sector respond to changes in economic conditions as a result to the burst of the housing bubble in 2008, and how businesses capitalize on the adoption of new financial strategies based on the exploitation of their relationship with suppliers. Additionally, Spain was especially hit by economic crisis that started in 2008; however, Spanish regions were unevenly affected by the burst of the housing bubble. According to statistics obtained from the Spanish Statistics Office (www.ine.es), housing transactions dropped 32.55% between 2007 and 2008 in Spain. Regions with a touristic or economic attractive reported the greatest plunge in housing transactions in 2008 (Catalonia: –45.33%; Balearic Islands: –43.21%; Community of Valencia: –37.58%, Andalusia: –32.62%, Madrid: –30.33%), while the fall in housing transactions was less severe in regions with lower population density or economic dynamics, such as Extremadura (–8.72%) or Murcia (–16.70%). Therefore, by scrutinizing the performance effects of different financial strategies in a diverse context—Spain—significantly affected the drastic fall of the construction activity, this study contributes to unveil how organizations re-shape their financial strategic choices to the changing market conditions.

The remainder of the paper is organized as follows. Section 2 presents the theoretical underpinning. Section 3 presents a brief description of the characteristics of the Spanish construction industry and the effects of the burst of the housing bubble. Section 4 describes the data and the methodological approach, while Section 5 offers the empirical results. Finally, Section 6 presents the discussion, concluding remarks and implications of the study.

Sources of Financial Resources: Background Literature and Hypotheses Development

There is a vast amount of literature dealing with the role of financial debt on business performance (see, e.g., Bolton and Freixas, 2000; Denis and Mihov, 2003; Diamond, 1993; Lin et al., 2013; Sufi, 2009; Rauh and Sufi, 2010). This literature emphasizes the relevance of bank lending as a primary source of financial resources that allows most businesses to operate and generate profits.

However, this section focuses on the review of the implications of suppliers' trade credit and seeks to explain to what extent systematic differences in economic conditions shed light on the potential benefits of trade credit. Besides the amount of input sold on credit, a supplier's decision to grant trade credit includes the due date and the cost of the trade credit. In this study we focus on the effect of the maturity component of trade credit, as it may reflect the suppliers' incentives to sell on credit. It has been argued that commercial suppliers may be

concerned with losing crucial customers and therefore be willing to support these customers when they have temporary financial difficulties (Wilner, 2000).

Because of the increasing imposition by banks of capital constraints as the creditworthiness of the borrower deteriorates (Nini, Smith and Sufi, 2009), firms are making more intensive use of suppliers' trade credit as an alternative, less traditional, source of financing.

Trade credit arises when a supplier allows a customer to delay payment for intermediate goods already delivered (Cuñat, 2007, p.491). The intuition underlying the potential benefit of using suppliers as a source of finance mainly comes from the increased level of liquidity derived from the concession of borrowing facilities to cover the costs of raw materials in the short-term (Rauh and Sufi, 2010).

This theoretical argument is based on two elements. First, suppliers are better able to enforce debt repayment than banks because their customers are aware that suppliers can stop the supply of intermediate goods if the trade credit is not repaid (Giannetti, Burkart and Ellingsen, 2011). Second, suppliers may act as liquidity providers, supporting their customers whenever they experience temporary liquidity shocks, as happens in periods of economic recession (Garcia-Appendini and Montoriol-Garriga, 2013). Therefore, a strong connection between the supplier and the customer is a necessary condition for increasing the supplier's willingness to grant trade credit: a strong commercial relationship makes it costly for the customer to find alternative suppliers and costly for the supplier to lose its current customers.

At this point, it is important to ask why commercial suppliers are more flexible lenders than banks are. Cuñat (2007) proposes that suppliers have a greater capacity than banks to ensure compliance with debt payments because their relationship with the customer involves bargaining power resulting from either high switching costs or high specificity in the good provided by the supplier. Additionally, suppliers have the capacity to freeze the operations of a business that claims trade credit by cancelling the supply of resources to their clients. The role of suppliers on corporate customers' value chain becomes especially relevant in the case of large construction businesses which often adopt supply chain integration strategies, create strategic alliances or coalitions to develop specific projects, such as large residential projects or public infrastructures (Castro, Galan and Casanueva, 2009).

Another relevant issue that is worth questioning is whether suppliers extend trade credit to customers irrespective of the market conditions (growth or recession), and whether businesses use trade credit as a substitute for bank credit in periods of economic decline to improve their financial results.

Liquidity safeguards are an indispensable requirement for business performance in times of crisis. In this regard, Kahle and Stulz (2013) indicate that firms whose credit is mainly granted by banks significantly increase their liquidity and do not reduce their financial costs during the first year of crisis. This result implicitly suggests an increased use of trade credit instruments. Therefore, suppliers may play a central role in supporting business survival and performance when the economy is going through bad times. As we indicated above, resource flow (raw materials) from suppliers is a key aspect of any business value chain, and payment for these resources is associated with planned cash flow reductions in the short term. Following this logic, suppliers may also act as suppliers of liquidity, to ensure their long-term relationship with their customers by establishing financial relationships that increase their customers' likelihood of survival in periods of liquidity shocks (Cuñat 2007). Empirical evidence by Garcia-Appendini and Montoriol-Garriga (2013) suggests that businesses

employing a larger number of suppliers significantly increase the use of trade credit during the period of economic crisis.

Prior research has documented that suppliers tend to be more financially compassionate towards businesses facing financial problems (e.g., Franks and Sussman, 2005; Huyghebaert, Van de Gucht and Van Hulle, 2007). Businesses with a strategy based on the use of suppliers as a source of financing seek to guarantee a short-term financial position. As stated by Garcia-Appendini and Montoriol-Garriga (2013), the most effective commercial relationships are those involving firms that have a history of high liquidity (liquid assets) and a supplier that is willing to sacrifice its own immediate liquidity in exchange for a guaranteed long-term cash flow. Trade credit tends to be used as the last resort, when other kinds of credit have run out. High growth firms, which need more funding, together with firms experiencing liquidity problems, have a higher proportion of credit from their suppliers (Cuñat, 2007). The validity of these arguments amplifies in periods of economic difficulties. Therefore, we hypothesize

H1: In periods of economic downturn, the use of suppliers' trade credit—in terms of longer maturity—has a positive impact on business performance

Now we turn to the other side of the credit coin analysed in this study: financial credit. Financial credit is a means for accessing capital and the crisis is a detonator of breaches of trade deals for different reasons. The financial response to breaches of trade deals is expected to be stronger when credit suppliers take different measures to moderate the supply of capital, and access by debtors to banking-based funding is limited or relatively expensive (Nini, Smith and Sufi, 2009).

