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The Debt Structure of SMEs: An Optimization Model

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Abstract

The existing finance literature is inadequate with respect to its coverage of the debt structure of small and medium sized enterprises (SMEs). In addition, the role of trust in accessing finance for such enterprises is under-investigated. This paper presents a mathematical model for optimizing the debt structure of SMEs that, since SMEs are often equity constrained, focuses on optimizing debt structure by minimizing its cost. The model is then extended by incorporating the level of trust that suppliers and bank managers have in the enterprise. The extended model, suggests that the higher the level of trust that bank managers and suppliers have in the SME, the more short-term finance an SME can obtain and should use.

Keywords: SMEs, Capital Structure, Trade Credit, Bank Debt, Trust.

I. Introduction

It is possible to distinguish two separate strands in the literature on firms' capital structure. On the one hand, there is the research rooted in the Modigliani and Miller (1958) model, which is based on the assumption of perfect markets. This stream of research focuses mainly on modeling, theoretically, the capital structure decision (that is, the mix between equity and debt) of large corporations. On the other hand, there is the empirical research on capital structure of small and medium sized enterprises (SMEs) and on SME lending relationships. This stream of research draws attention to the difficulty faced by SMEs in relying on equity to finance their expansion (Berger et al., 1998; Gregory et al., 2005; Mueller, 2011; Ang, 1992). This difficulty applies particularly where the owners and the managers of the firm are the same people and when they are reluctant to open the equity holding to new shareholders, as is often the case with SMEs. Here the owner/manager is typically very much concerned with not losing control of the firm, in order to pass it on to the next generation (José López-Gracia and Sánchez-Andújar, 2007; Romano et al., 2000; Porta et al., 1999). Consequently they do not like to access external equity finance, since it implies a reduction in their freedom in managing the firm and the implementation of (often very costly) additional control and management tools (Delmar, 2000). In addition, firms with concentrated ownership are found to under-invest and therefore are less appealing for the external providers of equity (Danielson and Scott, 2007). Therefore, potential investors face formidable problems in valuing the venture and making investment decisions.

Thus, a complex mix of ownership and financial factors have important consequences for how SMEs are financed: they do not typically seek external funds in the form of equity, and the equity invested in the venture consists entirely of the funds provided by the entrepreneurs and their families and by the profit shareholders decide to retain in the firm (Ang, 1992; Huyghebaert and Van de Gucht, 2007). When the firm needs additional funds to expand, the original funders are often not able to provide additional equity. In fact, SMEs' shareholders usually invest in the venture all (or at least the largest part of) their wealth at the beginning (Ang, 1992; Avery et al., 1998), and they typically do not hold a diversified portfolio of investments; therefore, their risk is much higher than that of a diversified investor (Kerins et al., 2004). As a result, these firms tend to be equity constrained, and their alternative option is to obtain additional bank finance or leverage their trade credit capability (Berger et al., 1998; Howorth, 2001). All in all, trade credit and bank debt (a mix of long-term and short-term debt) have a key role in SMEs.

The present paper, by focusing on debt, elaborates a theoretical model for optimizing the bank debt structure for SMEs. The model is based on the empirical observations that firms rely heavily on trade credit irrespective of its cost, and that short-term bank debt is typically more expensive than long-term bank debt. However, when a firm finances its activities with long-term bank debt, it will be charged the interest even when it does not use the credit provided, but when the firm uses short-term bank debt, it pays only for the credit used. As a result, because of the existence of a difference between the cost of short-term and long-term debt, there is scope to determine the optimal mix of debt that satisfies the desire of diversification of financing sources and minimizes its cost.

After elaborating the basic model for optimizing debt structure, a model that incorporates the role of trust is developed. Trusting relationships can help firms access trade credit and in the case of bank debt, trust can curb the negative effect of information asymmetries; trust is therefore expected to impact both the cost of credit and the amount obtained (Howorth and Moro, 2006). Indeed, the extended model suggests that high levels of trust can increase the amount of trade credit, both in good and in bad times (by extending the payment terms), even if trust does not affect the cost of trade credit. In addition, trust increases short-term credit access and it reduces the cost of short-term debt. Thus the model has two practical im-

plications. Firstly, the higher the level of suppliers' and banks' trust in the SME, the greater the availability of both trade credit and short-term bank debt. Secondly, the higher the trust, the more the firm should rely on short-term bank debt because of its reduced cost. All in all, highly trusted firms should increase the proportion of short-term liabilities (trade and bank credit) in order to optimize their debt structure. This implies that trust helps SMEs to build up a more flexible capital structure.

The paper is structured as follows. Section 2 provides a review of the literature on the factors affecting capital structure decisions in SMEs and on the nature of trust and how it can affect financing relationships. Section 3 discusses in detail the sources of finance for owner-managed firms and presents the mathematical model for optimizing the debt structure. Section 4 elaborates the extended model by incorporating the role of trust. Section 5 discusses the implications of the model for the financial management of SMEs. Section 6 draws conclusions and suggests some future research directions.

