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## THE ROLE OF TRADE CREDIT IN BUSINESS OPERATIONS<sup>1</sup>

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The paper aims to analyse the importance of trade credit in the financing of enterprises in Poland and to identify the determinants of the use of trade credit by Polish companies. Companies are granted trade credit by their suppliers while also extending them to their own recipients, therefore trade credit was analysed in net terms, i.e. the plus or minus sign and the difference between the trade credit obtained and extended in Poland. The trade credit received was measured as a trade liability without current expenses, i.e. adjusted by the current short-term trade liabilities amounting to the average monthly expenditures on the core activity (1/12 of the material and energy consumption plus the cost of subcontracted services). The determinants of the net trade credit use include the company size, the industry it represents, the share of exports in sales and the proportion of foreign ownership in the share capital, as well as the interest rate channel and the currency rate channel in the monetary policy transmission. Analysis was based on Central Statistical Office panel data: annual reports F-02 for the years 1995–2011. A system GMM (robust) estimator was used to estimate the coefficients of the model. It has been shown that the low profitability of sales, a long-term payable (outstanding), a low debt capacity and a long cycle funds are good predictors of the use of trade credit. Higher growth opportunities and the greater ability to generate cash surpluses increase the trade credit extended. The increase in size of the company also increases the tendency to the trade credit extended and the volume of the trade credit extended, and decreases the propensity to received net trade credit and the volume of the received net trade credit. Monetary policy reduces companies' inclination to extend trade credit and increases the volume of trade credit provision in the category of medium and large firms, but the interest rate channel increases the companies' inclination to contract net trade credit and increases the volume of trade credit contracted.

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## 1. INTRODUCTION

The way firms behave when seeking sources of financing for their business operations depends on the economic environment, which is determined by – among other factors – monetary and fiscal policy. Funds are needed not only to establish a business, but also to run it and develop. In the first phase of the company lifecycle, the entrepreneur's own contribution plays a significant role, but later on external sources of funding are required to provide the financial leverage effect. Yet, due to the low creditworthiness and the high cost of capital or banks' restrictive lending policies, many businesses find it difficult of access bank loans. Companies seeking bank loans are rather larger, less profitable, less liquid and younger (Cole, 2010). Firms in industries with high historical start-up failure rates use less bank debt (Huyghebaert, Van de Gucht and Van Hulle, 2007). The existence of trust between a firm and a bank improves the access to financing (Hernández-Canovas Gines and Martínez-Solano Pedro, 2010). The relational nature of collaboration is a tool reducing the rationing of loans to SMEs (Tymoczko, 2012). For start-ups, barriers to using bank loans include insufficient credit history, low creditworthiness, the obligation to pay loan instalments and interest in due time, the requirement to spend the funds as declared to the bank, as well as collateral requirements.

Short-term financing is often obtained in the form of trade credit (also referred to as merchant credit) where the payment of trade liabilities can be deferred, especially in periods of low liquidity. It may be a powerful bargaining chip in trade negotiations and become a strong competitive advantage or even an export-supporting tool. On the other hand, trade credit translates into higher trade liabilities resulting from extended payment terms. Firms increase their demand for trade credit when facing credit constraints imposed by banks (Danielson and Scott, 2004). Companies experiencing financial problems, financially less stable and whose most recent loan request was denied, are more likely to use trade credit (Wilner, 2000). Therefore in order to identify the role of credit in business operations it is important to investigate whether trade credit may solve the problem of credit rationing by banks, that is whether it is a substitute for bank loans.

It is worth noting that trade credit leads to the development of a network of financial dependency. Such a mechanism, while stimulating the demand and the economic growth, on the other hand brings about the risk of bankruptcy (Sędzicki, 2007). A debtor's insolvency brings financial problems onto all their creditors and undermines the stability of other

participants of the credit chain. Antonowicz (2011) suggests that bankruptcies are caused mainly by payment backlogs between business partners. Trade credit may mitigate the information asymmetry between banks and firms and credit rationing by banks (Biais and Gollier, 1997; Roncagli and Bathala, 2007; Couppey-Soubeyran and Hericourt, 2011), as well as the negative effects of a restrictive monetary policy (Schwartz, 1974; Melzer, 1996; Atanasova and Wilson, 2003). In Europe, trade credit liabilities account for 20% to 25% of total liabilities on average, but in some industries this can be even 80% (Bougheas, Mateut and Mizen, 2009). Trade credit is also very popular in the USA, China, India, Northern Africa and in the Near East (Petersen and Rajan, 1997; Couppey-Soubeyran and Hericourt, 2011).

This paper investigates the determinants of net trade credit in Poland in the period 1995-2011. The nature of net trade credit (accounts payable – accounts receivable) will be analysed, i.e. the plus or minus sign and the difference between the trade credit obtained and extended, with the rate of exchange and currency rate channels in the transmission of the monetary policy impulses taken into account. The paper develops three research questions: (i) which are the important firm-level determinants of trade credit, (ii) does monetary policy through the interest rate channel and the exchange rate channel affect trade credit, and (iii) are trade credit and bank credit substitutes or complements?

So far, the findings from empirical studies are not consistent regarding the relation between trade credit and bank loans. As far as Polish firms are concerned, Zawadzka (2009) reports their complementariness, while Marzec and Pawłowska (2011), their substitutability. Couppey-Soubeyran and Hericourt (2011) prove the substitutability of bank and trade credit in the Middle East and North African countries, which tends to be stronger wherever the access to the financial sector funding is constrained, while Ogawa, Sterken and Tokutsu (2011) report the same for SMEs. Ono (2001), on the other hand, supports the complementariness of trade and bank credit, expecting that monetary policy, through its impact on financial institutions, will also influence the level of trade liabilities and receivables. Therefore the substitutability of bank and trade credit is the main hypothesis to be verified here. Furthermore, the analyses will test an auxiliary hypothesis that a low profitability of sales, a long liabilities cycle, a low credit capacity and a long cash cycle are good predictors of the trade credit usage.

## 2. LITERATURE REVIEW

### 2.1. What is trade credit?

Trade credit, also referred to as merchant credit or open account, is defined as the delivery of goods and services under transactions between companies, with deferred terms of payment. Trade credit is a source of short-term financing for our recipient's business, i.e. it represents our accounts receivable on the one hand, while being our own credit from suppliers, i.e. our account payable on the other hand. Mian and Smith (1992, 1994) define trade credit as a deferral of payment for products delivered. Lee and Stowe (1993) indicate that trade credit is a part of a joint commodity and financial transaction in which a firm sells a good or service and simultaneously extends credit for the purchase to the customer – hence the seller finances the purchase, thereby taking the credit risk. According to Danielson and Scott (2004), vendors accept longer terms of the trade credit payment for the following reasons:

- (1) the short-term nature of trade credit allows vendors to continually monitor a firm's payment pattern and to adjust sale prices or terms accordingly,
- (2) the collateral value of a firm's inventory is likely to be higher to trade creditors than it would be to a bank,
- (3) foregone discounts provide a high effective interest rate, compensating the vendor for the risk of prospective non-payment.

Non-financial firms, when choosing trade credit, are driven by a financing motive or a transaction motive (Schwartz, 1974). According to the financing motive, vendors may become creditors, since owing to information asymmetry they have a comparative advantage over financial institutions in accessing information, enforcing contracts execution and in the process of assets liquidation (the sale of goods or products). The transaction motive implies that trade credit may be a way to reduce transaction costs. The payment deferral enables trade partners to separate delivery of goods from payments. Knowing the payment due date, vendors are able to estimate the expected cash proceeds more precisely and thereby minimize their requirements as regards the cash balance. Moreover, the use of trade credit reduces real prices as well as cash requirements and may act as an active sales support or price discrimination strategy.

From the cost point of view, two basic forms of trade credit can be distinguished: a classic and a non-classic one. In classic trade credit, the

debtor is guaranteed beneficial discounts for paying for goods shortly after the date of sale, while in the non-classic form only deferred payment is offered and no discount at all. The cost of trade credit is determined by calculating the annual discount offered and computing an effective annual interest rate on short-term trade liabilities. Based on such computations, some economists suggest that trade credit is a very expensive source of financing business operations, with the annual interest in excess of 40%. Due to this high hidden cost of interest, trade credit is sometimes considered to be rather an unattractive source of financing and is assigned a low position by the pecking order theory. According to Cunat (2007), the risk premium and insurance against liquidity shocks make the interest cost of trade credit significantly higher than those charged by banks.<sup>2</sup> Financial institutions are reluctant to extend credit on account of the relatively high risk of default, while suppliers are more likely to take the risk since it may be outweighed by the potential benefits of a long-term relationship with the client and the resultant future revenue (Petersen and Rajan, 1997). In our opinion, the estimation referred to above disregards some material facts. Firstly, a substantial part of trade credit is offered in a non-classic form, where no additional cost is involved, while a vast majority of clients using the classic form of trade credit benefits from the discounts offered.

Suppliers may offer trade credit to firms experiencing problems with access to capital, owing to their comparative advantage in obtaining information about their debtors, greater capability of liquidating the assets subject to trade credit, as well as a higher hidden share in the purchaser's survival over a longer period of time. Furthermore, trade credit allows reducing transaction costs through separating the supply cycle from the payment schedule. In their model of trade receivables, Petersen and Rajan (1997) state that larger firms extend more trade credit. The correlation between the company age and trade credit offered is a non-linear one. The credit supply grows together with the company age initially, to show a slow downturn thereafter. Larger firms provide more trade credit. The trade credit supply is positively related to the maximum credit line available. The demand for trade credit shows a weak positive relation to the company age and size. Delannay and Weill (2004) prove that firms tend to reduce their

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<sup>2</sup> The insurance premium may be regarded as a compensation received by the supplier for providing insurance against future liquidity deficits that may be experienced by the client. The default premium is associated with the non-payment risk, since suppliers often offer trade credit to clients who face relatively serious problems with accessing bank loans.

recourse to trade credit financing as their profitability increases in most Central and Eastern Europe countries (Bulgaria, the Czech Republic, Estonia, Latvia, Poland, Romania and Slovakia), except for Hungary and Lithuania. Yet larger and more profitable firms are more likely to extend trade credit, while those facing the risk of bankruptcy – less (Bougheas, Mateut and Mizen, 2009), although the latter group is more inclined to use trade credit (Coupey-Soubeyran and Hericourt, 2011). Based on the negative value of the variable measuring the length of the banking relationship, Petersen and Rajan (1997) find that trade credit falls below bank credit in the capital structure pecking order.

The motives for trade the credit extension may include: reduction of the information asymmetry between the financial and non-financial market, enhancing the operational effectiveness, reducing the inefficiency on the financial market, capturing investment opportunities or strengthening the competitive position. Cheng and Pike (2003) prove that firms operating in competitive markets are forced to offer trade credit. The decision to extend trade credit signals their plans to maintain and develop relationships with clients, thereby strengthening the firm's image.

The storage costs may be another motivation for the trade credit extension (among others: Mateut, Mizen, Ziane, 2011; Daripa and Nilsen, 2011). The cost of inventory storage is a stronger stimulus to offer trade credit in the case of smaller firms. Suppliers offer trade credit in order to transfer the storage process from the seller to the buyer. Furthermore, the literature of the subject refers to the collateral liquidation motive (Petersen and Rajan, 1997; Longhofer and Santos, 2003; Frank and Maksimovic, 2005). Manufacturing firms owe their advantage over the banking sector to their distribution network, which makes it easier to sell the product to some other recipient if the original buyer fails to pay. The negative correlation between trade credit and inventories is stronger in the industrial manufacturing sector with a wide range of diversified products and in the construction sector. The manufacturer's motivation to sell through offering trade credit is stronger for finished products than in the case of raw materials. The access to bank loans plays a more important role when decisions to extend trade credit are made by firms offering buyer-specific assets. This may be due to these assets lower collateral value. Bank loans are lower in the sector offering buyer-specific products than in the standardized production industries. Mateut, Mizen, Ziane (2011) prove that the access to bank loans has a positive effect on the amount of trade credit extended. Firms purchasing more production-specific assets use more trade credit. This

is consistent with the collateral liquidation hypothesis, as buyer-specific products have a greater collateral value for their suppliers than for banks. This benefit is not present in the case of suppliers of services as these represent no liquidation value.

## 2.2. The role of trade credit in the monetary policy transmission

According to the credit channel theory, the monetary policy transmission to reality occurs via the impact on bank loans and companies' balance sheet items. Monetary policy restrictions decrease the supply of bank loans and this, in turn, has a negative effect on the development plans of companies that are highly dependent on bank financing. Furthermore, a more restrictive monetary policy translates into a higher debt servicing cost, a lower present value of assets used as a loan collateral, as well as lower cash flows and net assets value. The impact of this mechanism may be **mitigated by the trade credit channel**, defined as the sum of short-term accounts payable and receivable (Ferrando and Mulier, 2012). The trade credit channel may also be interpreted as the total amount of short-term finance used by the firm which is directly related to the volume of its trade. The channel reflects the extent to which a firm's operations are independent of the imperfection of the financial market. The trade credit channel is important to companies' growth, its impact on smaller companies being stronger in each of the countries analysed by Ferrando and Mulier (2012): Belgium, Germany, Spain, Finland, France, Italy, the Netherlands and Portugal over the years 1993–2009. This is owing to the nature of credit extended to SMEs: the **relationship credit** (based on soft information obtained through direct contacts with relatively less transparent firms) or the **transactional credit** (based on hard data presented by transparent firms in their balance sheets).

Petersen and Rajan (1997) prove that firms with a better access to bank financing offer more trade credit, which means that they may act as intermediaries between institutional lenders and companies with a limited access to bank lending. The trade credit channel weakens the bank lending channel, hence credit relocation between firms – from those having access to bank loans towards those with a limited access to bank financing, via trade credit (a redistribution effect). The monetary policy transmission occurs via the trade credit channel, which weakens the traditional bank lending channel (Guariglia and Mateut, 2006). The redistribution effect plays an important role under a restrictive monetary policy where SMEs' access to bank lending is constrained (Ogawa, Sterken and Tokutsu, 2011).

