Assessment of Lebanese SME Troubles- Barriers to Banking Loan: Indebtedness Study for Lebanese SMEs

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Abstract: This paper investigates the determinants of banks' contribution to financing Lebanese SMEs using data from 2013 and 2019, pooled in a combined panel. The study focuses on factors such as firm size, bank account possession, informal competition, interest rate, location in capital city, external audit, female top manager, years without formal registration, collateral requirements, and the duration of SME-Bank relationships. The empirical analysis reveals that firms' size and the length of relationship duration affect loan approval, with larger firms less likely to have loans. Banks prefer to build long-term credit relationships with customers, but only one SME characteristic, having a checking or savings bank account, has a negative significant effect on loan rejection.

Another regression test tested the proportion of investments financed by banks, focusing on the economic sector, location of firms in capital city, interest rate, proportion of working capital financed by banks, SME's size, and duration of the relationship. Results show that firms using banks to finance their working capital (WCF) attract the most funds (BD). High interest rates can make loans expensive and unaffordable, leading to a decline in bank-financed investment. The consistency of the results between panels with grouped data and those with a binary variable to control for the year reflects the rigor of the Lebanese banking sector, but the difference in intensity could be attributed to macroeconomic conjunctures.

1. INTRODUCTION

The proportion of SME investment financed by banks is an expression of a firm's relations with financing institutions. Nowadays, bank credit is extremely important for large companies that have the ability to attract capital in the financial markets. Besides, banks are traditionally recognized as essential credit providers for small and medium-sized enterprises. National law acts in favor of preventing the fundamental risks in crediting that have been caused by asymmetric information – moral hazard and adverse selection. The use of collateral is a generally accepted approach for mitigating adverse selection and moral hazard problems related to financial relationships (Blazy & Weill, 2013; Agostino & Trivieri, 2017). The size of a firm is agreed to be contributing to the positive reputation of a firm. These large firms would easily inspire confidence in credit institutions. In reverse reasoning, SMEs are expected to have stronger financing difficulties than large firms (Beck et al., 2006). The type and strength of connections could be an important indicator of the success of these businesses (Granovetter, 1973). Therefore, the firms' credits are considered mainly as a function of the firm's size itself (Agostino & Trivieri, 2017). These factors have the potential to affect the capacities of the SMEs for borrowing and lastly, the amounts borrowed. The last conven-

tional expectation has become a conceptual basis for lots of empirical studies on the factors that prevent the SMEs from accessing bank loans. Thus, myriads of economists regress the frequency of accepting or rejecting applications for a loan with firm's size, interest rate, collateral requirement, proxies for closeness of bank-firm relations, working capital proxies, belonging to economic sector, and others. Besides factors influencing the approval/ rejection of loan and the indebtedness of the small and medium-sized firms to banks, there should be expectations for the impact of the general economic environment and policy influences by the central bank in line with its monetary policy. Therefore, commercial crediting would be influenced by monetary policy which – on the other hand – is determined by the macroeconomic dynamics and the phase of the business cycle.

This paper investigates the factors affecting loan applications and corporate indebtedness to commercial banks in Lebanese SMEs. Loans are a socio-economic process that begins with commercialization, client acceptance, application, evaluation, documentation submission, approval, compliance, registration, withdrawal, monitoring, administration, repayment, and collection. The study uses data from the Lebanese Central Bank and the World Bank to examine the structural and strategic determinants of banks' contribution in financing SMEs. It uses an indebtedness model that combines factors that determine a firm's financing path. The model will explain the deviations of binary variables, such as bank loan lent and rejected loan application, using firm-related factors

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(FRV), loan-related factors (LRV), and market-related factors (MRV). The study will focus on explaining the deviations of SMEs' indebtedness to banks through a set of variables, using regression methodology, particularly logistic and linear regressions. Correlations play a crucial role in economic analysis. The paper presents a theoretical background and review of empirical evidence on SMEs' access to bank debt and bank-financed investments. It describes the method of empirical analysis, selected variables, and data. The main section establishes correlation associations, regressions, and examines year effects on panels. The last section summarizes the results of the estimations performed in previous sections.

2. THEORETICAL BACKGROUND AND REVIEW LITERATURE

2.1. The Determinants of Lebanese Small and medium enterprises access to Debt

SME financing gap results from the difference between the demand and supply of financing through proprietary and/or debt sources that represent the capital structure (Carter & Evans, 2000). Schumpeter (1934) confirms that access to debt plays a key role in improving economic growth, innovation, and availability of opportunities for start-ups. The sources of finance for SMEs are the same as for large firms, but the financial structure of the two groups appears to be different. This difference is due to the features of small and medium-sized enterprises who can apply for loans from similar institutions, but the confidence and likelihood of acceptance they receive is very different. The credit risk related to the SME is higher than that of large firms due to the small stacks of tangible assets and weak economic power of small firms. In studying access to bank credit, Angela and Motsa Associates (2004) found factors such as: lack of personal savings, lack of collateral, lack of security, lack of financial history and business plans, and high interest rates (Amoako, 2015). According to Lebanese commercial banks, who also impose restrictions on the creditworthiness of firms seeking to acquire the loan, the reason is to avoid credit defaults and to ensure that the loan will be collected (Besanko & Thakor, 2017). In this context, the fact that small and medium-sized enterprises are riskier borrowers implies that these organizations will seek to hold a relatively larger share of total guaranteed loans. Collateral helps mitigate moral hazard and selection problems in a loan contract because it can serve as a signaling tool for financial institutions to identify quality borrowers. In the literature, emphasis is placed on the collateral required for credit risk as the most important barrier for SMEs to access bank loans (Alidu and Addae, 1994; Oteng-Gyasi, 2003; Amoako, 2015). Some theoretical sources link the collateral requirement to the interest rate in the context of the quality of the borrower seeking a loan (Bester, 1987). The case of Lebanon shows that it is a country where the shadow (informal) economy accounts for a significant portion of the total economy. Our research focuses on core components, including variables linked to company characteristics, in our case: external auditing of the firm's yearly financial statements; firm size; female gender of top management; number of years a firm ran without official registration; ownership of firm for a checking or savings account with a bank. We use collateral, duration of a firm's relationship with the primary

bank, and interest rate as variables reflecting loan characteristics. The market factors are then provided by the business's location in the capital city and identification of the firm for rivals' informal sector operations as a key restriction.

