POLITECNICO DI TORINO

Department Of Management and Production Engineering

Master of Science in Engineering and Management

Master's Degree Thesis

Credit Rationing and the financing of SMEs:

supply and demand problems

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Abstract

This paper analyzes the credit rationing phenomenon starting from the theoretical arguments provided by literature which are then compared with empirical studies performed across the years and across the countries. The aim is to identify the main causes which determine the limited access to external finance for small and medium enterprises (SMEs), and to reveal the possible remedies to this phenomenon, with a focus on European and Italian situation. The possible determinants for supply and demand of credit are analyzed together with their impact on credit rationing, through the empirical research provided by literature. The characteristics of lenders and SMEs seem to affect credit rationing, together with the context in which they operate. Valuable remedies to the phenomenon are identified in collateral requirements and relationship banking, albeit their incidence is subject to specific conditions. Finally, the impact of COVID-19 pandemic is reported, by comparing the empirical evidence in 2020 with that of previous years, accompanied by some policies solutions that may reduce credit rationing.

Summary

1. Introduction to Credit Rationing

Credit rationing is a widely studied phenomenon and an example of *market failure* that can be broadly defined as the situation in which economic operators are unable to obtain the amount of bank credit they desire as a result of the imperfections of the financial markets.

As it will be detailed later on, the market fails because of the presence of information asymmetries that make the credit market not an ordinary market where the supply and demand functions are simply and jointly governed by the price, i.e. by the interest rate.

Indeed, the credit market is composed by the two main actors that are the lenders (i.e. the banks) and the borrowers (i.e. the customers), and information about borrower's risk is a key point, together with the distribution of the information among the players and the effect of the price on that risk. Credit markets cannot be entirely cleared when this information is not equally distributed among the players and, as a consequence, the price has effects on the risk the borrower is willing to take.

Furthermore, actions on the interest rates will somehow influence the attraction to the market. The higher the interest rate, the riskier are the borrowers who apply for a credit loan, thus the lower will be the quality of the pool of borrowers, since risk-averse actors will be pushed out. This because the higher interest rates mean lower returns for the borrowers who are in this way pushed to invest into projects with a lower probability of success, but with higher payoffs if successful. Simultaneously, net returns for the bank will paradoxically decrease as well, when increasing interest rate, because losses in the event of insolvency can increase faster than the increase in interest income.

Thus, an action that the banks perform in order to protect themselves from this scenario is to limit the supply of credit, causing the rationing for part of the borrowers. As a result, demand will exceed supply without the price adjusting towards a new equilibrium, causing the market to fail.

Furthermore, credit rationing is present in those situations in which borrowers, even if they are willing to acquire the funds either at the current interest rates or even at higher ones, they do not receive the credit from the lenders, they are rationed, causing again the demand to exceed supply.

The mechanism of adapting the interest rate in order to reach the equilibrium does fail.

The causes of this phenomenon are often found in the information asymmetries as they increase the difficulty in granting a loan.

Usually, the borrower has more information than the lender, as she knows how committed she will be to the projects she will invest in to obtain a certain objective in terms of payoff, that in turn will make possible to repay the lender. The latter can only try to assess the creditworthiness of the borrower, to define her characteristic as a debtor and to try to anticipate her behavior.

1.1. Credit rationing classification

In details, credit rationing can have different forms based on the situation in which it arises. Literature proposes different classifications, however the one that is interesting to be presented is that of Jaffee and Stiglitz (1990) who establish four types of credit rationing.

The first type is called *interest rate credit rationing* and arises when the probability of failure of the borrowers is unknown by the lender, who instead does know the expected return on that project. This means that creditworthiness is not the discriminant for rationing. In this context, the lender rationally links the size of the loan with the risk of the project by increasing the bankruptcy costs as the size increase. This because the larger the loan, the higher should be the repayment. This entails that the borrower can pay a higher price in order to obtain a larger loan. On the other hand, if borrowers pay the current price, they are size rationed, i.e. they obtain a smaller amount than the one they expected.

The second type is called *divergent views rationing* and states that some "good" projects are not funded, i.e. some borrowers are rationed because the level of the interest rate is too high compared to the perception of the probability of default that the borrowers themselves do have on their projects.

The third type is called *redlining* and differs from the previous from the fact that the probability of default is now observable by the lenders, thus they will set their desired level of return and rationing arises whenever the project does not ensure a sufficient return for the bank.

The fourth type is defined *pure credit rationing* and it arises due to the presence of information asymmetries. The borrowers are identical from the eyes of the lender, however some of them are rationed without any observable and predictable reason, even if they would be willing to pay a higher price, while the others are fully financed.

Finally, it is interesting to report a more recent theory that, differently from before, focuses more on the demand side, taking into account also the non-applicant borrowers. Indeed, Levenson and Willard (2000) introduced the *discouragement theory* on credit rationing that

leads to the definition of the *self-credit rationing*. As the word itself says, this type arises when the borrower decides not to apply for a loan because it could be discouraged by the application costs or could anticipate the rejection. Here, the concept of duration of the application is essential, while it was instead left out from previous theories. Indeed, rationing can emerge also because of the delay of scheduling the application: borrower can, for instance, anticipate these further costs due to the time and decide to not apply. Then, Kon and Storey (2003) refined this model demonstrating the negative relationship between the number of discouraged borrowers and the amount of information available and the alternative source of finance, and the positive relationship with the application costs.

1.2. Credit rationing definitions

After what has been said, it can be affirmed that the nature of the imbalance of information and the way it occurs determine a different form of credit rationing. However, the common trait is given by the fact that increasing the interest rate is never the way to retrieve the point of equilibrium, in facts banks will always tend to exclude someone from credit access, in particular the riskiest customers.

This is because, an increase in the interest rate would incentivize an *adverse selection* from customers, i.e. favoring the riskiest projects instead of safer ones. This definition is given by Jaffee and Modigliani in the article "A Theory and Test of Credit Rationing" (1969), where they define credit rationing as "a situation in which the demand for commercial loans exceeds the supply of these loans at the commercial loan rate quoted by the banks". The key point is that it is not possible to clear the demand in market of loans by adjusting the interest rate.

A distinction should be made between the credit rationing described so far and the situation in which a lender simply restricts the size of the loan to any individual borrower, for example due to credit shortage. This is a situation that arises when lending is not scalable usually but should not be considered as credit rationing.

Another important definition of credit rationing is given by Stiglitz and Weiss in "Credit Rationing in Markets with Imperfect Information" (1981) where they affirms that it can arise in two different circumstances: the first one is when among different but identical aspiring borrowers some receive the loan while some others do not, even if the rejected ones would be willing to pay a higher price; the second situation is when the supply of credit is not so large to include a group of identifiable individuals with common traits, which will be unable

to obtain the credit, whatever is the interest rate. However, at a wider supply they would be able to obtain it.

In other words, lenders are able to deny the credit to some specific groups of applicants, despite the fact that they are indistinguishable from those who have received the loan.

To recap, the literature gives two broad definitions of credit rationing in the end, and both of them give prominence to the supply side of the market.

The first defines the situations where interest rate increases cannot compensate for excess demand in the credit market, regardless of whether this excess demand reflects a single borrower willing to obtain a larger loan amount or many borrowers. According to this definition, rationing would exist if each potential borrower receives a less amount of credit than the one that corresponds to the equilibrium interest rate.

On the other hand, the Stiglitz-Weiss definition focuses on situations in which some borrowers are completely pushed out of the market, even if they would be willing to pay a higher-than-market interest rate.

Moreover, there could also be exogenous factors other than supply-side constraints that can widen the definition of credit rationing, such as regulatory constraints.

1.3.   Credit rationing theory evolution

Credit rationing plays an important role in the market of credit. His importance founds its evidence in the literature that is in constant evolution and involves both macroeconomics and microeconomics.

From a macroeconomic standpoint, credit rationing can lead to consequences for the wellness in the economic system that are potentially negative. The price of this drawbacks is usually paid by the less economically powerful part of the economic actors, that are mainly small and medium enterprises (SMEs), that do not have direct access to capital markets, and also, they fall on low-income households and micro-enterprises. Therefore, credit rationing is an important issue addressed in the SME financing literature. Indeed, as Parker affirms in his paper "Do banks ration credit to new enterprises? And should governments intervene?" (2002), liquidity is a key element for the economic growth of young firms, and the availability of credit is somehow proportional to the potential growth of the business.

More generally, the studies on credit rationing were focused at the beginning on the macroeconomic effects of monetary policy, to then evolve in seeking causes and effects from a microeconomic point of view, and to finally turn in the modern period towards an analysis more aimed at understanding the problems of demand rather than supply.

In the early 1950s the approach was to look at the macroeconomic characteristics of the phenomenon. In this period the so-called *availability doctrine* was born and according to it there is always a supply constraint caused by the limited funds of banks which in turn create credit rationing by definition. The action that could solve this problem, from a macroeconomic perspective, are expansive monetary policies, which have direct effects on the supply of credit. The limit of this theory is to not look at the characteristic of the demand and thus to the profit-maximizing equilibrium.

In 1970, the development economist George Akerlof, in his pioneering article "The Market for Lemons: Quality Uncertainty and the Market Mechanism" on the role of adverse selection as a barrier to credit market development, put the attention on some effects that could bring to financial underdevelopment especially in developing countries.

Akerlof ultimately showed that it is essential for lenders to retrieve information on borrowers and to select the applicants based on this information. The absence of an agent capable to distribute credible information to players is a crucial element in determining financial underdevelopment because it causes the missing of screening and monitoring actions that would mitigate adverse selection and moral hazard respectively.

Then, Baltensperger (1978) fairly introduced the non-price determinants for credit rationing, from a microeconomic perspective, focusing on collateral requirements.

With Stiglitz and Weiss (1981) the analysis shifted to a microeconomic approach, by seeking the causes of credit rationing in the information asymmetries that lead to adverse selection and moral hazard.

More recently, a new approach was modelled by Kon and Storey in 2003, which focuses not only on applicant borrowers, but also in those borrowers who are discouraged to apply for the loan, because they can anticipate the rejection.

1.4. Information asymmetry

To understand the credit rationing phenomenon, it is essential to study the causes that generate such failure in the market. Starting from the first studies on this subject in the 1970s,

many economists have researched the causes in the information asymmetry between the two parties at stake, that are the lender and the borrower.

In a transaction, each of them needs to know something about the deal that is going to be subscribed. The lender should know the probability of repayment of the debt; however, this information is very hard to be reached or is simply too much costly for the lender. This often results in rationing some individuals, that are not financed.

In a perfect world the information would be symmetrical, that is each agent has the same information. However, in most of the real cases the borrower has more information with respect to the lender, regarding the risk of insolvency, since it is the leading actor of the project that will be directly financed. It should have the knowledge about the return and the risk probability of the project that, in the end, will determine the probability of repayment for the bank.

Furthermore, there are two different types of information asymmetry.

It can be *ex-ante*, when the gap of information is present prior to the conclusion of the contract. The mismatch of knowledge between the lender and the borrower does not allow the former to know the probability of risk of the project that is subject to the financing in the pre-contractual phase. This can lead to the so-called *adverse selection* problem, which could make the bank to select riskier project and to ration "good" projects. These are the cases considered in the models proposed by Jaffee-Russell and Stiglitz-Weiss at the turn of the 1980s.

