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The determinants of trade credit use: the case of the Tanzanian rice market

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Most small businesses in the developing economies suffer from a lack of access to formal external finance. One important alternative source of finance for these entrepreneurs is trade credit. Applying a unique data-set containing data on specific trade relations between rice wholesalers and rice retailers in Tanzania, we analyse the determinants of trade credit demand and supply in this market, using a simultaneous equation modelling approach. The analysis shows that while the demand for trade credit is primarily determined by the extent to which retailers need external funds, supply is mainly driven by wholesalers' incentives to attract and keep clients. Moreover, wholesalers' willingness to provide credit increases if they have better information about the possibility that the customer will fail to repay the credit.

Keywords: trade credit; disequilibrium model; rice market; Tanzania

JEL Classification: L12; L14

I. Introduction

Research has acknowledged that small businesses play an important role in the private sectors of countries around the world; at the same time, it has also been acknowledged that these businesses usually are confronted with lack of access to external finance (Beck and Demirguc-Kunt, 2006). They are particularly excluded from having access to finance from

formal financial institutions such as commercial banks. Consequently, they try to meet their financial needs by deploying alternative sources.

Trade credit (in terms of delaying payments) is an important source of alternative finance used by small businesses, especially in the developing economies (Fafchamps, 2000; Fisman and Raturi, 2004). We do not exactly know what triggers the use of this type of finance, however. Several studies have analysed the

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determinants of the use of trade credit (see, e.g. Petersen and Rajan, 1997; Giannetti *et al.*, 2011). These studies have looked at either determinants for supply of or demand for trade credit, using reduced form estimation models. This makes it difficult to establish whether determinants are linked either to trade credit supply, to demand or to both. To disentangle the impact of supply and demand factors, we need a simultaneous equation modelling approach, in which demand and supply of trade credit are jointly determined (Petersen and Rajan, 1997). To the best of our knowledge, no study has followed such an approach, because data for both sides of the trade credit market simultaneously are very difficult to collect.

In this article, we aim at disentangling the determinants of the use of trade credit by small business actors. We collect data on business transactions from firms active in the rice sector in Tanzania. Given that it is very difficult to collect data that allow for such an analysis, we argue that focusing on one sector and one country is justified. In particular, to be able to identify the determinants of supply and demand, we have created a unique data-set containing detailed information at the transaction level on specific trade relations between rice wholesalers and rice retailers. Using this data-set allows us to simultaneously analyse the determinants of trade credit demand and supply in this market. Such an analysis is important, because it allows us to get a better picture of the relevance of trade credit as a source of external finance and of the determinants on both sides of business transactions that lead to the use of trade credit in an emerging economy such as Tanzania.

The Tanzanian rice market is an interesting case to analyse the determinants of trade credit, because: (1) trade credit is used in many rice trade transactions, (2) both wholesalers and especially retailers have difficulties getting access to bank loans, (3) the rice market has become very competitive since the liberalization policies of the government in the 1990s (we will argue that competition is an important determinant of trade credit supply), and (4) the formal enforcement of financial contracts is difficult due to the country's underdeveloped legal structure (we will argue that the absence of formal rules has repercussions for the use of trade credit).

We use a structural modelling approach to disentangle the supply and demand effects. In particular, our approach allows for market disequilibria; that is,

demand does not necessarily have to be equal to supply. We find that while the demand for trade credit is primarily determined by the extent to which retailers need external funds, supply is mainly driven by wholesalers' incentives to attract and keep clients. Moreover, wholesalers' willingness to provide credit increases if they have better information about the possibility that the customer will fail to repay the credit. The article makes a contribution to the literature in that it shows which demand-side factors determine whether small businesses are looking for trade credit, while at the same time it points at supply-side conditions that increase the probability that this type of firms is able to use trade credit as a source of external finance.

