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ABSTRACT

This paper investigates new dimensions in the demand for trade credit in the UK. Based on a unique dataset we are able to measure both the level and the depth of trade credit. We realise this by considering six different metrics for trade credit. We focus on the most prominent theories of trade credit, which is thus modelled as a function of financing, transaction cost, operating cost, and business environment. We find evidence that supports the financing and transaction cost theories only. The results suggest that the level and length of trade credit demanded are affected by the need for short-term finance, which implies that trade credit is used to complement or substitute other sources of finance. We also find that firms with higher credit risk tend to rely more heavily on trade credit. On the transaction cost theory side, we find a positive relation between inventory to total assets ratio and most of the trade credit metrics.

1. INTRODUCTION

Trade credit (henceforth TC) takes place when there is a time lapse between the supply of goods¹ and the full payment for them. It is an implicit short-term loan from non-financial suppliers to their clients. TC occupies a prominent place in the world of business and is one of the most important forms of credit available to businesses. Despite its widespread use, though, TC is one of the least researched financial instruments.

The use of TC depends on a firm's ability to purchase its goods on credit (Burkart, Giannetti and Ellingsen 2008). In the UK at least 80% of corporate sector transactions take place on credit (Wilson and Summers, 2002; Paul and Wilson, 2006; Paul and Boden, 2008). On average TC exceeds the primary money supply by a factor of two (Wilson, 2008) while the 'trade creditors to current liability' ratio exceeded 75% in 2004 (Paul and Wilson, 2007).² Wilson (2008) reports that the value of trade creditors in UK limited companies' balance sheets exceeded £59 billion in 2006. In the US, the size of TC supply exceeds the credit supplied by the entire banking system (Lee and Stowe, 1993) and "remains the single largest source of short-term business credit" (Berlin, 2003, p.21). Berlin (2003) also finds that accounts receivable in France and Italy amount to 29% of firms' total assets. TC is no less important in Eastern Europe owing to the restricted availability of bank finance. For example, the accounts payable to total liabilities vary between 21% in Hungary and 49% in Bulgaria (Delannay and Weill, 2004). For the same reason, private sector firms in China also rely heavily on TC (Ge and Qiu, 2006).

One characteristic that most distinguishes TC from alternative sources of finance is the fact that it is offered by non-financial entities and is tied to the purchase of goods. In contrast, specialist financial institutions may offer loans that are unrestricted and longer-term. However, there is an even more significant difference. While the actual cost of institutional credit remains close to the nominal cost, the cost of trade credit varies widely. In principal, TC is by far more costly than other forms of credit. Nilsen and Gerzensee (1999) find that if TC is extended beyond its duration it becomes very costly and thus an unattractive alternative source of finance. Moreover, in the US (where discounts for early payment are common) TC is becomes an expensive way of borrowing given the high explicit cost of forgoing discount offered (Ng, *et al.*, 1999). However, despite the cost, TC can be an attractive substitute for loans as it seems to lie 'readily at hand', especially if firms are faced with restricted bank credit availability (Atanasova and Wilson, 2003,

¹ We use goods to mean both goods and services.

² These figures are taken from the Creditscorer Ltd. database and cover the population of manufacturing companies (that filed their accounts with Company House, approximately 100,000 p.a.) over the period 1977 to 2004.

Petersen and Rajan, 1997). One surprising fact is that, in the UK, TC may actually be a cheaper form of finance.

Theorists posit that imperfections in product and capital markets cause financial institutions to limit the credit they offer to businesses. This induces firms to look for alternative financing options and they often turn to TC (Ferris, 1981; Emery, 1988; Chant and Walker, 1988; Elliehausen and Wolken, 1993; Petersen and Rajan, 1997; Summer and Wilson, 2000). Start-up, small and less collateralised businesses often find it either hard or too expensive to obtain funds from financial institutions (Wilson *et al.*, 1999; Bickers, 1994). For example, Black *et al.*, (1996) argue that the role of banks in the provision of small business finance seems to be closer to that of pawnbrokers than of venture capitalists. Thus, for some businesses, TC may become the only way to access short-term finance and it is often found to be ‘crucial for firms that are running out of bank credit’ (Burkart *et al.*, 2008). Similarly, Burkart and Ellingsen (2004, p.582) argue that “suppliers lend goods and banks lend cash” and explain that “this simple observation provide a coherent explanation for the existence of trade credit, even in competitive credit market and product markets”.

Theories of TC are relatively abundant (see Pike and Cheng, 2001, Wilson *et al.*, 1999, Wilson *et al.*, 2004, Paul and Boden, 2008). In terms of the use of TC, five theories are generally contemplated, namely financing, transaction cost, operation and business environment theories. Yet, there is little empirical evidence favouring one or the other of these theories (Paul and Boden, 2008). This paper attempts to fill this gap. Using a unique dataset of 355 UK companies, we investigate empirically the explanatory power of these theories with regard to TC as a short-term financing tool. Although the number of firms may not appear to be large, the richness of the information obtained and the proposed measurement of TC allow our dataset to make an important contribution to the understanding of TC, at least for the UK. Although not obvious, measuring the scale of TC is problematic. TC is reflected in both the level of credit (the amount purchased on credit) and the length of the credit period (the number of days taken before payment is made). Indeed, both amount and maturity of credit are integral parts of TC suppliers’ decision (Burkart *et al.*, 2008). Most existing empirical work on TC has measured it via a single dimension. In this paper, we relax the rigid definition of TC used in previous studies and use a variety of TC metrics to capture as many features as possible.

The remainder of this paper is organised as follows: Section 2 discusses existing theoretical and empirical work advanced to explain the use of TC as a source of short-term finance. Following this, in Section 3 we describe the data sample and provide evidence on the use of TC in the UK. We then use models that explore the main factors that determine firms’ use of TC. The final section offers some concluding remarks.

