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Hermes, Niels; Lensink, Robert; Lutz, Clemens; Thu, Uyen Nguyen Lam

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Trade credit use and competition in the value chain¹

Evidence from Vietnam

Niels Hermes^{*,**}, Robert Lensink^{*,***}, Clemens Lutz^{*} and Uyen Nguyen Lam Thu^{*}

^{*}Faculty of Economics and Business, University of Groningen, The Netherlands.

E-mails: c.l.m.hermes@rug.nl; b.w.lensink@rug.nl; c.h.m.lutz@rug.nl;

nguyenlam_uyen@yahoo.com

^{**}Solvay Business School, Université Libre de Bruxelles, Belgium. E-mail: c.l.m.hermes@rug.nl

^{***}Wageningen University, The Netherlands. E-mail: b.w.lensink@rug.nl

Abstract

Trade credit is a major source of finance in value chains in developed and emerging economies. Despite its ubiquitous use, this is one of the first empirical studies that analyzes why the use of trade credit varies along the value chain. We argue that competition faced by firms at different stages in the value chain and enforcement mechanisms that stimulate repayment jointly determine the use of trade credit. We distinguish two dimensions of competition, that is, rivalry and customer bargaining power. Competition may stimulate firms to provide trade credit to keep customers from switching to other suppliers. Yet, high contract enforcement costs relative to the value of the transactions, reduce the willingness to offer trade credit. We find empirical evidence showing that competition does not (strongly) influence the use of trade credit in the retail market, whereas it does in the markets for wholesalers and millers. We interpret these results as suggestive evidence that the retail, wholesale and milling market segments differ in terms of the enforcement costs involved in the provision of trade credit. Rivalry at the retail market segment makes switching easy

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for customers, even in case of default. As enforcement of repayment in this market segment is difficult and costly, trade credit appears to be a risky and less attractive marketing instrument for retailers. In contrast, in the wholesale and milling market segment, trade credit is widespread as stakeholders know each other, making informal mechanisms effective in supporting the enforcement of trade credit repayment.

JEL classifications: L14, O53.

Keywords: Trade credit, competition, Vietnam.

1. Introduction

Trade credit refers to the practice of suppliers delivering goods to customers and allowing them to delay payments after delivery. It is used extensively in trade transactions among firms all over the world. For small and medium-sized enterprises (SMEs) and/or business start-ups (Huyghebaert, 2006) in particular, it is an important source of finance as these firms generally face difficulties with acquiring access to financial resources (Cassar, 2004; Van Auken, 2005; Winborg and Landstrom, 2000). Yet, the average size of trade credit varies greatly between countries. A recent survey article shows that, for firms in a number of developed economies, it ranges between 13 and 40 percent of sales (Seifert *et al.*, 2013). These results corroborate findings from earlier studies focusing on the use of trade credit in developing and emerging economies (see, e.g. Van Horen, 2004). In the same survey article, it is also shown that trade credit varies between different industries and that the use of trade credit appears to be negatively correlated with the distance to the end-consumer; in other words, although trade credit is relatively high at the beginning of the value chain, it is low at the end of the chain (Seifert *et al.*, 2013).

Why would trade credit use differ along the value chain? Perhaps surprisingly, there is not much empirical analysis investigating this question. A recent study by Giannetti *et al.* (2011) focuses on industry characteristics, market structure and product characteristics to explain the existence of trade credit, the extent to which it is provided to customers as a share of total sales, and the type of credit terms used, based on a sample of US-based SMEs. Yet, they do not focus on differences in the use of trade credit along the value chain.

In our paper, we elaborate on the work of Giannetti *et al.* (2011) by zooming in on the use of trade credit at different stages in the value chain. In particular, we are interested in discussing potential determinants of these differences. We first of all argue that competition plays an important role in explaining the use of trade credit. One main reason why firms provide trade credit is to keep customers from running away to competitors. If competitive pressure is felt to be strong, firms may have stronger incentives to provide trade credit in order to prevent customers from switching to another supplier (Cunat, 2007; Petersen and Rajan, 1997). Another

potentially important determinant of trade credit use is the extent to which repayment can be enforced through either formal and/or informal mechanisms (McMillan and Woodruff, 1999a). We argue that competitive forces and effective (informal) repayment mechanisms differ between market segments, explaining differences in the use of trade credit between firms in different markets.

We empirically investigate the relationship between competition and the use of trade credit using data from a large survey among 404 rice millers, wholesalers and retailers in the Mekong River Delta, Vietnam. We use a unique approach to analyze this relationship by measuring competition based on subjective appraisals of competition variables by individual rice traders. We focus on rivalry among rice traders and customer bargaining power as measures of competition. Our approach allows us to investigate the use of trade credit along the rice value chain and explain variations in its use based on within-industry conditions.

We find evidence that high levels of rivalry among peers as well as customer bargaining power increase the use of trade credit, but the importance of competitive pressure and customer bargaining power appears to be different along the value chain. First of all, rivalry plays an important role in the wholesale market segment while it does not influence trade credit use in the retail market. Second, our results suggest that customer bargaining power is strongly associated with trade credit use in the wholesale and milling market segment, while it is not statistically significant for retailers. We interpret these results by pointing at the importance of being able to informally enforce trade credit contracts. In particular, we argue that not being able to credibly enforce contracts makes trade credit a less attractive marketing instrument for retailers. In contrast, in the wholesale and milling market segment, transactions are realized between traders who know each other and operate in the business on a daily basis. This facilitates the spread of information and informal institutions are expected to be effective to increase switching costs in case of default.

The remainder of this paper is organized as follows. In Section 2, we present a brief review of the literature on the use of trade credit and the importance of competition faced by firms. In Section 3, we briefly explain the country context and show why the issue of trade credit is of importance in this particular case, we discuss the setup of the survey and we explain and discuss the method and definition of variables we use in the empirical part of the paper. The empirical results are described in Section 4, after which we provide a summary, conclusions and limitations in Section 5.

2. Competition and the use of trade credit: The argument

The literature on competition, instigated by the work of Michael Porter (1980, 1985, 2008), puts forward the idea that analyses of the impact of competition on firm behaviour should take into account the fact that it is a multidimensional concept. In his work, Porter discusses the nature and consequences of competition between firms. In particular, he distinguishes the rivalry between firms, the bargaining power of

suppliers, the threat of new entrants, the threat of substitutes and the bargaining power of customers as important dimensions of market competition. In our study of the relationship between competition and the use of trade credit, we are particularly interested in the first and the last of these five dimensions, as both dimensions are expected to operate differently on the wholesale and retail market segment. Moreover, the available literature on the relationship between competition and the use of trade credit generally discusses the importance of these two dimensions (albeit in most cases implicitly). Finally, in the context of the rice market in Vietnam, the other three dimensions are less relevant and/or are more difficult to observe.²

2.1 Rivalry, competitiveness and the use of trade credit

The literature focusing on the relationship between trade credit use and competition is not very extensive. Several contributions concern theoretical models (Brennan *et al.*, 1988; Cunat, 2007; Maksimovic, 1988; Petersen and Rajan, 1997) and only a few studies empirically investigate this relationship. These empirical studies provide different arguments explaining the relationship between competition and the use of trade credit.

