SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2022
ORGANIZATION AND MANAGEMENT SERIES NO. 166

PATTERNS IN CORPORATE TRADE CREDIT MANAGEMENT: INSIGHTS INTO THE POLISH TRADE SECTOR

Julia KORALUN-BEREŹNICKA

University of Gdańsk, Faculty of Management; julia.koralun-bereznicka@ug.edu.pl,
ORCID: 0000-0003-4498-0381

Purpose: The study identifies the intra-industry and cross-size regularities in corporate trade credit policies of Polish firms operating in the trade sector. It aims to verify whether the intra-industry effect is more likely to affect corporate trade credit behaviour than the firm size effect.
Design/methodology/approach: The research is based on yearly data from the ECCBSO trade credit database for three trade industry sub-sections (motor vehicle trade, wholesale trade and retail trade) and four size groups in the period 2005-2017. The rich collection of variables employed enables detailed insights into the corporate trade credit management practices. Methods include the analysis of variance, cluster analysis and multidimensional scaling.
Findings: Findings provide evidence that both size-related features and intra-industry specificity are significant determinants of corporate trade credit behaviour. The study also reveals that the industrial breakdown of trade firms into sub-sections is of greater importance in comparison to the size-based classification of firms.
Research limitations/implications: The dataset employed in the research offers aggregated information instead of firm-level data, which inevitably reduces the information resource, but also ensures data harmonisation and comparability. Narrowing the research to just one industrial section in Poland makes the study specific. Further investigation of the patterns in trade credit could be directed at other industries and (or) other countries.
Practical implications: The reported findings might be of interest to those involved in corporate finance management. Recognising the differences in receivables and payables management resulting mainly from the intra-industry specificity can contribute to a better understanding of business financing and its operational functioning. This knowledge may support the effective management of receivables and liabilities, especially in companies operating in developing countries.
Originality/value: The study contributes to the existing literature mainly through the application of the multi-sectional approach to private companies, covering the dimension of time, firm size and industry sub-section. This offers grounds for detailed multi-layered conclusions in terms of corporate trade credit behaviour in the Polish trade sector.

Keywords: trade credit, intra-industry effect, firm size, trade sector, classification methods.

Category of the paper: Research paper.

1. Introduction

Apart from using capital borrowed from financial institutions, ever since commerce appeared firms have commonly used funds from their suppliers, i.e. funds made available through trade credit. Whenever a delay is arranged between the purchase of goods or services and the payment for these purchases, trade credit is created, which constitutes one of the major sources of short-term financing for most businesses (Brick, Fung, 1984a). Trade credit can be considered both from the point of view of a buyer and a seller. Trade credit received is a short-term source of financing reported under current liabilities in the balance sheet, whereas trade credit granted can be seen as an investment in accounts receivable reported under current assets (García-Teruel, Martínez-Solano, 2010).

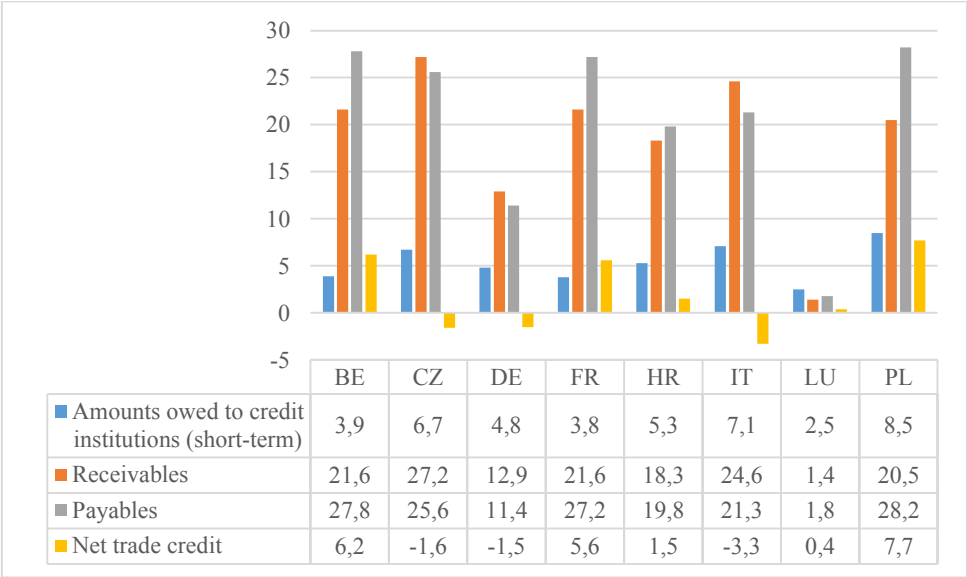
The funds obtained through trade credit are likely to be considered as a complementary source of capital to the funds transferred via financial channels, i.e. mainly through banks, but also – and in an increasing number of cases – as a substitute for traditional bank credits (Burkart, Ellingsen, 2004). According to the European BACH database (BACH, 2021), in 2019 trade payables amounted to as much as 28.2% of the assets for a sample of all-sized firms in the Polish trade sector, while the amounts owed to credit institutions revealed in the current liabilities accounted only for 8.5%. Similarly, the relation of trade receivables to assets in that sector, which reflects the scale of trade credit granted, was 20.5%. This indicates that the trade credit policy, which involves not only accounts payable, but also receivables management, is an important component of working capital management. The numerosity and interdependence of theories explaining trade credit, combined with an even larger set of factors and motives behind supplying and using trade credit by firms, make the issue highly researchable. Therefore, although working capital management has been an area of interest of virtually countless studies, it continues to attract attention among scholars. Given the considerable variations in trade credit usage, terms, and maturity periods across countries and industries, and even within industries, Dary and Harvey (2020) suggest that the research in this area should focus on specific industries. Following this recommendation and taking into account the fact that industry-level studies are relatively rare, this paper is restricted to just one specific sector of trade in Poland.

The contribution of this study to the existing literature on trade credit is three-fold. Firstly, this research covers private firms of various sizes, including even the often neglected micro firms. Secondly, the adopted multi-sectional approach encompassing the time cross-section, cross-size section and intra-industry cross-section provides a framework for multi-layered conclusions in terms of corporate trade credit behaviour. Thirdly, an unusually detailed set of variables was employed. As a result, the analysis provides deep insights into the trade credit behaviour of Polish firms, thus updating and broadening the knowledge in the field.

The remainder of this paper is organized as follows. The scale of use of corporate trade credit across industries and European economies is briefly reported in section 1, whereas section 2 provides a review of the major trade credit theories. Based on previous research findings, the role of the firm size and its industrial classification in corporate trade credit behaviour is also discussed here. The description of the sample, variables and methods used can be found in section 3, which is followed by the results and discussion. The study ends with a summary and conclusions.

2. The role of trade credit in the trade sector

A glance at the scale of use of the trade credit by firms from the trade sector across countries (Figure 1) and across industries in Poland (Figure 2) seems a purposeful prolegomenon to the more detailed study of the phenomenon. The data was retrieved from the European database (BACH, 2021), which provides aggregated and comparable data from financial statements of firms across countries, sectors, size groups and years.



	BE	CZ	DE	FR	HR	IT	LU	PL
Amounts owed to credit institutions (short-term)	3,9	6,7	4,8	3,8	5,3	7,1	2,5	8,5
Receivables	21,6	27,2	12,9	21,6	18,3	24,6	1,4	20,5
Payables	27,8	25,6	11,4	27,2	19,8	21,3	1,8	28,2
Net trade credit	6,2	-1,6	-1,5	5,6	1,5	-3,3	0,4	7,7