It can be *ex-post*, when the conflict of interests is related to the post-contractual phase; indeed, the borrower could be reluctant in sharing the information on real profit or the real riskiness of the funded project, being protagonist of the so-called *moral hazard*. While in the previous type the borrowers differed from each other with respect to the degree of risk on their project before the bank granted them the loan, now all the borrowers are undistinguishable and perfectly identical at the beginning. The gap of information is related to a second period that is after the loan is granted. Indeed, after the loan, when the borrowers have ensured the fund, they will be able to pick a project among a pool of different possibilities that brings with them different returns and degree of risk. This introduces the necessity of monitoring the behavior of the customer from the lender, an activity that in turn introduce a cost for the lender itself. Then, this will influence the maximization problem that the lender tends to resolve with respect to profits and lead to presence of credit rationing since not all individuals will be financed.

This reasoning about the causes leads to the following models that are united by the presence of information asymmetries that determine the credit rationing.

2. The models on credit rationing

A deeper view throughout the models proposed by the literature is now presented. The following theories will lead to see the described market failure as a consequence of the information asymmetries that characterize the deal between lender and borrower.

Preliminarily, it is important to distinguish the market of credit from that of goods, since they behave differently.

In the financial market, the exchange among the parties does not take place simultaneously: a granted cash loan is defined to be repaid in the future, increased by a certain amount on the basis of the agreed interest rate. The risk of failing the repayment can be high if the bank is not able to carefully assess the creditworthiness of the customer. Thus, the risk is related to the uncertainty which characterize this type of market.

The most important models on which the whole theory on credit rationing is based are those carried out starting from the Seventies, by Jaffee and Russell (1976), Stiglitz and Weiss (1981) and Williamson (1988).

Jaffee and Russell demonstrate that credit rationing in loan markets can be due to the information asymmetries that characterize the relationship between borrowers and lenders.

Lately, Stiglitz and Weiss focus on the fact that, even with the presence of *ex-ante* asymmetric information, credit rationing is present at the market equilibrium. It would not be profitable to the lender to clear the market by increasing the interest rate because this would lead to worsening the quality of the financed individuals, so that increasing the risk for them regarding debt payment.

Lastly, Williamson focuses on *ex-post* information asymmetries, keeping a special consideration on the costs of monitoring that lender would bear when the information is poor.

2.1. Jaffee and Russell (1976)

Jaffee and Russell in their paper "Imperfect Information, Uncertainty and Credit Rationing" (1976) state that the rationing phenomenon arises when lenders define a certain level of interest rate on loans, but their supply is lower than borrowers' demand at this rate.

In a perfect market, without information asymmetry, the ideal solution to cover this imbalance of demand with respect to supply would be to increase the price, that in the case of the credit market corresponds to the interest rate. This solution is not effective because here are the so-called market failures, that in this case are the information asymmetries themselves.

Indeed, they put the attention of their analysis on the adverse selection, that derives from the *ex-ante* information asymmetry. They identify in such a concept the cause of the phenomenon of credit rationing.

In this model, the borrowers are subdivided in two categories, that can be good-naturedly defined "honest" and "dishonest" borrowers.

The first category is composed by those individuals that get into debt only if they are reasonably sure to be able to repay the loan, and thus they accept the interest rate in the contract only if they can afford it. The second category, instead, is composed by the individuals that simply will not repay the debt if the default costs are low enough.

The *ex-ante* information asymmetry consists in the fact that the lender is not able to distinguish the type of the borrower who demands credit, before concluding the loan contract.

The behavior of the two categories is studied by considering a two-periods model in which each individual is characterized by its own utility function which depends exclusively on consumption in each of the time period:

$$U\ (C_1;\ C_2)$$

They also have an exogenous income in both periods $(Y_1;\ Y_2)$, while the interest rate at which they can borrow is r.

The demand curve is obtained by maximizing consumption with respect to the budget constraint, that is what the individual can actually spend:

$$max\ U\ [C_1, C_2]$$

$$s.t.\ C_2\ =\ Y_2 - (C_1\ -\ Y_1)(R)$$

Where:

$$R\ =\ 1 + r$$

Namely R can be seen as the interest rate factor, while $(C_1\ -\ Y_1)$ is the slope of the budget line, for the "honest" borrower.

Since there are two time periods, it is important to take into consideration the amount of the loan L that will have to be repaid in period two. This will result in two equations that show the level of consumption in the two different periods:

$$t_1 : C_1 = Y_1 + L$$

$$t_2 : C_2 = Y_2 - LR$$

Thus, the maximization problem will be resolved with respect to L:

$$max \ U \ [L + Y_1, Y_2 - LR]$$

Finally, from the first order condition it is possible to obtain the loan demand curve:

$$L^* = L^*(R)$$

As mentioned, it is not possible to distinguish the "honest" from the "dishonest" borrowers, so they are considered identical except for the fact that *ex-post* it is known that the second category prefers to fail instead of repaying the loan, whenever this action leads to an increase in their utility. Consequently, the demand for these two categories must be identical, otherwise the bank would be able to recognize them *ex-ante*, and therefore there would not be information asymmetry concerns.

In order to disincentivize the "dishonest" behavior, the bank introduces a cost Z to be paid in the second period only in case of default. Therefore, the "dishonest" borrower can alternatively maximize the utility function subject to the constraints described before or subject to the following scheme:

$$max \ U \ [C_1, C_2]$$

$$s.t. \ C_1 = Y_1 + L$$

$$C_2 = Y_2 - Z$$

Where L is the amount of credit of the loan that is common to all the borrowers. This choice depends exclusively on the consumption capacity in the second period. The borrower will decide to default only if the cost of failure is less than the cost of repayment of the loan:

$$Z < LR$$

Figure 1 depicts exactly what was just mentioned: in correspondence with the values below R_i, the "dishonest" borrower will prefer to fail rather than engage in likely successful projects.
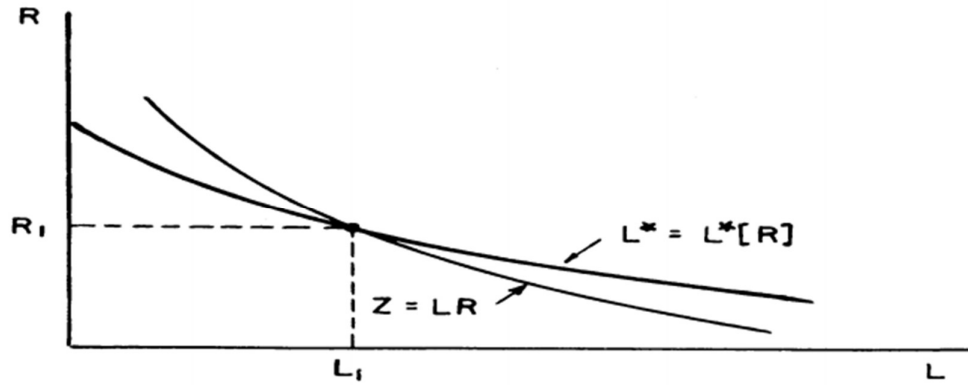
Figure 1 – "Dishonest" behavior of the borrower. Source: Jaffee, D. M. and Russell, T., 1976, "Imperfect Information, Uncertainty, and Credit Rationing", The Quarterly Journal of Economics.

Furthermore, the Z curve is a hyperbole and represents the set of "default points" whose allocation depends on the level of Z fixed by the lender, while the demand curve intersects the R axis by assumption. Thus, those two curves must have at least one point of intersection if the following assumption does hold: the value of Z is low enough to allow the presence of default possibilities, i.e. default points that are below the demand curve.

The intersection point is unique if it is assumed the gross substitution property between C_1 and C_2 in the utility function $U(C_1; C_2)$. It means that C_2 decreases as R decreases, since R is the relative price for consumption in the first period.

Then, from the condition $C_2 = Y_2 - LR$ (where $LR = Z$), it results that it is equivalent to say that the contract size (LR) increases as R decreases along the demand curve, since the consumption in the second period has instead a positive relationship with the interest rate factor. Instead, along the Z curve, the contract size is constant, as R decreases, thus after the intersection point the two curves do not meet anymore.

Therefore, these properties make the demand curve and the Z curve to match in one point, due to the intersection with the ordinate axis of the first, and the hyperbolic nature of the second, together with the assumption of actual default possibilities. This point represents the level at which, in a situation of market equilibrium, there would be no credit rationing.

On the other hand, lenders want to maximize their profits:

$$\pi = LR\lambda[LR] - LI$$

Where λ is the portion of individuals who are not at risk of default and $I = 1 + i$, where i is the constant interest rate at which lenders can obtain their funds, in a perfect capital market.

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In particular, the first term of the relationship indicates the expected revenues for the lenders, while the second term indicates the costs, i.e. the amount to be repaid to the capital markets.

The first order condition with respect to L leads to $R\lambda[LR] = I$, that can be re-written as:

$$R = \frac{I}{\lambda[LR]}$$

That is the supply function and shows the series of contracts which satisfy the zero-profit condition. It is drawn in Figure 2 from the points OTSV, and its backward-bending shape can be explained through the moral hazard issue which could lead to non-monotonic relationship between the interest rate and the expected return.
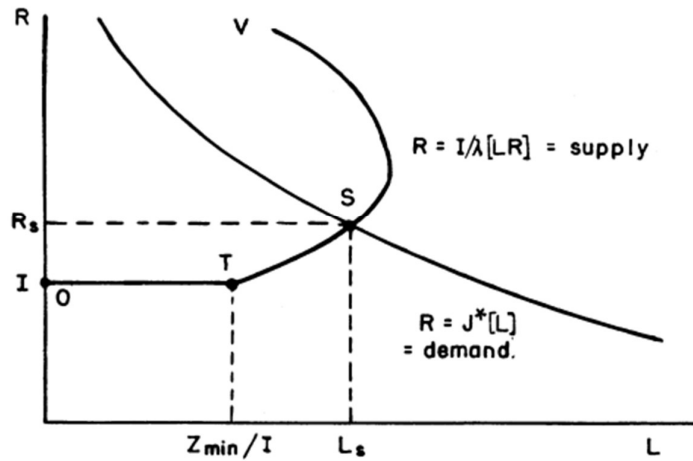

Figure 2 – Supply and demand curves. Source: Jaffee, D. M. and Russell, T., 1976, "Imperfect Information, Uncertainty, and Credit Rationing", The Quarterly Journal of Economics.

From Figure 2 it is possible to see that for $R = I$,

$$\lambda = 1 \text{ if and only if } LR \leq Z_{min} \text{ or equivalently } L \leq \frac{Z_{min}}{I}$$

Which means that no borrower will fail, and the supply curve is flat where the cost of failing is higher than the one of the contracts (from point O to point T).

From point T onwards, the behavior of the supply curve does change according to the distribution of and the changes in λ which starts to decrease, indicating that the borrowers now do fail. The behavior of λ with respect to the contract size is depicted in Figure 3.

As said, $\lambda[LR] = 1 \text{ for } LR \leq Z_{min}$ while $\lambda[LR]$ is continuous and monotonically decreasing for $LR > Z_{min}$.
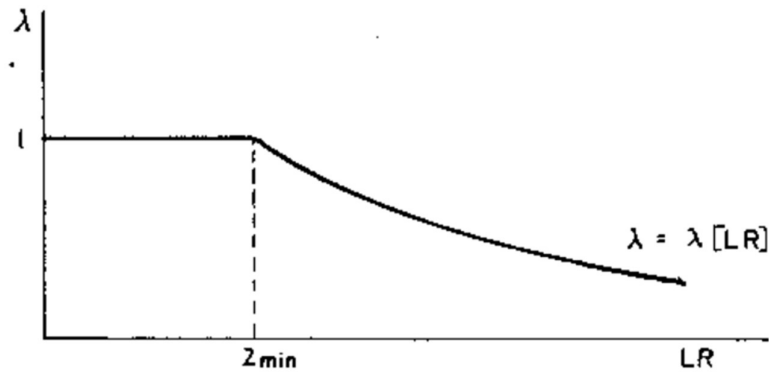
Figure 3 - Portion of individuals who do not default when a contract with size LR is offered. Source: Jaffee, D. M. and Russell, T., 1976, "Imperfect Information, Uncertainty, and Credit Rationing", The Quarterly Journal of Economics.