The net impact of the monetary policy tightening on corporate financing depends on the extent to which trade credit substitutes loans from banks and other financial institutions. Small firms are more likely to substitute bank loans with trade credit during periods of contractionary monetary policy. Firms with a high share of intangible assets that cannot be used as an additional collateral, seem to be both liquidity and trade credit constrained during monetary tightening.

### **2.3. Bank and trade credit substitutability**

Bank lending increases the supply of trade credit (Bougheas, Mateut and Mizen, 2009; Ogawa, Sterken and Tokutsu, 2011), while decreasing the demand for this type of financing (Ferrando and Mulier, 2012). The bank loan and trade credit substitution occurs in the context of credit rationing (Danielson and Scott, 2004; Niskanen and Niskanen, 2006; Couppey-Soubeyran and Hericourt, 2011). The average probability of a limited access to bank lending increases in the periods of monetary restrictions. Firms experiencing such problems tend to use more trade credit (Atanasova, 2007). During the credit crunch, firms with access to capital markets and trade credit may fill the financing gap, thereby mitigating the effect of the monetary policy tightening on business operations, especially in the SME sector. Small and medium size enterprises with constrained access to bank lending finance their operations with trade credit, while unconstrained firms use bank lending (Carbó-Valverde, Rodríguez-Fernández and Dell, 2016). The extent of substitution between trade credit and bank lending is significantly determined by the scale and the type of the firm's operations (Marzec and Pawłowska, 2011). Financial development reduces the substitution relationship between bank credit and trade credit, and more generally decreases the influence of most firm-level determinants on the trade credit demand (Couppey-Soubeyran and Hericourt, 2011). Huang, Shi and Zhang (2011) observe that the substitution effect is significantly stronger in a slow-growth period than in a rapid-growth period. The manufacturers' technological efficiency determines whether trade and bank credit are substitutes. Substitution is typical for higher efficiency levels, while complementariness exists when efficiency is very low.

Firms that applied for but were denied credit by financial institutions, are more inclined to seek trade credit as a bank loan substitute (Petersen and Rajan, 1997). Firms with limited access to bank lending do not have to reduce their business operations in periods of monetary tightening only if



they are able to finance them using trade credit. Taketa and Udell (2007) report that trade and bank credit were substitutes during the Japanese economic bubble, while in periods of restrictive monetary policy, trade liabilities and financial institutions' short-term lending were complementary.

In the initial phase of firms' operation, the risk of bankruptcy and bank lending constraints are both high. Although start-ups have no established relationships with banks and suppliers, the inventory cycle information gives suppliers an information advantage over banks in evaluating young, high-risk firms' creditworthiness. Huyghebaert (2006) proves that young firms use more trade credit when financial constraints are large. Start-ups have to pay more for bank credit, therefore they tend to borrow from suppliers, particularly in periods of rapid economic growth. With the high failure risk and short inventory cycles, young firms use more trade credit. In highly concentrated sectors where suppliers have limited possibilities of controlling buyers, the level of risky buyers' liabilities towards suppliers is lower. Fatoki and Odeyemi (2010) indicate that the management's experience, the firm's business plan, its relationship with the banks and its location, are key determinants of the access to trade credit. The owners' university education and the good credit history of the company have a positive impact on the access to trade credit, while the high crime rate of the area of the company location reduces the trade credit financing.

Creditworthiness and the access to the capital markets are positively correlated with the trade credit offered, although the competition for interbank market does not have any significant impact on the trade credit supply. Firms with a higher growth rate use more trade credit. Firms from urban areas offer and use trade credit more often than firms from rural areas. Firms whose credit contracts were renegotiated use more trade credit, while those maintaining close relationships with banks are offered better trade credit terms. Larger firms use more trade credit (Niskanen and Niskanen, 2006). Trade credit is more easily accessible for older companies, but they are less interested in using this source of finance (Niskanen and Niskanen, 2006; Couppey-Soubeyran and Hericourt, 2011).

The financial system's institutional bias in favour of state-owned companies increases the use of trade credit in China among firms with a limited access to bank lending (Cull, Xu and Zhu, 2007). State-owned companies expand trade credit more than other firms. Profitable firms redistributed a part of their bank credit in the form of trade credit so as to support their business partners, but when bank loans became more accessible the amounts of trade credit offered decreased. Non-state owned firms tend to

use more trade credit and have more trade credit outstanding than state-owned companies (Ge and Qiu, 2007). This indicates that their motivation is rather financial than transactional.

#### **2.4. Bank and trade credit complementariness**

The complementariness of bank credit and trade credit contracted has been proved by Ono (2001), Zawadzka (2009), Cole (2010), Vaidya (2011), as well as by Uesugi and Yamashiro (2006).

Zawadzka (2009) observes that with the growth of sales and inventories, the demand for trade credit increases. The demand for trade credit financing grows together with the firm's age and the resultant operational risk reduction. Low liquidity is positively correlated with trade liabilities, while financial risk – negatively. Cole (2010) finds that firms that use trade credit are larger, more liquid, of worse credit quality and less likely to be a firm that primarily provides services. Among firms that use trade credit, the amount used as a percentage of assets is negatively related to credit quality and is lower in firms that primarily provide services, which is consistent with the financing-advantage theory of trade credit. Firms that use bank credit are larger, less profitable, less liquid and younger. Among these firms, the share of bank credit in their assets is positively related to liquidity. Cole (2010) indicates that contrary to the pecking order theory, the amount of bank credit is positively influenced by profitability and negatively by the fixed assets value.

Vaidya (2011) reports that companies in India tend to increase their sales and thereby reduce their inventories of finished products, allowing buyers to delay payments. Highly profitable firms give and receive less trade credit. He finds that firm's holdings of liquid assets have a positive influence on the trade credit demand and supply, but he does not confirm the effect of redistribution for short-term bank credit and trade credit supply. Even profitable firms, if finance-constrained, prefer not to offer trade credit. Uesugi and Yamashiro (2006) find that a decrease in accounts payable dynamics is accompanied by a decrease in trade liabilities to suppliers and that in response to the financial institutions' tightening of lending terms, firms reduce the use of trade credit significantly. A trade credit reduction caused by a decrease in sales leads to a reduction in the number of bank loans extended.

## **2.5. The impact of financial crises on the trade credit financing of business operations**

Love, Preve and Sarria-Allende (2007), when analysing the effect of financial crises on trade credit in developing economies (Indonesia, South Korea, Malaysia, Mexico, Philippines, Thailand)<sup>3</sup>, find that although trade receivables tend to grow right after the crisis, they drop below the pre-crisis level in the following months or years. They indicate that firms with a high short-term debt level provide more trade credit in economic prosperity periods, while reducing their product range at the time of a crisis. Firms with no short-term debts do not experience any significant decline in the trade credit they offer to their clients in the post-crisis period. On the other hand, firms with a higher short-term debt level significantly reduce their supply of trade credit extended, as pointed out by Kestens, Van Cauwenberge and Bauwhede (2012).

Firms with more short-term debts experience an increase in trade liabilities during and after a crisis. Firms that meet a crisis with substantial savings (which play the role of a liquidity buffer) extend more trade credit to their clients, while using less trade credit for financing their own operations within the first two years after the crisis. Firms showing a stable financial standing at the beginning of the crisis are less affected by the crisis and provide more trade credit to their clients than firms that entered the crisis in a weaker financial condition. Love, Preve and Sarria-Allende (2007) observe a short-term increase in trade credit at the peak moment of the crisis, which they find to be caused by the overdue credit accumulation until payments are resumed. They explain the decline in trade credit taking place after the crisis to be caused by the supply effect, when firms having no access to bank lending reduce their supply of trade credit. The fact that bank credit is not redistributed by firms with a better access to capital may be a result of the constraints in all sources of financing during a deep crisis.

According to Coulibaly, Sapriza, Zlate (2012), the financial crisis of 2008–2009 which originated in advanced economies, spilled over to the emerging markets (China, India, Indonesia, Malaysia, Taiwan, Thailand) as

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<sup>3</sup> Crises of this group occurred first in South-Eastern Asia (Malaysia, Indonesia, South Korea) in 1997-1998. Their macro-economic situation was very good in this period – with budgetary surpluses and very low inflation, therefore the crisis was a great surprise to both investors and rating agencies as well. Studies have proved that Asian crises were caused by an external factor, i.e. they resulted from the incorrect functioning of microeconomic elements, in particular – banks that took excessive risks when extending loans.

a result of the reduction in demand for these countries' exports (the trade channel) and the deterioration in financing conditions (the financial channel). During the crisis, firms experiencing more financial constraints increased their use of trade credit obtained from suppliers. Similarly, the trade credit – bank credit substitution was stronger in Polish companies during the financial crisis period (2008–2009) and was more frequent in small than in large firms (Marzec and Pawłowska, 2011).

Garcia-Appendini and Montoriol-Garriga (2012) point out that firms with high pre-crisis liquidity levels increase the trade credit offered in the first year of the crisis, while trade credit taken by constrained firms increases during this period.

## **2.6. Data**

The empirical analysis of employing trade credit was conducted based on unit panel data, unbalanced, originating from balance sheets and profit and loss accounts of Polish enterprises, presented in the Central Statistical Office (GUS) reports. Data originated from F-02 annual statements of the period 1995–2011 (about 50,000 enterprises every year). Observations with a negative equity were eliminated from the sample since they prevented the correct interpretation of financial leverage as a total debt to total financing (internal and external) ratio. Otherwise the financial leverage would not be lower than 1 since a negative equity would diminish the total debt value (the denominator would not be greater than the numerator). If the external capital value is higher than the assets, this means that the funds that might be obtained from the liquidation of assets would be insufficient to cover accounts payable to creditors and the liabilities that have not occurred yet, but can be credibly valued.

The literature of the subject provided a basis for designing econometric models which describe the effect of three categories of factors on the trade credit financing in non-financial companies in Poland: macroeconomic, microeconomic, i.e. relative to the internal financial situation, and structural (e.g. the legal status, the industry, the direction of sale).

## **2.7. Model specification and variables**

The analysis was conducted for net trade credit extended and received in a breakdown by company size. Parameters were estimated using the robust system GMM (Generalised Methods of Moments) estimator (see: Arellano,

Bover 1995; Blundell, Bond 1998). A similar solution can be found in Breitung and Lechner (1999). The estimation was performed using a resistant variance-covariance matrix. It is an unquestionable advantage of the system-GMM method that it allows for including endogenous or slightly exogenous variables. An assumption of strict exogeneity leads to results that are often far from reality. The absence of correlation between the random component and the endogenous variables is obtained through including variables (so-called *instruments*) that are strongly correlated with explanatory variables, but independent on the random error. The system-GMM method uses a variety of instruments in equations and lagged instruments in equations on differences. In a combination like this, both correlation and the endogeneity problem can be eliminated from the model,

Table 1

The structure of variables used in the model of net trade credit extended (negative values)

Variable	Definition
Net trade credit extended	negative difference of trade liabilities (without current expenditures) and trade receivables / (total debt + (equity – revaluation reserve))
Short-term bank loan	Without long-term bank loans payable with the maturity term up to one year. Short-term bank loans payable without long-term bank loans payable with the maturity term up to one year / (total debt + (equity – revaluation reserve))
Company size	logarithm (total assets)
ROS	ROS for positive values – profit from sales to total sales (determined for profit only)
Self-financing in dynamic terms	cash flows from operations determined by indirect method (net profit (loss) + total adjustments/ (total debt + (equity – revaluation reserve))
Quick ratio	(current assets – inventories) / short-term liabilities
Growth opportunities	(revenue from sales (t) – revenue from sales (t–1)) / revenue from sales (t–1)
Long-term sources of financing	long-term liabilities / (total debt + (equity – revaluation reserve))
Collateral	fixed assets / total assets
Inventory to sales ratio	inventories / revenue from sales
Inventory turnover	value of goods and materials sold / inventories
Bankruptcy prediction ratio	inverse bankruptcy prediction ratio (Nehrebecka, Dzik, 2012)
WIBOR3M	3-month WIBOR interest rate
Effective currency exchange rate	effective currency exchange rate

Source: author's own

thereby reducing the estimator bias. A more precise description can be found in Mátyás and Sevestre (2008), or in Blundell and Bond (1998). The validity of the instrument mix was verified by means of the Sargan test, conducted to check if the condition of orthogonality between the instruments and the random component was satisfied. This condition was checked using a test for autocorrelation in differences of residuals from the model. The model design assumptions require that there is no correlation of the residuals of order 2 and higher orders.

Table 2

The structure of variables used in the model of net trade credit received (positive values)

Variable	Definition
Net trade credit received	Positive difference of trade liabilities (without current expenditures) and trade receivables adjustment by current short-term trade liabilities amounting to the average monthly expenditures on the core activity (1/12 of the annual material and energy consumption plus the cost of subcontracted services) / (total debt + (equity – revaluation reserve))
Company size	logarithm (total assets)
Self-financing in dynamic terms	cash flows from operations determined by indirect method (net profit (loss) + total adjustments / (total debt + (equity – revaluation reserve))
Quick ratio	(current assets – inventories) / short-term liabilities
Accounts payable conversion cycle	$360 \times \text{short-term trade liabilities} / \text{revenue from sales}$
Cash turnover cycle	$(360 \times \text{inventories} / \text{sales}) + (360 \times \text{trade receivables} / \text{sales}) - (360 \times \text{short-term trade liabilities} / \text{sales})$
Growth opportunities	$(\text{revenue from sales (t)} - \text{revenue from sales (t-1)}) / \text{revenue from sales (t-1)}$
Short-term bank loan	Without long-term bank loans payable with the maturity term up to one year. Short-term bank loans payable without long-term bank loans payable with the maturity term up to one year / (total debt + (equity – revaluation reserve))
Long-term sources of financing	long-term liabilities / (total debt + (equity – revaluation reserve))
Collateral	fixed assets / total assets
Inventory to sales ratio	inventories / revenue from sales
Inventory turnover	value of goods and materials sold / inventories
Financial risk	operating profit / interest
ROS	ROS for positive values – profit from sales / revenue from sales (determined for profit only)
WIBOR3M	3-month WIBOR interest rate
Effective currency exchange rate	effective currency exchange rate

Source: author's own

The variables used for analysing the factors determining the net trade credit extended and received included financial ratios, macroeconomic ratios and structural factors. Tables 1 and 2 summarize the structure of variables used in the empirical analysis.

