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Company self-rationing: The case of the Souss-Massa region

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Abstract

Using data from a survey for the companies of the Region Souss-Massa (RSM), we study the determiners of credit self-rationing. Our definition of discouraged companies is for businesses if they do not apply for bank credit when they would have asked for their financial position to be illustrative. We use logistic regression and we study the characteristics of the company and those of the administrator who can affect this type of credit rationing. We notice that for self-rationing, "the age of the company", "the rate of debts", "the experience of the administrator" and " the academic level of the administrator" establish the main determiners for the discouragement.

JEL classification numbers: E51
Keywords: credit, self-rationing, determiners.

1. Introduction

For companies to continue to exist and grow, they need financing. To obtain that, Small and Medium-sized companies (SMC) generally depend on bank financing (Laveren & Lernoux, 2012) which is not always easy to obtain despite the fact that credit is key to their economic growth.
Having said that, the opacity of information makes the situation even more difficult for small companies than bigger ones. Theoretically, in the face of information asymmetry, banks could either ration credit (Stiglitz and Weiss, 1981) or offer a set of contracts that act as a self-selection mechanism to distinguish

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good borrowers from bad ones (Bester, 1985).
Many small companies do not ask for bank credit even when capital is needed. These borrowers are called "discouraged borrowers" (Cieply and Dejardin, 2010). Admittedly, many factors are behind this decision to refrain from resorting to conventional banks despite the facilities banks offer to their customers and despite the existence of government measures and incentives to encourage the SMC-SMI to apply for credits.
In its 2014 report, the International Monetary Fund (IMF) shows that unlike individual's Moroccan companies are increasingly cautious with regards to bank credit. In Morocco, according to Bank Al-Maghrib's Banking Supervision Department, the rating of SMC in bank credits is only 18% in 2008 (DCS[3], "Financing SMC in Morocco", May 2011). We find that access to credit seems to be difficult for them.
These observations prompted us to find out what determinants affect credit self-rationing, and the factors that limit the use of informal credit by these SMC.
This study aims to analyze the determinants of the self-rationing of bank credit. To answer this problem, we will attempt, first of all, to briefly recall some concepts related to discouraged companies.
In a second step, we will try to answer the following question: what are the determinants linked to the company and the manager to explain this type of credit rationing?
Finally, we will have to verify our hypotheses using logistic regression, using as a field of application the companies of the Souss Massa Region via a 2015 survey.
Our work revolves around the following hypotheses:
H1,a : The characteristics of the company manager have an influence on self-rationing credit.
H2,a : the characteristics of the company have an influence on the self-rationing of credit.

2. Literature review

2.1 Overview of discouraged borrowers' theory

Research on credit rationing dates back to the 1950s (Baltensperger & Devinney, 1985: P476) and the concept took the attention of researchers to both macroeconomic and microeconomic levels, which makes it a very important topic today. The discouragement approach (Kon and Storey, 2003) which stands out from the macroeconomic and microeconomic theories that have dealt with credit rationing on the supply and demand side successively, taking not only the credit applicant companies, but also those that do not apply for credit because they fear rejection even if they need bank financing. In 1987, Besanko, & Thakor mentioned that companies that do not apply for credit because of fear of rejection

[3]Deontological Councilfor securities

also suffer from some form of credit rationing. Within the same context, Levenson and Willard (2000) and Kon and Storey (2003) introduced a new type of credit rationing called "discouraged borrowers or self-rationing" (Cieply and Dejardin, 2010: P5).

The first to mention this notion are Levenson and Willard (2000)[4] to describe the reality of SME access to credit in the US market. They explained the reason why this kind of rationing can exist: if the company receives the credit after having waited for a period of length α and if α is very small, then the firm is rationed for only a short period of time and the effects of credit rationing can be negligible. If α is high, then the delay in obtaining access to credit can affect the company's ability to grow or even survive; and finally some companies that anticipate a large α can be deterred from the demand for credit. In this case, companies do not ask for credit because they anticipate the refusal of banks for a long period (Bellier, Sayeh, Serve, 2012: P9)[5].

The discouraged borrower theory was then formalized by Kon and Storey (2003). According to them, the discouraged borrowers are good companies that have a need for financing, and choose not to apply for credit to the bank because they feel that this request will be rejected (Cieply and Dejardin, 2010: P5).the latter considered that a company is discouraged if it does not request credit even if their financial situation proves to be in need for it (Cieply and Dejardin, 2010: P7).

In our research, we consider that companies are self-rationed if they do not ask for bank credit when they would have asked for their financial situation to be illustrative.

2.2 The determinants of self-rationing

From a demand point of view, the empirical literature distinguishes several characteristics. In this research we study two groups: the determinants related to the company and those related to the manager.

2.2.1 The determinants related to the company

One of the most important determinants is the size of the business. More recently, Hashi and Toci (2010) assessed the determinants of CR using a database provided by the BEEPS[6] survey. The characteristics of the company include the age of the company, the size (measured by nominal variables indicating small and medium to big companies), ownership and performance. Their study demonstrated that compared to big companies, small companies rely more on internal funds and less on bank credit to finance investments. They are also less likely to apply for credit, more likely to be denied credit, will fall into the category of discouraged

[4]Besanko, & Thakor (1987). In their article "Collateral and rationing: Sorting equilibria in monopolistic and competitive credit markets" mentions that companies that do not ask for credit emerging from fear of rejection also suffer from some form of credit rationing,

[5]For more detail reference has also been made to the work of Levenson and Willard (2000: p. 85).

