THE ROLE OF TRADE CREDIT IN THE SPANISH AGROFOOD INDUSTRY

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Abstract– **Trade credit is an important way of firm financing. Its habitual practice and the excessive enlargement of the payment periods deteriorate profitability of firms and even could affect the performance of the financial system. In spite of the relevance of this issue there are few empirical researches with Spanish firms. This work intends to fill this gap and to shed light on the factors related to the extension of trade credit in a set firms of the agrofood industry. In the theoretic and empirical literature different motives have been proposed to explain the extension of trade credit: a mechanism to reduce transaction costs, a financial alternative to the bank system and an additional tool to improve commercial activities.**

To contrast these ideas a panel of 388 firms for the period 1998-2005 has been taken, and static and dynamic regression models have been estimated by using robust methods to heteroskedasticity, autocorrelation and endogeneity of the explanatory variables. The results confirm that trade credit receivable is associated with more active firms and with cheaper bank financing. Furthermore, a negative link with the size of the firm and a positive relationship with short-term liabilities, accounts payable and bank debts, are encountered. These findings are consistent with commercial perspectives, rather than a pure financial view, in the sense that small and financial distressed producers extend trade credit as a way of promoting products and increasing sales.

Keywords– **trade credit, agrofood industry, firm panel data**

JEL classification– **C23, D21, L66**

I. INTRODUCTION

Trade credit arises in commercial operations when goods or services are not paid immediately on delivery but the payment is deferred for a certain period of time. This behavior alters the working capital needed to finance the production process and in turn has effects on the individual decision making of firms. Its generalized use can affect the relationships between firms and may also diminish the profitability of creditor companies. What is more, trade credit operates out of the bank system and thus works without transparency on conditions and habitual practices and without control of the monetary authority. This entails a risk since it can modify monetary aggregates and the mechanism of transmission of monetary policy.

A first approach of its importance in the Spanish economy can be obtained from the Central Balance Sheet Data of Banco de España (Banco de España, 2006). It shows this source of finance reaches, on average, 14.5 percent of total assets, 34.6 percent of total debts and 42.8 percent short-term debts. Moreover, trade credit is a structural phenomenon that persists through time. And this causes somewhat puzzlement as does not seem logic, within developed economies with powerful financial systems, that suppliers were the most important short-term financing channel. Despite such a relevant role, there is a lack of knowledge on the causes that move nonfinancial firms to extend credit.

In the last years Administration has been aware of the problem that trade credit may cause and it is trying to stop the excessive enlargement of payment periods and to avoid the deterioration of small and middle firms' profitability. It was made concrete in the Directive 2000/35/EC of the European Parliament and of the Council which establishes measures to fight late payments in commercial transactions. However, there are hardly studies on trade credit and its motivations in the productive agrofood sector. The aim of this work is to study the recent evolution of trade credit granted in a sample of agrofood companies and to identify the characteristics associated with the firms that extend more credit. It is an attempt to shed light on the motives that induce agrofood suppliers to offer delayed payments.

Different reasons have been argued to explain the use of trade credit: a mechanism to save transaction cost, an alternative financial channel to the bank system and a tool to promote sales and widen markets. The latter would seem a more appropriate explanation for financially constrained firms selling on credit and allowing delayed payment, as it is observed in Spanish food industry. But contrary to this, other empirical studies using Spanish firms support financial theories of trade credit (Hernández de Cos and Hernando, 1999, Rodríguez-Rodríguez, 2006). Thus, we think there is an interest in validating or refuting these competing explanations in the agrofood industry.

To achieve this, information from mercantile official registers was taken so a panel data was constructed for 388 firms and 8 consecutive years (1998-2005). Different regression models have been estimated through generalized method of moments (GMM) that is more appropriate in situations with heteroskedasticity, autocorrelation and endogeneity of the regressors. The results indicate that the level of activity of the firm, debt cost, size and short-term liabilities are the factors more related with the extension of trade credit. The remaining of this work is structured as follows: theories and empirics on trade credit are summarized in section , whereas section presents the specification and

estimation procedures of the regression models used in this work; then the data of the Spanish agrofood industry are commented (section), jointly with the results. Finally, section concludes.