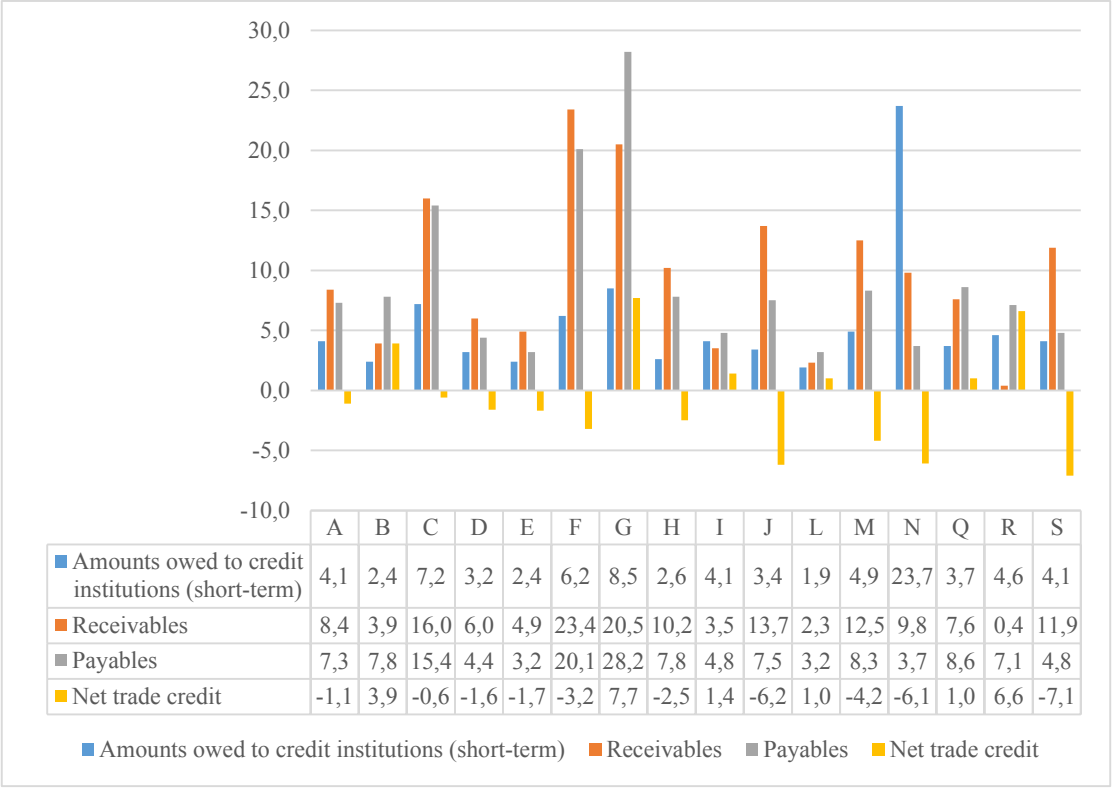
Note. The numbers represent percentage shares of the given amounts in total assets based on a sample of all-sized firms available in the database. The net trade credit is calculated as the difference between accounts payable and accounts receivable.

Figure 1. The use of short-term credit from financial sector and trade credit and in the trade sector across countries in 2019.

Source: own elaboration based on BACH (2021) database.

As for the international cross-section, the most obvious regularity characteristic for most countries, for which the relevant data was available in the most recent year in the BACH database, is the considerably lower share of short-term financial debt compared to trade credit received, illustrated by the share of accounts payable in assets. The only exception from this rule is Luxemburg, where the situation is inverse. It is also rather more typical for trade sector

companies to be net users of trade credit; only Czech, German, and Italian companies are net suppliers, on average. It appears that the Polish trade sector is characterised by the highest share of accounts payable to assets in comparison with several other EU countries. Similarly, the highest level of short-term financial debt and net trade credit can be observed for Poland. The relation of accounts receivable to assets is not the highest, but well above the average level for the considered countries. As a result, the net trade credit for companies from the Polish trade sector is the largest in the analysed group.



	A	B	C	D	E	F	G	H	I	J	L	M	N	Q	R	S
Amounts owed to credit institutions (short-term)	4,1	2,4	7,2	3,2	2,4	6,2	8,5	2,6	4,1	3,4	1,9	4,9	23,7	3,7	4,6	4,1
Receivables	8,4	3,9	16,0	6,0	4,9	23,4	20,5	10,2	3,5	13,7	2,3	12,5	9,8	7,6	0,4	11,9
Payables	7,3	7,8	15,4	4,4	3,2	20,1	28,2	7,8	4,8	7,5	3,2	8,3	3,7	8,6	7,1	4,8
Net trade credit	-1,1	3,9	-0,6	-1,6	-1,7	-3,2	7,7	-2,5	1,4	-6,2	1,0	-4,2	-6,1	1,0	6,6	-7,1

Note. The numbers represent percentage shares of the given amounts in total assets based on a sample of all-sized firms available in the database. The net trade credit is calculated as the difference between accounts payable and accounts receivable. Sector designations follow the NACE symbols: A – Agriculture, forestry and fishing, B – Mining and quarrying, C – Manufacturing, D – Electricity, gas, steam and air conditioning supply, E – Water supply, sewerage, waste management and remediation activities, F – Construction, **G – Wholesale and retail trade, repair of motor vehicles and motorcycles**, H – Transportation and storage, I – Accommodation and food service activities, J – Information and communication, L – Real estate activities, M – Professional, scientific and technical activities, N – Administrative and support service activities, Q – Human health and social work activities, R – Arts, entertainment and recreation, S – Other service activities.

Figure 2. The use of short-term credit from financial sector and trade credit and in the trade sector across industries in Poland in 2019.

Source: own elaboration based on BACH (2021) database.

When considering the cross-industry section in Poland, again it can be observed that accounts payable on average roughly double the short-term amounts owed to financial institutions. The difference is almost triple in the case of the trade sector. The only industry where trade credit received is smaller than financial short-term debt is the sector of administrative and support service activities.

3. Literature review and hypotheses development

There is a number of theories explaining the reasons for which on the one hand non-financial companies offer trade credit, and, on the other hand, other firms use this financial instrument. A review of the main trade credit theories can be found in Petersen and Rajan (1997), whereas Bhattacharya (2011) and Dary and Harvey (2020) offer a thorough historical evolution of these theories. A synthetic summary of these considerations can be found in Table 1.

Table 1.
Review of theories explaining trade credit

Theory	Explanation of the role of trade credit	Literature
Financing advantage	The supplier's better ability to evaluate customers' creditworthiness and execute repayments in comparison to traditional lenders (resulting from advantages in information acquisition, controlling the buyer, and recouping value from existing assets) may provide him with a cost advantage over financial institutions in offering credit to a buyer. Trade credit serves as a substitute for institutional finance, especially for firms with limited access to such financing and (or) poor creditworthiness.	Meltzer (1960); Schwartz (1974); Brennan et al. (1988); Smith (1987)
Liquidity	Sellers with advantageous access to capital may benefit from offering trade credit to customers with limited access to capital (trade credit as an instrument of redistribution). Firms suffering from low financial liquidity need trade credit to improve their cash flows.	Meltzer (1960); Schwartz, (1974); Emery (1984)
Financial distress	It might be more difficult for financially distressed firms to obtain trade credit, but they need larger amounts of trade credit to substitute alternative sources of financing when they become unavailable. The financial distress of a supplier makes the buyer more reluctant to pay on time, which aggravates the crisis.	Wilner (2007); Baxter (1967); Molina, Preve (2012)
Transactions costs	In the case of frequent transactions between parties, trade credit can serve as a means of reducing transaction costs for both buyers and sellers who might economise by periodic payments.	Williamson (1979); Ferris (1981); Emery (1984); Petersen, Rajan (1997)
Quality guarantee	If the quality of goods cannot be determined at the time of their purchase, trade credit serves as a guarantee by providing buyers additional time for verification of that quality before payment.	Smith (1987); Lee, Stowe (1993); Long et al. (1993); Fafchamps et al. (1995); Deloof, Jegers (1996)
Price discrimination	In highly competitive markets, sellers may deploy trade credit as a tool of indirect price discrimination (when the straightforward one is impermissible), which favours riskier and (or) low credit quality customers.	Brennan et al. (1988); Petersen, Rajan (1997); García-Teruel, Martínez-Solano (2010)
Product differentiation	Similarly to advertising, trade credit can serve as a marketing tool or sales promotion device to differentiate products from the competition and thus stimulate demand and increase market share.	Nadiri (1969); Wilner (2000); Summers, Wilson (2000); Cheng, Pike (2003)
Market power	As opposed to developed countries, companies with market power in developing economies tend to abuse their position to become net users of trade credit by extracting much more trade credit from the suppliers than granting it to the buyers.	Cheng, Pike (2003)

Cont. table 1.

Tax	Under cash accounting systems, firms can defer their tax liabilities and therefore enhance their cash flows by offering trade credit, especially in high-tax jurisdictions. Trade credit may be used to reallocate capital between different tax jurisdictions.	Brick, Fung (1984b); Brennan et al. (1988); Mian, Smith (1992); Desai et al. (2016)
Long-term relationship	Firms, especially newly established market entrants or operating in highly competitive industries, may invest in trade credit as a means of attracting customers, building long-term relationships with them and preventing them from defection.	Nadiri (1969); Ng et al. (1999); Wilner (2000); Summers, Wilson (2000); Cuñat (2007)

Source: own elaboration based on Petersen, Rajan (1997), García-Teruel, Martínez-Solano (2010), Bhattacharya (2011), and Dary, Harvey (2020).