II. Determinants of the Use of Trade Credit

Several papers discuss the reasons for the supply of trade credit. First of all, a substantial part of the literature suggests that suppliers provide trade credit, because they have a comparative advantage over banks in offering credit to customers (Biais and Gollier, 1997; Nilsen, 2002; Burkart and Ellingsen, 2004). Decisions to provide credit are determined by the extent to which asymmetric information exists between lender and borrower with respect to the repayment of the loan. Lack of information on the creditworthiness of the borrower reduces the willingness to lend. Petersen and Rajan (1997) discuss the advantages suppliers of goods have as compared to financial institutions when it comes to providing credit. To begin with, these suppliers have an advantage in acquiring information about the creditworthiness of the customer through regular trading relations and the regular ordering of goods and by visits made to the customer. These contacts with the customer enable the supplier to better monitor his/her repayment behaviour of the customer. Banks usually are not able and/or willing to monitor their clients on such a regular basis. Moreover, the supplier is better able to reduce the risk of nonrepayment as defaulting by the customer may endanger his/her future delivery of goods from the supplier. The threat of banks to cut off access to future loans is usually less effective. Finally, in case of default, the traded goods can be used as collateral by seizing these goods and resell them to another

customer. In most cases, small businesses do not have collateral that is acceptable to banks.

The essence of the above arguments is related to the extent to which the supplier has information about the customer's creditworthiness. Developing long-term relationships may be one essential feature in this respect. Experiences in the past provide suppliers with knowledge about the reliability of the customer (Giannetti *et al.*, 2011), the nature of their activities and the likelihood of moral hazard (Aaronson *et al.*, 2004). Aaronson *et al.* (2004) and Fafchamps (2000) argue that a supplier may also have more information about the customer if he/she is able to draw information from family, religious and/or ethnic networks in which information about customers is shared. Finally, some authors stress that suppliers are willing to use trade credit more frequently if the transaction with their customers is made frequently (Petersen and Rajan, 1997; Summers and Wilson, 2002; Fisman and Raturi, 2004). Under these circumstances, access to information about the customer will be better, the threat of nondelivery of goods in the future is more powerful, and seizing and reselling traded goods will be easier.

A second argument used to explain why suppliers provide trade credit to their clients stresses the role of trade credit as a marketing instrument. Especially young and/or growing firms may need to establish their reputation vis-à-vis potential customers, and offering trade credit may be an efficient way to do this and attract new customers (Summers and Wilson, 2002).

Finally, some authors argue that competitive pressure in the market may be a reason for offering trade credit (Cheng and Pike, 2003). In an environment with many suppliers, customers may easily switch (Fisman and Raturi, 2004). Providing trade credit can be an instrument to retain customers, in particular those customers facing financial constraints (Wathne *et al.*, 2001).

With respect to the demand side, the literature suggests that firms having no or limited access to internal and/or external financial sources have higher demand for trade credit (Petersen and Rajan, 1997; Nilsen, 2002; Huyghebaert, 2006). The argument for this view is based on the idea that if both internal funds and bank credit are insufficient to finance business activities, demand for funds spills over to other (usually more expensive) types of financing, such as trade credit.

Alternatively, it has been claimed that specific characteristics of the relationship between trading partners may have an impact on the demand for trade credit. In particular, it has been argued that the existence of longer-term trade relations between a supplier and a customer increases trade credit demand. Having long-term trading relationships leads to higher expectations regarding the ease of getting trade credit, which positively affects demand (Summers and Wilson, 2002).

III. Data Collection Process

As mentioned in the introduction, to get a full picture of the importance of trade credit as a source of external finance for small businesses, we need to know more about the determinants of both demand and supply of trade credit (Petersen and Rajan, 1997). The best way to establish this is to model supply of and demand for trade credit simultaneously, rather than using reduced form equation modelling. Simultaneous equation modelling allows us to clearly identify supply and demand effects. Such an approach requires data on the use of trade credit at the level of trade transactions between suppliers and their customers.