2 THEORIES OF TC

Because TC has peculiar features it is not surprising to find a relatively large number of theories trying to explain why it takes place despite the presence of a multitude of financing alternatives. Here we focus on the most prominent of these, namely financing, transaction costs, and asymmetry information theories. Three additional explanations for TC demand are operational considerations, firms' business environments and specific investment. We briefly review each of these theories in the following subsections.

2.1 Financing Theory

Financing theory states that TC demand depends on its implied interest rate and on the cost of alternative sources of financing. Like any other financing instrument, TC often comes at a cost and has substitutes. Financing theory thus assumes that the demand for a service depends on its cost and that of its substitutes. Indeed, common sense dictates that TC would not be taken if there were better and cheaper alternatives (Schwartz, 1974; Hutchinson and Ray, 1986; Smith, 1987). Therefore, a firm's ability to get TC depends on its access to other sources of funds and would only take it when it must (Burkart *et al.*, 2008). However, if capital is rationed, TC becomes an attractive source of finance even if it is costly (Petersen and Rajan 1997).

If TC comes with a higher cost, it should figure low in the list of preferred debt instruments (also known as the pecking order). However, although there is evidence that TC comes at a high cost in the US (Ng *et al.*, 1999), it is not so obvious in the UK, as discounts for prompt payment are not common practice. Our results show that although half of our respondents are offered a discount for early payment, only 20% always take it. This is consistent with Wilson and Summers (2002), who found that 17% of firms in their sample take such a discount. Burkart *et al.* (2008) find that the bulk of companies they studied seem to get trade credit at no cost. But if that is the case, this implies that TC comes at zero cost for at least half of our firms. Financing theory would be severely weakened as an explanation of TC. This is because, if TC is free, the demand for it will be infinite. Of course we would expect some kind of non-financial cost, such as the firm's reputation. Still, TC remains costly for half of our respondents. Those who are not taking early payment discounts are incurring higher costs. This in turn may give some role to financing theory explanation of TC.

Clearly, the empirical evidence is mixed. While the above studies suggest that a large part of TC in practice comes at no cost, and, hence, financing is not a consideration; there is another body of literature that point

to the contrary. For example, it has been found that firms that are able to generate funds internally may limit their demand for TC (Petersen and Rajan 1997; DeLoof and Jegers, 1996; Niskamen and Niskamen, 2006). Donaldson (1961) reports that US firms favour internal financing and Myers (1984) finds that, between 1973 and 1982, for non-financial firms, cash generated internally averages 62% of capital expenditure and most external funds are obtained through borrowing. On the other hand, rationed firms seek more TC, making it highly dependent on financing considerations. For example, among the types that have higher demand for TC are small firms (Nilsen and Gerzensee, 1999; Jain 2001), and low quality borrowers, especially during downturns (Atanasova and Wilson, 2003).

2.2 Transaction Costs Theory

The transaction costs theory is first proposed by Schwartz (1974), who suggests that TC helps reduce both transaction costs and the need for customers to hold high cash balances or convert liquid assets into cash. This is important in terms of the uncertainty of both when the cash is needed and the frequency of payments demanded; bills are accumulated in one transaction hence a reduction in transaction costs (Ferris, 1981). Moreover, firms that hold higher than average levels of inventory (relative to their size) have higher volumes of purchases, meaning higher volumes of transactions. This may lead to a greater use of TC to reduce transaction costs (Summers and Wilson, 1997). Mian and Smith (1992) find that cost advantages can arise from the fact that both goods and finance are supplied from a single source, lowering the costs compared with using different suppliers.

2.3 Operating Conditions

Supporters of this view hold that operational conditions within firms affect the demand for TC. The longer the production and sales cycle, the longer the firm has to wait for its cash. To fund such operations, firms usually turn to outside finance, including TC, which in turn is influenced by the length of the production cycle. So the demand for TC varies with the speed of activities and TC may offer more flexibility in accommodating such fluctuations than bank loans. Further, when faced with cash shortages, firms find it cheaper to delay payment than to renegotiate bank loans (Garcia-Teruel and Martinez-Solano, 2009).

Seasonality of a firm's demand may have an influence on TC used and the length of it. Buyers may adjust the volume/length of TC to deal with the fluctuation in the pattern of consumption of their goods (Paul and Wilson, 2007). Emery (1987) perceives TC as a financial response to variations in firms' demand for their goods. Thus, generous credit terms may be requested to deal with cash-flow problems when demand is off-season. Paul and Wilson (2007) find a strong relationship between TC decisions and seasonality of demand.

2.4 Asymmetric Information

An alternative explanation is that TC is the result of firms requiring time to inspect product quality (Long *et al.*, 1993; Ng *et al.*, 1999). The demand for TC and the length of time buyers take to pay may depend on how confident firms are about the quality of the goods they receive: the longer the period of credit, the greater the protection. Smith (1987) and Lee and Stowe (1993) argue that the seller may offer an early payment discount to make the buyer take on products risk at an earlier stage, since the shorter the inspection period, the less likely it is that product deficiencies is revealed. Their findings have subsequently been supported by other studies such as Long *et al.* (1993) and Deloof and Jegers (1996). However, if products quality is not easily ascertained, firms may expect to demand longer credit periods. So the ease of which the quality of goods can be ascertained affects the trade credit demanded.

2.5 Firms' Business Environment

There is a relationship between firms' business environment and the level of TC demanded. For instance, Smith (1987) finds a link between changes in macroeconomic conditions and demand for TC. During downturns, when firms' capabilities to generate funds from operation is limited or external funds are rationed, firms turn more to TC and even extend it further by delaying payment. When economic conditions improve, firms need more funds to finance investment opportunities (Niskamen and Niskamen, 2006). Smith (1987) argues that demand for TC changes with economic conditions and reports a direct link between TC terms offered and the price paid for goods. On the other hand, firms in certain sectors 'find it inherently easier to access trade credit' (Fishman and Love, 2003, p.354) and those operating in markets with fierce competition may use credit terms as a marketing tool to compete (Summers and Wilson, 2002). Furthermore, small, start-ups, less known, and/or growing firms may offer generous credit terms to attract more customers and thus, in turn, may expect to demand more credit to finance them (Paul and Wilson 2006).