II. THEORETICAL AND EMPIRICAL BACKGROUND

The motivations for the use of trade credit must be sought in market failures. Without them, there is no reasonable argument that justifies the fact that firms are so used to selling on credit. As mentioned by Blazenko and Vandezande (2003), if product and financial markets are competitive and transaction or information costs do not exist, no advantage is obtained by offering or receiving trade credit. There have been numerous arguments and theories that explain the use of trade credit as a consequence of frictions in the payments system and of imperfections in the financial and product markets.

A. *Operational motives*

It seems evident that the practice of trade credit lessens transaction costs. Delayed payments permit to accumulate invoices, which in turn diminishes the number of payments and makes easier and cheaper the cash management (Schwartz, 1974). Furthermore, long-term cooperation agreements between sellers and buyers can optimize the flows of goods and cash (Ferris, 1981). Even other costs derived of an irregular demand (such as customer queues o large inventories) can be reduced by improving (constraining) the trade credit conditions in situations of deficit (excess) in demand (Emery, 1984). Both buyer's and seller's wealth may increase because both save costs, the former from lower prices and the latter by reducing inventory or production. It means that trade credit, although is a short-term element, can hold a strategic role in the firm decision making (Emery, 1987).

In the empirical side, these arguments could imply that firms with irregular demand grant more credit to customers than firms with more stable demand, so the coefficient of variation of sales is a potential measure to test this idea. In account of the fact that a seller and a buyer may establish a long-term cooperation relationship, the former will extend more credit in response to a tighter financial environment (Ferris, 1981). Thus a positive relationship between trade credit and the interest rate may be expected. Other authors consider that transaction costs it does not say too much about the different use between firms and industries in spite of this motive probably induces an important amount of trade credit (Schwartz, 1974).

B. *Financial motives*

Despite the main activity of suppliers is not financial, they may exhibit better capacities than financial institutions derived from advantages in information acquisition, in controlling buyers and in recovering the goods supplied, as explained by Petersen and Rajan (1997). First, sellers have more information than financial institutions to know the creditworthiness of the buyers as they operate within a common industry. This implies that sellers can recognize more easily potential problems of risk default and reduce losses from customers (Smith, 1987). She also comments that different implicit interest rates and trade credit conditions may exist across industries since

market structure and capital necessities vary significantly. Second, sellers have the possibility of stopping new supplies of goods, and this can be used to enforce buyers to meet their payment obligations (Petersen and Rajan, 1997, Cuñat, 2007). Third, suppliers could take the goods and resell them in case the buyer fails the payment of the purchase (Emery, 1984, Mian and Smith, 1992). Since financial institutions do not have to do with production activities, sellers can do these operations in better conditions.

Another financial argument shows how taxes motivate trade credit. According to Brick and Fung (1984), the direction of the trade credit flow depends on the different marginal tax rates between buyers and sellers. For example, a customer will prefer to buy on credit (for cash) if its tax rate is lower (higher) than that of the seller. As a consequence, sellers with high tax rates are more likely to extend credit. Furthermore, the motives for giving and receiving trade credit are mutually excluding.

Financial motives have been tested in empirical works by using different measures that approximate the availability to obtain funds. The cost of external financing of the firm is the most direct alternative of quantifying its access to financial markets. That is, lower debt costs imply better conditions and might lead to provide more credit to clients. This negative relationship is supported by several empirical studies, Hernández de Cos and Hernando (1999, on Spanish firms),Rodríguez-Rodríguez (2006, on Canary Island firms) and Marotta (2005, on Italian firms), among others.

Size and age can be seen as expressions of quality and reputation of the company, which could also mean a better access to capital markets. Therefore they can be thought as appropriate proxies for credit worthiness of a firm. A positive relationship between size and accounts receivable is found by Petersen and Rajan (1997, on U.S. firms), Hernández de Cos and Hernando (1999) and Delannay and Weill (2004, on firms from several Eastern European Countries), meanwhile a positive effect of the age of the firm on trade credit given is observed in the works by Petersen and Rajan (1997), Rodríguez-Rodríguez (2006).

Other explanatory variables used to test financial motives are the ratio of equity to total assets (Delannay and Weill, 2004) or the return on assets ratio (Marotta, 2005), as measures of internal funds availability with influence on trade operations. Rodríguez-Rodríguez (2006) uses the operating result on turnover ratio to test financial motives arguing that the more profitable a firm the more likely it is to access institutional finance.

Although financing motivation causes a large amount of credit in commercial operations, it does not give a satisfactory explanation of why small sellers offer, or why large buyers take, trade credit (Smith, 1987).