For businesses using short and long-term debt, financial institutions who supply debt will make no concessions when the debtor cannot completely pay back; i.e. debt will entail risk. A mixture of short- and long-term bank debt is configured in such a way that the bank can continue to make low-risk loans or extend credit maturity rather than making downward adjustments to credit ratings, which is the reason creditors prefer liquidation (Diamond, 1993). Financial firms, in their role as capital suppliers, drastically reduce average short and long-term credit in times of crisis (Kahle and Stulz, 2013).

Banks tend to create a reputation as tough creditors to reduce adverse selection problems, that is, reduce the number of low-quality businesses applying for bank credit. Therefore, financial institutions are very inflexible in debt renegotiations with financially distressed businesses (Franks and Sussman, 2005). Additionally, financial institutions follow strict liquidation protocols when debtors face financial distress. In the context of this study, the probability of default increases in periods of economic recession, and this is particularly so in the case of the construction sector which suffered the most after the crash of the Spain's economy in 2008 (Castro, Galan and Casanueva, 2009; Kapelko, Lansink and Stefanou, 2014).

In this scenario, businesses have incentives to diversify their portfolio of suppliers of financial capital, that is, a likely solution to overcome liquidity problems comes from increasing the number of banks with which the business has credit operations. Although banking is a competitive sector characterized by shared information, credit diversification offers construction businesses the possibility to access credit lines that are essential for the functioning of these organizations. Therefore, increasing the number of creditors constitutes a valid strategy to obtain additional financial resources that contribute to

sustaining competitive positions for businesses. Following this theory and evidence we hypothesize:

H2a: A greater creditor diversification - in terms of the number of financial institutions with which a business operates - is positively associated with business performance.

H2b: The positive relationship between the number of creditors with which a business operates, and performance, is stronger in periods of economic recession.

The Context: The Housing Bubble and the Crisis in the Spanish Construction Sector

The beginning of the 21st century witnessed a rapid and increasing growth in the Spanish construction sector that reached 16% of Spain's gross domestic product in 2006, a figure double that reported in the rest of the EU countries (Kapelko, Lansink and Stefanou, 2014). Until 2007, the expansion of the construction industry was a driving force behind Spain's economic growth, employing 13.16% of the labour force (INE, 2017).

During this period a housing bubble was created because of a combination of factors including the growing housing supply in the short-term, the high market expectations of both construction businesses (supply side) and their potential customers (demand side), as well as the matching between competitive interest rates with increased leverage allowances on construction activity and home purchase by financial institutions (Horta et al., 2013). Moreover, the traditionally high housing ownership rates in Spain - 80% according to Eurostat statistics - coupled with a regulation that discourages house renting, contributed to increase the magnitude of the housing bubble in Spain (Andrews and Caldera-Sánchez, 2011). The amalgamation of these economic factors led to the formation of similar real estate bubbles in, among others, many EU countries, China, and the United States (Choy, 2011; Gimeno and Martinez-Carrascal, 2010; Shiller, 2008).

Notwithstanding the stricter lending conditions by financial institutions, housing oversupply and the emerging global financial crisis that started in 2008 when Lehman Brothers filed for bankruptcy protection led to the collapse of the Spanish economy. Following the burst of the housing bubble, which generated a notorious global subprime mortgage crisis (Shiller, 2008), the construction sector was most affected due to overpriced property and extreme credit reductions. Fuelled by the excessive business-level leverage, the financial constraints imposed by financial institutions put Spanish construction businesses in a more disadvantageous position than firms operating in other sectors, which caused the crunch for the whole industry (Gimeno and Martinez-Carrascal, 2010). The breaking of the economic crisis negatively impacted the construction sector by drastically shrinking the sector's output and employment levels. Figures made available by the Spanish Statistical Office (INE) reveal that the weight of the construction industry in the economy (GDP) fell from 16.74% in 2006 to 7.85% in 2012, while the proportion of employment in the sector decreased from 13.16% in 2006 to 6.15% in 2012.

The radical fall in the sector's business flow (number of entries minus exits) is another relevant observable negative consequence of the burst of the housing bubble in Spain. Figure 1 presents the pattern of business entries and exits in the construction sector between 2004 and 2011. Results in Figure 1 are in line with the tenor of the economic crisis that hit Spain, and show how the number of new businesses in the sector decreased after 2007 and fell to a trough in 2011 (341 businesses were created). On contrary, the number of exits in the sector rapidly

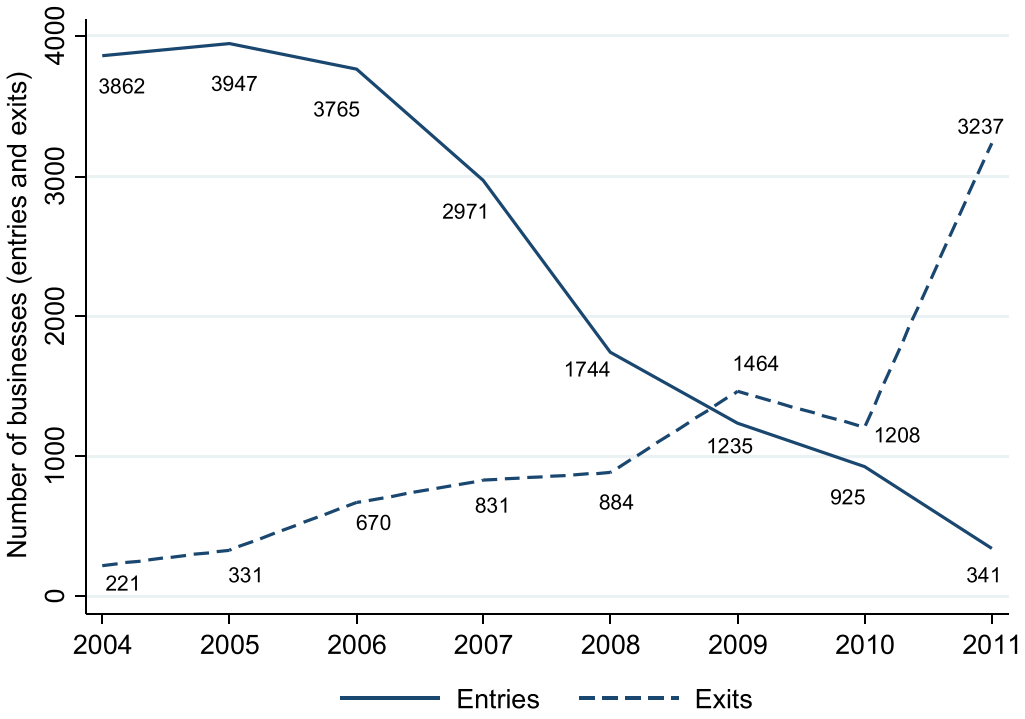

Figure 1 Flow of firms in the Spanish construction sector (2004-2011) (Source: Authors' elaboration on the study data)

increased during the period associated with the construction industry crisis (after 2007) to reach a peak in 2011 (3237 businesses exited the market).

