The impact of corporate distress along the supply chain: evidences from United States

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Abstract

Trade credit creates strict relationship between suppliers and customers that cannot be easily substituted over time. The kind of linkage established among firms from the same supply chain is a key value added for all members but in the event of a supply chain disruption all members may suffer from a decrease in profitability and in increase of their risk.

The paper examines the US market and evaluates the impact of a supply chain member default on the other members looking at the both the customer's and supplier's defaults. Results show that a supply chain disruption not only modify the trade credit policy but also affect firms' risk and profitability and the financing sources available in order to support the firm's growth.

1. Introduction

Trade credit features affect the different business processes during the firm's life, from the start-up to the decline: multiple theories and empirical evidences have been proposed to interpret a phenomenon that is multifaceted in its nature and still to explore as it evolves with the changing business environment. According to traditional theories (Omiccioli, 2005), the use of trade credit at individual level is determined by the features of the economic sector and the characteristics of the firm (Giannetti et al., 2011). The richness of motivations affecting the use of trade credit makes its information content valuable for outside investors: in particular, interfirm credit is positively associated with the quality of future investments at firm level (Aktas et al., 2012).

Beyond the traditional theories, more recently a distinctive role for trade credit was identified like a mechanism to coordinate supply chains (Luo and Zhang, 2012) that are targeted to optimize the flow of goods, information and financial flows in inter- and intra- company boundaries in the market (Lambert et al., 1998) in front of market changes (Stevens, 1989). Empirical evidences show that the supply chain affects the financial performance of the members (Yu, 2013): successful supply chains are associated with lower default risk (Ellinger et al., 2011), while supply chain disruption events can determine negative wealth and profitability outcomes for the member's investors both in the short (Hendricks and Singhal, 2003) and long term (Hendricks and Singhal, 2005). Financial distress of suppliers has become a major concern for disruptions to normal activities (Kleindorfer and Sand, 2005): financial distress by a supplier is found to affect other members of the supply chain, even though the impact is influenced by the counterparty exposure, the structure of the industry where supply chain interactions take place and the type of sector.

Notwithstanding the relevant role played by the supply chain in influencing the financial performance of its members, existing literature focuses the attention on the information content of total trade credit at firm level, but little is known on the relevance of the interfirm networks in propagating and redistributing the effects of financial distress among members that are directly connected. Because trade credit in use varies from country to country (Seifert et al., 2013), we focus our analysis on United States where about 80% of products are offered on trade credit (Tirole, 2006), the year end amount of trade credit looks moderate stable over time (U.S Census Bureau, 2016) and supply chains involve international business relationships as imports of goods historically far outweigh exports (Bureau of Economic Analysis, Department of Commerce, 2016).

Results show that a default in the supply chain has an impact on the trade credit policy both account receivable and payables), firms in the supply chain of a defaulted entity increase their risk (measured by the Z-score) but they do not necesserly suffer from a decrease of the performance (measured by ROA). When the default occurs, other players of the same supply chain may try tro reduce the negative effects related to rìlosing a supplier or a customer increasing the amount of capital collected from the financial markets in order to support their growth.

The paper is organized as it follows: section 2 presents a detailed literature review on trade credit while section 3 presents sample , the assumptions and the main results. Section 4 states closing remarks and policy implication of the paper.

