



Determinants of Bank-Tunisian SMEs Funding in a Context of Information Asymmetry

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Abstract

This paper explores the determinants of access to finance for small and medium enterprises (SMEs) in the context of asymmetric information. Our sample consisted of 250 Tunisian SMEs financed by Arab International Bank of Tunisia, broken down by sector of activity, size and region. The results of multiple linear regressions showed that size, interest rate, trade credits and profitability have a significant influence on the total volume of credit. The bank considers the size of commercial and industrial SMEs, and those located in the District of Tunis and the Center-East, as a positive signal when considering a loan. The bank also considers high interest rates when considering loans to commercial SMEs, microenterprises and SMEs located in the District of Tunis. As far as innovation is concerned, the results showed that service SMEs, micro-enterprises and SMEs located in the District of Tunis and in the Center-East, find it difficult to get a credit. It is interesting to note that the bank neglects liquidity issues and the net worth of the SME in its financing decision, which contradicts the theoretical assumptions. Finally, we conclude that bank's financing of Tunisian SMEs is characterized by conditions dominated by the problem of asymmetric information.

Keywords:

Small
Medium-sized enterprises
Bank financing
Information asymmetry
Multiple regression.

JEL Classification:

C13; G21; G32; O16.

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Publisher:

Scientific Publishing Institute.

Received: 12 July 2021

Revised: 19 August 2021

Accepted: 3 September 2021

Published: 17 September 2021

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Funding: This study received no specific financial support.

Competing Interests: The authors declare that they have no competing interests.

1. Introduction

For more than twenty years, a large amount of research has been conducted on a very specific category of firms: small and medium-sized enterprises (SMEs). This category of enterprises is receiving increasing attention not only from the scientific world, but also from the public authorities and the banking and financial sectors. Indeed, SMEs play a fundamental role in the economic sector of several countries around the world. They represent a continuous source of economic dynamism, accounting for three quarters of all jobs. They differ from large enterprises in their management methods, their relationships with customers, their integration in their environment and also in their financing methods. Today, SMEs are the main pillars of the modern economy.

The relationship between banks and SMEs is a topical issue insofar as these two actors play a very important role in the production system of a country. In Tunisia, the issue of the relationship between banks and SMEs has consistently been raised. Moreover, these relationships were, are and will be the subject of several debates and roundtables focusing on the importance of the one for the other and the requirements of the one on the other.

In addition, the prospects of economic recovery have given new relevance to the issue of SME financing. The bank and the enterprise are both partners in the development of the project and their relationship is based on mutual trust and a desire to find the best solution together to ensure the success of the project. However, the internal resources of small and medium-sized enterprises are insufficient. To meet the investment needs, the enterprise must then resort to external resources. These SMEs, whose characteristics can meet the conditions of access, must have their specific resources on terms that best suit their performance. Thus, bank credits constitute the essential share of SME financing in case of need.

However, SMEs face difficulties in meeting their financial needs, given the mismatch between their original innovative qualities and the quantitative and qualitative rationing imposed on them by the traditional financial system. One of the main difficulties encountered by SMEs is the reluctance of certain donors to grant them financial assistance, because they have not yet proven their worth. These uncertainties lead banks to adopt a cautious attitude, which often results in these young innovative firms being pushed out of the financing circuit. This caution is now explained by the poverty and opacity of the information structure of SMEs, by the high average risk that they present (Bank Commission, 1998), by their particularly opaque information system (Ang, 1991) and by their exposure to the phenomenon of rationing that can develop in the credit market (Yan, 1996). Bankers are therefore particularly exposed to the phenomena of adverse selection, moral hazard and opportunism.

Thus, our study aims to investigate the determinants of bank-SME financing in a context of asymmetric information. We will try to identify the most important implications of bank financing decisions in a context of asymmetric information by analyzing the following three dimensions: The problem of asymmetric information in economic theory, the impact of asymmetric information on banks' financing decisions with respect to SMEs, and the determinants of bank-SME financing in a context of asymmetric information, based on the case of BIAT (Arab International Bank of Tunisia).

The interest of our study is to highlight the depth of the bank-company relationship and the need to analyze information asymmetry before a failure to pay occurs. This will allow us to understand how the implementation of regular bank financing, which we will call relationship banking finance since it is part of both the duration and the multiplicity of exchanges between the parties, can allow SMEs to overcome their difficulties in obtaining financial resources. More precisely, we seek to evaluate the impact of such a contractual configuration on the financing conditions of these structures, which are particularly subject to difficulties associated with information asymmetries.

This paper is organized as follows: Section 1 will present a review of the theoretical literature. Section 2 will describe the research methodology. Finally, section 3 will present the empirical results, followed by the conclusion.

2. Theoretical Literature Review

The idea of developing bank-company relations has been the subject of numerous empirical and theoretical studies aimed at specifying the place of bank financing in relation to recourse to the financial market, in the debt structure of enterprises and essentially those of SMEs. Uncertainty is central to the funding relationship. It relates not only to the conditions of the future world, but also to the behavior of the other party in the future. The credit is, in effect, pledged on an activity of the enterprise that has not yet taken place: there is no objective product on which to evaluate the transaction. If a firm is, a priori, in a less risky situation, it nevertheless has to demonstrate to the community of lenders its ability to repay and to deserve the trust placed in it in order to renew its credit.

This section examines more concretely the primarily empirical literature on the financing conditions experienced by SMEs. To do so, we will proceed in stages. First, we will adopt a broad perspective in order to identify the main characteristics of their funding supply. We will also place particular emphasis on the opaque nature of these enterprises, i.e. the high degree of information asymmetry in which their potential financiers find themselves, and the difficulties that this situation generates. Then, in a more precise manner, we will review the work dealing more specifically with the effect of the establishment of a relationship banking finance on the financing conditions of the enterprises benefiting from it.