One strand of the empirical literature argues that trade credit is an instrument to improve the competitiveness of the supplier *vis-à-vis* his/her rivals. These studies stress that if suppliers are confronted with customers who may switch to other suppliers because of strong rivalry, trade credit can be used as an instrument to prevent customers from switching to competitors (Giannetti *et al.*, 2011; Petersen and Rajan, 1997). The use of trade credit may work particularly well in environments in which access to bank credit is low, making trade credit valuable to the customer.³

One early study on the relationship between rivalry and the use of trade credit is from Hill *et al.* (1981) who find that US firms change trade credit terms to match those of their rivals, rather than changing them due to changes in the macro-economy. Hill *et al.* (1981) suggest this behaviour is driven by the pressure from rivals and the willingness of firms to keep customers from switching. A similar result is found by Cheng and Pike (2003) for UK firms. Using multi-industry firm-level data from five Sub-Saharan African countries, Fisman and Raturi (2004) find that monopoly power is negatively associated with the use of trade credit. Hermes *et al.* (2012) show that preventing customers from switching to other suppliers is an important factor for explaining why Tanzanian rice traders provide trade credit. A few other studies have

² The threat of substitution is considered to be low, because rice is the staple food in Vietnam and is firmly rooted in consumption habits. With respect to the threat of new entrants, this cannot be easily separated from competition measured in terms of rivalry from other suppliers, as the rice market in Vietnam is highly competitive and market entrance and exit of competitors is taking place on a regular basis. With respect to the firms' bargaining power *vis-à-vis* their own suppliers of inputs, this dimension is indirectly taken into account in the empirical analysis using the amount of trade credit firms receive from their suppliers as one of the control variables (see Section 3).

³ In the industrial district literature, this phenomenon is known as interlinked credit (Dei Ottati, 1994).

looked at the relationship as part of a more general analysis of the determinants of trade credit use. These studies generally find support for the positive association between trade credit use and rivalry among firms (see, for example, Fisman, 2003).

A recent paper by Barrot (forthcoming) deals with the relationship between financial strength and trade credit provision, using data from French trucking firms. He finds that financially weaker firms may reduce their investment in order to be able to provide trade credit. Moreover, he shows that long payment terms extended by financially stronger suppliers reduces the entry and expansion of financially weaker ones, showing there is a relationship between competition and the provision of trade credit.

On the basis of the existing empirical evidence discussed above, we conclude that increased rivalry strengthens the threat of customer switching and encourages traders to use more trade credit. Thus, we hypothesize that:

Hypothesis 1. *Higher levels of rivalry are associated with higher levels of trade credit use.*

2.2 Customer bargaining power

Another strand of literature stressing the positive relationship between competition and trade credit use argues that customers with stronger bargaining power *vis-à-vis* the supplier may receive higher levels of trade credit. Customers with strong bargaining power may be responsible for a substantial share of the supplier's profits (Wilner, 2000), for example, because they buy large volumes and/or because they are large in size relative to their suppliers. Among other things, they may bargain over the provision of trade credit. Since suppliers may depend on these customers, they are more willing to provide trade credit to them in order to reduce the possibility that their customers switch to other suppliers.

Two recent empirical studies focus on the role of customer bargaining power. Van Horen (2004), using data on the use of trade credit of firms from different industries in 42 countries, shows that young and small firms, which are supposed to have relatively low bargaining power *vis-à-vis* their customers, offer more trade credit in order to lock-in their customers. In a similar vein, Fabbri and Klapper (forthcoming), using data from 2,500 Chinese firms, demonstrate that firms facing customers with strong bargaining power extend more trade credit. Additionally, a few other studies investigate the determinants of trade credit in general and take into account customer bargaining power as one of the explanatory variables. These studies find support for a positive association between the level of bargaining power and the use of trade credit (see Giannetti *et al.*, 2011; Wilson and Summers, 2002).

On the basis of the evidence discussed above, we conclude that increased customer bargaining power strengthens the threat of customer switching and encourages traders to provide more trade credit. Therefore, we hypothesize that:

Hypothesis 2. *Higher levels of customer bargaining power are associated with higher levels of trade credit use.*

2.3 Competition, trade credit and the role of contract enforcement

While the extent of competition in terms of both rivalry and/or customer bargaining power may be important, firms will also take into account the probability of repayment by their customers when providing trade credit to them. This probability is determined by the extent to which repayment can be enforced through either formal and/or informal mechanisms, as well as the costs involved in enforcing repayment. If enforcement is problematic and/or the costs of enforcing are high relative to the value of the trade contract, firms will be less willing to extend trade credit to their customers. This may be especially true when competition is high, because customers may not repay and go to competitors to buy goods. Some studies indeed find that monopolistic suppliers are more willing to provide trade credit (Cunat, 2007; Gianetti *et al.*, 2011; Petersen and Rajan, 1997).

We claim that competitive forces and effective repayment enforcement mechanisms may differ between market segments, leading to differences in the use of trade credit between firms in different markets. We support our claim by analyzing the use of trade credit in different segments of the value chain of the Vietnamese rice sector with a particular focus on the wholesale, milling and retail market segments. These segments share the fact that formal institutions to enforce repayment are hardly effective in Vietnam, stressing the importance of (strong) informal institutions for contract enforcement. In the context of the wholesale, milling and retail rice market segments in Vietnam (and also in other countries), these informal institutions may consist of network relationships between market participants. These relationships provide important sources of information about the repayment probability and credibility of potential customers.

In line with this, McMillan and Woodruff (1999a,b) show that suppliers provide trade credit more frequently if they have information about the customer's credit-worthiness based on longer-term trading relations, and/or if they are member of a network in which information about customers is exchanged in order to sanction defaulting customers. Their conclusion is that suppliers only provide trade credit to their trading partners if they can ensure that customers comply with the agreement to pay late and/or if they can enforce repayments. This study stresses the importance of informal enforcement mechanisms as Vietnam lacks strong formal regulatory and judicial frameworks.

Several specific characteristics of the structure of the Vietnamese wholesale, milling and retail market segments influencing competition and enforcement of repayment may determine the use of trade credit. First, the large number of retailers in local market places makes switching relatively easy for their customers. Second, as the total value of a retail contract is on average rather small, contract enforcement costs for retailers are usually relatively high. Customers can buy rice in a large number of shops or from petty traders in the local food market. Default may lead to a temporary loss of access to trade credit but will not further affect customer's access to resources. Moreover, individual consumers do not operate on a daily basis and

are not publicly known in the market as defaulters. This means that other retailers simply may not know them, making it difficult to settle debts through informal networks of retailers. These factors adversely affect credible enforcement and make trade credit a less attractive marketing instrument for retailers.

In contrast, in the wholesale market segments, transactions are realized between traders who know each other and interact on a regular basis. In such a context, information spreads easily and informal institutions are expected to be effective to increase switching costs in case of default. The defaulting customer will lose access to trade credit, which may compromise the scale of the business as trade credit operates as an important source of financial means. Thus, even if the market is characterized by high levels of rivalry, these buyers will have difficulty finding alternative suppliers willing to provide trade credit. Put differently, the informal enforcement mechanisms make trade credit enforcement credible in the wholesale segment.

On the basis of the above discussion, we hypothesize that:

Hypothesis 3. *The positive association between the level of rivalry among traders and the level of trade credit use is much weaker (or even absent) for the retail market segment compared to the wholesale and milling market segment due to a lack of effective informal enforcement mechanisms.*

Hypothesis 4. *The positive association between the level of customer bargaining power and the level of trade credit use is much weaker (or even absent) for the retail market segment compared to the wholesale and milling market segment due to a lack of effective informal enforcement mechanisms.*

Summarizing the above discussion, we suggest that, in principle, suppliers are willing to provide trade credit and this willingness is increasing in the extent to which they are confronted with higher competition (Hypotheses 1 and 2). Yet, whether they ultimately provide trade credit also depends on whether they can enforce trade credit contracts at sufficiently low costs (Hypotheses 3 and 4). So, providing trade credit is the outcome of a trade-off of costs (enforcement) and benefits (keeping customers from switching).

3. Data and method

3.1 *The Vietnamese context*

We investigate the relationship between competition and trade credit provision using data from SMEs active in the rice trading sector in the Mekong River Delta, Vietnam. The rice trading sector in Vietnam is an interesting case for studying the relationship between competition and trade credit.