II. Capital Structure in SMEs and Trusting Relationships

The most commonly used term in the literature to describe the capital structure of firms is "puzzle." It recurs in various titles of academic papers and effectively describes the problem of finding the optimal structure in financing firms and projects. The foundation of the finance literature theoretically considers the modeling of the optimal capital structure for corporations and is based on the seminal work of Modigliani and Miller (1958) which demonstrates that it is impossible to increase the value of firm by simply modeling a different capital structure (and therefore specifying an optimal capital structure). In fact, later research demonstrated that the value of the firm is affected by the capital structure when the role of taxes is incorporated in the model (Brick and Ravid, 1985). Moreover, the impact of refinancing costs (Jun and Jen, 2003), the probability of going bankrupt (Philosophov and Philosophov, 2005), the role of bank debt seniority (Longhofer and Santos, 2000) and the country bankruptcy regime (Ongena and Smith, 2000; Hall et al., 2004) were all found to affect optimal capital structure. Other research addresses the agency costs (Fama, 1980) and the moral hazard risk (Jensen, 1986). Some scholars focus on the debt structure as a signaling device where short-term debt signals the high quality of the assets (Flannery, 1986). The greater flexibility of short-term debt is also stressed (Sharpe, 1991).

II.1 Equity and Retained Profit

The main problem with the foregoing research and models is that they are primarily concerned with organizations that can easily access both equity and debt. What about firms that, for various reasons, are constrained in accessing equity? This is the typical situation faced by young firms (LaRocca et al., in press) and by SMEs, when the owners are unwilling to open the shareholdings to new shareholders (Ang, 1992).

Indeed, research indicates that SMEs have special features that at least partially hamper them in accessing additional equity (Ang, 1992; Ang et al., 1995; Ang et al., 2000). Firstly, raising finance in regulated markets is subject to constraints for small opaque firms that suffer from big information asymmetries (Berger et al., 2001; Berger and Udell, 1998). Only as firms become older, larger, and more informationally transparent, do their financial options become more attractive: they can access public equity funding as well as public long-term debt (Gregory et al., 2005). Secondly, SMEs capital structure is linked to the control of the firm; the owners are very much concerned with not losing control in order to pass the firm on to the next generation of the family. Therefore, SMEs tend to rely more on internal financing, even when it means constraining the growth of the firm. Thirdly, pure investors and SME entrepreneurs are different because of the non pecuniary benefits enjoyed by the former. Indeed, empirical research indicates that they can enjoy non-pecuniary benefits as high as 20%

of their investment (Moskowitz and Vissing-Jørgensen, 2002). Fourthly, the median entrepreneurial earnings after 10 years of business are found to be 35% less than the predicted alternative wage on a paid job of the same duration (Hamilton, 2000). This apparently illogical outcome can be justified by the freedom entrepreneurs enjoy to decide what to do and by the social prestige linked to running their own business. In addition, it is suggested that the entrepreneurs' possibility of exerting power over others is an important factor in deciding to start and to run their own business. All these benefits are highly valued by owners of SMEs, but they tend to clash with the interests of the external providers of equity. Fifthly, when the SMEis managed by the owners, it might benefit from incurring lower agency costs (Ang et al., 2000), even if Brau's (2002) empirical evidence suggests that there is no real reduction in agency costs suggesting that further research on this topic is appropriate. Thus, as suggested by Romano et al. (2000) and by Chittenden et al. (1996.), a complex mix of social, family, cultural and financial factors influence capital structure.

Entrepreneurs can also access finance from friends and relatives (Elston and Audretsch, in press; Landström, 1992). This is quite common for very new, innovative firms since they struggle to access traditional, formal sources of finance because of the lack of credit history, because of the innovativeness of the business idea or of the product/service they deliver, and because of doubts about the skills and competences of the entrepreneurs. Nevertheless, the access to family and friends finance is limited both in terms of amount and in terms of time (Ebben and Johnson, 2006). The amount is limited to the availability of funds from friends and family members. In addition, friends and relatives typically expect to be repaid after a relatively short period, since they are not proper investors: their decision to provide finance is not driven by a clear expectation in terms of return on investment, but simply by the desire to be supportive to a friend/relative. Indeed, access to formal sources of finance improves as the venture survives the start up period and implicitly the entrepreneurs demonstrate their capability to be successful. Thus, as time goes by, the entrepreneur can reduce the need to rely on family and friends finance (Avery et al., 1998).

Entrepreneurs can also finance the firm via retained profit; pecking order theory by Myers and Majluf (1984) suggests that firms prefer to finance the growth firstly with retained profit and then with other sources, since retained profit is the cheapest source of finance. In fact, retained profit may be withdrawn for personal use or reinvested at the owner-manager's discretion, and what drives the entrepreneur's decision is not only the cost of that source of finance. Indeed, whether an entrepreneur chooses to withdraw or reinvest retained profits is likely to depend on a host of factors relating to the personal characteristics of the entrepreneur (Ang et al., 1995; Hamilton, 2000; Moskowitz and Vissing-Jørgensen, 2002). These characteristics include the time horizon and attitude to risk (Mueller, 2011): an entrepreneur planning to retire in six months may well have a different time preference with regard to present versus future income from one hoping to expand the business over the next twenty years (Cassar, 2004; Degryse et al., forthcoming); a highly risk-averse owner-manager may prefer to take the money now rather than leave it invested in a potentially risky venture (Huyghebaert and Van de Gucht, 2007). The stage of the business's products' life cycles (e.g. 'star' versus 'cash cow') may also influence the decision whether to leave profits invested in the business to withdraw them. Last but not least, the possibility of financing firms' growth using retained profit is linked to the firm's capability of generating profit and converting profit (an accounting measure) into cash available to the entrepreneur. All in all, there are many factors that affect the entrepreneur's decision whether to retain profit in the firm or to withdraw it that are over and above the mere cost of this source of finance. Consequently, retained profit cannot be included in a generalizable optimization model based on its cost. To sum up, the decision concerning the amount of equity and retained profit that the entrepreneur should invest in the venture is not linked only (or even primarily) to the financial fac-

tors. Moreover, the amount of new equity and retained profit that entrepreneurs can access is severely constrained. Thus, equity and retained profit are typically a given (at least in the short- term) in SMEs capital structure optimization.

