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Is there a trade-off between inventories and trade credit? The role of the sovereign debt crisis

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Abstract

Using a panel of 72,172 manufacturing firms from 11 euro-area countries over the period 2006-2015, we investigate how the stock of inventories relates to the extension of trade credit. Consistent with the inventory-management motive for offering trade credit, we find an inverse relationship between the two variables. This association is stronger for firms producing differentiated goods and during the recent sovereign debt crisis. Furthermore, financial intermediation mitigates the inventory-management motive, especially during the crisis period. Our results are robust to using different definitions of trade credit and of the crisis.

Keywords: Trade credit; Inventories; Euro area; Sovereign debt crisis; Financial development

JEL: G31; G32; E44; D22

1. Introduction

Over the period 2006-2015, the average ratio of trade credit extended to sales for firms in euro-area countries was 28.0%. The ratio ranged from 8.8% in Germany to 59.3% in Greece.[1,2] These statistics indicate that companies direct a significant share of their sales to financing their customers, which may in turn have a positive feedback effect on their sales. At the same time, these firms had a 15.9% inventory-to-sales ratio on average; it ranged from 12.1% in Spain to 23.1% in Ireland.[3] Interestingly, figure 1 shows that the accounts receivable and stock of inventories (relative to sales) of euro-area firms move in opposite directions. This paper aims at explaining the reasons behind this pattern.

Holding inventories is typically costly (Bougheas *et al.*, 2009; Guariglia and Mateut, 2016). Accordingly, it is sensible for firms to minimize their inventory-to-sales ratio by enhancing sales. One way to do this is to provide credit to financially constrained buyers, which results in accounts receivable. This is known as the inventory-management motive for offering trade credit. Bougheas *et al.* (2009) find evidence of such a trade-off between inventories and accounts receivable in the UK; Guariglia and Mateut (2016) also find evidence of it in China.[4] The trade-off between inventories and trade credit observed in Figure 1 could be an indication that the inventory-management motive also applies to firms in the euro-area. The first aim of this paper is to formally test whether this is the case.

The 2010-2011 sovereign debt crisis was unprecedented, partly because it hit in the aftermath of the global financial crisis[5]. European Central Bank (ECB) officials highlighted on many occasions the financing constraints that small and medium-sized enterprises (SMEs)

[1] Trade credit extended is also referred to as accounts receivable. Hereafter, we use these two terms interchangeably.

[2] See Appendix B for descriptive statistics of relevant variables in each country.

[3] Inventories (hereafter also referred to as *stocks*) include finished goods produced but unsold, work-in-progress, and raw materials. In our dataset we observe only total inventories and cannot distinguish between raw materials, work in process, and finished goods.

[4] A negative relationship between trade credit and inventories is also consistent with Daripa and Nilsen (2011), who argue that sellers subsidize the shift of inventories to buyers.

[5] Previous studies document the chronology of the euro-area sovereign debt crisis (e.g. Fernandes *et al.*, 2019). The most severe phase of the crisis occurred in 2010–2011. The crisis period includes developments such as soaring government bond yields in the periphery of the euro area, downgrades by credit rating agencies, the initiation of a systemic response through bailouts, the ECB's purchase of distressed bonds via the Securities Markets Programme, and the three-year Long-Term Refinancing Operations at the end of 2011. By 2012, the worst was over; bond yields declined, especially after Mario Draghi's announcement in July of that year that the ECB was ready to do whatever it took to preserve the euro (Fernandes *et al.*, 2019). The announcement of the Outright Monetary Transactions (OMT) programme followed in August 2012. The OMT allowed the ECB to intervene in secondary sovereign bond markets, provided that the country requesting its intervention agreed a programme of economic adjustment.

faced during that period (Draghi, 2014), with credit weakness contributing to economic weakness.[6] As a result of the financial pressure, firms in the euro area turned to alternative sources of financing, such as trade credit (Carbó-Valverde *et al*., 2016; Casey and O'Toole, 2014). Trade credit is a significant source of funds, particularly for firms that are running out of bank credit (Petersen and Rajan, 1997; Nilsen, 2002). In line with this argument, figures 1 and 2 show that accounts receivable substantially increased during the sovereign debt crisis.

Considering that economic crises go hand in hand with increased demand uncertainty (ECB, 2016; Bloom *et al.,* 2018; Kozeniauskas *et al.,* 2018), it makes less sense for firms to hold costly inventories during those periods. The second aim of this paper is to investigate whether, in line with this argument, the trade-off between inventories and trade credit was magnified over the sovereign debt crisis period. Furthermore, we test whether the nature of the products transacted by firms (standardized versus differentiated)[7], as well as the degree of financial development in the firm's country affects the trade-off.

Our analysis is based on a panel of 72,172 euro-area firms, sourced from AMADEUS, (Analyze Major Databases from European Sources) over the period 2006-2015. Previewing the main findings, we first show that inventories are negatively associated with trade credit extended. This supports Bougheas *et al.'*s (2009) inventory-management motive. Second, we find that the trade-off between inventories and trade credit in the euro area is magnified during the recent sovereign debt crisis, and is stronger for producers of differentiated goods. Third, we show that financial development attenuates the inventory-management motive. These results are robust to a battery of sensitivity checks.

This paper brings together two strands of the literature on trade credit. The first is concerned with the motives for extending credit to customers and receiving trade credit from suppliers. Financial theories of trade credit dominate this strand, along with related empirical evidence regarding the relationship between trade credit and other balance sheet variables.[8]

[6] Several studies highlight how banking risk transformed the global financial crisis into a sovereign debt crisis, as well as the nexus between banking risk and sovereign risk (Alter and Schüler, 2012; De Bruyckere *et al.*, 2013; Acharya *et al.*, 2014; Delatte *et al.,* 2017). Other studies examine how the euro-area sovereign debt crisis affected the availability of credit for SMEs. For example, Ferrando *et al.* (2017) find that during the sovereign debt crisis, SMEs in stressed countries were more likely to experience rationed credit.

[7] Differentiated goods are often linked to the needs of particular customers, whilst standardized products are off-the-shelf products. Ng *et al*. (1999) and Mateut and Zanchettin (2013) show that the use of trade credit differs significantly across firms producing standardized and differentiated goods. See Section 5.3.1 for more details.

[8] As Bougheas *et al.* (2009) point out, the theoretical models on the determinants of trade credit relate to information asymmetry (Smith, 1987; Bias and Gollier *et al.*, 1997), discrimination arguments (Brennan *et al.*, 1988), monitoring advantages (Mateut *et al.*, 2006), product quality (Long *et al.,* 1993), bankruptcy (Frank and Maksimovic, 1998; Wilner, 2000), opportunistic behavior (Burkart and Ellingsen, 2004), and externalities (Daripa and Nilsen, 2011). For related empirical evidence, see among others, Mian and Smith (1992), Rajan and Zingales (1995), Fisman and Love (2003), Giannetti (2003), and Love *et al.* (2007).

The second strand focuses on how financial crises and associated financing constraints affect trade credit utilization. There is overall agreement that bank credit-constrained firms turn to trade credit during financial crises (Love *et al.,* 2007; Garcia-Appendini and Montoriol-Garriga, 2013; Casey and O'Toole, 2014; Carbó-Valverde *et al.*, 2016).[9]

We make three main contributions to this literature. First, we shed new light on the rather underexplored inventory-management motive and highlight its crucial role in the extension of trade credit to the euro-area corporate sector. Second, we investigate how recent turmoil in the euro area affected the trade-off between inventories and trade credit. In doing this, we extend the literature on economic crises in Europe, which, when it comes to financing effects, largely focuses on bank lending (Ferrando *et al.*, 2017; Acharya *et al.*, 2018). Whilst Casey and O'Toole (2014) and Carbó-Valverde *et al.* (2016) investigate changes in the uptake of trade credit during crisis periods, our main emphasis is on trade credit extension. Third, this paper provides, for the first time, a systematic empirical analysis of how financial development affects the inventory-management motive.

The remainder of the paper is structured as follows. Section 2 describes our data and presents summary statistics. Sections 3 develops our hypotheses. Sections 4 describes our methodology. Section 5 presents the main empirical results. Section 6 discusses robustness checks, and section 7 concludes.

2. Data and summary statistics

2.1 Data description

To construct our dataset, we use annual reports from AMADEUS, published by Bureau Van Dijk Electronic Publishing (*BvDEP*). The database comprises financial information on 19 million public and private firms across European countries. We cover 2006 through 2015 and focus on manufacturing firms.[10] We use two different versions of AMADEUS: AMADEUS November 2012 and AMADEUS January 2017. This approach allows us to address the potential attrition bias, as AMADEUS includes only firms that have not been inactive for more

[9] Theoretical models suggest that in the presence of ample liquidity, firms tend to finance themselves using relatively cheap bank credit. When liquidity dries up, they are more inclined to make use of more expensive trade credit (Petersen and Rajan, 1994; Nilsen, 2002; Burkhart and Ellingsen, 2004). A related strand of literature considers how monetary policy tightening increases the utilization of trade credit, which helps firms absorb the effect of credit contractions (Choi and Kim, 2005; Mateut *et al.,* 2006).

[10] We select only firms with unconsolidated statements. This avoids double-counting firms (Guariglia *et al.*, 2016; Fernandes *et al.*, 2019).

than four years**.** Our dataset spans 11 euro-area countries: Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Netherlands, Portugal, and Spain.[11,12]

Our final panel consists of 411,987 firm-year observations, which correspond to 72,172 firms. We remove observations with negative sales and assets, and drop firms that do not have complete records on the variables used in our regressions. We also exclude firms with fewer than three years of consecutive observations. Following standard practice in the literature, we control for the potential influence of outliers by excluding observations in the 1% tails of each of our regression variables[13].

Our panel is unbalanced. Allowing for the entry and exit of firms partially mitigates potential selection and survivorship bias. The vast majority of firms in the dataset are not traded in the stock market. This is an appealing characteristic because those firms are most likely to suffer from higher levels of information asymmetry. As such, they benefit more from extending trade credit, which allows them to enhance demand for their products and to attract new customers (Emery, 1987).

2.2 Summary statistics

Table 1 presents descriptive statistics for the variables we use in our analysis. We report means and standard deviations for the whole sample (column 1), for crisis and non-crisis periods (columns 2 and 3)[14], and for differentiated and standardized sectors (column 5 and 6)[15]. We present *p*-values for the tests of equality of means with unequal variances across relevant groups of firms in columns 4 and 7.

Column 1 shows that the average ratio of accounts receivable to sales (*TD*) for firms in our sample is 28.0%. This is similar to the corresponding figure in Mateut *et al.* (2015), which

[11] Luxembourg is excluded due to missing sales data.