First, rice is the most important crop produced in this country. Rice production is also by far the most important source of income in rural areas (World Bank, 1996).

Since 1989, the country has been world's second largest rice exporter after Thailand. Over the last number of years, the Mekong River Delta has accounted for approximately 50 percent of total Vietnamese rice production and 90 percent of total rice exports (Nguyen and Singh, 2005; Tsukada, 2011).

Second, trade credit is used extensively in the Vietnamese rice sector as most rice traders seem to provide trade credit to their customers. In our survey, 81 percent of the traders report that they provide trade credit to their customers. This is comparable to what Fafchamps (2000, 2003) found for a sample of manufacturing firms in Kenya and Zimbabwe (79 percent), Benin (74 percent), Malawi (64 percent) and Madagascar (68 percent). It is far higher than in several other emerging economies. For example, Fabbri and Klapper (forthcoming) find that 39 percent of the firms in their sample of Chinese firms report that they provide trade credit. Fisman and Raturi (2004) in their study, report that, for Ghana, Tanzania and Zambia only 32, 8 and 16 percent of the firms in their sample provide trade credit to their customers.

Third, trade credit is an important source of firm finance because formal financial markets in Vietnam are relatively underdeveloped and many firms (especially SMEs) lack access to external (bank) finance. Although the banking sector has shown remarkable progress since the start of the economic reform process in 1986 – the ratio of bank deposits to GDP grew from 28 percent during the period 1990–1997 to 92 percent in 2008 (see Anwar and Nguyen, 2011; Leung, 2009) – most bank finance still goes to the large state-owned enterprises (SOEs) and the bank penetration ratio within the Vietnamese population is only about 10 percent (IFC, 2008).

Fourth, the rice market in Vietnam is a highly competitive market, with many small-scale enterprises interacting on a frequent basis. Since the start of the reforms in the 1980s the large majority of domestic transactions are carried out by private rice traders. One indication of the highly competitive nature of the Vietnamese rice markets is the fact that regional rice markets in the Mekong River Delta appear to be well integrated, that is, price differences at different markets are extremely low. A detailed analysis of the five major rice producing districts shows that approximately 650 rice millers and 3,500 wholesalers are active in these markets (Lutz *et al.*, 2006). Moreover, rice is a relatively simple and homogeneous good, which increases the scope for competition among market participants. Although we acknowledge that some price differences exist due to preferences for certain qualities and varieties, prevalent rice flows traded in the market can be considered as quite homogeneous. For our study, this implies that it is relatively unattractive for traders to compete on the basis of price reductions. Consequently, this corroborates our claim that trade credit is an important alternative instrument in the competitive process. The highly competitive nature of the Vietnamese rice market provides an interesting environment for analyzing the relationship between competition and trade credit use.

Fifth, Vietnam lacks strong formal regulatory and judicial frameworks. According to the most recent World Governance Index, Vietnam ranks number 128 (of 213) with respect to the quality of rule of law, similar to countries such as Gambia, Tanzania and Uganda; it ranks number 149 with respect to the quality of the country's

regulatory framework, which is comparable to the score of countries such as Ukraine and Gabon (Kaufmann *et al.*, 2010). A survey study by McMillan and Woodruff (1999b) on contracting in Vietnam reveals that in the absence of effective courts, business relationships are very important in resolving disputes, for example, in case of non-repayment of trade credit, by threatening to stop delivery of goods and/or services. At the same time, McMillan and Woodruff (1999b) show that firms are hesitant to retaliate against a trading partner, since this may hurt future trade relations with other partners as well. These conditions make contract enforcement problems – at least potentially – an important issue in trade relations between trading partners in Vietnam, including the rice traders in our sample.

Finally, using the Vietnamese rice market as a case study for analyzing the relationship between competition and trade credit may be interesting, because studies using data from firms active in one particular sector have higher internal validity. Porter (2008) and others have argued that the extent of competition very much depends on the type of industry or sector and its contextual environment. At the same time, since rice markets are important markets in many emerging economies (FAO, 2000; USDA, 2003; Wailes, 2005; World Bank, 2008), the results we find for this study on Vietnam may be relevant for other emerging countries as well.

3.2 *The survey*

The data used in this research come from a survey held among 404 traders who are active in the Vietnamese rice market in six provinces in the Mekong River Delta. These provinces are Can Tho, An Giang, Vinh Long, Tien Giang, Hau Giang and Soc Trang. The survey was held in July 2007 and was conducted by experienced officials of the provincial statistical offices of the National Statistical Department. The specific questions regarding trade credit were part of a standardized nationwide enterprise survey these statistical offices carry out every 5 years. This survey is used by the government to collect information as an input for evaluations of the country's economic performance and economic policies and to plan for future economic developments.⁴

In the Mekong River Delta, rice is generally produced at small farms. Rice farms produce paddy, which in most cases is sold to gatherers (Minot and Goletti, 2000).

⁴ The government uses a standardized procedure when conducting the nationwide enterprise survey. The National Statistical Department first sends an official letter to selected firms requesting them to participate in the survey. Next, an appointment is made with experienced staff members of the Provincial Statistical Department, who carry an official letter from the government stating the purpose of the survey and the identity of the official. Firms know from experience they are expected to participate, since the enterprise survey has been carried out for at least a decade (the surveys have been held since 1995). Also, prior to the survey being carried out, information about its content and purpose is made public through television broadcasts and newspapers, meaning that respondents are well-informed about what to expect when they are interviewed. One of the authors, who accompanied staff members of the National Statistical Department when they visited firms, observed that firms in almost all cases were co-operative. We therefore believe that our data do not suffer from serious selection bias and/or non-response biases.

These gatherers then sell the paddy to rice millers. These millers transform the paddy into rice. Moreover, they may also polish the rice, which raises the quality of the product. In the Mekong River Delta, rice millers account for about 80 percent of the total milling and polishing activities.⁵ After the rice has been produced and polished, most of it is sold to wholesalers or directly to retailers, who then mainly sell it to final consumers in the domestic market.

The questionnaire was directed towards three types of traders active in the rice market, namely the rice millers taking title of the product, rice wholesalers and rice retailers. The questionnaire was filled out by the trader him/herself. In each of the six provinces, we used the list of officially registered traders to select the ones that finally participated in our survey on trade credit. On the basis of this list, which was ordered alphabetically using the name of the company, we selected the first of every five traders in the list (that is, number 1, 6, 11, etc.) to join the survey. This approach allowed us to select the millers and the wholesalers. Rice retailers, however, are in most cases not officially registered. They usually have small shops located at local market places in towns and cities. Retailers were therefore selected by visiting these local market places and randomly picking every first out of ten shops. Rice millers and retailers present 39 and 36 percent of the total sample, respectively; wholesalers account for 25 percent of the total sample.

All questions related to measuring competition are based on the manager/owner's perceptions. So, in fact, what we measure is perceived competition, rather than actual competition, which is mostly based upon objective measures, such as market size in terms of shares in total sales or assets. We focus on measuring perceptions because objective measures of total market size in the context of local rice markets in Vietnam are not available.⁶ Moreover, our unique approach to collecting data by measuring competition based on subjective appraisals of competition variables by individual rice traders allows us to investigate the use of trade credit along the rice value chain and to explain variations in its use based on within-industry conditions.

3.3 *Method and variable definitions*

The relationship between trade credit and competition faced by a trader (Hypotheses 1 and 2) is analyzed using the following regression model:

⁵ The above described marketing channel focuses on rice trading for the domestic market. Next to production for the domestic market, a substantial share of rice output is exported. The marketing channel for exported rice is dominated by SOEs and a few privately owned exporting firms. The SOEs and private exporters may buy paddy directly from farms or from gatherers and mill and polish the rice themselves. They account for 20 percent of the total milling and polishing activities in the region. Since SOEs and privately owned exporting firms are substantially larger in size and have easier access to external finance, we have excluded them from the sample.