As mentioned by Crosthwaite (2000), the importance of the construction industry is not only related to its size but also to its role in economic development. The deductions coming from the analysis of the evolution of the Spanish construction sector before and after the crash of the economy lead to the conclusion that the scarcity of financial resources is one of the key factors pushing up the number of bankruptcies in the sector. Yet existing work on the Spanish construction industry mostly focuses on the underlying operational factors that explain productivity losses in the sector, or the relationship between bank lending and activity in the sector (see, e.g., Fernández-López and Coto-Millán, 2015; Gimeno and Martinez-Carrascal, 2010, Horta et al., 2013; Kapelko, Lansink and Stefanou, 2014). These arguments further justify the proposed analysis of the role of alternative sources of finance - in our case, suppliers' trade credit - on performance; looking for a more comprehensive analysis of how construction businesses shape their financial strategy-making in times of economic downturn, and how their credit choices or possibilities impact their performance level.

Data, Variable Definition and Method

DATA

The database used in this study was obtained from the Spanish database Sistema de Análisis de Balances Ibéricos (SABI), provided by the data management company Bureau van Dijk (BVD, 2016). The SABI database contains detailed organizational and financial information for more than 1.3 million Spanish businesses and 500,000 Portuguese firms operating in all

industries. Data collected by Bureau van Dijk only refer to established businesses (excluding self-employees) and are obtained from official sources, including mercantile registries and the official gazette of the Spanish Mercantile Registry (BORME).

In addition, the database includes data on the financial institutions (banks, savings banks and other financial institutions) with which Spanish businesses operate. Due to the interest in studying the behaviour of businesses in the construction sector in periods of economic growth and during the crisis period, information was collected for the period between 2004 and 2011.

In line with our core objective, data on suppliers and the banks with which the business has relations is critical for the study. Therefore, the initial database obtained from SABI comprises information for a total number of 20312 businesses in the Spanish construction sector with data available on the accounts payable (suppliers) and the names of the banks associated to the sampled construction businesses. To ensure the robustness of our analysis, the dataset includes businesses that specifically perform construction activities—Construction of buildings (NACE code 41) and Civil engineering (NACE code 42)—and excludes firms operating in specialized construction activities, such as installations and building completion (NACE code 43).

Additionally, in the interest of following a rigorous methodology, we conducted a meticulous sampling procedure aiming to ensure the robustness of the results. First, we excluded 221 businesses that exited the construction market in the first study year (2004) and 341 businesses that were created in the last studied period (2011). Second, construction businesses were included in the sample if the start-up year was available and if their total assets were clearly identified in the database in each analysed period (from 2004 to 2011). In this second step, 8284 construction businesses were dropped from the sample mostly because their assets were not available in one or more of the analysed periods. Third, we included in the sample only those businesses whose operating profit and total debt values were reported in all the study periods. Based on this criterion, 7876 businesses were dropped.

After this sampling procedure, the final sample includes information for a total number of 3590 construction businesses created between 1946 and 2010. The total number of year/unit observations is 16359 (2004: 2020 businesses; 2005: 2257; 2006: 2516; 2007: 2482; 2008: 2170; 2009: 1978; 2010: 1669; 2011: 1267). A further scrutiny of the data reveals that during the analysed period the sampled businesses have, on average, 146 employees. This value is explained by the size distribution of the construction businesses in the sample: 48% are small businesses with less than 50 employees, 45% fall in the medium-sized category (between 50 and 250 employees), and 7% are large businesses with more than 250 employees.

Note that the representativeness of the study sample is ensured insofar as it includes businesses from the 17 Autonomous Communities that form Spain. Table 1 presents the description of the geographic distribution of the analysed businesses.

From the results in the table we can observe that the population of registered businesses in the construction sector (which includes start-ups, established firms and firms that left the market during the study period) is heterogeneously distributed across Spain. Although there is a high presence of firms in the sector in all Autonomous Communities, there is asymmetry in their geographical locations. For example, four Autonomous Communities concentrate just over

Table 1 Geographic distribution of analysed businesses and regional economic figures

Autonomous Community	Final sample		GDP (2012)		GDP from construction industry (2012)	
	Obs.	%	Value	%	Value	%
Andalusia	2273	13.89	138960	13.55	11625	14.38
Aragon	611	3.73	32552	3.17	2922	3.62
Asturias	477	2.92	21895	2.13	2057	2.54
Balearic Islands	293	1.79	25893	2.52	2118	2.62
Canary Islands	765	4.68	40172	3.92	2858	3.54
Cantabria	236	1.44	12541	1.22	1116	1.38
Castile and León	936	5.72	54306	5.30	4555	5.64
Castile La Mancha	684	4.18	36152	3.53	3633	4.50
Catalonia	2353	14.38	192587	18.78	12815	15.86
Community of Valencia	1447	8.85	97649	9.52	8739	10.81
Extremadura	302	1.85	16372	1.60	1851	2.29
Galicia	949	5.80	55323	5.39	5236	6.48
Madrid	2907	17.77	185238	18.06	12182	15.07
Murcia	590	3.61	26643	2.60	2188	2.71
Navarra	442	2.70	17769	1.73	1296	1.60
Basque Country	908	5.55	63614	6.20	4827	5.97
La Rioja	186	1.14	7849	0.77	612	0.76
Total	16359	100.00	1025514	100.00	80827	100.00

Data on the regional GDP is expressed in millions of euro and was obtained from the Spanish Statistical Office (INE, 2017).

half of the analysed construction firms (53.88%): Catalonia (15.77%), Andalusia (15.30%), Community of Valencia (13.08%) and Community of Madrid (9.73%). Note that this result is consistent with the distribution of the economic activity (GDP) of Spanish Communities. Figures from the Spanish Statistical Office (INE) reveal that these four Communities account for 59.91% of Spain's economic output in 2012, in terms of Gross Domestic Product: Catalonia: 18.78%, Community of Madrid: 18.06%, Andalusia: 13.55%, and Community of Valencia: 9.52%. Additionally, the regional distribution of the sampled businesses is in line with the economic importance of the construction industry across Spanish regions: the regions with the largest construction industry in Spain are Catalonia (15.86%), Madrid (15.07%), Andalusia (14.38%) and Community of Valencia (10.81%).