Along the supply curve, as λ decreases, R starts to increase above the marginal cost of funds (I) to compensate for the default rate.

The point of equilibrium is reached in $S(R_S; L_S)$, where the adjusted supply meets the demand and where there is no rationing.

It is important to underline that $R_s > I$ which means that "honest" borrower will pay a higher price with respect to the costs of the bank, due to the information asymmetry that induce the bank to compensate the cost for default eventuality, since it is not able to distinguish among the two categories of borrowers.

Backward-bending is explained by the fact that as R increases, λ approaches to zero, thus looking at the profit function for the bank it appears clear that revenues become lower than cost, making not profitable for bank to increase their supply of credit.

In the section OTS of the curve, credit will be certainly rationed since the supply curve is lower than the demand. However, for the honest borrowers, that do not think about default risk, it would be preferrable to pick a project at this level of interest rate, rather than the one at the equilibrium S, where the cost of the contract is higher.
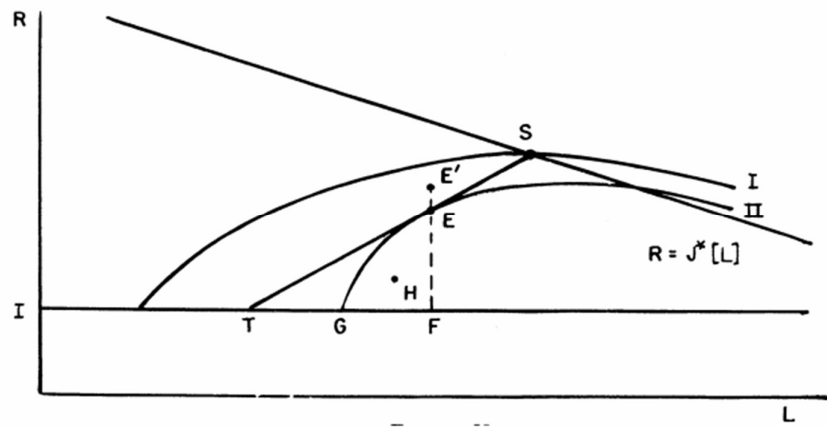
Figure 4 analyzes the indifference curves for the borrower, plotting them in the enlarged area of the TS section of the supply curve, in a situation in which the equation that defines the set of loan contracts $R\lambda[LR] = I$ is now subject to the condition $L \leq L^*[R]$ that is the contract does not exceed the demand function.

Figure 4 also shows that credit rationing is present below the point S because the contracts in this area lie below the demand curve. The crucial aspect is that some of those points are preferred by the honest borrowers, who would not default at the equilibrium point S, but would have higher utility with those non-equilibrium contracts.

The first indifference curve (I) passes through the point of equilibrium S, but the second indifference curve (II) is preferrable by the borrower because it implies a lower interest rate, and it is tangent to the segment TS in the point E. However, in E it is clear that the supply curve is lower than the demand curve, thus there is obviously credit rationing.

At the same moment, for the lender point E is not efficient since it would be preferrable for the lender to offer a contract H, for example, where the interest rate is lower than the one in point E, but it is higher than I, and the quantity of loan is lower than F and below the second indifference curve. At this point it does happen that the "dishonest" borrower will still continue to prefer the contract E, while the "honest" one will desire to switch to this contract H, since its cost is lower. Thus, a selection is possible within this stage, that leads dishonest borrowers to reveal themselves, in a dynamic context. However, H is profitable for lenders if only honest borrowers apply, but the selection of contract H makes contract E (which would be selected only by dishonest borrowers) to disappear from the market since it would lead to losses for the bank. Thus, even dishonest borrowers now have to apply for contract H, but this means again losses for the lender, since it captures the entire market with a

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contract that lies below the supply curve (i.e. lower interest rate). Thus, contract *H* should now disappear from the market, introducing again point *E* as preferred loan contract. This mechanism goes on indefinitely in the long run and underlines the absence of an equilibrium in case of multiple contracts.

The market solution identified by Jaffee and Russell is that of monopoly, which could lead to larger contract size offer, at the cost of higher interest rates, that of course are not attractive to honest borrowers as the competitive scenario does.

In the end, it is verified that in both points *S* and *E* credit rationing does arise, because in the first situation the high costs prevent from obtaining the requested loan even if all borrowers would be "honest", while in the second situation the "honest" borrowers will decide not to apply for the loan, since they could obtain it at lower interest rate in a multiple contract scenario (point *H*).

2.2. Stiglitz and Weiss (1981)

The model proposed by Stiglitz and Weiss is considered the most influential one and it is inspired by the theories of Akerlof on information asymmetries. Indeed, the analysis is based on the resolution of the *adverse selection* problem, that is caused directly by the presence of *ex-ante* information asymmetries. The objective is to demonstrate how the presence of adverse selection can give place to credit rationing.

They discuss about the possibility that, despite the fact that demand is greater than supply, there may be a point of equilibrium that makes the credit market balanced. Indeed, the interest rate is crucial, since it somehow establishes the level of risk of funds offered to borrowers that the lenders are willing to accept. As it will be discussed, the more the interest rate increases, the less are the expected profits for the lenders, since the riskiness of the borrowers who ask for a loan does increase, thus decreasing the probability of repayment.

The information asymmetry can be found *ex-ante* due to the heterogeneity of borrowers which are characterized by different level of risk; however, this information cannot be known by the other agent of the deal, i.e. the lender. From its eyes, in fact, individuals are totally indistinguishable.

In the end, some of the borrowers will not obtain the loan, even if they would be willing to pay a higher price: they are credit rationed, and this phenomenon, from a macroeconomic point of view, could cause a deceleration in economic growth, having repercussions on social well-being.

If the market did not fail, i.e. if there were no information asymmetries, the interest rate *r* would clearly represent the price of credit at which the demand meets the supply. However, in this more real context, the role played by *r* is also that of determining the quality of borrowers.

Thus, the presence of credit rationing is explained by the fact that the bank is not interested in increasing the interest rate, since it will induce borrower to undertake riskier projects, that will not ensure the repayment for banks. This is based on the assumption of limited liability of borrowers, that is in case of involuntary default, all the losses are borne solely by the lender.

Of course, this action leads to an exclusion of a part of borrowers, who will not be able to make investments.

Therefore, the definition of the interest rate which brings with it the consequences of the information asymmetries, can lead to a dual role: a selective one and an incentive one, since it classifies potential borrowers and their possible behaviors. As the interest rate increases, the quality of the borrowers applicating for the loan does change as well, making it possible for them to accept more onerous conditions considering their limited liability and making the low-risk borrowers to no longer apply for the loan. This increase does not imply an increase in lenders' profits, rather it could be even the opposite, even if it could appear counter intuitive.

Therefore, it is legitimate to think that there is a certain level of the interest rate which make it possible to maximize the expected return for the bank. This is defined as the optimal rate *r**, as shown in Figure 5.
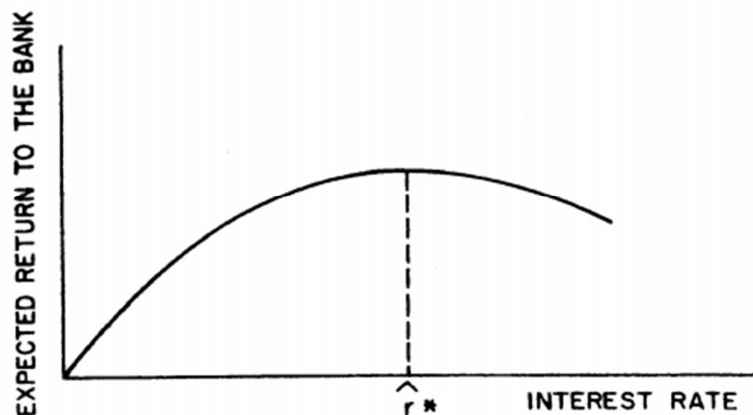

Figure 5 - Equilibrium interest rate. Source: Stiglitz, J. E. e Weiss, A., 1981, "Credit rationing in markets with imperfect information", The American Economic Review.

The equilibrium lies in the fact that the profit-maximizing bank might refuse to lend at a higher interest rate, as it is reasonable that at $r > r^*$ the required loans would be too risky, making the bank's expected profits lower than the equilibrium one, due to the likely costs of bankruptcy. Hence, there will be credit rationing also because there might be excess demand at this rate.
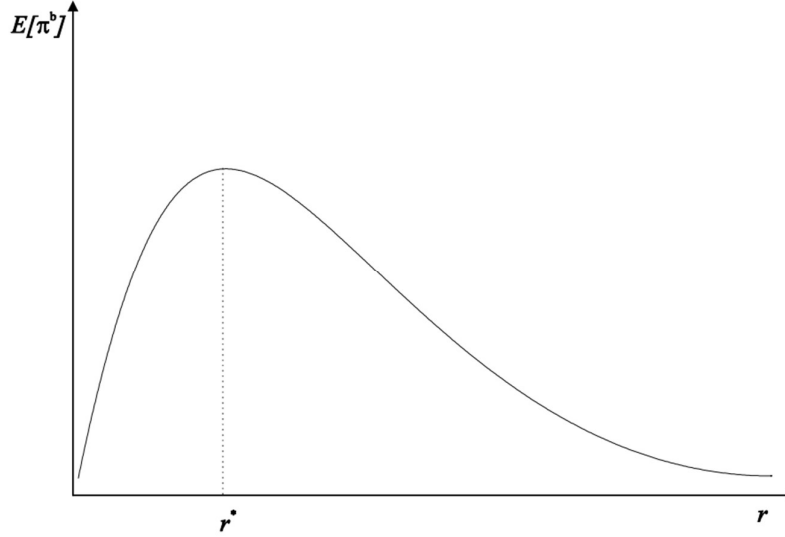

Figure 6 - Interest rate and expected return relationship for the bank.

Thus, the first part of the analysis focuses on the interest rate as a selection tool, aimed at distinguishing between "good" projects and "bad" projects, where it means that the latter are more likely to underperform, since the probability of unsuccess is much higher. Many assumptions are made in this first stage, such as the absence of moral hazard, the risk neutrality of the agents, the cost of the projects is fixed in time and cannot be divided, and the loan amount requested for each project that is identical for every borrower.

This leads to set a failure condition that will be verified when the borrower, asking for the amount B at the interest rate $\hat{r}$, will be unable to repay the debt, because the yield (R) and the collateral (C) are insufficient to cover the financing:

$$C + R \leq B(1 + \hat{r})$$

Naturally, the project returns R are subject to a certain degree of risk θ.

Hence, the net income for the borrower can be defined as:

$$\pi(R, \hat{r}) = max[R - B(1 + \hat{r}), -C]$$

The profit function results to be convex, thus, above a certain value, the higher the risk of the project, the higher the expected profit.

Assuming risk-neutral borrowers that have to commit to a given amount of risk capital K_0, a project will be undertaken if:

$$E[\pi] > K_0(1 + \delta)$$

where δ is the risk-free rate at which it is always possible to alternatively invest the funds.