2.1.1. Variables Related to Firms' Characteristics

2.1.1.1. External Audit of Firm's Annual Financial Statement

Previous research found that banks' ability to make loans was hampered by borrowers' incomplete knowledge (Stiglitz and Weiss (1981); Jaffee and Russell (1976)). As a response, banks frequently need audited financial accounts before giving loans to reduce this issue. Berry et al. (1993) found that lenders in the UK paid much more attention to accounting information to deal with the loan applications of small firms. Therefore, it might seem plausible that audited financial statements improve borrower's credibility and therefore reduce risk for lenders. Caneghem and Campenhout (2012) tested whether the volume and/or quality of information in the financial statements impacts the financial structure of SMEs using a sample of 79,097 Belgian and Luxembourgian SMEs. Their studies revealed that the quantity and quality of financial statement information are both connected to SME growth.

2.1.1.2. Business Size

Burkart and Ellingsen (2004) showed that a bigger business size provides more access to long-term finance. Fatoki and Odeyemi (2010) and Fatoki and Asah (2011) discovered that business size is positively linked with access to credit in South Africa. In Vietnam, there is also a favorable link between business size and access to bank loans (Le, 2012). According to the literature, company size is a significant predictor of debt availability for SMEs. Small businesses may also have less collateral (fewer tangible assets or capital) to ensure that they can repay their obligations. Additionally, during times of crisis, lending limits for SMEs should be tighter. Holmstrom and Tirole (1997) offer a model in which businesses with varying amounts of starting capital seek finance. They take into consideration several forms of economic fluctuations, such as credit crunches, and demonstrate that businesses with smaller levels of starting capital are more severely impacted by such global financial constraints. Small and medium-sized enterprises (SMEs) in particular, who have less capital, are expected to be more damaged by such shocks. Hyytinen and Pajarinen (2008) explore experimentally how the size of a business affects information asymmetries. Garcia-Teruel and Martnez-Solano (2010) examine the drivers of trade credit using data from seven European nations and discover that granted trade credit accounts for 22 percent of total assets on average. They discover favorable correlations between company size on the one hand and SMEs' trade credit on the other.

2.1.1.3. Female Top Manager

Over the last 15 years, the capacity of female entrepreneurs to obtain bank funding has been on the small business discipline's study agenda. Carter et al. (2007) found two major explanations for women's lower probability of utilizing external loan finance: structural differences between male and female-owned companies, and gender discrimination in sup-

ply and demand side variables. Several research have investigated gender discrimination in loan markets, but the results have been mixed. Hisrich and Brush (1984), for example, claimed that women had difficulty obtaining bank loans due to their gender. This could be because loan officers were risk averse and viewed female loan applicants adversely owing to a perceived poor track record, lack of strategic planning, and market strategies. Despite the abundance of studies, there is no clear evidence for the notion of gender disparities in access to money.

2.1.1.4. Operating without formal registration

The registration of a business and access to credit have a favorable and substantial link. La Porta and Shleifer (2008) provide three perspectives on the significance of informal enterprises in economic development: the romantic perspective, the parasitic perspective, and the dual perspective. The parasitic and dual perspectives regard informal enterprises as unproductive businesses. According to the parasitic viewpoint, informal enterprises are direct rivals of regular businesses. Even though this viewpoint recognizes informal enterprises as inefficient businesses because they must remain tiny to avoid detection by the government, it contends that the unfair cost advantage they produce by being unlawful outweighs their low productivity (Farrell, 2004). Meanwhile, the dual perspective contends that informal companies differ significantly from formal firms in a variety of ways that are unaffected by government regulations, such as entrepreneurial qualities (La Porta and Shleifer, 2008). In opposed to the parasitic viewpoint, this viewpoint contends that the presence of informal companies should not pose significant risks to the commercial operations of registered firms. As a result, informal companies are not considered direct rivals. Since informal companies are linked with increased inefficiency due to the employment of generally less competent and less educated employees, this viewpoint throws doubt on their capacity to undercut market rates for the same sort of product or service.

2.1.1.5. Owning bank account

Buyinza et al. (2018) affirm that, as predicted, having a personal **bank account** as well as a separate company bank account has a considerable beneficial influence on the likelihood of getting formal credit among Ugandan SMEs. According to the findings, a business owner who has a personal bank account improves the likelihood of getting formal credit by 3% when compared to counterpart SMEs who do not have personal bank accounts. Furthermore, an SME with a solid bank account enhances the likelihood of getting funding. When compared to an SME without a business bank account, forma bank credit increases by roughly 20%. This conclusion is consistent with earlier research (Fatoki & Smit, 2011), which show that having a bank account is an important factor of credit access.