As can be inferred from the summary of the trade credit theories collated in Table 1, both from the explanations and repeated literature items, the theories tend to overlap and interrelate rather than be mutually exclusive (Dary, Harvey, 2020). Similar interrelations can be observed in the case of the motives behind trade credit activity. It is not unusual for researchers to find confirmation for more than one theory in one study. This indicates that firms might get involved in trade credit activities for different reasons, which can further vary depending on such circumstances as economic situation or trading partners. Such a variety and interdependence of factors affecting firms' trade credit behaviour provides grounds for further research of this phenomenon both cross-sectionally and across time.

A wide range of factors has been found to affect corporate trade credit policies. The two factors of particular interest in this paper are the firm size and its industrial classification. It appears that the empirical evidence on the effect of firm size and the amount of trade credit granted and received is ambiguous (Dary, Harvey, 2020). A summary of some of the previous research findings in the field can be found in Table 2.

Table 2.
Summary of the research findings on the relation between firm size and trade credit

Relation	Trade credit supplied	Trade credit received
+	Petersen, Rajan (1997); Lin, Chou (2015); Carvalho, Schiozer (2015); Bougheas et al. (2009);	Bougheas et al. (2009); Lin, Chou (2015); García-Teruel, Martínez-Solano (2010); Ferrando, Mulier (2013); Fisman, Raturi (2004)
–	Long et al. (1993); Alarcón (2011); Jaleel et al. (2014); Wilson, Summers (2002)	Kihanga et al. (2010); Jaleel et al. (2014); Duliniec, Świda (2021)

Source: own elaboration based on Dary and Harvey (2020).

As for the industrial classification of firms as a factor affecting corporate trade credit behaviour, a number of various sector-related firm characteristics can be distinguished. A synthetic summary of such industry-specific factors based on previous literature is presented in Table 3.

Regardless of which industry-specific factor is responsible for the amount of trade credit or the trade credit period, the cross-industry variety of trade credit terms seems unquestionable, as widely evidenced by different studies. Similarly, the multiple reports on the existence of the size effect in corporate trade credit management make the firm size one of the key issues in the field.

Table 3.
The impact of industry-related factors on trade credit

Factor	Relation with trade credit amount and (or) period	Literature involved
Amount of goods purchased	The higher the amount of purchase, the more likely it is for trade credit to occur. Firms operating in industries where bulk purchases are common tend to offer trade credit more often than retail firms.	Burkart, Ellingsen (2004)
Liquidity of goods	In industries where goods are with a low degree of liquidity, larger amounts of trade credit are likely to occur.	Dary, Harvey (2020)
Quality verification	Higher amounts of trade credit and (or) longer periods occur in transactions between suppliers and international customers, especially when it is purposeful to verify the quality of goods sold.	Long et al. (1993); Deloof, Jegers (1996); Ng et al. (1999)
Uniqueness of goods	The amounts of trade credit are likely to be higher in industries where the goods involved in the exchange are highly specific.	Long et al. (1993)
Market concentration	Higher trade credit amounts are more typical for industries characterised by high competition, as opposed to monopolies.	Fisman, Raturi (2004)
Inventory volume	Firms with greater levels of inventory may also offer more trade credit. Large volumes of inventories usually suggest a greater volume of purchases from suppliers and hence greater demand for trade credit.	Elliehausen, Wolken (1993)
Production cycle	Larger trade credit amounts and (or) longer periods are associated with industries offering goods with long production cycles, implying their high quality or complexity. Low-quality or highly perishable products, like food, are less likely to be sold on credit.	Long et al. (1993); Fafchamps et al. (1995); Deloof, Jegers (1996); García-Teruel, Martínez-Solano (2010)
Product complexity	Longer trade credit periods are associated with hard or complex goods.	Klapper et al. (2012)

Source: own elaboration based on literature items listed in the table.

A question that remains partly open to debate is which of the two factors prevails in terms of trade credit behaviour. This leads to the formulation of the following research hypotheses:

- H1: trade credit behaviour varies significantly across sub-sections of the Polish trade sector in all size groups of firms.
- H2: trade credit behaviour varies significantly across size groups in the Polish trade sector and its sub-sections.
- H3: the intra-industry specifics is a more important determinant of corporate trade credit behaviour than the firm size in the Polish trade sector.

While the literature background for the first two hypotheses has already been discussed here, the third hypothesis might need some justification. The hypothesised hierarchy of the size effect and the intra-industry effect, in which the latter is favoured, derives from previous studies aiming at evaluating the relative importance of these two effects. The available evidence in other corporate finance areas, such as general corporate performance (Koralun-Bereźnicka, 2013) or capital structure (Koralun-Bereźnicka, 2016) more often than not gives priority to the industry effect.

4. Data and methods

The comparative analysis of the relative importance of the intra-industry sections and firm size effect in corporate trade credit behaviour is based on the data from the ECCBSO (European Committee of Central Balance Sheet Data Offices) Trade Credit Database (ECCBSO, 2020). The database contains results of Financial Statement Analysis Working Group (FSA WG) on the calculation of indicators of days sales outstanding (DSO) and days payable outstanding (DPO), used as proxies for customer and supplier payment periods, based on accounting information drawn from financial statements of firms. Apart from Poland, the database covers eight other countries, seven of which are also EU member states. The one country from outside the EU included in the database is Turkey. Of the three industrial sectors captured by the ECCBSO Trade Credit Database, namely the construction industry, manufacturing, and trade, only the latter is further broken into the sub-sections of motor vehicle (MV) trade, wholesale trade (WS), and retail trade (RT). This subdivision enables deeper insights into the trade credit behaviour of firms in this sector, which was found to be characterised by generally shorter receivables and payables cycles, compared to the manufacturing and construction sections.

As for the size breakdown, the data is available for four size groups, i.e. micro firms (with the sales lower or equal to €2 mln), small firms (with sales higher than €2 mln but lower than or equal €10 mln), medium firms (with sales between €10 mln and €50 mln) and large firms, whose sales exceed €50 mln. The time span for Poland covers the period from 2005 to 2017, and the frequency of data is yearly. Apart from the cross-size and intra-industry breakdown of the data for the analysed trade sector, the aggregated data items are also provided for all size groups without micro firms. The aggregation base varies across the years, as the number of companies included is different in each period. Table 4. shows the number of companies for each year and in each category of size and trade sub-sector.

Table 4.
The number of Polish trade sector companies covered by the ECCBSO trade credit database by size group, trade sub-sections, and years

Year	Trade sub-sector	Firm size			
		Micro	Small	Medium	Large
2005	MV	255	383	151	34
	WS	1 013	1 941	1 012	319
	RT	679	628	205	69
2006	MV	233	358	166	39
	WS	880	1 951	1 044	352
	RT	632	669	214	79
2007	MV	212	347	190	51
	WS	776	1 921	1 145	389
	RT	628	701	236	95
2008	MV	224	352	195	49
	WS	993	2 133	1 183	378
	RT	643	772	234	98

Cont table 4.

2009	MV	233	365	189	46
	WS	1 013	2 158	1 102	337
	RT	666	830	240	94
2010	MV	229	366	187	55
	WS	995	2 118	1 104	336
	RT	661	813	245	97
2011	MV	240	366	180	53
	WS	929	2 067	1 138	357
	RT	640	848	265	93
2012	MV	247	352	184	49
	WS	1 046	2 088	1 124	365
	RT	656	856	242	94
2013	MV	268	344	176	53
	WS	1 118	2 146	1 128	366
	RT	707	912	236	104
2014	MV	252	311	190	50
	WS	1 076	2 151	1 151	368
	RT	713	917	239	99
2015	MV	210	309	200	59
	WS	897	2 086	1 158	385
	RT	597	942	259	103
2016	MV	206	291	207	77
	WS	902	2 135	1 183	388
	RT	610	1 020	266	114
2017	MV	178	275	217	80
	WS	775	1 994	1 239	407
	RT	560	1 018	295	111
Average	MV	230	340	187	53
	WS	955	2068	1132	365
	RT	646	840	244	96

Note. MV – motor vehicle trade, WS – wholesale trade, RT – retail trade.