Since the expected profit depends on the risk of a project, there is a level of risk θ' such that only for $\theta > \theta'$ borrowers will sign the loan contract. Hence, the higher the interest rate, the lower the expected profits and the quality of borrowers and this implies that the critical value of θ increases (i.e. the value below which borrowers do not apply). Since the expected profits increase with risk, in the end, for each θ expected profits are decreased, but they decrease more for the less risky borrowers than for riskier ones, therefore the less risky borrowers, i.e. those with the lowest value of θ, will be forced to exit the market, while the riskier ones stay, causing the adverse selection.

On the other hand, the return for the bank is a concave function and the revenue for the bank is:

$$I\,(R,\hat{r})\ =\ min\,[R\ +\ C, B\,(1\ +\ \hat{r})]$$
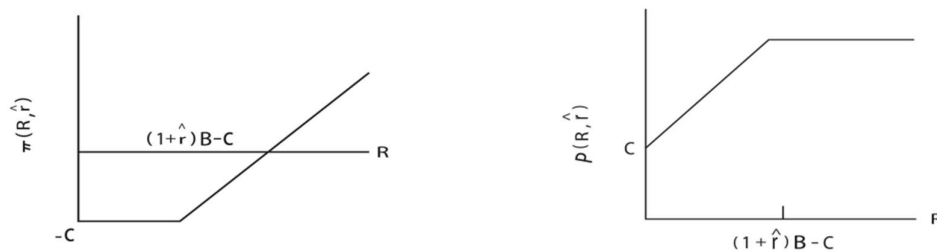
Figure 7 - Borrowers' profits on the left and Lenders' profits on the right. Source: Stiglitz, J. E. e Weiss, A., 1981, "Credit rationing in markets with imperfect information", The American Economic Review.

Therefore, there is a dual effect in the function of the expected return for the lender: a direct effect which relates positively the interest rate with profits and the indirect effect given by the adverse selection which makes the profits to decrease as *r* increases above a certain level.

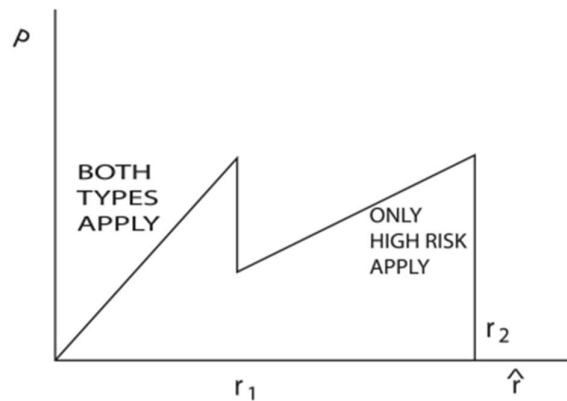As shown in Figure 8, at interest rate r_1 both types of borrowers do apply, while for values greater than r_1 until the value r_2, only the riskier borrowers do apply.

The main objective on which lenders focus on is naturally to maximize the profits, and this can be achieved by adjusting the interest rate to the proper level. This also entails a decision-making process regarding the degree of risk of the applicants.

As mentioned, the information asymmetry is related to the different degree of risk of the borrowers, that can be translated in the different probabilities of repaying the debt to the lender. In a perfect world without frictions, where information is costless, the bank would collect the information they need about the quality of the individuals, applying different contracts to each type of customer, with different costs.

Since this is not the case, some conditions have to be applied by the bank in order to make only some individuals to agree and going into debt.

Indeed, the bank would like to be able to screen individuals based on their ability to repay the debt, as their expected return is related to borrowers' likelihood of failure.

Thus, the bank can perform some screening actions to better recognize the individuals asking for the loans, and the first instrument is the interest rate itself.

The lender can anticipate that the riskiest borrowers are willing to pay a higher interest rate for receiving the loan, since they can be defined risk lovers. Thus, it is in the interest of the bank to exclude those individuals who would undertake riskier projects, since the probability of repaying the debt is much lower.

The point r^* is the equilibrium point such that the bank's profits are maximized. However, this point is non-optimal from a technical point of view if one looks at demand curve crossing supply curve. Here the demand exceeds supply because of the presence of information asymmetries.

The rationed borrowers were still such even if they were willing to pay a higher price, i.e. a higher interest rate, because, as said, the bank would not be better off in increasing the r^*.

Therefore, from the point of view of the bank, it is not worth to increase the interest rate in order to accommodate a larger pool of individuals, since it is not profitable, even if the bank itself cannot distinguish at this stage the level of risk of these customers.

Indeed, the interest rate can play the role of a screening device that allow the bank to grant loans only to those individuals who are more likely to repay the debt. One of the screening actions that the interest rate can perform is to distinguish among "bad" and "good" projects.

Furthermore, in the next step, the model describes another different situation in which the validity of the reasoning is still ensured, that is the case of distinguishable group of borrowers that are excluded from obtaining the loan, whatever it is the interest rate. This time the reason is that the expected return for the borrowers does not increase proportionally with the interest rate. Credit rationing here depends on the demand that exceeds supply either for a short or a long period: in the first case, the imbalance can be considered only temporary, while the second case constitute the real problem, because the credit rationing is permanent, thus the causes must be investigated.

The last part of the analysis of Stiglitz and Weiss leads to the formulation of the market equilibrium, once the supply and demand curves are determined.
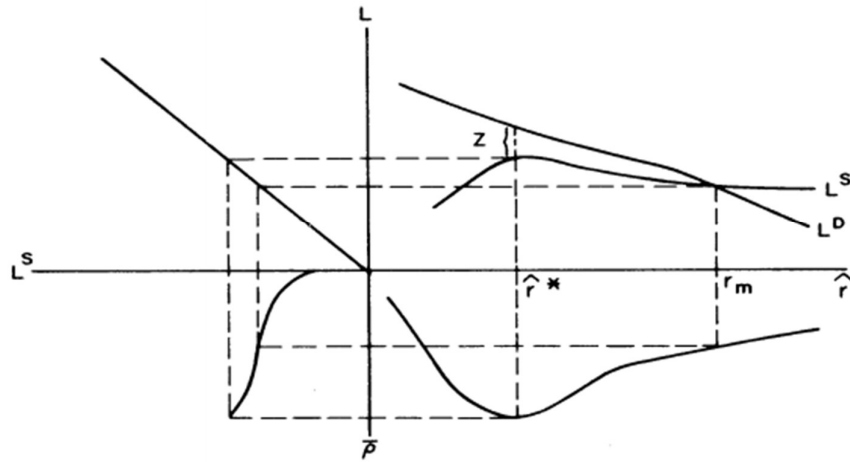
Figure 9 – Market equilibrium determination. Source: Stiglitz, J. E. e Weiss, A., 1981, "Credit rationing in markets with imperfect information", The American Economic Review.

From the Figure 9, by looking at the fourth quadrant, it is possible to see that the payoff of the bank is a concave function, and it does not grow proportionally with respect to the interest rate r. This is because there is a discrete number of borrowers, thus the different project to be undertaken with different degree of risk.

Consequently, the internal maximum point of the profit function for the bank correspond to the competitive equilibrium interest rate at which the supply curve does not meet the demand (first quadrant), thus leads to credit rationing (Z). It is clear from the graph that it is not optimal for the bank to increase the interest rate at such a level in which the supply curve and the demand curve matches. This would lead to less profits for the lender.

Furthermore, this leads to an important corollary that says that in a situation of credit rationing, increasing the credit supply L^s would leave unchanged the interest rate but would help to reduce the excess demand, thus the rationing of credit Z.

This is important because does imply important macroeconomic consequences, since it says that expansive monetary policies can have positive effects on rationing.

The supply curve is transferred to the first quadrant from the third quadrant which shows its relationship with the expected return of the bank, starting from the available money.

Indeed, by increasing the interest rate, the attractiveness of risky projects increases as well, causing eventually a reduction in the expected return for the bank. Thus, it can be seen as an incentive for borrowers to undertake riskier projects once they have collected the funds, arising the moral hazard problem, because they change their behavior. Therefore, whenever

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there is excess demand, the bank prefers to ration the credit rather than to increase the rate of interest.

Indeed, if risk-neutral borrowers, given a certain level of the interest rate, can choose indifferently between two alternative projects, an increase in the interest rate will induce to make the choice on the riskier one.

2.3. Williamson (1987)

Another important author that has contributed with further development in the studies about credit rationing is Williamson with its paper "Costly monitoring, Loan Contracts, and equilibrium credit rationing" (1987). The key point of the model built by Williamson is to explain the presence of the equilibrium in the credit market, introducing the cost of monitoring for banks. When the failure of the project is costly to the lender, due to the monitoring costs, lenders' profits might decrease as the nominal interest rate for loan increases, because it increases the probability of default for the borrowers as well. Indeed, this monitoring activity solves the moral hazard problem.

However, differently from Stiglitz and Weiss (1981), the form of the contract is derived rather than assumed, and the asymmetry in the payoff functions of lenders and borrowers, that could lead to credit rationing in equilibrium, is not a consequence of adverse selection and moral hazard.

For Williamson, bankruptcy can be seen as a state in which the bank has to consume its resources in order to observe how the individual is behaving, and this monitoring cost is interpreted as a "cost of failure".

Monitoring can occur only in the default state, thus it is an *ex-post* decision, and with a certain probability that is determined endogenously.

The fact the monitoring is costly, together with the risk neutrality of the agents, lead to debt contracts as the optimal agreement between lenders and borrowers. This, in turn, leads to payoff functions of these agents being asymmetric, and consequently allows for credit rationing to exist in equilibrium, because, due to this asymmetry, adjustments in the loan interest rate may not be efficient in clearing the market, resulting in some borrowers that are rationed in equilibrium.

Furthermore, as the loan interest rate increases, the expected return to the lender increases, but it also affects the probability that the borrower defaults which increases as well, thus the

expected cost of monitoring to the lender increases. Thus, in the end, in the event of default, returns for lenders could decrease.

In the model proposed by Williamson, there are infinite series of agents that include:

$$\alpha = \Pr\,[agent\ is\ a\ lender]$$

$$1 - \alpha = \Pr[agent\ is\ an\ investor],$$

where $\alpha > \frac{1}{2}$ i.e. the demand for credit can be potentially satisfied.

Then, only two periods of time are considered: the first in which planning takes place, and the second that is the actual consumption phase.

Here, at the beginning of the first period, a lender is indifferent in deciding what to do with the unit of money delivered to him, by choosing among the following two options:

1. to invest in a safe project that will have a certain return t_i in the second period;
2. to lend the same amount of money to a borrower who will invest in another project with unknown return $\widetilde{w_i}$. The level of risk is not known by the lender in this case. It can happen that the borrower invests in a good project and will get an unsafe but positive return in the second period, or alternatively she will get 0 profits.

The results are independent and identically distributed according to a certain probability distribution f with domain $[0, \bar{w}]$ where $\bar{w}$ is positive. The realization of the return $\widetilde{w_i}$ can only be observed by the individual himself, while others can only know the probability distribution.

If the lender wants to observe the precise performance, he has to spend on monitoring effort γ, eventually introducing a cost for him in the second period.

Thus, the features of the contract must be defined, deciding the states in which monitoring occurs and the different payments according to the presence or the absence of the monitoring costs.

Considering w^s as the signal that the borrower delivers to the lender once she knows her return in the second period, two scenarios are possible:

- monitoring occurs if $w^s \in S$, where S is a proper subset of the domain $[0, \bar{w}]$. Then the payment from the borrower to the lender will be given by the function $R(w)$, where $0 \leq R(w) \leq w$;
- monitoring does not occur if $w^s \notin S$, and the payment will be given by the function $K(w)$, where $0 \leq K(w^s) \leq w$.