[12] Following Blundell *et al.* (1992) and based on a two-digit NACE classification, we group firms into the following industrial sectors: metal and metal goods; other minerals and mineral products; chemical and man-made fibres; mechanical engineering; electrical and instrument engineering; motor vehicles and parts; other transport equipment; food, drink, and tobacco; textiles, clothing, leather, and footwear; and other.

[13] See Appendix A for details about our sample selection criteria. Appendix E presents details about the structure of the panel, and Appendix F presents the correlation matrix.

[14] Following Becker and Ivashina (2018) and Fernandes *et al.* (2019), we define the crisis years as 2010 and 2011. These two years can be considered as the peak of the European sovereign debt crisis. Several authors, such as, for instance, Acharya *et al.* (2018), also included 2012 within the sovereign debt crisis period. Our main results were robust to redefining the crisis so as to also include 2012. Furthermore, to avoid overlap between "normal times" and the financial crisis period, we also checked the robustness of our findings to including the years 2007-09 within the crisis dummy. The results based on these different definitions of the crisis are reported and discussed in Section 6.1.

[15] See Appendix D for details of which industrial sectors are classified as differentiated/standardized.

sampled French manufacturing firms (21.2%), but it is higher than the figures that Bougheas *et al.* (2009) and Guariglia and Mateut (2016) obtain for the UK and China, respectively.[16]

From columns 2 and 3, we notice that the average trade credit extended to sales ratio is higher during the sovereign debt crisis compared to non-crisis years. During crisis periods, firms with better access to credit likely redistribute capital via trade credit to their customers (Choi and Kim, 2005; Garcia-Appendini and Montoriol-Garriga, 2013)[17]. Moreover, the ratio of inventories to sales is lower during the turmoil, which is in line with Nikolov (2013). Taken together, these statistics are consistent with the view that during crisis periods, firms decrease inventories by channelling funds to financially constrained customers.

Considering other firm-specific characteristics, we observe that during the sovereign debt crisis years, firms report lower profitability and pledge smaller amounts of collateral. Firms also show higher ratios of short-term debt to sales during those times. This is driven by a decline in sales. The differences between the aforementioned indicators during and outside the crisis period are statistically significant at conventional levels (column 4).

Focusing on the sectors in which firms operate, we note that on average firms in the differentiated sector sell on credit more than manufacturers producing standardized goods do (column 5 and 6). This can be explained bearing in mind that producers of specialised goods have fewer alternative customers, and, as a result, have a stronger incentive to generate sales by offering trade credit (Mateut *et al*., 2015). Furthermore, firms selling differentiated goods are smaller, younger, more liquid, and more profitable. These differences between relevant indicators within the standardized and differentiated subsamples are statistically significant in all cases (column 7).

Overall, the aforementioned preliminary statistics suggest that extending trade credit may be related to inventory levels, the sovereign debt crisis, and the nature of the transacted goods.

[16] Bougheas *et al.* (2009) and Guariglia and Mateut (2016) find that the average ratio of accounts receivable to sales is 17.0% and 17.2%, respectively. The difference between our figures and theirs is probably due to the fact that we focus on euro-area countries, whilst they focus on the UK and China, respectively. Moreover, our study is based on the period 2006-2015, while they focus on 1993-2003 and 2000-2007, respectively.

[17] Figure 2 graphs the annual average standardized (*z*-score) level of accounts receivable for non-financial corporations in our sample over the period 2006-2015. This is calculated subtracting the sample's overall average accounts receivable from the average accounts receivable for each country and dividing the result by the standard deviation of overall accounts receivable. In line with the descriptive statistics in columns 2 and 3 of table 1, we see that accounts receivable grow significantly at the beginning of the sovereign debt crisis and then begins contracting in 2012. During the crisis period, bank-lending constraints and credit rationing likely increased firms' demand for trade credit in the euro area (Carbó-Valverde *et al.,* 2009; Ferrando and Mulier, 2013; Casey and O'Toole, 2014).

In the following sections, we provide a formal econometric analysis on the links among these variables.

3. Conceptual framework and hypotheses

3.1 Trade credit and inventories

A vast theoretical and empirical literature shows that trade credit is one of the most important sources of short-term financing for firms, irrespective of their size (Petersen and Rajan, 1997; Giannetti *et al*., 2011; Ferrando and Mulier, 2013; Casey and O'Toole, 2014). Daripa and Nilsen (2011) and Bougheas *et al.* (2009) advocate that extending trade credit is related to inventory management.[18] In particular, firms produce goods for sale. If firms do not sell the goods, they retain the inventory at a cost. Bearing in mind that the demand for their products is uncertain, producers have an incentive to provide credit to financially constrained customers in order to boost sales and to avoid holding costly inventories of finished goods. This is known as the inventory-management motive for sales on credit. Extending credit boosts sales and decreases the cost of holding inventories. Bougheas *et al.* (2009) and Guariglia and Mateut (2016) find evidence of the inventory-management motive in the UK and China, respectively. We anticipate a similar inventory-management motive for euro-area firms. Hence, our first testable hypothesis is:

H1: *There is a negative association between trade credit extended and inventories.*

3.2 The role of extreme economic events

Several studies in the past two decades investigate the use of trade credit across periods of tight and loose monetary policy. The financial-accelerator theory motivates this line of inquiry according to which periods of monetary contraction increase financing costs and weaken balance sheets (Bernanke *et al.,* 1996). Theoretical research predicts that when access to external financing is unrestricted, firms finance investment projects using bank credit (Petersen and Rajan, 1994; Biais and Gollier, 1997; Burkart and Ellingsen, 2004). Yet, when bank lending is insufficient to fund their operations, firms resort to trade credit. From an empirical

[18] The theoretical models in Bougheas *et al.* (2009) and Daripa and Nilsen (2011) are complementary. The former is a storage-cost model, in which the supplier faces a stochastic demand. The supplier needs to extend trade credit only to meet its financial obligations. In the latter study, it is the downstream customer who faces stochastic demand.

point of view, trade credit has been found to increase during periods of tight monetary policy (Petersen and Rajan, 1997; Nilsen, 2002; Choi and Kim, 2005).

How the recent global financial crisis affected trade credit is less clear-cut. For instance, Garcia-Appendini and Montoriol-Garriga (2013) show that larger US firms extended more trade credit to financially constrained counterparts during the global financial crisis. Yet, focusing on a sample of Dutch firms, Kabir and Zubair (2015) demonstrate that trade credit decreased during the crisis.

Recent literature focuses on trade credit among firms more and less likely to face liquidity constraints. For instance, Casey and O'Toole (2014) show that during the global financial crisis, financially constrained firms in the euro area used more trade credit as an alternative to bank lending than their unconstrained counterparts did. Using a sample of Spanish SMEs, Carbó-Valverde *et al*. (2016) also show that financially constrained firms depended heavily on trade credit during the recent crisis. In summary, this literature argues that financially constrained firms rely more on trade credit during bad economic times.

The European sovereign debt crisis led to a significant contraction in bank loan supply, with implications for firms' real decisions (Acharya *et al.*, 2018; Farinha *et al.*, 2019). Evidence also suggests that loan costs increased, which had dire effects on firms' employment decisions, especially for firms in the periphery of European economies.[19] As a result, during this period, credit-rationed firms used trade credit as an alternative source of financing (Casey and O'Toole, 2014).

In light of these arguments, we expect firms in the euro area to face a higher incentive to offer trade credit during the sovereign debt crisis, due to the increased uncertainty in the demand for their products[20]. At the same time, we expect their financially constrained customers to face a contraction of credit supply from banks, which encourages the search for alternative sources of financing. As a result, the inventory-management motive should be stronger during the sovereign debt crisis. This leads to our next hypothesis, which is:

[19] Previous studies (Bris *et al.,* 2008; Afonso *et al.,* 2014; Fernandes *et al.,* 2019) classify Greece, Ireland, Italy, Portugal, and Spain as periphery economies, and Austria, Belgium, Finland, France, Germany, Luxembourg, and the Netherlands as non-periphery countries.

[20] We verified whether the sovereign debt crisis was indeed associated with an increase in uncertainty by constructing a firm-specific measure of uncertainty based on sales. Specifically, following previous literature (Caglayan *et al.,* 2012; Byrne *et al.,* 2016), we estimated an AR(1) model of sales augmented with time, country, and industry-specific dummies. We then computed uncertainty as the three-year moving standard deviation of the unpredictable part of firms' total real sales. In figure 3, we plot the average values of firm-specific uncertainty per year. The figure shows a significant increase in uncertainty associated with the sovereign debt crisis.

H2: *The negative association between trade credit extended and inventories is stronger during the sovereign debt crisis*.

4. Empirical implementation and methodology

4.1 Baseline specification

Our baseline model follows Giannetti *et al.* (2011) and takes into account the inventory-management motive in Bougheas *et al.* (2009). It takes the following form:

$$TD_{it} = \propto_i + \beta_1 TD_{it-1} + \beta_2 Age_{it} + \beta_3 Size_{it} + \beta_4 Stock_{it} + \beta_5 Collateral_{it} + \\ + \beta_6 Profit_{it} + \beta_7 Liquidity_{it} + \beta_8 Loans_{it} + \\ + \varphi_i + \varphi_t + \varphi_j + \varphi_{jt} + \varphi_c + e_{it} \quad (1)$$

where, i = 1, 2, ...N, indexes firms and t = 1, 2, ...T, indexes years. TD_{it} is the dependent variable, measured as accounts receivable over sales. Our main variable of interest is $Stock_{it}$, which is defined as the ratio of inventory stock to sales, and accounts for the effect of holding costly stocks of inventories. Our first aim is to investigate whether there is a trade-off between inventories and trade credit extended. A negative β_4 supports *H1*, implying a trade-off between inventories and trade credit extended.

We also add controls for various firm-specific characteristics that influence the extension of trade credit.[21] We include Age_{it}, which is the logarithm of the difference between the present year and the firm's date of incorporation, to control for track record. The literature widely accepts that younger firms lacking a track record are more likely to bear credit constraints (Hadlock and Pierce, 2010), making them less likely to extend trade credit. As a result, we expect age to be positively related with trade credit extended.

Following Bougheas *et al.* (2009), we include $Size_{it}$, which is the logarithm of real total assets. We expect larger (smaller) firms should provide more (less) trade credit to their business partners (Bougheas *et al*., 2009). Next, we control for firms' borrowing capacity by including $Collateral_{it}$, which is the ratio of tangible assets to total assets. Previous studies show that firms with higher asset tangibility, and therefore higher borrowing capacity, tend to extend less credit to other firms because they operate in industries with lower growth potential

[21] See Appendix C for detailed definitions of all the variables in our data set included in our models.

(Hovakimian, 2009; Giannetti *et al.,* 2011). Hence, we expect a negative relationship between collateral and the extension of trade credit.