[6]Abbreviation for: The big-Scale Business Environment and Enterprise Performance Surveys. Survey executed by the World Bank and European Bank for Reconstruction and Development.

borrowers and face greater difficulties in accessing short-term credit and in the long term (Hashi and Toci, 2010: P 52-55).

Age is generally considered an indicator of the quality of the company since the duration may contain a signal for survivability and quality of management, as well as, reputation capital accumulation (Diamond, 1991; Oliner and Rudebusch, 1992). In addition, the lack of information is relatively smaller for older companies considering their balance sheet (Petersen and Rajan 1994, Cressy 1996). (Quoted by Giannakopoulos and Darkos, 2011: P 1776). Freel et al. (2010) studied the characteristics affecting auto CR using a database derived a biennial Survey in large scale attitudes and opinions of small businesses conducted on behalf of the Federation of Small Businesses (FSB). They have also shown that in addition to size, age has a negative impact on self-rationing.

Another dimension of credit rationing is indebtedness. Heavily indebted SME are more exposed to the risk of credit rationing. The more the company is in debt, the more likely it is to default on refund and the less it will access external financing because excessive indebtedness entails important financial costs which is detrimental to the health of the company. Rajan and Zingales (1995); Kremp et al (1999) found that there are positive and significant relationships between guarantees and the level of indebtedness.

Other factors are often proven by the empirical literature such as the location of companies. In this vein, Ram and Smallbone (2001: P 14) note that "local environmental conditions such as physical disrepair, insufficient parking, and vandalism" are between the factors that hinder the development of small and medium-sized enterprises and pose difficulties to raise capital.

Also, Rutherford et al (1999) have highlighted the fact that the type of business activity is an important factor (in addition to the age of the owner, size and shape) of access to sources of external financing. (hang phyng, 2011, p: 41)

As a consequence of inheritance considerations, business support and the goal of staying with family, family businesses will be more conservative and less likely to apply for bank loans (Gallo and Vilaseca, 1996) (cited by Freel et al. 2010), p: 6).

2.2.2 Determinants related to the manager

For many SMEs, the manager of the company is also the majority partner i.e. the owner.

Freel et al. (2010) have studied the characteristics affecting self-rationing and discouraging borrowers in depth using the traditional characteristics of the business (age, size, sector of activity) and the most original characteristics of the manager. In addition to the owner's age and gender, the level of education has an impact.

In addition to educational level, the professional experience and the age of the manager have been included. The results confirm the conclusions of Rand (2007) that highly qualified managers were more likely to be discouraged. When applying for credits, these managers also have a higher probability to be partially rationed than pure rationed. On the other hand, Coleman (2002) revealed that the age of the

manager plays a role. According to the results, young entrepreneurs are more likely to apply for credit, which may be due to their low risk aversion or more growth orientation.
The study of Baydas et al. (1994) also showed that highly experienced entrepreneurs were more likely to be rationed or discouraged.
Orser and Foster (Orser, 1994) find that, in general, women entrepreneurs as majority owners of micro-enterprises are extremely disadvantaged by the financial institutions financing standards.

3. Data and Methodology of research

In this section, we present the results of a study that took place in 2015 and 2016 with a sample of 404 SME in the Souss Massa region after 1160 contacts. We received 520 responses (44.82%) 404 of which are exploitable (34.82%). Of the overall questionnaires, 116 were rejected because they were not completed correctly or because the number of missing answers was high.
According to the latest SMC definition of the NASMC (national agency of small and medium companies) based on the turnover, we can deduce that our sample of 33.2% of companies whose turnover is less than three million dirhams are considered to be VSC i.e. very small companies. By the same token, small companies that make up 21.3%, of medium-sized enterprises are represented by a percentage of 39.1, while big companies represent 6.4%.

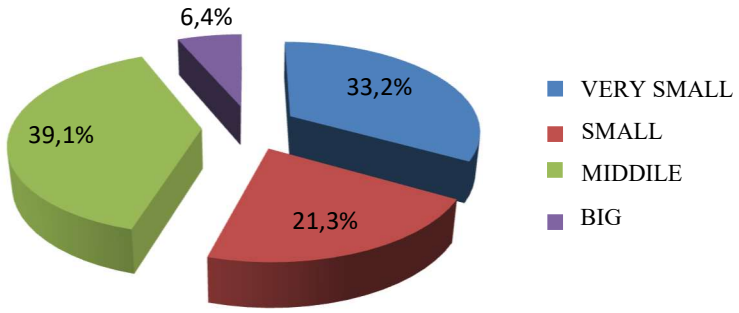

Figure 1.Distribution of companies by size

We note that our analysis sample is dominated by men as they represent 75.7%. However, women represent only 24.3%. We must point out that men were more understanding during the data collection step while their female counterparts were slightly more challenging to fill out questionnaires. They required a great deal of effort and time due to personal networking and attending different events, especially the Entre-Elles association which allowed direct contact with women managers.

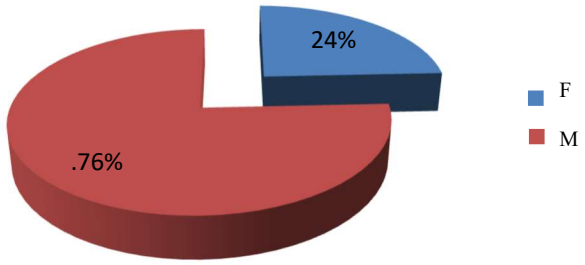

Figure 2. Distribution of managers by sex

The purpose of the regression model development is to describe the relationships between a preferred variable called a variable to be explained (or dependent), and many variables called explanatory (or independent) variables. The model also allows to forecast the explained variable according to the explanatory variables.
Concerning our research work, we were interested in logistic regression to describe and explain credit self-rationing as well as strong and weak rationing and multiple correspondence analysis to present typological analysis profiles of these self-rationed companies.