2.1.2. Variables related to loans' characteristics:

2.1.2.1. Collateral Requirement

Generally, banks demand a physical fixed asset as collateral (security) for the loan, and banks typically lend to a business based on the value of fixed assets given as collateral. For banks, collateral is never the objective of the loan, it is only a form of security. Small businesses, on the other hand, have less collateralizable assets than large businesses. This may be related to the firm's stage of development. Another reason why small businesses have a lower share of fixed assets is due to capital restrictions. It is difficult for them to purchase a significant number of fixed assets due to the requirement to obtain huge sums of cash. According to the above logic, companies with physical assets have easier access to bank funding and cheaper financing costs. Other variables being equal, Johnsen and McMahon (2005) said that businesses with more intangible assets need to borrow less because of the collateral issue.

2.1.2.2. Duration of a firm's relationship with the main bank

When an entrepreneur has such a long-term connection with a bank, the bank gains in-depth information of the firm's qualities and initiatives. This knowledge facilitates SME access to bank loans and makes the bank's decision to issue a loan less hazardous (Petersen & Rajan, 1994, Berger & Udell, 1995; Hernandez-Canovas & Martinez-Solano, 2010). According to Diamond (1991), the length of time a business has been servicing its debts enhances a bank's credibility in the entrepreneur. Furthermore, Cole (1998) believes that when banks have long-term loan relationships with companies, they create soft information about them, therefore alleviating the asymmetric information problem. Numerous studies have found that having a longer relation with the primary bank reduces the risk of credit rationing (Angelini et al., 1998; Agostino & Trivieri, 2017; Bharath et al., 2011; Cenni et al., 2015; Madrid-Guijarro et al., 2016). As a result, we suggest that the length of the firm's association with its oldest bank is related to a good opinion of bank funding accessibility.

2.1.2.3. Interest rate

Bank loans have been identified as a critical component in the expansion of SMEs not only in industrialized nations but also in emerging ones (Nguyen, Le, & Freeman, 2006; The United Nations, 2001; World Bank, 2015). According to Amonoo et al. (2003), the interest rate charged, as well as the owners' equity and the firm's yearly profit, impact credit demand among companies in Ghana. Interest rates have a negative link with SMEs' demand for credit and loan repayment at banks. According to Amonoo et al. (2003) also discover that owner's equity is connected to SMEs' desire for loan, as financial institutions prefer companies with a larger percentage of financial capital. Higher interest rates are substantial impediments to small company financing, and SMEs are discouraged from taking bank loans since they cannot agree on the loan price. Increased interest rates are one of the most significant causes driving loan default for SMEs, as higher loan prices raise the debt load for SMEs (Chaibi and Ftiti, 2015). According to empirical study, when the cost of loans is too high, borrowers are deterred from obtaining loans from banks since it raises their debt load, which can have a detrimental impact on the firm's value (Hernandez-Canovas and Martinez-Solano, 2010).

2.1.3. Variables related to markets' characteristics:

The third group of independent variables in the research focuses on market characteristics, specifically Lebanon's capi-

tal city location and competitive practices in the informal sector.

2.1.3.1. Location in the capital town of Lebanon

Kira and He (2012) discovered a link between a company's location and its debt ratio. Enterprises in urban regions have a better chance of receiving bank loans than firms in rural areas in South Africa (Fatoki & Asah, 2011; Fatoki & Odeyemi, 2010). Small companies may face high interest rates on bank loans or be required to comply with restrictive covenants such as collateral and other restrictions. Additionally, bank branch managers assigned to bank branches located far from the capital city may be given only limited delegated authority. As a result, banks may be hesitant to lend to small companies in regions far from the capital city since the assets given as collateral by these firms may have less valuation and may be harder to realize in the event of default. Kumar and Francisco (2005) also acknowledged a wide difference in branch density across different regions in Brazil, arguing that well-branched regions had simpler physical access and lower information asymmetry problems because of higher bank-to-firm ratios, and that firms located in these regions had access to finance.

2.1.3.2. Identifying competitive practices from informal sector

Distinguin et al. (2016) argue that their findings, based on 23084 registered SMEs in 86 countries, show that formal SMEs experiencing competition from informal companies are more likely to be credit-constrained than their counterparts, who are thought to be less affected by informal sector activities. The findings also show that competition from informal companies has a negative impact on registered SMEs' external financing opportunities, but only in countries with a low-quality institutional framework. Conversely, when the rule of law is successful and corruption is well-controlled, there are less incentives for informal companies to extend their activities for fear of being discovered. Furthermore, a high-quality business environment reduces the interconnections between the formal and informal sectors, making companies in both sectors less inclined to adapt to similar client bases.

2.2. Extended Review: Proportion of Investment Financed by Bank Loans

Most studies of SME financing consider the firm's bank debt as a function of a set of factors. This primary focus of their analytical frameworks' places bank indebtedness on the left side and various factors on the right side of the regression models they specify. Thus, the right-hand sides of their regressions include firm size, interest rate, proxies for the closeness of the bank-firm relationship, working capital proxies, economic sector membership, and other independent variables that could explain the importance of debt to banking institutions. The influence of aforementioned factors on the firm bank debt and loan contracts have been studied in terms of several samples of countries. Lebanon's situation is analyzed alone as well as in conjunction with the cases of other Middle Eastern and Northern African nations. To evaluate the proportion of investment financed by bank loans, factors like firm's relationship duration, interest rate, and

location in the capital city are considered. Working capital financed by banks and the business's economic sector (manufacturing, wholesale, retail, food production, and services) are also considered powerful factors.

2.2.1. Working capital and Economic sector

2.2.1.1. Working Capital

A firm's working capital is considered to be in relation to bank financing for SMEs. The use of banks to finance working capital could be an indication of closer bank-firm relationships. Additional information for the closeness of those relationships could be obtained by the proportion of working capital financed by banks. The last indicator is more related to the capacity of a firm to meet its financial needs in the short term and to borrow from a long-term perspective. According to Petersen and Rajan (1997) and Nilsen (2002), financially restricted companies are more inclined to use bank loans and informal lending as alternative sources of funding. Nilsen (2002) discovers that companies with limited access to bank loans utilize trade credit to finance their working capital.