We also include $Profit_{it}$, which is operating profit (or loss) divided by total sales. More profitable firms are more likely to channel their earnings toward accounts receivable (Guariglia and Mateut, 2016). As a result, we expect firms' profitability to be positively associated with accounts receivable.

$Liquidity_{it}$, measured as cash and equivalents to total sales, captures firms' gross liquid assets (cash, bank deposits, and other current assets excluding inventories and accounts receivable). In line with Petersen and Rajan (1997), Mateut *et al*. (2015), and Guariglia and Mateut (2016), we expect liquidity to be negatively associated with the volume of sales on credit. This can be explained considering that a firm with low liquidity may be better off increasing its credit sales by extending trade credit to customers rather than not selling at all. We capture access to bank credit using $Loans_{it}$, which is short-term debt to total sales. According to Bougheas *et al.* (2009) and Mateut *et al.* (2015), bank loans complement accounts receivable.[22] In line with their work, we expect a positive association between bank loans and the extension of trade credit.

Finally, the error term has four components: φ_i is a firm-specific component, φ_t is a time-specific component accounting for business cycle effects, φ_j is an industry-specific component accounting for industry dynamics, φ_{jt} is an industry-specific component that varies across time and accounts for industry-specific shifts across time periods, φ_c is a country-specific dummy, and ϵ_{it} is an indiosyncratic component. We control for φ_i by estimating our equations in first differences; for φ_t, by including time dummies; for φ_j, by including industry dummies; for φ_c, by including country dummies; and for φ_{jt}, by including time dummies interacted with industry dummies in all our specifications.

4.2 Accounting for the sovereign debt crisis

We next investigate how the trade-off between inventories and trade credit extended varies in and out of the sovereign debt crisi years. To this end, we augment equation (1) with a sovereign debt crisis dummy ($Crisis_t$) and an interaction term between $Crisis_t$ and $Stock_{it}$. The crisis dummy equals 1 over the period 2010-2011, and 0 otherwise. The remaining control variables and fixed effects remain unchanged. The model takes the following form:

[22] See Atanasova (2012) for a detailed analysis regarding substitutability and complementarity between bank loans and trade credit extended.

$$TD_{it} = \propto_i + \beta_1 TD_{it-1} + \beta_2 Age_{it} + \beta_3 Size_{it} + \beta_4 Stock_{it} + \beta_5 Crisis_t + \beta_6 Stock_{it} * Crisis_t + \\ + \beta_7 Collateral_{it} + \beta_8 Profit_{it} + \beta_9 Liquidity_{it} + \beta_{10} Loans_{it} + \\ + \varphi_i + \varphi_t + \varphi_j + \varphi_{jt} + \varphi_c + e_{it} \quad (2)$$

β_4 measures the association between inventory stocks and trade credit extended outside the sovereign debt crisis period. The corresponding association during the crisis period is the sum of β_4 and β_6. To support *H2*, we should observe negative β_4 and β_6 coefficients. This would imply that trade credit extended and the stock of inventories are negatively related, but more so during the sovererign debt crisis.

4.3 Estimation methodology

We estimate all our models using the system Generalised Method of Moments (GMM). The main advantage of the GMM estimator is that it takes into account unobserved firm-specific heterogeneity, as well as the possible endogeneity and mismeasurement problems of the regressors (Arellano and Bover, 1995; Blundell and Bond, 1998). The estimator combines in a system the relevant equation in first-difference and in levels. It makes use of values of the regressors lagged twice or more as instruments in the differenced equation, as well as of differences of the regressors lagged once in the levels equation. We treat all the regressors in our equations (with the exception of age and the crisis dummy) as endogenous and instrument them using their lagged levels in the differenced equation, as well as their lagged differences in the levels equation[23].

To evaluate whether our instruments are legitimate and whether our models are correctly specified, we first use the Sargan test (also known as the *J* test) to test for overidentifying restrictions. Under the null of instrument validity, it is asymptotically distributed as a chi-square with degrees of freedom equal to the number of instruments less the

[23] In Appendix G, we provide estimates of equation (1) obtained using the pooled ordinary least squares (OLS), the fixed effects (FE) estimator, and the first-difference (FD) GMM estimator for comparison. The coefficient associated with the lagged dependent variable from the pooled OLS (FE) estimator is upward- (downward-) biased in a dynamic panel model (Bond *et al.,* 2001). If the same coefficient estimated using the FD GMM lies close to or below the fixed-effects estimates, one could suspect the FD GMM estimate is downward-biased as well, possibly due to weak instruments. In this case, the system GMM is required (Bond *et al.,* 2001). The estimates reported in Appendix G show that the FD GMM coefficient is indeed smaller than the FE coefficient. This justifies our use of system-GMM as our preferred estimator.

number of parameters[24]. Our second criterion is based on the *n*th-order serial correlation in the differenced residuals. In the presence of serial correlation of order 2 in the differenced residuals, the instrument set needs to be restricted to lags 3 and deeper.The latter instruments are valid in the absence of serial correlation of order 3 in the differenced residuals. We assess the presence of *n*th order serial correlation in the differenced residuals by using the *AR(n)* test, which is asymptotically distributed as a standard normal under the null of no *n*th order serial correlation of the differenced residuals (Roodman, 2009).

5. Main results

5.1 Is there an inventory management motive?

We begin our enquiry by estimating equation (1), which aims at assessessing whether a trade-off between inventories and trade credit exists. Column 1 of table 2 presents the baseline results. We observe that the coefficient associated with the stock of inventories ($Stock_{it}$) is negative and statistically significant. The association between inventories and trade credit extended is also economically important. Elasticities evaluated at sample means suggest that a 10% lower stock of inventories (relative to sales) is associated with a 0.99% higher ratio of accounts receivable to sales, which is a sizeable effect.[25] This is consistent with our first hypothesis (H1), according to which, when product demand is uncertain, firms have an incentive to minimize inventory costs by selling on credit. Hence, in line with the empirical evidence in Bougheas *et al.* (2009) for the UK, we confirm the importance of the inventory-management motive for euro-area firms.[26]

With the exception of age (Age_{it}), the control variables in the regression model carry statistically significant coefficients at least at the 10% level. We can rationalize their signs on the basis of existing theoretical models and empirical evidence (Bougheas *et al.*, 2009; Gianneti *et al*., 2011). Larger firms tend to sell more on credit than smaller ones, as indicated by the positive coefficient associated with $Size_{it}$. Collateral ($Collateral_{it}$) is negatively linked to the extension of trade credit. The intuition for this effect is that firms with higher asset

[24] Using Monte Carlo experiments, Blundell *et al.* (2001) demonstrate that the Sargan test tends to over-reject the null hypothesis of valid instruments for the system GMM, especially for large samples. Chen and Guariglia (2013) and Fernandes *et al.* (2019) confirm this finding using a large panel of Chinese and European firms, respectively.
[25] We use the following formula to calculate elasticities: (coefficient on $Stock_{it}$*mean value of $Stock_{it}$)/ mean value of TD_{it}.
[26] Appendix H reports separate regressions for each country in our sample. All countries show a negative and significant coefficient associated with the inventory variable.

tangibility are less likely to extend trade credit, because they tend to operate in less dynamic industries with lower growth potential (Hovakimian, 2009). The positive coefficient associated with profit ($Profit_{it}$) shows that profitable firms are more likely to extend trade credit. This is consistent with the theoretical model and empirical evidence in Bougheas *et al.* (2009). Liquidity ($Liquidity_{it}$) is negatively associated with the extension of trade credit, indicating that less liquid firms extend more trade credit. Because trade credit extension is a way to boost sales, a firm with low liquidity may be better off increasing its credit sales as opposed to not selling at all (Guariglia and Mateut, 2016). The positive sign associated with bank loans ($Loans_{it}$) reveals that when more external funding is available, firms extend more trade credit to their buyers. This is consistent with Bougheas *et al.*'s (2009) argument, according to which accounts receivable complement bank loans. Finally, the autoregressive coefficient (TD_{it-1}) is highly significant and indicates a relatively low persistence in the extension of trade credit.

The diagnostic tests do not generally indicate problems with the choice of instruments and the specification of our model. The Sargan tests suggests the adequacy of the instruments, and there is no sign of second-order serial correlation in the error term of the first-differenced equation.

5.2 The role of the sovereign debt crisis

We next investigate whether the negative association between the stock of inventories and the extension of trade credit in the euro area strengthens during the sovereign debt crisis period. To this end, we estimate equation (2), which is equivalent to the baseline model augmented with two additional variables: an interaction between the stock of inventories and the sovereign debt crisis dummy ($Stock_{it} * Crisis_t$), as well as the crisis dummy not interacted. Through the former, our goal is to assess how the 2010-2011 crisis affects the inventory-management motive. Through the latter, we examine whether the extension of trade credit shifts during the crisis. The results are in column 2 of table 2.

We observe that, once again, the coefficient associated with $Stock_{it}$ is negative and statistically significant. Furthermore, in line with our second hypothesis (H2), the coefficient associated with the interaction between the stock of inventories and the crisis dummy is also negative and significant. Hence, the negative trade-off between inventories and extensions of trade credit becomes stronger during the crisis.[27]

[27] Appendix I reports separate regressions for each country in our sample. All countries show a negative and significant coefficient associated with both the *Stock* variable and its interaction with the *Crisis* dummy.

To assess the economic importance of the crisis, we focus on the coefficients on the interaction term ($Stock_{it} * Crisis_t$) and the stock of inventories ($Stock_{it}$). Elasticities evaluated at sample means show that a 10% lower inventory to sales ratio is associated with a 2.45% [((-0.123-0.315)*0.160)/0.278] higher accounts receivable to sales ratio during the crisis, but only a 0.70% [(-0.123*0.160)/0.278] higher ratio outside of the turmoil period. This reinforces the idea that during a crisis, as a result of higher demand uncertainty, firms face more incentives to sell their inventories on credit to boost sales.

Table 2 also shows that the coefficient associated with the *Crisis* dummy is positive and highly significant. This suggests that during the sovereign debt crisis, firms extended more trade credit to custmers. Considering that firms experienced increased financial difficulties during the crisis (Draghi, 2014), this is consistent with the idea that suppliers support customers that experience temporary financial difficulties, as they have an interest in their customers' survival (Petersen and Rajan, 1997; Cunat, 2007). This is also in line with previous empirical studies showing that trade credit increased in the euro area during the financial crisis (Casey and O'Toole, 2014; Carbó-Valverde *et al.,* 2016).

The other control variables generally behave as conjectured. Furthermore, the diagnostic tests do not indicate any problems with the specification of the model or the choice of instruments.