VARIABLE DEFINITION

Dependent variable. We measure economic performance using the return on assets (ROA), defined as the ratio of operating profit divided by total assets. Within the economic and strategic management literatures this variable has been widely used to proxy the economic performance of organizations operating in different industry sectors (see e.g., Epure and Lafuente, 2015; Rauh and Sufi, 2010; Sufi, 2009). In line with the tone of Spain's economy, descriptive statistics in Table 2 show how average performance of construction businesses drastically declined after 2007 to reach its lowest value in 2011 (–0.39%). A further scrutiny of the data reveals that the ROA results for poor performing businesses placed at the bottom decile of the distribution of performance drastically changed with the crisis period, falling from an average of 2.78% in the period 2004-2007 (2004: 2.86%; 2005: 2.64%; 2006: 2.84%; 2007: 2.77%) to an average result of –4.54% between 2008 and 2011 (2008: –1.70%; 2009: –3.82%; 2010: –5.95%; 2011: –8.11%) (Figure 2). A similar decreasing trend is reported for top performing businesses placed at the top decile of the ROA distribution. These top performing businesses reported an average ROA of 16.16% in the pre-crisis period (2004-2007) (2004: 16.52%; 2005: 16.65%; 2006: 16.31%; 2007: 15.23%), while their average performance between 2008 and 2011 fell to 10.55% (2008: 12.24%; 2009: 10.67%; 2010: 9.38%; 2011: 8.41%) (Figure 2).

Suppliers as a source of financing. The core objective of this study is to explore how businesses use alternative sources of finance to compensate for the increased credit unavailability from financial institutions. Like Garcia-Appendini and Montoriol-Garriga (2013), we use the average payment period of accounts payable to measure the business' capacity to access credit from its commercial suppliers. This variable, computed as the economic amount of accounts payable (suppliers) divided by the daily cost of materials (cost of materials/365), represents the

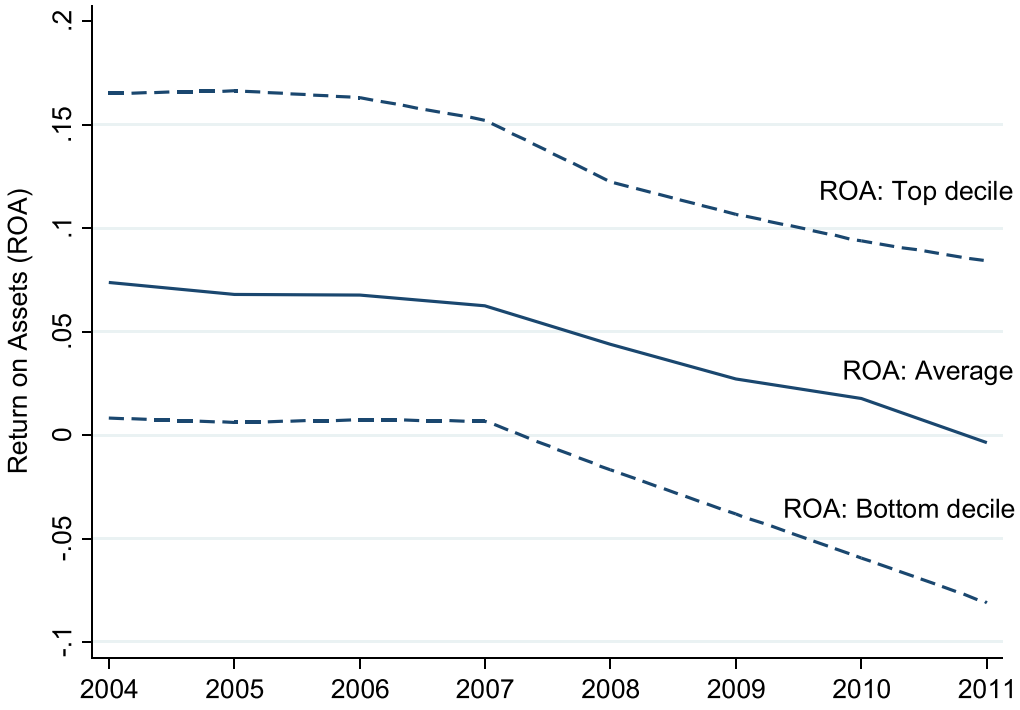

Figure 2 ROA in the Spanish construction sector (period 2004-2011). (Source: Authors' elaboration on the study data)

Table 2 Descriptive statistics for the study variables (2004-2011)

	ROA	Average payment period	Number of financial institutions	Proportion of banks	Total assets	Business age (years)	Leverage	Obs.
2004	0.0739 (0.0948)	188.49 (2445.30)	2.68 (1.17)	0.9282 (0.1894)	40.46 (194.50)	18.96 (11.36)	0.7411 (0.2047)	2020
2005	0.0681 (0.1080)	188.72 (3398.25)	2.64 (1.17)	0.9254 (0.1950)	46.07 (225.27)	19.18 (11.39)	0.7399 (0.2137)	2257
2006	0.0678 (0.0998)	195.22 (2234.02)	2.63 (1.16)	0.9228 (0.1988)	55.41 (283.20)	19.40 (11.23)	0.7525 (0.2155)	2516
2007	0.0624 (0.1423)	168.36 (2994.47)	2.64 (1.15)	0.9218 (0.1973)	65.25 (334.54)	19.94 (11.32)	0.7541 (0.2083)	2482
2008	0.0438 (0.0953)	111.93 (711.91)	2.65 (1.15)	0.9211 (0.1958)	70.94 (382.37)	21.01 (11.51)	0.7300 (0.2181)	2170
2009	0.0272 (0.1311)	130.44 (2721.86)	2.67 (1.13)	0.9189 (0.1971)	75.58 (396.10)	22.39 (11.88)	0.7238 (0.2560)	1978
2010	0.0177 (0.0967)	145.22 (2201.18)	2.68 (1.13)	0.9225 (0.1894)	80.17 (429.05)	23.71 (12.28)	0.7191 (0.3178)	1669
2011	–0.0039 (0.4387)	130.50 (2869.52)	2.70 (1.11)	0.9247 (0.1861)	104.65 (587.19)	24.83 (12.46)	0.6896 (0.4635)	1267
Total	0.0490 (0.1644)	160.24 (2059.46)	2.66 (1.15)	0.9231 (0.1944)	64.60 (353.66)	20.83 (11.76)	0.7349 (0.2582)	16359

Standard deviation is presented in brackets. Monetary values (total assets) are expressed in millions of 2011 constant euro and are deflated by inflation.

extent to which construction businesses use suppliers' trade credit to finance their operations. In our sample, businesses pay to their commercial suppliers in 160.24 days (5 months and 10 days approximately) (Table 2). Additionally, descriptive statistics in Table 2 indicate that on average suppliers apply strict credit conditions to their customers in the construction industry: during the growth period (2004-2007) the average payment period was 183.34 days, while this figure fell to 128 days after 2007. Additionally, note that after a declining trend between 2004 (188.49 days) and 2008 (111.93 days), the average payment period gradually grew after 2008 up to 130.50 days in 2011; however, this value is below the observed payment period before 2008.