2.2.1.2. Economic Sector

The majority of funding sources favor lending to industrial sector, whereas other sectors are mostly unsupported (Kira & He, 2012). The industry sector can be recognized as a potential determinant in bank loans to SMEs. One probable explanation is that lending banks prefer expanding industry sectors. North et al. (2010) found that manufacturing SMEs in Scotland were twice as likely to have issues as SMEs in other industries. Another reason why the industry sector contributes to lending is the presence of physical assets across industries. Cressy and Alofsson (1997) and Silva and Carreira (2010) suggest that manufacturing businesses have reduced credit constraints and a high indebtedness level since they have a substantial quantity of physical assets to employ as collateral. Rahman et al. (2017) present evidence that manufacturing businesses pledge lesser collateral than firms in other sectors in similar research, and they suggest that banks need lower collateral from manufacturing-industry enterprises because they display better information openness. Beck et al. (2006) show that loan rationing is more severe in the industrial sector than in the service sector. Cosh et al. (2008) and North et al. (2010) both present evidence that SMEs in the manufacturing business are less successful in obtaining bank loans than enterprises in other industries. North et al. (2010) further demonstrate that the challenges that manufacturing businesses have in presenting complex technological development plans are among the causes for their inability to secure bank financing.

3. EMPIRICAL FRAMEWORK

This part sets the framework for the upcoming empirical section. Two regressions will be run; the first one focuses on variables that affect the approval or rejection of loan applications. The second is dedicated to testing the determinants of indebtedness. Thus, in section 3.1 we present the methods used, the models and their components, while in section 3.2 we define the data and its sources.

3.1. Method and Variables

Studying the case of Ghana, Amoako (2015) considers the following barriers for the SME to access funds: high interest rates, short period for repayment, track record, associate risk, limited market, managerial inadequacy, collateral requirement, business plan, bank balance, and guarantor. The case of Lebanon has its specifics, and they should be considered for efficient empirical studying. Thus, the logistic regression model has been specified as follows:

(1.0) $BL_i / RL_i = \beta_0 + \beta_1 FRV_i + \beta_2 LRV_i + \beta_3 MRV_i + \varepsilon$

Where:

BL_i is a binary variable taking value 1 when a bank loan has been lent to a firm. In the second part of the analysis, this variable will be replaced by RL_i which is a binary variable taking value 1 recent loan application was rejected.

The right-side of regression insisted of three groups of variables:

FRV_i – firm related variables that include the following ones: AUD_i is a binary variable which takes value 1 if the firm's annual financial statement is audited by external auditors; SZ_i is the size of firm, measured as the average number of full-time employees; FM_i is binary variable which takes value 1 if a firm's top manager is female; NOR_i is the number of years a firm operated without formal registration; BAC_i is a binary variable which takes value 1 if a firm has a checking or savings account with bank.

LRV_i – loan related variables that include the following ones: COL_i is a binary variable taking value 1 when a bank loan requires collateral; DUR_i is the duration of a firm's credit relationship with the main bank; IR_i is the interest rate applicable.

MRV_i – market related variables that include the following ones: CT_i is a binary variable for location in the capital town; INC_i is a binary variable that takes value 1 if a firm has identified practices of competitors in the informal sector as a major constraint.

The characters $\beta_0, \beta_1, \beta_2, \beta_3$ are the parameters of the model.

The procedures of estimation will follow the conventional way of logistic regression estimation. The quantitative data on each observation have been derived from the Central Bank of Lebanon as well as the World Bank's Enterprise Surveys and Global Financial Development Database.

As mentioned earlier, what distinguishes this research is the follow-up flow we perform on the loans granted above. The analysis continues with a deeper empirical explanation of the bank loan that the firms received. The deviations of the SMEs' indebtedness to banks will be explained with a set of explanatory variables, most of which have no binary character. The indebtedness of firms to banks is measured by the proportion (percent) of investment financed by banks.

(2.0) $BD_i = \beta_0 + \beta_1 DUR_i + \beta_2 IR_i + \beta_3 CT_i + \beta_4 X_i + \beta_5 Y_i + \varepsilon$

Where:

BD_i is the proportion of investment financed by banks (%). DUR_i is the duration of a firm's relationship with the main bank. IR_i is the interest rate applicable.

CT_i is a dummy for location in the capital town.

X_i is a vector of dummies including the size of a firm (SIZE), as well as the proportion of working capital financed by banks (WCP).

Y_i is a dummy for industry – binary variables that take value one if a firm operating in the sector of manufacturing (MAN), the sector of wholesale and retails (RTL), the sector of food production (FOOD), and the sector of services (SER).

The $\beta_0, \beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ are the parameters of the model.

The logistic regression method will be adopted as the procedure for estimating the parameters of the second regression model. In this case, the regression is not of binary type. As pointed above, the quantitative data on each observation have been derived from the Central Bank of Lebanon as well as the World Bank's Enterprise Surveys and Global Financial Development Database.

3.2. Data

The data used in this study was gathered from Lebanon's Central Bank, the World Bank's Global Financial Development Database, and Enterprise Surveys, What Businesses Experience. The study interviewed owners and top executives of 532 businesses between May 2019 and April 2020, covering sectors such as manufacturing, food, wholesale & retail, and other services. The full sample of firms included in the 2019 survey included 279 small firms, 194 medium-sized firms, and 59 large firms. The Enterprise Surveys reported data on the percentage of firms not needing a loan, with 44.9 percent of firms having no need for borrowing. The study also reported data on the percentage of firms whose recent loan application was rejected, with 7.1 percent of small firms, 6.4% of medium- sized, and 7.4% of large firms rejecting their applications. The data was collected from companies from all regions of Lebanon, including Mount Lebanon, Beirut, South Lebanon, the Bekaa Valley, North Lebanon, and Nabatieh.