5.3 Additional results

5.3.1 Does the nature of the traded goods (standardized versus differentiated) make a difference?

Our estimates so far highlight that the sovereign debt crisis intensifies the trade-off between inventory and the extension of trade credit. We next examine whether the link varies according to the characteristics of the transacted goods. The motivation behind this exercise stems from the diversion-value hypothesis in Giannetti *et al.* (2011). Building on the diversion theory in Burkhart and Ellingsen (2004), these authors associate trade credit extended with the nature of the goods traded. In particular, suppliers of trade credit have an advantage relative to banks in financing their customers because repossessed goods are worth more to suppliers than to banks. This advantage is stronger for firms in differentiated industries than for those in standardized sectors. Firms in the former industries produce more specific products that are hard to replace due to their unique and customized inputs. As a result, the seller-buyer relationship is tighter

(Guariglia and Mateut, 2016). In this scenario, switching costs are higher and buyers are less tempted to end relationships with suppliers or default on them (Cunat, 2007). As they have fewer alternative customers, we expect producers of specialized goods to show higher incentives to generate sales by offering trade credit in order to reduce their inventory costs.

To assess whether this is the case, we estimate equations (1) and (2) separately for firms operating in standardized and differentiated industries. The results are presented in table 3. Columns 1 and 3 refer to firms operating in differentiated industries, whilst columns 3 and 4 refer to firms in standardised industries. Focusing on columns 1 and 2, we can see that the coefficient associated with $Stock_{it}$ is only significant for firms operating in the differentiated sector. In other words, the trade-off between inventories and the extension of trade credit is only apparent for firms producing differentiated goods. Furthermore, in column 3, both the coefficient associated with $Stock_{it}$ and that associated with the inteteraction between the stock of inventories and the crisis are negative and significant, whilst the corresponding coefficients in column 4 are not significant. This indicates that that the negative relationship between inventories and the extension of trade credit observed for firms in differentiated sectors is stronger during the sovereign debt crisis. Finally, we also observe a positive coefficient associated with the crisis dummy in column 3, whilst the corresponding coefficient in column 4 is not significant. This suggests that only firms in the differentiated sector are able to extend more trade credit during the crisis period.

5.3.2 The role of financial development

As an economy becomes more financially developed in terms of banking, low-cost credit becomes readily available to both suppliers and customers (Rajan and Zingales, 1998), thereby decreasing the demand for trade credit. Suppliers' incentive to extend trade credit to their customers will therefore be reduced, and, consequently, the incentive for firms to reduce their stocks of inventories by extending more trade credit may also be weakened.

To test whether this is the case, we first augment the baseline model with a country-specific, time-varying variable reflecting the development of the banking system in the country where the firm operates (FD_{ct}). We use two proxies for financial devlopment: the ratio of private bank credit to GDP and the ratio of bank assets to GDP (Beck *et al.*, 2000; Levine, 2006; Baltagi *et al.*, 2008)[28]. We include this variable to assess the direct effect of financial

[28] Following Beck *et al.* (2003), our financial-development data for various countries are taken from the World Development Indicators (WDI, November 2017).

development on the extension of trade credit. At the same time, we add an interaction between the stock of inventories and financial development. This term enables us to examine the extent to which financial development affects the inventory-management motive. The new model that we estimate takes the following form:

$$TD_{it} = \propto_i + \beta_1 TD_{it-1} + \beta_2 Age_{it} + \beta_3 Size_{it} + \beta_4 Stock_{it} + \beta_5 Stock_{it} * FD_{ct} + \beta_6 FD_{ct} + \beta_7 Collateral_{it} + \beta_8 Profit_{it} + \beta_9 Liquidity_{it} + \beta_{10} Loans_{it} + \varphi_i + \varphi_t + \varphi_j + \varphi_{jt} + \varphi_c + e_{it} \quad (3)$$

The results are presented in columns 1 and 2 of table 4. We observe that the coefficient associated with the financial development variable is not statistically significant, which suggests that financial development does not directly affect the extension of trade credit. Yet, the coefficient associated with the interaction between inventories and financial development is positive and significant, regardless of how we measure financial development. Specifically, focusing on column 1, which uses the ratio of private bank credit to GDP as a measure of financial development, a 10% lower stock of inventories for a firm in a country at the 25th percentile of the financial development distribution (0.879) is associated with a 1.38% higher ratio of trade credit extended to sales[29]. The corresponding figure for a country at the 75th percentile of financial development (0.966) is 0.88%[30]. Focusing on column 2, which measures financial development as the ratio of bank assets to GDP, a 10% lower stock of inventories for a firm in a country at the 25th percentile of financial development (1.121) is associated with a 1.67% higher ratio of trade credit extended to sales. The corresponding figure for a country at the 75th percentile (1.330) is 1.25%. This suggests that the inventory-management motive is weaker the higher the financial development characterizing the country where the firm operates. This is consistent with the view that in countries with higher financial development, where it is easier for companies to access cheaper bank credit, it may be more difficult for firms to reduce their stocks of inventories by extending more trade credit.

We next estimate an equation similar to the previous one, which takes the crisis into account by adding the crisis dummy, together with the following interaction terms: ($Stock_{it}$*$Crisis_t$), ($Crisis_t$*FD_{ct}), and ($Stock_{it}$*$Crisis_t$*FD_{ct}). The latter interaction enables us to

[29] This figure is obtained as follows:{[10*[[-0.435+(0.219*0.879)]*0.159]/0.280}.
[30] For both measures of FD, countries at the 25th percentile are Austria, Belgium, and Finland, while countries at the 75th percentile are Greece, Ireland, and Portugal.

test whether the association between inventories and accounts receivable during the crisis period also weakens for countries with higher levels of financial development. The new model takes the following form:

$$TD_{it} = \propto_i + \beta_1 TD_{it-1} + \beta_2 Age_{it} + \beta_3 Size_{it} + \beta_4 Stock_{it} + \beta_5 Stock_{it} * FD_{ct} + \\ + \beta_6 Stock_{it} * Crisis_t * FD_{ct} + \beta_7 Stock_{it} * Crisis_t + \beta_8 FD_{ct} * Crisis_t + \beta_9 Crisis_t + \\ + \beta_{10} FD_{ct} + \beta_{11} Collateral_{it} + \beta_{12} Profit_{it} + \beta_{13} Liquidity_{it} + \beta_{14} Loans_{it} + \\ + \varphi_i + \varphi_t + \varphi_j + \varphi_{jt} + \varphi_c + e_{it} \quad (4)$$

The estimates are reported in columns 3 and 4 of table 4. First, we observe that, once again, financial development does not have a direct impact on trade credit extension. Next, the coefficient associated with the crisis dummy is positive and significant, whilst the coefficient associated with the interaction between the crisis dummy and *FD* is negative and significant. This confirms our previous finding that there is a higher incentive to extend trade credit during crises periods, which, is, however, attenuated in countries with higher financial development. Furthermore, in line with previous findings, the negative and significant coefficient associated with $Stock_{it}$*$Crisis_t$ indicates that the inventory management motive is magnified during the crisis. Finally, the positive and significant coefficients associated with $Stock_{it}$*FD_{ct} and $Stock_{it}$*$Crisis_t$*FD_{ct} indicate that financial development attenuates the inventory management motive in all periods, but more so in crisis periods.

6. Robustness checks

6.1 Using different definitions of the crisis

Our dataset spans the years 2007-2015. So far, as in Becker and Ivashina (2018) and Fernandes *et al.* (2019), we have only considered 2010-2011 as sovereign debt crisis years. The argument is that this was the peak crisis period. Moreover, following Mario Draghi's announcement in July 2012 that the ECB was ready to do whatever it took to preserve the euro, and after the resulting decline in sovereign borrowing costs, the European debt crisis largely ended. Yet, the first half of 2012 was characterised by a restructuring of debt in Greece (March/April 2012) as well as yields on Italian and Spanish government bonds reaching levels normally considered unsustainable, which led to Draghi's announcement (Ferrando *et al.*, 2017; Fernandes *et al.*, 2019). Hence, 2012 could also be seen as part of the sovereign debt crisis. Some authors indeed include 2012 within the sovereign debt crisis years (e.g. Ferrando *et al.,* 2017; Archaya *et al.*,

2018). We therefore verify whether our main results are robust to redefining the *Crisis* including 2012. We report estimates of Equation (2) based on this new definition of the crisis in column 1 of table 5. The results suggest that there is still evidence of a trade-off between the stock of inventories and accounts receivable, which is amplified during the crisis. Yet, both this amplification effect and the direct effect of the crisis on the extension of trade credit are weaker than those reported in column 2 of table 2. This may be explained considering that only the first half of 2012 was in fact a crisis period.

Furthermore, our dataset encompasses not only the European sovereign debt crisis, but also the 2007-2009 global financial crisis. We therefore verify whether our main results are robust to using a broader measure of the crisis, which includes both the sovereign debt crisis and the financial crisis years. To this end, we create a new *Crisis* dummy equal to 1 in the years 2007 to 2011, and 0 otherwise, and re-estimate Equation (2). The results are reported in column 2 of table 5. Once again, we observe evidence in favour of a trade-off between the stock of inventories and trade credit extended, which is magnified over the crisis years. Moreover, the positive and significant coefficient associated with the crisis dummy confirms that trade credit extended rises during turbulent periods. We find similar results in column 3 of table 5, where the *Crisis* dummy is set equal to one in the years 2007-2012, and 0 otherwise.

6.2 Accounting for country heterogeneity

Differences across euro-area countries may influence the trade-off between extended trade credit and the stock of inventories. Although in our empirical specifications, we include country fixed effects to control for country-specific differences, we strenghten our identification by splitting the sample according to countries' legal origin. Previous literature links the usage of trade credit with the rule of law, defined by La Porta *et al*. (1998). The idea is that bank credit is less prevalent in countries with weaker creditor protection (i.e. countries based on French civil law), where financial contracts are less likely to be enforcable (Burkart and Ellingsen, 2004; Demirgüç-Kunt and Maksimovic, 2001). In line with this argument, Ferrando and Mulier (2013) show that trade credit usage is more important than bank lending in countries based on French civil law. We therefore expect a stronger inventory-management motive in these countries. To test whether this is the case, we estimate our main models on two samples, namely countries based on French civil law and other countries.[31] The results are in table 6. Columns 1 and 2 (3 and 4) report estimates of equation (1) (equation 2), respectively, for countries based

[31] Countries based on French civil law are Belgium, France, Italy, the Netherlands, Portugal, and Spain.

on French civil law and other countries. We can see that the inventory-management motive is statistically significant and stronger during the sovereign debt crisis only for firms based in countries that use French civil law.

6.3 Using alternative definitions of trade credit extended

Finally, we check whether our main results are robust to using alternative measures of trade credit extended. First, following Cerqueiro (2011) and Guariglia and Mateut (2016), we define trade credit as the ratio of accounts receivable to total assets.[32] Column 1 of table 7 reports estimates of equation (1) based on this new definition of trade credit, and column 2 reports estimates of equation (2). We continue to observe a trade-off between inventory and extended trade credit, which is stronger during the crisis.