2.1. Opacity and Financing Difficulty

The financial literature agrees that SME financing is mainly characterized by limited access to different sources of funds due to their opacity (Ang, 1992). Opacity is defined as the inability of potential external funders to fully understand the risk characteristics of firms, potentially due to poor business history or lack of complete and reliable financial information available. Berger and Udell (1998) proposed a study of different forms of financing used by SMEs in the USA according to different levels of opacity based on the age and size of the firms. The results obtained point to the primacy of internal financing, which is therefore less subject to information asymmetries, with an average in the sample of two thirds of the equity and one third of the debt coming directly from the main owner. Bank debt, on the other hand, appears to be the primary source of external financing, just before supplier credit.

2.2. Benefits of the Bank-Corporate-Client Relationship

Numerous empirical studies have sought to identify the effects of establishing a relationship banking finance system on the financing conditions of enterprises. The vast majority of these studies show a reduction in the difficulties linked to information asymmetry associated with the presence of this type of contract. These studies can be broken down into two main categories. The first is based on the event study method, which consists in measuring the presence of abnormal returns on the securities of firms when announcements are made in relation to the concept being tested, in this case, the presence of relationship banking finance. These contributions follow the article by James (1987) and concern essentially large companies, since they are listed. The second is based on the analysis of contract data. It proposes to assess measures of the conditions of credit granted to firms granted to firms, the availability of financing (fewer rationing problems), the cost and required collateral, in light of indications of relationship banking finance, the duration of the relationship between the bank and the firm, its degree of exclusivity and its scope.

2.3. Financing Conditions and Credit Rationing

The bank can undertake a number of actions and require some conditions when drafting the credit agreement contract, such as collateral requirements, interest rate, credit rationing. The theoretical literature (Chan & Thakor, 1987) finds that real guarantees can limit the problems of moral hazard and adverse selection in credit agreements. The bank sees these guarantees as the best solution to the asymmetric information problems that arise between the firm and the bank. The bank requires greater collateral and continuously controls the collateral rate (Rajan & Winton, 1995) in order to reduce the risk of loan default and to induce the borrower to meet his commitments. Nevertheless, the longer the credit partnership lasts, the lower the collateral requirements become (Berger & Udell, 1995).

The bank also considers the interest rate as a means of protection against credit default. The bank sets the interest rate depending on the volume of credit granted, the borrower's situation, the nature of the relationship established with the borrower, etc. However, Cowling and Westhead (1996) state that the interest rate is used as a compensatory means for banks to take on additional risk. Banks may charge higher interest rates when establishing a credit relationship with a new customer because they consider specific information about the borrower to be an important part of their relationship (Rajan, 1992). On a practical level, strong credit relationships are generally associated with lower interest rates (Berger & Udell, 1995). The borrower is required to pay interest on the debt at fixed intervals to ensure repayment of the credit. Credit rationing cannot be ruled out. Indeed, the bank may find it impossible to verify exactly what the firm's intentions are due to a lack of information. In this way, the risk of moral hazard is present. It arises in particular in the event of misappropriation of the funds lent by the creditors for purposes that are riskier than expected, with a minimization of the value of the investment at the expense of the risk. The bank may also be subject to misappropriation of a portion of the gains from the investment due to information asymmetry. As a result, it often has to check, in the event of a credit repayment difficulty, whether this situation actually stems from a bad economic situation or from opportunistic behavior by the SME (Williamson, 1988). All of these phenomena may lead lenders to plan adjustments through borrower rationing, which is particularly important in the SME credit market. Credit selection and evaluation mechanisms are very important in the process of bank credit approval. However, as a result of technological development, banks can invest in information technology that allows for proper review of credit applications, monitoring of projects, reduction of credit default risks and debt rationing (Watanabe, 2004). Generally speaking, rationing refers to the refusal of the banking sector to lend to enterprises at the requested quantity rates. This phenomenon occurs when banks are no longer able to discriminate between bad (non-creditworthy) and good (creditworthy) borrowers. From this point of view, information asymmetry can transform the way firms are financed, and in general, the financing structure of an economy.

3. Research Methodology

After having studied the first two aspects focusing on the problem of information asymmetry in economic theory and the related problems that hamper SME financing opportunities, we will attempt to apply these concepts to the reality of SME financing by taking the case of BIAT. Indeed, we will study the financing granted by BIAT and its relationship with certain variables, and we will try to determine to what extent the implications of this relationship contribute to influence the bank's financing decisions. Thus, we will present the hypotheses of our research, the methodology followed in collecting data as well as the choice of variables and the model. For this research, we considered a database composed of variables that were chosen based on recent studies on bank financing of SMEs.

3.1. Research Hypotheses

Based on the studies that have examined the financing structure of SMEs, we have tried to derive some hypotheses related to the choice of variables.

Liquidity Crisis: According to Alexandre and Buisson-Stéphan (2014), the liquidity crisis produced in an SME can generate significant losses, pushing it to increase its loan demand as long as it has not reconstituted

a sufficient level of equity. In addition, SMEs are affected by the fact that a major part of their activity is destined for large companies to which they have a supplier role. However, these large companies have significantly reduced their orders. These SMEs will thus have more opportunity to obtain a loan. Mialocq (2018) found that the SME liquidity crisis has a positive impact on its access to bank financing. Indeed, by taking the case of French unlisted medium-sized companies, this author has shown that the bank does not care about the problem of a liquidity crisis when granting the loan to this type of SME, since it performs a preliminary study on the duration of this crisis to know if it is temporary or structural. This result was confirmed by Mazeri and Mohammed (2019) on Algerian banks. We therefore state our first hypothesis as follows:

H1: *The liquidity crisis is positively correlated with access to finance for SMEs.*

Net Position: According to the results of the studies conducted by Colot and Croquet (2007), Mazeri and Mohammed (2019), the net position of the SME is negatively related to the decision to grant the loan. These authors conclude that whenever there is a negative liquidity position within the SME, there is a reservation in lending. Hence our second hypothesis is as follows:

H2: *Net worth is negatively correlated with access to finance for SMEs.*

Size of the Firm: A body of previous empirical studies has used firm size as an indicator of better credit quality and shown that it can have a positive effect on access to credit (Cenni, Monferrà, Salotti, Sangiorgi, & Torluccio, 2015; Hernandez-Canovas & Martinez-Solano, 2007). As the firm grows, it may acquire more tangible assets that can be useful to banks in assessing the firm's credit risk (Gompers, 1995). At the same time, larger firms can acquire more bargaining power and they can negotiate with banks on credit terms that can facilitate loans with fewer restrictions and larger loan amounts (Cenni et al., 2015). Brancati (2015) showed that microenterprises in the Italian market are more credit constrained than SMEs, as information opacity is even more stringent for microenterprises. It is clear that microenterprises have a lower level of asset tangibility and it is difficult to assess their future growth rate. Similarly, large firms can more easily show better transparency of information to banks by producing audited financial statements (Berger & Udell, 2002; Ortiz-Molina & Penas, 2008). Overall, research shows that lower information opacity of large firms and reduced information asymmetry can have a positive effect on SMEs' access to bank financing. Therefore, we expect the size of the firm to be positively related to access to finance. We introduce the following hypothesis:

H3: *Size is positively correlated with access to finance for SMEs.*

Age of the Firm: Research shows that younger firms are more vulnerable to restricted access to bank financing because information transparency is lower. It also asserts that younger firms have a lower level of asset intensity and, as a result, are credit rationed (Ferri & Murro, 2015). Similarly, banks are reluctant to lend money to younger firms because survival rates are lower than those of older firms (Dierkes, Erner, Langer, & Norden, 2013). In his study, Kirschenmann (2016) found that young firms are more likely to be credit rationed since they received no previous loans from banks and, therefore, it is difficult for banks to judge their loan repayment history. Moreover, access to credit also depends on the survival analysis of firms, and in this context (Shumway, 2001) has shown that default rates for younger firms are higher than those of older firms. From the perspective of the bank-borrower relationship, older firms can establish a long-term relationship with banks, which is less likely for younger firms. Thus, based on the banking relationship, older firms may receive more credit from banks (Cenni et al., 2015; Comeig, Fernández-Blanco, & Ramírez, 2015). Given the above literature, we formulate the following hypothesis:

H4: *Age is positively correlated with access to financing for SMEs.*

Innovation: Recent research shows that innovation is very important for the long-term growth of firms seeking to attract new customers. By innovating, a firm can create a competitive advantage over its competitors, which helps generate an additional profit margin for the innovative firm (Baregheh, Rowley, & Sambrook, 2009). Previous studies have shown that European SMEs are more likely to rely on bank loans to support their innovative ideas, as they cannot raise funds from the external financial market (Lee, Sameen, & Cowling, 2015). However, the lack of support from commercial banks negatively affects firms' ability to innovate (Mohnen & Röller, 2005). Investments in innovative activities are generally risky because investment returns are uncertain (Hall, 2002). In the UK context, Lee et al. (2015) show that innovative firms seek more external sources of finance than non-innovative firms. They also show that innovative firms are more likely to be credit rationed than non-innovative firms. Similarly, Pederzoli, Thoma, and Torricelli (2013) show that default rates for innovative firms are higher than for non-innovative firms. They argue that in most cases, R&D investments for SMEs are not profitable and innovative SMEs suffer more payment defaults. Brancati (2015) studied the financing opportunities for innovative firms in the Italian market and found that high-tech firms are more rationed by banks than non-tech or non-innovative firms. The author argues that commercial banks cannot assess the growth prospects of innovative firms and that this may result in a lack of financing. Because of the uncertainties associated with innovative SMEs, the latter are perceived as risky investments by banks and, therefore, innovative SMEs are more likely to receive fewer bank loans. Therefore, we assume that there may be a negative relationship between firm innovation and access to finance.

H5: *Innovation is negatively correlated with access to finance for SMEs.*

Interest Rate: In their study of Portuguese SMEs, [Farinha and Félix \(2015\)](#) found that banks offering lower interest rates received more loan applications than those offering higher interest rates. According to [Neuberger and R athke-D oppner \(2015\)](#); [Stefani and Vacca \(2015\)](#), there are several factors that can affect interest rates on loan contracts, such as the availability of collateral, concentration and competition in the credit market, the size and type of ownership of the bank, the characteristics of the SME and the bank, the maturity of the loan, etc. [Hernandez-Canovas and Martinez-Solano \(2007\)](#) state that borrowers are discouraged from obtaining loans from banks when the cost is too high, causing their debt burden to increase and thus negatively affecting firm value. Thus, we predict a negative correlation between access to finance and interest rates as high borrowing costs may discourage borrowers from taking large loans from the bank. Hence, our final hypothesis is as follows:

H6: *Interest rate is negatively related to access to finance for SMEs.*

Information Asymmetry: In the bank debt relationship, information asymmetry is present throughout the execution of the contract. This leads to problems of adverse selection, moral hazard and opportunism, which explains the particular nature of the bank financing relationship. Lenders are forced to exclude firms deemed to maximize information asymmetry, such as SMEs. This results in a rationing equilibrium ([Stiglitz & Weiss, 1981](#)). To reduce information asymmetry, some studies recommend a signaling strategy ([Harris & Raviv, 1990](#); [Leland & Pyle, 1977](#)). Thus, a high amount of trade credit is a good indicator of the firm's solvency vis- -vis its partners, which encourages banks to grant it credit. [Diamond \(1984\)](#); [Haubrich \(1989\)](#) and [Sharpe \(1990\)](#) show that the good reputation of a firm positively influences its relations with creditors. Banks therefore refer to trade credits as an indicator of good reliability and a lower risk of payment default. Profitability is also a good signal of the firm's financial reliability, which increases the supply of bank loans ([Coleman & Carsky, 1999](#); [Panno, 2003](#)). Profitability can be understood in terms of return on assets (ROA), which is the ratio of net profit to total assets ([Kremp, Stoss, & Gerdesmeier, 1999](#)). Our hypotheses are then as follows:

H7: *The firm's good reputation with its business partners is positively related to access to finance.*

H8: *Financial profitability is positively related to access to financing.*

3.2. Sample and Data Base

Our sample is composed of 250 Tunisian SMEs financed by BIAT, broken down by sector of activity, size¹, and region. The database is a collection of accounting data and selected information related to loan granting. These data were collected from BIAT (SME Credit Risk and Retail Clients Department and Superior Credit Committee).