II.2 Bank Finance and Trade Credit

SMEs might rely also on very specific financing tools like leasing and factoring (Beck and Demirguc-Kunt, 2006; Deloof et al., 2007). In addition, SMEs are found to rely on bootstrap finance (Wingborg and Landström, 2000), that is on informal sources of finance like the use of personal credit cards and personal loans. However, these sources can typically cover only a small proportion of the financial needs and very often for a very short period (this holds particularly true for the use of personal credit cards or personal loans). Indeed, in the studies quoted above, the use of owner-related sources of finance significantly decreased over time while the use of trade credit increased (Ebben and Johnson, 2006).

In fact, SMEs tend to rely mainly on banks (Petersen and Rajan, 1994; Berger and Udell, 1995; Cole, 1998), and on trade credit (Summers and Wilson, 2002; Atanasova and Wilson, 2003; Petersen and Rajan, 1997) to finance their operation.

Bank credit is found to be the most important source of finance for firms (Bornheim and Herbeck, 1998; Angelini et al., 1998; Binks et al., 2006; Cole, 1998), and is granted according to different lending technologies (Berger and Udell, 2006). Heyman et al. (2008) suggest that maturity matching between debt and the life of assets plays an important role in deciding the length of the debt used to finance the firm, since the matching provides the minimum risk maturity structure. Short-term debt is positively correlated with a firm's growth opportunities (García-Teruel and Martínez-Solano, 2007), it is higher in stronger and more flexible firms, when there are big differences between short-term and long-term interest rates and when firms have more growth opportunities. Some research investigates specifically the role short-term debt has in SMEs. It is regarded as a good tool for the bank that can act rapidly to recoup the principal on the arrival of bad news (Landier and Thesmar, 2009). Some research indicates that the determinants of the amount of short-term debt and long-term debt used are different. For instance, short-term debt is not affected by the trade off between tax benefits and bankruptcy costs; long-term debt is affected by collateralizable assets but short-term debt is not (Pindado et al., 2006). All in all, SMEs rely heavily on bank finance but there is no definitive understanding of its use, and it is not clear whether they optimize it.

An additional important source of finance for SMEs is trade credit. It is used by SMEs since it is easily accessible and is also considered to be a signaling device about the firm its products and future prospects (Paul and Wilson, 2006). The better the quality of the firm, the higher the overall trade credit it can obtain. Cuñat (2006) stresses that trade credit can be a two- or one-part contract. In the former case, customers are entitled to receive a discount if it pays immediately; in the latter case, customers do not receive any discount if they pay cash. For the two parts contract, the cost of trade credit is defined as the discount received by customers if they pay cash. Previous research provides strong evidence that, in the case of two part contracts, the cost of trade credit is very high (Huyghebaert et al., 2007; Cuñat, 2006; Petersen and Rajan, 1994), raising questions about the rationale of using it to finance the firm instead of using bank debt or equity. Nevertheless, various previous studies provide different explanations (Huyghebaert et al., 2007; Deloof and Jegers, 1996; Atanasova and Wilson, 2003; García-Teruel and Martínez-Solano, 2010). One suggested argument for relying on trade credit is the fact that trade credit is the most easily obtainable source of finance for firms (Huyghebaert, 2006), definitely easier to obtain than bank finance (Petersen and Rajan, 1997). Moreover, often, the firms have to finance their activity with trade credit since they either do not access bank finance at all (this happens typically for very young firms) or they are constrained in the amount of bank credit they can obtain. Furthermore, suppliers are typi-

cally more supportive to customers when they need extended credit than banks are (Howorth and Reber, 2003; García-Teruel and Martínez-Solano, 2010) by extending credit granted and/or by supplying additional services/goods (Cuñat, 2006). Interestingly, the extended trade credit is costless since suppliers do not charge extra fees to the customers. In fact, suppliers are in a better position than banks to evaluate the credit quality of the customer, they have more tools to enforce proper behavior by the customer and therefore have greater control over the credit provided (Cuñat, 2006). The decision to rely on trade credit is also based on the benefits of diversifying the sources of finance (Tsuruta, 2008) since different providers of finance utilize different information and rely on different approaches to monitor firm's creditworthiness (Howorth and Reber, 2003), trade credit access and bank credit access are largely independent. It is therefore argued that the high price of trade credit incorporates an insurance premium that customers pay in order to be sure of obtaining (non-bank) credit when other sources of finance (typically banks) dry up (Tsuruta, 2008).

In summary then, SMEs are constrained in financing their operation and growth by relying on equity and retained profit. Thus, they have to turn to short- and long-term bank debt and trade credit where the decision concerning which source of finance to use is only partially affected by their relative costs.