Tables 3 and 4 present the summary statistics of variables used in the model of net trade credit extended and net trade credit received.

Table 3

Summary statistics of variables used in the model of net trade credit extended (negative values)

Variable	Mean	Std. dev.	Min	Max
Net trade credit extended	-0.193	0.180	-7.161	0.000
Short-term bank loan	0.054	0.111	0.000	1.000
Company size	8.059	1.968	-2.303	17.641
ROS	0.059	0.064	0.000	0.204
Self-financing in dynamic terms	0.134	0.271	-0.397	0.758
Quick ratio	2.088	1.723	0.020	6.624
Growth opportunities	0.115	0.303	-0.370	0.918
Long-term sources of financing	0.068	0.144	0.000	1.000
Collateral	0.297	0.250	0.000	1.000
Inventory to sales ratio	0.065	0.081	0.000	0.305
Inventory turnover	3.708	7.891	0.000	31.900
Bankruptcy prediction ratio	0.002	0.001	0.000	0.028

Note: Number of observations = 446,093.

Source: authors' own

Table 4

Summary statistics of variables used in the model of net trade credit received (positive values)

Variable	Mean	Std. dev.	Min	Max
Net trade credit received	0.214	0.201	0.000	1.000
Company size	7.758	1.840	-2.303	17.427
Self-financing in dynamic terms	0.134	0.251	-0.397	0.758
Quick ratio	0.945	1.105	0.020	6.624
Accounts payable conversion cycle	53.222	38.769	0.094	131.9178
Cash turnover cycle	8.630	34.458	-32.322	135.4692
Growth opportunities	0.115	0.305	-0.370	0.918
Short-term bank loan	0.055	0.099	0.000	0.997
Long-term sources of financing	0.073	0.145	0.000	1.000
Collateral	0.326	0.275	0.000	1.000
Inventory to sales ratio	0.092	0.090	0.000	0.305
Inventory turnover	7.429	9.322	0.000	31.900
Financial risk	12.164	34.660	0.000	166.1826
ROS	0.035	0.047	0.000	0.204

Note: Number of observations = 326,718.

Source: author's own

## 2.8. The role of trade credit in business financing in Poland

The total trade credit (without current expenditures) financed from 7% to 13% of total assets over the period 2002–2011. The highest share of trade credit in assets, without current expenditures, was observed in 2002 and 2003. Trade credit adjusted by current short-term trade liabilities amounting to the average monthly expenditures on the core activity (1/12 of the annual material and energy consumption plus the cost of subcontracted services) had been showing a growing tendency until 2002, followed by a decline until 2007 (11.26%). It has been growing again since 2008 (from 11.4% to 11.8% in 2012). At the same time, short-term liabilities to other entities, without trade credit, ranged from 1.9% to 3%. On the other hand, short-term liabilities to affiliated companies ranged from 5.8% to 6.9% of total assets, reaching the peak values in 2008 and 2009.

Over the period 1995–2012, trade credit extended by the companies from the research sample surpassed the trade credit received by 2.3% in 2002, up to 4.93% one year earlier, which generated a negative net trade credit value. Trade credit extended in association with sales with a deferred payment term had been showing a growing tendency in the period between 1995 (10.2% of assets) and 2000 (16.08%), to drop and remain on the level ranging between 14.5 and 15.7% of assets. The value of trade credit extended was lowest in the period 2009 and 2012 which might have been caused by a decline in companies' financial liquidity in the economic slowdown period. The value of trade credit received was growing up to 12.9% of assets in 2002–2003, starting from 7% in 1995, to remain on the level of 11.2–12%.

In 2001, due to the dot-com bubble collapse, the net trade credit (the difference between trade credit extended and received) took the highest values (4.93% of assets) which did not recur in 2008 (3.6% against 4% in 2006 and 2007). This could have been partly caused by firms' awareness of the consequences of selling with excessive payment deferrals. The negative effects of extending trade credit emerged in the financial statements in 2005, in the form of losses on accounts receivable (0.54% of total assets) reflected by write-offs compensating for uncollectible or overdue receivables, as a result of bankruptcy, settlement or recovery proceedings. The losses suffered due to non-payment for delivery of goods or services and the necessity to write off uncollected accounts receivable accounted for 0.4% and 0.71% of total assets in 2010 and 2009 respectively. This resulted in discrepancies between the trade receivables gross value and the value of trade credit extended in the period 2005-2012.



When exploring the causes of the net trade credit negative value, we analysed the sign of the difference between accounts payable and receivable (trade credit extended) over the period 1995-2012. Until 2004 more firms received net trade credit than extended it, with the value of funds obtained in this way accounting for 3.3–5.6% of assets. The Russian crisis brought a gradual decrease in the net trade credit received from 5.6% of assets in 1998 to 4.8% in 2001. Thereafter, the economic slowdown caused a growth in excess of 5% of assets in 2002–2003. Later on, the net trade credit received did not exceed 4.5% of assets. From 2005 on, more firms extended net trade credit. This tendency strengthened in the credit boom period in 2008 and continued until the end of the period analysed here. The net trade credit extended increased from 2.9% up to 4.2% of assets in 2001 and remained on the level of 4.2–4.5%. A higher net value of trade credit extended was accompanied by a higher percentage of firms extending net trade credit.

The net trade credit received (without current expenditures) grew from 3.3% of assets in 1995 to 5.6% in 1998, to fall and range between 2.76% and 3.24% from 2004 on. The net credit extended (without current expenditures) grew from 2.9% to 8% of assets in 2004, to remain on the level of 7–8% until 2011 (6.4% in 2012). At the same time the number of firms extending net trade credit (without current expenditures) increased and exceeded the number of firms receiving net trade credit (without current expenditures) significantly even earlier, namely in 2002. As a consequence of the Russian crisis the percentage of firms using net trade credit (without current expenditures) dropped in 1999, together with the net trade credit value (without current expenditures). While the percentage of firms using net trade credit (without current expenditures) was showing a decreasing tendency in the period between 2002 and 2010, the percentage of firms extending net trade credit (without current expenditures) was growing faster, but dropped in 2001. The number of firms extending net trade credit (without current expenditures) was lowest in 1995 – 36% against 43.5% of those using net trade credit (without current expenditures), while the number of firms using net trade credit (without current expenditures) was lowest in 2010 – 30.9% against 69% of firms extending net trade credit (without current expenditures).

## **2.9. Net trade credit extended**

The factors determining the net trade credit extended by firms were analysed in a breakdown by company size. Two models were estimated: the inclination to extend net trade credit and the relation of the net trade credit

extended to sources of financing. The descriptive statistics and histograms of continuous variables show a significant percent of outliers in all the samples. Taking the distribution of probability into account, 5% of the outermost values were replaced with the 0.95 quantile or 0.05 quantile value at the same time, depending on the distribution. This allows the analysis of the relations between the variability of dependent variable and the variability of explanatory variables without any loss of essential information. Before the econometric analysis, the correlation between explanatory variables was estimated. Detailed outcomes of Spearman's ranks correlation are presented in Tables 5 and 6.

The research sample was divided into three groups: small, medium and large firms. Models I, II, V, VI, IX, X address the effect of the year, while models III, IV, VII, VIII, XI and XII were expanded by adding control variables for the macro-economic environment: WIBOR and the effective rate of exchange (Table 7). The findings indicate that regardless of the company size, the net trade credit extended in the previous period reduces the inclination to extend trade credit, but increases the volume of net trade credit extended. Net trade credit extended worsens firms' liquidity, but on the other hand it enables firms to retain their market shares, i.e. to keep their sales at the existing level at least.

In 2002 and 2005–2010, large companies were more likely to extend trade credit than in 1996 (the preference was highest in the economic slowdown period in 2002 – in order to boost sales). Yet, due to the downturn which took place in 2002 and – to a lesser extent – in 2003–2006 and 2008, they extended less trade credit than in 1996. When taking the monetary policy impact into account, it is possible to observe that large firms were less likely to extend trade credit in 1999 and 2001 than in 1996, but the volume of trade credit extended was higher than in 1996. Similarly, taking the monetary policy impact into consideration enables one to note that the volume of trade credit extended by large companies was higher in 2006 and 2010 than in 1996. Over the years 1997–2001 and 2003–2008, medium-size firms were less likely to extend trade credit than in 1996, and their approach changed only in 2010 during the crisis in the EU states (based on the model outputs, without taking the monetary policy impact into account). In the years 1997 (before the Russian crisis), 2002 (the economic slowdown) and 2004 (after Poland's accession to the EU), medium-size firms extended less trade credit, while in 1999, 2001, 2006, 2009–2010 more trade credit than in 1996. Small firms were more inclined to extend trade credit in the economic slowdown period in 2002, after Poland's accession to the EU in 2004 and

Table 5. Correlation of explanatory variables in the model of inclination to contract net trade credit extended (negative values)

No	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Net trade credit extended	1.000											
2	Company size	0.001	1.000										
3	ROS	-0.224	0.105	1.000									
4	Self-financing in dynamic terms	-0.023	-0.065	0.403	1.000								
5	Growth opportunities	-0.019	0.062	0.241	0.117	1.000							
6	Inventory to sales ratio	0.226	0.252	0.019	-0.122	-0.092	1.000						
7	Short-term bank loan	0.039	0.181	0.027	-0.053	-0.011	0.273	1.000					
8	Collateral	0.213	0.213	-0.186	-0.018	-0.036	-0.038	0.017	1.000				
9	Long-term sources of financing	0.096	0.323	0.028	-0.005	0.043	0.085	0.167	0.296	1.000			
10	Bankruptcy prediction ratio	0.287	-0.069	-0.570	-0.306	-0.180	0.119	0.143	0.166	0.087	1.000		
11	Quick ratio	-0.514	-0.017	0.208	0.048	0.035	-0.377	-0.417	-0.161	-0.171	-0.432	1.000	
12	Inventory turnover	0.277	0.051	-0.068	-0.001	-0.017	0.282	0.173	-0.022	0.014	0.028	-0.294	1.000

Source: authors' own based on data published by the Central Statistical Office of Poland

Table 6. Correlation of explanatory variables in the model of net trade credit extended (negative values)

No	Variable	1	2	3	4	5	6	7	8	9	10	11	12
1	Net trade credit extended	1.000											
2	Company size	0.261	1.000										
3	ROS	-0.141	0.100	1.000									
4	Self-financing in dynamic terms	-0.029	-0.060	0.407	1.000								
5	Growth opportunities	-0.031	0.051	0.255	0.104	1.000							
6	Inventory to sales ratio	0.227	0.332	0.029	-0.112	-0.083	1.000						
7	Short-term bank loan	0.021	0.193	-0.009	-0.077	0.002	0.269	1.000					
8	Collateral	0.452	0.252	-0.146	0.014	-0.028	0.065	0.050	1.000				
9	Long-term sources of financing	0.203	0.317	0.011	-0.016	0.048	0.114	0.198	0.315	1.000			
10	Bankruptcy prediction ratio	0.176	-0.030	-0.533	-0.294	-0.184	0.090	0.181	0.132	0.106	1.000		
11	Quick ratio	-0.227	-0.124	0.171	0.050	-0.011	-0.285	-0.527	-0.154	-0.240	-0.380	1.000	
12	Inventory turnover	0.122	0.200	-0.016	-0.024	-0.003	0.352	0.182	0.001	0.063	0.006	-0.174	1.000

Source: authors' own based on data published by the Central Statistical Office of Poland