3.3. Definition of Variables

At the empirical level, the objective of the research is to highlight certain criteria used by BIAT in the decision to grant credit to SMEs. This part is related to the specification of the variables and their corresponding retained measures. Our database includes one endogenous variable and eight explanatory variables.

3.3.1. The Variable to be Explained

Theoretical models of customer relationships in banking are almost all models of asymmetric information ([Diamond, 1984](#); [Sharpe, 1990](#)). Once information imperfection is taken into account, it becomes impossible for the lender to determine the quality of the borrower, or impossible or very costly to monitor the actions of an agent ([Psillaki, 1995](#)). Thus, the information imperfection faced by lenders has a considerable influence on the assessment of the quality of potential borrowers in the credit market, in line with the approach developed by [Akerlof \(1970\)](#). By exploiting this literature and confronting it to the Tunisian context, the dependent variable will be measured by the amount of credit requested by the SME, and not actually granted by the bank.

3.3.2. Explanatory Variables

Given the difficulty to obtain variables measuring the problem of information asymmetry in the field of information economics, we resorted to approximate variables that could mitigate these difficulties, and that could be broken down into three groups. Indeed, and referring to the study done by [Mazeri and Mohammed \(2019\)](#), we found it appropriate to classify these variables into three groups: variables measuring information symmetry, variables that mitigate the problem of information asymmetry, and variable that reinforce the problem of information asymmetry. [Table 1](#) defines the different variables selected in our study, presents their measures and the phenomena they describe and specifies the expected signs.

¹In Tunisia, the criteria used differ according to the legislative or regulatory provisions establishing the SME aid schemes. The National Directory of Enterprises (RNE) maintained by the National Institute of Statistics (INS), has adopted, for statistical purposes, the following definition: Micro-Enterprises: units employing less than 6 workers, Small Enterprises: units employing between 6 and 49 workers, and Medium Enterprises: units employing between 50 and 199 workers.

3.4. Empirical Estimation Methodology

To estimate the proposed model, it would be necessary to choose the appropriate methodology. In line with the existing literature, we will proceed with a multiple linear regression Equation 1. The choice of a type of function has been studied, namely by Short (1979), and the results show that a linear analysis produced results that were "as good as with any other type of function". This model works as follows:

$$CREDIT_i = c + \sum_{j=1}^n \alpha_j x_i^j + \varepsilon_i \quad (1)$$

$CREDIT_i$ represents the loan amount requested by the SME "i", c is a constant, x_i^j are the independent variables described above, et ε_i represents the error. The model chosen in our study is largely inspired by

Ashiqur, Rahman, and Belas (2017). It is expressed as follows:

$$Ln(CREDIT) = c + \alpha_1 LC + \alpha_2 NS + \alpha_3 SIZE + \alpha_4 AGE + \alpha_5 INNOV + \alpha_6 TC + \alpha_7 ROA + \alpha_8 INTEREST + \varepsilon \quad (2)$$

Table-1. Definition of variables and expected signs.

| Variable | Measure | Phenomenon described | Expected sign |
|---|---|-------------------------------------|---------------|
| Variables under the symmetric information | | | |
| Liquidity Crisis (LC) | Gross operating surplus - Financial expense/ Turnover | Support cost | + |
| Net Situation (NS) | Total Assets / Total Indebtedness | Potentialities of recovery | - |
| Variables under the asymmetric information: Variables that will mitigate the problem of asymmetry of information | | | |
| Size of the SME (SIZE) | Ln (Turnover) | Existence of asymmetric information | + |
| | | Existence of asymmetric information | |
| Age of the SME (AGE) | Number of years the firm has been operational | Existence of asymmetric information | + |
| Innovation (INNOV) | Dummy variable equal to 1 if the SME has launched new products or services in the last three years, and 0 otherwise | Existence of asymmetric information | - |
| Trade Credits (TC) | Trade payables and related accounts / Equity | Existence of asymmetric information | + |
| Profitability (ROA) | Net Profit / Total Assets | Existence of asymmetric information | + |
| Variable under asymmetric information: Variable that reinforce the problem of asymmetric information | | | |
| Interest rate (INTEREST) | Appropriate interest rate charged on the loan | Asset substitution risk | - |
| Measure | | | |
| Gross operating surplus - Financial expense/ Turnover | | Support cost | + |
| Total Assets / Total Indebtedness | | Potentialities of recovery | - |
| Ln (Turnover) | | Existence of asymmetric information | + |
| Number of years the firm has been operational | | Existence of asymmetric information | + |
| Dummy variable equal to 1 if the SME has launched new products or services in the last three years, and 0 otherwise | | Existence of asymmetric information | - |
| Trade payables and related accounts / Equity | | Existence of asymmetric information | + |
| Net Profit / Total Assets | | Existence of asymmetric information | + |
| Appropriate interest rate charged on the loan | | Asset substitution risk | - |

In Equation 2, we regress the variables chosen in a linear regression model using Eviews. The dependent variable is measured by the natural logarithm of the amount of the loan requested by the SME and not

actually granted by the bank, which is a proxy for access to finance. To test the hypotheses, we considered variables that could affect the credit granting decision of the commercial bank. The size of the SME (SIZE) is measured by the Napierian logarithm of sales. It is more likely that larger firms (high turnover) can acquire more bargaining power and acquire more assets showing better credit quality of the firm. Firm age (AGE) is measured by the number of years the SME has been operational. We believe that the older the firm is, the more it can prove to the bank its creditworthiness by presenting its business history, and the more it can establish a long-term relationship with the bank. INNOV is a dummy variable equal to 1 if the SME has launched new products or services in the last three years, and 0 otherwise. It is widely accepted that the returns to innovation and R&D activities are uncertain, and therefore SMEs with innovative activities suffer from a lack of funding from banks. The variable “interest rate” (INTEREST) is the appropriate interest rate charged on the loan. Research assumes a negative relationship between the interest rate and the loan amount because a high rate will discourage borrowers to applying large loans from the bank. The “Liquidity crisis” (LC) is measured by the difference between the gross operating surplus of the SME and its financial charges related to its turnover. The “Net situation” (NS) is measured by the ratio between total assets of the SME and its debts. The “Profitability” (ROA) is the Return on Assets measured by the ratio of the net profit to the total assets of the SME. Finally, “Trade credits” (TC) variable represents trade credits measured by the ratio between trade payables and related accounts and the SME’s own funds. A multiple linear regression was implemented in order to explain the financing decision through the previously determined variables. This was done using the OLS method.