⁶ We do acknowledge that our approach of using perceptions rather than objective measures may lead to over- or underestimating actual competition. We have no reason to believe, however, that this bias is systematically related to specific trader characteristics.

$$TC_i = \beta_0 + \beta_k \text{Competition}_{i,k} + \beta_m \text{Trader}_{i,m} + \beta_n \text{Type}_{i,n} + \varepsilon_i. \quad (1)$$

In this model, the dependent variable TC reflects the share of total sales for which payments are delayed (that is trade credit supplied, also referred to as supplier credit in the literature; see, for example, Fafchamps, 2000). For each trader, we have information about the value of total sales and the value of sales for which trade credit has been provided to customers. The dependent variable therefore has a value between 0 and 100 percent. *Competition* is a vector of k variables measuring the perceived competitive environment a trader is faced with, consisting of two types of variables ($k = 2$). The first one is *Rivalry* and measures competition from other competitors in the market as perceived by trader i . The competitive force from other suppliers in the market is rated on a scale that runs from 0 (no competition) to 4 (severe competition), which means that a higher value for *Rivalry* represents a higher level of perceived market competition. The second variable is *Customer power* measuring the bargaining power of the customer perceived by the firm owner. It measures the percentage of total sales for which the supplier has to negotiate about the price with the customer. This variable has a value between 0 and 100 percent. A higher value for *Customer power* represents a higher level of the bargaining power of the customer.

Trader is a vector of m control variables, measuring several trader-specific characteristics. We have selected six different variables ($m = 6$). This selection is based upon the empirical literature on the determinants of trade credit. First, we include *Years in business* measured as the logarithm of the number of years since the trader started doing business. Existing studies on the determinants of trade credit have shown that the use of trade credit is positively related to the availability of financial sources. The number of years in business is used in the literature as a measure for the availability of credit, since more experienced traders are able to signal their reputation, giving them better access to bank loans, and thus more sources to provide trade credit (Petersen and Rajan, 1997; Van Horen, 2004). Second, we use *Size* as a control variable, which is measured as the logarithm of the value of total sales of the trader. Larger traders generally have better access to sources to provide trade credit to their customers (Petersen and Rajan, 1997).⁷ Third, we include *Difficult to get loan*, which measures the difficulty a trader has in obtaining a bank loan. This variable takes the value 1 if the trader indicates it is difficult to obtain a loan, and 0 otherwise. A trader indicating it is difficult to obtain a loan is expected to provide less trade credit. Fourth, *Margin* is a measure of the profit margin of a trader and is calculated as $\frac{AP_i - AVC_i}{AP_i}$. AP_i is the average selling price per ton rice of the trader i in 2006; AVC_i reflects the average variable costs of trader i in 2006.⁸ The more profitable a trader is, the more trade credit it is able to

⁷ In other studies, this measure has also been used as a proxy for the bargaining power of the supplier relative to its customers (Van Horen, 2004). Yet, the size of a firm is a very indirect measure of bargaining power.

⁸ The measurement of the average variable costs differs, depending on the specific market segment in which a firm is active. For rice millers selling rice, the variable costs consist of the costs of main materials, fuel and labour costs; for wholesalers and retailers these costs reflect main materials, transportation costs and labour costs.

provide. Fifth, *Trade credit received* measures the percentage of total inputs trader i has bought on credit. This variable has a value between 0 and 100 percent and is expected to be correlated positively with trade credit supplied. Fabbri and Klapper (forthcoming) show that firms receiving trade credit from their own suppliers are more likely to extend trade credit to their customers. Finally, we include *Contact*, which measures the frequency of contacts between supplier and customer. This variable ranges from 1 (yearly contact) to 6 (daily contact). Several studies have shown that the extent to which a supplier has information about the creditworthiness of its customers influences the amount of trade credit given. The better the supplier is informed, the more willing he will be to provide trade credit. In the literature, a proxy for this information is used by measuring the frequency of contact with the customers (Fisman and Raturi, 2004; McMillan and Woodruff, 1999a).

Type is a vector of n dummy variables reflecting different types of traders that are active in the rice market. We have defined three dummy variables ($n = 3$). In particular, we define *Miller*, which has the value 1 if the trader is a miller (taking title of the product), and 0 otherwise; *Wholesaler*, which has the value 1 if the trader is a wholesaler, and 0 otherwise; and *Retailer* which has the value 1 if the trader is a retailer, and 0 otherwise. We include these dummies because the market segments on which these three types of rice traders operate differ, which may influence the use of trade credit.

We first estimate regression model equation (1) using the full sample to investigate Hypotheses 1 and 2. Next, we estimate the same model using data for the wholesale, milling and retail segments separately. This allows us to investigate Hypotheses 3 and 4. We expect that the results for the wholesalers and millers will be similar. The trading activities of millers are comparable to those of the wholesalers: they trade rice in relatively large quantities with either rice wholesalers and/or retailers in markets in which a relatively low number of competitors are operating (as compared to the retail market), and in which traders know each other and are active on a regular basis. As discussed in Section 2.3, this facilitates the spread of information and results in informal institutions being effective to increase switching costs in case of default.

4. Descriptive statistics and empirical results

4.1 Descriptive statistics

Table 1 provides descriptive information with respect to our sample and the extent to which trade credit is supplied. As was reported earlier, 81 percent of the traders in our sample state that they provide trade credit to their customers.⁹ The

⁹ This also means that 19 percent ($N = 78$) of the traders in our sample do not provide any trade credit to their customers. Comparing these traders with those that report non-zero values for trade credit, it turns out that they are much smaller and younger, are less profitable, have more difficulty getting a bank loan and receive less trade credit themselves from their suppliers of inputs.

Table 1. Trade credit use in the Vietnamese rice market

	Retailers	Wholesalers	Millers	Total
Number of observations	145	101	158	404
<i>Percentage of total</i>	36	25	39	100
Traders providing trade credit	102	76	148	326
<i>Percentage of total</i>	70	75	94	81
Average share of trade credit (<i>percentage of total sales</i>)	19	31	41	31

importance of trade credit differs for different types of traders: 94 percent of the rice millers report they provide trade credit to their customers; for rice wholesalers and retailers, this is 75 percent and 70 percent, respectively. With respect to the amount of trade credit, the table shows that the average value of trade credit as a percentage of total sales is 31 percent. This is lower than has been reported for other emerging economies. In a large sample of firms from 42 emerging economies, Van Horen (2004) finds that the average value of trade credit as a percentage of total sales is 40 percent. Hyndman and Serio (2010) report that Indonesian firms, on average provide trade credit equivalent to 46 percent of total sales. Yet, it is higher than Fabbri and Klapper (forthcoming) report in their study on China. They find that Chinese firms provide trade credit equivalent to 14 percent of the total value of their sales. Moreover, studies on the use of trade credit in developed countries also find much lower values. Petersen and Rajan (1997) find that the average value of trade credit as a percentage of total sales is just 7 percent for SMEs in the US. For Canadian firms, this is 11 percent (Cunningham, 2005).¹⁰

The amount of trade credit provided differs between different types of rice traders in our sample. While for rice millers the value of trade credit to total sales is 41 percent, for wholesalers and retailers, this is 31 and 19 percent, respectively. These figures corroborate the results reported by Seifert *et al.* (2013) who show that the use of trade credit appears to be negatively correlated with the distance to the end-consumer. These figures also show that the amount of trade credit provided by retailers is substantially lower than that of wholesalers and millers.