We next argue that managers should use both channels of trade credit (extended and taken) when deciding to generate profits via inventory management (Chod, 2017). To test whether this is the case, we explore whether the trade-off between inventories and accounts receivable also holds for net trade credit (defined as the difference between trade credit extended and trade credit received scaled by total sales). The empirical findings in table 7 suggest there is a trade-off between inventories and net trade credit (column 3), which is stronger during the sovereign debt crisis (column 4). In summary, our results are robust to using different definitions of trade credit.

7. Conclusion

This paper examines two key hypotheses related to the link between inventories and trade credit in the euro area, and the role of the European sovereign debt crisis. Specifically, according to the inventory-management motive, firms shoud prefer to extend trade credit as opposed to holding on to costly inventories. This link is expected to be stronger during crisis periods when demand uncertainty heightens and bank lending dries up, hence increasing the demand for alternative sources of external funding.

Our results, based on a multicountry data-set covering 72,172 euro-area firms over the period 2006-2015, support these hypotheses by providing evidence of a negative relationship between inventories and the extension of trade credit, which becomes stronger during the

[32] Also see Fisman and Love (2003) and Cunat (2007) for a discussion of why it it may be appropriate to deflate trade credit by total assets.

European sovereign debt crisis of 2010-2011. The trade-off is mainly prevalent among firms selling differentiated goods, especially during the sovereign debt crisis. Furthermore, we find that higher levels of financial intermediation weaken the inverse relationship between inventories and sales on credit, particularly in crisis periods. A likely reason for this is that in countries with a higher level of financial intermediation, the financial system is able to provide low-cost credit to firms, thereby decreasing the demand for trade credit. In summary, to fully explain why firms extend trade credit, beyond the inventory management motive, we should also consider the role of financial crises, the nature of the goods sold, and the underlying level of financial development.

Our findings have important insights for financial managers in their day-to-day business operations, as well as for policymakers. They highlight the important "lender of last resort" role that firms play as liquidity providers, particularly during financial crises. Given the traditionally strong dependence of euro area firms on bank lending (European Commission, 2013), and the increased level of fragmentation in the European banking system during the recent sovereign debt crisis (ECB, 2018; Gabrieli and Labonne, 2018), the role of trade credit was vital to maintain supply chains and reduce the potential economic fallout. Thus, we agree with Casey and O'Toole (2014) who reinforce the need of a more diverse financing environment for European firms.

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Supplementary material: Supplementary material can be found in the online Appendix. Appendix A presents details about our sample selection steps. Appendix B presents descriptive statistics for accounts receivable, sales, and inventories by country. Appendix C contains definitions of our main variables. Appendix D presents our industrial classification based on the characteristics of the goods produced. Appendix E provides the structure of our panel. Appendix F contains the correlation matrix. Appendix G presents the OLS, fixed effects, and first-difference GMM estimates of equation (1). Appendixes H and I respectively contain estimates of Equation (1) and Equation (2) for each of the countries in our sample.

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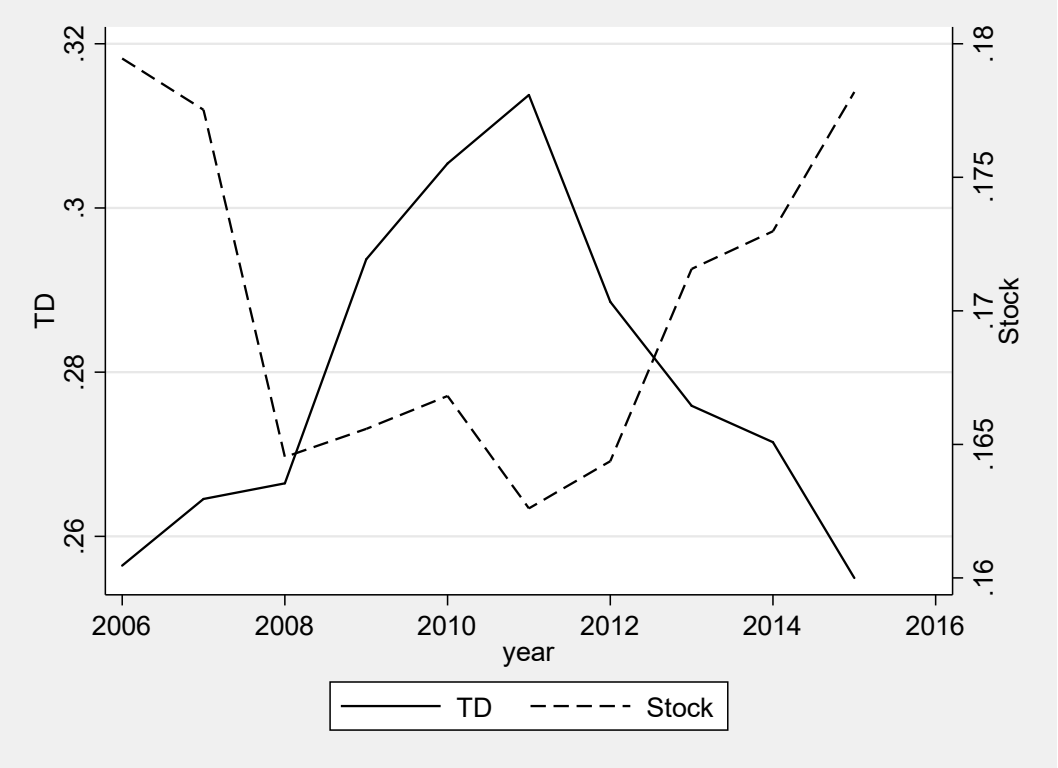

Figure 1: Accounts receivable relative to sales (*TD*) and stock of inventories relative to sales (*Stock*) for non-financial euro-area corporations over the period 2006-2015.

Source: Authors' calculations based on the AMADEUS database

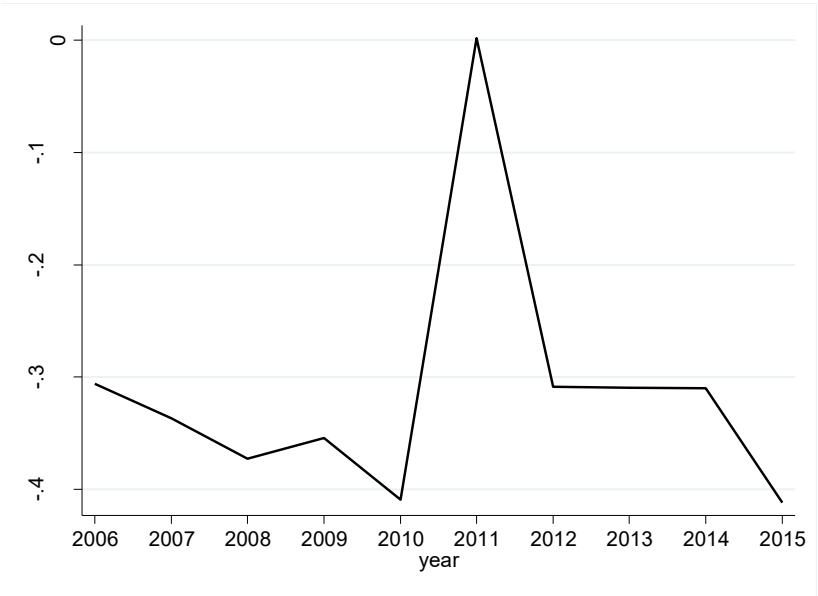

Figure 2: Average standardized (*z*-score) level of accounts receivable for non-financial euro-area corporations over the period 2006-2015.

Source: Authors' calculations based on the AMADEUS database

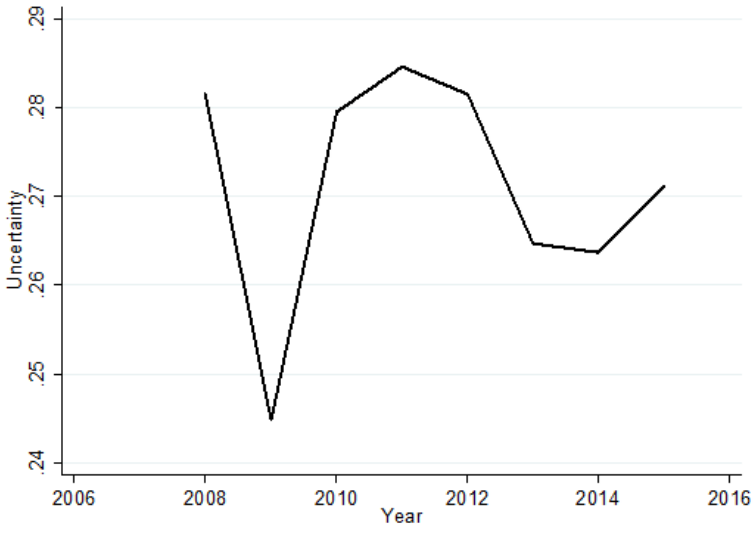

Figure 3: Average level of uncertainty faced by non-financial euro-area corporations over the period 2008-2015.

Source: Authors' calculations based on the AMADEUS database (see footnote 20 for details)

Table 1: Descriptive statistics

Variables	Full Sample	Crisis	Non-crisis	Diff.	Differentiated	Standardized	Diff.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
TD_{it}	0.280	0.282	0.278	0.000	0.277	0.150	0.000
	(0.196)	(0.200)	(0.194)		(0.195)	(0.147)	
Age_{it}	28.440	28.568	28.408	0.001	27.942	29.061	0.000
	(15.022)	(14.844)	(15.066)		(14.752)	(0.548)	
$Ln(Age_{it})$	3.209	3.225	3.205	0.000	3.193	3.195	0.000
	(0.545)	(0.512)	(0.553)		(0.541)	(0.619)	
$Size_{it}$	8408.925	8312.989	8432.96	0.059	8029.876	8882.006	0.000
	(16,345.91)	(16,252.56)	(16,369.15)		(15,828.79)	(16,957.38)	
$Ln(Size_{it})$	8.186	8.187	8.163	0.879	8.145	8.237	0.000
	(1.202)	(1.188)	(1.212)		(1.190)	(1.216)	
$Stock_{it}$	0.159	0.158	0.160	0.004	0.167	0.150	0.000
	(0.151)	(0.151)	(0.151)		(0.153)	(0.147)	
$Collateral_{it}$	0.225	0.223	0.225	0.002	0.199	0.257	0.000
	(0.187)	(0.187)	(0.187)		(0.178)	(0.194)	
$Profit_{it}$	0.043	0.041	0.044	0.000	0.045	0.040	0.000
	(0.046)	(0.044)	(0.046)		(0.047)	(0.044)	
$Liquidity_{it}$	0.102	0.102	0.102	0.791	0.108	0.094	0.000
	(0.129)	(0.129)	(0.129)		(0.133)	(0.123)	
$Loans_{it}$	0.079	0.082	0.078	0.000	0.075	0.085	0.000
	(0.121)	(0.123)	(0.120)		(0.118)	(0.124)	
Observations	411,987	82,539	329,448		228,725	183,262	

Notes: The table reports means with standard deviations in parentheses. $Crisis$ equals 1 in 2010-2011, and 0 otherwise. $Differentiated$ equals 1 for firms in the differentiated sector and 0 for firms in the standardized sector. Age_{it}: Difference between the present year and the firm's date of incorporation. $Ln(\ Age_{it})$: Logarithm of Age_{it}. $Size_{it}$: Real total assets, measured in thousands of euros and deflated using each country's GDP deflator. $Ln(Size_{it})$: Logarithm of $Size_{it}$. Appendix C contains definitions of all other variables. Appendix D provides details of which industrial sectors are classified as differentiated and standardized.