2.6 Specific Investment

Marketing considerations mean that offering TC may be explained, at least partially, by the fact that suppliers compete in the market and may therefore need to use it for competitive advantage. Buyers may experience special treatment from sellers if they are seen to have potential for long-term relationships. Thus TC can be used as a marketing tool to strengthen existing customers-relations and/or attract new customers (Paul and Wilson, 2006). This can be achieved through the credit terms offered and/or the extension of existing terms when it is judged that customers are worth investing in with the aim of keeping them in business and thus generating future returns (Smith, 1987).

3 DATA AND METHODOLOGY

The data for this study were obtained from a survey questionnaire posted to 2500 UK firms. The sample frame was selected from a broad range of sizes and industry sectors in manufacturing, services, and construction. Respondent firms are located throughout the UK. The target firms were randomly selected from the credit reference agency, *Creditscorer*. The questionnaire gathered data on many areas of TC management and business performance. This information was then supplemented with formal accounting data on each of the responding firms.

The final sample consists of 355 fully completed questionnaires, a response rate of 14%. The resulting database was tested for non-response bias. The technique employed was to test for significant differences in the responses of early and late replies using t-tests on a range of characteristic variables. The results revealed no significant differences in the responses of the sub-samples. Moreover, we were able to compare the characteristics of respondents versus the mailing sample using accounting data. We conducted t-tests on size, sector, profitability and a range of financial ratios and were satisfied that response bias was not an issue.³

The main empirical model is a simple linear regression. TC is assumed to be linear in a number of independent variables

$$TC_i = \alpha_0 + \sum_{j=1} \alpha_j I_j + \varepsilon_i$$

Where: TC_i is the trade credit supplied to firm i , I_j is the j th independent variable, and ε_i is the disturbance term. Both TC and the independent variables are defined below. The model is estimated by ordinary least squares.

4 DEFINITION OF THE MAIN VARIABLES

In this section, we present a detailed discussion on the choice of the dependent and independent variables (a summary of all variables is given in Appendix A). Our choice of variables is informed by the work of Wilson *et al.* (1999), Elliehausen and Wolken (1993) and Chant and Walker (1988). The theories discussed in these papers are summarised in the previous section.

³ The results are available from the authors upon request.

4.1 Dependent Variables

Measuring the quantity of TC is somewhat problematic as there is no single metric that can fully reflect all its dimensions. TC has at least two dimensions, namely the level and the length of the credit. Most measures used in empirical studies focus on one or the other separately (Summers and Wilson, 2002 Paul and Wilson, 2006) but not the combination of volume *and* length of credit. Our first task, therefore, is to find a metric that is able to reflect both TC dimensions.

In this paper we use pure and combined measures. The following is a brief definition of each metric.

- **APTA:** the ratio of accounts payable in relation to the firm's total assets. It shows the extent of the use of TC as a source of finance. The higher this ratio the higher the use of credit in the sample.
- **PURCR:** the percentage purchases on TC. It varies from '0' for cash⁴ purchase to '100' for those that purchase all their goods on TC.
- **CRDAYS:** average number of creditor days.
- **DAYBDD:** days outstanding over and above the credit terms offered (late payment).
- **PURCR × CRDAYS:** measure the level and the (normal) length of TC. The unit for this measure would be £-days, so a firm getting that £1 for 2 days is the same as a firm getting £2 for 1 day.
- **PURCR × (CRDAYS + DAYBDD):** this encompasses the previous case and measures the 'total' credit (normal plus delayed).

The first metric, APTA, is obtained from the firms' accounts. While this metric is more objective, it suffers from the fact that it only reflects the TC situation at a specific point in time, namely the end of the accounting year. In our sample, APTA has a mean of 35% and a standard deviation of 0.297.

The remaining metrics are less objective than APTA, since they are based on the firm managers' perceptions. However, they have the advantage of reflecting the whole year since the respondents provided us with an 'average' estimate of their TC throughout the year. Moreover, these metrics provide us with different facets of TC, which enriches both data and analysis.

The volume of purchase on TC (PURCR) measures the relative amount of purchases made on credit. Our survey results show that 93% of respondents purchase over 80% of their goods on credit. This is substantial and reflects the findings of previous studies on the widespread use of TC (Pike *et al.*, 1998; Wilson and Summers, 2002).

⁴ 1.3% of the sample have 0% of purchases on credit against 60% that buy 100% on credit.

Although APTA and PURCR measure the level of TC, it fails to capture its length. The credit period is important as longer credits entail greater cost and are thus equivalent to higher levels of credit. For example, given the same amount, a two-day-credit is greater, and therefore more costly, than a one-day-credit. Thus, incorporating this metric (CRDAYS) in our study adds value and improves the measurement of TC. The empirical distribution of our sample shows three main peaks: 30 days, 31 to 45 days and 60 days. These variations may be related to whether the terms offered are days from the beginning/end of month, from invoice or from dispatch. Only 9% of the firms get less than 30 days credit, just under a third get the norm of 30 days while over half get over 31 days. The mean number of days is 45 while the range goes from 0 to a maximum of 110 days.

Credit can be extended even further if payment is delayed beyond the due date and thus, DAYBDD is yet another dimension of TC that the previous two measures fail to account for. In our survey, over 77% of the respondents admit to having paid up to two weeks after the due date. Although the mean is 15 days, the maximum delay in the sample is 120 days. Strictly speaking, delaying payment amounts to a default and should normally bring heavy penalties. UK firms have the right to charge an interest rate of 8% above the bank rate on any outstanding debts (the Late Payment of Commercial Debts (Interest) Act 1998, amended in 2000 and 2002). However, consistent with the peculiar nature of TC, late payment is very common in the UK, and such a widespread use indicates that payment delays rarely carry significant penalties (Paul and Boden, 2008). Better still, the true costs of credit is the one that combine level and length and our next 2 metrics capture both costs related to TC.