Tables 2 and 3 provide further information regarding the descriptive statistics and correlations of the variables used in the analysis. With respect to the variables describing the competition faced by traders, Table 2 shows that the average value for *Rivalry* is 3 (where the maximum score is 4), suggesting that perceived rivalry is rather high. The descriptive statistics of *Customer power* suggest that, on average,

¹⁰ Note that these studies use accounts receivable to total sales as their measure of trade credit. This measure is slightly different from measures used in this and other papers (see, Fafchamps, 2000; MacMillan and Wooldruff, 1999a). The difference is that whereas Petersen and Rajan (1997) and Cunningham (2005) use balance sheet information, indicating end-of-year values of trade credit, the other studies use survey data in which firms indicate the average value of total sales that has been sold on credit.

Table 2. Descriptive statistics

Variables	Mean	SD	Max	Min	Number of observations
Trade credit variable					
<i>Trade credit use</i>	0.31	0.25	1	0	404
<i>Trade credit provided by small traders</i>	0.26	0.25	1	0	202
<i>Trade credit provided by large traders</i>	0.37	0.26	1	0	202
<i>Trade credit provided by wholesalers</i>	0.31	0.25	1	0	101
<i>Trade credit provided by millers</i>	0.41	0.27	1	0	158
<i>Trade credit provided by retailers</i>	0.19	0.20	0.9	0	145
Trader-specific					
<i>Size</i>	20.69	2.22	26.99	16.30	403
<i>Years in business</i>	8.01	5.06	29	1	403
<i>Margin</i>	0.09	0.10	0.55	0.003	404
<i>Trade credit received</i>	0.23	0.25	1	0	404
<i>Difficult to get loan</i>	0.20	0.40	1	0	404
<i>Contact</i>	3.95	1.34	5	0	404
Competition					
<i>Rivalry</i>	3.08	0.90	4	0	403
<i>Customer power</i>	0.55	0.37	1	0	403
Trader-type					
<i>Wholesaler</i>	0.25	0.43	1	0	404
<i>Miller</i>	0.39	0.49	1	0	404
<i>Retailer</i>	0.36	0.48	1	0	404

Notes: See main text and Appendix A for definitions of variables. Small traders are all traders with total sales below the median value of trader sales of the whole sample; large traders are all traders with total sales equal to or above the median size of sales of the whole sample.

perceived customer bargaining power is rather strong: according to our respondents, traders have to negotiate with the customer about the price for more than 50 percent of total sales.¹¹

Table 3, showing the correlation matrix, provides preliminary indications of potential associations between variables in our dataset. Most importantly for our research, both our measures of competition (*Rivalry* and *Customer power*) show a

¹¹ Potentially, *Customer power* and *Rivalry* may not be independent: customer power may be higher if rivalry in the market is stronger. Yet customer bargaining power also depends on a number of other factors, such as cost of switching, relative order size and the length of business relationship. This may reduce the interdependency between the two variables. This is corroborated by the data as the correlation matrix shows that the correlation between both variables is relatively low (that is only 0.179).

Table 3. Correlation matrix

	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]	[12]
[1] Wholesaler	1.000											
[2] Miller	-0.459**	1.000										
[3] Retailer	-0.431**	-0.603**	1.000									
[4] Retailry	-0.025	0.223**	-0.204**	1.000								
[5] Size	0.169**	0.461**	-0.620**	0.168**	1.000							
[6] Years in business	0.020	0.041	-0.059	0.083	0.102*	1.000						
[7] Customer power	0.045	0.334**	-0.380**	0.179**	0.279**	0.018	1.000					
[8] Trade credit received	-0.073	0.001	0.065	0.083	-0.013	-0.024	0.024	1.000				
[9] Margin	-0.188**	0.327**	-0.163**	0.128*	-0.178**	0.003	0.184**	0.064	1.000			
[10] Contact	0.019	-0.207**	0.193**	-0.191**	-0.048	-0.096	-0.110*	-0.076	-0.233**	1.000		
[11] Difficult to get loan	-0.014	-0.060	0.074	-0.072	0.002	-0.086	0.098*	-0.125*	-0.076	0.051	1.000	
[12] Trade credit supplied	-0.002	0.333**	-0.337**	0.270**	0.218**	0.104*	0.377**	0.426**	0.295**	-0.166**	-0.095	1.000

Note: ** and * denote significant correlation coefficients at the 1 and 5 percent significance level, respectively.

positive and significant correlation with the use of trade credit. These results suggest that more trade credit is supplied when traders are confronted with a more competitive environment. The control variables *Years in business*, *Size*, *Margin* and *Trade credit received*, all show an expected positive and significant correlation with the use of trade credit, whereas for *Difficult to get loan*, the correlation is negative as expected. *Contact* is negatively correlated with the use of trade credit, which is not in line with what we expected based on previous research.

4.2 Empirical results

Table 4 presents the outcomes of the regression analysis, testing for Hypotheses 1 and 2. The first three estimations shown in this table have been carried out applying OLS with robust standard errors. The specifications in columns [1] and [2] show the outcomes when we include one of the two competition variables separately plus the trader-type dummy variables. The results in column [1] reveal that perceived competition from rivals in the market is positively and significantly (1 percent level) associated with the use of trade credit. Moreover, the results in column [2] support the view that perceived customer bargaining power is positively associated with trade credit use as the coefficient for *Customer power* is positive and statistically significant at the 1 percent level. These two outcomes do not change when we combine both measures of competition and add our set of control variables in column [3].

The table also shows the standardized coefficients (in italics). These standardized coefficients reflect how many standard deviations the dependent variable will change per standard deviation change in the independent variable. They thus provide information on the effect size, or economic significance of the competition variables on the provision of trade credit. The results show that the standardized coefficients range between 0.18 (for *Rivalry*) and 0.27 (for *Customer power*), which we interpret as a significant economic effect. Moreover, the results indicate that changes in customer bargaining power seem to have bigger impact on the provision of trade credit than changes in the rivalry from competitors. When we control for other variables, the standardized coefficients drop to 0.11 and 0.22, respectively. According to us, this indicates that competition remains an economically significant factor even if we take into account other determinants of trade credit. To summarize, the results in columns [1]–[3] are clearly in line with Hypotheses 1 and 2 and support the view that traders provide trade credit as a strategy to reduce customer switching in competitive markets.

The results in column [3] also show that the trader-specific variable, *Years in business*, is positively and significantly associated with trade credit use, suggesting that older traders provide more trade credit to their customers. This corroborates results from previous research suggesting that these types of traders have easier access to external finance, which enables them to provide more trade credit (Petersen and Rajan, 1997; Van Horen, 2004). *Size* is positively associated with trade credit, but its coefficient is not significant. The variable *Margin* is also positive and significant,

Table 4. OLS and Tobit regressions of the relationship between trade credit use and competition faced by traders

Full sample results						
(Dependent variable: trade credit in percentages of total sales)						
	[1]	[2]	[3]	[4]	[5]	[6]
	OLS	OLS	OLS	Tobit	Tobit	Tobit
	Full	Full	Full	Full	Full	Full
	sample	sample	sample	sample	sample	sample
Competition						
<i>Rivalry</i>	0.053*** (0.000) 0.186		0.032*** (0.006) 0.113	0.063*** (0.000)		0.037** (0.008)
<i>Customer power</i>		0.194*** (0.000) 0.276	0.158*** (0.000) 0.224		0.229*** (0.000)	0.181*** (0.000)
Trader-specific						
<i>Years in business</i>			0.004** (0.032) 0.082			0.005** (0.020)
<i>Size</i>			0.004 (0.488) 0.036			0.010 (0.137)
<i>Margin</i>			0.457*** (0.000) 0.173			0.555*** (0.000)
<i>Trade credit received</i>			0.418*** (0.000) 0.411			0.483*** (0.000)
<i>Difficult to get loan</i>			-0.014 (0.578) -0.021			-0.038 (0.210)
<i>Contact</i>			0.001 (0.890) 0.005			0.001 (0.861)
Trader-type						

Table 4. (Continued)