The definition and sources of the variables included in the logistic regression of the first model is given in the table **1**.

Table 1. Definitions of the Variables in First Regression Models.

Variable	Definition	Source
AUD	Binary variable which takes value 1 if the firm's annual financial statement is audited by external auditors	World Bank, Enterprise Surveys
FM	Binary variable which takes value 1 if a firm's top manager is female	World Bank, Enterprise Surveys
NOR	Number of years a firm operated without formal registration	World Bank, Enterprise Surveys
BL	Binary variable taking value 1 when a bank loan has been lent to a firm	World Bank, Global Financial Development Database
COL	Collateral needed for a loan (binary variable)	World Bank, Enterprise Surveys

DUR	Duration of a firm's relationship with the main bank	World Bank, Global Financial Development Database
SZ	Size of firm, measured as the average number of full-time employees	World Bank, Enterprise Surveys
BAC	Binary variable which takes value 1 if a firm has a checking or savings account with bank	World Bank, Global Financial Development Database
RL	Binary variable taking value 1 recent loan application of a firm has been rejected	World Bank, Global Financial Development Database
INC	Binary variable which takes value 1 if a firm has identified practices of competitors in the informal sector as a major constraint	World Bank, Enterprise Surveys
IR	Average value of the basic interest rate owed on a bank loan	Lebanese Central bank
CT	Binary variable which takes value 1 if a firm is located in the capital town of Lebanon	World Bank, Enterprise Surveys

Source: WB; LCB

Table **2** contains variables of the second model's specification.

Table 2. Definitions of the Variables in Second Regression Models.

Variable	Definition	Source
BD	Proportion of investment financed by banks (%)	World Bank, Global Financial Development Database
DUR	Duration of a firm's relationship with the main bank	World Bank, Global Financial Development Database
SIZE	Size of firm, measured as the average number of full-time employees	World Bank, Enterprise Surveys
WCP	Proportion of working capital financed by banks (%)	World Bank, Global Financial Development Database
MAN	Binary variable which takes value 1 if a firm operates in the manufacturing sector	World Bank, Enterprise Surveys
RTL	Binary variable which takes value 1 if a firm operates in the sector of wholesale and retails	World Bank, Enterprise Surveys
FOOD	Binary variable which takes value 1 if a firm operates in the sector of food production	World Bank, Enterprise Surveys
SER	Binary variable which takes value 1 if a firm operates in the sector of services	World Bank, Enterprise Surveys

IR	Average value of the basic interest rate owed on a bank loan	Lebanese Central bank
CT	Binary variable which takes value 1 if a firm is located in the capital town of Lebanon	World Bank, Enterprise Surveys

Source: WB; LCB.

4. EMPIRICAL ESTIMATION AND REGRESSION RESULTS

This section will be divided into three parts: 4.1, 4.2, and 4.3. Section 4.1 will present the correlations between the independent and dependent variables: BL, RL, and BD respectively. Section 4.2 is a section devoted to the presentation of the regression models, followed by analysis and discussion. In Section 4.3, a panel logistic model with variable a dummy variable is used to test the effects of the year (2013-2019) on the estimated model, followed by analysis and discussion. To avoid any inconvenience, we will enumerate the equations as follows:

$$BL_i = \beta_0 + \beta_1 FRV_i + \beta_2 LRV_i + \beta_3 MRV_i + \varepsilon$$

$$RL_i = \beta_0 + \beta_1 FRV_i + \beta_2 LRV_i + \beta_3 MRV_i + \varepsilon$$

$$BD_i = \beta_0 + \beta_1 DUR_i + \beta_2 IR_i + \beta_3 CT_i + \beta_4 X_i + \beta_5 Y_i + \varepsilon$$

4.1. Correlation Associations

4.1.1. Correlation Among Variables in Equation 1 (BL)

Table 3. SME - Correlations among the variables in the First Equation.

	BL	SZ	IR	DUR	NOR	BAC	AUD	INC	COL	CT	FM
BL	1.00										
SZ	-0.33	1.00									
IR	0.01	-0.02	1.00								
DUR	0.03	0.04	-0.06	1.00							
NOR	-0.02	-0.01	0.02	0.05	1.00						
BAC	0.16	-0.20	0.02	0.00	0.04	1.00					
AUD	0.13	-0.16	0.06	0.01	0.08	0.24	1.00				
INC	0.04	0.02	-0.02	-0.01	-0.05	0.02	0.06	1.00			
COL	-0.02	0.01	-0.04	-0.05	0.00	0.07	0.03	0.01	1.00		
CT	0.05	-0.13	0.03	0.06	0.12	0.09	0.11	-0.09	-0.01	1.00	
FM	0.03	-0.02	-0.01	0.04	0.02	0.06	0.02	-0.02	0.00	0.13	1.00

Source: Author's calculation

4.1.2. Correlation Among Variables in Equation 2 (RL)

Table 4. SME - Correlations among the variables in Second Equation.