Obtaining this type of information is difficult, however, especially in the setting of a developing economy. In the developing economies, small business traders are generally not officially registered. Moreover, even if they are, they will still not provide information about trade transactions with specific clients. Therefore, in order to be able to obtain this information, we decided to focus on one market, that is, the rice market in Tanzania, and survey rice wholesalers and retailers. The survey was conducted from January to August 2008. The survey sampling strategy we used was as follows: we went to the market places in several Tanzanian cities/towns and randomly chose retailers to be interviewed. The interviews took place in Dar es Salaam, Dodoma, Morogoro, Iringa and Mbeya. Dar es Salaam is the largest urban market centre for agricultural products. Dodoma is located in a rice deficit region. Morogoro, Iringa and Mbeya are all located in some of the largest regional rice surplus centres of the country. The retailers were asked information related to their access to bank loans, the size of their business activities, etc., as well as information related to the last

rice trade transaction in which they had been involved. This provided data about the price of the rice bought, the average size of rice transactions he/she has with the wholesaler from which he/she bought rice most recently, the length of trade relationship with this wholesaler, etc.

After the interview was finished, the retailer was asked to give the name and contact address of the wholesaler from whom he/she bought the last rice supplies. Moreover, the retailer was asked to give the name and contact address of another retailer buying from the same wholesaler. Using this methodology, usually referred to as *snowball sampling* (Goodman, 1961; Landström, 1993; Heckathorn, 1997), we finally managed to interview 141 wholesalers and 276 retailers. For 135 wholesalers, we have detailed information for rice trade transactions with two of their customers, and for six of them, we have information for the rice trade transactions with only one of their customers.

IV. Measurement of Variables¹

The dependent variable in our analysis is the ex post observed amount of trade credit (defined as delaying payments) provided by rice wholesalers (suppliers) to retailers (their customers). As our data are at the level of an individual trade transaction, the supply of trade credit (denoted by DP_{Sij}) of wholesaler i is measured as the proportion of his/her sales to a particular customer j for which delaying payments have been allowed; that is, the rice has been sold on credit. By definition, the demand for trade credit (denoted by DP_{Dij}) for the transaction with this particular customer j is equal to the supply of trade credit provided by wholesaler i .

Supply-side variables

Asymmetric information problems between the lender and borrower may be one factor determining trade credit supply. In the context of our research, rice wholesalers are willing to provide trade credit based on the extent to which they are informed about the creditworthiness of the customer. They may obtain information about this in a number of ways.

First, they may establish long-term trade relationships and/or develop a high frequency of

transactions with them. In the setting of the Tanzanian rice market, this may be particularly relevant, since almost all transactions are carried out without written documentation. Moreover, the formal enforcement of contracts is difficult due to the country's underdeveloped legal structure (Kaufmann *et al.*, 2010). We measure the length of the trade relationship (*Relationship*) by the number of years wholesaler i is trading with retailer j . The frequency of purchase (*Frequency*) is measured by the number of times retailer j purchases from wholesaler i per month.

Second, they may obtain information about the repayment performance of clients when they share the same networks in terms of religion and/or are part of the same ethnic group or tribe (McMillan and Woodruff, 1999). Traders from the same religion and/or ethnic group meet regularly in the context of tribe associations or during special gatherings such as weddings and funeral ceremonies. Such meetings are important for information sharing, because they make evaluation and monitoring of customers easier and less costly. They may also be used to enforce contracts in the event of repayment problems. Again, in Tanzania, these characteristics of trade relationships are relevant as channels for exchanging information, especially with respect to ethnic ties as there are over 100 different ethnic groups in Tanzania (Heilman and Kaiser, 2002; Miguel, 2004). We measure being member of the same ethnic group or tribe (*Ethnicity*) and sharing the same religion (*Religion*) by using dummy variables that take the value one (1) if wholesaler i and retailer j belong to the same ethnic group or religion and zero (0) otherwise.

Finally, in the literature, it has been argued that women are better monitors, which helps them to reduce asymmetric information problems. If this is the case, women may be more willing to supply trade credit as compared to men. In particular, we argue that female traders are better in monitoring the creditworthiness of their clients. Several recent studies in the area of finance have shown this positive gender effect on monitoring (see, e.g. Adams and Ferreira, 2009; Beck *et al.*, 2013). To capture the gender effect, we use a dummy variable *Female(w)*, which is one (1) if the wholesaler is a woman and zero (0) if the wholesaler is a man.