4. Results and discussion

According to Kon & storey (2003), discouraged borrowers are good companies that have a need for financing, and who choose not to apply for credit to the bank because they feel that this request will be rejected (Cieply and Dejardin, 2010: P5). Based on our survey, we consider self-rationed enterprises any company that has responded by totally agreeing or rather agreeing on fear of credit file rejection. Taking this into account, we reprocessed our database and kept only the companies concerned by our study theme which is credit rationing.
From the data deduced from our survey, 80 companies did not ask for credit for other reasons stronger than fear of rejecting their files. We notice that, of a sample of 336 companies, 100 discouraged borrowers, which corresponds to 30.86%. Previous research by Levenson and Willard (2000) and Freel et al. (2012) showed that discouraged borrowers are twice as prevalent as rejected borrowers (denied) in the United States and the United Kingdom, respectively.

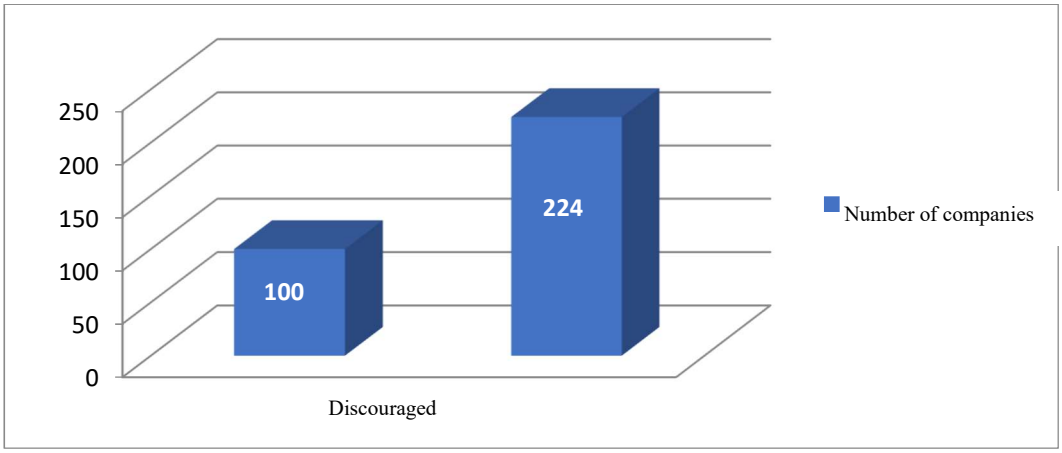

Figure 3. Division of companies

Indeed, discouraged borrowers seem to represent a significant group. To our best knowledge, no studies have validated empirically a structural model for the generalized existence of discouraged borrowers, nor have there been studies to evaluate the real effects of discouragement. Therefore, and considering the important part identified of these rationed enterprises in our sample, we will try in this research to study the determinants of this kind of enterprises in our region.

We will begin by studying the characteristics related to the manager, then those related to the enterprise. To do this, there are necessary steps that must be followed for each group of variables, namely:

Step 1: Evaluation of the meaning of the regression model

Step 2: Evaluation of the adjustment of the data to the regression model

Step 3: Evaluation of the adjustment of the final model

Step 4: Discussion of results

To study self-rationing, we refer to the credit demand number variable of our sample. In this case, our variable to explain is a dichotomous variable where the answers take the value 1 when the company did not apply for credit and value 2 when the company submitted one or more requests during the three year period (2012 to 2014).

Our step-down logistic regression analysis consists of studying the dependency relationship between each variable group and the variable to be explained. Indeed, this analysis of discouraged companies is based on the determinants related to the Manager and the determinants related to the company.

Table 1: Summary of the independent variables

	Variables	Code	Components
Characteristicsrelated to the company	Physical location	LIE_IMP	Main location[7]
	Activity	ACT_TEP	Main activity sector related to the requested credit (in case of request)
	Age of the company	AGE_ESE	The year of creation that we have transformed into age groups.
	Size	CA_2014 NBR_SALARIE	Turnover and number of employees to have a general vision
	Company of family	ESE_FAM	When the partners are from the same family
	Debt ratio	TX_END	Slices of rate of indebtedness to find the least indebted companies.
Characteristics related to the manager	Gender	SEX_GES	Female or male
	Age of manager	AGE_GES	Age range from youngest to oldest
	Academic level	NIV_IST	Highest degree achieved
	Skill	TYP_FRM NBR_ANE	Measured by type of training and manager's experience

The test of the multi-collinearity between the variables characterizing the manager shows that there are two relations of association between the gender of the manager and the type of training on the one hand and the age of the manager and the number of year's experience on the other hand. For these two relationships, the Spearman Rho statistic is significant at the 5% threshold but the degree of relationship remains low. For other relationships, and according to Spearman's Rho statistic, the variables are not correlated. Then, we can finally say that there is

[7]According to the companies' responses on the spot, we grouped them in accordance with CTTT prefectures and provinces: Chtouka, Tata, Tiznit, Taroudant, to distinguish those close to the center and those far away.

no problem of collinearity and we decide to keep all these descriptive variables of the manager (appendix 1.1).
The test of the multi-collinearity between the variables characterizing the company shows that there are significant associations at the threshold of 5% between a set of variables JavaScript: void (0). However, these relationships remain very weak except for the difference between the age of the company and the turnover for which the Spearman correlation is moderate with a statistic of 0.58. However, we decide to keep all the descriptive variables of the company. Hence, the rejection of the hypothesis of the presence of the multi-collinearity between the (appendix 1.2).