Table 7. Net trade credit extended (*negative values*) determinants

Explanatory variable	Large firms				Medium-sized firms				Small firms				
	Model with the year effect taken into account		Model with the monetary policy impact taken into account		Model with the year effect taken into account		Model with the monetary policy impact taken into account		Model with the year effect taken into account		Model with the monetary policy impact taken into account		
	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII	Model IX	Model X	Model XI	Model XII	
	Inclination to contract net trade credit extended b (se)	Net trade credit extended b (se)	Inclination to contract net trade credit extended b (se)	Net trade credit extended b (se)	Inclination to contract net trade credit extended b (se)	Net trade credit extended b (se)	Inclination to contract net trade credit extended b (se)	Net trade credit extended b (se)	Inclination to contract net trade credit extended b (se)	Net trade credit extended b (se)	Inclination to contract net trade credit extended b (se)	Net trade credit extended b (se)	
1	2	3	4	5	6	7	8	9	10	11	12	13	
Net trade credit extended in t-1	-1.4162*** (0.17)	0.3489*** (0.03)	-0.8874*** (0.18)	0.3245*** (0.03)	-1.5214*** (0.16)	0.5633*** (0.07)	-1.2770*** (0.20)	0.5033*** (0.07)	-1.4956*** (0.17)	0.6711*** (0.11)	-1.2547*** (0.15)	0.5736*** (0.09)	
Net trade credit extended in t-2										0.0162 (0.10)		0.0561 (0.08)	
1997	0.0122 (0.03)				-0.1959*** (0.03)	-0.0854* (0.05)			-0.1465 (0.10)	-0.0470 (0.05)			
1998	0.0414 (0.03)	0.0023 (0.00)			-0.1627*** (0.02)				-0.0219 (0.04)	-0.0062 (0.01)			
1999	0.0298 (0.00)	0.0005 (0.00)	-0.0725*** (0.02)	0.0250*** (0.00)	-0.1260*** (0.02)	0.0109* (0.01)			-0.0097 (0.03)	-0.0007 (0.01)	-0.0505*** (0.02)	0.0188*** (0.01)	
2000	0.0068 (0.02)	0.0061 (0.00)	0.0098 (0.02)	-0.0041 (0.00)	-0.0827*** (0.02)	-0.0005 (0.01)	-0.1116*** (0.01)	0.0265*** (0.00)	0.0109 (0.02)			0.0282 (0.02)	0.0048 (0.01)
2001	0.0014 (0.02)	0.0059 (0.00)	-0.0664*** (0.01)	0.0172*** (0.00)	-0.1135*** (0.01)	0.0132** (0.01)	-0.0414*** (0.02)	-0.0005 (0.01)	-0.0157 (0.01)	0.0202*** (0.01)	-0.0254# (0.02)	0.0297*** (0.01)	
2002	0.0587*** (0.01)	-0.0337*** (0.00)				-0.0274*** (0.01)	-0.1161*** (0.01)	0.0194*** (0.00)	0.0518*** (0.01)		-0.0189*** (0.01)		
2003		-0.0208*** (0.00)			-0.0813*** (0.01)	0.0006 (0.01)				0.0127* (0.01)			
2004	-0.0031 (0.01)	-0.0153*** (0.00)			-0.0943*** (0.01)	0.0028 (0.01)			0.0012 (0.01)	0.0028 (0.01)	0.0495*** (0.01)	-0.0235*** (0.00)	
2005	0.0318*** (0.01)	-0.0088** (0.00)	0.0185 (0.02)	0.0051 (0.00)	-0.0455*** (0.01)	0.0053 (0.01)		-0.0162*** (0.00)	0.0040 (0.01)	0.0033 (0.01)			
2006	0.0293*** (0.01)	-0.0082** (0.00)	-0.0088 (0.01)	0.0060*** (0.00)	-0.0611*** (0.01)	0.0052 (0.00)	-0.0365** (0.02)		0.0077 (0.01)	0.0035 (0.01)	-0.0141*** (0.01)	0.0030 (0.00)	
2007	0.0312*** (0.01)	-0.0047 (0.00)			-0.0536*** (0.01)	0.0039 (0.00)	-0.0197*** (0.01)	0.0055** (0.00)	-0.0066 (0.01)	-0.0008 (0.00)			
2008	0.0280** (0.01)	-0.0098*** (0.00)	0.0190 (0.02)	-0.0134*** (0.00)	-0.0321*** (0.01)	0.0033 (0.00)			0.0042 (0.01)	-0.0043 (0.01)			
2009	0.0334* (0.02)	-0.0035 (0.00)			-0.0072 (0.01)	0.0134** (0.01)	-0.0010 (0.01)		0.0061 (0.02)	0.0130* (0.01)	0.0500*** (0.01)	-0.0083 (0.01)	

2010	0.0289*** (0.01)	0.0016 (0.00)	-0.0029 (0.01)	0.0088*** (0.00)	0.0111* (0.01)	0.0103** (0.00)		-0.0015 (0.01)	0.0248*** (0.01)	0.0124** (0.01)	0.0156** (0.01)	0.0056* (0.00)
Exporter unspecialised	0.0728 (0.09)	0.0093 (0.02)	0.1822** (0.07)	-0.0068 (0.02)	0.3472*** (0.07)	-0.0115 (0.03)	-0.0171** (0.01)	0.0069* (0.00)	0.4799*** (0.10)	0.0446 (0.04)	0.5575*** (0.10)	0.0418 (0.03)
Exporter specialized	0.2478*** (0.09)	0.0444** (0.02)	0.2331*** (0.09)	0.0378* (0.02)	0.0918 (0.09)	0.0191 (0.03)	0.1297 (0.09)	0.0384 (0.03)	0.1315 (0.14)	-0.0286 (0.05)	-0.2173# (0.15)	-0.0091 (0.05)
The share of foreign ownership	-0.1657* (0.09)	-0.0095 (0.02)	-0.1405* (0.08)	-0.0084 (0.02)	-0.2278** (0.11)	-0.0198 (0.04)	-0.0682 (0.11)	-0.0275 (0.03)	-0.4103*** (0.14)	-0.0064 (0.05)	-0.3205*** (0.12)	-0.0522 (0.04)
Construction	-0.0592 (0.12)	-0.0029 (0.03)	-0.0100 (0.11)	-0.0193 (0.03)	-0.2572*** (0.08)	0.0480* (0.03)	0.1218 (0.08)	0.0636** (0.03)	0.0971 (0.11)	0.0382 (0.03)	-0.0618 (0.11)	0.0216 (0.03)
Trade	-0.2645** (0.13)	0.1697*** (0.04)	-0.2926** (0.12)	0.1515*** (0.04)	-0.2647*** (0.08)	-0.0059 (0.03)	-0.2664*** (0.08)	0.0254 (0.03)	-0.1448* (0.08)	0.0219 (0.08)	-0.1050# (0.07)	0.0260 (0.03)
Transport	0.2262* (0.14)	-0.0163 (0.04)	0.1665 (0.13)	0.0214 (0.04)	0.0891 (0.15)	-0.0265 (0.05)	0.1802 (0.15)	-0.0091 (0.05)	0.0021 (0.16)	0.0532 (0.05)	0.3723** (0.17)	0.0134 (0.04)
Other services	0.1240 (0.10)	-0.0193 (0.03)	0.2112** (0.09)	-0.0200 (0.02)	-0.0146 (0.09)	0.0062 (0.03)	0.1331 (0.09)	0.0354 (0.03)	-0.0517 (0.10)	0.0476* (0.03)	0.0542 (0.08)	0.0157 (0.02)
Limited partnerships	-1.5994** (0.68)	-0.3061** (0.12)	-1.3597** (0.65)	-0.4087*** (0.12)	-0.9218** (0.37)	-0.1421 (0.15)	-0.7971** (0.35)	-0.2771** (0.14)	0.9166 (0.80)	-0.0611 (0.24)	0.2986 (0.57)	-0.2958# (0.19)
Limited liability companies	-0.4046*** (0.15)	-0.0033 (0.03)	-0.1872 (0.14)	-0.0458 (0.04)	0.2209*** (0.08)	0.0014 (0.03)	-0.0108 (0.08)	0.0157 (0.02)	-0.0141 (0.12)	-0.0233 (0.04)	0.0874 (0.10)	0.0054 (0.03)
Joint-stock companies	-0.3781*** (0.14)	0.0535* (0.03)	-0.2123# (0.14)	0.0165 (0.04)	0.1370 (0.13)	-0.0297 (0.04)	-0.1310 (0.13)	-0.0071 (0.03)	-0.2755 (0.24)	0.0199 (0.07)	0.2728 (0.22)	0.0147 (0.07)
Foreign companies	3.5157 (2.61)	0.1848 (0.61)	3.2100 (2.53)	0.4659 (0.56)								
State-owned enterprises	-0.5035** (0.20)	0.0977** (0.05)	-0.3756** (0.19)	-0.0085 (0.05)	0.8519*** (0.19)	-0.0118 (0.07)	-0.1932 (0.19)	-0.0129 (0.06)	1.0468** (0.51)	0.0281 (0.14)	0.2013 (0.44)	0.1159 (0.12)
Cooperatives									-0.1360 (0.13)	0.0041 (0.06)	0.0841 (0.12)	0.0187 (0.05)
Others	-0.0091 (0.26)	-0.0196 (0.07)	0.3457# (0.24)	0.0012 (0.07)	0.1559 (0.12)	-0.0365 (0.04)	-0.0701 (0.12)	-0.0121 (0.04)	-0.1613 (0.16)	-0.0363 (0.06)	-0.1004 (0.14)	-0.0452 (0.05)
Company size	0.1014*** (0.02)		0.0581** (0.02)	0.0113** (0.01)	-0.0080 (0.02)	-0.0092 (0.01)	0.0488** (0.02)	0.0025 (0.01)	0.0436** (0.02)	0.0092 (0.01)	0.0500*** (0.02)	0.0108** (0.01)
ROS	1.5980** (0.71)	-0.1516 (0.14)	1.5347*** (0.57)	-0.2244* (0.13)	1.6678** (0.66)	-0.3650# (0.23)	-0.4556 (0.74)	-0.7830*** (0.23)	0.5513 (0.89)	-0.4393 (0.32)	-0.2900 (0.84)	-0.2487 (0.27)
ROS in t-1	-0.9640*** (0.37)	0.1173# (0.07)	-0.7853*** (0.30)	0.1258* (0.07)	-0.6132** (0.28)	0.2818 (0.22)	0.4308 (0.41)	0.4784** (0.21)	0.4604 (0.58)	0.1221 (0.30)	1.6662** (0.73)	-0.1252 (0.26)
Self-financing in dynamic terms	-0.1898 (0.14)	0.1210*** (0.03)	-0.2346** (0.12)	0.1088*** (0.02)	-0.1128 (0.14)	0.1319*** (0.05)	0.1156 (0.13)	0.2671*** (0.04)	-0.2302* (0.13)	0.1502*** (0.06)	-0.1435 (0.14)	0.2199*** (0.04)
Self-financing in dynamic terms in t-1	0.0554*** (0.02)	-0.0063 (0.00)	0.0291# (0.02)	-0.0049 (0.01)	0.0658*** (0.01)	-0.0638# (0.04)	-0.0494 (0.11)	-0.0695* (0.04)	-0.1895** (0.09)	0.0468 (0.06)	-0.0975 (0.12)	0.0872* (0.05)
Quick ratio	0.0753* (0.04)	0.0090 (0.01)	0.0767** (0.04)	0.0091 (0.01)	0.0395 (0.03)	0.0079 (0.01)	0.0224 (0.04)	0.0323** (0.01)	0.0468 (0.04)	-0.0112 (0.01)	0.0624* (0.03)	0.0034 (0.01)
Quick ratio in t-1	-0.0266 (0.02)	-0.0033 (0.00)	-0.0172 (0.02)	-0.0025 (0.00)	-0.0073 (0.02)	0.0020 (0.01)	0.0102 (0.03)	-0.0262** (0.01)	0.0117 (0.03)	0.0124 (0.01)	-0.0199 (0.03)	-0.0007 (0.01)
Growth opportunities	0.0876 (0.09)	0.0296* (0.02)	0.0021 (0.07)	0.0324** (0.01)	0.1276 (0.08)	0.1025*** (0.03)	-0.2179*** (0.08)	0.1082*** (0.03)	-0.0211 (0.11)	0.1369*** (0.04)	0.1480# (0.09)	0.0843** (0.04)
Growth opportunities in t-1	-0.0331* (0.02)	-0.0057 (0.00)	-0.0193 (0.02)	-0.0089** (0.00)	-0.0046 (0.01)	0.0413# (0.03)	-0.0897** (0.04)	0.0241 (0.03)	0.0867* (0.05)	0.1040*** (0.03)	-0.0831 (0.08)	0.0875*** (0.03)

Table 7, cont.