In this second case, the borrower will minimize $K(w)$ for the payment, obtaining a constant payment $\bar{R}$. While, in the first case, when the lender will spend in monitoring, then the payment must be accordingly incentivized, so that $R(w) < \bar{R}$ when the monitoring occurs, and $R(w) \geq \bar{R}$ when it does not (assuming that when the borrower is indifferent between being monitored or not, she will choose to not be monitored). These conditions give place respectively to set A and B, depending on the value of w. The greater $\bar{R}$ the higher the probability of bankruptcy from the borrower, that in turn is translated with higher monitoring costs from the lender.

Therefore, the optimal contract will be such that the borrower's expected utility is maximized while giving to the lender's expected utility a value equal or greater than the market interest rate r. Individuals will only maximize consumption since they do not bear any costs, while lenders will take into account the monitoring efforts in maximizing the payoff.

$$max_{\{R(w),\bar{R}\}}K\left\{\int_A [w - R(w)]f(w)dw + \int_B [w - \bar{R}]f(w)dw\right\}$$

$$s.t. \int_A [R(w) - \gamma]f(w)dw + \int_B \bar{R} f(w)dw \geq r$$

Where γ is the cost of bankruptcy. This problem leads to the conclusion that the optimal payment schedule is $R(w) = w$, thus it is independent from $\bar{R}$. This means that the optimal contract is given by the minimization of the expected monitoring cost of the bank. In fact, the object function can be rewritten as:

$$\int_A [w - R(w)]f(w)dw + \int_B [w - \bar{R}]f(w)dw =$$

$$= \int_A wf(w)dw - \int_A R(w)f(w)dw + \int_B wf(w)dw - \int_B \bar{R} f(w)dw =$$

$$= \int_A wf(w)dw + \int_B wf(w)dw - \left[\int_A R(w)f(w)dw + \int_B \bar{R} f(w)dw\right] =$$

$$= E(w) - \left[\int_A R(w)f(w)dw - \int_A \gamma f(w)dw + \int_A \gamma f(w)dw + \int_B \bar{R} f(w)dw\right] =$$

$$= E(w) - \left[r + \int_A \gamma f(w)dw\right] = E(w) - r - \gamma \int_A f(w)dw$$

Where $E(w)$ represents the expected return in the whole domain and the following identities are derived:

- from the constrain it is derived: $\int_A R(w)f(w)dw - \int_A \gamma f(w)dw + \int_B \bar{R} f(w)dw = r$

- then, $\int_A f(w)dw = \Pr[R(w) < \bar{R}]$

Since the optimal payment schedule is $R(w) = w$ and it is independent from $\bar{R}$, the optimal contract is a debt contract in which monitoring occurs in any case, either the borrower pays the fixed amount $\bar{R}$ in period 1 or she defaults, and the lender receives the entire return w. Furthermore, the expected utility functions are obtained respectively for the lender and the borrower as a function of $\bar{R}$:

$$\pi_l(\bar{R}) = \int_0^{\bar{R}} wf(w)dw + \bar{R}[1 - F(\bar{R})] - \gamma F(\bar{R})$$

$$\pi_b(\bar{R}) = \int_{\bar{R}}^{\bar{w}} wf(w)dw - \bar{R}[1 - F(\bar{R})]$$

Where *f()* is the density distribution while *F()* is the probability distribution function. This asymmetry in the two payoff functions could lead to an equilibrium credit rationing.

Indeed, the expected utility of each lender is a concave function of $\bar{R}$, assuming that for $\bar{R} \in [0, \bar{w}]$ it holds that $f(\bar{R}) + \gamma f'(\bar{R}) > 0$ which avoids the multiplicity of equilibria, and it reaches a maximum for some $\bar{R} \in [0, \bar{w})$, since $f(\bar{R}) > 0$ and therefore $\pi_l'(\bar{w}) < 0$.

The expected utility of the borrower is instead monotone decreasing in $\bar{R}$.

This different characteristics in the payoff functions can lead to credit rationing at equilibrium, in particular the concavity of the lender's expected utility function, as for Stiglitz and Weiss (1981).

Williamson defines equilibrium the set of:

- loan interest rate $(\bar{R}^*)$ which solves:
$$max_{\bar{R}} \, K \int_{\bar{R}}^{\bar{w}} (w - \bar{R})f(w)dw \ \ subject \ to \ \pi_l(\bar{R}) \geq r^*$$
- where *r** is the market interest rate at equilibrium
- aggregate loan quantity (*q**) satisfying:
$$q^* = \alpha \int_{\underline{t}}^{R^*} h(t)dt = \alpha H(r^*)$$

    Where *h()* is a probability density function (positive on $(\underline{t}, \bar{t}]$ and 0 otherwise) and *H()* is the corresponding distribution function, while *t* is the certain return for the lender if she invests in a safe project (no borrowing).

    Then, it is also satisfied one of the following:

    a) $q^* = (1 - \alpha)K$
    b) $q^* < (1 - \alpha)K \ and \ 1 - F(\bar{R}^*) - \gamma f(\bar{R}^*) = 0$

Indeed, Williamson was able to show the existence of two types of equilibria which involve credit rationing or not. Indeed, the first type provides for the allocation of all the projects to the respective lenders, that is naturally cleared since all borrowers are financed. This means that the equilibrium loan quantity q^* is:

$$q^* = (1 - \alpha)K$$

Where α is the fraction of lenders in the population and K is the number of lenders.

The second type, instead, includes the possibility that some borrowers do not receive the fund because they cannot borrow at a higher interest rate than the market one, since it would be a signal for the lenders that will understand the higher propensity to risk and thus the greater monitoring costs to suffer. In formulae, the following relations are satisfied:

$$\begin{cases} q^* < (1 - \alpha)K \\ 1 - F(\bar{R}^*) - \gamma f(\bar{R}^*) = 0 \end{cases}$$

Where $\bar{R}^*$ is the equilibrium loan interest rate and the second equation is obtained from the first order condition of the expected payoff of the lender with respect to $\bar{R}$ in the equilibrium point $\bar{R}^*$:

$$\pi_l'(\bar{R}^*) = 0$$

In particular, in this type of equilibrium, there are lenders with $t_i \leq r^*$ which will find convenient to lend to entrepreneurs, and lenders with $t_i > r^*$ which instead will invest in their certain return projects.

All the borrowers offer the same debt contracts with a promised payment of $\bar{R}^*$ in period 0, and lenders with $t_i < r^* = \pi_l(\bar{R})$, thus those who are willing to accept one of these contracts, will choose randomly an entrepreneur, which does have a probability of $\frac{q^*}{1-\alpha} < 1$ of receiving a loan, and it is the same for all of them.

Then, when all lenders have made this selection, if an entrepreneur is chosen by one or more lenders, but this is not sufficient to completely fund her project, these lenders will select another borrower at random, and this process continues until the allocation of all the lenders to the entrepreneurs is completed and all the projects are fully funded.

Thus, it is possible that some entrepreneurs are excluded from funding, because they are not able to bid loans that can attract lenders, since the previous equations are satisfied and $\bar{R}^*$ is the loan interest rate maximizing a lender's expected return from a loan contract. If a borrower offers to pay a higher loan interest rate, she will signal a higher probability of default, thus greater expected monitoring costs for the lender, as said, thar is greater than the expected positive variation in the interest income.

3. Collaterals as remedies

A key to reading can be that the main purpose of the banks is to obtain more information about the propensity to risk of its potential customers, in order to anticipate their opportunistic behavior. This can help in mitigating the information asymmetries and at the same moment can lead to reduce the credit rationing.

Thus, the lender can implement several remedies that can help in discriminating the potential borrowers. One of them is to present different kinds of loan contract that can help in distinguishing the borrowers, who will choose the specific type based on their characteristics (Bester, 1985, screening by collateral). More specifically, banks can develop different types of loan contracts that include different covenants such as collaterals requirements.

Indeed, usually banks require collaterals, that are by definition "properties pledged by a borrower to protect the interests of the lender, or other forms of guarantees identified in the real or financial assets of the borrower, on which the banks can claim in the event of non-payment of the debt at maturity date".

However, it should by highlighted that guarantees are only an additional precautionary measure whenever a loan is guaranteed, but they do not increase the probability of repayment. Indeed, the possibility of guaranteeing an asset often allows for a reduction in credit rationing, as many more borrowers can obtain the loan, even if the risk of default is still considerable. This, of course, can only happen when borrowers have assets to offer as collateral.

Therefore, collaterals are a valid instrument used in loan contracts, with which lenders have the possibility to mitigate the *ex-ante* and the *ex-post* information asymmetries, respectively anticipating the quality of the borrowers and limiting their opportunistic behavior after granting the loan. This can be translated in the mitigation of the adverse selection and moral hazard problems.

Indeed, collaterals can convey a lot of information from borrowers to lenders that in turn can compensate the limited access to the more traditional credit rating system that is usually costly. This allows a more facilitated access to credit for small and medium enterprises that are not rated.

Therefore, according to what has been said so far, since the information asymmetries were defined as the main causes for credit rationing on supply side, it is expected that these covenants can lead to a reduction in the credit rationing.

The reduction in the information asymmetry makes the lender to select more accurately the interest rate, because it knows more about the risk of losses on the loan thanks to the value of the collateral which covers, totally or partially the repayment of the debt in case of default of the financed project.

The lender knows *a priori* the evolution of the value of the collateral during the period of the loan and is not forced to estimate the solvency of the enterprise, which of course is harder to define from the point of view of the lender.

In "Screening vs. Rationing in Credit Markets with Imperfect Information" (1985), Bester states that "no credit rationing will occur in equilibrium if banks compete by choosing [simultaneously] collateral requirements and the rate of interest to screen investors' riskiness". Within this context, borrowers are incentivized to choose a type of contract according to the risk of their projects.

In his further studies Bester strengthens the concept of collateral as a valid instrument for disincentivizing opportunistic behavior and thus to mitigate the information asymmetries, due to the fact that outside collateral can impact on borrowers' losses in case of default. His model reveals in the end a negative relationship between the amount of collateral and the default risk of the related project. Indeed, the use of collaterals in a loan contract makes the borrower to choose the less-risky project when he has at disposal a pool of different projects to be financed, each of them with a different degree of risk. On the other hand, to mitigate the adverse selection problem, the lender can screen the customers, based on their risk, by offering different loan contracts that will attract separately each category of borrowers. The model predicts this negative relationship between the collateral and the interest rate and in particular says that low-risk borrowers will select loan contracts where the collateral is high and the interest rate is as low as possible, while high-risk borrowers will behave in the opposite way.

These conclusions do have an explanation: if the borrower believes that the risk is sufficiently low, he is willing to pledge a higher amount of collateral, since it is likely it will not be implemented. On the other hand, with collateral he could put an economic limit to its liability is case of default.

Moreover, as said, collateral can mitigate moral hazard once the loan is granted, since the use of collateral implies the increase in the default costs for the borrower, who is now disincentivized from picking riskier projects when he has to balance the expected profits with the failure costs.

Indeed, it is important to remind that there is asymmetry in the payoff structures of lenders and borrowers and thus in the incentives of the two parties: the first depends only on

interest rate, with the condition that the financed project must be successful; in facts, in case of default this means a loss for the lender. Instead, for the borrower, profits are generated only if the project is successful, but a limited liable borrower do not incur in financial loss if it fails: they do not have any downside in this situation.

This means that risky borrowers would accept high interest rates while low-risk borrowers will be crowded-out with those level of interest rate, since they are "honest" and would not be able to repay the debt. This is in line with the statement that says that high interest rate reduces the quality of borrowers.