II.3 Trust and Financing Decisions

The research on the sources of finance for SMEs pays only marginal attention to trust as a distinct factor that affects the relationship between the provider and user of finance, in recent times a growing interest has emerged (Ferrary, 2003; Howorth and Moro, 2006; Saparito and Gopalakrishnan, 2009). Nevertheless, when a bank or a supplier makes a decision to provide credit, even though the granting of credit is a contractual relationship, it is underpinned by an assessment of trust. In fact, including trust shifts the attention from the traditional approach linked to transaction costs economics and agency theory to a wider and more complex perspective where interpersonal ties and relationships are taken into consideration (Barney, 1990; Deutsch, 1958; Mayer et al., 1995; Lewicki and Bunker, 1996). The crucial role of trust is evidenced by research that approaches economic exchange with this wider perspective: the presence of trust reduces agency problems (Ring and Van de Ven, 1992); cuts transaction costs (Macaulay, 1963) and affects a firm's boundaries as defined by transaction cost economics (Langfield-Smith, 2008). Trust supports inter-firm cooperation (Doz, 1996; Ven and Ring, 2006), relationships (Fisman and Khanna, 1999), and alliances (Gulati, 1995); aids decision making when information is scarce (Luhmann, 2000), and affects performance (McEvily and Zaheer, 2006). At an organizational level, Bradach and Eccles (1989) identify trust as an alternative to market-based and hierarchy-based control proposed by traditional institutional economies (Williamson, 1988). Trust aids decision making in a situation where information is scarce (Luhmann, 2000), and high levels of trust are purported to encourage trustworthy behavior (Nooteboom, 2002). Previous research has also developed tools for measuring trust. The trust inventories produced by Cummings and Bromiley (1996); Currall and Judge (1995); Mayer and Davies (1999); Jarvenpaa et al. (1998) are mainly based on the model by Mayer et al. (1995).

A widely accepted model of how trust works is provided by Mayer et al. (1995). These authors suggest that trustworthiness is based on three factors: ability, benevolence, and integrity. Ability looks at attributes such as skills and competence; it is domain specific and it cannot necessarily be generalized to other situations. When suppliers perceive a high level of ability in the customer (Mayer et al., 1995), they are more confident of the customer's capability of paying for the goods or services provided. Trust can help obtain trade credit even in difficult times, when perceived ability can increase the confidence of the supplier in the SME owner/manager's capability of surviving the difficulties. Simi-

larly, a high level of perceived ability can positively affect the credit access because of the increased loan manager confidence in the entrepreneur's capability of repaying the debt (Howorth and Moro, 2006; Hernandez-Canovas and Martınez-Solano, 2010). Thus, trust can support the provision of credit and its extension both from suppliers and banks. Benevolence is the extent to which a trustee is believed to voluntarily do good to the trustor and, thus, it is relationship specific. If the supplier thinks that that the customer is likely to behave in a way that is not detrimental to the supplier, clearly the supplier will be more inclined to give trade credit and extend it when requested. Similar reasoning can be applied to the access to bank credit as suggested by Howorth and Moro (2006). Integrity is the trustor's perception that the trustee adheres to a set of principles considered acceptable to the trustor; it is not linked to skills or competences, nor is it relationship specific (morality is over and above each specific relationship). Integrity, as an intrinsic part of an individual's commitment to moral principles, is a personal characteristic of the SME owner/manager. A high level of perceived integrity in the customer can reduce the expectation of moral hazard, as well as increasing the perceived reliability of information supplied by the firm, increasing the access to both trade credit and bank credit.

Usually, bank managers have some discretion on the interest rate charged on overdraft and this can be renegotiated easily according to changes in firm-bank relations. Indeed, Harhoff and Körting (1998) as well as Howorth and Moro (2012) find empirical evidence of a negative relationship between trust and interest rate on short-term debt. Brau (2002) found that banks do not charge a premium when the firm is not managed by the owner, because the main determinants of interest rate tend to be the length of the relationship and by firm size (not ownership/management structure). In contrast, the interest rate charged on long-term debt is contractually determined at the beginning of the contract. Not only is the interest rate less subject to negotiation when the contract is signed, but it cannot reflect the current relationship between the bank and the firm. Thus, the cost of long-term debt is assumed to be independent of trust.

All in all, trust bestowed by the supplier and by the bank manager on the entrepreneur affects the entrepreneur's access to trade credit and to short-term debt.

III. Debt Optimization: The Model

In this section we elaborate the basic model for the optimization of the debt structure of the firm. The following section will theoretically extend the model by incorporating trusting relationships in the model, and it will examine trust impact on capital structure.

An SME's financial structure can be summarized as follows:

$$F = E + TC + STD + LTD \tag{1}$$

where F is the total finance the firm needs, E is the equity provided by shareholders and the retained profit belonging to them, TC is trade credit provided by suppliers, and STD and LTD are respectively short- and long-term debt provided by banks.

As discussed above, equity and retained profits at best have a limited capability of financing the firm. Thus, our concern is with modeling the optimal debt structure of the venture, and therefore we focus on trade credit and bank debt (both in the form of short- and long-term debt).

III.1 Trade Credit

The overall amount of trade credit the firm can obtain is a matter of negotiation with the suppliers and is affected by the relative power (usually low) the SMEs have, as well as by suppliers' marketing strategy (Summers and Wilson, 2002). The amount of trade credit fi-

nancing employed by the firm is significantly influenced by the nature of its operations and the resultant cost structure. Indeed, if a large proportion of the firm's costs are accounted for by materials and services purchased externally, the firm can access a higher level of trade credit financing than if this proportion is low and the majority of costs are accounted for by the firm's own labor force. Thus, firms that rely on out-sourcing can leverage more trade credit than those that rely on in-sourcing. Nevertheless, trade credit does not have a fixed and clear cost: where there is a one-part contract (and the cost of trade credit is embedded in the overall cost of the goods or services purchased) there is no benefit to the customer in paying cash; where there is a two-part contract, the cost of credit can be easily determined as the discount received by customers if they pay cash (Cuñat, 2006). The cost of trade credit incorporates three components. Firstly, the cost of credit reflects the pure interest paid to the supplier for the credit provided. Secondly, it incorporates an insurance premium that the customer pays in order to be sure of receiving credit if other sources of finance (typically banks) dry up. Thirdly, it includes an additional premium which customers are willing to pay for diversifying the sources of finance. Such diversification reduces the financial risk resulting from reliance on one or a few sources of finance that are correlated with each other. Thus, in the case of two part contracts, SMEs have to balance the cost incurred by utilizing trade credit and the overall perceived benefits obtained by the diversification of the sources of finance.