	1	2	3	4	5	6	7	8	9	10	11	12	13
Short-term bank loan	-0.0852 (0.14)	-0.0021 (0.03)	-0.1923# (0.13)	0.0081 (0.03)	0.1799 (0.13)	0.0548 (0.05)	0.2358* (0.13)	0.0304 (0.05)	0.0233 (0.14)	-0.0225 (0.06)	0.2919** (0.14)	-0.0413 (0.05)	
Long-term sources of financing	-0.4603 (0.35)	0.1300* (0.07)	-0.0011 (0.32)	0.1650*** (0.07)	-0.5793 (0.36)	-0.0042 (0.15)	-0.6478 (0.46)	-0.0585 (0.15)	1.0818** (0.50)	0.0443 (0.19)	0.1676 (0.52)	0.0938 (0.17)	
Long-term sources of financing in t-1	0.1861 (0.28)	-0.1498** (0.06)	-0.2482 (0.26)	-0.1882*** (0.06)	0.3740 (0.33)	0.1065 (0.14)	0.5941 (0.41)	0.0437 (0.14)	-1.6514*** (0.46)	-0.1641 (0.18)	-1.0253* (0.53)	-0.2115 (0.16)	
Collateral	0.0665 (0.15)	0.2049*** (0.04)	0.0720 (0.15)	0.1925*** (0.04)	0.2683** (0.13)	0.2087*** (0.05)	0.1323 (0.13)	0.2336*** (0.05)	0.4193*** (0.15)	0.1498*** (0.05)	0.1028 (0.15)	0.1967*** (0.05)	
Inventory to sales ratio	0.6200 (0.67)	0.4120*** (0.12)	0.7773 (0.62)	0.3370*** (0.13)	-0.8810 (0.69)	1.1779*** (0.30)	-2.0169** (0.90)	1.3133*** (0.28)	-1.4510 (1.01)	1.7446*** (0.29)	-1.6285* (0.93)	1.6910*** (0.28)	
Inventory to sales ratio in t-1	-0.3060 (0.50)	-0.2868*** (0.08)	-0.4857 (0.42)	-0.2428*** (0.09)	0.5341 (0.41)	-0.7422** (0.29)	1.4987** (0.74)	-0.8163*** (0.27)	1.0859 (0.86)	-1.3826*** (0.28)	1.2650 (0.90)	-1.3185*** (0.27)	
Inventory turnover	0.0051 (0.01)	-0.0026* (0.00)	0.0039 (0.01)	-0.0018 (0.00)	-0.0111** (0.00)	0.0025 (0.00)	-0.0116# (0.01)	-0.0000 (0.00)	0.0075 (0.01)	-0.0001 (0.00)	0.0128 (0.01)	-0.0008 (0.00)	
Inventory turnover in t-1	-0.0042 (0.00)	0.0013* (0.00)	-0.0037 (0.00)	0.0009 (0.00)	0.0036* (0.00)	-0.0002 (0.00)	0.0059 (0.01)	0.0017 (0.00)	-0.0033 (0.01)	0.0012 (0.00)	-0.0142* (0.01)	0.0022 (0.00)	
WIBOR3M			-0.50*** (0.1)	0.15*** (0.1)			0.09 (0.1)	0.07# (0.1)			-0.31** (0.1)	-0.05 (0.1)	
WIBOR3M in t-1			-0.50*** (0.1)	0.20*** (0.1)			-0.64*** (0.1)	0.09* (0.1)			-0.23# (0.00)	0.05 (0.00)	
WIBOR3M in t-2			0.70*** (0.1)	-0.22*** (0.1)			0.45** (0.1)	-0.17*** (0.0)			0.43*** (0.00)	-0.09* (0.00)	
Effective currency rate			0.14** (0.1)	-0.02 (0.0)			0.05 (0.1)	0.00 (0.00)			-0.07* (0.00)	-0.01 (0.00)	
Effective currency rate in t-1			-0.02 (0.1)	0.03 (0.0)			0.13* (0.0)	-0.08*** (0.0)			0.25*** (0.00)	-0.15*** (0.00)	
Effective currency rate in t-2			0.02 (0.00)	0.05** (0.00)			-0.31*** (0.00)	0.04*** (0.00)			-0.22*** (0.00)	0.08*** (0.00)	
Constant	-0.3614# (0.25)	-0.2374*** (0.04)	-0.1544 (0.27)	-0.3826*** (0.06)	0.3114* (0.17)	-0.1531** (0.06)	0.1280 (0.23)	-0.2521*** (0.07)	-0.0531 (0.19)	-0.2530*** (0.06)	-0.0575 (0.17)	-0.2279*** (0.06)	
Test	Test statistic [p-value]												
Arellano-Bond Test for the first-order autocorrelation	-20.107 [0.0000]	-15.643 [0.0000]	-22.595 [0.0000]	-15.403 [0.0000]	-26.312 [0.0000]	-10.107 [0.0000]	-14.080 [0.0000]	-10.216 [0.0000]	-19.781 [0.0000]	-15.411 [0.0000]	-17.487 [0.0000]	-6.923 [0.0000]	
Arellano-Bond Test for the second-order autocorrelation	-1.921 [0.0547]	1.480 [0.1386]	-1.086 [0.2774]	1.461 [0.1438]	-0.857 [0.3910]	1.731 [0.0834]	0.3773 [0.7059]	-0.321 [0.7475]	-0.316 [0.7514]	-0.590 [0.5547]	0.962 [0.3363]	0.898 [0.3692]	
Sargan Test	113.597 [0.2035]	205.381 [0.2911]	114.611 [0.0507]	215.049 [0.3541]	133.695 [0.0516]	90.543 [0.1387]	114.962 [0.1619]	107.187 [0.0919]	116.126 [0.0533]	125.628 [0.0529]	94.3061 [0.3574]	123.359 [0.0367]	

Note: # 20% significance, ## 15% significance, \* 10% significance, \*\* 5% significance, \*\*\* 1% significance

Source: authors' own based on data published by the Central Statistical Office of Poland

during the EU crisis in 2009–2010, although the volume of trade credit extended by them in 2002 and 2004 was lower than in 1996. The European debt crisis of 2010 led to an increase in the trade credit provision (compared to 1996). On the other hand, small firms' willingness to extend trade credit was lower in 1999 (after the Russian crisis hit), 2001 and 2006 than in 1996, although the volume of trade credit provided by them was higher then.

Non-specialized exporters are more likely to extend trade credit than non-exporters and specialized exporters, regardless of the firm's size, while large specialized exporters are more likely to extend trade credit and provide more trade credit than some non-exporters do. On the 15% significance level, small specialized exporters are less likely to extend trade credit due to their aversion to currency risk and the risk of debt collection from foreign clients.

Medium-size construction firms are less likely to extend trade credit than industrial firms, but they provide more trade credit than industrial firms do. Trading companies are less likely to extend trade credit than industrial firms, regardless of size. However, large trading firms provide more trade credit than industrial firms do. Both large and small transport firms are more likely to extend trade credit than industrial firms, similarly as service companies (from the "Other services" sector). Small service companies (from the "Other services" sector) provide more trade credit than industrial firms.

Large and medium size limited partnerships are less likely to extend trade credit and they provide less trade credit than partnerships. Similarly, small limited partnerships provide less trade credit than small partnerships. Large limited liability companies and state-owned enterprises are less likely to extend trade credit, while medium-size limited liability companies as small and medium-size state-owned enterprises are more likely to extend trade credit than partnerships. Large joint stock companies and state-owned enterprises are less likely to extend trade credit, but they provide less trade credit than partnerships.

Firm size measured by the natural logarithm of assets is related to a greater inclination to extend trade credit, as well as to the volume of trade credit provided. Petersen and Rajan (1997), as well as Bougheas, Mateut and Mizen (2009), report that larger firms extend more trade credit.

More profitable large and medium-size firms are more likely to extend trade credit but they reduce the volume of trade credit provision. On the other hand, large and medium-size firms' higher profitability achieved in the previous period are less likely to extend trade credit, although it enables them to increase the volume of trade credit provision. Cull, Xu and Zhu (2007), as well as Bougheas, Mateut and Mizen (2009) also report a positive

correlation between the company margin and the volume of trade credit provision. Only small firms, due to the scale of their operations, are more likely to extend trade credit as their profitability grows.

A higher capability of generating a financial surplus increases the volume of trade credit provision (regardless of the firm size), although it reduces the inclination to extend trade credit due to the debt collection risk and fear of payment backlogs. Only a higher level of self-financing achieved in the previous period makes large firms more likely to extend trade credit owing to the lower risk of the cash flows instability, greater scale of operations and business risk diversification. On the other hand, medium-size firms showing a higher financial surplus in the previous period provide less trade credit, while being more likely to extend trade credit. Small firms, fearing payment backlogs, are less likely to extend trade credit even if they generated higher positive cash flows in the previous period. Yet, under pressure from their buyers, they provide more net trade credit being aware of the higher financial surplus generated in the previous period.

More liquid firms, large and small, are more likely to extend trade credit as their liquidity will be less jeopardized by the liquidity loss in case of any payment backlogs. More liquid medium size firms provide more trade credit, while medium size firms with a higher liquidity recorded in the previous period provide less trade credit as they bear in mind the problems with collecting their accounts receivable and the payment backlogs they experienced in the previous period. Garcia-Appendini and Montoriol-Garriga (2012) indicate that more liquid firms increase their supply of trade credit in crisis periods.

Better growth opportunities (regardless of firm's size) increase the volume of trade credit extended, since favourable terms of payment enable providers to keep increasing their sales. Yet better growth opportunities faced by medium size firms in the current and previous period reduce their inclination to extend trade credit due to a higher demand for cash needed to finance the purchase of inventories. Similarly, large firms that recorded a growth of sales in the previous period are less likely to extend trade credit and extend less trade credit, since owing to their high growth opportunities and the large scale of operations they do not need to offer longer terms of payment in order to increase their sales. The scale of operations and the diversification of business risks play a vital role here, as small firms experiencing a growth of sales in the previous period are more likely to extend trade credit and they provide more trade credit in order to support their growing sales and to benefit from the growth opportunities. Small firms



with smaller market shares, wishing to match the competition and increase their sales, secure their sources of revenue by offering longer payment terms. This is why they adjust to the expectations of their buyers regarding payment terms.

SMEs use the trade credit service as a bank credit **complement**. Firms are more likely to extend trade credit as they increase short-term bank loans since having access to the bank lending, SMEs can afford to offer longer payment terms without losing their liquidity and the capability of paying their own liabilities in due time. Both large and small firms use the trade credit service as a **complement** to long-term maturity sources of financing, including long-term bank loans. A higher degree of long-term financing, including bank loans, increases the volume of trade credit extended by large firms, as well as the small firms' inclination to extend trade credit since with the access to long-term financing they can afford offering longer terms of payment without losing the capability to pay their long-term maturity liabilities. Yet, in the case of a long-term debt originating in the previous period (which does not bring any financial proceeds in the current period), no redistribution effect occurs and large companies with a higher debt level using their financial surplus for repayment of debt, offer less trade credit. On the other hand, small firms with a higher debt level are less likely to extend trade credit.

A higher collateral value (fixed assets) increases the volume of trade credit extended, regardless of the company size, since it provides a better access to external financing, both long-term and short term. Firms with a higher collateral (fixed assets) – both small and medium in size – encounter less barriers in accessing sources of external finance and are therefore more likely to extend trade credit. Hence the grounds for the redistribution effect. In the case of small and medium size firms, insufficient collateral is a significant barrier to accessing bank loans.

A lower inventory-to-sales ratio (i.e. a higher share of inventories in sales) is positively correlated with the volume of trade credit extended, the motivation is to dispose of the stocks and thereby reduce the cost of inventory management. Small and medium size companies with a lower inventory-to-sales ratio are less likely to extend trade credit, due to the smaller scale of operations and lower diversification of business risks (or no such diversification at all). Problems with disposing of inventories in the previous year motivate medium size firms to extend trade credit – they are more likely to extend trade credit) in order to accelerate sales – while reducing the volume of trade credit extended by small and medium firms due

to their liquidity problems resulting from holding stocks. A higher turnover of inventories reduces the volume of trade credit extended by large firms and the medium size firms' inclination to extend trade credit as they are not forced to offer longer payment terms in order to boost their sales. For similar reasons, a higher turnover of inventories in  $t-1$  reduces small firms' inclination to extend trade credit. On the other hand, large companies recording a higher turnover of inventories in the previous period extend more trade credit, while medium size companies are more likely to extend trade credit since offering longer terms of payment they attract more clients and dispose of their inventories faster.

Monetary policy – via the interest rate channel – reduces companies' inclination to extend trade credit (except for the current period in case of medium firms) and increases the volume of trade credit provision in the category of medium and large firms. WIBOR lagged by two periods is positively correlated with the firms' inclination to extend trade credit and reduces the volume of credit provision – regardless of their size. In the case of SMEs, the monetary policy influence exercised via the rate of exchange channel is lagged by one and two periods, although the direction of impact is opposite. In the category of large firms, where monetary policy changes are analysed on a current basis by in-house financial analysts, the effective rate of exchange of the current period is positively correlated with the inclination to extend trade credit. The effective rate of exchange lagged by two periods is positively correlated with the volume of trade credit provision, regardless of the company size.

## **2.10. Net trade credit received**

The factors determining the net trade credit received by firms were analysed in a breakdown by company size. Two models were estimated: the inclination to contract net trade credit and the share of net trade credit received in the sources of financing. The descriptive statistics and histograms of continuous variables show a significant percent of atypical observations in all samples. Taking the distribution of probability into account, 5% of the outermost values have been replaced with the 0.95 quantile or 0.05 quantile value at the same time, depending on the property distribution. This allows an analysis of the relations between the variability of dependent variable and the variability of explanatory variables without any loss of essential information. Before the econometric analysis, the correlation between explanatory variables was estimated. Detailed outcomes of Spearman's ranks correlation are presented in Tables 8 and 9.

Table 8. Correlation of explanatory variables in the model of inclination to contract net trade credit received (positive values)

No	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Net trade credit received	1.000													
2	Company size	-0.121	1.000												
3	Self-financing in dynamic terms	0.001	-0.065	1.000											
4	Quick ratio	-0.546	-0.017	0.048	1.000										
5	Accounts payable conversion cycle	0.355	0.315	-0.146	-0.385	1.000									
6	Cash turnover cycle	-0.542	0.169	-0.114	0.245	-0.165	1.000								
7	Growth opportunities	-0.009	0.062	0.117	0.035	-0.005	-0.073	1.000							
8	Inventory to sales ratio	0.211	0.252	-0.122	-0.377	0.290	0.436	-0.092	1.000						
9	Short-term bank loan	0.055	0.181	-0.053	-0.417	0.171	0.117	-0.011	0.273	1.000					
10	Long-term sources of financing	0.005	0.323	-0.005	-0.171	0.164	-0.031	0.043	0.085	0.167	1.000				
11	Collateral	0.022	0.213	-0.018	-0.161	-0.077	-0.181	-0.036	-0.038	0.017	0.296	1.000			
12	Inventory turnover	0.328	0.051	-0.001	-0.294	0.056	-0.130	-0.017	0.282	0.173	0.014	-0.022	1.000		
13	Financial risk	-0.105	0.288	0.169	0.008	0.070	0.125	0.113	0.105	0.144	0.135	-0.046	0.066	1.000	
14	ROS	-0.191	0.105	0.403	0.208	-0.080	0.209	0.241	0.019	0.027	0.028	-0.186	-0.068	0.383	1.000

Source: authors' own based on data published by the Central Statistical Office of Poland

Table 9. Correlation of explanatory variables in the model of net trade credit received (positive values)

No	Variable	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1	Net trade credit received	1.000													
2	Company size	-0.286	1.000												
3	Self-financing in dynamic terms	0.080	-0.089	1.000											
4	Quick ratio	-0.430	0.010	0.050	1.000										
5	Accounts payable conversion cycle	0.190	0.358	-0.138	-0.126	1.000									
6	Cash turnover cycle	-0.218	0.038	-0.107	-0.137	-0.193	1.000								
7	Growth opportunities	-0.022	0.074	0.133	0.105	-0.027	-0.053	1.000							
8	Inventory to sales ratio	0.180	0.163	-0.147	-0.397	0.285	0.703	-0.112	1.000						
9	Short-term bank loan	0.024	0.156	-0.016	-0.358	0.058	0.246	-0.033	0.253	1.000					
10	Long-term sources of financing	-0.187	0.332	0.010	-0.097	0.124	-0.033	0.035	0.017	0.110	1.000				
11	Collateral	-0.279	0.153	-0.070	-0.177	-0.167	-0.225	-0.055	-0.240	-0.049	0.262	1.000			
12	Inventory turnover	0.281	-0.120	0.052	-0.141	-0.296	0.052	-0.030	-0.009	0.119	-0.081	-0.086	1.000		
13	Financial risk	-0.036	0.241	0.180	-0.026	0.037	0.121	0.084	0.122	0.160	0.134	-0.101	0.078	1.000	
14	ROS	-0.065	0.061	0.420	0.109	-0.014	0.155	0.223	0.092	0.097	0.066	-0.241	-0.029	0.390	1.000