2. Literature Review

According to traditional theories (Omiccioli, 2005), the supply and demand for trade credit are determined by the features of the economic sector and the characteristics of the firm (Giannetti et al., 2011).
Trade credit allows firms to separate the delivery of the good/service in time from the payment of the price, so the buyer benefits from an extended period of time to verify the quality of the supply depending on the relevant economic sector (Long et al., 1993). Both the terms (Ng et al., 1999) and volumes (Giannetti et al., 2011) of trade credit vary according to the type of product/service supplied: given the economic sector and product type (Lee and Stowe, 1993), buyers consider discounts for cash payments as low quality signals regarding the supply, while the extension of trade credit is considered to be a more effective solution than minimum quality guarantees (Faith and Tollison, 1981). As it concerns the contract enforcement, the type of product also affects the buyer's opportunistic behaviour: services and tailor-made products are exposed to a lower risk of diversion (Burkart and Ellingsen, 2004), even though their lower level of liquidity can affect the recovery value in case of the debtor's default (Mian and Smith, 1992).
Besides the relevant economic sector, the use of trade credit is also influenced by characteristics of the firm. According to the theory of real motivations, suppliers extend trade credit to support sales (Nadiri, 1969), while financial motivations stress the position of trade debt in the firm's financial structure (Lewellen et al., 1980). To support sales, suppliers can use trade credit as a mean of price discrimination between cash and delayed payments by means of a two-part terms approach (Ng et al., 1999). Moreover, the combined supply of finance and goods allows trade creditors to modify the offer conditions without modifying the price (Schwartz and Withcomb, 1979). Lastly, price discrimination can affect the fiscal effects of trade credit (Florentsen et al., 2003). Nevertheless, to support sales, the counterparties can agree to delay the payment for a few days to minimise the financial flow variability due to the dynamics of receipts and payments and the pertinent transaction costs (Ferris, 1981).
Besides price discrimination, suppliers can also extend trade credit to stabilise the demand, both at the micro and macro levels. On the micro level, trade credit allows firms to protect their non-salvageable investments in their relationships with buyers (Smith, 1987), to transfer the inventory warehousing costs to buyers by promoting a push strategy (Emery, 1987), and to benefit from the customer's inertia and performing payment behaviour due to the high costs of supplier switching (Cunãt, 2007), particularly for non-standardised goods/services that favour the building of long-lasting trade relationships (Summers and Wilson, 2003), even if the debtor is experiencing difficulties in the reimbursement of the debt (Wilner, 2000). At the macro level, trade credit supports sales during economic downturns (Meltzer, 1960), particularly by extending delayed payment plans to new customers (Nielsen, 2002); moreover, the extension of trade credit is

particularly relevant as a smoothing tool when the demand is characterised by a seasonal trend (Paul and Wilson, 2006).

Trade debt allows buyers to delay payment for the inputs until after the revenues are realised (Lewellen et al., 1980); thus, they can use it as either a substitute or a complement for other financial sources. Theories on the substitution effect indicate that in the presence of market imperfections, the suppliers' cost of financial sources is lower than the buyers' cost, therefore, buyers can use trade debt as a substitute (Meltzer, 1960) and residual (Jaffee and Stiglitz, 1990) source compared to bank credit. Theories supporting the complementary use of trade and financial debt stem from the competitive advantage based on the combined supply of finance and goods that allows firms to improve the operative efficiency (Mian and Smith, 1992). First of all, suppliers benefit from a competitive advantage in the acquisition of information on a firm's creditworthiness (Berger and Udell, 1998). Second, suppliers benefit from continuous exchanges of information during the trade relationship (McMillan and Woodruff, 1999). Third, if the debtor defaults, suppliers can easily recover the assets due to their knowledge of the supplied goods (Myers and Rajan, 1998), and they can extract value from the collateral assets in a way that is not always easy for other creditors (Longhofer and Santos, 2003).