4.1 Determinants related to the Manager

To develop this explanatory sub-model of self-rationing (dependent variable), we based ourselves on five variables which are company manager related. Namely, instruction level, number of years of experience, age, type of training and gender. Following the steps above we get the results below:

Table 2: Evaluation of the data adjustment to regression model in 4 steps

Variables in the equation							
		A	E.S.	Wald	Ddl	Sig.	Exp(B)
Step 1[a]	SEX_GES	-,457	,315	2,112	1	,146	,633
	AGE_GES	-,043	,158	,073	1	,787	,958
	NIV_IST	-,239	,111	4,611	1	,032	,788
	TYP_FRM	-,035	,108	,108	1	,742	,965
	NBR_ANE	,699	,201	12,117	1	,000	2,012
	Constant	,966	,681	2,011	1	,156	2,628
Step 2[a]	SEX_GES	-,446	,311	2,050	1	,152	,640
	NIV_IST	-,240	,111	4,703	1	,030	,786
	TYP_FRM	-,033	,107	,093	1	,761	,968
	NBR_ANE	,670	,169	15,735	1	,000	1,954
	Constant	,902	,639	1,995	1	,158	2,465
Step 3[a]	SEX_GES	-,454	,310	2,143	1	,143	,635
	NIV_IST	-,243	,111	4,844	1	,028	,784
	NBR_ANE	,662	,167	15,755	1	,000	1,939
	Constant	,855	,619	1,909	1	,167	2,351
Step 4[a]	NIV_IST	-,264	,109	5,916	1	,015	,768
	NBR_ANE	,653	,166	15,512	1	,000	1,921
	Constant	,375	,522	,516	1	,473	1,455
a. Variable (s) entered in step 1: SEX_GES, AGE_GES, NIV_IST, TYP_FRM, NBR_ANE.							

Ultimately, the evaluation of the final model adjustment lead us to accept the results received (see Appendix 2.1 for the regression steps).
The final equation of the logistic model (LOGITH2, a)) which describes the self-rationing with respect to the determinants related to the manager is then presented in the following form:

$$LOGIT_{H1,a} = -0.264\ NIV\_IST + 0.653 NBR\_ANE$$

Education level is significantly and negatively correlated with self-rationing credit. This means that the level of education probably facilitates credit requests file with regards to respecting the basic standard procedures, providing the information requested by the bank from the credit applicant. Thus, a higher level of education helps the leaders to better study the financial data of their company and analyze their business environment to anticipate the result of acceptance or refusal of the application for credit. This concurs with Parker and Van Praag (2006) that each additional year of schooling reduces the capital constraints for new Dutch creations.
The number of years of experience in the professional domain of the manager allows more competence and control of the activity and thus an effective control of the risk according to the considerations of the bankers. This explains the presence in our study of a strong correlation with the self-rationing of our Souss-Massa managers which conforms with our hypotheses regarding this correlation. These results concur with those obtained by Baydas et al. (1994) and Rand (2007) showing that highly experienced managers were more likely to be discouraged.

4.2 Company determinants

The variables on which we based ourselves to develop this explanatory model of self-rationing (dependent variable) are seven in number and are the ones that explain the company itself. Namely, the place of implantation, the sector of activity, the age, the turnover, the number of employees, type of business (family or not) and the rate of indebtedness.

Table 3: Adjustment Results of data to the regression model

Variables in the équation							
		A	E.S.	Wald	Ddl	Sig.	Exp(B)
Step 1[a]	AGE_ESE	,316	,166	3,619	1	,057	1,372
	TX_END	,671	,190	12,484	1	,000	1,956
	ASP_JUR	-,043	,209	,042	1	,837	,958
	LIE_IMP	-,011	,146	,006	1	,939	,989
	ACT_TÉP	,030	,121	,063	1	,801	1,031
	CA_2014	,181	,141	1,665	1	,197	1,199
	NBR_SAL	-,029	,094	,095	1	,758	,972
	ESE_FAM	,234	,279	,700	1	,403	1,263
	Constante	-1,745	,670	6,791	1	,009	,175
Step 2[a]	AGE_ESE	,317	,166	3,661	1	,056	1,373
	TX_END	,673	,189	12,728	1	,000	1,960
	ASP_JUR	-,043	,209	,042	1	,838	,958
	ACT_TÉP	,030	,120	,062	1	,804	1,030
	CA_2014	,181	,140	1,661	1	,197	1,198
	NBR_SAL	-,029	,093	,100	1	,752	,971
	ESE_FAM	,234	,279	,702	1	,402	1,264
	Constante	-1,767	,604	8,548	1	,003	,171
Step 3[a]	AGE_ESE	,313	,164	3,623	1	,057	1,367
	TX_END	,673	,189	12,765	1	,000	1,961
	ACT_TÉP	,027	,120	,051	1	,821	1,028
	CA_2014	,181	,140	1,668	1	,196	1,199
	NBR_SAL	-,031	,093	,115	1	,734	,969
	ESE_FAM	,228	,277	,673	1	,412	1,256
	Constante	-1,791	,594	9,082	1	,003	,167
Step 4[a]	AGE_ESE	,312	,164	3,605	1	,058	1,366
	TX_END	,676	,188	12,950	1	,000	1,967
	CA_2014	,183	,140	1,701	1	,192	1,201
	NBR_SAL	-,030	,093	,106	1	,745	,970
	ESE_FAM	,234	,276	,718	1	,397	1,263
	Constante	-1,743	,556	9,837	1	,002	,175
Step 5[a]	AGE_ESE	,313	,164	3,634	1	,057	1,367
	TX_END	,682	,187	13,302	1	,000	1,978
	CA_2014	,182	,140	1,684	1	,194	1,199
	ESE_FAM	,226	,275	,678	1	,410	1,254
	Constante	-1,815	,511	12,595	1	,000	,163
Step 6[a]	AGE_ESE	,321	,163	3,872	1	,049	1,379
	TX_END	,702	,186	14,177	1	,000	2,017
	CA_2014	,177	,140	1,594	1	,207	1,194
	Constante	-1,549	,392	15,587	1	,000	,212
Step 7[a]	AGE_ESE	,431	,138	9,735	1	,002	1,539
	TX_END	,776	,178	19,087	1	,000	2,172
	Constante	-1,515	,391	15,016	1	,000	,220
a. Variable (s) entered in step 1: AGE_ESE, TX_END, ASP_JUR, LIE_IMP, ACT_TÉP, CA_2014, NBR_SAL, ESE_FAM.							