Table 2: The inventory-management motive

	Baseline	Crisis
	(1)	(2)
TD_{it-1}	0.394***	0.488***
	(4.35)	(3.75)
Age_{it}	0.006	0.002
	(1.63)	(0.48)
$Size_{it}$	0.014*	0.018
	(1.88)	(1.57)
$Stock_{it}$	-0.174***	-0.123**
	(-3.57)	(-2.45)
$Crisis_t$		0.061**
		(2.17)
$Stock_{it} \times Crisis_t$		-0.315**
		(-2.03)
$Collateral_{it}$	-0.104**	-0.132*
	(-2.47)	(-1.76)
$Profit_{it}$	0.439*	-0.180
	(1.84)	(-0.53)
$Liquidity_{it}$	-0.046*	0.160
	(-1.68)	(0.90)
$Loans_{it}$	0.366***	0.315***
	(5.34)	(3.27)
Observations	411,987	411,987
Number of id	122,430	122,430
Ar(1)	0.000	0.000
Ar(2)	0.006	0.021
Sargan (p-value)	0.051	0.039

Note: All specifications are estimated using a system-GMM estimator. The figures in parentheses are *t*-statistics, asymptotically robust to heteroskedasticity. $Crisis_t$ equals 1 in 2010-2011, and 0 otherwise. Appendix C contains definitions of all other variables. We include country, industry, and time dummies, as well as time dummies interacted with industry dummies, in all models. Instruments include all regressors lagged twice or more (with the exception of the Age_{it} and $Crisis_t$). *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *Ar(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. *, **, and *** indicate statistically significance at the 10%, 5%, and 1% level, respectively.

Table 3: Inventory-management motive accounting for the type of goods traded

	Differentiated (1)	*Standardized* (2)	*Differentiated* (3)	*Standardized* (4)
TD_{it-1}	0.547***	0.479***	0.605***	0.476**
	(6.39)	(3.52)	(4.56)	(2.27)
Age_{it}	-0.000	0.017***	0.002	0.011
	(-0.05)	(2.99)	(0.46)	(1.33)
$Size_{it}$	0.021**	-0.011	0.042***	-0.017
	(2.55)	(-0.99)	(2.74)	(-0.97)
$Stock_{it}$	-0.154***	-0.068	-0.162**	-0.005
	(-2.71)	(-1.18)	(-2.43)	(-0.07)
$Crisis_t$			0.125**	-0.018
			(2.16)	(-0.38)
$Stock_{it} \times Crisis_t$			-0.638***	0.051
			(-2.70)	(0.20)
$Collateral_{it}$	-0.083*	-0.026	-0.313***	0.117
	(-1.73)	(-0.47)	(-2.84)	(1.22)
$Profit_{it}$	0.686***	0.626*	0.576	0.190**
	(2.94)	(1.76)	(1.24)	(2.03)
$Liquidity_{it}$	-0.096***	-0.037	-0.254	0.234
	(-3.43)	(-0.91)	(-0.92)	(1.10)
$Loans_{it}$	0.293***	0.267***	0.347***	0.037**
	(3.93)	(2.82)	(2.79)	(2.09)
Observations	228,725	183,262	228,725	183,262
Number of id	69,309	53,121	69,309	53,121
Ar(1)	0.000	0.000	0.000	0.000
Ar(2)	0.000	0.043	0.039	0.033
Ar(3)	0.544	0.748	0.8581	0.192
Sargan (p-value)	0.010	0.150	0.453	0.482

Note: All specifications are estimated using a system-GMM estimator. The figures in parentheses are *t*-statistics, asymptotically robust to heteroskedasticity. We include country, industry, and time dummies, as well as time dummies interacted with industry dummies, in all models. $Crisis_t$ equals 1 in 2010-2011, and 0 otherwise. Appendix C contains definitions of all other variables. Appendix D provides details of which industrial sectors are classified as differentiated and standardized. Instruments include all regressors lagged three times or more (with the exception of Age_{it} and $Crisis_t$). *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *Ar(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. *, **, and *** indicate statistically significance at the 10%, 5%, and 1% level, respectively.

Table 4: Inventory-management motive accounting for financial development

	FD= Private Bank Credit to GDP (1)	*FD*= Bank Assets to GDP (2)	*FD*= Private Bank Credit to GDP (3)	*FD*= Bank Assets to GDP (4)
TD_{it-1}	0.226***	0.260***	0.399***	0.475***
	(5.53)	(6.18)	(5.68)	(6.40)
Age_{it}	-0.036***	-0.039***	-0.037***	-0.038***
	(-4.98)	(-5.50)	(-3.70)	(-3.98)
$Size_{it}$	0.041***	0.041***	0.030***	0.028***
	(8.99)	(9.43)	(3.83)	(4.08)
$Stock_{it}$	-0.435***	-0.693***	-0.670***	-0.710***
	(-5.06)	(-8.10)	(-4.02)	(-3.76)
$Stock_{it} \times FD_{ct}$	0.219***	0.356***	0.297***	0.304***
	(3.09)	(5.86)	(2.59)	(2.70)
$Stock_{it} \times Crisis_t \times FD_{ct}$			0.130***	0.046**
			(2.77)	(2.22)
$Stock_{it} \times Crisis_t$			-0.142***	-0.056**
			(-2.76)	(-2.10)
$FD_{ct} \times Crisis_t$			-0.230***	-0.074**
			(-3.02)	(-2.00)
$Crisis_t$			0.241***	0.022**
			(3.00)	(2.43)
FD_{ct}	-0.003	0.005	0.010	-0.019
	(-0.25)	(0.33)	(0.33)	(-0.72)
$Collateral_{it}$	-0.183***	-0.171***	-0.065*	-0.043
	(-5.89)	(-4.83)	(-1.92)	(-1.27)
$Profit_{it}$	0.112	0.225***	-0.240	-0.329
	(1.57)	(2.84)	(-0.85)	(-1.44)
$Liquidity_{it}$	-0.629***	-0.774***	-0.006	0.561***
	(-5.39)	(-6.65)	(-1.05)	(3.09)
$Loans_{it}$	0.844***	0.816***	0.514**	0.041***
	(6.94)	(6.16)	(2.47)	(4.13)
Observations	411,987	411,987	411,987	411,987
Number of id	122,430	122,430	122,430	122,430
Ar(1)	0.000	0.000	0.000	0.000
Ar(2)	0.328	0.143	0.000	0.000
Ar(3)			0.176	0.270
Sargan (p-value)	0.021	0.016	0.029	0.036

Note: All specifications are estimated using a system-GMM estimator. The figures in parentheses are *t*-statistics, asymptotically robust to heteroskedasticity. We include country, industry, and time dummies, as well as time dummies interacted with industry dummies, in all models. FD_{ct} indicates the ratio of private credit to GDP in columns 1 and 3, and the ratio of bank assets to GDP in columns 2 and 4. $Crisis_t$ equals 1 in 2010-2011, and 0 otherwise. Appendix C contains definitions of all other variables. Instruments include all regressors lagged two (three) times or more in column 1 (2) and 2 (4), with the exception of Age_{it}, $Crisis_t$, and FD_{ct}. *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *Ar(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. *, **, and *** indicate statistically significance at the 10%, 5%, and 1% level, respectively.

Table 5: Inventory-management motive using different definitions of the crisis

	Crisis: 2010-2012	*Crisis*: 2007-2011	*Crisis*: 2007-2012
	(1)	(2)	(3)
TD_{it-1}	0.375***	0.443***	0.389***
	(2.96)	(3.38)	(2.86)
Age_{it}	0.004	0.003	0.006
	(1.04)	(0.94)	(1.56)
$Size_{it}$	-0.002	0.017	-0.000
	(-0.21)	(1.54)	(-0.03)
$Stock_{it}$	-0.074*	-0.128**	-0.077*
	(-1.69)	(-2.51)	(-1.79)
$Crisis_t$	0.035*	0.073***	0.044**
	(1.80)	(3.03)	(2.31)
$Stock_{it} \times Crisis_t$	-0.164***	-0.269**	-0.205*
	(-2.92)	(-2.12)	(-1.96)
$Collateral_{it}$	-0.062	-0.139*	-0.106**
	(-1.40)	(-1.82)	(-2.19)
$Profit_{it}$	-0.240	-0.285	-0.385
	(-0.65)	(-0.78)	(-0.98)
$Liquidity_{it}$	-0.014***	0.217	-0.018***
	(-2.67)	(1.18)	(-3.16)
$Loans_{it}$	0.366***	0.336***	0.376***
	(4.17)	(3.39)	(3.98)
Observations	411,987	411,987	411,987
Number of id	122,430	122,430	122,430
Ar(1)	0.000	0.000	0.000
Ar(2)	0.098	0.032	0.123
Sargan (p-value)	0.081	0.066	0.029

Note: All specifications are estimated using a system-GMM estimator. The figures in parentheses are *t*-statistics, asymptotically robust to heteroskedasticity. $Crisis_t$ equals 1 in 2010-12 (column 1), 2007-2011 (column 2), 2007-2012 (column 3), and 0 otherwise. Appendix C contains definitions of all other variables. We include country, industry, and time dummies, as well as time dummies interacted with industry dummies, in all models. Instruments include all regressors lagged twice or more (with the exception of the Age_{it} and $Crisis_t$). *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *Ar(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. *, **, and *** indicate statistically significance at the 10%, 5%, and 1% level, respectively.