Beyond the traditional theories, more recently a distinctive role for trade credit was identified like a mechanism to coordinate supply chains (Luo and Zhang, 2012) that are targeted to optimize the flow of goods, information and financial flows in inter- and intra- company boundaries in the market (Lambert et al., 1998) in front of market changes (Stevens, 1989). The presence of market power along the supply chain can impact the efficiency goal affecting the distribution of the enhanced total performance among the members (Crook and Combs, 2007): focal companies of a supply chain, being very often large and powerful, can impose their payment terms onto smaller companies, which in turn enforce their terms onto those smaller yet (Van Horen, 2005). Empirical evidences show that the supply chain affects the financial performance of the members (Yu, 2013): successful supply chains, featured by effective sourcing strategies, usage of information technology, integration and external relationships (D'Avanzo et al., 2003), are associated with lower default risk (Ellinger et al., 2011), while supply chain disruption events can determine negative wealth and profitability outcomes for the member's investors both in the short (Hendricks and Singhal, 2003) and long term (Hendricks and Singhal, 2005). Financial distress of suppliers has become a major concern for disruptions to normal activities (Kleindorfer and Sand, 2005): financial distress by a supplier is found to affect other members of the supply chain, even though the impact is influenced by the counterparty exposure, the structure of the industry where supply chain interactions take place and the type of sector. Given the financial distress of a firm, the strategies of the other members in supply interactions can determine the following effects: predation, because the competing non distressed firms try to gain the monopoly resulting in further hurting of the distressed entity and benefiting the common supplier; bail out of the distressed entity through the supplier's concessions determining negative outcomes for all the members out of the distressed debtor; abetment, when the supplier decides to profit more from the non distressed entity, with negative impact on the distressed entity (Yang et al., 2015). Depending on the selected strategy, the supply chain member can be exposed to counterparty risk toward the distressed entity: due to the high relative amount of trade credit extended, the ongoing business of a supply chain entity can be impaired by the bankruptcy of a relevant borrower and losses are determined by both credit exposure in the balance sheet and the reduction of future earnings if the customer is not replaced quickly, showing possible future impact on creditor's financial distress in the case of high leverage (Jorion and Zhang, 2009); moreover, it can drive to the potential activation of chain effects (Kiyotaki and Moore, 1997) that

can pass liquidity shocks upstream to other entities (Boissay and Gropp, 2007). The outcomes of counterparty risk stemming from strategic decisions on the supply chain interactions with the distressed entity are affected by intra-industry relationships: multi-sourcing strategies inside the industry are ineffective when default dependence levels among suppliers are found significant due to the contagion (Wagner et al., 2009) that is expected to be more relevant in concentrated industries (Lang and Stulz, 1992). Moreover, the concentration level affects the spreading of contagion both in the suppliers and customers distressed entity industries (Hertzel et al., 2008). The magnitude of the propagation of shocks along the supply chain can be affected by the credit linkage among industries: empirical evidences show that the increase of direct trade credit relationships among industries significantly increase the output correlation, while an increase of bank credit related to trade credit is able to reduce the sectors co-movements. Moreover, the co-movements among sectors deriving from trade credit usage can manifest also through links mediated by other industries (Raddatz, 2010). Limited empirical evidences are available on cross sectional determinants: suppliers and customers of firms of unique or specialized products are expected to be strongly affected by the distress of the supply chain member (Titman and Wessels, 1998).

3. Empirical Analysis

3.1 Sample

The sample consider all firms in the United States for which is declared the bankruptcy from the 2012 to 2015 that are not classified as financial intermediaries and for which Thompson Eikon is able collecting information about customers and suppliers. The final sample considers 146 corporations for which detailed information about the most related to time period 2015-16 (Table 1)[1].

Table 1. Defaulted firms sample

	2012	2013	2014	2015	2016	Overall
Default	13	6	17	37	73	146
% with relevant Suppliers and Customers	46,15%	50,00%	64,71%	51,35	54,79%	54,11%
Relevant suppliers	4	3	15	31	78	131
Relevant customers	23	3	36	58	162	282

Source: Thompson Eikon data processed by the author

Around the 54% of the sample has information about at least one relevant customer or one supplier available in the database and only the 20% of the firms have only one relevant commercial counterparty. Firms with larger supply chain network have up to 15 entities (suppliers or customers) and the number of relevant customers is the double with respect to the suppliers (respectively 282 and 131).

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[1] The Value Chain database provided by Thomson Eikon does not consider exposures for financial intermediaries and so the analysis does not consider exposure with respect to financial intermediaries even if they have trade credit exposures with respect to defaulted entities

In order to construct a control sample for the analysis the criterion considered is the industry sector matching and on the basis of the sample previously identified all firms in United States working in the same sector are taken into account (Table 2).