C. *Commercial motives*

Much has been written on the role of trade credit as a way of stimulating the purchases of sellers. Nadiri (1969) was the first who considered trade credit as a selling expense. Like advertising, it affects the position of the firm and provides

return over time. As another selling expenditure it can be optimally determined in the context of the neoclassical theory of the firm. Sellers can make an improved offer (product plus credit), and in the long-run, they will try to establish a dependent and lasting relationship with buyers in search of maximizing expected profits (Wilner, 2000).

Price discrimination toward financially constrained buyers is another view linked to commercial motives (Brennan et al., 1988, Petersen and Rajan, 1997). Potential buyers with difficulties to obtain credit of the banking system constitute new opportunities. Giving easier terms of payment to this segment through trade credit, seller's market can be extended.

Other authors (Smith, 1987, Long et al., 1993) argue that when a supplier offers delayed payments he adds the possibility of verifying the quality of its products. Trade credit has a promotional or commercial motivation in the sense that the buyer pays once the quality of goods is known. By selling on credit, small, new or not well-established companies can enhance competitiveness in relation to similar suppliers. Another suggestion of this idea is that postponed payments are expected when a reputable buyer does not know too much on the performance of the seller, so the delayed period is used to check it.

And associated with this, the frequent observation that large companies pay late or take unearned discounts could be interpreted as a quasi-rent on the buyer's reputational capital (Smith, 1987) but also as a demonstration of market power. Wilner (2000) also enquires why firms without financial problems take trade credit. He analyzes the effect of bilateral relationships and posits that they can be damaging if one firm depends on the other. More explicitly Van Horen (2004) suggests that a supplier dealing with large clients is more likely to permit delayed payments in order to avoid its change to another supplier. Rather than a voluntary offer, she contemplates the possibility that was the customer who forces the supplier to sell on credit under the threat of not buying and looking for another suppliers. She formulates the "reputation" hypothesis as " firms that lack a solid reputation will provide trade credit to customers with large bargaining power compared to firms with a good reputation".

With regards to empirics, the profit maximization model of Nadiri (1969) postulates trade credit is positively related to the level of sales (i.e., the ratio of turnover to total asset (Rodríguez-Rodríguez, 2006)) and inversely to its opportunity cost. Firms with high gross profit margin would be more inclined to follow price discrimination policies as they have more incentives to sell and to finance and additional unit (Petersen and Rajan, 1997). Although the contrary, opposite direction movements between profit margin and trade credit, may also be justified and tested (Blazenko and Vandezande, 2003).

Quality and reputation issues can be tested through several variables. Long et al. (1993) hypothesize that (1) firms with longer production cycle (which can be identified with higher quality) will extend more trade credit; (2) extending credit small and young firms exhibit quality and acquire prestigious so they are expected to

sell more goods on credit than large suppliers that usually have a well-established reputation; (3) high-quality suppliers could discourage low-quality firms by rising the cost of trade credit, so short-term debts and accounts payable should be positively related to accounts receivable; (4) firms producing more durable goods (which implies more time to asset quality) will extend trade credit over longer periods.

III. EMPIRICAL MODEL

In order to test and explore the patterns behind the extension of trade credit in the sample, a panel data econometric model is specified:

$$y_{it} = \sum_j \beta_j x_{jit} + \mu_i + \nu_{it} \quad \forall i, t \tag{1}$$

with i $(i = 1 \ldots I)$ denoting individuals, t $(t = 1 \ldots T)$ time and j $(j = 1 \ldots J)$ exploratory variables, and being y_{it} and x_{jit} values of the variables, β_j coefficients to be estimated, μ_i the unobserved time-invariant individual effects and ν_{it} the error term with the usual assumptions. Individual-invariant time effects can be modeled by adding a λ_t term.

The dependent variable is the proportion of accounts receivable to total assets. The independent variables and the expected signs under the different perspectives are shown in the Table 1.