The remaining two metrics are combinations of PURCR, CRDAYS and DAYBDD. The first compound metric is the product of $PURCR \times CRDAYS$ and measures the compounded credit in terms of level and length. Its main weakness is its symmetry, that is, a 1 day £2 credit equals a 2 day £1 credit. This variable is superior to using PURCR or CRDAYS separately as it combines both potential costs related to the volume and the period of credit.

The last metric incorporates the delayed payment and adds the days beyond due date to the credit days: $PURCR \times (CRDAYS + DAYBDD)$. This is the most comprehensive measure, but may be a noisy measure because the cost of 'delayed' credit may be higher than normal credit. Since we do not have information on the cost of these delayed payments, the conclusions drawn from such a measure should be used with caution.

4.2 Independent Variables

Following our previous discussion, we relate a number of explanatory variables to the various theories that have been advanced to explain TC. In this subsection, we first present the moderating variables used in this study, namely the cost of TC and financing problems, firms that are unable to obtain sufficient institutional finance are likely to use trade credit when available, (Wilson, 2008; Petersen and Rajan, 1995). We then summarise variables related to five theories, namely financing, transaction cost, asymmetric information, specific investment, operation and the firm's business environment.

4.2.1. Moderating Variables

The first, and perhaps most important, of these moderating variables is the cost of credit (DISCOFFER). Like other forms of credit, we expect TC to come at a cost. The cost of TC is therefore expected to be inversely related to the level of TC used. However, this may not be so obvious. One reason is that the cost is indirect and comes in the form of a discount. So firms may not perceive it as real cost, and may forgo the discount as a matter of habit. Indeed, more than 60% of the respondents 'agree' or 'strongly agree' that it is cheaper to finance purchases through TC than to obtain finance elsewhere. This perception may reflect the practical difficulty in obtaining other forms of short term finance. But it may also reflect companies' heavy downgrading of the value of savings they could achieve by taking up the discount offered. Moreover, we find that a large proportion of our respondents are offered no discount at all, in which case TC is indeed cheap and even free source of finance in many cases. We proxy the cost of TC by the percentage of suppliers that offer a discount (DISCOFFER) to the respondents.

An important reason why firms have recourse to possibly costly TC is credit rationing. High levels of credit rationing gives firms strong incentive to either 'lobby' their suppliers for TC and/or accept high TC cost. This second moderating variable is proxied by the difficulty in obtaining bank finance (DIFFINBK). This variable measures the extent to which firms are rationed. Dummy variables are used to indicate whether firms are facing difficulties in obtaining finance (1) or otherwise (0). One would expect the use of TC to increase with the existence of credit rationing. Preliminary results of our survey show that more than 32% of respondents 'agree'/'strongly agree' that TC is used to fill gaps when other sources of finance are rationed. Also, more than 50% 'agree'/'strongly agree' that TC is an alternative source of finance. We therefore expect this variable to be positively correlated with TC use.

4.2.2. Financing Theory

TC can be used as one of the many short-term finances to substitute/complement other sources of funds. Using principal component analysis, 11 variables dealing with this question are reduced to 4 factors, as

shown in Panel A of Table 1. These factors are: F1 (short-term loans seekers), F2 (trade credit seekers), F3 (sophisticated sources seekers) and F4 (factoring seekers). The factors are selected on the basis of maximum factor loading(s). The aim of this principal component analysis is to capture the extent to which different sources of finance are sought by firms in the sample when they need to raise funds and to analyse their reliance on short/medium-term finance. The four extracted factors account for 55.937% of the cumulative variance with satisfactory communalities for all the variables.

The varimax rotated factor loadings in Panel B of the table show variables clustering as predicted. F1 accounts for 20.977% of the variance and measures the extent to which firms seek short-term loan. Variables that loaded heavily measured secured medium-terms bank loans and bank overdraft. F2 represents companies seeking TC and accounts for 14.214% of the variance with TC demanded and invoice discounting attracting the heaviest loadings of 0.790 and 0.780 respectively. The factor measuring sophisticated sources (F3) has its highest loading on commercial paper and venture capital. Although factoring (F4) accounts only for 9.394%, it attracts the heaviest loading of 0.874. As expected, the principal component analysis confirms that our respondents seek more short/medium-term institutional finance as reflected in these high factor scores. These factor scores are used in the multivariate analysis to see if any of them influence TC use decisions.

[Table 1 about here]

Risk aversion implies that suppliers will offer less credit to more risky customers. It is thus expected that the supply of TC may be related to business risk. In practice, however, it is not clear whether business risk is high enough to affect TC. One obvious reason is the long term relationship between suppliers and customers. Nevertheless, for completeness, we include three variables that measure business risk. These are credit score, ownership of the company (OWNDIREC), and the number of years a firm has been in business (YEARSEPP).

The first variable measures the firm's creditworthiness (CREDScore). Firms with low credit scores may be associated with a high default risk and thus may be rationed by financial institutions and are more likely to use TC (Summer and Wilson, 1997). Financing theory posits that sellers⁵ step in to fill the financing gap (complementary effect) by offering TC to those that are rationed with the aim of building a long-term relationship and benefiting from future revenues from sales. Moreover, buyers that are rationed see TC as an alternative (supplementary effect) way to finance their inventory (Petersen and Rajan 1997). This variable ranges from '0' indicating high risk, to '100' virtually no risk. We expect firms that have a low

⁵ This is partly because sellers have more information or different time horizon from banks.

credit score, and that are thus unable to access funds, to turn to TC as a source of finance. In our survey more than 44% of respondents 'agree'/'strongly agree' that credit ratings determine their demand for trade credit. Hence, we expect this variable to be negatively associated with TC use.

The second risk variable is firm ownership. Owner-managed firms are more likely to be smaller and take on risky projects, thus their business risk may be higher. This could imply lower levels of TC. However, firms with higher perceived business risk are less likely to attract institutional finance. Moreover, given a choice these firms would rather not use sources of finance that dilute their ownership and thus would see TC as an attractive source of finance that is readily available (Paul and Wilson, 2006). So, while owner-managed firms may be more risky, they may also exercise pressure on suppliers to offer them more TC. Clearly, the direction of relationship between TC and business risk could go either way. This variable takes a value of '1' if the firm is mainly owned by its current directors and '0' otherwise.