Table 2. Defaulted sample and control sample

NAICS sector	Suppliers' sample			Customers' sample		
	All	Default	Control	All	Default	Control
Accommodation and Food Service	139	2	137	-	-	-
Arts, Entertainment and Recreation	92	1	91	94	3	91
Construction	156	1	155	158	3	155
Health Care and Social Assistance	145	2	143	147	4	143
Information	1099	9	1090	1108	18	1090
Management of Companies and Enterprises	-	-	-	3	1	2
Manufacturing	1577	51	1526	3093	111	2982
Mining, Quarrying, and Oil and Gas Extraction	976	14	962	988	26	962
Other Services	-	-	-	34	1	33
Professional, Scientific, and Technical Service	974	14	960	978	18	960
Retail trade	-	-	-	336	10	326
Transportation and Warehousing	156	6	150	164	14	150
Utilities	164	5	159	176	17	159
Wholesale Trade	284	6	278	290	12	278
Overall	5782	131	5651	7613	282	7331

Source: Thompson Eikon data processed by the author

As expected the most represented sample for both the defaulted entities and the control sample is the Manaufacturing and the control sample for the supplier defaults is more than 50 times the defaulted sample while for the customers' default it is more more than 35 times the original sample.

For all the firms previously identified, Thopson Eikon allows collecting the full balance sheet, income statement e financial prospectus for the time horizon 2011-2016.

3.2 Methodology

An event related to the supply chain may affect the usefulness and the capability of the firm to use trade credit for supporting its business. In order to test the impact of the default, the analysis consider the value of account receivables and payable near to the default considering both the gross and the abnormal value. In formulas:

$$Account\ payable\ ratio_{it} = \frac{Account\ payable_{it}^S}{TA_{it}^S} \qquad (1)$$

$$Account\ receivable\ ratio_{it} = \frac{Account\ receivable_{it}^S}{TA_{it}^S} \qquad (2)$$

where for each firm i at time t, the account payable and receivable ratio are computed considering respectively the amount of account payables ($Account\ payable_{it}^S$) and receivables ($Account\ receivable_{it}^S$) with respect to the total assets (TA_{it}^S).
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In order to consider the structural differences in the trade policy in different sectors affecting both the terms (Ng et al.,1999) and the volumes (Giannetti et al., 2011), two additional measures are constructed considering the differences in the policy adopted by the firm and other players in the same sector. In formulas:

$$Account\ payable\ ratio_{it}^\Delta = \frac{Account\ payable_{it}^S}{TA_{it}^S} - \sum_{k=1}^{n} \frac{Account\ payable_{kt}^S}{TA_{kt}^S} \tag{3}$$

$$Account\ receivable\ ratio_{it}^\Delta = \frac{Account\ receivable_{it}^S}{TA_{it}^S} - \sum_{k=1}^{n} \frac{Account\ payable_{kt}^S}{TA_{kt}^S} \tag{4}$$

Where the benchmark is the simple arithmetical average of values computed for all the n firms that included in the controlling sample for the same sector of the firm (S). Both the two group of measures are constructed for the year before the default, the default date, and the three years after the event.

The analysis considers the effect of the default of a member of the supply chain on its suppliers and customers considering both the accounting and the financial performance. Coherently with the literature on the information content of trade credit, we consider as performance proxies the following variables (Aktas et al. 2012)[2]:

$$ZScore_{it} = 0.012\frac{WC_{it}}{TA_{it}} + 0.014\frac{RE_{it}}{TA_{it}} + 0.033\frac{EBIT_{it}}{TA_{it}} + 0.006\frac{E_{it}}{D_{it}} + 0.999\frac{Sales_{it}}{TA_{it}} \tag{5}$$

$$ROA_{it} = \frac{Operating\ Income_{it}}{TA_{it}} \tag{6}$$

where

$Z - Score_{it}$ is a proxy of firm's risk computed following the approach and the weights identified by Altman (1968).