Thus, the amount of trade credit utilized is a function of the operation structure of the firm and the perceived benefit of trade credit. Let us define the net perceived benefit of using trade credit (that is the monetary and non monetary benefits implicit in using trade credit less the cost – i.e. the missed discount – of using trade credit) as W_{TC}, where $0 \le W_{TC} \le 1$. Here the value approaches 0 when the entrepreneur does not perceive any benefit in relying on trade credit (i.e. when the offered discount is very high and the entrepreneur does not need to diversify the sources of finance or/and has cash available in a bank). Conversely, the value 1 means that the entrepreneur perceives relying on trade credit as highly beneficial (such as when there is no cost in using trade credit because no discount is provided, or when entrepreneur would like to diversify the sources of finance or when entrepreneur needs trade credit since they cannot pay in cash because they lack ready money/bank finance). In addition, let us define the amount of outsourced services and raw materials bought by the firm as M and the number of days that trade credit is granted for by *d*. Thus, we can define the trade credit used as:

$$TC = M \frac{d}{365} W_{tc} \qquad (2)$$

Here, $M \frac{d}{365}$ represents the available trade credit while W_{tc} (as illustrated above) is the propensity to use trade credit. Clearly, the higher the cost of trade credit with respect to the perceived benefits gained by diversifying the sources of finance, the lower the value of W_{TC}, and therefore the lower the amount of trade credit used, other things being equal.

In reality, many SMEs are continually strapped for cash (given the amount forthcoming from other sources), and so entrepreneurs' perception of the benefits linked to relying on trade credit is very high. This approach can be suboptimal in terms of the determination of the amount of trade credit employed in financing the operation when one looks only at its cost; nevertheless, it is the only possibility the entrepreneurs have when they are constrained in accessing bank credit. Moreover, entrepreneurs highly value the possibility of accessing the credit needed and the flexibility in accessing it (Agarwal et al., 2006; Berlin, 1996). Extensive use of trade credit grants entrepreneurs such flexibility and thus they tend to use the maximum trade credit available, irrespective of its cost. The amount of trade credit W_{TC} con-

sidered appropriate to use is largely independent of its cost since it is affected by the negotiation power of the entrepreneur; the cash in the firm's bank account; the possibility of the entrepreneur accessing bank credit instead of trade credit (indeed, if the bank does not provide credit the entrepreneur is forced to turn to trade credit); the entrepreneur's personal preferences; the entrepreneur's perceived benefits linked to additional flexibility in credit; the insurance provided if banks freeze the credit; the personal relationships with bank and suppliers. Thus, in a capital structure model that relies on minimizing the cost of finance, trade credit has to be considered an exogenous variable.

III.2 Bank Debt: The Short-Term and Long-Term Mix

Short-term debt is a financial tool that should cover the financial needs left uncovered by other forms of financing. It is expected to be a temporary source of finance. The habitual use of short-term debt means that the firm needs financing in excess of temporary and occasional needs. In other words, when the firm uses short-term debt continuously, it transforms *de facto* short-term debt to some kind of medium long-term debt. The steady use of short-term debt means that the firm is not correctly matching the life of the assets and the debt used to finance them. Such a mismatch implicitly increases the firm's financial risk (Heyman et al., 2008). Here an important question arises: what is the level of long-term debt, defined as $D \geq 0$, that is optimal in the sense that the overall amount of interest paid (on short- and long-term debt) is minimized during a period (say one year)? Let r_L be the interest rate for long-term debt, r_S the rate for short-term debt, and the reinvestment rate r_R for interest earned on a positive account balance. For our optimization model to be operationalized, it is necessary to assume that $r_S > r_L > r_R$. In fact, the interest paid on short-term deposits (i.e. what the bank pays to the provider of the funds) has to be smaller than the interest rate charged to customers who are using the funds; otherwise, the bank would receive less than it pays. Empirical evidence suggests that firms pay a higher interest rate on short-term debt than on long-term debt support for this proposition is found by, for example, Degryse et al. (forthcoming). There are different possible explanations for this phenomenon: for instance, the long-term debt is often collateralized and therefore the bank is hedged in case of default. In addition, banks might charge short-term debt with additional management fees (which in our model are included in the short-term interest rate) linked to the additional management costs the banks incur (for instance, the regular revision of the line of credit, the production of monthly bank accounts statements, the management of payments and receipts, etc.).