¹ Table A1 in Appendix provides an overview of all the variables used in this study, along with the sign we expect to find in the analysis.

Next to asymmetric information problems, trade credit supply may also be related to the aim of suppliers to increase sales. In particular, suppliers new to the business in search of customers may use trade credit to raise their sales. The business experience of the wholesaler is measured as the log of the number of years the wholesaler has been active in the trading business (*Years in business(w)*). Moreover, in order to avoid loss of sales, suppliers may offer trade credit more easily if the market is competitive (Fisman and Raturi, 2004). This is relevant in the context of our research, since competition in the rice market in Tanzania has been strong since the market liberalization of the 1990s. We measure the risk of customer switching (*Switching*) as perceived by wholesaler *i* by asking him/her whether he/she thinks retailer *j* will switch to another supplier if he/she does not provide delayed payments to this retailer. *Switching* is a dummy variable taking the value one (1) if the wholesaler perceives that the customer will switch and zero (0) otherwise.

Demand-side variables

The most important determinant of the demand for trade credit is the lack of access to other financial sources. The lack of access to finance may be measured in various ways. First of all, a firm's observed access to external funds signals the extent to which it lacks funding. In the context of the rice retailers in Tanzania, one external source to which these businesses may have access is bank loans. If access to bank loans is low, demand for trade credit may be higher. Bank loan access of the retailer (*Loan access(r)*) is measured as a dummy variable, which takes the value one (1) if the retailer has received a loan from a bank and zero (0) otherwise. Moreover, there is evidence that women have more difficulties in obtaining external credit as compared to men (Marlow and Patton, 2005). We therefore expect that female retailers have a higher demand for trade credit. We use a dummy variable *Female(r)*, which is one (1) if the retailer is a woman and zero (0) if the retailer is a man.

Second, the demand for trade credit may also depend on the availability of internal finance; that is, if a trader has sufficient own funds available, he/she may have a lower need for external finance such as trade credit. In the context of the rice trading business, one important measure of the availability of internal finance may be the quick ratio (*Quick-ratio(r)*), that is, the short-term assets to short-term

debt ratio. This ratio measures the liquidity of the trading business. The higher the ratio, the lower the need for trade credit.

Third, in the empirical literature on trade credit, lack of access to finance has also been measured by the size of firms (Chant and Walker, 1988; Petersen and Rajan, 1997). This approach has been borrowed from the empirical literature on the determinants of lack of access to finance (see, e.g. Fazzari *et al.*, 1988). According to this literature, information asymmetry between lenders and larger borrowers is considered to be lower, because this type of firms is generally seen as more creditworthy as compared to small firms. Consequently, larger firms will have better access to bank loans and/or equity finance and thus a lower demand for other finance, such as trade credit. The size of the trading activities of the retailer (*Size of business(r)*) is measured as the log of the value of his/her total assets.

Fourth, the demand for trade credit may be determined by the possibilities the retailer has to switch to other wholesalers. If switching is easy, the retailer has a stronger bargaining position vis-à-vis the wholesaler, which may be used as a leverage to receive more trade credit from the current wholesaler. Therefore, we expect that having a higher number of regular suppliers increases the demand for trade credit from the current wholesaler. We measure the possibility to switch by the number of suppliers from which the retailer buys rice on a regular basis (*Other suppliers(r)*).

Finally, the demand for trade credit may also be explained by the existence of long-term trade relations with suppliers as this increases expectations of getting access to trade credit. We measure the length of the trade relationship (*Relationship*) by the number of years wholesaler *i* is trading with retailer *j*.

V. Econometric Framework

As discussed earlier, most previous empirical works on the use of trade credit have applied reduced form models. Yet, the best way to establish the determinants of trade credit demand and supply is to model supply of and demand for trade credit simultaneously. Simultaneous equation modelling allows us to clearly identify supply and demand effects.