Use of financial institutions. Instead of focusing on the economic value of debt, in this study debt heterogeneity is analysed via a novel variable that captures businesses' capacity to access financial resources from multiple financial agents. Our dataset allows identifying the total number of financial institutions used by each construction business in the sample. This variable not only captures the businesses' capacity to work with more banks and, therefore, increase the likeliness of accessing to more sources of credit; but also measures the willingness of financial institutions for working with businesses operating in the construction sector (Giannetti, Burkart and Ellingsen, 2011).

Control variables. We control for business size, business age, type of financial creditor, geographic location, leverage and time in the different model specifications. Business size is defined as total assets and is expressed in millions of constant euro at 2011 prices, while business age is measured in years of market experience. We acknowledge that businesses can access credit from different financial institutions (Sufi, 2009). Thus, to account for the potential effect that access to different types of creditors may have in performance, we introduced the proportion of banks relative to the number of financial institutions used by the sampled

construction businesses. We included a set of dummy variables that account for the location of the sample businesses (in all model specifications Madrid is the omitted Autonomous Community). We introduced the leverage ratio, defined as the relationship between total debt and total assets. Finally, we included two time-related variables. First, we used a 'crisis' dummy taking the value of one if for the period 2008-2011, and zero otherwise. Second, we introduced a set of time dummies to rule out the potential effects of other economic and environmental conditions that may affect the economic performance of businesses in the construction industry.

METHOD

In line with the arguments that underpin this study, we argue that businesses seek to access financial resources from different sources based on expected performance improvements.

We employ panel data techniques to estimate the proposed model which emphasizes a positive relationship between the access to financial resources from diverse sources (suppliers and financial institutions) and businesses' economic performance. Pooling repeated observations on the same organizations violates the assumption of independence of observations, resulting in autocorrelation in the residuals. First-order autocorrelation occurs when the disturbances in a time-period are correlated with those in the previous time-period, resulting in incorrect variance estimates, rendering ordinary least squares (OLS) estimates inefficient and biased (Wooldridge, 2002). Therefore, we estimate random-effects (GLS) panel data models with robust standard errors to correct for autocorrelation of error terms due to constant university-specific effects (Greene, 2003). Additionally, the proposed estimation approach allows evaluating the effect of relevant time-invariant factors on business performance (in our case, the number of financial institutions used by construction businesses). To evaluate the role of different sources of finance empirically, we propose a random-effects model with the following form:

$$\begin{aligned} \text{ROA}_{it} = {} & b_0 + b_1\text{Crisis}_{it} + b_2\text{Avg. Payment Period}_{it} + b_{12}\text{Crisis}_{it} \times \text{Avg. Payment Period}_{it} \\ & + b_3\text{No. Financial Institutions}_{it} + b_{13}\text{Crisis}_{it} \times \text{No. Financial Institutions}_{it} \\ & + b_4\text{Control variables}_{it} + b_5 T_t + e_{it} \end{aligned} \quad (1)$$

In equation (1) ROA is the economic performance variable computed for each business (i) and each time-period (t), b_j are parameter estimates estimated for the independent variables (j), T refers to the set of time dummy variables, while e is the normally distributed error term that varies cross-businesses and cross-time (t).

In terms of the study hypotheses, we expect that increased use of suppliers' trade credit as a source of finance during the crisis period yields superior performance (**H1:** $b_{12} > 0$). Additionally, we expect that businesses with a greater capacity to operate with more financial institutions improve their performance (**H2a:** $b_3 > 0$), and that this effect is stronger during the crisis period (**H2b:** $b_{13} > 0$).

EMPIRICAL RESULTS

Table 3 reports the estimates of the random-effects regression models linking the sources of financial resources and economic performance. Model 1 is the baseline specification which includes the different sources of finance analysed in this work (commercial suppliers and financial institutions) and the control variables. Model 2 includes the main effects and the interaction terms between the 'crisis' dummy and the analysed sources of finance.

To address the threat of collinearity we computed the average variance inflation factor (VIF) for all variables. The average VIF value for model 1 is 1.88 and ranges between 1.01 and 5.36. For model 2 the average VIF is 7.77, and the only VIF values that exceed 10 - a generally accepted rule of thumb for assessing collinearity - were observed for the variables linked to the interaction terms. By construction these terms are correlated and, even if computationally correct, this explains the VIF results (Greene, 2003). The results for this diagnostic test do not raise collinearity concerns.

The findings for the control variables indicate that performance is positively associated with businesses size, while the relationship turns negative in the case of the business age variable. Additionally, the results indicate that businesses performance is negatively affected by the exposure to high levels of debt, in relation to business assets.

The results in Table 3 indicate that economic performance of the sampled construction businesses drastically declined during the crisis period. More concretely, performance suffers an average fall of 16.28 percentage points during the period 2008-2011, compared to the average performance level in the growth period (2004-2007).

Concerning the key results of the study, from model 2 in Table 3 we note that the coefficient for the interaction term between the 'crisis' dummy and the average payment period is positive

Table 3 Regression results: Alternative sources of finance and performance (ROA)

	Model 1	Model 2
Crisis (dummy)	–0.1079 (0.0111)***	–0.1628 (0.0258)***
Average payment period (ln)	–0.0050 (0.0022)***	–0.0082 (0.0027)***
Crisis X Average payment period (ln)		0.0069 (0.0029)**
Number of financial institutions	0.0047 (0.0048)	0.0022 (0.0036)
Crisis X Number of financial institutions		0.0063 (0.0037)*
Business size (ln total assets)	0.0224 (0.0066)***	0.0231 (0.0065)***
Business age (ln years)	–0.0528 (0.0201)***	–0.0529 (0.0201)***
Proportion of banks	–0.0140 (0.0155)	–0.0150 (0.0171)
Leverage (debt to assets ratio)	–0.4815 (0.1889)**	–0.4830 (0.1892)**
Time dummies	Yes	Yes
Regional dummies	Yes	Yes
Intercept	0.4065 (0.1323)***	0.4263 (0.1359)***
Wald test (chi^2)	601.30***	615.61***
R^2 (overall)	0.2855	0.3056
VIF	1.88	7.77
Observations	16359	16359

Robust standard errors adjusted by heteroskedasticity are presented in brackets. *, **, *** indicate significance at the 10%, 5% and 1% level, respectively.

and statistically significant ($b_{12} > 0.0069$ and p – value < 5%). This suggests that longer payment periods granted by suppliers are associated with superior performance in the crisis period (2008-2011). This is in line with our arguments that suppliers play a central role on business performance in crisis periods by extending payment periods that allow the business to obtain financial resources in the short term, and ensuring their long-term relationship with their customers in periods of liquidity shocks (Cuñat, 2007). Therefore, we confirm our hypothesis **H1** which proposes that the use of suppliers' trade credit as an alternative source of finance in periods of economic recession leads to superior performance levels.