If the account balance b is known for every day of the year, the total interest paid over a year can be calculated by summing the daily interest paid for the short-term debt $b + D$ (when this is negative), subtracting the interest earned on the amount $b + D$ (when this is positive), and adding the annual interest $r_L D$ for the long-term debt. While this can be done retrospectively, the daily account balances will not be known precisely in advance, and it is sensible to specify the financial requirements of the firm by a distribution function $C(b) \geq 0$ for the account balance b, which could be derived by making assumptions about future cash flow. Given a cumulative distribution function $F_C(x) = \int_{-\infty}^{x} C(b)\, db$, the distribution function $C(b)$ describes how often an account balance b is available, in the sense that the integral over an interval

$$\int_{b_1}^{b_2} C(b)\, db = F_C(b_2) - F_C(b_1) \tag{3}$$

specifies what fraction of days of the year the account balance lies between b_1 and b_2, or, in other words, it gives the probability that on any given day the account balance lies within this range. In practice, there will be a minimum and maximum balance, so $C(b) = 0$ outside a certain range of values, and the integral will reduce to a finite domain. However, it might be useful to allow for an infinite range: for instance to be able to use a simple normal (Gaussian) distribution as a model.

The total interest I, paid over a year is a function of the long-term debt level $D \geq 0$, which contributes $r_L D$ to the annual interest. The account balance is $b + D$, so short-term debt at rate r_S is only needed if $b + D < 0$ or, in other words, if $b < -D$. On the other hand, when $b > -D$, the account balance is positive, and the firm gains interest at rate r_R. The total interest payment per year is thus

$$I(D) = r_L\ D - r_S \int_{-\infty}^{-D} C(b)\ (b + D)\ db - r_R \int_{-D}^{\infty} C(b)\ (b + D)\ db \tag{4}$$

The optimal choice for the long-term debt D, is the value that minimizes this function. The derivative of $I(D)$ with respect to D is where the two integrals are the areas under the distribution function $C(b)$ to the left and right of $-D$, representing the fraction of time the account balance is below and above $-D$, respectively. Using the cumulative distribution function F_C, this expression simplifies to

$$\frac{dI}{dD} = r_L - r_S\ F_C(-D) - r_R\ \left(1 - F_C(-D)\right) \tag{5}$$

which can be written as

$$\frac{dI}{dD} = r_L - r_R - (r_S - r_R)\ F_C(-D) \tag{6}$$

The minimum is obtained when this derivative is zero, hence the optimal value of D is determined by the condition

$$F_C(-D) = \frac{r_L - r_R}{r_S - r_R} \tag{7}$$

This means that the optimal value of long term debt D has to be chosen such that the fraction of time the account balance falls below $-D$ equals the ratio of interest rates on the right-hand side of the equation above.

III.3 Drawing It All Together: The Financial Model

Having identified the different sources of finance for an owner-managed SME, it is time now to present the overall model for optimizing the firm's financing structure. The model, therefore, is as follows:

$$\mathrm{F} = \mathrm{E} + M\ \frac{d}{365} W_{TC}\ +\ D - \int_{-L}^{-D} C(b)\ (b + D)\ db - \int_{-D}^{\infty} C(b)\ (b + D)\ db \tag{8}$$

where E is initial equity plus retained profit and is given, $M\ \frac{d}{365} W_{TC}$ is the trade credit used that is decided ex ante, D is the long term debt, $\int_{-L}^{-D} C(b)\ (b + D(\theta))\ db$ is the (average) short-

term debt, $\int_{-D}^{\infty} C(b)\,(b+D)\,db$ is the (average) cash in the bank. The proportion of long and short-term credit is optimized according to $F_C(-D) = \frac{r_L - r_R}{r_S - r_R}$.

IV. The Extended Model: The Impact of Trust on Debt Structure

In order to examine the role of trust on debt structure, we examine separately its impact on trade credit and on bank debt.

As discussed above, the amount of credit extended d , is affected by the level of trust, since high perceived ability increases the perception that the entrepreneurs will be successful in running their business and in repaying debt; high perceived benevolence supports the belief that the entrepreneur will do their best to repay the debt in order to avoid problems for the supplier; high integrity means perceiving the values and ethics of the entrepreneur as similar to those of the supplier which increases the confidence that the entrepreneur's behavior will be beneficial to the supplier. Thus, the number of days of credit granted, which takes into consideration the level of trust, can be defined as $d(\theta)$. Trust affects the cost of trade credit only in two-part contracts. In such contracts, trust does not affect the pure interest paid to the supplier since this is simply the remuneration for providing extended payment terms (it covers the cost the suppliers incur by providing extend payment terms). Also, trust does not affect the extra premium customers pay for keeping their sources of finance diversified; higher levels of perceived ability, benevolence, and integrity in the customer are unrelated to what the customer is prepared to pay to diversify their sources of finance. In fact, higher levels of perceived ability and benevolence should impact the insurance premium the customer is charged in order to be sure of receiving credit when other sources of finance (typically banks) dry up (since such a premium is linked to the perceived riskiness of the customer). All in all, customers typically do not benefit significantly from a reduced interest rate because of high levels of trust for at least three reasons. Firstly, trust might affect only one of the three components of the discount. Secondly, suppliers tend to apply standard discounts in order to simplify the management of the payment system. Thirdly the discount for early payment is not a matter of negotiation between the parties. Thus, the firm's decision about how much trade credit to utilize W_{TC}, is not affected by the level of trust placed by suppliers.

The exogenous component, trade credit, as defined by equation (2) can be redefined as

$$M\ \frac{d(\theta)}{365} W_{TC} \tag{9}$$

where $d(\theta)$ is the number of days of trade credit according to the level of trust and $d(\theta) > d$ when the trust in the entrepreneur (θ) is higher than the trust in the average customer and $d(\theta) < d$ when the trust in the entrepreneur (θ) is lower than that in the average customer.