Source: own elaboration based on ECCBSO (2020) trade credit database.

The variables involved in the study include the following ratios:

- Days Sales Outstanding (DSO), defined as:

$$DSO = \frac{Trade\ Receivables - Customer\ Prepayments}{Net\ Turnover} \cdot 360, \tag{1}$$

where the customer prepayments are defined in 4th EU Directive as: "Payments received on account of orders in so far as they are not shown separately as deductions from stocks";

- Days Payables Outstanding (DPO), defined as:

$$DPO = \frac{Trade\ payables - Advances\ to\ Suppliers}{Purchases} \cdot 360, \tag{2}$$

where the advances to suppliers are defined in 4th EU Directive as "Payments on account", and purchases – as a sum of material expense and services rendered;

- Trade Credit Balance (TCB), defined as:

$$TCB = \frac{DSO \cdot Net\ Turnover - DPO \cdot Purchases}{Net\ Turnover}. \quad (3)$$

For each of the three ratios (1) – (3), the following information is provided:

- the percentage share of companies with the ratio value falling into a certain range,
- the ratio's distribution in days,
- the weighted mean based on percentile distribution.

The details of the data available for each ratio are shown in Table 5, along with the symbols assigned to each variable for easier identification in the remainder of the study.

The structure of the analysed data is three-dimensional and can be visualised by a data cube in Figure 3. The dimensions correspond to the trade industry sub-sections, four size groups of firms and to the number of years in the analytical period, i.e. from 2005 to 2017. Then, for each object defined by the three dimensions, 42 variables are available, as specified in Table 5. Overall, the data cube creates 6552 aggregated data items, 504 per year.

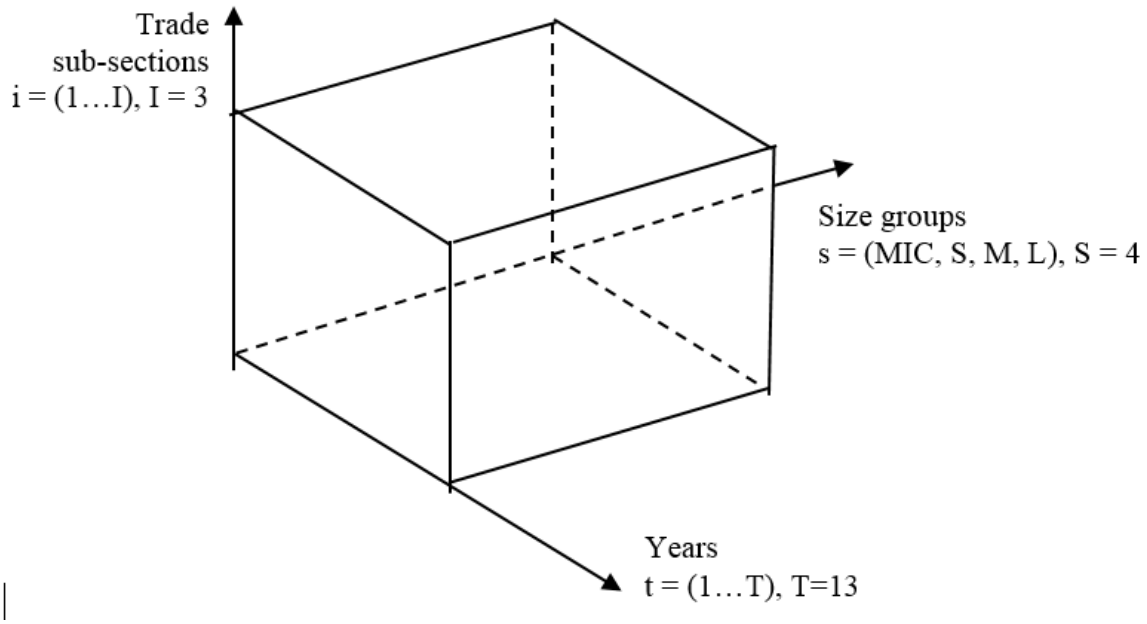


Figure 3. Data structure.

Source: own elaboration.

The selection of research methods is mainly determined by the aim of the study, which is to evaluate the relative importance of the firm size versus intra-industry effect in corporate trade credit behaviour of the Polish trade sector firms. At the same time, however, the very data structure, composed of multi-dimensional objects (i.e. size groups in years, industries in years, size groups in industries) described by numerous diagnostic variables, implies the need to simplify the data organisation to identify the main regularities. The multivariate statistical analysis provides an adequate means of realising this objective.

Table 5.
Variables characteristics and symbols

Ratio	Specification		Symbol of variable
DSO (Days Sales Outstanding)	a) % of companies with	1. $DSO < 0$	$DSO_{<0}$
		2. $DSO \in \langle 0; 30)$	$DSO_{0\text{-}29}$
		3. $DSO \in \langle 30; 60)$	$DSO_{30\text{-}59}$
		4. $DSO \in \langle 60; 90)$	$DSO_{60\text{-}89}$
		5. $DSO \in \langle 90; 120)$	$DSO_{90\text{-}119}$
		6. $DSO \geq 120$	DSO_{120+}
	b) distribution in days	1. $P05$	DSO_{P05}
		2. $P10$	DSO_{P10}
		3. $P25$	DSO_{P25}
		4. $P50$	DSO_{P50}
		5. $P75$	DSO_{P75}
		6. $P90$	DSO_{P90}
		7. $P95$	DSO_{P95}
		8. weighted mean	DSO_{WM}
DPO (Days Payables Outstanding)	a) % of companies with	1. $DPO < 0$	$DPO_{<0}$
		2. $DPO \in \langle 0; 30)$	$DPO_{0\text{-}29}$
		3. $DPO \in \langle 30; 60)$	$DPO_{30\text{-}59}$
		4. $DPO \in \langle 60; 90)$	$DPO_{60\text{-}89}$
		5. $DPO \in \langle 90; 120)$	$DPO_{90\text{-}119}$
		6. $DPO \geq 120$	DPO_{120+}
	b) distribution in days	1. $P05$	DPO_{P05}
		2. $P10$	DPO_{P10}
		3. $P25$	DPO_{P25}
		4. $P50$	DPO_{P50}
		5. $P75$	DPO_{P75}
		6. $P90$	DPO_{P90}
		7. $P95$	DPO_{P95}
		8. weighted mean	DPO_{WM}
TCB (Trade Credit Balance)	a) % of companies with	1. $TCB < 0$	$TCB_{<0}$
		2. $TCB \in \langle 0; 30)$	$TCB_{0\text{-}29}$
		3. $TCB \in \langle 30; 60)$	$TCB_{30\text{-}59}$
		4. $TCB \in \langle 60; 90)$	$TCB_{60\text{-}89}$
		5. $TCB \in \langle 90; 120)$	$TCB_{90\text{-}119}$
		6. $TCB \geq 120$	TCB_{120+}
	b) distribution in days	1. $P05$	TCB_{P05}
		2. $P10$	TCB_{P10}
		3. $P25$	TCB_{P25}
		4. $P50$	TCB_{P50}
		5. $P75$	TCB_{P75}
		6. $P90$	TCB_{P90}
		7. $P95$	TCB_{P95}
		8. weighted mean	TCB_{WM}

Source: own elaboration based on ECCBSO (2020) trade credit database.

The first stage of the empirical part of the study involves the basic statistical analysis of the diagnostic variables. This was performed taking into account the following cross-sections: across size groups of firms, across sub-sections of the trade industry, and across time. Insights into the descriptive statistics of the trade credit ratios, such as mean value or standard deviation, set up a preliminary diagnosis of their diversity in the above-mentioned cross-sections and enable the initial recognition of the main regularities within the analysed population.

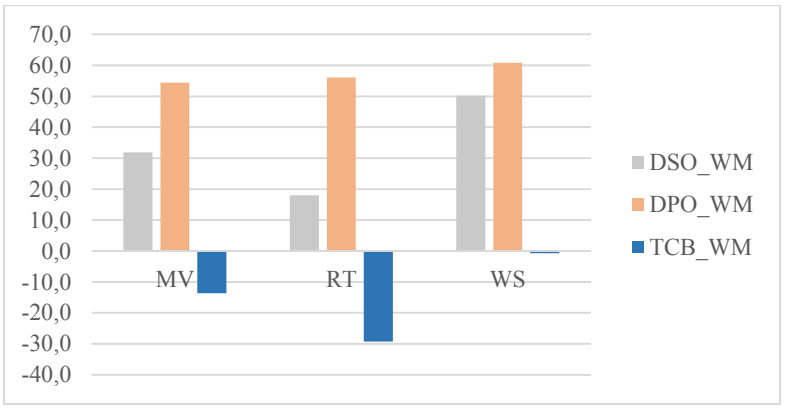
Although descriptive statistics constitute a rich source of basic knowledge about the examined dataset, they do not portray any information on the significance of the identified differences. Therefore, to evaluate the statistical significance of the ratios' diversity, the one-way analysis of variance (ANOVA) was applied (Fisher, 1954). The following grouping factors were involved in the ANOVA: firm size, industrial sub-section, and year.