$\frac{WC_{it}}{TA_{it}}$ is an asset structure proxy constructed as the ratio between the working capital and the total assets for the firm i at time t.

$\frac{RE_{it}}{TA_{it}}$ is a proxy of growth opportunities for the firm constructed as the ratio between the amount of retained earnings and total assets for the firm i at time t.

$\frac{EBIT_{it}}{TA_{it}}$ is a measure of profitability computed the ratio between the earnings before interest and taxes with respect to total assets for the firm i at time t-

$\frac{E_{it}}{D_{it}}$ is a leverage proxy computed as the ratio between the value of the equity and the value of the debt for the firm i at time t.

$\frac{Sales_{it}}{TA_{it}}$ is a turnover proxy constructed as the ratio between the value of sales and the total assets for the firm I at time t.

ROA_{it} is a measure of the accounting performance of the firm i at time t computed as the ratio between operating income and total assets.

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[2] The Jensen Alpha on the customers or suppliers of the defaulted entities is not considered because more than 50% of the defaulted sample includes not listed firms.

The analysis compares the value of the proxies constructed considering the sample of firms with defaulted customers and/or defaulted suppliers and the rest of the market considering the time of the default and years near to the event.

Identified differences between the performance of firms that experienced the default and the other, the analysis is focused on the implication of the default on the value added created by the firm. Following the approach proposed by Ferrando and Muller (2013), the model constructed is the following:

$$growth_{it}^{AV} = \alpha_0 + \alpha_1 growth_{it-1}^{AV} + \alpha_2 TC\ Channel_{it-1} + \alpha_3 Bank\ loans_{it-1} + \alpha_4 Growth_{it-1}^{Sales}$$
$$+\alpha_5 \ln(Size)_{it-1} + \alpha_6 \log(age)_{it-1} + v_i + v_t + v_{it} + \varepsilon_{it} \tag{7}$$

$$growth_{it}^{AV} = \alpha_0 + \alpha_1 growth_{it-1}^{AV} + \alpha_2 TC\ Channel_{it-1} + \gamma_1 Default_{it-1} + \alpha_3 Bank\ loans_{it-1} \tag{8}$$
$$+\alpha_4 Growth_{it-1}^{Sales} + \alpha_5 \ln(Size)_{it-1} + \alpha_6 \log(age)_{it-1} + v_i + v_t + v_{it} + \varepsilon_{it}$$

$$growth_{it}^{AV} = \alpha_0 + \alpha_1 growth_{it-1}^{AV} + \alpha_2 TC\ Channel_{it-1} + \gamma_2 Default_{it-1} \times TC\ Channel_{it-1} \tag{9}$$
$$+\gamma_3 Default_{it-1} \times Bank\ Loans_{it-1} + \alpha_3 Bank\ loans_{it-1} + \alpha_4 Growth_{it-1}^{Sales} + \alpha_5 \ln(Size)_{it-1}$$
$$+ \alpha_6 \log(age)_{it-1} + v_i + v_t + v_{it} + \varepsilon_{it}$$

where:

$growth_{it}^{AV}$ is calculated as the difference between the current and lagged value divided for the past value added

$TC\ Channel_{it-1}$ is the trade credit channel computed as the sum of account receivables and payable divided for total sales for the firm i at time t

$Bank\ loans_{it-1}$ is the sum of short and long term financial debt scaled for total sales for the firm I at time t

$Growth_{it-1}^{Sales}$ is the growth rate of the sales value on the yearly time horizon for the firm i at time t

$\ln(Size)_{it-1}$ is a proxy of size compute as natural logarithm of the total assets for the firm I at time t

$\log(age)_{it-1}$ is the natural logarithm of the age of the firm I at time t

$Default_{it-1}$ is a dummy variable that assume value 1 if one of the suppliers or customers of the firm's supply chain is already defaulted.

v_i, v_t, v_{it} are dummy variables for considering the fixed effect for the sector, the time and the interaction term

All independent variables are lagged of one year in order to avoid endogeneity problems and the regression analysis is performed using a GMM panel regression model. The analysis is released separately for the sample of customers (defaulted ad control) and suppliers (defaulted and control).