Full sample results						
(Dependent variable: trade credit in percentages of total sales)						
	[1]	[2]	[3]	[4]	[5]	[6]
	OLS	OLS	OLS	Tobit	Tobit	Tobit
	Full	Full	Full	Full	Full	Full
	sample	sample	sample	sample	sample	sample
<i>Wholesaler</i>	0.107*** (0.000) <i>0.181</i>	0.075** (0.010) <i>0.125</i>	0.088*** (0.001) <i>0.148</i>	0.121*** (0.002)	0.079** (0.046)	0.081** (0.021)
<i>Miller</i>	0.193*** (0.000) <i>0.367</i>	0.154*** (0.000) <i>0.293</i>	0.118*** (0.000) <i>0.223</i>	0.234*** (0.000)	0.186*** (0.000)	0.122*** (0.002)
<i>Constant</i>	0.039 (0.351)	0.122*** (0.000)	-0.207 (0.118)	-0.039 (0.468)	0.059** (0.027)	-0.417*** (0.007)
R ²	0.169	0.200	0.433			
Adjusted R ²	0.163	0.194	0.419			
Pseudo R ²				0.233	0.277	0.703
Observations	404	403	401	404	403	401

Notes: All estimations presented in the table have been carried out using robust standard errors. *P*-values are reported in parentheses. ***, ** and * denote significant correlation coefficients at the 1, 5 and 10 percent significance level, respectively. Standardized coefficients are given in italics. These standardized coefficients reflect how many standard deviations the dependent variable will change per standard deviation change of the independent variable. They provide information on the effect size, or economic significance of the independent variables shown in the table. Please note that standardized coefficients are not calculated for the Tobit regressions because their calculation is not straightforward.

indicating that more profitable traders generally provide more trade credit. The same holds for *Trade credit received*, supporting the view that traders receiving higher levels of trade credit themselves provide more trade credit to their own customers. This result is similar to what Fabbri and Klapper (forthcoming) find in their analysis of Chinese firms providing trade credit. The other two trader-specific control variables (*Difficult to get loan* and *Contact*) are not statistically significant. The results of the trader dummy variables show that, on average, wholesalers and millers provide more trade credit than retailers do as both dummy variables have a positive and statistically significant sign. These outcomes generally confirm the results from our descriptive analysis with respect to the differences in trade credit use between different types of traders (see Table 1).

Columns [4]–[6] in Table 4 show the results when we redo the estimations of columns [1]–[3], but use Tobit instead of OLS regressions. We use Tobit because one may argue that the dependent variable is censored, which means that a two-sided Tobit model should be used instead of OLS. The Tobit results appear to be very similar to those of the OLS regressions, as is shown in columns [4]–[6] in the table. We find the same set of variables statistically significant, including our two competition measures. Moreover, all estimated coefficients are in the same order of magnitude. Since the OLS and Tobit results do not differ much, we continue our analysis using OLS.

In Table 5, we focus on analyzing the relationship between competition and trade credit use for the retail vs. the wholesale and milling market segments. This allows us to investigate Hypotheses 3 and 4. The results for the retail segment shown in column [1] suggest that competition as measured by *Rivalry* is not associated with the use of trade credit. The same holds when *Customer power* is used as a measure of competition (column [2]). If we include both competition variables together with a set of control variables, only *Customer power* becomes marginally significant (column [3]). Overall, these outcomes suggest that, for the retail segment the use of trade credit is hardly affected by competitive pressures in the market.

For the wholesale segment, as is shown in column [4], the coefficient for *Rivalry* is clearly positive and significant. Moreover, *Customer power* is also positively associated with trade credit (column [5]). These results are unaffected when we include both variables together with a set of control variables (column [6]). Economically, the association between competition and providing trade credit appears to be strongly significant. The standardized coefficients reported in columns [4]–[6] of Table 5 range between 0.14 and 0.51, which is much higher than those reported for the sample as a whole in Table 4. The outcomes in Table 5 thus provide strong support for the hypothesis that for wholesalers, stronger market competition increases incentives to provide trade credit to their customers.

For the millers, the results are similar to those of the wholesalers. Columns [7] and [8] show that the coefficients for *Rivalry* and *Customer power* are both positive and significant. If we include both variables together with the controls (column [9]), the coefficient for *Customer power* remains positive and significant, whereas the coefficient for *Rivalry* is also still positive but loses significance. The association between competition and providing trade credit is also economically significant: the standardized coefficients reported in columns [7]–[9] of Table 5 range between 0.09 and 0.23, which is in line with those reported for the sample as a whole in Table 4, but much lower than those reported for the wholesale sector. Overall, the outcomes in columns [7]–[9] provide at least partial support for the hypothesis that, also for the millers, stronger market competition increases incentives to provide trade credit to their customers.

As a robustness check, we add wholesalers and millers together into one category and run the same set of regressions as presented in Table 5. The results we obtain are very similar to those presented in the table: the coefficients for the two

Table 5. OLS regressions of the relationship between trade credit use and competition faced by traders

Variables	Sub-sample results								
	(Dependent variable: trade credit in percentages of total sales)								
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Retailers	Retailers	Retailers	Wholesalers	Wholesalers	Wholesalers	Wholesalers	Millers	Millers	Millers
Competition									
Rivalry	0.015 (0.415) 0.072		0.009 (0.623) 0.046	0.084*** (0.004) 0.284		0.045** (0.033) 0.148	0.076*** (0.001) 0.238		0.029 (0.141) 0.092
Customer power		0.052 (0.291) 0.087	0.096* (0.077) 0.161		0.354*** (0.000) 0.513	0.206*** (0.000) 0.300		0.195*** (0.001) 0.238	0.152*** (0.000) 0.184
Trader-specific									
Years in business			0.003 (0.267) 0.105			0.006 (0.111) 0.122			0.000 (0.936) 0.004
Size			0.015 (0.264) 0.096			-0.008 (0.602) -0.054			0.003 (0.696) 0.025
Margin			-0.253 (0.564) -0.051			-0.028 (0.907) -0.008			0.530*** (0.002) 0.257
Trade credit received			0.157* (0.061) 0.239			0.585*** (0.000) 0.480			0.657*** (0.000) 0.580
Difficult to get loan			-0.099** (0.012) -0.218			0.075 (0.199) 0.117			-0.021 (0.643) -0.030
Contact			-0.038 (0.160) -0.137			-0.023 (0.103) -0.129			0.022** (0.024) 0.137

Table 5. (Continued)

Variables	Sub-sample results								
	(Dependent variable: trade credit in percentages of total sales)								
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
	Retailers	Retailers	Retailers	Wholesalers	Wholesalers	Wholesalers	Millers	Millers	Millers
Constant	0.149*** (0.011)	0.174*** (0.000)	-0.027 (0.917)	0.053 (0.533)	0.106*** (0.002)	0.151 (0.670)	0.158** (0.035)	0.276*** (0.000)	-0.154 (0.446)
R ²	0.005	0.007	0.187	0.081	0.263	0.545	0.056	0.056	0.503
Adjusted R ²	-0.001	0.0007	0.140	0.071	0.255	0.505	0.050	0.050	0.476
Observations	145	145	145	101	100	99	158	158	157

Notes: All estimations presented in the table have been carried out using robust standard errors. P-values are reported in parentheses. ***, ** and * denote significant correlation coefficients at the 1, 5 and 10 percent significance level, respectively. Standardized coefficients are given in italics. These standardized coefficients reflect how many standard deviations the dependent variable will change per standard deviation change of the independent variable. They provide information on the effect size, or economic significance of the independent variables shown in the table.

competition variables are positive and significant when we use the data for the sub-sample of wholesalers and millers (not reported).