Using the variables explained in the previous section, we specify the equations for the determinants of trade

credit supply (in terms of delaying payments, DP_S) and demand (DP_D) in Equations 1 and 2 as follows:

$$\begin{aligned} DP_S = & \alpha_0 + \alpha_1 Price_{dp} + \alpha_2 Relationship \\ & + \alpha_3 Frequency + \alpha_4 Ethnicity + \alpha_5 Religion \\ & + \alpha_6 Female(w) + \alpha_7 Years\ in\ business(w) \\ & + \alpha_8 Switching + \varepsilon_S \end{aligned} \quad (1)$$

$$\begin{aligned} DP_D = & \beta_0 + \beta_1 Price_{dp} + \beta_2 Loan\ access(r) \\ & + \beta_3 Female(r) + \beta_4 Quick - ratio(r) \\ & + \beta_5 Size\ of\ business(r) \\ & + \beta_6 Other\ supplier(r) \\ & + \beta_7 Relationship + \varepsilon_D \end{aligned} \quad (2)$$

In Equations 1 and 2, we include a proxy for the price of trade credit ($Price_{dp}$) in the supply and demand equation. Elliehausen and Wolken (1993) argue that the price of trade credit is negatively related to its demand. At the same time, the supply of trade credit is expected to be positively related to its price. The problem, however, is that in practice the price of trade credit is often not explicitly specified. Giannetti *et al.* (2011) argue that suppliers implicitly charge for trade credit by raising the price of a good. Similarly, Cunat (2007) observes that product prices generally include the interest rate paid for trade credit in the price for the traded good. The price of trade credit cannot be explicitly observed by customers.

Also in the Tanzanian rice market, the price of trade credit appears to be implicitly taken into account when trading the rice.² Thus, for each transaction, the quantity and price of trade credit offered and the quantity and price of the rice traded are jointly determined. It is therefore difficult to isolate the price for trade credit. We solve this problem by using a proxy for the price of trade credit. Assuming that the price of rice in this market is given and that transaction costs are zero (i.e. no costs for writing a contract, no costs for establishing the quality of the rice traded), the differences in

observed prices per kilo reflect the premium paid, which is the price of trade credit. Thus:

$$Price = Price_{rf} + Price_{dp} \quad (3)$$

Here, $Price$ is the observed price per kilo, $Price_{rf}$ is the price given for all market participants in the rice trade (excluding the cost of trade credit), and $Price_{dp}$ is the difference between $Price$ and $Price_{rf}$ reflecting the price of trade credit. This framework allows us to use the observed price per kilo as a proxy for the price of trade credit in the empirical analysis; that is, $Price_{dp} = Price$.

In order to separate supply and demand effects, we estimate a structural model using the disequilibrium framework adopted from Laffont and Garcia (1977), simultaneously estimating the supply and demand equation. This framework has been applied in other studies to analyse credit demand and supply determinants (Agénor *et al.*, 2000; Carbó-Valverde *et al.*, 2009). According to this framework, at a given point in time, the trade credit market may exhibit a temporary disequilibrium (i.e. excess supply or demand) because of the imperfect flexibility of the price of trade credit (Poghosyan, 2010). In contrast, the observed trade credit at a certain moment may lie either on the supply curve (excess demand), on the demand curve (excess supply) or on both (equilibrium). Using the disequilibrium framework thus allows for maximum flexibility when describing the nature of the supply and demand conditions in a particular market at a specific moment in time.

Mathematically, the framework can be expressed as follows:

$$DP = \min(DP_S, DP_D) \quad (4)$$

In this equation, DP is the observed trade credit. DP_S is trade credit supply, and DP_D is trade credit demand, both as specified in Equations 1 and 2. Using this framework, it can be established whether the supply or demand side (or both) determines observed use of trade credit.³

² When retailers and wholesalers were asked for the price of trade credit, they consistently answered that the same price is paid if trade credit is provided and that no interest rate or other costs are made.

³ Maddala and Nelson (1974) have shown that in the absence of information about the price adjustment process and assuming that the error terms ε_S and ε_D in Equations 1 and 2 are normally distributed, the model described in Equation 4 can be solved using the maximum likelihood method. We optimize the log-likelihood function derived in Maddala and Nelson (1974) using the Newton–Ramsey iterative procedure. Further details on how the optimization of the log-likelihood function has been carried out are available on request from the authors.