Source: authors' own based on data published by the Central Statistical Office of Poland

Table 10. Net trade credit received (positive values) determinants

Explanatory variable	Large firms				Medium-sized firms				Small firms			
	Model with the year effect taken into account		Model with the monetary policy impact taken into account		Model with the year effect taken into account		Model with the monetary policy impact taken into account		Model with the year effect taken into account		Model with the monetary policy impact taken into account	
	Model I	Model II	Model III	Model IV	Model V	Model VI	Model VII	Model VIII	Model IX	Model X	Model XI	Model XII
	Inclination to contract net trade credit received b (se)	Net trade credit received b (se)	Inclination to contract net trade credit received b (se)	Net trade credit received b (se)	Inclination to contract net trade credit received b (se)	Net trade credit received b (se)	Inclination to contract net trade credit received b (se)	Net trade credit received b (se)	Inclination to contract net trade credit received b (se)	Net trade credit received b (se)	Inclination to contract net trade credit received b (se)	Net trade credit received b (se)
1	2	3	4	5	6	7	8	9	10	11	12	13
Net trade credit extended in t-1	0.8414*** (0.17)	0.4307*** (0.04)	0.7207*** (0.16)	0.4222*** (0.04)	0.9176*** (0.10)	0.5254*** (0.06)	0.9159*** (0.09)	0.4277*** (0.05)	1.0136*** (0.11)	0.4217*** (0.07)	0.8468*** (0.12)	0.4766*** (0.07)
Net trade credit extended in t-2										-0.0145 (0.03)		0.0736# (0.05)
1997	0.1829*** (0.03)	0.0578*** (0.01)				0.0296*** (0.01)			0.1501** (0.06)	0.0202** (0.01)		
1998	0.1481*** (0.03)	0.0455*** (0.01)			0.0346*** (0.01)	0.0318*** (0.01)			0.0858*** (0.02)	0.0237*** (0.01)		
1999	0.1276*** (0.02)	0.0400*** (0.01)	0.0938*** (0.01)	0.0286*** (0.01)	0.0395*** (0.01)	0.0301*** (0.01)	0.0861*** (0.01)	0.0397*** (0.00)	0.0874*** (0.01)	0.0295*** (0.01)	0.1355*** (0.02)	0.0298*** (0.01)
2000	0.1070*** (0.02)	0.0456*** (0.01)	-0.0295* (0.02)	-0.0017 (0.01)	0.0468*** (0.01)	0.0225*** (0.01)	-0.0156# (0.01)	0.0012 (0.00)	0.0760*** (0.01)	0.0276*** (0.00)	0.0525** (0.02)	-0.0018 (0.01)
2001	0.1153*** (0.02)	0.0469*** (0.01)	0.0617*** (0.01)	0.0272*** (0.00)	0.0669*** (0.01)	0.0271*** (0.01)	0.0603*** (0.01)	0.0322*** (0.00)	0.0644*** (0.01)	0.0276*** (0.00)	0.0646*** (0.01)	0.0251*** (0.00)
2002	-0.0339** (0.01)	-0.0203*** (0.01)			-0.0717*** (0.01)	-0.0311*** (0.00)			-0.0280*** (0.01)			
2003					-0.0529*** (0.01)					0.0119*** (0.00)		
2004	0.0251* (0.01)	0.0035 (0.01)			-0.0406*** (0.01)	-0.0028 (0.00)	-0.0201*** (0.01)		-0.0080 (0.01)	0.0051# (0.00)	-0.0185*** (0.01)	
2005	-0.0010 (0.01)	-0.0050 (0.01)	-0.0256** (0.01)		-0.0364*** (0.01)	-0.0069* (0.00)			-0.0113* (0.01)	0.0062** (0.00)		
2006	-0.0116 (0.01)	-0.0100* (0.01)	0.0056 (0.01)	0.0034 (0.00)	-0.0380*** (0.01)	-0.0087*** (0.00)	0.0140*** (0.00)	0.0008 (0.00)	-0.0085 (0.01)	0.0112*** (0.00)	0.0042 (0.00)	0.0047*** (0.00)
2007	-0.0053 (0.01)	-0.0079# (0.01)			-0.0287*** (0.01)	-0.0051 (0.00)			-0.0031 (0.01)	0.0095** (0.00)		
2008	0.0110 (0.01)	-0.0048 (0.01)	-0.0192# (0.01)	-0.0093* (0.00)	-0.0087 (0.01)	-0.0020 (0.00)		-0.0111*** (0.00)	-0.0046 (0.01)	0.0031 (0.00)		-0.0146*** (0.00)
2009	-0.0080 (0.01)	0.0015 (0.01)		-0.0098* (0.01)	0.0013 (0.01)	-0.0073* (0.00)	-0.0053 (0.01)	-0.0082* (0.00)	-0.0080 (0.01)	0.0018 (0.00)	-0.0249** (0.01)	-0.0141*** (0.00)
2010	-0.0122 (0.01)	-0.0011 (0.01)	0.0046 (0.01)	0.0035 (0.00)	0.0000 (0.01)	-0.0138*** (0.00)	0.0113** (0.00)	0.0020 (0.00)	-0.0162*** (0.01)	-0.0020 (0.00)	-0.0109* (0.01)	-0.0022 (0.00)
Exporter unspecialised	-0.1487** (0.06)	-0.0377** (0.02)	-0.2069*** (0.05)	-0.0329** (0.01)	-0.1839*** (0.05)	0.0243 (0.02)	-0.2143*** (0.05)	0.0062 (0.02)	0.0445 (0.07)	0.0361 (0.03)	-0.0455 (0.07)	0.0381# (0.02)
Exporter specialized	-0.1737*** (0.07)	-0.0222 (0.02)	-0.2213*** (0.06)	-0.0094 (0.02)	-0.1175** (0.06)	0.0468* (0.03)	-0.0768 (0.05)	0.0218 (0.02)	0.1709* (0.09)	0.0550 (0.04)	0.1128 (0.10)	0.0242 (0.04)

The share of foreign ownership	0.0348 (0.06)	0.0020 (0.02)	0.0511 (0.06)	-0.0034 (0.02)	0.0653 (0.07)	0.0128 (0.03)	0.0274 (0.06)	0.0269 (0.02)	0.0821 (0.09)	-0.0284 (0.04)	0.1173 (0.09)	-0.0216 (0.03)
Construction	-0.0115 (0.08)	-0.0799*** (0.03)	-0.0265 (0.08)	-0.0817*** (0.03)	0.0016 (0.06)	0.0317 (0.03)	0.0040 (0.05)	0.0155 (0.02)	0.1121* (0.06)	0.0523# (0.03)	0.1301** (0.06)	0.0536* (0.03)
Trade	0.0844 (0.10)	0.0880*** (0.02)	0.1048 (0.09)	0.0925*** (0.02)	0.1739*** (0.06)	0.0535*** (0.02)	0.1549*** (0.06)	0.0630*** (0.02)	0.2261*** (0.05)	0.0572*** (0.02)	0.2176*** (0.05)	0.0642*** (0.02)
Transport	0.1228 (0.09)	0.1182*** (0.03)	0.1169 (0.09)	0.1175*** (0.02)	0.0966 (0.10)	-0.0159 (0.04)	0.0583 (0.10)	0.0102 (0.04)	0.0021 (0.11)	0.1894*** (0.07)	0.0173 (0.12)	0.0778# (0.05)
Other services	-0.0054 (0.07)	0.0224 (0.03)	-0.0603 (0.07)	0.0229 (0.03)	0.0327 (0.06)	0.0040 (0.03)	0.0147 (0.06)	0.0206 (0.03)	0.1463*** (0.06)	0.0539** (0.03)	0.1093** (0.05)	0.0453* (0.02)
Limited partnerships	0.7898* (0.47)	-0.0372 (0.09)	0.5294 (0.42)	-0.0118 (0.08)	-0.3579# (0.22)	0.0375 (0.05)	-0.2043 (0.20)	0.0421 (0.05)	-0.4753 (0.52)	0.3104 (0.25)	-0.3074 (0.44)	-0.1479 (0.19)
Limited liability companies	-0.0881 (0.09)	-0.0460** (0.02)	-0.1119 (0.09)	-0.0439** (0.02)	-0.0653 (0.05)	-0.0779*** (0.02)	-0.1246*** (0.05)	-0.0587*** (0.02)	-0.0855 (0.07)	-0.0529*** (0.02)	-0.1564** (0.02)	-0.0208 (0.07)
Joint-stock companies	-0.1308 (0.10)	-0.0335# (0.02)	-0.1176 (0.09)	-0.0335* (0.02)	0.1293# (0.08)	-0.0454* (0.03)	0.0198 (0.07)	-0.0178 (0.03)	0.4703*** (0.15)	-0.0501 (0.05)	0.0927 (0.14)	-0.0390 (0.04)
Foreign companies	-2.0716# (1.39)		-1.9871# (1.37)									
State-owned enterprises	-0.0337 (0.13)	-0.0816** (0.03)	-0.0794 (0.13)	-0.0771*** (0.03)	-0.0231 (0.12)	-0.0682# (0.04)	-0.1231 (0.10)	-0.0387 (0.04)	-0.5341* (0.28)	0.1152 (0.12)	-0.0095 (0.26)	0.1131 (0.11)
Cooperatives									0.0269 (0.08)		-0.0879 (0.08)	
Others	-0.2626 (0.19)	-0.0561# (0.04)	-0.3537** (0.17)	-0.0606* (0.03)	-0.0487 (0.08)	-0.0697** (0.03)	-0.0658 (0.07)	-0.0699** (0.03)	0.0418 (0.10)	-0.0628** (0.03)	0.0276 (0.10)	-0.0249 (0.02)
Size	-0.0020 (0.02)	-0.0037 (0.00)	-0.0279# (0.02)	-0.0055 (0.00)	-0.0542*** (0.01)	-0.0059 (0.01)	0.0017 (0.01)	-0.0220*** (0.01)	-0.0065 (0.01)	-0.0242*** (0.00)	-0.0148* (0.01)	-0.0231*** (0.00)
Self-financing in dynamic terms	-0.0631 (0.11)	0.0946*** (0.03)	-0.0885 (0.10)	0.0826*** (0.03)	0.1584# (0.10)	0.0594 (0.04)	-0.0576 (0.08)	0.0899** (0.04)	0.2073** (0.09)	-0.0347 (0.03)	-0.1177 (0.09)	0.0594# (0.04)
Self-financing in dynamic terms in t-1	-0.0265* (0.01)	-0.0000 (0.01)	-0.0222# (0.01)	-0.0017 (0.01)	0.0041 (0.01)	-0.0946*** (0.03)	-0.0058 (0.01)	-0.0855*** (0.03)	0.0564 (0.05)	-0.0157 (0.03)	0.3035*** (0.09)	-0.0095 (0.03)
Quick ratio	-0.0015 (0.03)	-0.0015 (0.01)	0.0083 (0.03)	-0.0040 (0.02)	0.0089 (0.02)	0.0110 (0.02)	0.0070 (0.01)	0.0171 (0.01)	0.0033 (0.02)	-0.0238* (0.02)	-0.0525** (0.01)	-0.0272** (0.01)
Quick ratio in t-1	-0.0006 (0.02)	0.0024 (0.01)	-0.0024 (0.02)	0.0021 (0.00)	0.0037 (0.01)	-0.0144 (0.01)	0.0027 (0.01)	-0.0254*** (0.02)	-0.0024 (0.01)	0.0080 (0.02)	0.0487** (0.01)	0.0130 (0.02)
Accounts payable conversion cycle	0.0036*** (0.00)	0.0013*** (0.00)	0.0045*** (0.00)	0.0013*** (0.00)	0.0014# (0.00)	0.0011*** (0.00)	0.0011 (0.00)	0.0015*** (0.00)	0.0013 (0.00)	0.0003 (0.00)	0.0039*** (0.00)	0.0008** (0.00)
Accounts payable conversion cycle in t-1	-0.0007 (0.00)	-0.0005** (0.00)	-0.0010* (0.00)	-0.0005** (0.00)	-0.0001 (0.00)	-0.0011*** (0.00)	-0.0000 (0.00)	-0.0010*** (0.00)	0.0004 (0.00)	-0.0003 (0.00)	-0.0015 (0.00)	-0.0005# (0.00)
Cash turnover cycle	-0.0051*** (0.00)	-0.0022*** (0.00)	-0.0053*** (0.00)	-0.0022*** (0.00)	-0.0074*** (0.00)	-0.0027*** (0.00)	-0.0071*** (0.00)	-0.0022*** (0.00)	-0.0046*** (0.00)	-0.0034*** (0.00)	-0.0051*** (0.00)	-0.0023*** (0.00)
Cash turnover cycle in t-1	0.0004 (0.00)	0.0004** (0.00)	0.0003 (0.00)	0.0004** (0.00)	0.0011** (0.00)	0.0008** (0.00)	0.0014*** (0.00)	0.0001 (0.00)	0.0002 (0.00)	0.0010*** (0.00)	0.0005 (0.00)	0.0008** (0.00)
Growth opportunities	-0.0564 (0.06)	-0.0250 (0.02)	-0.0383 (0.05)	-0.0324* (0.02)	0.0997** (0.05)	0.0247 (0.03)	-0.0074 (0.05)	0.0404 (0.03)	-0.0596 (0.07)	0.0180 (0.03)	0.1088# (0.07)	-0.0316 (0.03)
Growth opportunities in t-1	0.0094 (0.01)	0.0136** (0.01)	0.0158 (0.01)	0.0161*** (0.01)	-0.0167** (0.01)	-0.0462*** (0.02)	-0.0149** (0.01)	-0.0049 (0.02)	-0.0083 (0.03)	0.0080 (0.01)	0.1727*** (0.05)	-0.0179 (0.02)
Short-term bank loan	0.2006* (0.11)	0.0042 (0.03)	0.2456** (0.11)	0.0229 (0.03)	0.3508*** (0.09)	-0.0082 (0.05)	0.2509*** (0.09)	0.0256 (0.05)	0.0129 (0.11)	0.0038 (0.04)	-0.3238*** (0.12)	-0.0517 (0.05)
Long-term sources of financing	-0.1130 (0.26)	-0.0903# (0.06)	0.0342 (0.24)	-0.0993* (0.06)	-0.2399 (0.26)	-0.1981** (0.09)	-0.0163 (0.23)	-0.1589* (0.09)	-0.2676 (0.32)	0.0739 (0.11)	-0.3369 (0.33)	-0.2516*** (0.09)

Table 10, cont.