Ultimately, the evaluation of the final model adjustment lead us to accept the results received (see Appendix 2.2 for the regression steps).
This logistic model (LOGITH2, a)) which describes self-rationing with respect to the determinants linked to the enterprise is then presented as follows:

$$LOGIT_{H2,\,a} = 0.313\ \text{AGE\_ESE} + 0.673\ \text{TX\_END} - 1.515$$

The high rate of indebtedness means that the level of risk of the loans is high and therefore the cost of a new credit is high too because of a high interest rate and additional guarantees, which pushes the manager of the company to not request credit. These results confirm those of Bernanke and Gertler (1989) and Paranque et al (1998). In this sense, Rajan and Zingales (1995) have shown that there is a positive relationship between guarantees and the level of indebtedness. This explains the self-rationing of the company manager when additional guarantees are requested and which represent in some cases a restrictive factor.
The age of a company is a factor that explains its sustainability. The existence of a positive relationship between credit self-rationing and the age of the company means that the longer the life of the company, the more self-rationed the company is. These results confirm those developed by Rutherford et al (1999) that have highlighted the fact that the age of the company does not constitute an obstacle to external financing.
We will use the results of the different global regressions performed above to present a typological analysis for each type of rationing.
Our approach consists, in the first place, of reducing the number of initial factors in an iterative process in order to preserve those which contribute to the amelioration of the Cronbach coefficient which represents a measure of the internal coherence of a scale built from a set of items. In a second step, we interpret the factorial axes based on the contributions. And, third, we determine groups of modalities based on the criterion of proximity between them.
As results, the following table shows that Cronbach's alpha which measures the degree of reliability of the questions asked during the maintenance is of an average value of 0.46, which is positive. Therefore, the three variables chosen contribute to the explanation of the self-rationing of credit. Thus, the factorial plane consisting of axes 1 and 2 represents 76% of the total inertia. In other words, the representation of the explanatory factors of the failure in this plan keeps close to 76% of the information.

Table 4. Cronbach Alpha Reliability Test Results

Summary of the models

Dimension	Cronbach's Alpha	Explained variance	
		Total (proper value)	Inertia
1	,542	1,685	,421
2	,350	1,357	,339
Total		3,041	,760
Average	,456[a]	1,521	,380

a. The average Cronbach alpha value is based on the average proper value

The results of the ACM show that the variables that contribute to the formation of the first axis are the number of credit requests (52%), the rate of the indebtedness (56%), and the age of the company (53%).

These three variables contribute to the formation of 42% of the first axis. For the second axis, the variables to retain are the level of instruction (49%) and the age of the company (54%). These two variables contribute to the formation of the second axis by 34%.

The projection of the modalities on a two-dimensional space is done so that the graph obtained reproduces the maximum of existing correlations between the groups of variables. To avoid including non-significant modalities in the analysis, missing answers as well as weak modalities (less than 8.33% contribution) were excluded from the analysis. The results of the projection of the modalities are presented in the map of modalities presented in the following figure.