Equation (1) can be estimated by different procedures, depending on the assumptions. Fixed and random effects models have been widely used, but a less restrictive estimation is possible by means of instrumental variables and the generalized method of moments (GMM). It is a more robust alternative that allows to cope with potential heteroskedasticity and autocorrelation of the error term and also endogeneity of the regressors. Given the difficulty in obtaining other variables correlated with the original ones but not with the error term, it arises the possibility of using these same variables but lagged as instruments. Time effects are modeled through dummy variables and firm effects, provided their large number, are eliminated by estimating the equation (1) in first differences:

$$\Delta \ln y_{it} = \sum_j \beta_j \Delta \ln x_{jit} + \frac{1}{2} \sum_j \sum_k \beta_{jk} \Delta \ln x_{jit} \ln x_{kit} + \Delta \lambda_t + \Delta \nu_{it} \tag{2}$$

An alternative to first differences is the orthogonal deviations transformation, which removes individual effects but does not introduce serial correlation (Arellano and Bover, 1995). In this case, each observation is obtained as a deviation to a weighted mean of future values, that is:

$$y_{it}^* = \sum_j \beta_j x_{jit}^* + \nu_{it}^* \tag{3}$$

where

$$x_{jit}^* = \sqrt{\frac{T-t}{T-t+1}} \left(x_{jit} - \frac{x_{ji,t+1} + \cdots + x_{jiT}}{T-t} \right)$$

Arellano and Bond (1991) propose the utilization of GMM and the orthogonality conditions between the residuals of the transformed equations and the lagged values of

Table 1: EXPECTED SIGN OF THE REGRESSORS

| | Motive | | |
	Operational	Financial	Commercial
Total asset turnover	+	+	+
Debt cost		−	−
Return on assets		+	
Profit margin			+
Size		+	−
Accounts payable	+	−	+
Short-term bank debt		−	+

the original explicative variables. The estimation by GMM is carried out in two stages, using the second one a weighted matrix constructed with the residuals obtained in the first stage. The procedure followed in this work consists in regressing jointly the system of equations in first differences (2) and levels (1). It was proposed (by Arellano and Bover, 1995, Blundell and Bond, 1998, among other) in order to reduce the weakness of instruments.

It is necessary to test lack of second order autocorrelation because the GMM estimator is based on $E(\Delta\nu_{it}\Delta\nu_{i,t-2}) = 0$. In addition, a Sargan test of overidentifying is used to validate the orthogonality restrictions.

A dynamic model is also specified in order to capture the effects of the variables over time. It is a way of considering that the changes of the variables do not affect instantaneously but they have a period of adjustment.

$$y_{it} = \lambda y_{i,t-1} + \sum_j \beta_j x_{jit} + \mu_i + \nu_{it} \tag{4}$$

If the time dimension of the data set is short, the estimation by fixed or random effects is inconsistent due to the fact that the lagged dependent variable is correlated with the error term. An efficient and non-biased option is the GMM estimator previously mentioned (Arellano and Bover, 1995, Blundell and Bond, 1998).

IV. DATA AND RESULTS

A. *Descriptive analysis*

The sources of this work are the provincial mercantile registers, to whose information we have accessed through the SABI data base (http://www.informa.es/). The selection includes companies of food and beverage industry (code 15 following CNAE-93 classification, National Statistics Institute of Spain), with information on the variables income from sales and customers' accounts over the period 1998-2005. The latter has been the bounding factor as a lot of firms present abbreviated balance sheets and customers' account appears aggregated with other receivables.

Table 2: SOME VARIABLES OF THE SAMPLE CLASSIFIED ACCORDING TO THE $\frac{ACCOUNTS\ RECEIVABLE}{TOTAL\ ASSETS}$ RATIO

	average	percentile average									
		1	2	3	4	5	6	7	8	9	10
1. Accounts receivable (%)	29	3	11	17	21	25	30	34	39	45	61
2. Accounts payable (%)	21	18	15	16	18	20	21	22	24	26	28
3. Net trade credit (%)	8	-14	-3	1	3	5	9	11	14	19	33
4. Total asset turnover (%)	149	114	97	113	123	135	152	153	166	197	245
5. Return on assets (%)	3,7	3,3	3,8	3,4	3,0	3,3	4,2	4,0	4,0	3,6	4,0
6. Profit margin (%)	3,4	3,8	6,0	4,2	3,2	2,9	3,5	3,2	3,1	2,4	2,1
7. Size (%)	100	117	159	126	114	108	95	96	65	63	56
8. Short-term bank debt(%)	23	24	22	21	21	22	23	23	25	28	25
9. Debt cost (%)	7,4	14,8	5,3	6,7	6,1	8,3	7,2	7,2	7,0	6,0	5,3
10. Current (%)	199	215	214	256	212	188	177	190	202	158	176
11. Reserves (%)	26	23	25	31	29	26	28	28	27	23	23

1. Accounts receivable/total assets
2. Accounts payable/total assets
3. (Accounts receivable - accounts payable)/total assets
4. Sales/total assets
5. Operating profit/ total assets
6. Operating profit/Sales
7. Total assets/total assets (industry average)
8. (Short run debts less commercial creditors)/total assets
9. Financial expenditures/(Long and short run debts less commercial creditors)
10. Current assets/current liabilities
12. Reserves/total assets

After removing outliers, it was obtained a panel sample of 388 firms with data of 8 consecutive years.