	1	2	3	4	5	6	7	8	9	10	11	12	13
Long-term sources of financing in t-1	0.1524 (0.20)	0.0009 (0.05)	0.1082 (0.19)	0.0018 (0.05)	0.5231** (0.23)	0.1509# (0.09)	0.2615 (0.21)	0.0775 (0.08)	0.4772# (0.31)	-0.0268 (0.11)	0.5133# (0.32)	0.2255** (0.09)	
Collateral	0.0571 (0.11)	-0.0969*** (0.03)	0.1038 (0.10)	-0.0966*** (0.03)	0.2268*** (0.09)	-0.0286 (0.04)	0.1428* (0.08)	-0.0543# (0.03)	0.2300** (0.10)	-0.1051*** (0.04)	0.2116* (0.11)	-0.0300 (0.04)	
Inventory to sales ratio	1.7363*** (0.60)	1.0714*** (0.19)	2.0456*** (0.58)	0.9710*** (0.18)	3.6230*** (0.49)	1.4240*** (0.24)	2.8673*** (0.46)	1.1349*** (0.23)	1.8517*** (0.69)	0.9883*** (0.26)	2.3092*** (0.66)	0.6806*** (0.24)	
Inventory to sales ratio in t-1	0.0861 (0.34)	-0.3204*** (0.11)	0.0327 (0.32)	-0.2355** (0.11)	-0.9728*** (0.24)	-0.6517*** (0.23)	-0.5826*** (0.22)	-0.3555* (0.21)	-0.2239 (0.54)	-0.0469 (0.21)	-0.4338 (0.62)	-0.1641 (0.22)	
Inventory turnover	0.0063 (0.01)	0.0009 (0.00)	0.0081* (0.00)	0.0020# (0.00)	0.0055# (0.00)	0.0037** (0.00)	0.0060* (0.00)	0.0041** (0.00)	-0.0053 (0.01)	-0.0005 (0.00)	-0.0036 (0.01)	-0.0021 (0.00)	
Inventory turnover in t-1	-0.0009 (0.00)	-0.0003 (0.00)	-0.0015 (0.00)	-0.0010 (0.00)	-0.0015 (0.00)	-0.0021# (0.00)	-0.0018# (0.00)	-0.0021# (0.00)	0.0052 (0.00)	0.0029* (0.00)	0.0057 (0.01)	0.0032** (0.00)	
Financial risk	0.0001 (0.00)	-0.0003* (0.00)	0.0005 (0.00)	-0.0002 (0.00)	0.0015*** (0.00)	0.0002 (0.00)	0.0008** (0.00)	0.0002 (0.00)	-0.0002 (0.00)	-0.0004 (0.00)	-0.0007 (0.00)	0.0001 (0.00)	
Financial risk in t-1	0.0000 (0.00)	0.0001* (0.00)	-0.0000 (0.00)	0.0001* (0.00)	-0.0002** (0.00)	-0.0001 (0.00)	-0.0001# (0.00)	-0.0001 (0.00)	0.0001 (0.00)	0.0003* (0.00)	0.0002 (0.00)	-0.0002 (0.00)	
ROS	0.1054 (0.51)	0.0517 (0.17)	0.1737 (0.48)	0.0659 (0.16)	-0.2189 (0.48)	0.0013 (0.24)	0.3492 (0.43)	-0.1641 (0.21)	0.4056 (0.53)	-0.2570 (0.24)	-0.3618 (0.66)	-0.0562 (0.27)	
ROS in t-1	0.0123 (0.25)	-0.1525# (0.09)	0.0137 (0.23)	-0.1343# (0.09)	-0.0677 (0.20)	-0.0086 (0.19)	-0.2206 (0.18)	0.0912 (0.17)	-0.6761* (0.37)	0.2301 (0.17)	-0.3605 (0.57)	-0.0164 (0.21)	
WIBOR3M			0.66*** (0.00)	0.23*** (0.00)			0.48*** (0.00)	0.10*** (0.00)			-0.54** (0.00)	0.21** (0.00)	
WIBOR3M in t-1			0.87*** (0.00)	0.31*** (0.00)			0.78*** (0.00)	0.26*** (0.00)			0.64*** (0.00)	0.16*** (0.00)	
WIBOR3M in t-2			-0.81*** (0.00)	-0.26*** (0.00)			-0.60*** (0.00)	-0.33*** (0.00)			-0.35*** (0.00)	-0.30*** (0.00)	
Effective currency rate			-0.07# (0.00)	-0.04** (0.00)			-0.02 (0.00)	-0.06*** (0.00)			0.05* (0.00)	-0.05*** (0.00)	
Effective currency rate in t-1			0.03 (0.00)	-0.02 (0.00)			-0.12*** (0.00)	0.02 (0.00)			-0.16*** (0.00)	0.06*** (0.00)	
Effective currency rate in t-2			-0.02 (0.00)	0.06*** (0.00)			0.11*** (0.00)	0.06*** (0.00)			0.17*** (0.00)	0.07*** (0.00)	
Constant	0.2563 (0.18)	0.0757 (0.06)	0.5428*** (0.18)	0.0742 (0.06)	0.5864*** (0.11)	0.0988* (0.05)	0.2032* (0.12)	0.2175*** (0.05)	0.0871 (0.11)	0.2412*** (0.05)	0.2010* (0.10)	0.1174** (0.05)	
Test	Test statistic [p-value]												
Arellano-Bond Test for the first-order autocorrelation	-11.109 [0.0000]	-10.900 [0.0000]	-17.487 [0.0000]	-24.508 [0.0000]	-41.328 [0.0000]	-11.065 [0.0000]	-44.365 [0.0000]	-12.525 [0.0000]	-28.859 [0.0000]	-8.495 [0.0000]	-19.887 [0.0000]	-6.811 [0.0000]	
Arellano-Bond Test for the second-order autocorrelation	0.608 [0.5432]	0.524 [0.5999]	0.962 [0.3363]	-2.062 [0.0392]	-1.549 [0.1213]	1.1089 [0.2675]	-1.274 [0.2024]	0.615 [0.5380]	-2.018 [0.0435]	1.075 [0.2820]	1.214 [0.2245]	0.023 [0.9812]	
Sargan Test	171.224 [0.2070]	158.063 [0.1840]	94.3061 [0.3574]	172.664 [0.1574]	165.659 [0.0684]	112.468 [0.6749]	166.8349 [0.2267]	161.475 [0.0414]	152.582 [0.0683]	130.305 [0.4760]	166.78 [0.0589]	138.028 [0.3200]	

Note: # 20% significance, ## 15% significance, \* 10% significance, \*\* 5% significance, \*\*\* 1% significance

Source: authors' own based on data published by the Central Statistical Office of Poland

The research sample was divided into three groups: small, medium and large firms. Models I, II, V, VI, IX, X addressed the effect of the year, while models III, IV, VII, VIII, XI and XII were expanded by adding control variables for the macro-economic environment: WIBOR and the effective rate of exchange (Table 10). The findings indicate that regardless of company size, net trade credit contracted in the previous period increases the inclination to contract trade credit and the volume of net trade credit received. Net trade credit received has a negative effect on firms' liquidity (by increasing the short-term accounts payable value), but on the other hand it enables firms to keep their sales level despite the shortage of funds for renewing their inventories.

Until 2001 inclusively, firms were more likely to contract net trade credit and they contracted more trade credit than in 1996. As a result of the economic slowdown of 2002, firms were less likely to contract net trade credit and the volume of net trade credit received decreased. Large companies were more likely to contract trade credit after Poland's accession to the EU in 2004, with temporary downturns in 2005 and 2008. On the other hand, the negative impact of the economic slowdown on the volume of net trade credit received by large firms lasted longer and was observed over the period 2006–2009. Medium size firms were less likely to contract net trade credit in 2002–2007 than in 1996. The net trade credit received by medium size firms was negatively affected by the economic slowdown of 2002, the growth of competition after Poland's accession to the EU, in 2005–2006 and by the credit boom of 2008 (an easier access to bank financing owing to the greater supply of bank loans), as well as by the European debt crisis (2009–2010). With the monetary policy impact taken into account, it is possible to observe the positive effect of the impulses sent via the interest rate channel and the currency exchange rate channel on the inclination to contract net trade credit in 2006 and 2010 (falling interest rates).

Small firms were less likely to use net trade credit in the 2002 economic slowdown period, during the growth of competition in 2004–2005, after Poland's accession to the EU and during the European debt crisis in 2009–2010. On the other hand, the use of net trade credit by small firms was negatively affected by the credit boom in 2008 and the European crisis in 2009. With the monetary policy impact taken into account, it is possible to observe a negative effect of the impulses sent via the interest rate channel and the currency exchange rate channel on the inclination to contract net trade credit in 2009 and even in 2010. In the periods 1997–2001 and 2003–2007, small firms used more net trade credit than in 1996.

Medium size and large, non-specialized and specialized exporters are less likely to use trade credit than non-exporters as they are seeking to pay their liabilities at a foreign exchange rate close to that at which the debt was created, or to implement financial strategies oriented towards foreign exchange risk management.

Large non-specialized exporters use less trade credit than non-exporters, while medium size specialized exporters use more trade credit than non-exporters. On the other hand, this results from the fact that the growing scale of operations translates into a higher liquidity and a shorter conversion cycle of the accounts payable. Small specialized exporters are more likely to use net trade credit due to their aversion to foreign exchange risk and the tendency to delay the payment until the moment when the currency exchange rate reaches the best level, as well as to use trade credit extended by foreign business partners associated to them by personal or capital links, with a much longer maturity. On the 15% significance level, small non-specialized exporters use more trade credit than non-exporters.

Large construction firms use less net trade credit than industrial firms, while large trading and transport firms more than industrial firms, which is a consequence of their financial strategy and the capital intensity of their projects. Construction firms use long-term credits more often, while trading and transport firms use short-term credit.

Medium-size trading companies are more likely to use trade credit and they use more net trade credit than industrial firms, since they typically pay their debts back having received the proceeds from the sale of inventories purchased using trade credit. Small construction, trading and other service firms are more likely to use net trade credit than industrial firms. Small construction, trading, transport and service firms (representing the "Other services" sector) use more trade credit than industrial firms. This follows from the smaller scale of their operations as well as from the insufficient collateral required to gain access to the long-term maturity financing. Small firms' insufficient internal financing capacity and extending trade credit reduces their liquidity, thereby increasing the use of financing provided by suppliers. As a rule, industrial firms have more fixed assets (factories, machinery and equipment) which can be used to collateralize a long-term maturity debt.

Large limited partnerships are more likely to use trade credit, while medium size limited partnership, less. Limited liability companies (regardless of size), as well as large and medium size joint stock companies and state-owned enterprises use less net trade credit than partnerships owing



to a better access to external finance (including the issue of shares or bonds), as well as due to the risk of bankruptcy in case of losing the capability to pay their debts in due time as required by the Polish Code of Commercial Companies. Medium size limited liability companies are less likely to use net trade credit, while small and medium size joint stock companies are more likely to use net trade credit since joint stock companies, owing to the capital surplus which increases the company equity significantly, face a lower risk of being unable to continue as a going concern than limited liability companies with the minimum share capital which is only PLN 5,000 in Poland now (previously, from 2004 to 2008 – PLN 50,000, and until 2003 – PLN 4,000). Large foreign firms are less likely to use trade credit than partnerships, owing to a better access to other sources of finance.

As the company size (measured using the natural logarithm of assets) grows, both the inclination to use trade credit and the net trade credit volume decreases, especially in SMEs (in terms of the number of employees). In companies employing more than 250 workers, a greater logarithm of assets translates only into a lower inclination to use net trade credit. One might presume that the volume of net credit contracted is determined by the scale of the firm's business operations and the accounts receivable conversion ratio.

In medium and large firms, the growth of the capability to generate a cash surplus in the current period is positively correlated with the volume of trade credit contracted. Unpaid liabilities increase the cash flow since they prevent the outflow of cash. A higher cash flow from business operations is a result of growing trade liabilities. On the other hand, a higher capability of generating a cash surplus in the previous period reduces the large firms' inclination to use net trade credit and the medium firms' volume of trade credit used, since higher positive cash flows improve the liquidity, increase the self-financing capacity and reduce the accounts payable conversion cycle.

Additionally, the medium size firms' capability of generating a cash surplus is positively correlated with their inclination to use net trade credit on the 15% significance level. Small firms are more likely to use trade credit and – on the 15% significance level – use more net trade credit as their capability to generate cash surplus grows in the current and previous period. Due to the smaller scale of their operations and business risk diversification, SMEs prefer to finance their operations at the cost of their suppliers – at least until the moment of collecting their accounts receivable.