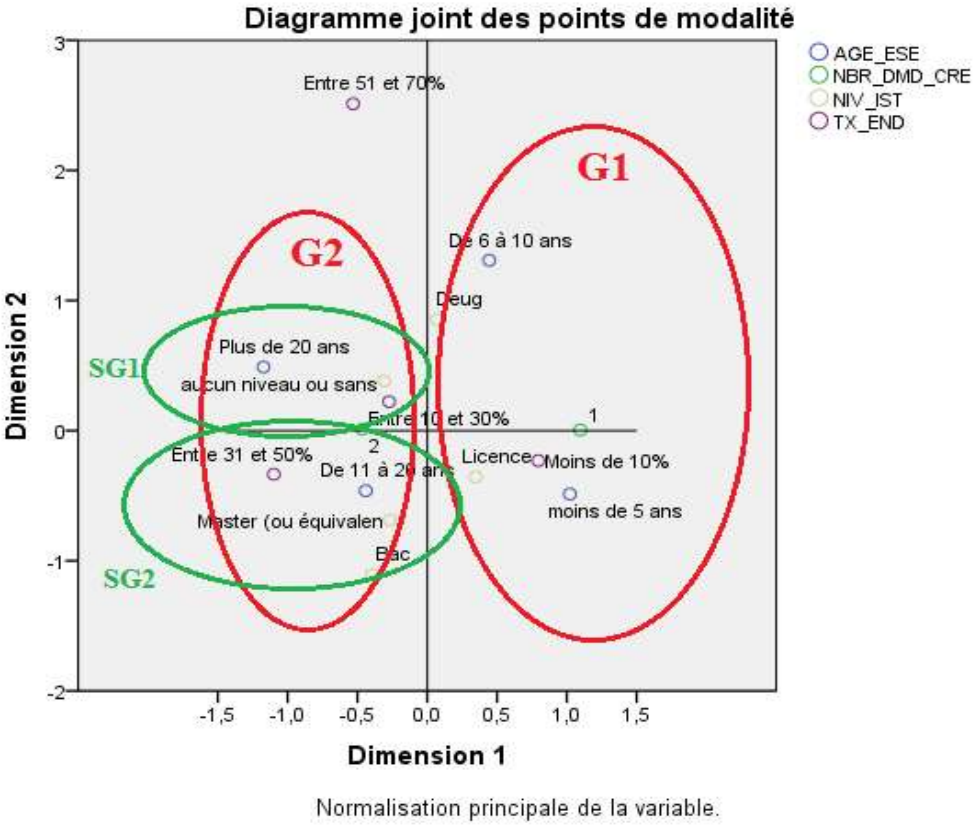

Figure 4. Map of the modalities of self-rationed enterprises

The modalities map presents two classes of individuals. It is these two classes that describe the typical profile of self-rationing credit.

Indeed, the first class G1 is composed of company managers having a medium level of instruction (DEUG or License) who have lead young companies under 10 years old and have a low rate of debt less than 10%. The leaders with these descriptions are self-rationed.

The second class G2 describes the leaders of non-self-rationed companies who are in the habit of requesting for credits. However, we notice that this class is divided into two subclasses of not self-rationed. The first SG1 subclass is made of company leaders without any level of instruction who have lead companies that have existed for over 20 years and have an average rate of debt from 10% to 30%. The second SG2 subclass is composed of company leaders with no average level of instruction (baccalaureate or Master) who have lead medium-duration companies that have existed between 11 to 20 years and have a high rate of debt from 31% to 50%.

5. Conclusion

In conclusion, this research provides a frequent measure of company behavior in credit demand. Access to credit seems to come from a less dynamic demand than from a decline in offer. We proceeded to discuss the results resulting from the clash of our research hypotheses with the main theoretical works mobilized in the theoretical framework. The results allowed us to put into perspective the determinants that most influence credit rationing.

Moreover, we have revealed that the "age of the company", "the rate of indebtedness", "the level of instruction of the manager" and "the experience of the manager" are the main determinants of discouragement against the demand for credit in the Souss-Massa region, In Casablanca, Bellemare (2000) confirmed that education also plays a role in the self-selection of applicants for credits. This confirms our results in Souss-Massa. Our results for age alo back findings by (Beck et al., 2006) and (Frel et al., 2010).

Indeed, the use of typological analysis has helped synthesize our results by showing that self-rationed companies whose leaders have an average instruction level (DEUG or License) and have lead young companies of less than 10 years of existence do have a low rate of indebtedness less than 10%.

Our research provides bankers and business managers in general with a set of contributions to limit this credit rationing. Although our results should be considered somewhat preliminary, they do give an explanation of the use of informal credit by some companies.

This research work was limited to the study of the Souss Massa Region with a representative sample of 324 companies. In addition, cultural and technological differences across Morocco accounts for the fact that each region has certain particularities. Therefore, we cannot presume the validity of this study beyond our research field "RSM" and similar regions and we do not claim absolute generalization of our results.

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Appendix 1

Multi-collinearity test

Table (appendix 1.1). Test of the multi-collinearity between the variables characterizing the manager

Correlations							
			SEX_GES	AGE_GES	NIV_IST	TYP_FRM	NBR_ANE
Rho of Spearman	SEX_GES	Correlation coefficient	1,000	-,092	,058	,112*	,076
		Sig. (bilateral)		,066	,261	,025	,126
		N	404	404	374	404	404
	AGE_GES	Correlation coefficient	-,092	1,000	-,006	-,078	,521**
		Sig. (bilateral)	,066		,915	,117	,000
		N	404	404	374	404	404
	NIV_IST	Correlation coefficient	,058	-,006	1,000	,047	-,092
		Sig. (bilateral)	,261	,915		,362	,075
		N	374	374	374	374	374
	TYP_FRM	Correlation coefficient	,112*	-,078	,047	1,000	,087
		Sig. (bilateral)	,025	,117	,362		,081
		N	404	404	374	404	404
	NBR_ANE	Correlation coefficient	,076	,521**	-,092	,087	1,000
		Sig. (bilateral)	,126	,000	,075	,081	
		N	404	404	374	404	404
***. The correlation is significant at the 0.05 level (bilateral).**							
****. The correlation is significant at the 0.01 level (bilateral).**							

Table (appendix 1.2). Test of the multi-collinearity between the variables characterizing the company