Table 6: Inventory-management motive differentiating countries by legal origin

	French civil law countries (1)	*Other countries* (2)	*French civil law countries* (3)	*Other countries* (4)
TD_{it-1}	0.378***	0.469**	0.444***	0.439*
	(4.44)	(1.98)	(8.09)	(1.70)
Age_{it}	0.008*	-0.015**	0.021***	0.003
	(1.93)	(-2.09)	(4.95)	(0.67)
$Size_{it}$	0.012	0.046**	-0.017**	-0.001
	(1.51)	(2.08)	(-2.42)	(-0.17)
$Stock_{it}$	-0.153***	-0.073	-0.085**	-0.022
	(-3.37)	(-0.63)	(-2.19)	(-0.20)
$Crisis_t$			0.631***	0.007
			(5.78)	(0.80)
$Stock_{it} \times Crisis_t$			-0.135***	0.150
			(-6.49)	(0.56)
$Collateral_{it}$	-0.110**	-0.082	-0.143***	-0.147
	(-2.54)	(-0.86)	(-4.57)	(-1.24)
$Profit_{it}$	0.444*	-0.492	0.126	-0.897*
	(1.84)	(-0.89)	(0.60)	(-1.88)
$Liquidity_{it}$	-0.047*	0.083	0.018	0.169*
	(-1.75)	(0.71)	(0.96)	(1.82)
$Loans_{it}$	0.377***	0.246	0.313***	0.230
	(5.44)	(1.51)	(4.89)	(1.08)
Observations	375,133	36,854	375,277	36,854
Number of id	110,495	11,935	110,567	11,935
Ar(1)	0.000	0.000	0.000	0.000
Ar(2)	0.007	0.448	0.252	0.679
Ar(3)	0.744	0.452	0.232	0.381
Sargan (p-value)	0.001	0.359	0.020	0.008

Note: Countries based on French civil law are Belgium, France, Italy, the Netherlands, Portugal, and Spain. All specifications are estimated using a system-GMM estimator. The figures in parentheses are *t*-statistics, asymptotically robust to heteroskedasticity. $Crisis_t$ equals 1 in 2010-2011, and 0 otherwise. Appendix C contains definitions of all other variables. We include country, industry and time dummies, as well as time dummies interacted with industry dummies, in all models. Instruments include all regressors lagged three times or more (with the exception of the Age_{it} and $Crisis_t$). *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *Ar(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. *, **, and *** indicate statistically significance at the 10%, 5%, and 1% level, respectively.

Table 7: Inventory-management motive using alternative definitions of trade credit extended

	TD= trade credit extended/assets (1)	*TD*= trade credit extended/assets (2)	*TD*= Net trade credit (3)	*TD*= Net trade credit (4)
TD_{it-1}	0.420***	0.435***		
	(4.36)	(4.87)		
NTC_{it-1}			0.922***	0.894***
			(17.80)	(19.61)
Age_{it}	0.065	-0.010***	0.000	0.004
	(1.10)	(-3.07)	(0.05)	(0.84)
$Size_{it}$	0.013***	-0.010	0.007	0.003
	(2.96)	(-1.50)	(1.26)	(0.36)
$Stock_{it}$	-0.202***	-0.252***	-0.069**	-0.123**
	(-3.47)	(-5.40)	(-2.01)	(-2.19)
$Crisis_t$		0.137***		0.056***
		(3.48)		(2.67)
$Stock_{it} \times Crisis_t$		-0.733***		-0.286**
		(-3.54)		(-2.44)
$Collateral_{it}$	-0.135***	-0.160***	-0.056*	0.001
	(-3.70)	(-4.84)	(-1.69)	(0.06)
$Profit_{it}$	-0.234	-0.033	-0.480**	0.846***
	(-1.01)	(-1.53)	(-2.47)	(3.05)
$Liquidity_{it}$	-0.020***	0.065	0.026	-0.190***
	(-3.16)	(1.16)	(1.18)	(-4.39)
$Loans_{it}$	0.139***	0.119	0.065*	0.159*
	(3.22)	(0.86)	(1.95)	(1.92)
Observations	394,130	394,130	410,743	410,743
Number of id	119,407	119,407	122,030	122,030
Ar(1)	0.000	0.000	0.000	0.000
Ar(2)	0.002	0.001	0.000	0.000
Ar(3)	0.528	0.639	0.762	0.888
Sargan (p-value)	0.063	0.013	0.303	0.167

Note: All specifications are estimated using a system-GMM estimator. The figures in parentheses are *t*-statistics, asymptotically robust to heteroskedasticity. $Crisis_t$ equals 1 in 2010-2011, and 0 otherwise. In columns (1) and (2), *TD* denotes the accounts receivable to assets ratio, whilst in columns (3) and (4), it denotes the net trade credit to sales ratio. Appendix C contains definitions of all other variables. We include country, industry, and time dummies, as well as time dummies interacted with industry dummies, in all models. Instruments include all regressors lagged three times or more (with the exception of the Age_{it} and $Crisis_t$). *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *AR(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. *, **, and *** indicate statistically significance at the 10%, 5%, and 1% level, respectively.

Online Appendix

Appendix A: Sample selection

We use data in the AMADEUS database from Bureau Van Dijk. We start with an initial sample of 1,803,285 firm-year observations. Following standard practice in the literature, we control for the potential influence of outliers by excluding observations in the 1% tails for each of our regression variables. After removing outliers, our sample contains 1,250,439 firm-year observations. We also remove observations with negative sales and assets, which further reduces our sample to 1,078,228 firm-year observations. In addition, we drop firm-year observations that do not have complete records on the variables in our regressions, leaving us with a sample of 1,050,539 observations. Furthermore, we drop firms with fewer than three years of consecutive observations from the sample. This is justified, considering that when using the system-GMM estimator, we estimate equations in both levels and first differences, using values of the regressors lagged twice or more as instruments. Because our main specification is dynamic, we need at least three cross-sectional observations for each firm. This leaves us with a sample of 411,987 firm-year observations (corresponding to 72,172 firms), which is the sample used for the OLS, within-group, and system-GMM estimates. For the first-difference GMM estimates, due to first-differencing and to the use of lagged regressors as instruments, the sample only consists of 313,110 firm-year observations. Finally, we allow for entry and exit of firms, because using an unbalanced panel partially mitigates potential selection and survivorship bias.

Appendix B: Accounts receivable, sales, and inventories: Mean values by country

	Accounts Receivable	Sales	(Accounts Receivable)/Sales	Inventory stock	Inventory stock / Sales
	(1)	(2)	(3)	(4)	(5)
Austria	5,103.93	33,716.95	0.151	7,015.18	0.208
Belgium	5,113.78	22,071.67	0.232	3,919.87	0.178
Finland	830.639	7,988.33	0.104	1,132.49	0.142
France	1772.208	9,206.24	0.193	1,302.33	0.142
Germany	3,312.43	37,640.41	0.088	5,232.98	0.139
Greece	4,050.04	6,828.43	0.593	1,427.78	0.209
Ireland	5,132.38	22,122.00	0.232	5,116.26	0.231
Italy	2,295.50	8,227.47	0.279	1,180.15	0.143
Netherlands	2,918.25	8,333	0.350	1,080.50	0.130
Portugal	2,984.62	6,275.23	0.476	900.57	0.144
Spain	3,489.19	9,400.52	0.372	1138.445	0.121

Notes: The table reports mean values of accounts receivable (column 1), sales (column 2), the stock of inventories (column 4), the accounts receivable to sales ratio (column 3), and the inventory stock to sales ratio (column 5) for each of the countries in our sample.

Appendix C: Variables definitions

TD_{it}	Ratio of accounts receivable to total sales
Age_{it}	Logarithm of the difference between the present year and the firm's date of incorporation
$Size_{it}$	Logarithm of real total assets
$Stock_{it}$	Ratio of inventory stock to total sales
$Profit_{it}$	Ratio of operating profits (or loss) to total sales
$Collateral_{it}$	Ratio of tangible assets to total assets
$Liquidity_{it}$	Ratio of cash and equivalents to total sales
$Loans_{it}$	Ratio of short-term debt to total sales
$Crisis_t$	Dummy variable equal to 1 in the years 2010-2011, and 0 otherwise
$Diff_j$	Dummy variable equal to 1 for firms in the differentiated sector, and 0 otherwise
FD_{ct}	Proxy for financial development, measured based on the size (ratio of private bank credit to GDP) and liquidity (ratio of bank assets to GDP) of the banking sector

Note: Appendix D provides details of which industrial sectors are classified as differentiated and standardized.

Appendix D: Industrial classification based on the characteristics of the goods produced

US SIC code	Sectors	Differentiated
10	Metal mining	0
20	Food and kindred products	0
22	Textile mill products	0
23	Apparel and other finished products made from fabrics and similar materials	0
24	Lumber and wood products, except furniture	0
25	Furniture and fixtures	1
26	Paper and allied products	0
27	Printing, publishing, and allied industries	1
28	Chemicals and allied products	0
29	Petroleum refining and related industries	0
30	Rubber and miscellaneous plastics products	1
31	Leather and leather products	0
32	Stone, clay, glass, and concrete products	1
33	Primary metal industries	0
34	Fabricated metal products, except machinery and transportation equipment	1
35	Industrial and commercial machinery and computer equipment	1
36	Electronic and other electrical equipment and components, except computer equipment	1
37	Transportation equipment	1
38	Instruments; photographic, metal, and optical goods; watches and clocks	1
39	Miscellaneous manufacturing industries	1

Notes: This table presents the classification of industry groups, distinguishing between differentiated and standardized products in the manufacturing sector. This classification follows Giannetti *et al.* (2011), and is based on Rauch (1999). In column 3, the number 1 denotes firms in differentiated sectors, whereas 0 represents firms in standardized sectors.

Appendix E: Structure of the unbalanced panel

	Frequency	Percent	Cumulative
3	17,537	4.26	4.26
4	80,832	19.62	23.88
5	5,996,	1.46	25.33
6	12,206	2.96	28.29
7	21,658	5.26	33.55
8	37,710	9.15	42.70
9	72,364	17.56	60.27
10	18,738	4.55	64.82
11	29,237	7.10	71.91
12	42,823	10.39	82.31
13	72,886	17.69	100.00

Notes: The table shows the number of observations, percentage, and cumulative distribution by year.

Appendix F: Correlation matrix

	TD_{it}	Age_{it}	$Size_{it}$	$Stock_{it}$	$Profit_{it}$	$Liquidity_{it}$	$Collateral_{it}$	$Loans_{it}$
TD_{it}	1.000							
Age_{it}	-0.038***	1.000						
$Size_{it}$	0.190***	0.230***	1.000					
$Stock_{it}$	0.109***	0.059***	0.206***	1.000				
$Profit_{it}$	0.007***	0.027***	0.055***	-0.143***	1.000			
$Liquidity_{it}$	-0.014***	0.070***	-0.036***	-0.082***	0.374***	1.000		
$Collateral_{it}$	0.013***	0.047***	0.136***	-0.042***	-0.028***	-0.120***	1.000	
$Loans_{it}$	0.364***	-0.021***	0.182***	0.269***	-0.227***	-0.205***	0.156***	1.000

Notes: This table presents correlation coefficients for the main variables included in our models. Appendix C contains definitions of all variables.