Thus, being able of sorting the borrowers applying collaterals requirements also reduce this asymmetry in the pay-offs since the borrowers would incur into some losses if going bankrupt.

To recap, collateral is useful in reducing the opportunity of moral hazard from the customers because it makes riskier project less attractive to the borrowers due to their increased costs, and this aligns the incentives of the two parties at stake.

Finally, the improved sorting effect that collateral can have can be seen as a signal of borrowers' creditworthiness. Assuming a positive relationship between the amount of collateral and the creditworthiness, credit rationing would occur only in case of a collateral exceeding borrower's wealth.

4. From theory to empirical data

4.1. Determinants for Demand and Supply of credit: a focus

It is interesting to develop a deepening in the determinants both of demand and supply, considering different empirical analysis together with theoretical studies that were developed during the years, for better understanding what mostly affect availability of credit, directly or indirectly.

From a microeconomic perspective, the availability of credit can be determined by a very wide set of conditions and characteristics of the lenders. In particular the analysis will focus on the relationship between banks and SMEs and on the dimensions and organization of the banks, which are factors that, according to the studies made on these determinants, can affect credit rationing in a direct or indirect way.

Before analyzing the theories, since it has been said that information among the parties is the key element, it is important to define the difference between "hard information" and "soft information", as they are commonly defined when talking about debt contracts (Liberti and Petersen, 2019).

Hard information is the one that can be expressed through quantitative data, such as balance indexes, yields of shares, compliance to payments and so on. Thus it is a codified type of information and it is objective. Its access is available from all the parties on the market, even for external agents, i.e. other banks different from the one that is in relation with the SME at stake. Then, it can be easily collect, stored and shared internally or publicy, without geographic or temporal borders. Indeed, since its objectivity, the interpretation of the information is not related to the bank who has collected it. However it loses in flexibility, since the decisions made based on this type of information is quite categorical.

On the other hand, soft information is often based on qualitative variables such as opinions, soft skills of the entrepreneur, future expectations and context conditions, thus it is hard to be codified, and can be subject to different interpretations due to its subjectivity. Indeed this type of information is collected through a personal and direct contact between the lender and the borrower, taking into account the context of the deal. This means that the individuals and the context are part of the information itself, and this makes hard to codify and share it. Thus, it cannot be easily transmitted and verified externally over the years. Even within the bank itself, sharing could be difficult, when for instance the "distance" between the branch and the headquarter is significant.

Furthermore, when uncertainty in economy is generally high, hard information rapidly lose its reliability, thus having at disposal a pool of soft information is a comparative advantage in order to make decisions.

4.1.1. Relationship banking

Soft information is at the foundation of the "relationship banking" which is characterized by durable and stable relationships between firms and banks (Berger and Udell, 1995). According to Boot (2000), relationship banking arises when the bank evaluates that it is convenient, in a long-term perspective, to invest resources for acquiring reserved information about the borrower.

The longer the relationship, the more it is possible to enrich the soft information to collect over time, since it is possible, for instance, to see the evolution in the conditions and the behavior of the client and to keep up to date the information. Thus, it is expected that a longer duration should decrease the information asymmetry between the parties.

Indeed, many studies on this phenomenon were aimed at establishing a correlation between the duration of the relationships and the availability of credit. A survey of these studies is summarized in Table 1.

Table 1 - Relationship banking and impact on credit availability

Study	Sample	Expected impact of duration on availability of credit	Comments
Cole (1998) – "*The Importance of Relationships to the Availability of Credit*", Journal of Banking and Finance.	US SMEs	After the first year there is no impact of the duration, however relationship banking has positive impact on availability of credit.	A lender is more likely to grant credit to a borrower with which there is already a banking relationship, however the length of the duration is not important.
Berger and Udell (1995) – "*Relationship Lending and Lines of Credit in Small Firm Finance*", The Journal of Business.	US SMEs	Positive	Borrowers that established longer banking relationships are more likely to pay lower interest rates thanks to lower costs of credit and are less likely to pledge collateral.

Petersen and Rajan (1994) – "*The Benefits of Lending Relationships: Evidence from Small Business Data*", Journal of Finance.	US SMEs	Positive	A durable relationship with an institutional creditor makes a firm more likely to see an increase in the availability of financing.
Harhoff and Körting (1998) – "*Lending Relationships in Germany: Empirical Results from Survey Data*", CEPR Discussion Paper No. 1917.	German SMEs	Positive	Relationship banking can have positive effects on the availability of credit and negative on collateralization.
Lehmann and Neuberger (2001) – "*Do Lending Relationships Matter? Evidence from Bank Survey Data in Germany*", Journal of Economic Behavior and Organization.	German SMEs	Positive	Relationship banking and interactional variables measuring the social relations between lender and borrower negatively affects loan prices, collateral requirements and credit rationing.
Angelini *et al.* (1998) – "*Availability and cost of credit for small businesses: Customer relationships and credit cooperatives*", Journal of Banking & Finance.	Italian SMEs	Negative only for the short-term (3 years)	With larger banks, contract interest rates are likely to increase with the length of the duration, implying that the bank is able to capture monopoly rents through hold-up. Then, when the duration of the relationship between the SME and its main bank is less than 3 years, the probability of being liquidity constrained seems to increase for the SME.

Furthermore, relationship banking carries some advantages for the banks and, in turn for, the SMEs. Indeed, it allows the transmission of the soft information that can reduce the *ex-ante* and *ex-post* asymmetries between lenders and borrowers. Consequently, the bank can better assess the risk profile of the debtor, thus being able to better predict cash flows of the project and the expected cost for the financing. It can finally lead to an increase in the availability of credit, decreasing the probability of rationing (Petersen and Rajan, 1994). Indeed, screening and monitoring costs for the bank can decrease over time thanks to the collected soft information, followed by a decrease in the credit risk, and by a decrease in the probability of pledging collateral (Berger and Udell, 1995).

In turn, for firms this imply an easier access to credit, fewer requests for guarantees and an attest of quality as a debtor. In addition, when the firm encounters financial difficulties, it is more likely that the related bank provides liquidity insurance, when it is less risky for the bank to invest in the project, rather than dealing with a firm that goes bankrupt (Elsas and Krahnen, 1999).

However, some drawbacks are present for the SMEs, due to the fact that the bank holds the information about the firm, that is related to their strict relationship, and it is hard to be transmittable to third parties. Thus, the so-called "hold-up" problem can arise.

The issue is about the bank that takes an advantage on the firm, leveraging its dominant position. The information collected by the bank does put the bank itself in a situation of greater bargaining power, since it is the only that can accurately assess the credit risk of that customer and grant the loan without any additional requirements such as collateral or securities. Thus, in the end, the bank can exploit this superior condition with respect to competitors, requiring to the firm higher interest rates or any other more onerous conditions when renewing the loans (Elsas and Krahnen, 1999).

4.1.2. Multiple banking relationship

To escape from the hold-up problem and the informational rent of a single bank, it may be worthwhile to establish multiple banking relationships, from the firms' point of view, in order to stimulate competition among banks and obtain a more efficient interest rate *ex-post*. However, it is important that the informational rent is not driven to zero, i.e. the banks at stake should be able to retrieve the sufficient soft information about the SME (Baglioni, 2002).

Increasing competition among banks can consequently lead the firm to increase its bargaining power, since it can always have the opportunities to choose among a pool of financial intermediaries.

Then, by entering multiple banking relationships, firms may minimize the risk of being rationed especially in countries where the fragility of the bank industry is low, i.e. low liquidity problems for banks and where adverse selection is an issue (Detragiache *et al.*, 2000). In the same way, on average firms are more likely to maintain multiple banking relationships in countries where the judicial systems are inefficient and the enforcement of creditor rights is weak (Ongena and Smith, 2000).

Ongena and Smith (2000) showed how among the European countries this phenomenon is widely spread and at the same time varies in its dimensions across the countries. From their study it came out that historically only the 15% of countries relies more on unique relationship banking, and those are located mostly in the North Europe. The average number of relationships of Italy is the highest, with 15.2 banking relationship per firm on average.

These results seem to be in line with the trend highlighted by Burlon *et al*. (2016) with respect to Italian SMEs. In Figure 10 it is shown that, following the indicator adopted in their analysis, the intensity of credit rationing is higher for single-lender firms.
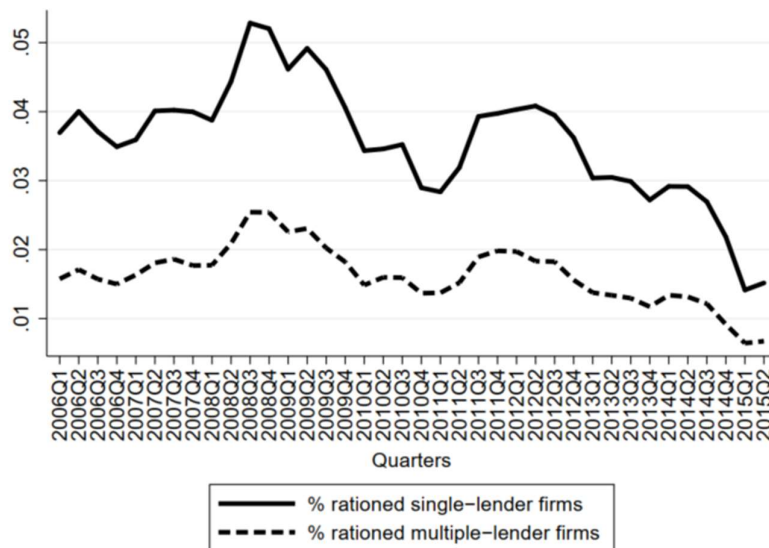

Figure 10 - Credit rationing indicators: single vs multiple lenders firms in Italy. Source: Burlon L., Fantino D., Nobili A., Sene G. (2016), Banca d'Italia Working Papers N. 1058.

On the other hand, the drawbacks arise, for instance, when the firm finds itself in financial distress, and encounters difficulties in retrieving funds, due to the bad payment prospectus. The absence of a close and lasting relationship with an intermediary could aggravate the problems, since there is no bank willing to invest in such a risky project.

Petersen and Rajan (1994) found that in USA, small and young firms are less likely to be rationed and more likely to receive better lending rates when they establish relationships with only one bank and work in a concentrated credit market. Furthermore, for them competition among banks is detrimental for small and young firms.

Other drawbacks that induce banks to limit the supply of credit are spotted by empirical results. In Table 2 are reported some of the results obtained by the studies on this phenomenon.

Study	Sample	Expected impact of number of bank relationships on availability of credit	Comments
Cole (1998) – "*The Importance of Relationships to the Availability of Credit*", Journal of Banking and Finance.	US SMEs	Negative	A lender is less likely to grant credit to firms that established multiple banking relationships.
Petersen and Rajan (1994) – "*The Benefits of Lending Relationships: Evidence from Small Business Data*", Journal of Finance.	US SMEs	Negative	A borrower that establishes multiple banking relationships is more likely to pay higher interest rates and the availability of credit decreases.
Harhoff and Körting (1998) – "*Lending Relationships in Germany: Empirical Results from Survey Data*", CEPR Discussion Paper No. 1917.	German SMEs	Negative	Multiple banking relationships makes private information about SMEs less valuable, and banks are less incentivized in monitoring borrowers' behavior or to require collateral requirements, which decrease with increased number of banking relationships.
Angelini *et al.* (1998) – "*Availability and cost of credit for small businesses: Customer relationships and credit cooperatives*", Journal of Banking & Finance.	Italian SMEs	Negative	For a given level of indebtedness, the lower the number of related banks, the less the probability of being constrained in liquidity. The negative effect of having multiple banking relationships is related to the fact that the private information about SMEs is less valuable from the point of view of the bank, when the firm has multiple sources of financing.