Correlations										
			ASP_ JUR	LIE_ IMP	ACT_ TÉP	AGE_ ESE	CA_ 2014	NBR_ SAL	ESE_ FAM	TX_ END
Rho de Spearman	ASP_JUR	Correlation coefficient	1,000	-,039	,142**	,161**	,092	,160**	,151**	,036
		Sig. (bilateral)		,431	,004	,001	,063	,001	,002	,467
		N	404	404	404	404	404	404	404	404
	LIE_IMP	Correlation coefficient	-,039	1,000	,042	-,067	,013	,023	-,120*	-,114*
		Sig. (bilateral)	,431		,404	,177	,801	,642	,016	,022
		N	404	404	404	404	404	404	404	404
	ACT_TÉP	Correlation coefficient	,142**	,042	1,000	-,011	,086	,007	,138**	,071
		Sig. (bilateral)	,004	,404		,818	,085	,882	,006	,157
		N	404	404	404	404	404	404	404	404
	AGE_ESE	Correlation coefficient	,161**	-,067	-,011	1,000	,582**	,039	,144**	,329**
		Sig. (bilateral)	,001	,177	,818		,000	,435	,004	,000
		N	404	404	404	404	404	404	404	404
	CA_2014	Correlation coefficient	,092	,013	,086	,582**	1,000	-,035	,055	,466**
		Sig. (bilateral)	,063	,801	,085	,000		,480	,266	,000
		N	404	404	404	404	404	404	404	404
	NBR_SAL	Correlation coefficient	,160**	,023	,007	,039	-,035	1,000	,017	-,055

		Sig. (bilateral)	,001	,642	,882	,435	,480		,735	,274
		N	404	404	404	404	404	404	404	404
	ESE_FAM	Correlation coefficient	,151**	-,120*	,138**	,144**	,055	,017	1,000	,159**
		Sig. (bilateral)	,002	,016	,006	,004	,266	,735		,001
		N	404	404	404	404	404	404	404	404
	TX_END	Correlation coefficient	,036	-,114*	,071	,329**	,466**	-,055	,159**	1,000
		Sig. (bilateral)	,467	,022	,157	,000	,000	,274	,001	
		N	404	404	404	404	404	404	404	404
**. The correlation is significant at the 0.01 level (bilateral).										
*. The correlation is significant at the 0.05 level (bilateral).										

Appendix 2

Step 1: The meaning evaluation of the regression model

Table. Summary of models

Summary of models			
Step	-2log-verisimilitude	R-deux de Cox & Snell	R-deux de Nagelkerke
1	325,749[a]	,078	,114
2	325,822[a]	,078	,114
3	325,915[a]	,077	,113
4	328,016[a]	,071	,104
a. The estimate was interrupted at iteration number 4 because the parameter estimates changed by less than, 001.			

Table. Model specification tests

Model specification tests				
		Khi-Chi-deux	Ddl	Sig.
Step 1	Step	24,663	5	,000
	Bloc	24,663	5	,000
	Model	24,663	5	,000
Step 2	Step	-,073	1	,786
	Bloc	24,589	4	,000
	Model	24,589	4	,000
Step 3	Step	-,093	1	,761
	Bloc	24,496	3	,000
	Model	24,496	3	,000
Step 4	Step	-2,101	1	,147
	Bloc	22,395	2	,000
	Model	22,395	2	,000
a. A negative khi-deux value indicates that the khi-deux value has decreased since the previous step.				

We observe that from step 1 to step 4 the values of the Logloklihood statistic (-2LL) decrease and become negative. Thus, these probabilities are lower than the probability - 2LL of base (328.01), with a significance at the threshold of 5% for the model. We can say then that the final model makes it possible to predict significantly better than the probability of self-rationing that the fact that the model includes only the constant.

Table. 4-step Hosmer-Lemeshow test

Hosmer-Lemeshow test			
Step	Khi-Chi-deux	Ddl	Sig.
1	2,969	8	,936
2	7,070	8	,529
3	3,739	8	,880
4	19,510	8	,012

The Hosmer-Lemeshow test shows that there is no significant difference between the predicted and observed values for the first three steps. However, there is a significant difference when moving to the 4th step. And thus by the elimination of the 3rd variable, the predicted and observed values are incoherent.

Step 2: Evaluation of the adjustment of the data to the regression model

Based on the Wald test, for the evaluation of the significance of the estimated coefficients of the preserved independent variables in order to ensure that each contributes to a better prediction of the model, we observe that in the final stage, the coefficients of the conserved variables are significant, although three others have been eliminated. Therefore, each of these variables contributes to the amelioration of the model. It is the level of education variable (NIV_IST) and the number of years of experience. Both variables are significant even at the 5% threshold. Also, for the direction of the relationship between the predictor variables and the phenomenon by studying the meaning of the coefficients A and Exp (B), we find that the relation is negative for the variable level of instruction and positive for that of the number of expérience years.

Therefore, the higher the instruction level is, the more self-rationed the manager of the company is and vice versa. And the more important the years of experience are, the more credit requests the company manager makes and vice versa.

Step 3: Evaluation of the adjustment of the final model

After testing the significance of the regression model as well as that of the independent variables, we can say that the model is not well adjusted to the data. Indeed, the summary table of the model shows that the R2 values of Cox and Snell are low and decrease for each step. Nevertheless, from the final equation, the model correctly ranked 73% of credit applicants in their appearance group.