3.3 Results

The analysis of the impact of the supply chain default of the trade credit policy show some interesting difference with respect to the average firms from the same sector (table 3).

Table 3. Trade credit policy and supply chain default

Supplier default				
	Account receivable / Total Assets		Account payable / Total Assets	
	Average value	Δ Sector average	Average value	Δ Sector average
- 1 year	11,73%	-1,85%	8,81%	-7,11%**
Default	11,70%	-1,47%	8,56%	-6,38%**
+ 1 year	10,87%	-3,09%**	7,09%	-8,33%**
+2 years	11,80%	-3,24%**	9,73%	-6,10%**
+3 years	10,10%	-5,39%**	5,00%	-11,83%**
Customer default				
	Account receivable / Total Assets		Account payable / Total Assets	
	Average value	Δ Sector average	Average value	Δ Sector average
- 1 year	10,85%	-2,59%**	10.18%	-6,82%**
Default	10,74%	-1,67%	10,64%	-5,84%**
+ 1 year	10,25%	-2,00%**	11,40%	-7,14%**
+2 years	9,14%	-1,98%*	11.01%	-7,65%**
+3 years	9,38%	-0.33%	11.94%	-7,52%**

Notes: ** *Average difference statistically significant at 99% level* * Average difference statistically significant at 95% level
Source: Thompson Eikon data processed by the author

Firms with defaulted supplier request on average significantly lower amount of trade credit and once the supplier defaults the amount of account and payable receivable decreases immediately and also the gap with respect to the average sector increases. Firms with defaulted suppliers are characterized by a lower capability to both obtain and offer trade credit financing opportunities.

If a customer defaults, the time effect on the trade receivable is not so relevant and It expires on average after two years from the default. Firms that are experiencing problems from their relevant customers are normally financially constrained by their suppliers and the relevance of the lack of trade financing increases once the default occurs.

Looking at the risk and return of firms that experiences defaults in their supply chain, some interesting differences can be pointed out from the comparison with other firms working in the same sector (Table 4).

Table 4. Supply chain default and the risk and return proxies for the linked firms

	Z-score				ROA	
	Average value	% Safe firms	% Grey zone	% Distress zone	Average value	Average growth
Supplier default						
- 1 year	11,08	39,62%	43,40%	16,98%	12,22%	-0.03%
Default	2,32	44,00%	32,00%	24,00%	10,79%	-0.18%
+ 1 year	1,20	42,86%	47,62%	9,52%	11,28%	-0.29%
+2 years	2,83	30,00%	60,00%	10.00%	12,69%	-0.21%
+3 years	2,89	40,00%	40,00%	20,00%	11,85%	-0.22%
Customer default						
- 1 year	3,51	35,71%	42,86%	21,43%	13,34%	0,00%
Default	0,51	33,02%	41,51%	25,47%	10,43%	-0,09%
+ 1 year	0,38	31,25%	47,92%	20,83%	11,60%	-0,21%
+2 years	2,27	31,03%	51,72%	17,24%	13,43%	-0,07%
+3 years	2,53	33.03%	50,00%	16,67%	10,96%	-0,06%

Source: Thompson Eikon data processed by the author

Defaults of relevant customers or suppliers have a significant effect on the perceived default risk of a firm and the effect is persistent over time. On average firms that lose a relevant supplier are those that experienced an higher and more persistent increase in the credit risk while firms that lose relevant customers need at least two years in order to reach an average comparable risk. Looking at the classification of firms on the basis of the value of the Z-Score, after the default of a supplier the number of safe firms does not decrease but the number of distressed firms increases while the customer default increases the number of distress classified firms and reduces the number of safe firms but after one year results tend to align to the base scenario.