4.1.3. Bank organizational structure

Another determinant for availability of credit is identified in the organizational structure of the bank. In particular, from the studies of Del Prete, Pagnini, Rossi and Vacca (2013) it results that larger banks are more likely to supply credit to larger companies, while small

and local banks focus on smaller SMEs. In the same way, the weight of the rating method as a screening tool for SMEs decreases as the size of the bank decreases.

This is explained by the fact that larger banks cannot exploit scale economies by applying standardizes screening mechanisms when dealing with SMEs, which are characterized by their opacity in information and by their requests for loans of limited value in terms of money.

These can represent obstacles for larger bank, which, in order to make efficient the relationships with SMEs, may orient themselves towards the collection of soft information.

Then, to overcome the transmission problem of this type of information, a solution may be the decentralization of the bank's organization, that gives more decision-making autonomy to branch managers (Del Prete *et al.*, 2013). However, it is difficult to obtain an optimal degree of decentralization to exploit the soft information without losing in efficiency and often there is a trade-off between reducing the distance between lenders and borrowers and reducing the one within the bank itself, i.e. between branch and headquarter managers.

The first leads to reduce information asymmetries between parties, simplifying the collection of soft information, the second allows the alignment of incentives between local managers and headquarter one. A greater distance within the banks' agents could lead to the prevailing of personal interests rather than the ones of the bank itself. For avoiding this risk, the adoption of rating and other quantitative methods can reduce the internal moral hazard.

On the other side, local banks can rely on direct contact with the borrowers, which allows to collect a lot of soft information during the time of the relationship, which in turn allow to reduce the information asymmetries, even with the micro-companies that are typically characterized by information opacity, making easier the access to credit even for them. Indeed, the acquisition of soft information is facilitated by the organizational structure and by the proximity to the reference territory.

Another contribution to this phenomenon is given by the theory of Berger, Udell and Rosen (2006) which suggests that different sized banks have different approaches in evaluating the projects to be funded: larger banks rely on hard information, while small banks rely on soft information.

This means that the former relies on formal information derived from credit rating, that can be standardized and can be objectively assessed, such as balance sheet, income statement, performance indicator and so on. This enables the ability to screen borrowers *ex-ante* and to monitor their behavior during the loan relationship.

On the other hand, small banks rely more on those information that are derived from a direct contact with the borrower itself, which is more difficult to be standardized, making harder to perform screening actions. Agency problems can arise, and to solve them bank organizational structure is crucial.

In particular, when the organization of a bank is structured with few managerial layers, i.e. the size of the bank is small, agency costs decrease. On the other hand, larger bank are characterized by greater coordination costs, since they are often structured on a multi-layer organization that may lead to credit policies that are based on hard information, thus that are very standardized. Then, another difference is given by the proximity to the client, i.e. the potential borrower, which is higher for small banks that in this way face minor problems about the transmission of the soft information, that are reduced also by the fewer layers to be reached (Berger and Udell, 2002).

4.1.4. Screening and monitoring incentives

The presented determinants of supply can also affect the incentives for banks to screen and monitor SMEs, which can be considered one of the characteristics of the bank that affects credit availability. According to Agostino *et al*. (2009), by performing screening and monitoring, banks can better assess the riskiness of borrowers and consequently the interest rate to apply, reducing the rationing of credit.

In Table 3 are summarized the determinants identified from theory that affects the incentives on screening and monitoring and, in turn, its expected relation with credit rationing.

Table 3 - Determinants on screening and monitoring actions and expected relationship with Credit Rationing.

Study	Determinant	Expected relationship with CR	Comments
Thakor (1996) – "*Capital Requirements, Monetary Policy, and Aggregate Bank Lending: Theory and Empirical Evidence*", The Journal of Finance.	Multiple banking relationships	Positive	It may disincentivize screening and monitoring actions, because of the balance between costs and gains in retrieving information could not be worth enough for the single bank, which does bear the full cost while sharing the benefits. Thus, the lower the incentives, the higher credit rationing.

Detragiache *et al.* (2000) – "*Multiple Versus Single Banking Relationships*", Journal of Finance.	Multiple banking relationships	Negative	When refinancing a project and the adverse selection is strong, it decreases the probability of being credit rationed and lowers the interest rate, thus it is beneficial to firms.
Carletti *et al.* (2007) – "*Multiple-Bank Lending: Diversification and Free-Riding in Monitoring*", Journal of Financial Intermediation.	Multiple banking relationships	Negative	When agency costs are high enough, diversification in banking relationship incentivizes monitoring, thus credit rationing should decrease.
Beck *et al.* (2005) – "*Financial and Legal Constraints to Firm Growth: Does Firm Size Matter?*", Journal of Finance.	Banking competition	Negative	Banking competition stimulates the availability of credit and leads to a "social-optimum", like in the traditional view of perfect competition.
Hauswald and Marquez (2006) – "*Competition and Strategic Information Acquisition in Credit Markets*", Review of Financial Studies.	Banking competition	Positive	Competition in local markets can induce banks to avoid investments for acquiring information on SMEs, due to the sharing benefits problem and the overall less profitability. This implies a lower quality of loans, higher credit risk, and in turn credit rationing is likely to increase.
Berger and Udell (2006) – "*A More Complete Conceptual Framework for SME Finance*", Journal of Banking and Finance.	Size of banks	Not clear-cut	The size of the bank has effects in incentivizing screening and monitoring: larger banks can easily perform standardized screening actions, while smaller banks can rely on more accurate information thanks to relationship banking. Therefore, predictions on how bank size affects credit rationing are difficult.
Bester (1985) – "*Screening vs. Rationing in Credit Markets with Imperfect Information*", The American Economic Review.	Collateral requirement	Negative	The theory says that it can act as a self-selection mechanism and eliminate credit rationing.

Manove *et al*. (2001) – "*Collateral versus Project Screening: A Model of Lazy Banks*", The RAND Journal of Economics.	Collateral requirement	Positive	Collateral requirements could disincentivize banks from screening and monitoring in an accurate way borrower's projects, ending in the end to fund "bad projects" and increase credit rationing in time.

From the surveyed literature it comes out some contrasting results. The first regards competition in the lending market, which on the one hand can positively affect credit supply, until the competition gets too heavy, causing disincentivizing effects on screening and monitoring actions, that, in the end, may limit credit to SMEs. Then, theory says that collateral requirements serve for resolving credit rationing, however the behavior of banks seems to lead to less attention in screening and monitoring actions that in the end are detrimental for credit availability. Indeed, the downside of their usage could be that of disincentivizing banks from screening and monitoring sufficiently accurately the borrowers' projects, because they feel somehow protected by the provided guarantees.

Furthermore, the costs of retrieving information are crucial: larger banks can exploit scale economies, thus reducing costs and having greater availability of money, while smaller and local banks can rely on deeper relationships with their clients that break down the information asymmetries. For these reasons it is not possible to accurately predicts the effects bank sizing on credit rationing.

The empirical model proposed by Agostino *et al*. (2009), aimed at verifying the statistically significant determinants for Italian SMEs, suggested that the average size of banks and the establishment of multiple banking relationships are statistically significant in influencing credit rationing, while, on the other hand, other potential determinants, such as local banking competition and the availability of collaterals from firms, are never significant.

4.2. Evidence from empirical data

The phenomena and the concerns that the theory described has highlighted so far are supported by empirical evidence. The focus is on the small and medium enterprises (SMEs) in the Euro area, with a particular attention to the situation of Italy.

Indeed, empirical data reports for the countries of Euro area an overall 18% of SMEs that are credit constrained in the reporting period of the SAFE (Survey on the Access to Finance of Enterprises) survey of 2019 delivered by the European Central Bank, prior to the advent of Covid-19 pandemic.

Bank loans is the main source of external financing for 46% of SMEs, however only 24% did apply for a bank loan in the reference period. A percentage of 4% declared to have not apply for a loan because of the fear of rejection.

Remaining at the European level, the 7% of the applicant SMEs have seen their request denied, and in addition to this, for those who applied, the 10% received a smaller amount than what desired, while the 1% declined the loan offer due to the unaffordable costs. This is translated in an important percentage value of 18% of SMEs at European level that were fully or partially rationed during 2019. However, despite the relevant percentages, it can be seen from Figure 11 a decreasing trend over the past decade.
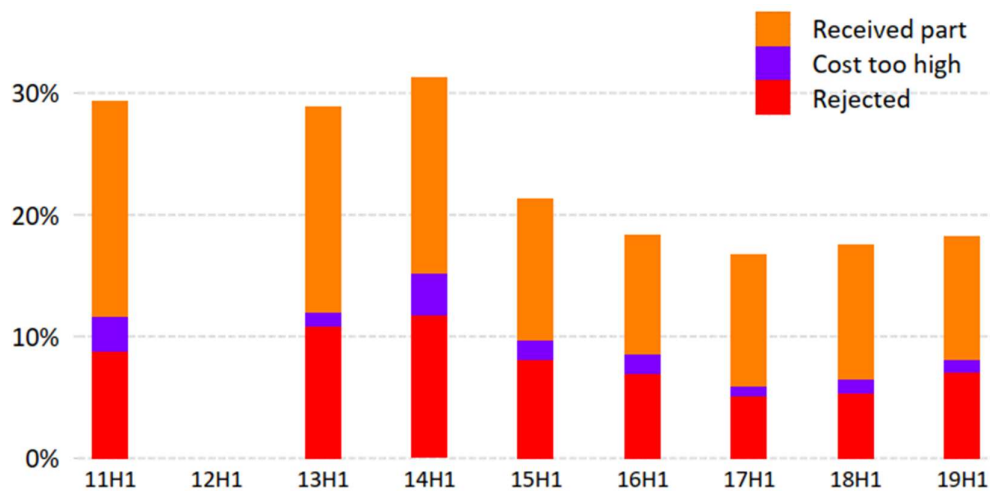
Figure 11 - Bank loans application from SAFE surveys of the first semester of each year. Source: European Commission SAFE results for April – September 2019.

Focusing on Italy, it does emerge from the survey that credit access is the main concern for only the 9% of the SMEs, although it is above the European average of 7%. However, as it possible to see from Figure 12, this is continuously becoming a minor problem for SMEs, but these numbers should be read very carefully, it is not an obvious implication that credit rationing is decreasing, because it could mean that the problem is still hugely present, but there are other problems that arises with greater force (e.g. availability of skilled labor and difficulty of finding customers).
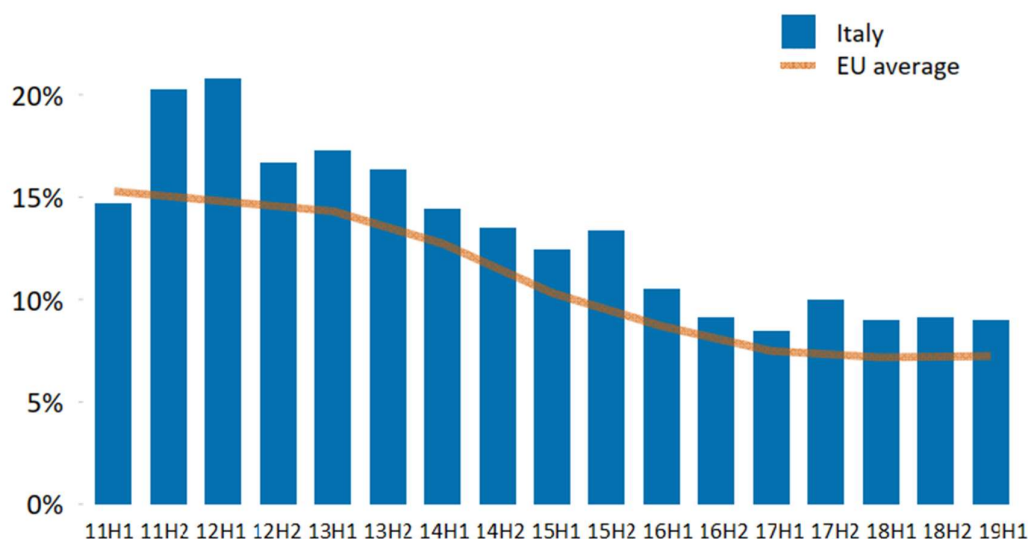
Figure 12 - Evolution of access to finance as the most important concern over the years for SMEs in Italy compared to EU. Source: European Commission SAFE results for April – September 2019.