We interpret the differences between the retail segments on the one hand and the wholesale and miller segments on the other hand as follows. First, a large number of (petty) retailers are operating in the local market places in which the retailers in our sample are active. Among other things, this means that switching costs for customers of retailers, even in case of default, are low. Alternative suppliers willing to sell rice on a cash basis are always available. The only potential consequence is that in the short run, the customer may lose access to trade credit and alternative moneylenders have to be found. Second, contract enforcement costs for retailers are relatively high as the total value of a retail deal is generally small. Moreover, because of the large number of customers in local markets, they are generally not well-known in the retailers' network, making enforcement of contracts difficult. In contrast, wholesale transactions and transactions in the milling market segment are realized between traders who know each other and operate in the business on a regular basis. In such a context, information spreads easily and informal institutions are expected to be effective to increase switching costs in case of default: customers of wholesalers and millers will have difficulty finding alternative suppliers willing to provide trade credit. As trade credit is an important means of financing business activities, this will be perceived as a serious threat.

We would like to note that we are not able to directly measure the impact of contract enforcement. Instead, we are only able to interpret the results with respect to the use of trade credit for different sub-samples of rice traders as indirect evidence of this impact. Our conjecture of how to interpret the estimation results is in line with Hypotheses 3 and 4.

We acknowledge that the analysis may suffer from a potential endogeneity bias and, in particular, from reverse causality, because providing trade credit may also affect rivalry and customer bargaining power. We try to address this problem by applying an instrumental variable approach and re-estimate the relationship between trade and competition. The problem, however, is that the dataset we have does not contain variables that can serve the role of strong external instruments.

Initially, we address potential endogeneity by applying 2SLS regressions using the average competition levels for each of the three market segments in each of the six provinces in which the survey was carried out as instrumental variables.¹² The average competition levels are calculated using competition levels at the individual trader level. In this way, we create two external instrumental variables, one for our rivalry measure (*Average Rivalry*) and one for our customer bargaining power measure (*Average Customer power*). The rationale for using these variables as instruments is that trader-level competition is at least partly determined by the provincial and sector level, that is, traders in the same sector and province face a similar level of

¹² We have borrowed this approach from Anderson *et al.* (2011). It has also been used by, among others, Huang and Wang (2015).

competition. These average competition levels are, at least conceptually not related to trade credit use at the trader level. The results of the 2SLS estimations are reported in columns [1], [4] and [7] of Table 6. We note that for the sub-sample of wholesalers (column [4]), the results of the 2SLS estimation cannot be shown, because the two external instruments are perfectly collinear. Looking at the results for the retailers and millers reported in columns [1] and [7], we observe that the test statistics – based on the Cragg Donald Wald F -statistic and the Stock and Yogo (2005) weak ID test – indicate that our instruments are weak.

Next, we apply Lewbel's (2012) method of identifying instruments. This method is developed for cases like ours, that is, when endogeneity may be an issue, but appropriate external instruments are weak or non-existent. This method generates external instruments, which are based on the data for the variables we include in our regression model. More specifically, instrumental variables are created by regressing each endogenous variable on all exogenous variables (internal instruments) and a constant. Then, the residuals from these regressions are multiplied by each exogenous variable in mean-centred form. This multiplication provides the newly generated (external) instruments (Bezemer *et al.*, 2014). Lewbel (2012) suggests using this method and to add the available external instruments (even if they are weak) to improve the efficiency of the IV estimations. This approach is similar to the approach of applying dynamic panel data estimations developed by Arellano and Bond (1991), which makes use of lagged values of external variables in the model. Lewbel's method can be applied in the context of cross-sectional data, which we have here as well.

Table 6 reports the results of the IV estimations for the three market segments using Lewbel's method with and without the external instruments – *Average Rivalry* and *Average Customer power*. Columns [2] and [3] refer to the retailing market segment, columns [5] and [6] show the outcomes for the wholesale market segment and columns [8] and [9] relate to the milling market segment. The IV estimates in columns [2], [5] and [8] refer to Lewbel's method without external instruments; the estimates in columns [3], [6] and [9] are based on IV estimates using Lewbel's method with our two external instruments.

The results show some support for the estimations we obtain from the OLS regressions. For retailers we find that competition is positively associated in only one of four cases (for *Customer power* when using Lewbel's method with external instruments). For wholesalers, the results show that in two of four cases, the association between competitions is positive (for *Customer power* when using Lewbel's method with and without external instruments; see columns [5] and [6]). With respect to millers, the IV estimates are supportive of the OLS outcomes in three of four cases (for *Rivalry* when using Lewbel's method with and without external instruments as well as for *Customer power* when using Lewbel's method with external instruments; see columns [8] and [9]). We do acknowledge, however, that for these IV estimates the test statistics, based on the Sargan statistic, the Cragg Donald Wald F -statistic, as well as the Stock and Yogo (2005) weak ID test, suggest that we

Table 6. IV regressions of the relationship between trade credit use and competition faced by traders

Variables	Sub-sample results								
	(Dependent variable: trade credit in percentages of total sales)								
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
2SLS	Retailers Lewbel	2SLS/Lewbel	Wholesalers 2SLS	Wholesalers Lewbel	Wholesalers 2SLS/Lewbel	Wholesalers 2SLS/Lewbel	Millers 2SLS	Millers Lewbel	Millers 2SLS/Lewbel
Competition									
<i>Rivalry</i>	3.876 (0.696)	-0.046 (0.183)	-0.008 (0.808)	-	0.023 (0.602)	0.028 (0.521)	0.703* (0.051)	0.095*** (0.002)	0.098*** (0.002)
<i>Customer power</i>	4.649 (0.644)	0.067 (0.471)	0.197** (0.026)	-	0.175* (0.086)	0.203** (0.027)	1.118 (0.137)	0.001 (0.992)	0.328*** (0.002)
Trader-specific									
<i>Years in business</i>	-0.130 (0.703)	0.005* (0.079)	0.004 (0.190)	-	0.006* (0.077)	0.006** (0.027)	0.010 (0.447)	0.002 (0.550)	0.001 (0.764)
<i>Size</i>	0.366 (0.718)	0.010 (0.492)	0.011 (0.406)	-	-0.0033 (0.806)	-0.005 (0.711)	-0.012 (0.663)	0.001 (0.860)	0.001 (0.870)
<i>Margin</i>	-0.984 (0.906)	-0.250 (0.536)	-0.273 (0.491)	-	-0.039 (0.876)	-0.041 (0.869)	-0.591 (0.383)	0.544*** (0.001)	0.376** (0.020)
<i>Trade credit received</i>	0.261 (0.814)	0.156*** (0.004)	0.158*** (0.003)	-	0.617*** (0.000)	0.598*** (0.000)	0.480* (0.100)	0.616*** (0.000)	0.646*** (0.000)
<i>Difficult to get loan</i>	0.039 (0.978)	-0.106*** (0.009)	-0.117*** (0.003)	-	0.081 (0.136)	0.075 (0.160)	0.096 (0.529)	-0.012 (0.776)	-0.008 (0.853)
<i>Contact</i>	-0.441 (0.668)	-0.036 (0.163)	-0.049* (0.054)	-	-0.025* (0.061)	-0.024* (0.068)	0.120** (0.030)	0.027*** (0.010)	0.033*** (0.003)
<i>Constant</i>	-16.548 (0.711)	0.232 (0.459)	0.111 (0.717)	-	0.134 (0.634)	0.144 (0.606)	-3.004** (0.030)	-0.264 (0.270)	-0.501** (0.039)

Table 6. (Continued)