The third business risk variable is the firm's age. This also has no clear direction. Well established firms usually have lower business risk and are therefore expected to have easy access to institutional finance. So their use of TC may be lower and, following that logic, we expect the number of years in business YEARSEPP to be negatively correlated with the dependent variables. On the other hand, established firms are more likely to be creditworthy and hence can obtain TC relatively easily (and cheaply if discount is offered), so this variable also can have a positive effect on TC.

4.2.3. Transaction Cost Theory

TC reduces transaction costs and removes uncertainty associated with cash purchases. The first variable used under this theory is inventory to total assets (INVENTORYTA). This is used as a proxy for the volume of transactions on credit. Higher inventory level implies higher use of TC. The second variable is the uncertainty of transaction. This is measured by the number of active suppliers (NASUP) and is a proxy for the frequency of transactions; a high value for this variable reflects high purchases and thus a high number of transactions. In the absence of TC, each transaction is paid for separately and consequently this increases bank charges and the degree of uncertainty. Furthermore, the higher the volume of transactions, the more uncertainty the firm faces and the higher its reliance on TC. Hence, we expect both variables to be positively correlated to TC.

4.2.4. Operating Conditions and Information Asymmetry

Operating condition is measured by firms' seasonality of their goods. If firms have seasonal patterns they often hold high inventory and/or adjust their production rate to cope with peak seasons to prevent the cost

of running out of inventory. Consequently, this is likely to increase firms' holding costs⁶ and thus increase their use of TC to finance the inventory. SEASDEM is expected to be positively correlated with our dependent variables. Firms that consider product quality important, when choosing suppliers may demand credit to have enough time to allow them to inspect the goods to ensure that they comply with their expectations (asymmetric information). PROQUSPP is used as a proxy for the extent to which products quality is an important factor in the choice of suppliers. We expect this variable to be negatively correlated with TC use.

4.2.5. Firm's Trading Environment Theory

Firms that operate in a market where credit is the norm have no choice but to adhere to that if they are to stay in business (Paul and Wilson, 2006). If they have to offer credit then they are very likely to demand it in order to balance out their short-term finance. Our descriptive statistics show that over 38% of our respondents operate in markets that are dominated by large buyers while only 13.7% operate in a market that is generally characterised by small buyers. The bargaining power of markets dominated by large buyers tends to result in offering generous TC terms. If that is indeed the case, then these firms are more likely to demand more credit for longer periods to finance their customers' inventory. This theory is represented by two variables. First, SIZEBUY, which is the size of buyers of product in the market and is used as a proxy for the firm's bargaining power. This variable is expected to be positively correlated with TC. The second variable, ARTA (accounts receivable to total assets), is used as a proxy for the amount of trade debtors in the company. It is expected that firms that invest in trade debtors (and thus have a high ratio of ARTA) are more likely to have a high value of trade creditors as they demand more credit to compensate for the TC they offer to their customers. We therefore expect ARTA to be positively correlated with TC.

4.2.6. Specific Investment

There is one variable for this theory. PREFCRED is used as a proxy for the extent to which firms receive preferential credit terms from their suppliers with whom they have a long-term relationship. It takes the value of '0' for the lowest preferential treatment to '8' for the highest level of preferential credit terms. This variable is obtained as a combination of two other variables. Firms are asked whether they receive preferential credit terms from suppliers for whom they are large customer or with whom they had long term relation. Both of these questions are on a scale of '0' to '4'. Our proxy is obtained by simply adding the two

⁶ Paul and Wilson (2006) argued that if firms hold high inventories, they may have to offer generous TC to shift the inventory and reduce this cost.

responses to capture the size and length of relationship. It is readily seen that preferential terms would be positively correlated with TC use.

5 RESULTS

5.1 Volume of Trade Credit.

The first two simple metrics considered are the percentage of goods purchased on credit (PURCR) and account payable to total assets (APTA). Both reflect the volume of purchase on TC. The regression results are shown in Table 2. It is apparent that the two metrics measure different properties of TC. PURCR has two significant factors while APTA has six. In addition, only one factor (F2) is common to both metrics.

PURCR is strongly explained by two of the four financing theory factors (F2 and F4). However, F4 displays a negative sign suggesting that firms only use factoring when they have exhausted all other forms of short term finance. This is supported by our survey which shows that only 10% of respondents claim to ‘always’ use factoring. PURCR is clearly not explained by the other four alternative theories. All coefficients associated with these theories are statistically insignificant.

APTA appears to be explained by an almost completely different set of variables. The only variable shared with PURCR is the second financing theory factor (F2). The first factor (F1) is highly significant, and the negative sign suggests that firms that cannot have access to other short/medium term loans turn to TC. The second factor (F2) is also highly significant and has a positive sign, implying that TC is used to fill financial gaps.

Consistent with the financing theory, companies’ financial risk, credit score, is negatively correlated with APTA implying that firms with a high financial risk are more likely to have a high level of creditors compared with their total assets. Such firms may face credit rationing thus are more likely to turn to TC from their suppliers that play the intermediary role of financing them (helping hand). However, the other two risk variables are insignificant, possibly due to the fact that credit score implicitly accounts for these two aspects of business risk.

Besides being strongly explained by financing theory, TC is also partially explained by transactions cost theory, firm’s business environment theory and specific investment theory.

Transaction cost theory is supported by a positive and highly significant relationship between the inventory to total assets ratio and APTA. This is consistent with the transaction cost theory, which posits that firms with high inventory levels relative to their size tend to have a relatively higher volume of purchases and so are more likely to demand more TC. The firm's business environment theory is confirmed by a positive and highly significant coefficient for 'trade debtors to total asset' variable. This implies that firms with large trade debtors (relative to their total assets) need to find a source to finance the extra goods that are offered on credit. Firms have the choice of seeking funds from financial institutions or their suppliers; our result suggests that our respondents turn to TC rather than other sources.