Table 2 classifies several accounting ratios of the firms of the sample according to the percentiles of the customer accounts receivable to total assets ratio, in order to accomplish a first approach to the factors associated with the extension of trade credit. The average proportion of trade credit extended to customers is 29 % (row number 1) on total assets, meanwhile the trade credit payable to suppliers is 21 % (row 2). A creditor position is the most usual, being the net trade credit (extended less payable) 8% over total assets on average (row 3). This highlights the role of financial intermediation assumed by agrofood firms and the interest in deepening the factors associatted with this behavior.

If other variables are considered, it seems to be a positive relationship between trade credit extended and the level of activity: the total assets turnover ratio $\frac{sales}{total\ assets}$ increases in each percentile (excluded the first), passing from 97% in percentile no 2 to 245% in no 10 (row 4). Thus, a first approach to the sample gives some support to the hypothesis that the extension of trade credit is used as a means of promoting sales. That is, besides an productive activity, the companies of the sample provide financial services to gain competitivity and increase market share. A less clear positive relationship is observed between trade credit extended and operating profit to total asset ratio (row 5): the 1-5 percentiles take values lower than 4%, below the values of the remaining. However, the firms that extend more trade credit have a lower profit margin (row 6).

On the other hand, firm size (row 7) is negatively related to accounts receivable, so the smaller a supplier is the more credit gives, in proportion to its total assets. This could mean that larger companies have some capacity to choose customers with better payment conditions, in detriment of the remaining firms that have to work with stretching payment periods. Trade credit seems to play an important role for small producers, and this would be in consonance with commercial motives, rather than the financial ones.

Trade credit received from suppliers rises with trade credit given to customers. As can be seen in row 2, the first four percentiles show an account payable ratio lower than 20% but higher than this percentage in the followings, getting almost 30% in the last percentile. Likewise, the ratio of short-term bank debts (row 8) show a slight positive relationship at first look. These insights seem also opposite to the financial view. Firms inclined to extend trade credit would not have many reasons to receive it or to borrow from banks, therefore a negative relationship would be expected according to this perspective.

The cost of bank debts (row 9) takes a very expensive value (14,8%) for the firms of first percetile, in contrast with a cheaper financing of the ones that more trade credit extend (last percentile, 5,3%), so a negative link seems more plausible. The current ratio (row 10) and the reserves to assets ratio (row 11) show also a loose negative relationship with trade credit extended: starting from the third percentile they take descending values.

Table 3: DAYS SALES OUTSTANDING

	year							
	1988	1999	2000	2001	2002	2003	2004	2005
15. Food and drink industry	78	81	83	82	86	83	84	85
151 Meat processing	72	80	83	81	83	87	90	88
152 Fish processing	82	77	79	76	78	76	76	77
153 Fruit & vegetables	76	76	79	77	84	84	78	81
154 Oils & fats	64	64	68	78	62	62	64	69
155 Dairy	71	73	80	76	76	75	78	72
156 Grain milling	79	77	81	83	80	82	77	85
157 Animal feed	59	62	65	63	68	61	63	66
158 Miscellaneous products	75	77	77	74	86	73	73	72
159 Drinks	104	106	110	112	114	110	112	116

The days sales outstanding or average collection period for the food and drink firms of the sample (Table 3) is almost three months, rising from 78 days in 1988 to 85 in 2005. This is an increase of 7 days during the studied period, a day each year on average. To fight against delayed payment periods in commercial operations, the Spanish late payments law (the transposition of Directive 2000/35/EC), starts on December 2004. Although the time to observe its effects is short, no signal of trend change is perceived in year 2005.

At a lower level of disaggregation two industries stand out. On the one hand, animal feed presents the shortest collection period, around two months (59 days in 1998 and 66 in 2005). On the other extreme, the drink industry reaches by far three months (104 days in 1998 and 116 in 2005). Except for fish and miscellaneous products, the average collection period of all other sub-industries registers a growth, being the largest for drinks firms with 12 days of increase. The variability of collection periods is bigger within meat and drinks companies, so that periods up to 10 or 11 months can be found.