	RL	SZ	IR	DUR	NOR	BAC	AUD	INC	COL	CT	FM
RL	1.00										

SZ	0.09	1.00								
IR	0.02	-0.02	1.00							
DUR	-0.03	0.04	-0.06	1.00						
NOR	-0.01	-0.01	0.02	0.05	1.00					
BAC	-0.27	-0.20	0.02	0.00	0.04	1.00				
AUD	-0.10	-0.16	0.06	0.01	0.08	0.24	1.00			
INC	-0.03	0.02	-0.02	-0.01	-0.05	0.02	0.06	1.00		
COL	0.05	0.01	-0.04	-0.05	0.00	0.07	0.03	0.01	1.00	
CT	-0.02	-0.13	0.03	0.06	0.12	0.09	0.11	-0.09	-0.01	1.00
FM	-0.05	-0.02	-0.01	0.04	0.02	0.06	0.02	-0.02	0.00	0.13	1.00

Source: Author's calculation

4.1.3. Correlation Among Variables in Equation 3 (BD)

Table 5. SME - Correlations among the variables in Third Equation.

	BD	WCP	SZ	IR	DUR	Y	CT
BD	1.00						
WCP	0.39	1.00					
SZ	0.11	0.26	1.00				
IR	-0.18	0.00	-0.02	1.00			
DUR	0.01	-0.02	0.04	-0.06	1.00		
Y	-0.04	-0.06	-0.08	-0.03	0.01	1.00	
CT	-0.03	0.04	-0.13	0.03	0.06	-0.06	1.00

Source: Author's calculation

4.2. Model Estimation

4.1.2. Equation 1: SMEs Bank Loan Approval

$$BL = \beta_0 + \beta_1 FRV + \beta_2 LRV + \beta_3 MRV + \epsilon \quad (1)$$
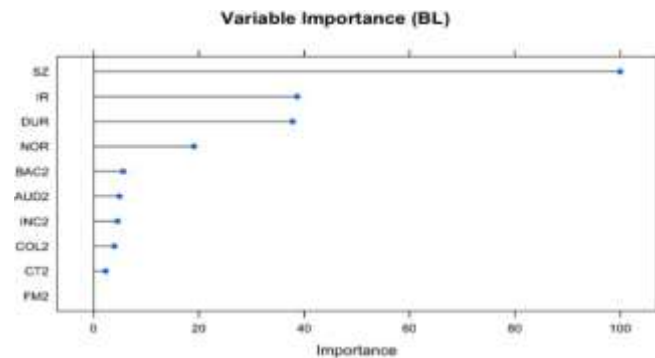
Fig. (1). BL variable importance.

Among the variables considered to estimate the probability of having SME loan approval (BL), size (SZ), interest rates (IR), length of relationship with the main bank (DUR), years in business without a license (NOR) and having a checking

or savings account (BAC) are identified as the most important characteristics for the estimation of the model (Fig. **1**). However, when estimating the model using all these characteristics, only the SME size (SZ) and the length of duration between SME and bank (DUR) determine significantly whether a bank loan will be approved.

Table 6. Bank Loan – Logistic Regression Coefficients.

	Estimate	Std. Error	z value	Pr(>|z|)
(Intercept)	0.190879	0.12	1.55	0.10
SZ	-0.005912	0.00	-5.45	0.00
DUR	0.002965	0.00	1.78	0.08

Source: Author's calculation.

The coefficients of the resulting model fitted using the significant features are shown above (Table **6**). The logistic model can therefore be represented as:

$$BL = 0.190879 - 0.005912 * SZ + 0.002965 * DUR + \epsilon \quad (1.1)$$

At a 0.1 level of significance, firm size *(SZ)* and the duration of SME- bank relationship *(DUR)* are found to be significant. The negative coefficient for SZ shows that the likelihood that a firm has no loan reduces for larger firms. The positive coefficient for *DUR* indicates that SMEs are more likely to have loans with longer initial duration.

In principle, the size of a firm would inspire confidence in bank clerks that would review an application for a loan. This conventional wisdom assumption is not confirmed in Lebanon. Increases in firm' size does not entail more loans lent. Large SMEs applying for a loan are a cause of suspicion for banks.

Concerning duration of firm's credit relationship with the main bank, the results proved Lebanon's banks prefer to establish long-term relationships with their clients. Logistic Regression results confirm a positive and significant relationship between the duration of a firm's credit relationship with the main bank and the loans lent to firms. This kind of preference is implied by the insights of conventional economic wisdom.

4.2.2. Equation 2: SMEs bank loan rejection

In the second equation, rejected bank loans for SMEs are regressed based on the same set of independent variables:

$$RL = \beta_0 + \beta_1 FRV + \beta_2 LRV + \beta_3 MRV + \epsilon \quad (2)$$

Among the variables considered for estimating the probability that the most recent SMEs loan application was rejected (RL), interest rates (IR), having a checking or savings account (BAC), firm's size (SZ) and duration of the credit relationship with the main bank are identified (DUR) are among the most important characteristics for the estimation of the model (Fig. **2**). However, when estimating the model using these characteristics, only having a savings or checking account (BAC) significantly affects the rejection of a SMEs loan application.
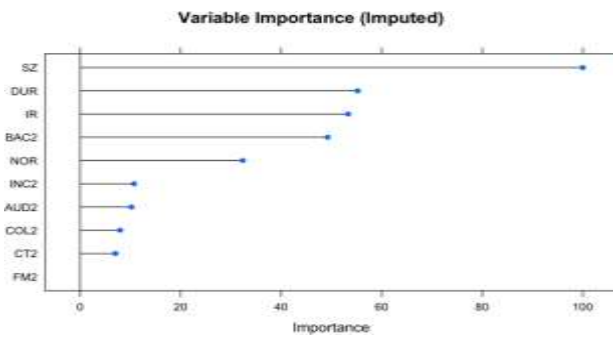
Fig. (2). RL variable importance.

Table 7. Rejected Loan – Logistic Regression Coefficients.

	Estimate	**Std. Error**	**z value**	**Pr(>|z|)**
(Intercept)	2.639	0.33	7.88	0
BAC	-0.770	0.29	-2.61	0

Source: Author's calculation.