4. Interpretation of Results

Before presenting our econometric estimates, a descriptive analysis of our data that brings together the observations of the different SMEs is essential. This first exploratory step ensures the understanding of the results that will be obtained from the regressions and proposes the characteristics and the econometric methods that correspond to the phenomena revealed by descriptive statistics.

4.1. Descriptive Statistics

Table 2 presents the discrepancy between the average values of the explanatory variables and the variable to be explained and their standard deviations for the different SMEs in the sample.

Table-2. Descriptive statistics of the SMEs.

| Variables | CREDIT | SIZE | AGE | LC | INNOV | NS | INTEREST | TC | ROA |
|--------------------|--------|--------|--------|-------|-------|-------|----------|-------|--------|
| Observations | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 | 250 |
| Mean | 5.824 | 6.636 | 2.484 | 0.162 | 0.170 | 1.492 | 0.085 | 1.172 | 0.049 |
| Standard deviation | 0.443 | 0.555 | 0.588 | 0.391 | 0.377 | 0.706 | 0.008 | 1.408 | 0.0428 |
| Skewness | -0.309 | -0.248 | -0.267 | 5.753 | 1.757 | 0.111 | -0.894 | 0.324 | 0.142 |
| Kurtosis | 3.262 | 3.009 | 2.735 | 47.33 | 4.087 | 2.952 | 19.460 | 2.536 | 3.518 |
| Jarque-Bera | 1.888 | 1.030 | 1.486 | 8742 | 56.37 | 0.215 | 19.460 | 1.487 | 1.419 |

By observing Table 2, we can note that the average amount of credit granted by BIAT to Tunisian SMEs is around 5,824 with a fairly high average interest rate of 8.5%, and that the average age of the firm is two and a half years. It also emerges that only 17% of firms have launched new products or services in the last three years, showing that these SMEs do not have a strong orientation towards innovative activities. The results in Table 2 show that the Kurtosis coefficient (distribution coefficient) for most of the variables implies a high probability of extreme points and series with thicker tails than the normal distribution. In addition, the Skewness coefficient, which measures the skewness of the distribution, is non-zero indicating the presence of asymmetry. Finally, the Jarque-Bera test statistic has a high value, which confirms the non-normality of the data studied.

Table-3. Correlation matrix for SMEs.

| Variables | CREDIT | SIZE | AGE | LC | INNOV | NS | INTEREST | TC | ROA |
|-----------|--------|--------|---------|--------|--------|--------|----------|-------|-------|
| CREDIT | 1.000 | | | | | | | | |
| SIZE | 0.564* | 1.000 | | | | | | | |
| AGE | 0.226 | 0.358* | 1.000 | | | | | | |
| LC | -0.052 | -0.115 | -0.071 | 1.000 | | | | | |
| INNOV | -0.128 | -0.116 | -0.248* | 0.202 | 1.000 | | | | |
| NS | 0.142 | 0.131 | 0.158 | 0.012 | -0.075 | 1.000 | | | |
| INTEREST | 0.282* | 0.154 | 0.042 | -0.217 | -0.024 | 0.040 | 1.000 | | |
| TC | 0.213* | 0.034 | 0.053* | 0.067 | 0.165 | 0.037 | 0.041* | 1.000 | |
| ROA | 0.317* | 0.004 | 0.001 | 0.054* | 0.072 | 0.165* | 0.002 | 0.043 | 1.000 |

Note: * indicates statistical significance at 5%.

In order to detect a possible relationship between the different variables, Table 3 presents the different correlation coefficients. This matrix takes into account the observed relationship between the different explanatory variables. Thus, the correlation coefficient is an indicator that gives us an idea about the activity of the linear relationship between two variables. As shown in this table, the correlation coefficients between the different explanatory variables are low. Thus, no variable will be excluded from the model.

To study the stationarity of the variables, we used the Augmented Dickey-Fuller test. We will accept the hypothesis of the existence of a unit root, i.e. a non-stationary process, when the empirical value of the ADF test is greater than that of the t-statistic. Table 4 presents the results of the ADF tests applied to each of the variables. The comparison of the ADF test values with the t-statistics values (McKinnon's statistic) shows that at the 5% threshold, all the variables are stationary in first difference since the ADF statistics are lower than the critical value at the 5% threshold.

Table-4. Summary of the Augmented Dickey-Fuller (ADF) stationarity test.

| Variables | ADF test value | Critical value at 5% | Integration order |
|---------------|----------------|----------------------|-------------------|
| CREDIT (-1) | -9.493490 | -2.890926 | I(1) |
| AGE (-1) | -10.35662 | -2.890926 | I(1) |
| LC (-1) | -9.894688 | -2.890926 | I(1) |
| NS (-1) | -8.634633 | -2.890926 | I(1) |
| SIZE (-1) | -8.454663 | -2.890926 | I(1) |
| INTEREST (-1) | -8.722648 | -2.890926 | I(1) |
| TC (-1) | -9.564267 | -2.890926 | I(1) |
| ROA (-1) | -9.529012 | -2.890926 | I(1) |

4.2. Empirical Results

In the following, we present the results of the estimates according to the firm's sector of activity, size and region.