B. *Univariate tests*

Table 4 presents tests for mean equality in a attempt to respond to the question: are there differences between firms that extend more and less trade credit?. To do this, first the firms of the sample are classified in two groups, above and bellow the median of the accounts receivable to total assets ratio; second parametric (ANOVA F) and nonparametric (Kruskal-Wallis) tests are performed to check if exist differences in the central tendency measures of both groups. The answer is yes: all the ratios, except reserves to assets, have statistically different values for the mean or median if firms are separated into more or less inclined to extend trade credit.

C. *Multivariate regressions*

Table 4: UNIVARIATE TESTS FOR MEAN EQUALITY OF SOME VARIABLES CLASSIFIED ACCORDING TO THE $\frac{ACCOUNTS\ RECEIVABLE}{TOTAL\ ASSETS}$ RATIO

	F (ANOVA)	χ_1^2 (KRUSKAL-WALLIS)
1. Accounts receivable (%)	5218.80**	2327.30**
2. Accounts payable (%)	231.02**	305.98**
3. Net trade credit (%)	1204.90**	1027.70**
4. Total asset turnover (%)	472.26**	530.03**
5. Return on assets (%)	8.80**	20.23**
6. Profit margin (%)	21.75**	15.06**
7. Size (%)	94.72**	15.06**
8. Short-term bank debt(%)	25.64**	35.05**
9. Debt cost (%)	3.47	44.17**
10. Current (%)	15.76**	0.19
11. Reserves (%)	0.81	0.70

Asterisks, (*), (**), indicate the null of mean equality is rejected at critical level of 5% and 1%, respectivaly

Table 5: GMM ESTIMATIONS (SECOND STAGE)
DEPENDENT VARIABLE: ACOUNTS RECEIVABLE/TOTAL ASSETS

	STATIC		DYNAMIC	
	coefficient	t value	coefficient	t value
Accounts receivable (-1)			0.564	10.30**
Total asset turnover	0.050	3.97**	0.034	2.94**
Profit margin	-0.028	0.790		
Debt cost	-0.036	-4.05**	-0.022	-3.33**
Size	-0.011	-2.37*	-0.005	-2.02*
Accounts payable	0.238	3.50**	0.177	3.67**
Short-term bank debt	0.216	4.35**	0.118	2.48**
Statistics	value	prob	value	prob
Wald (joint):	68.22 (χ_6^2)	0.000**	299.42 (χ_6^2)	0.000**
Wald (dummy):	54.54 (χ_{16}^2)	0.000**	11.75 (χ_{15}^2)	0.698
Wald (time):	41.88 (χ_8^2)	0.000**	3.83 (χ_7^2)	0.799
Sargan test:	118.90 (χ_{108}^2)	0.222	119.70 (χ_{101}^2)	0.099
AR(1) test: N(0,1)	-5.08	0.000**	-6.80	0.000**
AR(2) test: N(0,1)	-1.81	0.070	0.58	0.559

Time and three-digit industrial dummies are included
Asterisks indicate significance at 5% (*) and 1% (**) level

The GMM estimations, static and dynamic, are presented in Table 5. Both consider the joint system of equations in levels and orthogonal deviations. They use as instruments the same variables lagged 1 and 2 years for the equations in deviations, and first differences lagged one period for the equations in levels. Annual and industry dummies are included in all estimation to control temporal shocks and industry specific effects but their results are not shown in the Tables. The basic hypotheses of the estimator are fulfilled. That is, the Sargan tests do not reject the suitability of the instruments. The AR(2) tests indicate there are no serious problems with second order autocorrelation. Wald tests reject the null of joint insignificance of the regressors employed. Wald tests for time and three-digit dummies indicate they are significant for the static model but not for the dynamic one. Explanatory variables not significant, such as market interest rate or other financial ratios, were excluded from the final estimations.

The results confirm a clear relationship between the volume of sales and the accounts receivable ratio, given positive and significant coefficients in both models. In other words, more active firms extend more trade credit. This is in consonance with the bulk of the predictions of theoretic reasoning but it does not permit to discriminate between them. Likewise, the debt cost is negative and significant as predicted by financial theories but also by commercial ones. The debt cost is in fact the price of capital that suppliers use for selling on credit, so whatever the motives its demand is downward sloped. Cheaper bank financing induce to sell more on credit or to enlarge collection periods, adding a financial activity to its own productive.