To aid in the interpretation of the results, we plot the interaction terms between the 'crisis' dummy and the sources of finance variables based on estimates from model 2 (equation (1)). The results are presented in Figures 3 and 4. In the figures, the vertical axis indicates the estimated level of economic performance (ROA), and the horizontal axis indicates the log value of the average payment period of accounts payable (Figure 3) and the number of financial institutions associated with the sampled construction businesses (Figure 4). Control variables are set at their sample means.

Figure 3 graphically illustrates that the relationship between suppliers' trade credit and performance is negative in the growth period, while this relationship turns positive in the crisis period. In the case of the former effect, the result may indicate that, in growth periods, better economic conditions reduce the suppliers' willingness to grant credit to their customers beyond the standard terms. The positive impact of the average payment period and performance during the crisis period suggests that suppliers adopt a more flexible position by increasing the payment period in their attempt to increase the probability of payment and keep commercial relationships with their bank-constrained clients (Burkart and Ellingsen, 2004; Garcia-Appendini and Montoriol-Garriga, 2013).

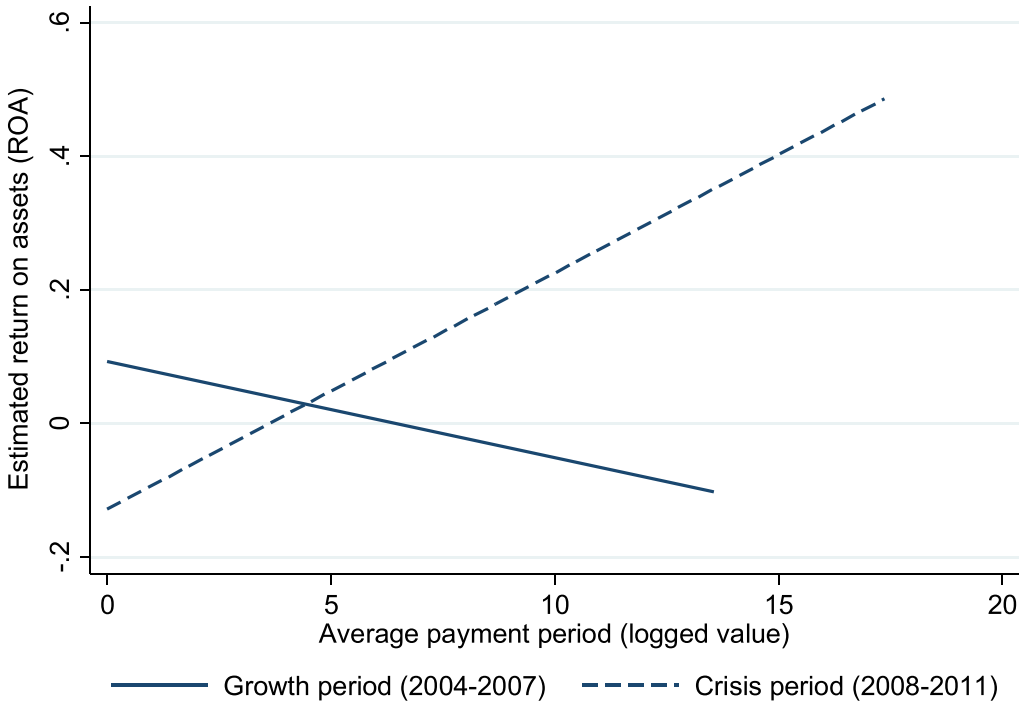

Figure 3 Estimated trajectory of ROA and average payment period in growth and crisis periods

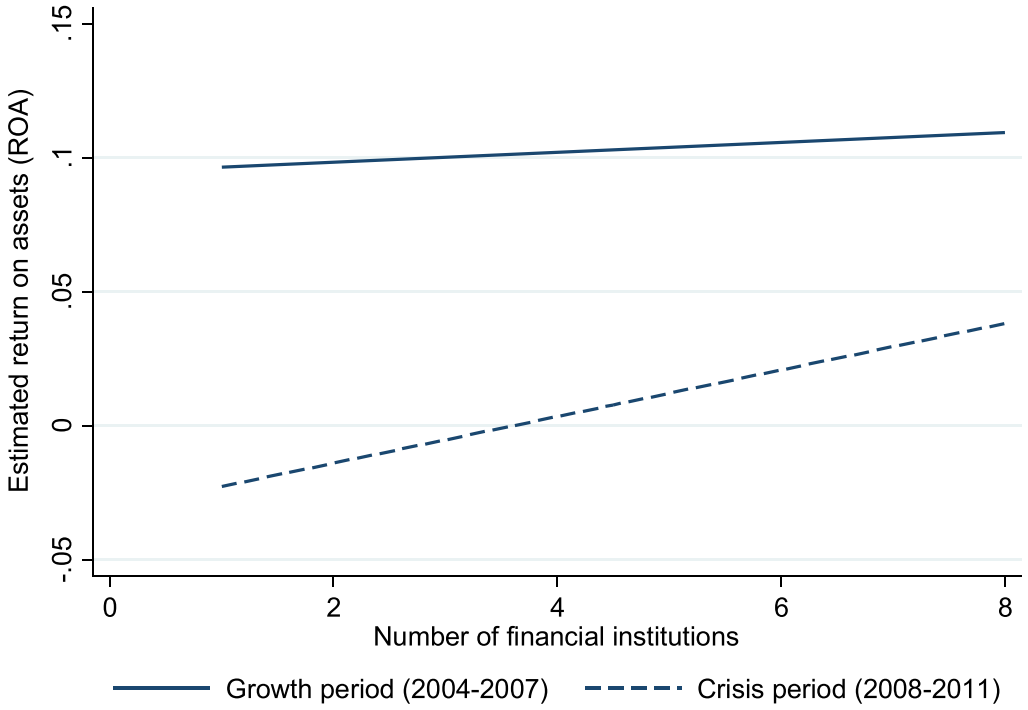

Figure 4 Estimated trajectory of ROA and number of banks in growth and crisis periods

Concerning the relationship between creditor diversification and performance, results in Table 3 indicate that working with a greater number of financial institutions is not linked to significant performance improvements (ROA) during the growth period, while this effect turns statistically significant in the period of economic downturn that followed the burst of the housing bubble in 2008 (model 2: $b_{13} > 0.0063$ and p – value < 10%). This result indicates that construction businesses that have the capacity to establish financial operations with more banks access the financial capital necessary to capitalize on their resources by executing their projects.

Figure 4 graphically shows that construction businesses have a lower estimated performance level during the crisis period (2008-2011). Although the slope of both estimated effects is positive, the figure illustrates how the positive relationship between the number of financial institutions and performance is steeper in the period of economic decline. That is, the effect of the use of more financial institutions as sources of finance is significantly higher in the crisis period than in the growth period.