VI. Descriptive Statistics

Table 1 presents the descriptive statistics of the variables in the model. On average, 67% of total sales is sold on credit. Access to bank loans of retailers is generally low. Only 5% of these traders have a bank loan. These results indicate that access to external finance may be an impediment on business activities for them. At the same time, however, the liquidity of their trading business does seem to be sound as the average value of the quick ratio is 2.4.

Customer switching appears to be a major issue for suppliers in the rice trading market, as 85% of the wholesalers indicate that customers' switching to another supplier is a real risk. Wholesalers tend to have relatively long-standing trade relationships with their customers. On average, trade relations exist for more than 4 years. Regarding ethnicity, the data show that 40% of the trading pairs have the same ethnicity. Having the same religion is even more common. For 65% of all trading pairs, the supplier and customer have the same religion.

Retailers on average have between one and two wholesalers from which they buy rice on a regularly basis. This may indicate that retailers are generally loyal to their suppliers, and it does seem to corroborate the finding that trade relationships are relatively

long-standing. On average, they purchase rice twice a month. Finally, the majority of the retailers are male: only 17% of the retailers are women. Among the wholesalers, male are even more dominant: only 8% of these traders are women.

VII. Results

Table 2 presents the results of the estimations of the trade credit supply and demand equation. We apply the general to specific approach when presenting the outcomes: we start with the full specification of the supply and demand models as specified in Equations 1 and 2. Next, we delete variables for which we find insignificant coefficients in subsequent rounds, except for the price variable. This allows for testing the stability of the outcomes with respect to the significant variables for different specifications of the model.

Regarding trade credit supply, the results in column [1] of Table 2 show that five variables appear to have a statistically significant coefficient. First, the length of the trade relationship and the frequency of purchase are positively and strongly significantly associated with trade credit supply. We interpret this

Table 1. Descriptive statistics: variables used in the model

Variables	Observations	Mean	SD	Minimum value	Maximum value
Dependent variable					
$DP_S = DP_D$	276	0.665	0.363	0	1
Independent variables					
Supply					
$Price_{dp}$	276	6.727	0.077	6.55	6.90
<i>Relationship</i>	276	4.214	1.804	1	14
<i>Frequency</i>	275	2.207	0.519	1	4
<i>Ethnicity</i>	276	0.391	0.489	0	1
<i>Religion</i>	276	0.645	0.479	0	1
<i>Female(w)</i>	276	0.083	0.276	0	1
<i>Years in business(w)</i>	276	7.594	3.100	3	19
<i>Switching</i>	246	0.858	0.350	0	1
Demand					
$Price_{dp}$	276	6.727	0.077	6.55	6.90
<i>Loan access(r)</i>	276	0.054	0.227	0	1
<i>Female(r)</i>	275	0.167	0.373	0	1
<i>Quick-ratio(r)</i>	236	2.446	3.692	0.24	35.29
<i>Size of business(r)</i>	276	747 753.6	482 726.4	100 000	3 000 000
<i>Other suppliers(r)</i>	275	1.684	0.915	1	6
<i>Relationship</i>	276	4.214	1.804	1	14

Note: For explanations of variable names, see Appendix Table A1.

Table 2. Maximum likelihood estimation of the disequilibrium model with respect to the determinants of trade credit supply (DP_S) and demand (DP_D)