4.2.1. Based on the Firm's Sector

Table 5 displays the empirical results by considering all SMEs and then disaggregating them by their sectors of activity. The Fisher test indicates that the model is globally significant up to the 1% threshold (Prob > F = 0.0000). The goodness of fit is acceptable since the model explains 44.55% of the total variance. The coefficient of multiple determination of the model (R²) is equal to 0.445 and the adjusted coefficient of multiple determination is equal to 0.403, showing that the model variables explain 40% of the dependent variable. The remaining 60% is attributed to the influence of factors not recorded or not taken into account.

Table-5. Regression results by sector of activity of the SME.

| Variables | Total Firms Log (CREDIT) | Industrial Firms Log (CREDIT) | Commercial Firms Log (CREDIT) | Service Firms Log (CREDIT) |
|--------------------|-----------------------------|----------------------------------|----------------------------------|-------------------------------|
| SIZE | 0.29885 (4.40387)*** | 0.32444 (3.06967)*** | 0.48507 (3.61477)*** | 0.05960 (0.80721) |
| LC | 0.054990 (0.565194) | 0.06259 (0.565833) | 0.85687 (2.953534)*** | 0.01806 (0.098615) |
| INNOV | -0.08743 (-0.76790) | -0.19858 (-1.38041) | 0.36607 (2.25628)*** | -0.36940 (-3.45725)*** |
| NS | 0.03020 (0.600491) | 0.12464 (2.026752)** | -0.05510 (-0.874114) | -0.23168 (-1.329673) |
| INTEREST | 8.72613 (2.090263)** | 4.15750 (0.592694) | 12.8842 (2.312683)** | 6.62050 (0.668445) |
| AGE | 0.00479 (0.681397) | 0.00094 (0.110266) | 0.00917 (1.236648) | 0.00261 (0.549423) |
| TC | 0.03265 (1.54623)** | 0.01487 (0.36512)** | 0.28712 (0.36912)** | 0.00451 (0.04198)** |
| ROA | 0.00986 (1.62809)* | 0.03167 (1.52768) | 0.11276 (0.04167)** | 0.17865 (0.45612) |
| _CONS | 2.67242 (5.333217) | 2.65039 (4.046244)*** | 0.89126 (0.939844) | 4.98854 (4.191634)*** |
| Number of Firms | 250 | 109 | 86 | 55 |
| R-Squared | 0.445565 | 0.503212 | 0.633021 | 0.756543 |
| Adjusted R-Squared | 0.403379 | 0.420414 | 0.530266 | 0.601616 |
| Log likelihood | - 30.55162 | -15.35129 | -3.473318 | 9.265211 |
| F Statistic | 10.56208 | 6.077589 | 6.160532 | 0.010021 |
| Prob (F statistic) | 0.000000 | 0.000062 | 0.000295 | 0.000021 |

Note:

(.) t of Student

*** Significance at 1%, ** 5%, * 10%.

Table 5 shows that SME size, interest rate, trade credits and profitability are the four statistically significant variables. The variable SIZE is positively and significantly correlated at the 1% threshold with the volume of credit granted by BIAT. This result confirms the one found by Cenni et al. (2015); Hernandez-Canovas and Martinez-Solano (2007) and shows that the larger the firm becomes, the more bank financing it can acquire. We can explain this result by the fact that larger firms incur a lower risk of bankruptcy than smaller firms and this is due to a greater diversification of activities. Thus, by reducing the volatility of cash flows, this diversity also reduces the probability of bankruptcy and, consequently, increases the attractiveness of debt. Hypothesis H3 is therefore accepted. Also, it is interesting to note that the SIZE variable is positively and significantly correlated at the 1% threshold with the volume of loans granted to industrial and commercial SMEs. This result shows that BIAT considers the size of these two types of SMEs as a positive signal when considering a loan grant. This can be explained by the high transparency of information of industrial and commercial SMEs, which facilitates the possibility of obtaining a bank loan (Bolton, Freixas, Gambacorta, & Mistrulli, 2016; Ferri & Murro, 2015), in contrast to service SMEs.

The INTEREST variable is positively and significantly correlated at the 5% threshold with access to finance for SMEs. This result corroborates the result found by Ashiqur et al. (2017). It shows that the loan amount increases with the increase in the interest rate. In other words, the higher the loan amount, the higher the risk. Therefore, banks may charge a higher interest rate as the loan amount increases. Moreover, a large loan amount may increase the moral hazard problem causing banks to charge sufficiently high interest rates to receive their compensation in a relatively short period of time. Hypothesis H6 is therefore rejected. We also note that there is a positive and significant correlation at the 5% threshold between the INTEREST variable and the volume of credit granted to commercial SMEs. This result shows that BIAT considers high interest rates when planning to grant credit to commercial SMEs. However, we did not find significant results for the other two sectors of activity.

Trade credits (TC) show a positive and significant signal at the 5% threshold. This relationship supports the important role played by the reputation effects of the SME with its business partners in its access to bank credits. This result confirms hypothesis (H7) associated with the role of trade credit as a signaling tool facilitating SMEs' access to bank credit. This positive relationship can be explained by the signal theory. Indeed, a preponderance of trade credits is a good indicator of the firm's ability to honor its commitments, which encourages banks to finance them. Several authors have shown that taking into account the firm's reputation positively influences its relations with its creditors (Diamond, 1984; Haubrich, 1989; Sharpe, 1990). The role of the signal attributed to trade credits is confirmed by the estimates for the three sectors of activity identified. Banks refer to trade credits as an indicator of good payment reliability, regardless of the activity.

The link between the Return on Assets (ROA) and the volume of credit granted differs between manufacturers and service providers, on the one hand, and traders, on the other. Profitability encourages manufacturers and service providers to reduce their debt. On the other hand, profitability encourages traders to obtain bank loans. These results can be explained by the nature of commercial activity, which is difficult to assess for banks. The wealth created by trading firms cannot be measured by indicators such as value added. Moreover, their assets are mainly current assets consisting of inventories. Banks are therefore more sensitive to the performance of firms. Profitability is therefore a good signal of reliability. We therefore confirm hypothesis (H8).