Although the specific investment theory appears to explain APTA, it does not show the expected behaviour. The preferential credit terms variable shows a negative coefficient, suggesting that a long-term relationship seems to give grounds for obtaining less TC rather than more. This may be explained by the fact that firms that have been dealing with the same suppliers for a long time are more likely to have confidence in the quality of their products. Thus, they do not need the level of credit required by newer customers who may be unfamiliar with the products' quality and so the former's demand for TC is more likely to be lower.

[Table 2 about here]

5.2 Length of Trace Credit.

The second set of metrics relate to the length of TC. These are 'credit days given' (CRDAYS) and 'days beyond due date' (DAYBDD). The regression results are presented in Table 3.

At a first glance there does not seem to be much explanatory power in these two regressions given that CRDAYS only has one significant variable (with an R-squared of 26%) and DAYBDD has two significant variables only (with a marginally better R-squared of 28%).

The first significant variable is the importance of quality of goods, which is highly associated with CRDAYS. This suggests that firms that consider product quality as an important factor when choosing between suppliers are more likely to ask for longer credit periods. This is consistent with theoretical expectations. Clearly, the operating theory is the only plausible explanation for the length of TC as represented by the number of credit days.

Another important dimension of the length of TC is late payment. Late payment has been largely ignored in the empirical literature on TC despite the fact that it extends the maturity of the credit. Late payment is a real problem in the UK as many firms pay well beyond the due date. Burkart *et al.* (2006, p.27) confirm that

“Firms that fear to be denied other loans ... pay a larger fraction of their trade credit late and are more likely to pay after the due date”. In our sample, only 13% of respondents claim that they have ‘never’/‘rarely’ paid their suppliers late while over a quarter ‘always’ do so. Thus, one can extend the length of TC by simply delaying payment, and most firms in the UK do so. Moreover, most of these delays end up not being penalised (Petersen and Rajan, 1997; Wilner, 2000, Cuñat 2007).

The results for DAYBDD highlight the additional explanations to the length of TC offered by both financing and transaction costs theories. On the financing theory side, the second factor (F2) is significant and positive, suggesting that TC seekers tend to extend their TC beyond the due date more than others. The second significant (at the 7% level) financing theory variable is credit score. The negative coefficient suggests that more creditworthy firms tend to delay payment relatively less compared with other firms. There is also some weak evidence that transaction costs theory explains TC length. The coefficient of inventory to total asset ratio is positive and significant at the 10%. This suggests that firms with high level of purchases leading to high inventory tend to pay over and above the agreed terms.

Thus, while the normal length of TC is partially explained by the operating theory, the delayed TC is partially explained by the financing theory and, to some extent, by the transaction costs theory.

[Table 3 about here]

5.3 Combined Measures of Trade Credit

The previous dependent variables measure either the volume or the length of TC. However, a better measure would combine both elements of TC to assess how much credit is taken and for how long. So the next two measures reflect a broader definition of credit. The product of the volume and length of TC captures both dimensions. For example, one can get a £10 credit for 1 day while another can get a £5 credit for 4 days. In such a case, only the product of the two figures would provide us with a good discrimination of the value of the two credits. A limitation of this measure is symmetry as we consider that £1000 for a day is equivalent to a £1 for 1000 days. However, given that our data does not contain such extremes, this limitation is unlikely to affect the results.

The results for the simple combination, $PURCR \times CRDAYS$, and the extended combination, $PURCR \times (CRDAYS+DAYBDD)$, are shown in Table 4. A first comparison between the simple and long combinations shows that the latter has one more factor explaining TC. The R-squared for the extended version has 3% more explained variation than the simple combination. This gives credence to the inclusion of the delay in payment as an important part of TC. Both measures are significantly influenced by the

second financing factor (F2), suggesting that large amount of TC is sought for as long as possible and even after the normal due date. The extended combination is further affected by credit score. The negative coefficient implies that firms with high credit score have relatively lower measures of TC. However, given that the previous results involving PURCR and CRDAYS on their own showed no significant credit score, and given that this same variable was significant under the simple DAYBDD model, the effect found here is probably associated with DAYBDD. In other words, the negative coefficient of credit score suggests that less risky firms tend to pay earlier compared with other, more risky, firms.

Both simple and extended combinations are also partially explained by transaction costs theory. The inventory to total asset ratio has a significant coefficient in both cases. The positive coefficient suggests that firms with high levels of inventory demand longer credit periods and even over and above the agreed terms. This is consistent with transaction cost theory. Thus, in this extended version of TC two theories appear to explain the pattern of TC, namely financing and transaction costs theories.

[Table 4 about here]

6 DISCUSSION OF RESULTS

A general picture emerges from the various regressions. It seems natural that different definitions of TC lead generally to different explanations. However, if we take the whole set of results we can see a clearer picture as to which theories dominate. A summary of the regression results, showing the significant cases as well as the direction of association is given in Table 5.

It seems clear that the strongest theory is the financing theory with two variables influencing TC, namely F2, which is positively related to TC, and credit score, which is negatively related to TC. F2 is strongly significant in 5 out of the six definitions. This implies that TC is considered by our respondents as a cheaper way of financing their purchases as suggested by some who consider TC as one of the many short-term sources of finance to substitute/complement other sources of funds. F1, short/medium-term loan, is only associated with APTA but attracts a negative sign meaning that when firms cannot have access to other short-term finance they turn to TC. Furthermore, F4 (negative association) is only significantly correlated with PURCR, implying that other sources of finance may be sought and respondents tend to avoid factoring (F4). Credit score is significant in half of the models, implying that firms' creditworthiness plays a major role in their demand for TC.

The second most important theory appears to be operating cost theory. This theory explains four of the six measures of TC, all of which are positive. The remaining three theories are weak, only managing to explain a fraction of TC. Specifically, the operating cost theory explains CRDAYS, while the business environment theory and the specific investment theory explain APTA.