The heterogeneity of the analysed population, as well as its multidimensionality, imply the need to organise its objects into groups of a clearer internal structure and more characteristic features, i.e. to classify them according to certain criteria. In this study, two commonly applied classification algorithms were used, namely the agglomerative cluster analysis, as well as the k-means grouping technique (Wishart, 2003) available in the STATISTICA software package. In the case of agglomerative clustering, the squared Euclidean distance metric was used to measure the distances between objects, whereas the Ward hierarchical method was applied in the amalgamation procedure, i.e. for determining the similarity of clusters (Ward, 1963). A detailed analysis of the grouping results, including the internal structure of each cluster, may provide an answer to whether the objects bear more similarity according to their intra-industrial classification, or whether they tend to get clustered by size groups.

To simplify the data structure, an exploratory technique of multidimensional scaling was applied (Springall, 1978; Mugavin, 2008). The use of multidimensional scaling (MDS) was specifically aimed at constructing a two-dimensional map of binomial objects formed by trade sub-sections in size groups. Through the MDS the objects are located in a space of a declared number of dimensions in such a way, that the obtained configuration provides the best approximation of the observed distances. Reducing the number of dimensions (variables) allows to easily visualise the identified patterns, as well as extract the unrecognised factors which explain the observed (dis)similarities between the objects.

5. Results and discussion

As indicated in the previous section, the first stage of the analysis was aimed at the preliminary recognition of the main trade credit patterns based on the basic statistics. A glance at the mean values of the three main weighted mean ratios across the three sub-sections of the trade industry (Figure 4) reveals the longest cycles of receivables and payables in the wholesale trade sector.



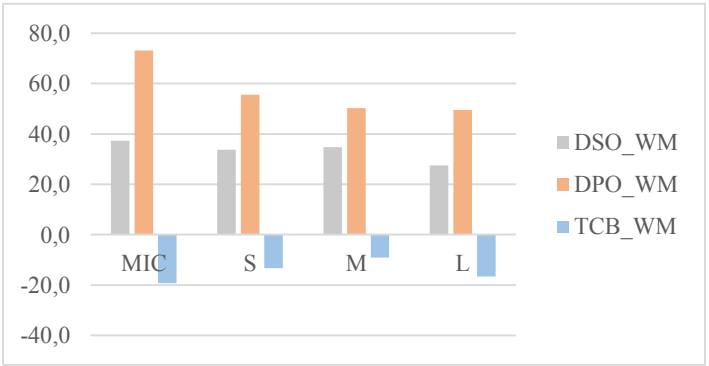
Note. MV – motor vehicles trade, RT – retail trade, WS – wholesale trade; weighted mean ratios: DSO – days sales outstanding, DPO – days payable outstanding, TCB – trade credit balance.

Figure 4. Average values of the weighted mean ratios across trade sub-sections.

Source: own elaboration based on ECCBSO (2020) trade credit database.

On average, it takes about 17 days longer for wholesale trade companies to collect their receivables than the average for all trade sector firms, whereas firms from the retail trade sector on average manage to do that within a period two weeks shorter. This should not be surprising though, as it is less common for retailers to credit their customers, especially in business-to-customer relations. Companies operating in the motor vehicle trade section remain closest to the industrial mean both in terms of receivables and payables management. Much less remarkable intra-industry-related differences are noticeable in the area of days payables outstanding ratio, which is on average 57 days long for the whole trade sector, and only three days longer in the case of the wholesale trade firms. These firms, however, face the highest trade credit balance, though still negative as for the whole trade sector. Retail trade companies are characterised by the considerably longest, almost a month-long trade credit balance, as well as the shortest receivables turnover. The greatest variability of all three ratios can be noticed in the case of the wholesale trade.

As for the cross-size section, the average values of the main variables can be traced in figure 5.



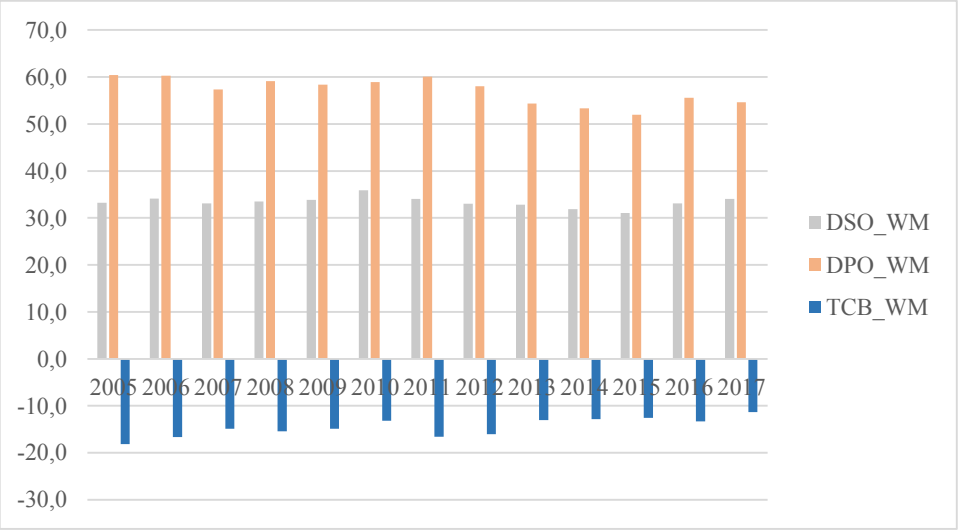
Note. MIC – micro firms, S – small firms, M – medium firms, L – large firms; weighted mean ratios: DSO – days sales outstanding, DPO – days payable outstanding, TCB – trade credit balance.

Figure 5. Average values of the weighted mean ratios across size groups.

Source: own elaboration based on ECCBSO (2020) trade credit database.

An interesting regularity noticeable regarding the receivables management is that trade companies tend to become slightly more restrictive with collecting their receivables as they grow larger in size. On average micro-firms allow their customers to pay their bills about ten days later than large companies. A similar consistency can be detected in terms of payables days outstanding, where micro-firms on average delay their payments by about three weeks longer than large ones. The most remarkable difference, however, is observed between micro firms and other sized firms. The group of small, medium and large firms appears as more homogeneous. No clear patterns can be distinguished between size and trade credit balance ratio; the average trade credit balance is negative for all size groups and rather only slightly varied - the span between the longest and shortest trade credit balance on average is about 10 days only.

When taking into account the time cross-section of the data visualised in Figure 6, it appears that no obvious or evident tendencies are observable. The level of days payables outstanding ratio appears as the most stable across the analysed period, whereas the DPO_{WM} decreases slightly, though not regularly. As a result the trade credit balance in 2017 is about a week shorter than in 2005, though always negative.



Note. Weighted mean ratios: DSO – days sales outstanding, DPO – days payable outstanding, TCB – trade credit balance.

Figure 6. Average values of the weighted mean ratios across time.

Source: own elaboration based on ECCBSO (2020) trade credit database.

In the case of observing differences between variables across the considered categories, it should be verified whether they are statistically significant. This issue was addressed by using the univariate analysis of variance across sub-sections of the trade sector and size groups of firms. The results – for the sake of brevity – are reported only for the three main weighted mean variables and are collated in tables 6 and 7, with the grouping variables as industry and size, respectively.

Table 6.
Total and by-size ANOVA results with trade sub-section as the grouping factor

Variable	All size groups		Size group			
			MIC	S	M	L
DSO_{WM}	F	486.5*	202.3*	1018.5*	778.5*	739.8*
	p	0.000	0.000	0.000	0.000	0.000
DPO_{WM}	F	4.4*	18.0*	20.4*	4.4*	161.7*
	p	0.014	0.000	0.000	0.000	0.019
TCB_{WM}	F	205.7*	56.1*	237.3*	314.0*	513.0*
	p	0.000	0.000	0.000	0.000	0.000

Note. * – significant at p=0.05, MIC – micro firms, S – small firms, M – medium firms, L – large firms, weighted mean ratios: DSO – days sales outstanding, DPO – days payable outstanding, TCB – trade credit balance.