The AGE variable is positively correlated with loan size but is statistically insignificant regardless of the SME's sector of activity. This result corroborates the one found by Comeig et al. (2015); Cenni et al. (2015) and contradicts the results of Petersen and Rajan (2002). It shows that older and more mature firms need a relatively higher amount of debt from financial institutions to have more liquidity for investment. In addition, the older the SME is, the better relationship it can form with banks (Brancati, 2015; Neuberger, R athke, & Schacht, 2006). Hypothesis H4 is then accepted.

The INNOV variable is negatively and significantly correlated at the 1% threshold with the size of the loan granted to service SMEs. This result shows that innovative service SMEs represent risky investments for banks that are constrained to lend them. It confirms the finding by Brancati (2015) that high-tech firms are more rationed by banks than non-tech or non-innovative firms and that banks cannot assess the growth prospects of innovative firms, hence the lack of financing. Hypothesis H5 is then accepted.

The LC variable is positively and significantly correlated at the 1% threshold with the loan amount for the case of commercial SMEs. This result confirms the one found by Mazeri and Mohammed (2019) on Algerian banks. It appears then that the bank does not care about the problem of a liquidity crisis when granting the loan to this type of SME, since it performs a preliminary study on the duration of this crisis to know if it is temporary or structural. Hypothesis H1 is thus accepted. As for the NS variable, the results of the estimate show a positive and significant correlation at the 5% threshold with the amount of credit for the case of industrial SMEs. This result comes in contrast with the one found by Colot and Croquet (2007); Mazeri and Mohammed (2019). We conclude that the positive liquidity position within the industrial SME encourages the bank to finance it. Hypothesis H2 is then rejected.

4.2.2. Based on the Size of the Firm

We present the results of the regression model estimates by SME size. The estimation results are shown in Table 6. The table shows that the SIZE variable is positively and significantly correlated at the 5% threshold with the total volume of credit granted by the bank, whatever the size of the SME (micro, small and medium). This result shows that the bank grants credit independently of the size of the SME. The INNOV variable is negatively and significantly associated at the 5% threshold with the dependent variable for microenterprises. In other words, the more a microenterprise innovates, the less it could benefit from bank financing. This may be due to poor growth prospects for microenterprises in the market. However, a positive relationship between the INNOV variable and total credit volume was detected only for medium-sized SMEs. We can deduce that these firms are not penalized by BIAT; on the contrary, BIAT values the innovation activities of innovative medium-sized firms by providing them with financial support. The INTEREST variable is positively and significantly correlated at the 10% threshold with the volume of credit granted by the bank, particularly for microenterprises. This result shows that BIAT considers high interest rates when it plans to grant loans to microenterprises, given that the latter are substantially risky. Indeed, interbank competition may affect the bank's decision to extend credit to high-risk borrowers, and a high interest rate represents an incentive for the bank to increase its profit margin.

The two variables, "Trade credits" (TC) and ROA, present a positive and significant signal at the 10% threshold, for all SMEs regardless of size. This relationship supports, on the one hand, the important role played by the reputation effects of the SME with its commercial partners in its access to bank credits; and on the other hand, the role of the profitability as a signal on the financial reliability of the firm. These results confirm the role of trade credit and profitability as signaling means facilitating SMEs' access to bank credit. The AGE variable is negatively and non-significantly correlated with the dependent variable for micro and small firms. The negative sign of this relationship can be explained by the fact that an older firm may have succeeded in accumulating, during its existence, a significant amount of equity through self-financing and, consequently, needs less bank financing. In contrast, this variable is positively related to the volume of credit for medium-sized firms. This result corroborates the findings of Dietsch (2003), who points out that SMEs need to be able to build up long-term relationships with banks in order to strengthen their confidence and thus facilitate their access to credit. The positive direction of this impact is explained, according to this author, by the intensification of the relationship of trust between medium-sized SMEs and BIAT over time.

Table-6. Regression results by size of the SME.

| | Micro Firms | Small Firms | Medium Firms |
|--------------------|--------------------------|-------------------------|-------------------------|
| Variables | Log (CREDIT) | Log (CREDIT) | Log (CREDIT) |
| SIZE | 0.66299 (3.429663)** | 0.31309 (2.199317)** | 0.27813 (2.454463)** |
| LC | 1.21741 (3.574812)** | 0.05610 (0.456642) | 0.29424 (0.914981) |
| INNOV | -0.41309 (-2.49166)** | -0.27223 (-1.33018) | 0.10049 (0.61705) |
| NS | -0.29312 (-1.47071) | 0.06190 (0.81837) | -0.09377 (-1.14414) |
| INTEREST | 12.5451 (1.930750)* | 8.91197 (0.826225) | 7.78776 (1.035794) |
| AGE | -0.00441 (-0.360256) | -0.00136 (-0.164489) | 0.00719 (1.013244) |
| TC | 0.41543 (1.55817)* | 0.09126 (1.34254)* | 0.17231 (0.02654)* |
| ROA | 0.00943 (0.17698)* | 0.05413 (0.091253)* | 0.01128 (0.106215)* |
| _CONS | -0.10295 (-0.08670) | 2.41359 (1.79535) | 3.07877 (3.09030)** |
| Number of Firms | 33 | 75 | 142 |
| R-Squared | 0.779498 | 0.426322 | 0.410714 |
| Adjusted R-Squared | 0.669248 | 0.282902 | 0.292857 |
| Log likelihood | 1.182925 | -10.43956 | -9.461714 |
| F Statistic | 7.070228 | 2.972548 | 3.484850 |
| Prob (F statistic) | 0.001005 | 0.018388 | 0.006143 |

Note: (.) t of Student.
 *** Significance at 1%, ** 5%, * 10%.

Finally, we can highlight the positive and significant relationship at the 5% threshold between the CL variable and the amount of the loan for microenterprises, showing that the bank is not concerned about the problem of a liquidity crisis when granting the loan, especially for this type of SMEs.