Variables	[1]	[2]	[3]	[4]
Trade credit supply				
<i>Price</i>	0.047 (0.869)	0.052 (0.856)	0.056 (0.845)	0.064 (0.823)
<i>Relationship</i>	0.041*** (0.010)	0.039*** (0.009)	0.038** (0.011)	0.037** (0.011)
<i>Frequency</i>	0.213*** (0.000)	0.212*** (0.000)	0.215*** (0.000)	0.216*** (0.000)
<i>Ethnicity</i>	0.144*** (0.003)	0.145*** (0.002)	0.146*** (0.002)	0.146*** (0.002)
<i>Religion</i>	0.003 (0.938)	0.003 (0.940)		
<i>Female(w)</i>	0.019 (0.794)	0.016 (0.822)		
<i>Years in business(w)</i>	-0.100* (0.097)	-0.099* (0.099)	-0.095 (0.114)	-0.094 (0.117)
<i>Switching</i>	0.233*** (0.000)	0.234*** (0.000)	0.233*** (0.001)	0.233*** (0.000)
<i>Constant</i>	-0.168 (0.931)	-0.188 (0.923)	-0.204 (0.917)	-0.265 (0.892)
Trade credit demand				
<i>Price</i>	0.065 (0.833)	0.055 (0.856)	0.050 (0.869)	0.027 (0.929)
<i>Loan access(r)</i>	0.109 (0.574)	0.117 (0.557)		
<i>Female(r)</i>	1.239*** (0.000)	1.211*** (0.000)	1.219*** (0.000)	1.221*** (0.000)
<i>Quick-ratio(r)</i>	-0.052*** (0.000)	-0.050*** (0.000)	-0.051*** (0.000)	-0.052*** (0.000)
<i>Size of business(r)</i>	-0.122** (0.028)	-0.130** (0.011)	-0.123** (0.012)	-0.132*** (0.007)
<i>Other suppliers(r)</i>	-0.015 (0.467)	-0.015 (0.452)	-0.015 (0.462)	
<i>Relationship</i>	-0.004 (0.728)			
<i>Constant</i>	1.001 (0.671)	1.177 (0.609)	1.119 (0.621)	1.359 (0.555)
<i>Number of observations</i>	233	233	233	233
<i>Log Likelihood</i>	54.239	54.179	53.894	53.634
<i>Wald χ^2</i>	48.32	48.05	46.79	47.17
<i>Probability > χ^2</i>	0.0000	0.0000	0.0000	0.0000

Notes: The description of the variables in this table is provided in Table A1 in Appendix. *p*-Values are in parentheses below the coefficients.

*, ** and *** indicate significance at the 10%, 5% and 1%, respectively.

as evidence that both the length of the trade relationship and the frequency of transactions between trading partners are important sources of information for the probability of credit repayment.

Second, also ethnic ties with customers are positively associated with the supply of trade credit. This suggests that wholesalers are willing to provide more

trade credit when having such ties, because they can be used as channels for information sharing. This makes evaluations and monitoring of customers, as well as enforcing contracts, easier and less costly.

Third, customer switching is positively associated with trade credit supply, confirming that suppliers perceive customer switching as a serious issue,

which leads them to provide trade credit. In line with this, we also find a negative (albeit weakly) significant association between trade credit supply and the number of years the wholesaler is active in the trading business. This confirms the idea that suppliers who are new to the business may be more willing to use trade credit in search of customers to raise their sales.

Regarding trade credit demand, the results in column [1] of Table 2 show that three variables have a statistically significant coefficient. All three variables relate to the importance of the lack of finance as an explanation for trade credit demand. First, the variable showing that a retailer is a female is positively and significantly associated with the demand for trade, supporting the view that for women it is more difficult to obtain access to other types of external finance such as bank loans. Second, the quick ratio and the demand for trade credit are negatively and significantly associated, which suggests that traders having more liquidity are less in need of trade credit. Finally, there is a negative and significant association between the size of the retailer's business and demand for trade credit. This confirms the view that larger firms need less trade credit because they have better access to formal finance as they are generally seen as more creditworthy.

Next, we delete insignificant variables in three consecutive rounds. The results are shown in columns [2] to [4] in Table 2. We observe that the results for the variables found significant in the first column remain strongly significant in all but one case (*Years in business(w)*). Moreover, the coefficients of the variables hardly change; that is, the results seem to be very stable.

VIII. Conclusions

The analysis in this article has shown that the demand for trade credit is primarily determined by the extent to which retailers need external funds. In particular, we found evidence that female retailers and retailers having smaller business activities show higher demand for trade credit. In the literature, these characteristics of traders are associated with higher trade credit demand, because these traders are expected to be more financially constrained. Moreover, we showed that less liquid retailers demand more trade credit.