The coefficients of the model are shown above (table **7**). The logistic model is therefore represented as follows:

$RL = 2.639 − 0.77 * BAC + \epsilon$ *(2.1)*

At a 0.1 significance level, having a checking or savings bank account (BAC) is significant. The absence of a bank account is associated with an increase in the probability of loan applications being rejected.

- In this line, having a checking or savings account with a bank has been proven to be a factor leading to easier lending of bank loans. It seems to be a factor that leads to fewer rejections of applications for loans. It is evident: the banks would already have basic information on the applying firm that would be useful in the process of creditworthiness evaluation. Having a current or savings bank account reflects good bank-client relations, mutual confidence, and trust as well as an expression of longer-term relations. This result could be intercepted by the impact of the duration of bank-borrower relationships detected in the results of the logistic model of BL (equation 1).

4.2.3. Equation 3: Proportion of investment financed by banks.

In the third equation, the regression will discuss the SMEs indebtedness as follows:

$BD = \beta_0 + \beta_1 DUR + \beta_2 IR + \beta_3 CT + \beta_4 X + \beta_5 Y + \epsilon$ *(3)*

Among the variables considered for estimating the proportion of investments financed by banks (BD), the proportion of working capital financed by banks (WCP), the size of the firm (SZ), interest rates (IR), the duration of the credit relationship with the main bank (DUR) are identified as the most important characteristics for the estimation of the model (Fig. **3**). However, when estimating the model using these characteristics, only the coefficients of interest rates (IR) and bank-financed working capital (WCP) significantly affect the proportion of bank-financed investments.
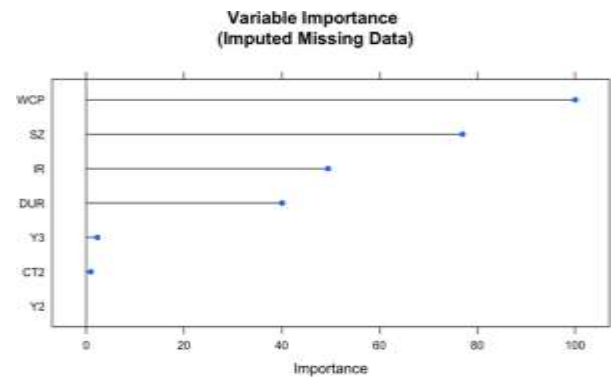

Fig. (3). BD variable importance.

Table 8. BD – Regression Coefficients.

	Estimate	**Std. Error**	**t value**	**Pr(>|t|)**
(Intercept)	68.51512	8.10808	8.450	0
IR	-8.17598	1.25488	-6.515	0
WCP	0.53813	0.03624	14.849	0

Source: Author's calculation.

The coefficients of the resulting model fitted using the significant features are shown above (Table **8**). The overall model is also significant since it has a p-value < 0.05. This regression model is therefore be represented as:

$BD = 68.51512 − 8.17598 * IR + 0.53813 * WCP + \epsilon$ *(3.1)*

Higher interest rates are associated with a decrease in the proportion of investments financed by bank loans. In contrast, there is a positive relationship between the proportion of investments and the proportion of working capital financed by bank loans.

-Similar to the insights of conventional economic wisdom, interest rate is a factor with significant impact on the indebtedness of firms to banks. Interest rate is considered as a significant barrier to a high indebtedness. Negative and significant coefficient is detected. High interest rates are likely to make loans expensive and unaffordable since bank- financed investment has declined.

- Using banks to finance working capital is a conventional factor that influences positively the indebtedness of the private firms to banks. It is a commonplace, the higher the proportion of working capital financed by banks, the bigger the indebtedness is. Similar results were found by other economists (Agostino & Trivieri, 2017).

4.3. Panel Regression- Year Effects

As planned earlier, a binary variable is introduced to control the year. It is time to allow the role of economic fluctuations to reveal themselves. The year effect study was applied to the previous 3 equations.

4.3.1. Equation 1: SMEs bank loan approval- Year effects

A binary variable was applied to equation (1) to reveal the impact of the year and thus detect whether there are any

Table 9. Logistic Regression with year effect- BL.

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation)
[glmerMod]
Family: binomial (logit)
     AIC   BIC   logLik deviance   df.resid
1432.5675   1452.5542 -712.2837   1424.5675   1089
Random effects:
  Groups Name   Std.Dev.
  year   (Intercept) 0.4085
Number of obs: 1093, groups: year, 2

Fixed Effects:
(Intercept) SZ DUR 0.249634   -
    0.0061430.002373

Source: Author's calculation.

Table 10. Logistic Regression with year effect- RL.

Generalized linear mixed model fit by maximum likelihood (Laplace Approximation)
[glmerMod]
Family: binomial (logit)
    AIC BIC logLik deviance df.resid 725.7866 740.7766 -359.8933 719.78661090
Random effects:
 Groups Name Std.Dev.
 year   (Intercept) 1.218
Number of obs: 1093, groups: year, 2

Fixed Effects:
(Intercept) BAC
    2.503 -2.498

Source: Author's calculation.

changes between the 2013 and 2019 results, the resulting equation is:

$$BL = 0.249634 - 0.006143 * SZ + 0.002373 * DUR + \epsilon \ (1.2)$$

The data is grouped based on the year the survey was taken and the panel logistic model is then used to check the effects of the *Year* on the estimated model. The results show that the random effects based on the year of the survey have a standard deviation of 0.4085. The negative coefficient for SZ shows that a firm has loan reduces for larger firms. The positive coefficient for *DUR* indicates that firms are more likely to have loans with longer initial duration. Therefore, panels do not provide additional information on the relationship between having bank loans with both firm size and duration of the loan. This is consistent with the model for BL with combined panels (Table **9**).