Variables	Sub-sample results								
	(Dependent variable: trade credit in percentages of total sales)								
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
Retailers 2SLS	Retailers Lewbel	Retailers 2SLS/Lewbel	Wholesalers 2SLS	Wholesalers Lewbel	Wholesalers 2SLS/Lewbel	Wholesalers 2SLS	Millers 2SLS	Millers Lewbel	Millers 2SLS/Lewbel
<i>Sargan statistic</i>	–	0.033	0.000	–	0.078	0.055	–	0.009	0.000
<i>(P-value)</i>									
<i>Cragg Donald</i>	0.076	3.078	2.684	–	1.497	1.618	2.864	2.163	3.176
<i>Wald F-statistic</i>									
<i>Stock-Yogo</i>	3.95	6.22	6.20	–	6.22	6.21	3.95	6.22	6.20
<i>weak ID</i>									
<i>test (20% maximal</i>									
<i>IV size)</i>									
<i>R²</i>	0.000	0.119	0.153	–	0.539	0.543	0.032	0.444	0.405
Observations	145	145	145	–	99	99	157	157	157

Notes: The results in columns [1], [4] and [7] present the results when using only external instruments for rivalry and customer power (i.e., applying 2SLS estimations). For the sub-sample of wholesalers, the results of the 2SLS estimation cannot be shown, because the two external instruments are perfectly collinear. The results in columns [2], [5] and [8] present the results when using Lewbel's (2012) method of identifying (internal) instruments. Columns [3], [6] and [9] provide the outcomes when using both 2SLS (external instruments) and Lewbel's methods (internal instruments). *P*-values are reported in parentheses. ***, ** and * denote significant correlation coefficients at the 1, 5 and 10 percent significance level, respectively. The Sargan statistic is used to test for the over-identification of the instruments used. This is a test of the validity of the instruments (i.e., a test of whether the instruments are orthogonal to the error distribution of the dependent variable). The Sargan statistic cannot be shown when using 2SLS because the estimated models are exactly identified. *P*-values above 0.05 for this statistic confirm instruments are valid. The Cragg Donald Wald *F*-statistic is used to test the relevance of the instruments. The higher the value for this statistic, the more valid (i.e., the stronger) the instruments are. The Stock and Yogo (2005) weak identification test is also a test of the relevance of the instruments. Again, the higher the value for this statistic, the more valid (i.e., the stronger) the instruments are. The results of the test statistics as shown in Table 6 reveal that we have weak internal, external, as well as generated external instruments. The IV results in this table should therefore be interpreted with caution.

still have weak external as well as weak generated external instruments. The IV results should therefore be taken with caution. In fact, since our instruments are weak, we are inclined to put more confidence in the results from the simple OLS regressions shown in Table 5.

5. Conclusions, limitations and further research

In this study, we have revisited the empirical analysis of the relationship between the competitive environment of firms and their willingness to provide trade credit to customers. Our research has been inspired by recent evidence that the provision of trade credit varies along the value chain (Seifert *et al.*, 2013). We argue that these differences can be explained by competition and the availability of effective mechanisms to enforce repayment.

In our analysis, we particularly focus on two dimensions: competition in terms of the trader's perceived competition from its rivals and the bargaining power of its customers. Based on previous empirical evidence, we hypothesize that higher levels of rivalry among traders and higher levels of customer bargaining power are associated with higher levels of trade credit use. Given these market conditions, traders have incentives to provide more trade credit to customers in order to retain market shares and avoid customer switching. Using data from a large-scale survey among wholesale and retail rice traders in Vietnam, we find strong evidence for these hypotheses, confirming the view that competition faced by traders is an important determinant of the use of trade credit.

More importantly, however, we empirically investigate whether the relationship between competition and trade credit is different depending on the market segment within the value chain. We test this by looking at differences between the wholesale and miller segment on the one hand and the retail market segment on the other hand. Our results show that competition does not (strongly) influence the use of trade credit in the retail market. We explain this as follows. Switching costs for customers of retailers are low and contract enforcement costs for retailers are relatively high, as the total value of a retail deal is generally small. Moreover, consumers are generally not well-known in the retailers' network and do not buy rice on a daily basis. Under these circumstances, trade credit becomes an unattractive marketing instrument for retailers.

In contrast, wholesalers and millers show a stronger willingness to provide trade credit when confronted with competition. Our results show that competition is positively and significantly associated with the use of trade credit by wholesalers and millers. This relationship is also economically significant, especially in case of the wholesalers. This can be explained by the fact that in these market segments, transactions are realized between traders who know each other and operate in the business on a regular basis. In such a context, information spreads easily and informal institutions are expected to be effective to increase switching costs in case of default.

We check whether our analysis suffers from potential endogeneity problems. Using Lewbel's method with and without external instruments, a method that is appropriate in the context of cross-sectional data, we find some support for the results generated by the OLS regressions. We note, however, that the results of our instrumental variable estimates should be interpreted with caution due to a lack of good instruments in our dataset.

We propose extending our analysis in a number of ways. First of all, future research should focus on redoing the analysis for firms in different industries with different competitive conditions to verify to what extent our results are corroborated in other market settings and competitive environments. Moreover, our study could be extended to rice markets in other countries to investigate the relationship between competition and the use of trade credit under different formal regulatory and judicial frameworks. By extending our analysis in both these directions, that is, by making use of the heterogeneity across countries and sectors, it can be analyzed to what extent our results have high external validity. Second, the current analysis uses cross-sectional data. Creating a panel dataset that reveals the use of trade credit and competition faced by firms would support investigations of changes in the relationship over time, for example, due to changes in the development of financial markets and the institutional context. Third, we use information on the total use of trade credit at the level of traders. We do not have information on the determinants of trade credit relating to the individual trade relationship between the supplier and their customers. This type of data would allow us to include supplier- and customer-specific characteristics that may have an impact on the competitiveness of a firm as determinants of trade credit use. For example, such data would allow us to better measure the bargaining power of both the supplier and the customer in the trade relationship. Finally, the data should be expanded by collecting additional data, allowing us to improve the use of instrumental variables.

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Appendix A

Description of the independent variables used in the empirical analysis

Variables names	Description of measurement
Dependent variable	
<i>Trade credit use</i>	Percentage of total sales for which delayed payment (trade credit) is offered. This is calculated by dividing the value of sales for which delayed payment has been offered to customers by the value of total sales. The variable has a value between 0 and 100 percent
Trader-specific	
<i>Size</i>	Logarithm of the value of total sales of the trader
<i>Years in business</i>	Logarithm of the number of years since the trader has been in business
<i>Margin</i>	Profit margin of a trader; calculated as $\frac{AP_i - AVC_i}{AP_i}$. AP_i is the average selling price per ton rice of the trader i in 2006; AVC_i reflects the average variable costs of trader i in 2006
<i>Trade credit received</i>	Percentage of total inputs the trader has bought on credit. This variable has a value between 0 and 100 percent
<i>Difficult to get loan</i>	Dummy variable which has the value 1 if the trader indicates it is difficult to obtain a loan, and 0 otherwise
<i>Contact</i>	Measure of the frequency of contacts between supplier and customer rated on a scale with the following items: 1 = contact once a year; 2 = contact once every 6 months; 3 = contact once every 3 months; 4 = contact once every month; 5 = contact once every week; 6 = contact once a day

Appendix A (Continued)

Competition	
<i>Rivalry</i>	Measure of competition in the market as perceived by the trader. The competitive force from other suppliers in the market is rated on a scale with the following items: 0 = the trader perceives no competition from rivals; 1 = the trader perceives competition from rivals to be low; 2 = the trader perceives competition from rivals to be modest; 3 = the trader perceives competition to be rather high; 4 = the trader perceives competition to be severe
<i>Customer power</i>	Measure of the potential bargaining power of customers, measured as the percentage of total sales for which the supplier has to negotiate about the price with the customer. This variable has a value between 0 and 100 percent
Trader-type	
<i>Wholesaler</i>	Dummy variable which has the value 1 if the trader is a wholesaler, and 0 otherwise
<i>Miller</i>	Dummy variable which has the value 1 if the trader is a miller, and 0 otherwise
<i>Retailer</i>	Dummy variable which has the value 1 if the trader is a retailer, and 0 otherwise