Two important conclusions are easily drawn from our results. The first conclusion is that the financing theory is by far the best explanation of trade credit, at least in our sample. The explanatory power of this theory possibly stems from a combination of two main variables: the lack of finance available from alternative sources, and low to zero cost of TC. While the first variable is apparent in our four factors and credit score, the second variable is not obvious. But our survey data do reveal the existence of zero cost TC in the UK. This is also confirmed by the findings of Burkart *et al.*, (2009).

The second conclusion is the importance of an appropriate and comprehensive definition of TC. Our findings show that the question as to which theory explains TC is dependent upon which definition of TC we use. For example, a study that proxies TC by CRDAYS would conclude that only the operating cost theory matters. On the other hand, another study that uses APTA instead would conclude that four of the five theories explain TC. By extending the definition of TC and taking a holistic approach we reach a different conclusion.

[Table 5 about here]

7 CONCLUSION

This paper has examined the relevance of some of the most important theories of TC use as a source of short-term finance. Most previous work has focused on a simple TC metric that essentially measures the level of credit, namely Accounts Payable to Total Assets (APTA). A few studies examined another simple metric that measures the length of credit, namely credit days. In this paper, we emphasise the potential gain that can be obtained through considering both the length and level of credit simultaneously. We contribute to the literature by considering a number of metrics that combine several TC dimensions.

Most of the existing empirical studies of TC are based on US data. This study contributes by looking at a sample of UK firms. A further contribution of this paper is testing five important theories of TC. We know of only one previous study that has tested these theories jointly. However, our work differs from theirs in that we use combined metrics, and are therefore able to benefit from the holistic view of our results.

Overall, we find evidence that support the financing and the transaction costs theories only. This suggests that the use of TC is largely influenced by short-term needs. The other theories are only weakly supported by our data.

This study has several limitations. First, the sample used in this study is relatively small. Therefore, any generalisation should be carried out with caution. The reason for our small sample is the attempt to collect a richer data set directly from firms. This has led to a small response rate. Future studies should attempt to increase the response rate by reducing the number of information requested from firm managers. Another limitation is that we do not relate TC to firm characteristics, such as size and sector. Although the size and sector information are available to the authors, the sample size is such that if we were to divide the sample into size quintiles, there would be too few firms in the bottom quintile. This issue can be solved easily by obtaining a larger sample.

This study focuses on the use for TC of a given firm. Our results show that ‘trade debtors to total asset ratio’ is a strong predictor of APTA. This is not unusual since those who give more TC tend to need to ask for more. An interesting venue for future research, therefore, would be to examine the interaction of TC used by a given firm with the TC supplied by that same firm.

APPENDIX A

Summary of Dependent and Independent Variables.

Name	Definition	Value range
Dependent Variables		
PURCR	Percentage of goods purchased on credit	0 – 100%
APTA	Account payable to total assets	0 – 1.65
CRDAYS	Credit days given	2 – 331
DAYBDD	Days beyond due date	2 – 623
Moderating Variables		
DISCOFFER	Cost of Credit (proportion of suppliers offering early discount)	0 – 100%
OWNDIREC	Firm is own managed	1 if firm is owned managed, 0 otherwise
YEARESEPP	Years in business	0.5 – 300
DIFFINBK	Difficulty Obtaining Finance for Day-to-day Operation	1 for yes, 0 for no
Financing Theory		
F1STLOAN	Short/medium Term Loan	-1.37 – 4.67
F2TCRED	Trade Credit Demanded	-2.35 – 4.63
F3SOPH	Sophisticated Sources	-1.19 – 5.34
F4FACTOR	Factoring	-3.85 – 4.91
CRDESCORE	Creditworthiness (Credit Score)	0 (high risk) – 100 (no risk)
Transaction Cost Theory		
INVENTORYTA	Inventory to Total Asset Ratio	0 – 0.65
NASUP	Number of Active Suppliers	1 – 34000
Operating Theory		
DSEAS (SEASDEM)	Seasonality of Product	1 if product is seasonal, 0 otherwise
DQUAL (PROQUSPP)	Product Quality Important Factor in Choosing Suppliers	1= important , 0 = unimportant
Firm's Business Environment Theory		
DSIZE (SIZEBUY)	Market Sector Dominated by Large Buyers of your product	1= yes, 0= no.
ARTA	Trade Debtors to Total Assets Ratio	0 – 0.99
Specific Investment Theory		
PREFCREDIT	Preferential Credit terms from Suppliers	0 = never ... 8 = always

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Table1. Factor Analysis of Firms' Seeking Short and Medium Term Finance.

Panel A: Rotated Factor Matrix				
Source of Finance	Factor 1	Factor 2	Factor 3	Factor 4
Bank Overdraft	0.638	0.126	-0.122	0.122
Secured Short-terms Bank Loans	0.523	-0.121	0.005	0.262
Secured Medium-terms Bank Loans	0.711	-0.022	0.107	-0.022
Commercial Mortgages	0.558	0.108	0.000	0.098
Leasing/HP	0.540	0.511	0.042	0.118
Invoice Discounting	0.011	0.780	0.071	0.166
Trade Credit Demanded	0.082	0.790	0.173	-0.010
Commercial Paper (Bonds)	0.182	-0.252	0.709	0.423
Venture Capital	0.35	0.189	0.700	0.013
Group Funds	-0.158	0.225	0.629	-0.160
Factoring	0.026	0.181	-0.036	0.874
Panel B: Factor Variance Contribution.				
Factor (F)	Eigenvalues	% of Variance	Cumulative %	
F1 - Short-term loans	2.308	20.977	20.977	
F2 - Trade Credit Demanded	1.563	14.214	35.191	
F3 - Sophisticated sources	1.249	11.352	46.543	
F4 - Factoring	1.033	9.394	55.937	

Rotation Method: Varimax with Kaiser Normalisation

Table 2. Regression Results for Volume of TC.