A higher quick ratio of the previous period reduces the net trade credit volume contracted by medium size firms, owing to their higher internal

financing capacity and the capability of paying their accounts payable with the proceeds from sales. On the other hand, with a higher previous period quick ratio, small firms are more likely to use net trade credit owing to the lower risk aversion regarding the capability to pay their trade liabilities in due time. In the current period, a higher quick ratio translates into a decline in the inclination to use net trade credit and in the volume of the net trade credit used, since a shorter accounts receivable conversion cycle improves the internal financing capacity and enables firms to service their accounts payable. Marzec and Pawłowska (2011) obtain a negative correlation between the firm's liquidity and its use of trade credit, while Ono (2001) indicates that a higher cash flow translates into a lower trade credit demand.

With a longer accounts payable cycle in the current period, firms are more likely to use net trade credit and use more net trade credit due to problems with liquidity and timely processing of accounts payable. A firm needs to buy more on credit in order to sell more, to get paid and thereby to be able to pay its trade liabilities.

On the other hand, the awareness of the previous period's longer accounts payable cycle reduces large firms' inclination to use net trade credit and the volume of net trade credit contracted, as well as the volume of net trade credit used by SMEs, due to their aversion to excessive debt and the risk of bankruptcy that might follow insolvency.

With a longer cash conversion cycle in the current period, firms are less likely to use net trade credit and use less net trade credit, due to problems with liquidity and timely payments of debt, as well as due to the fear of bankruptcy that might follow insolvency. With a longer previous period's cash conversion cycle, the volume of net trade credit contracted by both large and small firms grows and medium size firms are additionally more likely to use net trade credit due to the higher demand for inventories purchased using deferred payment terms, so as to be able to increase the firm's sales and the resultant cash proceeds. In the future this would enable shortening the cash conversion cycle. Large firms with high growth opportunities in the previous period use more net trade credit, thereby being able to increase their inventories so as to meet the growing demand. On the other hand, higher growth opportunities in the current period translate into a lower volume of the net trade credit used as higher sales and inventories turnover are positively correlated with cash proceeds and with the capability to meet the obligations as debts become due, hence a faster accounts payable conversion cycle.

SMEs with high growth opportunities in the current period are more likely to use net trade credit as they seek purchasing more inventories so as

to keep increasing their sales. On the other hand, medium size firms with higher growth opportunities in the previous period are less likely to contract net trade credit and use the net trade credit financing since the growth of sales enhances their internal financing capacity and ability to meet the current obligations. Small firms with high growth opportunities in  $t$  and  $t-1$  are more likely to use net trade credit since they purchase inventories in order to increase their sales volume. Small firms operate on a small scale and are incapable of generating a financial surplus that would enable them to finance the sales growth internally without increasing the net trade credit volume. The positive correlation between the trade credit financing and growth opportunities is reported by Huyghebaert (2006).

Medium size and large firms use the trade credit service as a bank credit **complement**. A greater extent of the short-term bank financing increases the inclination to use net trade credit since, with the access to bank finance, medium size and large firms may use net trade credit without fearing that they might become illiquid and insolvent. Trade credit and bank credit are complementary. With the growing use of short-term loans, small firms use less net trade credit owing to the higher liquidity and greater capability of timely processing their accounts payable. In the case of small firms, the bank credit and trade credit **substitutability** may follow from the smaller scale of their operations, but also from a more constrained access to short-term bank lending, especially credit lines or overdraft facilities.

A higher degree of the long-term external financing use, including bank loans, reduces the volume of the net trade credit used in the current period (regardless of the firm's size), as banks monitor the firm's debt ratio and the firm seeks to avoid insolvency that might be caused by an excessive indebtedness. Yet SMEs with a long-term debt in the previous period (which prevents cash proceeds in the current period) suffer from the shortage of free cash which increases their demand for additional financing reflected in the stronger inclination to use net trade credit, as well as in the higher volume of the net trade credit used by small and medium size firms.

The fact of possessing fixed assets capable of collateralizing long-term liabilities reduces the volume of the net trade credit used regardless of the firm's size as it improves the accessibility of external debt-based financing – this finding is consistent with the observations published by Huyghebaert (2006), among others SMEs with a higher collateral value are more likely to use net trade credit since it reduces the risk of bankruptcy caused by insolvency. In the case of problems with liquidity and with meeting trade obligations, firms with valuable assets may sell some of them thereby

“releasing” the cash invested there, or contract a long-term loan. Firms with a higher collateral have a better access to bank loans.

A lower share of inventories in sales increases the inclination to use trade credit as well as the net trade credit volume since firms need more time for liquidating (selling) inventories and collecting the proceeds from the sales. Firms try to benefit from longer terms of payment offered by suppliers, seeking to overcome problems with selling their products and disposing of excessive stocks. High inventory levels are accompanied by growing costs of inventory management and by the risk that inventories lose their market value.

In large and medium firms, a higher share of inventories in sales in  $t-1$  is negatively correlated with the contracted trade credit volume. This is caused by the fact that firms learn from their own mistakes, finding it hard to dispose of inventories and experiencing liquidity problems caused by the tying up of cash in inventories lingering in the warehouse, therefore they do not want to repeat the same mistakes and decide to buy less in the future. In medium size firms, a higher share of inventories in sales in the previous period also reduces the inclination to use net trade credit for fear of insolvency which is a reason for bankruptcy.

In medium size and large firms, a higher turnover of inventories increases the net trade credit use and the inclination to use net trade credit since it provides an opportunity to enhance sales and profit through the effect of scale. Medium size firms with a higher turnover of inventories in the previous period are less likely to use net trade credit (on the 15% significance level) since they feel that they do not have to finance their operations at the cost of suppliers in order to increase their sales. A growing demand for trade credit, accompanied by a decline in the rotation of inventories, indicates that the company is in need of funds for financing supplies (Zawadzka, 2009). In small firms, it increases the volume of trade credit used as purchasing at a deferred payment term they can earn more, while meeting the demand from their customers.

The EBITDA-to-interest-coverage ratio measures the risk of bankruptcy caused by inability to meet the obligations, i.e. the risk that the profit generated by the firm will be insufficient to pay the cost of its debts (interest). In large firms, a higher bankruptcy risk (a lower EBITDA-to-interest-coverage ratio) of the current period increases the net trade credit used since firms with a lower creditworthiness have less access to alternative sources of financing. A higher EBITDA-to-interest-coverage ratio in the previous period increases the net trade credit used by large firms

insignificantly (and by small – three times as much) due to their limited aversion to contract trade credit for fear of losing the capability to pay it back. The interest coverage ratio is used by Atanasova (2007), who argues that it reflects the creditworthiness i.e. that a lower interest coverage ratio is a symptom of a constrained access to credit.

Medium size firms with a higher bankruptcy risk in the current period are less likely to use net trade credit for fear of bankruptcy caused by insolvency. A similar correlation is reported by Bougheas, Mateut and Mizen (2009) and others. On the other hand, medium size firms with a higher bankruptcy risk in  $t-1$  are more likely to use net trade credit since a firm with a lower creditworthiness has less access to alternative sources of finance and is therefore “forced” to use trade credit.

On the 15% significance level, large firms with higher sales profitability in the previous period use less trade credit since higher profits (higher margins) accelerate the accounts payable turnover (Huang, Shi and Zhang, 2011). In small firms, on the other hand, a higher profitability reduces the tendency to use net trade credit due to the scale of their business operations. Small, profitable firms show a higher capacity of servicing their trade obligations with the profit margin earned which reduces their need for financing the business at the cost of suppliers.

A low profitability of sales recorded by large firms in period  $t-1$  increases their net trade credit use, while in the category of small firms this situation increases the inclination to contract net trade credit. A longer accounts payable period is positively correlated with the inclination to use net trade credit and on the net trade credit use, regardless of the company size. A longer cash conversion cycle in period  $t-1$ , resulting from a long accounts receivable period and longer inventory period, increases the use of net trade credit financing by large and small firms, while in the case of medium size companies it additionally increases the inclination to contract net trade credit. Large firms with a low creditworthiness resulting from a higher financial risk increase their use of the net trade credit financing, while in the category of medium size firms this situation increases the inclination to contract net trade credit. The estimation outcomes quoted above indicate that there are no grounds for rejecting the **auxiliary hypothesis** that a low profitability of sales, a long accounts payable period, a low creditworthiness and a long cash conversion cycle are good predictors of the trade credit use.

Monetary policy – via the current and previous period interest rate channel – increases the companies’ inclination to contract net trade credit (except for the current interest rate in the case of small firms) and increases

the volume of trade credit contracted. WIBOR, lagged by two periods, is negatively correlated with the firms' inclination to use net trade credit and with the volume of trade credit use (the cost of using trade credit seems to high) – regardless of their size. In the case of SMEs, the monetary policy impact on the firms' inclination to use net trade credit, exercised via the foreign exchange rate channel, is lagged by one and two periods. A negative effect of the effective currency rate and a positive effect of the currency rate on the net trade credit use is lagged by two periods and occurs regardless of the company size. In the category of large firms where monetary policy changes are analysed on a current basis by in-house financial analysts, the effective exchange rate of the current period is negatively correlated with the tendency to contract net trade credit. In small firms, on the other hand, the effective exchange rate of the current period has a positive impact on the inclination to use net trade credit. Atanasova and Wilson (2003) report that in a situation of monetary policy contractions, firms with a limited access to bank lending increase their demand for trade credit more than those experiencing credit rationing, which is an indication of a strong monetary policy channel.

## CONCLUSION

The paper discusses the role of trade credit in business operations financing in Poland, with a focus on the determinants of the net trade credit nature, i.e. the value of the difference between trade credit extended and contracted. The determinants of the net trade credit use include the company size, the industry it represents, the share of exports in sales and the proportion of foreign ownership in the share capital, as well as the interest rate channel and the currency rate channel in the monetary policy transmission.

Bank and trade credits have been found to be complements in medium size and large companies, where a higher degree of short-term bank financing increases the inclination to use net trade credit. Similar findings are reported by Zawadzka (2009) for Polish firms, and by Ono (2001) for companies in Japan. As far as small firms are concerned, the substitutability of bank and trade credits has been confirmed, i.e. the more short-term bank loans are used, the less net trade credits are contracted. This may be caused by the smaller scale of small firms' operations, as well as by the lesser accessibility of short-term bank loans to them. The substitutability relationship between trade and bank credits is also proved by Marzec and

Pawłowska (2011) for Polish firms, and by Couppey-Soubeyran and Hericourt (2011) for the Middle East and North Africa countries. SMEs have been found to use the trade credit service as a complement to bank loans, i.e. the accessibility of short-term bank lending increases SMEs' inclination to extend trade credit. Both large and small firms use trade credit as a **complement** to long-term maturity sources of financing. No distribution effect has been observed in the case of a long-term debt from the previous period (which did not cause any capital inflow in the present period). This is because large firms with a higher debt level pay their debts using cash surplus and extend less trade credit, while small indebted firms are less likely to offer trade credit.

A higher degree of the use of long-term external financing, including bank loans, reduces the net trade credit volume used in the current period, because banks monitor the firm's debt ratio and the firm seeks to avoid insolvency risk that might be caused by excessive indebtedness. Yet SMEs with long-term debts from the previous period (with no capital inflow in the present period) are more likely to use net trade credit and the volume of net trade credit used by them grows.

It has been proved that monetary policy – via the interest rate channel of the current and previous period – reduces the inclination to extend trade credit (except the current interest rate in case of medium size firms) and increases the inclination to use net trade credit (except for the current interest rate in case of small firms), the volume of trade credit extended by medium size and large firms and the volume of net trade credit used. The monetary policy impact exercised via the currency rate channel on the volume of trade credit extended is lagged, especially in SMEs. In large firms, the effective exchange rate has a positive impact on the inclination to extend trade credit. On the other hand, the effective exchange rate of the current period is negatively correlated with the large firms' inclination to use net trade credit, while in the category of small firms the impact is positive. The effective exchange rate has a negative impact on net trade credit used.

It has been proved that as the company size grows, its inclination to extend trade credit increases and so does the volume of trade credit extended, which is confirmed by Petersen and Rajan (1997), Bougheas, Mateut and Mizen (2009) and others, while the inclination to use net trade credit decreases. More profitable large and medium-size firms are more likely to extend trade credit, but they reduce the volume of trade credit provision. SMEs with a higher collateral encounter less barriers in accessing sources of external finance and are therefore more likely to extend trade

credit, hence the grounds for the redistribution effect. Problems with the disposing of inventories in the previous year motivate medium size firms to extend trade credit in order to accelerate sales, but reduce the trade credit extended by SMEs due to their liquidity problems resulting from long inventory periods. A greater capability to meet the trade obligations with the sales margin earned reduces both large and small firms' demand for financing at the cost of suppliers. According to Huang, Shi and Zhang (2011), a greater profit accelerates the accounts payable period. A low profitability of sales, a long accounts payable period, a low creditworthiness and a long cash conversion cycle have all been proved to be good predictors of the trade credit usage.

The volume of net credit contracted is determined by the scale of the firm's business operations and the accounts receivable turnover ratio. A higher quick ratio reduces the inclination to contract net trade credit and the volume of net trade credit contracted, which is also reported by Marzec and Pawłowska (2011). The net trade credit volume contracted by medium size firms was reduced by the economic slowdown of 2002, the growth of competition in the EU (2005-2006), the credit boom of 2008 and the European debt crisis (2009-2010). The positive impact of monetary policy impulses sent via the interest rate channel and the foreign exchange rate channel on the inclination to contract net trade credit in the years 2006 and 2010 has been proved. SMEs' inclination to contract net trade credit increases together with their growth opportunities, which is also reported by Huyghebaert (2006). In large firms, a higher bankruptcy risk increases the net trade credit volume, while in medium size firms it reduces the tendency to contract net trade credit for fear of insolvency (see Bougheas, Mateut and Mizen (2009) for example).

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