The profit ratio is not significant in both estimations (it is omitted in the dynamic model). The return on assets ratio is neither significant and its results are not shown. Therefore, the idea that more profitable firms provide more credit to their customers is not supported for the data, and the price discrimination motive vanishes.

The size variable is negative and significant at 5% level in both estimations. This evidence reveals that larger suppliers do not play as financial intermediaries providing credit to distressed customers as predicted by financial theories. On the contrary, smaller producers appear as more inclined to provide credit and to delay collection moments. This leads to think that the role of sales promotion might be more appropriate, since larger firms have a lesser need of selling on credit to encourage product demand than smaller ones.

The account payable ratio is positive and significant in both estimations. This could mean that there are suppliers without better financing alternatives than postponing payments. And in spite of its expensive cost and its drawbacks, they continue granting credit because they have strong commercial motivations or because they do not have other way of selling their products. Other possible interpretation could be that customers enlarge payments periods because they do not have too many incentives to pay on time to suppliers with financial difficulties. That is, the scarce bargaining power of small producers leads to an involuntary action of extending trade credit. In any case, a positive sign between receivable and payable ratios is against a financial perspective of trade credit. The positive sign of the short-term bank debt ratio also strengthens this finding, as it implies that there are a lot of

Table 6: GMM ESTIMATIONS (SECOND STAGE)
DEPENDENT VARIABLE: NET TRADE CREDIT/TOTAL ASSETS

	STATIC		DYNAMIC	
	coefficient	t value	coefficient	t value
Accounts receivable (-1)			0.289	2.16*
Total asset turnover	0.031	3.21**	0.018	1.54
Debt cost	-0.117	-15.00**	-0.088	-5.44**
Size	-0.016	-2.21*	-0.014	-2.38*
Short-term bank debt	0.304	5.27**	0.273	5.15**
Statistics	value	prob	value	prob
Wald (joint):	305.80 (χ^2_4)	0.000**	507.20 (χ^2_5)	0.000**
Sargan test:	80.43 (χ^2_{72})	0.232	74.05 (χ^2_{67})	0.259
AR(1) test: N(0,1)	-5.56	0.000**	-3.34	0.001**
AR(2) test: N(0,1)	-1.59	0.111	0.25	0.802

firms making use of short-term bank loans to finance their sales.

Further regressions have been undertaken (Table 6) to check the robustness of the results. Now the dependent variable is net trade credit (accounts receivable less accounts payable) to total assets ratio. The above mentioned relationships still apply. The creditor position of firms is clearly related to short-term bank debts and to smaller sizes, which again points to commercial rather than financial theories. And at last, a comment on the dynamic adjustment model. It reduces second serial correlation of the residual as is shown by AR(2) tests. Both lagged dependent variables are positive and significant, which indicate there is not a immediately response to changes in the short run. Instead, the variations of the dependent variables to movements in the explanatory variables are slow and take a time. The adjustment process for net trade credit is faster than for accounts receivable, given a lower coefficient estimated for the former. The period of adjustment is 1.29 years for accounts receivable but only 0.41 years (less than 5 months) for net trade credit. This persistence behavior should be modeled through lagged variables, otherwise error conclusions may be obtained.

V. CONCLUSIONS

A set of firms within the Spanish agrofood industry has been studied to investigate the motives behind the extension of trade credit. Specifically, a panel of 388 firms over the period 1998-2005 has been analyzed. In this sample, a creditor position in relation to trade credit is the most common, i.e. firms sell to customers more than they buy to their suppliers on credit. The difference between trade credit extended and received is 8% on average. The collection period was 78 days in 1998 and rose to 85 days in 2005. This upward tendency does not seem to have been broken by the entrance of the late payment legislation in december 2004. It is worth to note that excesively large collection periods, almost 4 months, are detected in drinks firms.

At a fist glance to the sample, it can be seen that the accounts receivable ratio is positively related to total asset turnover and accounts payable, and negatively to size and debt cost. More in depth regression analysis with static and dynamic estimations confirms these relationships and allows to test some theories on the extension of trade credit. Commercial motives are supported by the data against financial ones. The positive sign of total asset turnover ratio and the negative one of debt cost do not help to discriminate between competing theories. However, financial theories are discarded on the grounds that there is no evidence of larger or creditworthy suppliers transmitting credit to customers with difficulties as found in other empirical works (Petersen and Rajan, 1997, Hernández de Cos and Hernando, 1999, Delannay and Weill, 2004, Rodríguez-Rodríguez, 2006).