With respect to the supply of trade credit, we found that this is mainly driven by wholesalers' incentives to attract and keep clients, specifically if they feel customer switching is a real threat. Moreover, wholesalers' willingness to provide credit increases if they have better information about the possibility that the customer will fail to repay the credit. This is corroborated by the finding that supply of trade credit is associated with the length of the trade relationship, the frequency of purchase and the wholesaler and retailer sharing the same ethnic background. Longer trade relations, higher frequency of purchase and having the same ethnic background provide wholesalers with more information about the creditworthiness of the retailer, reducing the risk of default.

The outcomes of this study may have practical relevance to financially constrained small businesses. As our results suggest, these businesses may increase access to trade credit by anticipating the behaviour of their suppliers. On the one hand, these small businesses could aim at signalling their willingness to develop a long-term business relationship with their supplier. At the same time, however, they could signal that there may be alternative suppliers in the market. Balancing these two types of behaviour in the interaction with suppliers poses an interesting challenge to those small businesses that aim at having access to trade credit successfully.

We argue that using the Tanzanian rice market as a case for studying the determinants of trade credit supply and demand has both internal and external validity. First of all, we focus on a particular market, since Giannetti *et al.* (2011) show that the determinants of the use of trade credit are specific to the type of goods and activities traded. This means that studies using data from firms active in one particular sector have higher internal validity; that is, our approach is better able to identify supply and demand characteristics. Second, rice markets are important markets in many developing economies (FAO, 2000; Wailes, 2005; World Bank, 2008). The results we find in this study are therefore relevant to other developing economies as well; that is, our case study also has external validity.

Future research should focus on redoing the analysis for small businesses in different industries with different competitive conditions to verify to what extent our results are corroborated in other market settings and competitive environments. Second, our study should be extended to rice markets in other

countries, allowing us to investigate the relationship between competitiveness and trade credit supply under different formal regulatory and judicial frameworks. Third, the research in this article is based on cross-sectional data. Creating a panel data-set that reveals the supply of trade credit and the competitiveness of firms would support investigations into changes in the relationship over time, for example, due to the changes in the development of financial markets and the institutional context. Finally, the current analysis focuses on trade credit only. However, small businesses in developing economies may have other financing sources as well, such as informal credit, bank loans, leasing, sharing resources. Future research may investigate the determinants of these alternatives and compare them to trade credit to get a broader picture of the financing options small businesses in developing economies have.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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Appendix

Table A1. Summary of variables used in the empirical analysis

Variable	Measure	Supply or demand related	Expected sign
<i>Price_{dp}</i>	Observed price per kilo of rice at which it is traded	Supply/Demand	+/-
<i>Relationship</i>	Number of years a retailer has been a customer of a wholesaler	Supply/Demand	+
<i>Frequency</i>	Number of times a retailer purchases from a wholesaler per month	Supply	+
<i>Ethnicity</i>	1 if the wholesaler and retailer belong to the tribe and 0 otherwise	Supply	+
<i>Religion</i>	1 if the wholesaler and retailer belong to the same religion and 0 otherwise	Supply	+
<i>Female(w)</i>	1 if the wholesaler is a female, 0 if he is a male	Supply	+
<i>Years in business(w)</i>	Log of firm age (wholesaler business)	Supply	–
<i>Switching</i>	1 if a wholesaler perceives that a customer will switch if delayed payment is not given	Supply	+
<i>Loan access(r)</i>	1 a retailer has a bank loan and 0 otherwise	Demand	–
<i>Female(r)</i>	1 if the retailer is a female, 0 if he is a male	Demand	+
<i>Quick-ratio(r)</i>	Short-term assets to short-term debt ratio	Demand	–
<i>Size of business(r)</i>	Log of total assets of a retail business	Demand	–
<i>Other suppliers(r)</i>	Number of regular suppliers	Demand	+

Notes: The table provides an overview of all independent variables used in the econometric analysis of this article (column 1), how they are measured (column 2), whether they relate to the supply or demand of delayed payments (column 3), and what the expected sign of the relationship is between the variable and delayed payment (column 4).