Consequently, we do not find support for our hypothesis **H2a** that states that businesses with a greater capacity to operate with more financial institutions show higher performance; while we confirm our hypothesis **H2b** that proposes that the positive effect of working with more financial institutions on business performance is stronger in crisis periods.

Conclusion

In this study, we proposed that changes in the configuration of business' suppliers of finance constitute a valid strategy to improve business performance. Furthermore, we argue that in the crisis period that follows the bursting of a housing bubble, the incentives to use suppliers' trade

credit and to diversify traditional sources of finance (i.e., banks) have important performance implications for businesses in the construction sector.

The crisis represents an unexpected negative shock to the supply of external finance for construction businesses (Kapelko, Lansink and Stefanou, 2014), which makes it an ideal scenario to analyse the role of alternative sources of financing when bank credit is scarce. By analysing the Spanish construction sector during the period 2004 to 2011, our approach offers a compelling vision of how construction businesses enhance their performance using suppliers' trade credit and banking finance diversification, in terms of the number of financial institutions used by businesses.

Overall, the results of the longitudinal analysis are consistent with recent studies that emphasize the strategic relevance of the management of suppliers and the role of the trade credit granted by them (e.g., Cuñat, 2007; Garcia-Appendini and Montoriol-Garriga, 2013; Giannetti, Burkart and Ellingsen, 2011). The findings reveal that suppliers are an important source of liquidity for construction businesses i.e., by extending the maturity of their trade credit, with positive effects on economic performance in the period of economic downturn that affected Spain after 2008. Also, it is found that credit diversification i.e., number of banks associated to the construction businesses, is conducive to performance, but only during the crisis period.

The results of this study have relevant implications for scholars and practitioners. From an academic perspective, the results contribute to extending the growing literature on the relevance of suppliers' trade credit as a means for enhancing business performance (e.g., Burkart and Ellinsen, 2004; Cuñat, 2007; Garcia-Appendini and Montoriol-Garriga, 2013). In the context of this study, we argue that the specific technological characteristics of the production process in the construction sector - e.g., high interactions between suppliers and corporate clients, dissimilar level of specificity in the intermediate goods provided by suppliers (Keung and Shen, 2017) - gives suppliers an advantage in enforcing non-collateralized debts to construction businesses. Suppliers are effectively a source of liquidity for construction businesses, by providing a continuous flow of intermediate goods sold on credit, as a means of increasing the temporal horizon of the commercial relationships with their clients (Garcia-Appendini and Montoriol-Garriga, 2013). Therefore, the importance of trade credit may result from the suppliers' need to ensure long-term interactions with their corporate customers in periods of credit rationing.

The finding that increased credit diversification is conducive to superior performance in periods of economic downturn helps to better understand the way through which strategic changes of businesses' debt structure yield superior economic results. By analysing a novel source of debt heterogeneity based on the number of banks with which construction businesses work, this study also contributes to the extensive literature on debt heterogeneity (e.g., Diamond 1993; Huyghebaert, Van de Gucht and Van Hulle, 2007; Kahle and Stulz 2013; Rauh and Sufi, 2010; Sufi, 2009).

The construction industry involves a series of cooperative relationships between clients, construction businesses, specialist sub-contractors and suppliers (Keung and Shen, 2017). We suggest that construction managers need to turn their attention to the relationships with their suppliers when considering the introduction of strategic changes that will modify the business' debt structure. Bank credit is not the only source of financial resources, and our results underline the relevance of both supplier's trade credit and bank diversification. Because the collaborative incentives between suppliers and construction businesses are

stronger in a crisis period, a network analysis seems necessary (Pryke, 2005). By conducting a profound analysis of the business' commercial networks, managers of construction businesses will be in a better position to understand the potential value of trade credit as an alternative source of financing as well as to better develop business strategy in periods of economic growth or stagnation.

A series of limitations to the present study must, however, be mentioned. These limitations, in turn, represent avenues for future research. First, like other studies on suppliers' trade credit (see e.g., Cuñat, 2007; Garcia-Appendini and Montoriol-Garriga, 2013), the data do not permit the direct analysis of the underlying commercial relationships between commercial suppliers and construction businesses. We present various interpretations of how suppliers' lending incentives vary according to the stage of the economic cycle; however, we do not evaluate how relevant characteristics of business networks (e.g., density in terms of the number of suppliers associated to the business, strength of the commercial relationship, temporal duration) affect the suppliers' willingness to grant trade credit to construction businesses, nor do we assess the processes through which trade agreements are designed (e.g., collaborative agreement between the two parties or imposed by one party with greater bargaining position). Further research on this issue would be valuable. For example, specifically designed future studies can address this point by evaluating whether the suppliers' lending response is conditioned by the characteristics of their relationship with the organization (e.g., short-term vs. long-term relationship, level of specificity of the intermediate goods provided by the supplier).

Second, differences in regulatory frameworks, as well as variations in the dynamics of credit markets and in the effect of the crisis, may explain performance changes in the construction industry. For example, we have argued that the importance of trade credit in crisis periods may result from the suppliers' need for ensuring the long-term interaction with their corporate customers. Furthermore, though it was not the objective of this study, the suppliers' incentives to grant trade credit in crisis periods may increase if businesses are backed by a supportive legal framework that warrants trade payments. As a response to the burst of the housing bubble in 2008, both the European Union - via the Late Payment Directive 2011/7/EU - and the Spanish administration - via The Royal Decree-Law 4/2013 - introduced legislation that regulates payment terms in B2B transactions. With the new regulations fully in place in 2013, the maximum payment period for commercial transactions is 60 days (30 days in the case of transactions with the public administration), unless otherwise expressly agreed in the contract. From an economic perspective, future research should evaluate the potentially moderating effect of regulatory changes in the relationship between trade credit and performance.

References

Andrews, D. and Caldera Sánchez, A., 2011. The Evolution of Homeownership Rates in Selected OECD Countries: Demographic and Public Policy Influences. *OECD Journal: Economic Studies*, 2011/1, pp. 1-37. http://dx.doi.org/10.1787/eco_studies-2011-5kg0vswqpmg2.

Bigelli, M. and Sánchez-Vidal, J., 2012. Cash holdings in private firms. *Journal of Banking & Finance*, 36(1), pp. 26-35. https://doi.org/10.1016/j.jbankfin.2011.06.004.

Bolton, P. and Freixas, X., 2000. Equity, bonds, and bank debt: Capital structure and financial market equilibrium under asymmetric information. *Journal of Political Economy*, 108(2), pp. 324-51. https://doi.org/10.1086/262121.

Burkart, M. and Ellingsen, T., 2004. In-kind finance: a theory of trade credit. *American Economic Review*, 94(3), pp. 569-90. https://doi.org/10.1257/0002828041464579.

Bureau Van Dijk (BVD), 2016. Sistema de Análisis de Balances Ibéricos (SABI). [online] Available at: https://sabi-bvdinfo-com.recursos.biblioteca.upc.edu/version-2017116/home.serv?product=SabiNeo [Accessed 23 06 2016].