	PURCR		APTA	
	Coef.	p-value	Coef.	p-value
Moderating Factors:				
Constant	0.250	0.689	-0.145	0.732
Cost of Credit (DISCOFFER)	0.334	0.557	0.332	0.392
Financing Theory:				
Short/medium Term Loan (F1)	0.011	0.909	-0.155	0.016
Trade Credit Demanded (F2)	0.183	0.059	0.146	0.028
Sophisticated Sources (F3)	0.154	0.158	0.100	0.179
Factoring (F4)	-0.190	0.035	-0.068	0.266
Credit Score (CRDESCORE)	-0.002	0.761	-0.016	0.000
Firm is own managed (OWNDIREC)	0.088	0.662	0.081	0.553
Years in business (YEARSEEPP)	0.002	0.351	0.001	0.630
Difficulty Obtaining Finance (DIFFINBK)	0.007	0.984	-0.095	0.686
Transaction Cost Theory:				
Inventory to Total Asset Ratio (INVENTORYTA)	-0.188	0.740	1.563	0.000
Number of Active Suppliers (NASUP)	0.000	0.368	0.000	0.630
Operating Theory:				
Seasonality of Product (SEASDEM)	-0.148	0.419	0.001	0.993
Product Quality (PROQUSPP)	-0.266	0.401	-0.223	0.286
Firm's Business Environment Theory:				
Market Sector Dominated by Large Buyers (SIZEBUY)	-0.334	0.231	-0.048	0.799
Trade Debtors to Total Assets Ratio (ARTA)	-0.204	0.670	3.119	0.000
Specific Investment Theory:				
Preferential Credit terms from Suppliers (PREFCREDIT)	0.035	0.382	-0.058	0.031
R-squared	0.10		0.52	

Table 3: Regression Results for Length of TC.

	CRDAYS		DAYBDD	
	Coef.	p-value	Coef.	p-value
Moderating Factors:				
Constant	0.057	0.938	0.000	1.000
Cost of Credit (DISCOFFER)	-0.489	0.433	-0.256	0.476
Financing Theory:				
Short/medium Term Loan (F1)	-0.150	0.142	0.004	0.950
Trade Credit Demanded (F2)	0.033	0.753	0.124	0.043
Sophisticated Sources (F3)	-0.058	0.558	0.029	0.648
Factoring (F4)	-0.144	0.222	-0.071	0.326
Credit Score (CRDESCORE)	-0.008	0.187	-0.007	0.062
Firm is own managed (OWNDIREC)	0.135	0.532	-0.023	0.866
Years in business (YEARSEEPP)	-0.001	0.725	0.002	0.290
Difficulty Obtaining Finance (DIFFINBK)	-0.115	0.773	-0.267	0.242
Transaction Cost Theory:				
Inventory/Total Asset Ratio (INVENTORYTA)	0.540	0.408	0.689	0.084
Number of Active Suppliers (NASUP)	0.000	0.636	0.000	0.822
Operating Theory:				
Seasonality of Product (SEASDEM)	0.032	0.866	-0.087	0.461
Product Quality (PROQUSPP)	1.056	0.001	0.232	0.255
Firm's Business Environment Theory:				
Market Sector Dominated by Large Buyers (SIZEBUY)	0.213	0.595	0.014	0.950
Trade Debtors to Total Assets Ratio (ARTA)	0.318	0.545	0.500	0.129
Specific Investment Theory:				
Preferential Credit terms from Suppliers (PREFCREDIT)	-0.016	0.725	0.011	0.691
R-squared	0.26		0.28	

Table 4. Regression Results for Combined TC.

	PURCR × CRDAYS		PURCR × (CRDAYS+DAYBDD)	
	Coef.	p-value	Coef.	p-value
Moderating Factors:				
Constant	-0.047	0.956	0.118	0.896
Cost of Credit (DISCOFFER)	-0.765	0.298	-0.462	0.526
Financing Theory:				
Short/medium Term Loan (F1)	-0.090	0.458	0.000	0.999
Trade Credit Demanded (F2)	0.223	0.072	0.289	0.021
Sophisticated Sources (F3)	0.028	0.814	0.121	0.352
Factoring (F4)	-0.214	0.123	-0.204	0.169
Credit Score (CRDESCORE)	-0.010	0.152	-0.015	0.065
Firm is own managed (OWNDIREC)	0.008	0.975	0.006	0.982
Years in business (YEARSEEPP)	0.001	0.636	0.003	0.392
Difficulty Obtaining Finance (DIFFINBK)	-0.353	0.455	-0.458	0.322
Transaction Cost Theory:				
Inventory/Total Asset Ratio (INVENTORYTA)	1.305	0.092	1.531	0.059
Number of Active Suppliers (NASUP)	0.000	0.505	0.000	0.762
Operating Theory:				
Seasonality of Product (SEASDEM)	-0.262	0.249	-0.195	0.415
Product Quality (PROQUSPP)	0.674	0.094	0.570	0.169
Firm's Business Environment Theory:				
Market Sector Dominated by Large Buyers (SIZEBUY)	0.036	0.939	0.005	0.992
Trade Debtors to Total Assets Ratio (ARTA)	0.236	0.701	0.803	0.228
Specific Investment Theory:				
Preferential Credit terms from Suppliers (PREFCREDIT)	0.068	0.204	0.026	0.651
R-squared	0.27		0.30	

Table 5. Summary of Significant Influences of Theories.

	PURCR	APTA	CRDAYS	DAYBDD	P*C	P*(C+D)
Financing Theory:						
Short/medium Term Loan (F1)		-				
Use of Trade Credit (F2)	+	+		+	+	+
Sophisticated Sources (F3)						
Factoring (F4)	-					
Credit Score (CRDESCORE)		-		-		-
Transaction Cost Theory:						
Inventory to Total Asset Ratio		+		+	+	+
Number of Active Suppliers						
Operating Cost Theory:						
Seasonality of Product (SEASDEM)						
Product Quality (PROQUSPP)			+			
Firm's Business Environment Theory:						
Market Sector Dominated by Large Buyers (SIZEBUY)						
Trade Debtors to Total Assets Ratio (ARTA)		+				
Specific Investment Theory:						
Preferential Credit terms from Suppliers (PREFCREDIT)		-				