Instead, the role of trade credit as a mechanism to promote sales and gain competitiveness is reinforced. The negative link with size and the positive one with accounts payable and short-term bank debt ratios prove the existence of firms extending trade credit that do not have the best conditions to do it. Customer receivables are financed by both types of short-term debts, providers and banks, and this means that producers have to use expensive financing in order to finish their production cycles. Thus, there is evidence of small and financially constrained agrofood suppliers who are used (or compelled) to selling on credit, which gives rise to commercial motives (in the line of Nadiri, 1969, Long et al., 1993, Deloof and Jegers, 1996, Van Horen, 2004). The causes behind this behavior are probably the composition of the sample, small productive firms, the strong competition of the market within they operate and the market power of large customers.

References

Arellano, M. , Bond, S., 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. Review of Economic Studies, 58, pp. 277–297.

Arellano, M. , Bover, O., 1995. Another Look at the Instrumental-Variable Estimation of Error-Components Models. Journal of Econometrics, 68, pp. 29–51.

Banco de España, 2006. Central de Balances 2005. Resultados anuales de las empresas no financieras. http://www.bde.es.

Blazenko, G.W. , Vandezande, K., 2003. The product differentation hypothesis for corporate trade credit. Managerial and Decision Economics, 24, pp. 457–469.

Blundell, R. , Bond, S., 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. Journal of Econometrics, 87, pp. 115–144.

Brennan, M.J., Miksimovic, V. , Zechmer, J., 1988. Vendor Financing. Journal of Finance, 43-5, pp. 1127–1141.

Brick, L.E. , Fung, W.K., 1984. Taxes and the theory of trade credit. Journal of Finance, 39-4, pp. 1169–1176.

Cuñat, V., 2007. Trade credit: suppliers as debt collectors and insurance providers. Review of Financial Studies, 20, pp. 491–527.

Delannay, A.F. , Weill, L., 2004. The determinants of trade credit in transaction countries. Economics of Planning, 37, pp. 173–193.

Deloof, M. , Jegers, M., 1996. Trade credit, product quality, and intragroup trade: some European evidence. Financial Management, 25(3), pp. 33–43.

Emery, G.W., 1984. A Pure Financial Explanation for Trade Credit. Journal of Financial and Quantitative Analysis, 19-3, pp. 271–285.

Emery, G.W., 1987. An optimal financial response to variable demand. Journal of Financial and Quantitative Analysis, 22-2, pp. 209–225.

Ferris, J.S., 1981. A Transactions Theory of Trade Credit Use. Quaterly Journal of Economics, 96-2, pp. 243–270.

Hernández de Cos, P. , Hernando, I., 1999. El crédito comercial en las empresas manufactureras españolas. Moneda y Crédito, 209, pp. 231–267.

Long, M.S., Malitz, I.B. , Ravid, S.A., 1993. Trade credit, quality guarantees, and product marketability. Financial Management, 22-4, pp. 117–127.

Marotta, G., 2005. When do trade credit discounts matter? Evidence from Italian firm-level data. Appied Economics, 37, pp. 403–416.

Mian, S.L. , Smith, C.W., 1992. Accounts Receivable Management Policy: Theory and Evidence. Journal of Finance, 47-1, pp. 169–200.

Nadiri, M.I., 1969. The determinants of trade credit in the U.S. total manufacturing sector. Econometrica, 37-3, pp. 408–423.

Petersen, M.A. , Rajan, R.G., 1997. Trade Credit: Theories and Evidence. Review of Financial Studies, 10-3, pp. 661–691.

Rodríguez-Rodríguez, O.M., 2006. Trade credit supply: evidence from SME firms in Canary Islands. Documento de trabajo 2006-02, Universidad de La Laguna.

Schwartz, R.A., 1974. A Economic Model of Trade Credit. Journal of Financial and Quantitative Analysis, 9-4, pp. 643–657.

Smith, J.K., 1987. Trade Credit and Information Asymmetry. Journal of Finance, 42-4, pp. 863–872.

Van Horen, N., 2004. Trade credit as a competitiveness tool. Evidence from developing countries. MPRA Paper 2792, Munich Personal RePEc Archive.

Wilner, B.S., 2000. The Exploitation of Relationships in Financial Distress: The Case of Trade Credit. Journal of Finance, 55-1, pp. 153–178.