4.3.2. Equation 2: SMEs Bank Loan Rejection- Year Effects

A binary variable is applied to equation (2) to reveal the year effect. The resulting equation is:

$$RL = 2.503 - 2.498 * BAC + \epsilon \ (2.2)$$

When panels are introduced for the survey year, equation 2 returns the above results (Table **10**). The results show that the standard deviation of the log probabilities of a loan application rejection is 1.218. The negative coefficient between RL and BAC indicates that loan applications for SMEs without a bank account were more likely to be rejected than those firms with a bank account. The panel with binary variable controlling the *year* does not provide additional information on the relationship between bank loan rejection and firm's having bank account.

4.3.3. Equation 3: Proportion of Investment Financed by Banks- Year Effects

Checking the year effect is also applied for the equation (3) to get the following:

$$BD = 68.03404 - 8.10368 * IR + 0.53848 * WCP + \epsilon \ \ (3.2)$$

A panel regression analysis is also carried out to estimate the effect of the year on the model estimating the proportion of investments financed by banks. The results are presented above (Table **11**). According to the model, the standard deviation of the random effects due to the survey year is 1.156. The panel with binary variable controlling the *year* does not provide additional information on the interest rate and working capital financed by bank loans. This is the same as the model estimates obtained with combined panels.

Table 11. Regression with year effect- BD.

Linear mixed model fit by REML ['lmerMod'] Formula: BD ~ IR + WCP + (1 | year) Data: data4 REML criterion at convergence: 10889.8					
Scaled residuals:					
Min 1Q		Median		3Q	Max

-2.1422 -0.5883	-0.2921	0.5557	2.5722	
Random effects:				
Groups Name year (Intercept)	Variance 1.336		Std.Dev.	1.156
Residual	1245.331		35.289	
Number of obs: 1093, groups: year, 2 Fixed effects:				
Estimate	Std. Error	t value		
(Intercept) 68.03404	8.17164	8.326		
IR -8.10368	1.25815	-6.441		
WCP 0.53848	0.03623	14.861		
Correlation of Fixed Effects: (Intr) IR IR -0.982				
WCP -0.097	0.005			
Estimate	Std. Error	t value	Pr(>|t|)	
(Intercept)	68.5151235	8.10807584	8.450232 9.202748e-17	
WCP 0.5381348	0.03624017	14.849124	1.455789e-45	
IR -8.1759780	1.25487687	-6.515363	1.105611e-10	

Source: Author's calculation

5. CONCLUSIONS

This study focuses on the Lebanese SMEs credit market, analyzing business survey data from the World Bank database. The analysis aims to assess the barriers for SME to receive bank loans and align with literature and conventional economic wisdom. The study uses linear and Logistic Regression (logreg) algorithms for numerical and categorical variables. The study's findings are original and unique, making it a focal point of attention for economic researchers.

The first model predicts whether a firm has a loan facility (BL) based on firm, loan, and market characteristics. Two factors, size (SZ) and the length of the relationship duration of SMEs with the bank (DUR), significantly affect bank loan approval. Large firms have more access to alternative financing options and longer credit relationships, suggesting long-term facilities. The results show no significant difference between 2013 and 2019, suggesting a prudent banking system that credits well-known commercial projects with small risks. The second model estimates the probability of loan rejection, with the presence of a checking or savings account (BAC) significantly affecting loan rejection. SMEs without a bank account are considered unknown entities and do not deserve credit and banking facilities. The third model predicts the proportion of business investment financed by bank loans. Interest rates (IR) and working capital financed by banks (WCF) significantly affect the proportion of bank investment. Firms with higher working capital are more likely to have higher levels of bank-financed investment. However, high interest rates can make loans expensive and unaffordable due to declining bank-financed investment. There was no significant difference in financing levels between 2013 and 2019, with interest rates negatively impacting indebtedness. Working capital is considered a sign of firm seriousness for commercial banks. The intensity of bank loan approval changes over time, highlighting the impact of macroeconomic conjunctures on banks' disposal. The results from the World Bank samples from 2013 and 2019 show a strong Lebanese banking system with clear ideas and robust policies that capture the specificities of the Lebanese economy and banking system.

6. LIMITATIONS

This study explores the bank-SME interaction in Lebanon, focusing on how bank credit constraints limit SMEs' growth. The primary data sources are financial data from banks as lenders and SMEs as borrowers. However, the study faces limitations due to bank secrecy, inaccuracy, and informality in SME financial data. The Ministry of Trade and Finance lacks updated records. The World Bank is the main source of data with recently published data belonging to 2013 then 2019. The limited number of participants and observations hinder diagnosis of credit cyclicality, which could be a potential field for future research.

RECOMMENDATIONS OF SMES ROLE MODEL

Estimations allowed us to draw the shape of the bank-SME relationship in Lebanon. The perspective was the financial distress caused by banks once SMEs ask for credits to feed their businesses. The hypothesis model obtained is:

An assumption model for the profile of SMEs for which commercial banks participate in their financial distress because they avoid lending to them: these are SMEs that have failed to have a long duration of relationship with the bank, and especially if those SMEs have a big size; large SMEs applying for a loan are a cause of suspicion for banks. What is more, SMEs that fail to have a checking or savings account with bank has been proven as a factor leading to a definitive application rejection. Besides, the higher the propor-

tion of working capital financed by banks, the bigger the indebtedness is. High interest rates are likely to make loans expensive and unaffordable since bank-financed investment has declined. What is more challenging is that even if SMEs meet all these conditions, it does not mean that they will be offered credit. Moreover, these conditions change dynamically, which causes SMEs to panic; they are forced to constantly ask themselves what their application packages should contain in order to get a higher percentage of approval.

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