The analysis of the average return of assets show that a default a significant negative impact on the ROA with a decrease of the mean value of more than 1,5% for the default of a key supplier and around 3% for a default of a relevant customer. The growth rate of the ROA registered the maximum yearly reduction in the year of the default and the year following the event even if it doesn't see that the effect expire in few years.

The last type of analysis considers the effect of the supply chain default on the possibility to finance growth for the firm and results related to customers' and suppliers' defaults show some interesting differences.

Table 4. Supply chain default and fund raising for supporting the value added growth

	Customers' Default			Suppliers' default		
	(7)	(8)	(9)	(7)	(8)	(9)
$growth_{it-1}^{AV}$	0.01**	0.01**	0.01**	-0.01	-0.01	-0.01
$TC\ Channel_{it-1}$	0.52*	0.52*	0.52*	0.75**	0.75	0.75**
$Bank\ loans_{it-1}$	-0.23*	-0.23*	-0.23*	-0.32**	-0.32	-0.32**
$Growth_{it-1}^{Sales}$	-0,51**	-0.51*	-0.51**	0.06*	0.06	0.06*
$\ln(Size)_{it-1}$	0.22**	-0.22**	0.22**	0.35	0.35	0.35
$\ln(age)_{it-1}$	-0.45**	-0.45*	-0.45**	-0.05	-0.05	-0.45
$Default_{it-1}$		7,40			4.26	0.23
$Default_{it-1} \times TC\ Channel_{it-1}$			-3.36*			-7.18*
$Default_{it-1} \times Bank\ Loans_{it-1}$			3.39*			9.02*
Constant	3,01**	3,02**	-3.13**	7.39		7.21
Firms	6606	6606	6606	4369	4369	4369
Industry instruments	☑	☑	☑	☑	☑	☑
Year Instruments	☑	☑	☑	☑	☑	☑
Interaction instruments	☑	☑	☑	☑	☑	☑
Wald χ2	151.79	151.86	151.90	9.56	9.57	9.57
Value and probability	(0.00)	(0.00)	(0.00)	(0.14)	(0.21)	(0.38)

Source: Thompson Eikon data processed by the author

The growth of the value added is normally financed using the trade credit channel and results are confirmed for both the sample analysed (customers and suppliers). The default of one of supply chain members does not affected the base model but if the analysis considers separately how these firms finance their growth it seems that they switch from trade channel financing to bank financing.

Results obtained support the hypothesis a crisis in the supply chain network may affect the financial condition of the frim driving to an increase of the financial resources necessary to support their growth.

4. Conclusion

Trade credit features the different business processes during the firm's life, from the start-up to the maturity: the richness of motivations affecting its use makes its information content valuable for outside investors. Recently a distinctive role for trade credit was identified like a mechanism to coordinate supply chains, therefore supply chain interactions can increase the information value of trade credit as they affect the financial performance of the members. Financial distress of suppliers has become a major concern for disruptions to normal activities : financial distress by a supplier is found to affect other members of the supply chain, even though the impact is influenced by the counterparty exposure, the structure of the industry where supply chain interactions take place and the type of sector.

By evaluating the counterparty exposure, our results for the United States over 2012 -2015 timeframe show that firms with defaulted suppliers are characterized by a lower capability to both obtain and offer trade credit financing opportunities. Moreover, defaults of relevant customers or suppliers have a significant effect on the perceived default risk of a firm and the effect is persistent over time. On average firms that lose a relevant supplier are those that experienced an higher and more persistent increase in the credit risk while firms that lose relevant customers need at least two years in order to reach an average comparable risk. Lastly, the default of one member of the supply chain does not affected the base model of value added creation, but suggest a substitution between trade channel financing to bank financing.

Because supply chain events contributes to the information content of members' indicators, future research developments will implement the structure of the industry and the economic sector in analysing the impact of supply chain interactions.

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