Source: author's calculations based on ECCBSO (2020) trade credit database.

As can be seen in tables 6 and 7, the ANOVA procedure was performed for the analysed population as a whole, and then in individual size groups and trade sub-sections. All of the three main trade credit ratios demonstrate significant variation both across trade sub-sections, as well as across size groups of firms. Moreover, this is observed not only in terms of the whole population examined, but also in individual size groups of companies – with industry as the grouping variable, and individual trade sub-sections – with the size factor.

Table 7.
Total and by-section ANOVA results with firm size as the grouping factor

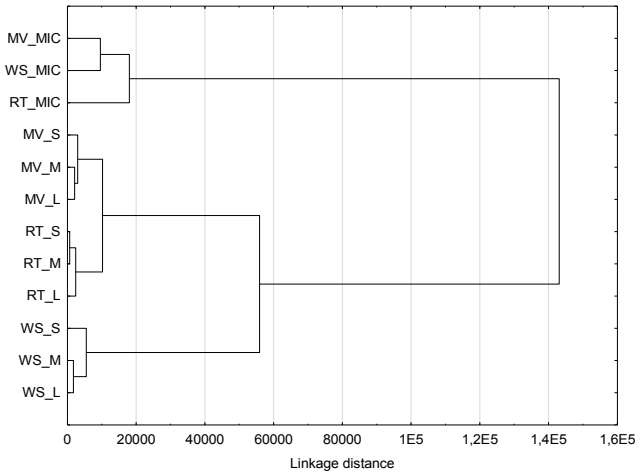
Variable	All trade sub-sections		Trade sub-section		
			MV	WS	RT
DSO_{WM}	F	3.5*	20.4*	142.8*	53.1*
	p	0.017	0.000	0.000	0.000
DPO_{WM}	F	103.4*	96.5*	85.8*	58.0*
	p	0.000	0.000	0.000	0.000
TCB_{WM}	F	4.3*	7.3*	43.0*	81.6*
	p	0.006	0.000	0.000	0.000

Note: * – significant at p=0.05, MV – motor vehicles trade, RT – retail trade, WS – wholesale trade, weighted mean ratios: DSO – days sales outstanding, DPO – days payable outstanding, TCB – trade credit balance.

Source: author's calculations based on ECCBSO (2020) trade credit database.

As for the remaining variables, their vast majority is also characterised with significant cross-industry variability when the whole population is considered. The only exceptions from this rule, i.e. the only ratios for which no significant cross-industry variability was found are the following: DPO_{120+}, DPO_{P90}, and DPO_{P95}. However, when taking into account the size factor as the qualitative predictor, the cases with lack of significant variability were more numerous and pertained to the following ratios: DSO_{0-29}, DSO_{30-59}, DSO_{90-119}, DSO_{120+}, DSO_{P25}, DSO_{P50}, DSO_{P75}, $TCB_{<0}$, TCB_{0-29}, TCB_{30-59}, TCB_{60-89}, TCB_{P50}, TCB_{P75}.

The ANOVA results provide a preliminary indication that while the industrial breakdown proves quite meaningful for corporate trade credit behaviour, the firm size appears to be of slightly lower importance in that matter. These insights might be better visualised by a tree diagram in figure 7.



Note. The tree diagram for binomial objects is based on all variables except $DSO_{<0}$, $DPO_{<0}$, and $TCB_{<0}$. The distance between objects was measured with the square Euclidean distance, and the Ward linking method was applied. MV – motor vehicles trade, RT – retail trade, WS – wholesale trade, MIC – micro firms, S – small firms, M – medium firms, L – large firms.

Figure 7. Agglomerative cluster analysis results for trade sub-sections in size groups.

Source: own elaboration based on ECCBSO (2020) trade credit database.

If the tree branches were intersected where the linkage distance is around 40000, three clear clusters can be identified, only one of which a size-oriented one, while the other two are industrially-dominated. The first cluster from the top consists of only micro-firms of all three trade sub-sections. The second cluster contains firms of three different sizes from two trade sub-sections of motor vehicles and retail trade. The last cluster again has the features of sectoral concentration around the wholesale trade.

Another way of verifying whether the binomial objects in the form of trade sub-sections in size groups bear more resemblance across industries or size groups is to perform a more detailed cluster analysis, e.g. with the use of the *k*-means method. The number of clusters was predefined at the level of four, which corresponds to the number of different size classes. The clustering was based on mean values of ratios for the whole period and was performed with the following sets of variables:

- all ratios except $DSO_{<0}$, $DPO_{<0}$, and $TCB_{<0}$,
- only three main weighted mean ratios: DSO_{WM}, DPO_{WM}, and TCB_{WM},
- DSO ratios except for $DSO_{<0}$,
- DPO ratios except for $DPO_{<0}$,
- TCB ratios except for $TCB_{<0}$.

Using such configurations of variables was meant to identify whether the prevalence of a given effect pertains to all areas of trade credit policy or is specific only to some of them. The *k*-means grouping results of industry-size items can be found in Table 8.

The clustering results for the whole dataset based on the largest set of ratios indicate the greater importance of the intra-industry effect. Three of the four clusters correspond ideally to the three trade sub-sections whereas one cluster is a size-oriented one, containing elements from

all industries, but only representing one size, namely micro-firms. Similar conclusions can be drawn from the grouping procedures performed for other sets of variables, except for the ratios characterising payables management, where the dominant effect cannot be identified based on the clustering results, as there is only one size-oriented cluster, while the remaining three are indefinable.

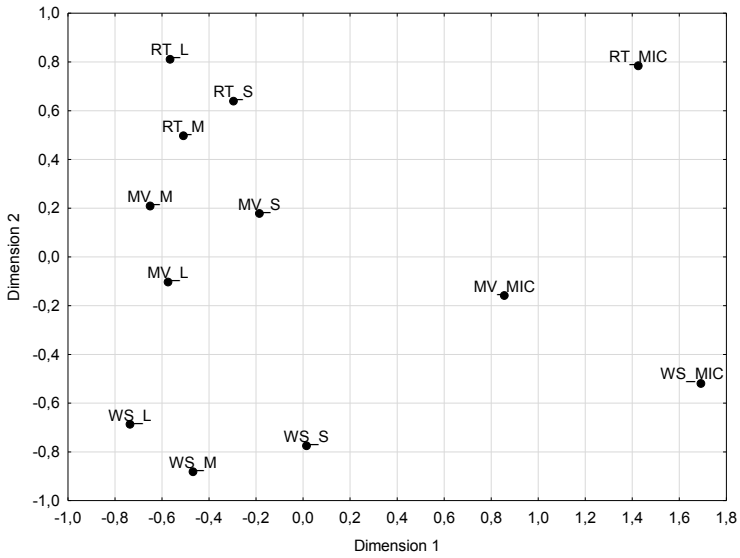
Having identified the structure of clusters, it is purposeful to find what trade credit features are particularly responsible for the differences observed between the groups of objects. At the same time, given the number of diagnostic variables, some simplification of the data structure would be worthwhile. One of the methods enabling both of the above intentions is the multidimensional scaling (MDS), applied here on the matrix of distances between all variables except $DSO_{<0}$, $DPO_{<0}$, and $TCB_{<0}$. The MDS results in the form of a two-dimensional scatterplot are reported in figure 8.

Table 8.
K-means grouping results of industry-size items into four clusters

Variables included	Cluster number and content			
	1	2	3	4
All but $DSO_{<0}$, $DPO_{<0}$, $TCB_{<0}$	MV_S MV_M MV_L	RT_S RT_M RT_L	**MV_MIC** **WS_MIC** **RT_MIC**	WS_S WS_M WS_L
DSO_{WM}, DPO_{WM}, TCB_{WM}	MV_S MV_M MV_L RT_S RT_M	**MV_MIC** **WS_MIC**	RT_MIC RT_L	WS_S WS_M WS_L
DSO without $DSO_{<0}$	MV_MIC MV_L	MV_S MV_M	RT_MIC RT_S RT_M RT_L	WS_MIC WS_S WS_M WS_L
DPO without $DPO_{<0}$	WS_S	MV_S WS_M RT_S RT_M	MV_M MV_L WS_L RT_L	**MV_MIC** **WS_MIC** **RT_MIC**
TCB without $TCB_{<0}$	**WS_MIC** **RT_MIC**	MV_S MV_M RT_S RT_M RT_L	MV_MIC MV_L	WS_S WS_M WS_L

Note. Industry-dominated clusters were shaded and size-dominated clusters were bolded. Vriables as in Table 5. MV – motor vehicles trade, RT – retail trade, WS – wholesale trade, MIC – micro firms, S – small firms, M – medium firms, L – large firms.