The level of long-term debt $D(\theta) \geq 0$ is optimal when the total amount of interest paid is minimized. Since the short-term interest rate may depend on trust (Howorth and Moro, 2012), we will consider it as a $r_S(\theta)$, which can be assumed to decrease with increasing trust θ. The model depends on the assumption that, whatever the level of trust, $r_S(\theta) > r_L > r_R$. Thus, it is now possible to re-write the total interest cost as expressed in equation 4 as:

$$I(D(\theta)) = r_L\ D(\theta) - r_S(\theta) \int_{-L(\theta)}^{-D(\theta)} C(b)\ (b + D(\theta))\ db - r_R \int_{-D(\theta)}^{\infty} C(b)\ (b + D(\theta))\ db \qquad (10)$$

As previously, the optimal choice for the long-term debt $D(\theta)$ is the value that minimizes I. By deriving I with respect to D and simplifying the expression, we find that the optimum value of long-term debt, $D(\theta)$, is determined by the condition

$$F_C(-D(\theta)) = \frac{r_L - r_R}{r_S(\theta) - r_R} \qquad (11)$$

As in the basic model, the equation implies that $D(\theta)$ has to be chosen so that the fraction of time the account balance falls below $-D(\theta)$ equals the ratio of interest rates on the right-hand side of the equation. To calculate this value, knowledge of the cumulative distribution of funding is required. The assumptions concerning the interest rates imply that the fraction on the right-hand side is always a number between 0 and 1, so there is always a unique optimal solution. Interestingly, since trust reduces the value of the denominator of equation (11), the implication is that the higher the level of trust, the greater the proportion of short-term debt (since higher levels of trust increase $-D(\theta)$ i.e. the negative level of long term debt). The original model can therefore be refined as

$$\mathrm{F} = \mathrm{E} + M\ \frac{d(\theta)}{365} W_{TC}\ +\ D(\theta) - \int_{-L(\theta)}^{-D(\theta)} C(b)\ (b + D(\theta))\ db - \int_{-D(\theta)}^{\infty} C(b)\ (b + D(\theta))\ db \qquad (12)$$

where E is initial equity plus retained profit, $M\ \frac{d(\theta)}{365} W_{TC}$ is the trade credit obtained, $D(\theta)$ is the long term debt, $\int_{-L(\theta)}^{-D(\theta)} C(b)\ (b + D(\theta))\ db$ is the (average) short-term debt, $\int_{-D(\theta)}^{\infty} C(b)\ (b + D(\theta))\ db$ is the (average) cash in the bank. The proportion of long and short-term credit is optimized according to equation (11).

V. Implications of the Model for the Financial Management of the Firm

The model elaborated above demonstrates that firms can determine the optimal mix of short- and long-term bank debt. It assumes that the entrepreneurs have a clear understanding of the amount of finance they will need, and, according to their personal preferences, firm characteristics, etc., they decide exogenously how much finance to acquire via trade credit (if any). Then, they turn to the bank and here they can optimize the amount of short and long term bank debt, thereby minimizing their cost. The optimization formula has important implications.

According to the formula, the optimum (that is, the proportion of short- and long-term bank debt) is not affected by the overall amount of debt needed since only relative interest rates are necessary in order to derive the proportion of short- and long-term debt. Thus, the proportion of short- and long-term bank debt for a firm that needs a small amount of bank debt and for a firm that needs a huge amount of bank debt is the same, as long as the interest rates and the probability distribution function of the finance required are the same.

In general terms, when $r_S - r_R$ increases with respect to $r_L - r_R$, (that is, when the interest rate on short-term debt increases with respect to the interest rate on long-term debt), the value of the fraction reduces. This means that the firm should reduce the short-term debt by increasing the proportion of long-term bank debt. Thus, what affects the proportion of long- and short-term debt is the relative weight of short- and long-term interest rate.

In addition, the optimization formula implies that what is important is the net interest rate charged on both short- and long-debt; that is the difference between interest rates charged (on long- and short-term debt) and the interest rate paid by the bank on cash deposits. Thus, the interest rate the firm obtains on cash it has temporarily deposited in the bank impacts the optimal mix between short- and long-term debt; an increase in the interest rate on cash in the bank has a greater effect on the net long-term interest rate than on the net short-term interest rate since the long-term interest rate is smaller than the short-term rate. Thus, the relative weight of net short- and net long-term interest rate changes and the proportion of long-term debt will be bigger. In fact, if the firm receives a higher interest rate on the cash it has temporarily in the bank, the firm will be better off. In order to increase the amount of cash deposited in the bank, the firm has to increase the long-term debt, thereby reducing the number of days for which it needs short-term debt and increasing the number of days for which it has cash in bank (and the average amount of cash it has in bank, accordingly).

The literature stresses that it is important to match the length of assets' life and the maturity of liabilities (Heyman et al., 2008). The model elaborated in this paper provides partial support for this proposition. In fact, a perfect match between assets' life and debts' maturity is not necessarily achieved when the cost of finance is minimized. When a firm misuses short-term debt to finance long-term liabilities, it is likely to be charged a higher interest rate on short-term debt (because of the financial risk it incurs). In addition, because of the assets it holds, the firm would be able to gain long-term finance on good terms since it has assets that can be provided as collateral. Thus, such a firm can certainly reduce its cost of debt by optimizing the debt structure according to the model elaborated in this paper (and this, irrespective of changes in interest rate charged because of the lower level of financial risk). Such a change will imply a reduction of short-term debt and an increase of long-term debt and the new debt structure will tend to time-match the assets' structure. As a consequence, even if this model does not guarantee a perfect matching between assets' life and debt maturity, it works in this direction.