4.2.3. Based on the Region of the Firm

In a third step, we present the results of the estimation of the regression models according to the region of the SME. The estimation results, shown in Table 7, show that the size of the SME is positively and significantly correlated at the 5% threshold with the dependent variable, namely for SMEs located in the District of Tunis and in the Center-East. This shows that BIAT is more active with these SMEs, which receive more support than those located in the Northeast. This result can be explained by the fact that BIAT has a higher number of branches in these regions which, in 2020, account for more than a third of the industrial fabric (35.1% in the District of Tunis and 24.2% in the Center-East). The INNOV variable is negatively and significantly related at the 5% threshold with the volume of credit granted to SMEs located in the District of Tunis and the Center-East. This result is explained by the fact that innovative firms located in these regions are generally risky because the returns on their investments are uncertain; they are also likely to be rationed in terms of credit. Thus, innovative SMEs are more likely to receive fewer loans from BIAT, which would not be able to assess their growth prospects. The AGE variable is positively and significantly related at the 10% threshold with the dependent variable for SMEs located in the District of Tunis, but negatively and significantly related at the 5% threshold for SMEs located in the Northeast and Center-East.

Table-7. Regression results by region of the SME.

| | District of Tunis | Northeast | Center-East |
|--------------------|---------------------------|---------------------------|---------------------------|
| Variables | Log (CREDIT) | Log (CREDIT) | Log (CREDIT) |
| SIZE | 0.546432 (3.79866)** | 0.319876 (2.76490) | 0.128975 (2.17954)** |
| LC | 1.376651 (3.52678) | 0.547424 (0.28065) | 0.154643 (0.75491) |
| INNOV | -0.312765 (-2.48749)** | -0.165743 (-1.94571) | -0.111765 (-0.19053)** |
| NS | 0.298564 (1.26479) | 0.004123 (0.18934) | 0.852764 (1.19561) |
| INTEREST | 11.54364 (1.85743)* | 7.324567 (0.12645) | 6.128756 (1.98301) |
| AGE | 0.231456 (0.22543)* | -0.067578 (-0.13854)** | -0.023451 (-1.23185)** |
| TC | 0.12753 (1.08278)** | 0.05287 (0.06442)** | 1.42698 (1.65497)** |
| ROA | 0.06575 (0.04167)*** | 0.14723 (0.03653)*** | 0.00512 (0.01278)*** |
| _CONS | -0.235342 (-0.01275) | 2.318765 (1.18724) | 3.624865 (3.68123)** |
| Number of Firms | 112 | 85 | 53 |
| R-Squared | 0.64894 | 0.517865 | 0.365464 |
| Adjusted R-Squared | 0.52687 | 0.384654 | 0.197869 |
| Log likelihood | 1.12167 | -9.65464 | -8.546475 |
| F Statistic | 7.18943 | 3.657437 | 2.657427 |
| Prob (F statistic) | 0.00000 | 0.000012 | 0.000015 |

Note: (.) t of Student.

*** Significance at 1%, ** 5%, * 10%.

This result can be explained by the fact that SMEs located in the District of Tunis are older and more mature, and can thus establish a long-term relationship with the bank by benefiting from more credit, which is less likely for younger firms, located in the Northeast and Center-East, which are more vulnerable to restricted access to bank financing because the transparency of information is lower. As for the 'profitability' variable, it is positively and significantly correlated at the 1% threshold with the dependent variable for all SMEs regardless of the region. This result shows that the most profitable firms have easier access to bank financing than the least profitable ones. The more profitable the firm, the easier it is to negotiate the loan contract. This is because they have a low risk of financial default. Finally, the trade credit (TC) variable plays a positive and significant role at the 5% threshold, regardless of the region. Moreover, this positive impact confirms that bank financing increases with the reputation effects of the SME with its business partners.

5. Conclusion

Tunisian SMEs are often neglected in empirical studies dealing with the problem of bank financing in a context of asymmetric information. With this study, after having carried out a review of the existing literature on the subject, we wished to carry out an econometric study to understand what role could play certain variables specific to SMEs, which we classified in three categories: variables measuring the symmetry of information, variables which attenuate the problem of the asymmetry of information and variable which reinforces the problem of the asymmetry of information. This was done in order to determine the extent to which the implications of the bank-SME relationship contribute to influencing the bank's financing decisions. Our sample consisted of 250 Tunisian SMEs financed by BIAT, broken down by sector of activity, size and region.

Of the eight variables considered in our model, size, interest rate, trade credits and profitability have a statistically significant influence on the total volume of credit requested by SMEs. We also found that BIAT considers the size of commercial and industrial SMEs, and those located in the District of Tunis and the Center-East, as a positive signal when considering a loan, this can be explained by the high transparency of information of these companies, although it grants a credit regardless of the size of the SME. BIAT also considers high interest rates when considering loans to commercial SMEs, microenterprises and SMEs located in the District of Tunis, as these are substantially risky. As far as innovation is concerned, the results showed that service SMEs, micro-enterprises and SMEs located in the District of Tunis and in the Center-East, find it difficult to get a credit from BIAT, which is constrained to finance them, since these innovative SMEs represent risky investments. However, the bank values the innovative activities of medium-sized companies by providing them with financial support. We can also underline that the bank is not concerned about the problem of a liquidity crisis when granting the loan, especially for microenterprises. Finally, our study noted the important role played by the reputation effects of the SME, regardless of size, sector of activity and region, with its business partners in its access to bank credit. Similarly, the results confirmed the role of profitability as a signaling device that facilitates SMEs' access to bank credit, especially for commercial SMEs.

It is interesting to note that BIAT neglects liquidity issues and the net worth of the SME in its financing decision, which contradicts the theoretical assumptions. In fact, the bank's financing of newly created institutions makes information about them very limited, which accentuates the problem of information asymmetry. Finally, we conclude that BIAT's financing of Tunisian SMEs is characterized by conditions dominated by the problem of asymmetric information. It would then be necessary to adjust the behavior of the bank and the SMEs in order to improve the conditions of access to financing, thus reinforcing the confidence in the bank-SME relationship.

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