Source: author's calculations based on ECCBSO (2020) trade credit database.



Note. The scatterplot is based on the matrix of distances between all variables except $DSO_{<0}$, $DPO_{<0}$, and $TCB_{<0}$. MV – motor vehicles trade, RT – retail trade, WS – wholesale trade, MIC – micro firms, S – small firms, M – medium firms, L – large firms.

Figure 8. Multidimensional scaling results – scatterplot of binomial objects: trade sub-sections in size groups.

Source: own elaboration based on ECCBSO (2020) trade credit database.

The information conveyed by the scatterplot corresponds to the clustering results mainly by demonstrating the dissimilarity of micro firms. All other sized firms bear much more resemblance, at least with regard to the first dimension. Wholesale trade firms of all sizes except micro-firms create another clearly separated group, quite different from motor vehicles and retail trade firms in terms of the second dimension. A crucial issue in applying the MDS method is to assign meaning to the artificial dimensions which replace the original variables. A closer look at the raw data indicates that micro firms are characterised by considerably higher values of ratios describing days payable outstanding than all other sized firms. Therefore the first dimension is likely to correspond to payables management, whose higher values are on the right-hand side of the graph. As for the other dimension, it should be noted that wholesale trade firms had apparently higher ratios of days sales outstanding, compared to the motor vehicles and retail trade firms placed in the upper part of the graph. As a result, a reasonable interpretation of the second dimension is the conservatism in receivables collection with the lowest values at the bottom of the scatterplot.

Summing up, the importance of the industrial classification of firms as a determinant of corporate trade credit policy – confirmed in this study – is a finding supported by several published works, such as Fisman and Love (2003), Fisman and Raturi (2004), or more recently Shi (2022). Similarly, support for the relevance of firm size in trade credit behaviour has been delivered e.g. by Burkart and Ellingsen (2004) or García-Teruel and Martínez-Solano (2010). The research results from this study, which indicate that the intra-industry specificity of companies is of slightly higher relevance than firm size in trade credit, contribute to the existing findings.

6. Conclusions

Theoretically, corporate trade credit behaviour is supposed to be affected both by the industrial specifics of the firm, as well as by the firm size. This study finds both of these factors as important determinants of trade credit management in the Polish trade sector. This is in line with the large body of literature, where the impact of industrial specificity and (or) firm size has been empirically confirmed.

Considerable intra-industry differences identified in trade credit patterns, both in the area of receivables and payables and, as a result, in the area of trade credit balance, provide support for the first research hypothesis (H1) concerning the significant variability of trade credit behaviour across the sub-sections of trade firms in Poland. The support for this hypothesis was found not only for the whole population examined, but also – for most trade credit variables – in each size group of firms, i.e. micro, small, medium, and large enterprises.

As for the cross-size variability of trade credit management policies addressed in the second research hypothesis (H2), the findings from this study indicate that while the firm size is a significant factor affecting corporate trade credit in the Polish trade sector as a whole, the firm size effect is definitely less evident in individual trade sub-sections. Moreover, the analysis has shown that these are mainly the micro-firms that are responsible for the size effect in trade credit patterns. This means, that while micro-firms do differ significantly from their larger peers, other firms, i.e. small, medium and large ones, are more homogeneous in terms of receivables and payables management. As a result, only partial support for H2 has been delivered.

The prevalence of the intra-industry effect over the firm size effect in trade credit behaviour reported using statistical multivariate analysis implies that the third hypothesis (H3) is quite likely to be truthful. Therefore, it can be expected that trade credit management policies should be different across firms operating in different sub-sections of the Polish trade sector, but similar across firms of different size groups, except for micro-firms.

Two main limitations of the study should be highlighted. Firstly, the dataset employed in the research offers aggregated information instead of firm-level data. On the one hand, this inevitably reduces the information resource but, on the other hand, ensures that the data is harmonised and comparable. Secondly, narrowing the research to just one industrial section in Poland makes the study quite specific. Nevertheless, the reported findings might be of interest to those involved in corporate finance management. Recognising the differences in receivables and payables management resulting mainly from the intra-industry specificity can contribute to a better understanding of business financing and its operational functioning. This knowledge may support the effective management of receivables and liabilities, especially in companies operating in developing countries. Further investigation of the patterns in trade credit could be directed at other industries and (or) other countries. This is left for future research.

References

1. Alarcón, L. S. (2011). The trade credit in the Spanish agrofood industry. *Mediterranean Journal of Economics, Agriculture and Environment, Vol. 10, Iss. 2*, pp. 51-57.
2. BACH (2021). *Bank for the Accounts of Companies Harmonized*. Retrieved from: https://www.bach.banque-france.fr, 20.11.2021.
3. Baxter, N.D. (1967). Leverage, risk of ruin and the cost of capital. *Journal of Finance, Vol. 22, Iss. 3*, pp. 395-403. doi: 10.2307/2978892.
4. Bhattacharya, H. (2011). Theories of Trade Credit: Limitations and Applications. *SSRN Electronic Journal*. doi: 10.2139/ssrn.1286443.
5. Bougheas, S., Mateut, S., Mizen, P. (2009). Corporate trade credit and inventories: New evidence of a trade-off from accounts payable and receivable. *Journal of Banking and Finance, Vol. 33, Iss. 2*, pp. 300-307. doi: 10.1016/j.jbankfin.2008.07.019.
6. Brennan, M.J., Maksimovics, V., Zechner, J. (1988). Vendor Financing. *Journal of Finance, Vol. 43, Iss. 5*, pp. 1127-1141. doi: 10.2307/2328210.
7. Brick, I.E., Fung, W.K. (1984a). Taxes and the Theory of Trade Credit. *Journal of Finance, Vol. 39, Iss. 4*, pp. 1169-1176. doi: 10.1111/j.1540-6261.1984.tb03900.x.
8. Brick, I.E., Fung, W.K. (1984b). The Effect of Taxes on the Trade Credit Decision. *Financial Management, Vol. 13, Iss. 2*, pp. 24-30. doi: 10.2307/3665443.
9. Burkart, M., Ellingsen, T. (2004). In-kind finance: a theory of trade credit. *American Economic Review, Vol. 94, Iss. 3*, pp. 569-590. doi: 10.1257/0002828041464579.
10. Canto-Cuevas, F.J., Palacín-Sánchez, M.J., di Pietro, F. (2016). 'Trade credit in SMEs: a quantile regression approach', *Applied Economics Letters, Vol. 23, Iss. 13*, pp. 945-948. doi: 10.1080/13504851.2015.1122727.
11. Carvalho, C.J. de, Schiozer, R. (2015). Determinants of Supply and Demand for Trade Credit by Micro, Small and Medium-Sized Enterprises. *Revista Contabilidade & Finanças, Vol. 26, Iss. 68*, pp. 208-222. doi: 10.1590/1808-057x201500940.
12. Cheng, N.S., Pike, R. (2003). The trade credit decision: evidence of UK firms. *Managerial and Decision Economics, Vol. 24, Iss. 6-7*, pp. 419-438. doi: 10.1002/mde.1049.
13. Cuñat, V. (2007). Trade Credit: Suppliers as Debt Collectors and Insurance Providers. *Review of Financial Studies, Vol. 20, Iss. 2*, pp. 491-527. doi: 10.2139/ssrn.423501.
14. Dary, S.K., and Harvey, S.J.J. (2020). Trade Credit Contracts, Theories and their Applications: A Synthesis of the Literature. *Ghana Journal of Development Studies, Vol. 17, Iss. 1*, pp. 86-91. doi: 10.4314/gjds.v17i1.4.
15. Deloof, M., Jegers, M. (1996). Trade credit, product quality, and intragroup trade: some European evidence. *Financial Management, Vol. 25, Iss. 3*, pp. 33-43. doi: https://doi.org/10.2307/3665806.
16. Desai, M.A., Foley, C.F., Hines, J.R.J. (2016). Trade Credit and Taxes. *Review of*

Economics and Statistics, Vol. 98, Iss. 1, pp. 132-139. doi: 10.1162/REST_a_00534.