Castro, I., Galan, J.L., and Casanueva, C., 2009. Antecedents of construction project coalitions: a study of the Spanish construction industry. *Construction Management and Economics*, 27(9), pp. 809-22. http://dx.doi.org/10.1080/01446190903117751.

Chava, S. and Roberts, M.R., 2008. How Does Financing Impact Investment? The Role of Debt Covenants. *Journal of Finance*, 63(5), pp. 2085-2121. http://doi.org/10.1111/j.1540-6261.2008.01391.x.

Choy, C F., 2011. Revisiting the 'Bon curve'. *Construction Management and Economics*, 29(7), pp. 695-712. http://dx.doi.org/10.1080/01446193.2011.578959.

Crosthwaite, D., 2000. The global construction market: A cross-sectional analysis. *Construction Management and Economics*, 18(5), pp. 619-27. http://dx.doi.org/10.1080/014461900407428.

Cuñat, V., 2007. Trade Credit: Suppliers as Debt Collectors and Insurance Providers. *Review of Financial Studies*, 20(2), pp. 491-527. https://doi.org/10.1093/rfs/hhl015.

Denis, D.J. and Mihov, V.T., 2003. The choice among bank debt, non-bank private debt, and public debt: evidence from new corporate borrowings. *Journal of Financial Economics*, 70(1), pp. 3-28. https://doi.org/10.1016/S0304-405X(03)00140-5.

Diamond, D.W., 1993. Seniority and maturity of debt contracts. *Journal of Financial Economics*, 33, pp. 341-68. https://doi.org/10.1016/0304-405X(93)90011-Y.

Directive 2011/7/EU of the European Parliament and of the Council of 16 February 2011 on combating late payment in commercial transactions (recast).

Epure, M. and Lafuente, E., 2015. Monitoring bank performance in the presence of risk. *Journal of Productivity Analysis*, 44(3), pp. 265-81. https://doi.org/10.1007/s11123-014-0413-z.

European Commission, 2016. *Analytical Report: Stimulating favourable investment conditions*. Brussels: European Construction Sector Observatory.

Fernández-López, X.L. and Coto-Millán, P., 2015. From the Boom to the Collapse: A Technical Efficiency Analysis of the Spanish Construction Industry during the Financial Crisis. *Construction Economics and Building*, 15(1), pp. 104-17. http://dx.doi.org/10.5130/AJCEB.v15i1.4168.

Franks, J. and Sussman, O., 2005. Financial Distress and Bank Restructuring of Small to Medium Size U.K. Companies. *Review of Finance*, 9(1), pp. 65-96. https://doi.org/10.1007/s10679-005-2988-8.

Garcia-Appendini, E. and Montoriol-Garriga, J., 2013. Firms as liquidity providers: Evidence from the 2007-2008 financial crisis. *Journal of Financial Economics*, 109(1), pp. 272-91. https://doi.org/10.1016/j.jfineco.2013.02.010.

Giannetti, M., Burkart, M., and Ellingsen, T., 2011. What you sell is what you lend? Explaining trade credit contracts. *Review of Financial Studies*, 24(4), pp. 1261-98. https://doi.org/10.1093/rfs/hhn096.

Gimeno, R. and Martinez-Carrascal, C., 2010. The relationship between house prices and house purchase loans: The Spanish case. *Journal of Banking & Finance*, 34(8), pp. 1848-55. https://doi.org/10.1016/j.jbankfin.2009.12.011.

Greene, W., 2003. *Econometric Analysis*, fifth ed. Upper Saddle River, NJ: Prentice Hall.

Horta, I.M., Camanho, A.S., Johnes, J. and Johnes, G., 2013. Performance trends in the construction industry worldwide: An overview of the turn of the century. *Journal of Productivity Analysis*, 39(1), pp. 89-99. https://doi.org/10.1007/s11123-012-0276-0.

Huyghebaert, N., Van de Gucht, L., and Van Hulle, C., 2007. The Choice between Bank Debt and Trace Credit in Business Start-Ups. *Small Business Economics*, 29(4), pp. 435-55. https://doi.org/10.1007/s11187-006-9005-2.

INE, 2017. *Construction and Housing, Building Construction Statistics*. [online] Available at: http://www.ine.es/dyngs/IOE/en/operacion.htm?numinv=20001 [Accessed 25 10 2017].

Kahle, K.M. and Stulz, R.M., 2013. Access to capital, investment, and the financial crisis. *Journal of Financial Economics*, 110(2), pp. 280-99. https://doi.org/10.1016/j.jfineco.2013.02.014.

Kapelko, M., Lansink, A.O., and Stefanou, E.S., 2014. Assessing dynamic inefficiency of the Spanish construction sector pre- and post- financial crisis. *European Journal of Operational Research*, 237, pp. 349-57. https://doi.org/10.1016/j.ejor.2014.01.047.

Keung, K. and Shen, L., 2017. Network strategy for contractors' business competitiveness. *Construction Management and Economics*, in press. https://doi.org/10.1080/01446193.2017.1329539.

Lin, C., Ma, Y., Malatesta, P., and Xuan, Y., 2013. Corporate ownership structure and the choice between bank debt and public debt. *Journal of Financial Economics*, 109(2), pp. 517-34. https://doi.org/10.1016/j.jfineco.2013.03.006.

Nini, G., Smith, D.C., and Sufi, A., 2009. Creditor control rights and firm investment policy. *Journal of Financial Economics*, 92, pp. 400-20. https://doi.org/10.1016/j.jfineco.2008.04.008.

Pryke, S.D., 2005. Towards a social network theory of project governance. *Construction Management and Economics*, 23(9), pp. 927-39. http://dx.doi.org/10.1080/01446190500184196.

Rauh, J. and Sufi, A., 2010. Capital Structure and Debt Structure. *Review of Financial Studies*, 23(12), pp. 4242-80. https://doi.org/10.1093/rfs/hhq095.

Royal Decree-Law 3/2013, of February 22nd, 2013, Amending the rules on fees in the Justice system and the free Legal Aid system.

Shiller, R.J., 2008. *The subprime solution: How today's global financial crisis happened and what to do about it*. Princeton, N.J.: Princeton University Press.

Sufi, A., 2009. Bank Lines of Credit in Corporate Finance: An Empirical Analysis. *Review of Financial Studies*, 22(3), pp. 1057-88. https://doi.org/10.1093/revfin/hhm007.

Wilner, B.S., 2000. The exploitation of relationships in financial distress: The case of trade credit. *Journal of Finance*, 55(1), pp. 153-78. https://doi.org/10.1111/0022-1082.00203.

Wooldridge, J., 2002. *Econometric Analysis of Cross Section and Panel Data*. Cambridge, MA: MIT Press.