The optimization of the long-term/short-term bank debt mix is easier when the firm concentrates its banking relationships within one bank. The effect of concentrating banking relationships with one or a few banks is widely discussed in the literature (Neuberger et al., 2008; Elsas, 2005; Angelini et al., 1998). Such concentration provides the bank with more information: it is less affected by information asymmetry and can reduce monitoring costs. If the bank passes such savings on to the firm, the firm is also better off. On the other hand, when small firms rely on one bank only, they may have reduced negotiating power. In such a situation, they may face problems switching to another bank because of the difficulties in providing a clear picture of their performance (Howorth et al., 2003). If the current bank is aware that it is not incurring the risk of losing the customer, it can avoid passing on part of the savings. In this case, small firms can be locked in, and worse off.

Since debt optimization improves firm's performance by reducing financial costs and by improving the match between assets life and debt maturity, it can help to overcome problems in providing a new bank with appropriate information. Thus, even if the model supports the logic of concentrating the relationship with one bank, it can help the small family-run firm to avoid lock-in situations by improving the quality of the relationship with the current bank and by simplifying switching to a new bank.

The extended model enables the examination of the role of trust on debt structure. Since, in the model, trust affects only the short-term interest rate, trust level impacts only the denominator by reducing the short-term interest rate. In mathematical terms, trust affects the relative weight of short- and long-term interest rates by reducing the value of the short-term interest rate; that is, by increasing the value of the fraction in our model, (i.e. the negative proportion of D). Thus, with higher levels of trust, the firm should reduce the long-term debt

and increase the short-term debt accordingly. This proposition raises an important question: is the firm capable of substituting long-term debt with short-term debt in order to optimize the debt structure? According to the model, the amount of short-term finance available to the firm is positively affected by the level of trust. Thus, firms should be able to access additional short-term debt in order to optimize the debt structure.

Interestingly, the extended model has yet further implications. Short-term finance is a very flexible source of finance that can be used whenever the firm needs it. The possibility of using more short-term debt because of high levels of trust increases the flexibility of the firm. Empirical research indicates that SMEs tend to rely more on short-term debt than long-term debt because of their need for flexibility. In addition, short-term credit is found to be correlated with firm's growth opportunities (García-Teruel and Martínez-Solano, 2007). The model suggests that when firms are trusted by lenders, they can (and should) increase the proportion of short-term debt. The implication of the extended model is that less trusted firms should consolidate their debt into long-term debt possibly by collateralizing the long term debt with additional assets. Indeed, not only the cost of long term debt is relatively cheaper than the cost of short term debt for the low trusted firm but also the bank's loan manager may be willing to lend to the firm if it provides some additional collateral that compensates for the low level of trust they have in the entrepreneur. In other words, loan managers may be willing to lend to the low trusted firm by substituting additional collateral for trust, although Moro et al. (2012) do find a weak empirical correlation between trust and collateral request. In fact, less trusted firms are those which are more likely to face some reduction in access to finance in the future and particularly in harsh times. Thus, in order to avoid a credit constraint situation by both suppliers and banks, less trusted firms should build up a capital structure that is less flexible, by leveraging more long-term debt.

VI. Conclusion

In this paper, it has been argued that the existing finance literature is incomplete with respect to the capital structure of SMEs, since its focus is on the debt-equity mix, which is inappropriate when shareholders are not happy to or cannot open the equity holding to new entrants. In such cases, equity has to be considered as a given and the focus should be on optimizing other primary sources of finance: trade credit and the mix of short- long-term bank debt.

The model illustrated is based on optimizing the mix by minimizing the overall cost of debt. According to the model, SMEs firstly decide the amount of trade credit they wish to utilize. This amount is determined by considering the benefit they can gain by diversifying their sources of finance and the constraints in accessing bank finance on the one hand and the extra cost they have to pay for such a diversification on the other hand. Then, they have to turn their attention to bank debt and consider the differential between long- and short-term debt interest rates. Here, SMEs should choose the mix that minimizes the overall cost of debt.

The basic model has also been extended by incorporating suppliers' and bank managers' trust in the SME. Previous literature has discussed the benefits of trust relationships for both the trustor and the trustee; such relationships can reduce the cost of monitoring, improve the commercial relationship, and reduce the bonding costs. High levels of trust can increase the amount of trade credit, both in good and in bad times (by extending the payment terms), even if trust does not affect the cost of trade credit. In addition, trust increases short-term credit access and it reduces the cost of short-term debt. Thus, according to the extended model, the higher the level of suppliers' and banks' trust in the SME, the greater the availability of both trade credit and short-term bank debt; the higher the trust, the more the firm should rely on short-term bank debt because of its reduced cost. All in all, highly trusted firms

should increase the proportion of short-term liabilities (trade and bank credit) in order to optimize their debt structure and might build up a more flexible capital structure.

The issues raised in this paper also have implications for a future research agenda in related fields. Models for investment appraisal in SMEs (such as those based on the weighted average cost of capital) should try to incorporate the present approach in determining the appropriate discount rate for discounted cash flow calculations. Thus, the development of different tools for evaluating SME projects could be an important area for future research. A different stream of research could be testing the extended model empirically. Some previous research has tested the effect of trust on the cost of bank debt. It would be very interesting to measure the effect of trust relationships on the relative proportions of trade credit and short-term and long-term debt used to finance SMEs.

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