17. Duliniec, A., Świda, N. (2021). Factors influencing the use of trade credit in financing Polish listed companies. *Economics and Business Review, Vol. 7, Iss. 21*, pp. 113-134. doi: 10.18559/ebr.2021.1.7.
18. ECCBSO (2020) *Trade Credit Data Base*. Retrieved from: https://www.eccbso.org/wba/pubblica/database.asp, 10.11.2021.
19. Elliehausen, G.E., Wolken, J. (1993). The demand for trade credit: an investigation of motives for trade credit use by small businesses. *Staff Studies. Board of Governors of the Federal Reserve System, No. 165*, pp. 1-18.
20. Emery, G.W. (1984). A Pure Financial Explanation for Trade Credit. *Journal of Financial and Quantitative Analysis, Vol. 19, Iss. 3*, pp. 271-285. doi: 10.2307/2331090.
21. Fafchamps, M., Pender, J., Robinson, E. (1995) *Enterprise finance in Zimbabwe*. Retrieved from: https://documents1.worldbank.org/curated/en/389241468140649660/pdf/56870-Replacement-File-PUBLIC.pdf, 15.11.2021.
22. Ferrando, A., Mulier, K. (2013). Do firms use the trade credit channel to manage growth? *Journal of Banking and Finance, Vol. 37, Iss. 8*, pp. 3035-3046. doi: 10.1016/j.jbankfin.2013.02.013.
23. Ferris, J.S. (1981). A transactions theory of trade credit use. *Quarterly Journal of Economics, Vol. 96, Iss. 2*, pp. 243-270. doi: https://doi.org/10.2307/1882390.
24. Fisher, R.A. (1954). *Statistical Methods for Research Workers*. Edinburgh: Oliver and Boyd.
25. Fisman, R. Love, I. (2003). Trade Credit, Financial Intermediary and Industry Growth Development. *Journal of Finance, Vol. 58, Iss. 1*, pp. 353-374.
26. Fisman, R., Raturi, M. (2004). Does Competition Encourage Credit Provision? Evidence from African Trade Credit Relationships. *Review of Economics and Statistics, Vol. 86, Iss. 1*, pp. 345-352. doi: 10.1162/003465304323023859.
27. García-Teruel, P.J., Martínez-Solano, P. (2010). Determinants of trade credit: A comparative study of European SMEs. *International Small Business Journal, Vol. 28, Iss. 3*, pp. 215-233. doi: 10.1177/0266242609360603.
28. Jaleel, A., Hui, X., Jaweria, K. (2014). Determinants of Trade Credit: The Case of a Developing Economy. *European Researcher, Vol. 83, Iss. 9-2*, pp. 1694-1706. doi: 10.13187/er.2014.83.1694.
29. Kihanga, E. et al. (2010). Determinants of trade credit demand and supply in the Tanzanian rice market: A Structural Modelling Approach. *SSRN Electronic Journal*, pp. 1-42. doi: 10.2139/ssrn.1674842.
30. Klapper, L., Laeven, L., Rajan, R. (2012). Trade credit contracts. *Review of Financial Studies, Vol. 25, Iss. 3*, pp. 838-867. doi: 10.1093/rfs/hhr122.
31. Koralun-Bereźnicka, J. (2013). *Corporate Performance. A Ratio-Based Approach to Country and Industry Analyses*. Springer.

32. Koralun-Bereźnicka, J. (2016) *Wpływ kraju i sektora oraz wielkości przedsiębiorstwa na strukturę kapitału przedsiębiorstw w krajach Unii Europejskiej.* Gdańsk: Wydawnictwo Uniwersytetu Gdańskiego.
33. Lee, Y.W., Stowe, J.D. (1993). Product Risk, Asymmetric Information, and Trade Credit. *Journal of Financial and Quantitative Analysis, Vol. 28, Iss. 3*, pp. 285-300. doi: 10.2307/2331291.
34. Lin, T.-T., Chou, J.-H. (2015). Trade credit and bank loan: Evidence from Chinese firms. *International Review of Economics and Finance, Vol. 36*, pp. 17-29. doi: 10.1016/j.iref.2014.11.004.
35. Long, M.S., Malitz, I.B, Ravid, S.A. (1993). Trade credit, quality guarantees, and product marketability. *Financial Management, Vol. 22, Iss. 4*, pp. 117-127. doi: 10.2307/3665582.
36. Meltzer, A.H. (1960). Mercantile credit, monetary policy, and size of firms. *Review of Economics and Statistics, Vol. 42, Iss. 4*, pp. 429-437. doi: 10.2307/1925692.
37. Mian, S.L., Smith, C.W. (1992). Accounts Receivable Management Policy: Theory and Evidence. *Journal of Finance, Vol. 47, Iss. 1*, pp. 169-200. doi: 10.2307/2329094.
38. Molina, C.A., Preve, L.A. (2012). An Empirical Analysis of the Effect of Financial Distress on Trade Credit. *Financial Management, Vol. 41, Iss. 1*, pp. 187-205. doi: 10.1111/J.1755-053X.2012.01182.X.
39. Mugavin, M.E. (2008). Multidimensional Scaling: A Brief Overview. *Nursing Research, Vol. 57, Iss. 1*, pp. 64-68. doi: 10.1097/01.NNR.0000280659.88760.7c.
40. Nadiri, M.I. (1969). The Determinants of Trade Credit in the U.S. Total Manufacturing Sector. *Econometrica, Vol. 37, Iss. 3*, pp. 408-423. doi: 10.2307/1912790.
41. Ng, C.K., Smith, J.K., Smith, R.L. (1999). Evidence on the Determinants of Credit Terms Used in Interfirm Trade. *Journal of Finance, Vol. 54, Iss. 3*, pp. 1109-1129. doi: 10.1111/0022-1082.00138.
42. Petersen, M., Rajan, R. (1997). Trade Credit: Theories and Evidence. *Review of Financial Studies, Vol. 10, Iss. 3*, pp. 661-691. doi: 10.1093/rfs/10.3.661.
43. Schwartz, R.A. (1974). An Economic Model of Trade Credit. *Journal of Financial and Quantitative Analysis, Vol. 9, Iss. 4*, pp. 643-657. doi: 10.2307/2329765.
44. Shi, G. (2022). Does industry-specific information disclosure improve trade credit financing? *China Journal of Accounting Studies*, pp. 1-25. doi: 10.1080/21697213.2022.2086028.
45. Smith, J.K. (1987). Trade Credit and Informational Asymmetry. *Journal of Finance, Vol. 42, Iss. 4*, pp. 863-872. doi: 10.2307/2328295.
46. Springall, D.A. (1978). A review of multidimensional scaling. *Journal of Applied Statistics, Vol. 5, Iss. 2*, pp. 146-192. doi: 10.1080/768370750.
47. Summers, B., Wilson, N. (2000). Trade Credit Management and the Decision to Use Factoring: An Empirical Study. *Journal of Business Finance and Accounting, Vol. 27, Iss. 1-2*, pp. 37-68. doi: 10.1111/1468-5957.00305.

48. Ward, J.H. (1963). Hierarchical grouping to optimize an objective function. *Journal of the American Statistical Association, Vol. 58, Iss. 301*, pp. 236-244. doi: 10.1080/01621459.1963.10500845.
49. Williamson, O.E. (1979). Transaction-cost economics: The governance of contractual relations. *Corporate Governance: Values, Ethics and Leadership, Vol. 22, Iss. 2*, pp. 133-162. doi: 10.1086/466942.
50. Wilner, B.S. (2000). The exploitation of relationships in financial distress: The case of trade credit. *Journal of Finance, Vol. 55, Iss. 1*, pp. 153-178. doi: 10.1111/0022-1082.00203.
51. Wilson, N., Summers, B. (2002). Trade credit terms offered by small firms: Survey evidence and empirical analysis. *Journal of Business Finance and Accounting, Vol. 29, Iss. 3-4*, pp. 317-351. doi: 10.1111/1468-5957.00434.
52. Wishart, D. (2003). k-Means Clustering with Outlier Detection, Mixed Variables and Missing Values. In: M. Schwaiger, O. Opitz (Eds.), *Exploratory Data Analysis in Empirical Research. Studies in Classification, Data Analysis, and Knowledge Organization* (pp. 216-226). Berlin-Heidelberg: Springer. doi: 10.1007/978-3-642-55721-7_23.