Appendix G: Dynamic models of trade credit

	First-difference GMM	OLS	FE
	(1)	(2)	(3)
TD_{it-1}	0.032***	0.755***	0.110***
	(5.04)	(404.85)	(65.20)
Age_{it}	0.014*	0.004***	-2.532
	(1.88)	(11.16)	(-0.92)
$Size_{it}$	0.006	0.001***	0.071***
	(1.63)	(8.07)	(87.53)
$Stock_{it}$	-0.174***	-0.019***	-0.045***
	(-3.57)	(-11.42)	(-17.05)
$Collateral_{it}$	-0.104**	-0.029***	-0.225***
	(-2.47)	(-27.94)	(-88.43)
$Profit_{it}$	0.439*	0.147***	-0.059***
	(1.84)	(30.67)	(-9.26)
$Liquidity_{it}$	-0.046*	-0.012***	-0.190***
	(-1.68)	(-7.58)	(-73.57)
$Loans_{it}$	0.366***	0.253***	0.415***
	(5.34)	(102.91)	(151.30)
Observations	313,110	411,987	411,987
R^2		0.652	0.145
Adjusted R^2		0.652	0.145
P			0.996
Ar(1)	0.000		
Ar(2)	0.113		
Sargan (p-value)	0.011		

Notes: This table contains estimates of equation (1) obtained using the first-difference GMM (column 1), the pooled OLS (column 2), and the fixed-effects (column 3) estimators. Appendix C contains definitions of all variables. We include country, industry, and time dummies, as well as time dummies interacted with industry dummies, in all specifications. In column 1, instruments include all regressors (except Age_{it}) lagged twice or more. *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *Ar(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. For the pooled regression (column 2), *t*-statistics in parentheses are asymptotically cluster-robust to heteroskedasticity. For the fixed-effects regression (column 3), ρ indicates the proportion of the total error variance accounted for by unobserved heterogeneity. *, **, and *** indicate statistically significance at the 10%, 5%, and 1% level, respectively.

Appendix H: Inventory management motive by country

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
TD_{it-1}	0.144	0.188	0.110	0.746***	0.400***	0.160	0.198	0.018	0.038	0.685***	0.268***
	(0.86)	(1.36)	(1.58)	(11.15)	(2.96)	(1.15)	(1.19)	(0.58)	(0.22)	(5.34)	(3.99)
Age_{it}	0.018***	-0.003	0.001	-0.010**	0.004***	-0.012	-0.006	0.019***	-0.029	0.020*	0.010**
	(2.74)	(-0.44)	(0.30)	(-2.27)	(2.86)	(-0.39)	(-0.59)	(3.70)	(-0.96)	(1.77)	(2.15)
$Size_{it}$	-0.008	0.019	-0.009	0.022***	-0.003	0.078	-0.255	-0.003	0.027	-0.016	0.198***
	(-0.49)	(1.12)	(-0.82)	(2.96)	(-1.54)	(1.49)	(-1.24)	(-0.30)	(1.50)	(-0.84)	(3.11)
$Stock_{it}$	-0.245**	-0.315**	-0.091*	-0.062**	-0.127*	-0.197*	-0.021**	-0.076**	-0.025**	-0.258***	-0.147***
	(-2.14)	(-2.00)	(-1.68)	(-2.53)	(-1.72)	(-1.77)	(-2.12)	(-2.42)	(-2.25)	(-5.14)	(-4.82)
$Collateral_{it}$	-0.244*	-0.012	-0.026	-0.073***	-0.033	-0.401***	-0.042	-0.094***	-0.013	-0.153**	-0.095***
	(-1.91)	(-0.18)	(-0.86)	(-3.57)	(-1.32)	(-3.00)	(-0.41)	(-4.54)	(-0.06)	(-2.07)	(-4.67)
$Profit_{it}$	0.718	-0.203	-0.130	0.190**	0.249**	0.287**	0.167	0.103***	-0.792	0.299*	0.299*
	(1.55)	(-1.12)	(-1.03)	(2.43)	(2.05)	(1.98)	(0.91)	(4.38)	(-1.59)	(1.91)	(1.91)
$Liquidity_{it}$	0.229	0.015	0.010	0.003	-0.016	-0.344	-0.073	-0.434**	0.424	-0.438	-0.438
	(1.15)	(0.25)	(0.26)	(0.21)	(-0.45)	(-0.71)	(-0.89)	(-2.87)	(1.64)	(-1.56)	(-1.56)
$Loans_{it}$	-0.035	-0.012	0.257**	0.307***	0.067	0.942***	-0.065	0.596***	-0.204	0.996***	0.473***
	(-0.41)	(-0.18)	(2.25)	(3.00)	(0.42)	(3.50)	(-0.52)	(12.65)	(-0.75)	(3.72)	(6.69)
Observations	2,627	5,118	11,329	101,536	17,073	5,106	575	186,283	22,237	23,728	36,375
Number of id	898	1,574	2,456	21,162	6,942	1,348	219	66,589	4,217	4,955	12,070
Ar(1)	0.001	0.000	0.000	0.000	0.000	0.002	0.003	0.000	0.000	0.000	0.000
Ar(2)	0.492	0.391	0.257	0.000	0.564	0.947	0.725	0.002	0.234	0.175	0.348
Ar(3)	0.121	0.376	0.486	0.644	0.085	0.080	0.310	0.091	0.485	0.996	0.777
Sargan (p-value)	0.740	0.118	0.097	0.027	0.585	0.684	0.771	0.065	0.994	0.011	0.034

Notes: We estimate all specifications using a system-GMM estimator. The figures in parentheses are *t*-statistics, asymptotically robust to heteroskedasticity. Appendix C contains definitions of all variables. We include country, industry, and time dummies, as well as time dummies interacted with industry dummies, in all models. Instruments include all regressors (with the exception of age) lagged two (three) times or more in columns 1 to 3 and 6 to 11 (4 and 5). *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *Ar(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix I: Inventory management motive by country taking the crisis into account

	Austria	Belgium	Finland	France	Germany	Greece	Ireland	Italy	Netherlands	Portugal	Spain
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
TD_{it-1}	-0.020	0.339	0.498**	0.027***	0.587***	0.125	0.413**	0.052	0.616***	0.721***	0.499***
	(-0.13)	(1.34)	(2.57)	(5.25)	(4.49)	(1.02)	(2.15)	(0.87)	(8.75)	(13.87)	(4.75)
Age_{it}	0.024***	-0.011	0.005	-0.017	0.003***	-0.080	-0.003	0.052***	0.014**	0.011	0.013*
	(3.09)	(-1.34)	(0.94)	(-1.63)	(2.70)	(-1.58)	(-0.37)	(3.51)	(2.10)	(1.00)	(1.92)
$Size_{it}$	-0.007	0.062**	0.026	0.037**	-0.002	0.204**	-0.019	0.043	-0.005	-0.010	-0.005
	(-0.33)	(2.15)	(1.52)	(1.99)	(-1.13)	(2.21)	(-1.51)	(1.29)	(-1.00)	(-0.62)	(-1.05)
$Stock_{it}$	-0.045*	-0.074***	-0.189*	-0.124*	-0.013***	-0.036*	-0.091***	-0.038***	-0.094*	-0.019***	-0.110**
	(-1.94)	(-3.21)	(-1.81)	(-1.77)	(-4.58)	(-1.91)	(-3.21)	(-8.06)	(-1.84)	(-3.21)	(-2.01)
$Crisis_t$	0.037*	0.045*	0.096*	0.090*	0.051*	0.047**	0.303**	0.075***	0.045**	0.073***	0.050***
	(1.90)	(1.91)	(2.13)	(1.81)	(1.79)	(2.04)	(1.99)	(3.53)	(2.52)	(5.17)	(2.74)
$Stock_{it} \times Crisis_t$	-0.209*	-0.435*	-0.801**	-0.489*	-0.359*	-0.158*	-0.369*	-0.565***	-0.152*	-0.028***	-0.144*
	(-2.59)	(-1.72)	(-2.25)	(-1.82)	(-1.67)	(-1.87)	(-1.67)	(-4.03)	(-1.79)	(-4.84)	(-1.67)
$Collateral_{it}$	-0.399***	0.132	-0.028	-0.120	-0.051	-0.478***	0.048	-0.008	-0.113	-0.243***	-0.766**
	(-2.93)	(1.17)	(-0.41)	(-0.83)	(-1.00)	(-3.06)	(0.38)	(-0.37)	(-1.40)	(-4.06)	(-2.17)
$Profit_{it}$	0.428	-0.041	0.096**	0.342	-0.017	-0.113	0.282	-0.131	0.022***	0.178***	0.361***
	(1.22)	(-0.19)	(2.13)	(1.43)	(-0.13)	(-0.29)	(1.12)	(-0.33)	(3.02)	(3.23)	(2.59)
$Liquidity_{it}$	-0.224*	-0.022	0.086	0.163	0.006	0.250	-0.152	-0.226***	-0.027***	-0.397*	-0.119
	(-1.84)	(-0.29)	(0.30)	(1.04)	(0.15)	(1.06)	(-1.36)	(-2.79)	(-7.58)	(-1.69)	(-1.45)
$Loans_{it}$	-0.088	-0.058	-0.259	0.069	0.002	0.476**	0.082	0.072	0.179*	0.176**	0.271**
	(-0.90)	(-0.53)	(-1.21)	(0.38)	(0.01)	(2.53)	(0.46)	(0.47)	(1.94)	(2.26)	(2.46)
Observations	2,627	5,118	11,329	101,536	17,073	5,106	575	186,283	23,237	23,728	36,375
Number of id	898	1,574	2,456	21,162	6,942	1,348	219	66,589	4,217	4,955	12,070
Ar(1)	0.001	0.000	0.000	0.000	0.000	0.004	0.003	0.000	0.000	0.000	0.000
Ar(2)	0.943	0.682	0.584	0.000	0.480	0.764	0.596	0.000	0.007	0.002	0.053
Ar(3)	0.236	0.413	0.259	0.677	0.056	0.088	0.762	0.010	0.989	0.344	0.910
Sargan (p-value)	0.935	0.465	0.986	0.990	0.437	0.080	0.244	0.527	0.025	0.015	0.071

Notes: We estimate all specifications using a system-GMM estimator. The figures in parentheses are *t*-statistics, asymptotically robust to heteroskedasticity. $Crisis_t$ equals 1 in 2010-2011, and 0 otherwise. Appendix C contains definitions of all other variables. We include country, industry, and time dummies, as well as time dummies interacted with industry dummies, in all models. Instruments include all regressors (with the exception of age and the crisis dummy) lagged two (three) times or more in columns 1 to 3 and 6 to 11 (4 and 5). *Sargan* is a test of overidentifying restrictions, distributed as chi-square under the null of instrument validity. *Ar(j)* is a test of *j*th-order serial correlation in the first-differenced residuals, asymptotically distributed as N(0,1) under the null of no serial correlation. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.