Table. Ranking table of credit applicants

Classification table					
Observations			Forecasts		
			NBR_DMD_CRE		Correct percentage
			1	2	
Step 1	NBR_DMD_CRE	1	10	70	12,5
		2	8	216	96,4
	Global percentage				74,3
Step 2	NBR_DMD_CRE	1	8	72	10,0
		2	8	216	96,4
	Global percentage				73,7
Step 3	NBR_DMD_CRE	1	8	72	10,0
		2	8	216	96,4
	Global percentage				73,7
Step 4	NBR_DMD_CRE	1	10	70	12,5
		2	12	212	94,6
	Global percentage				73,0
a. The caesure value is,500					

We observe that the correct percentage of classification goes from 74.3% with all independent variables and decreases to 73.7% for step 2 and 3. It goes down to 73% minimally for step 4 where only 12.5 % of credit applicants are ranked correctly. However, 94.6% of non-applicants are classified correctly.
Ultimately, the evaluation of the adjustment of the final model leads us to accept the collected results.

Appendix 3

Step 1: Evaluation of the regression model meaning

Table. Summary of models

Summary of models			
Step	-2log-verisimilitude	R-deux de Cox &Snell	R-deux de Nagelkerke
1	353,392[a]	,135	,191
2	353,398[a]	,135	,191
3	353,440[a]	,135	,190
4	353,491[a]	,135	,190
5	353,597[a]	,135	,190
6	354,278[a]	,133	,187
7	355,903[a]	,129	,181
a. The estimate was interrupted at iteration number 5 because the parameter estimates changed by less than ,001.			

Table. Model specification tests

Model specification tests				
		Khi-Chi-deux	Ddl	Sig.
Step 1	Step	47,078	8	,000
	Bloc	47,078	8	,000
	Model	47,078	8	,000
Step 2	Step	-,006	1	,939
	Bloc	47,072	7	,000
	Model	47,072	7	,000
Step 3	Step	-,042	1	,838
	Bloc	47,031	6	,000
	Model	47,031	6	,000
Step 4	Step	-,052	1	,820
	Bloc	46,979	5	,000
	Model	46,979	5	,000
Step 5	Step	-,106	1	,745
	Bloc	46,873	4	,000
	Model	46,873	4	,000
Step 6	Step	-,681	1	,409
	Bloc	46,192	3	,000
	Model	46,192	3	,000
Step 7	Step	-1,625	1	,202
	Bloc	44,568	2	,000
	Model	44,568	2	,000
a. A negative khi-deux value indicates that the Khi-deux value has decreased since the previous step.				

We notice that Wald's step-by-step procedure stops at the seventh step, which explains the elimination of six variables among the initial eight.

Then, from step one to step seven, the values of Logloklihood statistics (-2LL) decrease. Thus, these probabilities are less than the probability - 2LL of base (400,47), with a significance at the threshold of 5% for the model. Also, the Khi-deux statistic becomes negative in step seven. We can then say that the final model can predict the probability of self-ration significantly better than the fact that the model includes only the constant.

Table. 7-step Hosmer-Lemeshow test

Hosmer-Lemeshow test

Step	Khi-Chi-deux	ddl	Sig.
1	26,043	8	,001
2	24,677	8	,002
3	28,996	8	,000
4	32,665	8	,000
5	23,713	8	,003
6	12,601	8	,126
7	4,529	7	,717

The Hosmer-Lemeshow test shows that there is a significant difference between the values observed and the predicted values for the first five steps for which the Khi-deux statistic is significant at the 5% level.

However, there is no significant difference between the predicted and observed values when moving to step 6 and the 7th with non-significant Chi-square. So, by eliminating the 5th variable, the predicted and observed values are coherent.

Step 2: Evaluation of the data adjustment to the regression model

Based on the Wald test, for the evaluation of the significance of the estimated coefficients of the independent variables conserved in order to ensure that each contributes to better predict the model, it is observed that in the final step, only the two conserved variables coefficients are significant. Therefore, these are the two variables that contribute perfectly to the amelioration of the model. Both the age variable of the company (AGE_ESE) and the rate of indebtedness (TX_END) are significant even at the 5% threshold.

Thus, for the meaning of the relationship between the predictor variables and the dependent variable by studying the meaning of the coefficients A and Exp (B), we find that the relation is positive for both. Therefore, the higher the age of the company, the more self-rationing the manager is and the higher the rate of indebtedness the more self-rationing the manager is. Moreover, self-rationing in this case is mainly affected by the rate of indebtedness rather than the age of the company. Indeed, as measured by the Odds Ratio (Exp (B)), the reports shows 2.17 for the rate of indebtedness and only 1.53 for the age of the company.

Variables out of the équation					
			Score	Ddl	Sig.
Step 7	Variables	ASP_JUR	,014	1	,907
		LIE_IMP	,001	1	,975
		ACT_TÉP	,128	1	,720
		CA_2014	1,607	1	,205
		NBR_SAL	,055	1	,815
		ESE_FAM	,588	1	,443
	Global statistics		2,490	6	,870

Step 3: Final model adjustment evaluation

After testing the significance of the regression model as well as that of the independent variables, we can say that the model is not well adjusted to the data.
Indeed, the summary table of the model shows that the R2 values of Cox and Snell are low and decrease for each step. Nevertheless, from the final equation, the model correctly ranks 73% of credit applicants in their membership group.

Table. Results of final model adjustment

Classification table					
Observations			Forecasts		
			NBR_DMD_CRE		Correct percentage
			1	2	
Step 1	NBR_DMD_CRE	1	38	62	38,0
		2	24	200	89,3
	Global percentage				73,5
Step7	NBR_DMD_CRE	1	28	72	28,0
		2	22	202	90,2
	Global percentage				71,0

We observe that the correct percentage of classification goes from 73.5% with all independent variables to 71% for step seven where only 28% of self-rationed are classified correctly and 90.2% of applicants are classified correctly.
In the end, the evaluation of the final model adjustment leads us to accept the results received (insert the reference).