Also in Italy bank loans represent the most utilized source of external financing for one SME out of two, slightly greater than European average (45%). However, in the reference period the 29% did apply for a bank loan while the 5% did not because they assumed they would be rejected. Both values are above the European average.

Comparing the results of the importance given to bank loans with respect to the other main countries in the Euro-area, it comes out that only Germany presents a lower value (42%) even lower than the European average, while Portugal (51%), Spain (55%) and France (63%) present higher values of SMEs utilizing bank loans as preferred source of external financing.

At Italian level, the 6% of the SMEs who applied have been rejected (less than the European average), and in addition to this, for those who received the loan, the 12% received a smaller amount than requested (greater than European average), while the 1% declined the loan offer due to the unaffordable costs (in line with European level).

Thus, an overall 19% of SMEs, that are more than the European average, were fully or partially rationed during 2019. However, also Italy is following a decreasing trend in this issue, as it is shown in Figure 13.
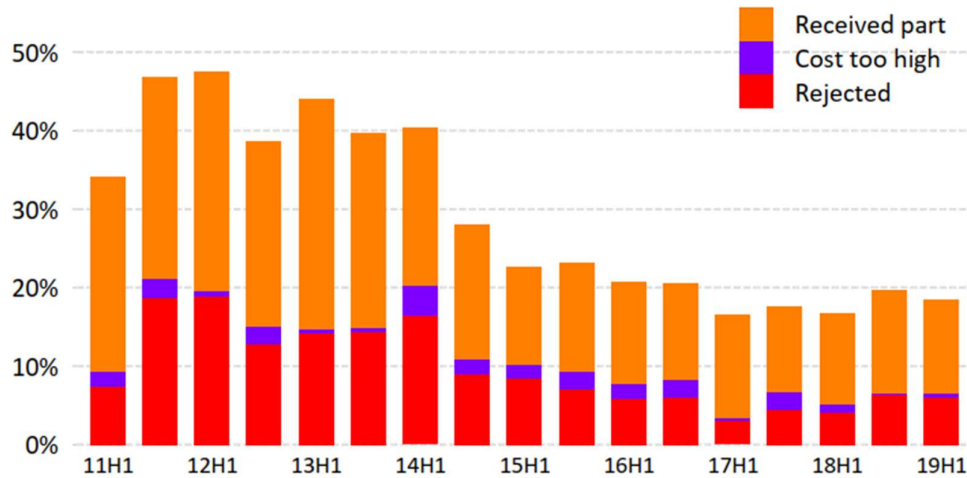
Figure 13 - Bank loans application from SAFE surveys for Italy. Source: European Commission SAFE results for April – September 2019.

Furthermore, the following graph (Figure 14) shows the improvement of turnover together with a reduction in the losses of Italian SMEs, which can be the result of the slow economic recovery in the past decade. However, the most important signal to highlight is how these positive trends are related to a positive trend in lending from the banks since they imply a higher probability of loans repayment.
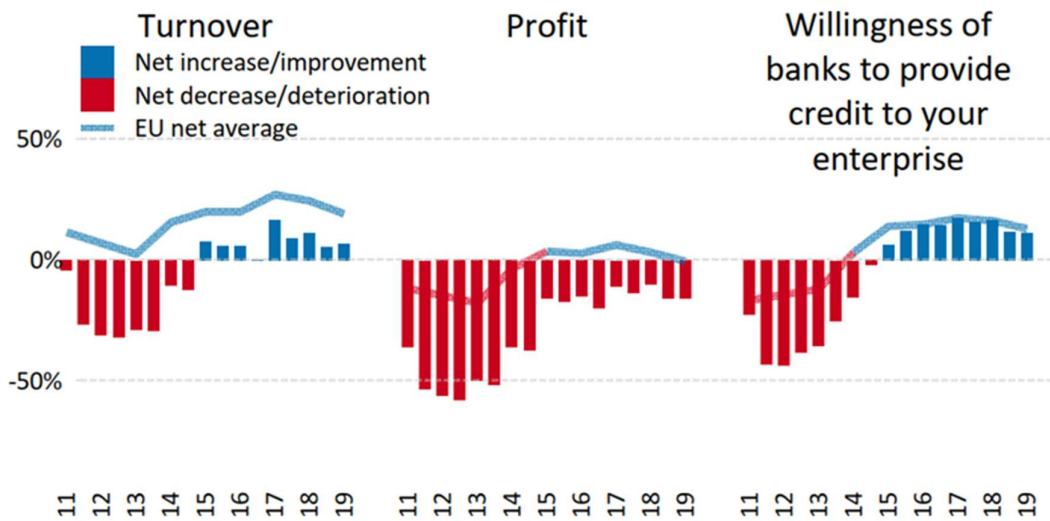
Figure 14 - Results from the reported increase/decrease about Turnover, Profit and Expectation about credit access for SMEs in Italy in the period April-September of each year. Source: European Commission SAFE results for April – September 2019.

Returning to the EU level, it is interesting to show as data of the survey confirm the relationship between credit rationing and the size of the firm. Figure 15 shows this inverse relationship: the smaller the firm, the higher the rejection rate and the partial credit rationing.

Micro-companies report a percentage of rejection of 12%, that is from two to six times higher than those of lager SMEs.

In the same way, the 6% of micro-firms reported that they did not apply for a bank loan because of the fear of rejection, while this percentage decrease to 4% and 3% as the size of the company increase. This signals out the awareness of these companies of their lower capacity in obtaining external financing with respect to larger companies.

The same proportions can be seen in the answer to the question "what is the most important problem that the company is currently facing", where the access to finance takes the 8% of respondents for firms with 1-9 employees and decreases progressively as the size increases.
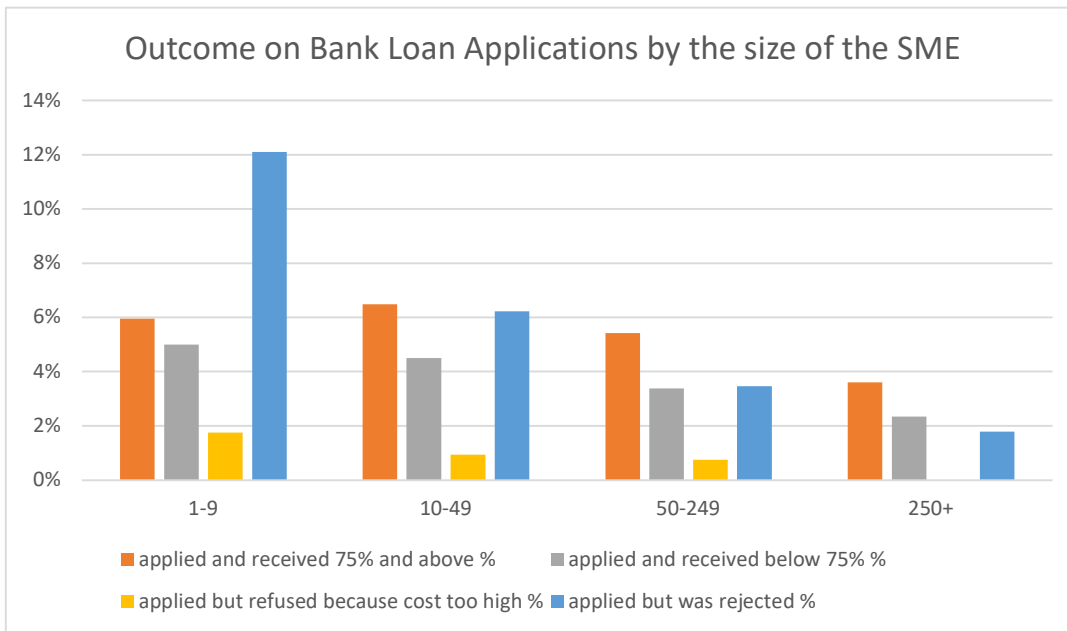

Figure 15 - Outcome of bank loan applications for SMEs divided by the number of employees at European level. Data Source: European Commission SAFE results for April – September 2019.

4.3. Evaluation of SMEs' access to finance in Europe

The availability of credit is a crucial determinant for economic recovery. As previous data has shown, there is evidence of a slow recovery in the whole system after the financial crisis that goes hand in hand with an improved access to credit from SMEs, at least prior to the Covid-19 pandemic of 2020. Italian SMEs report a positive balance of 9% that sees an increasing in the availability of bank loans, exactly in line with the average of EU, for the

period April-September 2019. Indeed, there is a relevant connection between a country's general economic performance and the successful supply of credit, that is shown also from data.

However, the information asymmetry problem and other market failures such as the high transaction costs and the lack of financial knowledge among small entrepreneurs are still hugely present.

As said, bank loans are the most used source of external financing in EU, however their availability presents several differences among the member states.

This factor is again related to the wealth of the country. Indeed in 2019 it is reported that Germany has a very low financing gap (less than 1%[1]), that is the difference between demand and supply of credit for SMEs, thus a proxy of credit rationing. It appears to be the same for countries like France and Belgium, where bank credit conditions are not hostile thus SMEs can have easily access to external financing.

The downside is represented by Greece, where the economic situation is very difficult, and this is projected to the financial problem that SMEs are facing over this decade. Here, in the last decade economic conditions have not improved as much as in Germany, thus on average SMEs are relatively riskier. Therefore, banks which suffered more the impacts of bank regulation, in order to reduce risk, have proportionally reduced credit to SMEs, more than what happened in healthy countries like Germany. This is not only the case of Greece, but also the one of Italy. These, of course, are impediments to the complete recover of the financial sector.

Other examples of the market failures bringing to limiting the access to credit are given by countries like Finland, where the problem arises especially when SMEs try to scaling-up or internationalize the business, since banks find it difficult to retrieve collaterals or securities and this is translated in a difficult assessment of the risk of financing those projects. This is because many Finnish SMEs are working in very innovative sectors, that are consequently riskier. Moreover, usually small firms, alike young firms, are treated differently from banks and investors in general, due to their elevated risk profile and their poor public information.

Loan rejection rate is much higher for small SMEs and for riskier projects that are carried out by young and innovative SMEs because of many factors such as the risk itself, the lack of stable cash-flows and tangible assets (usually start-ups mostly own intangible assets like patents and other intellectual properties) that makes difficult for the bank to assess company's reliability. This can be seen in Figure 16, where it is clear that the rejection rate

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[1] Source: fi-compass, EIF's RMA, 2019. Data are computed as a ratio between "debt gap" and "GDP" and are retrieved from Eurostat 2019 and ECB SAFE 2019.

is higher for innovative projects, and for companies up to 5 years of age (e.g. they could be startups), even if it results that for very young SMEs is more likely to be partially rationed.
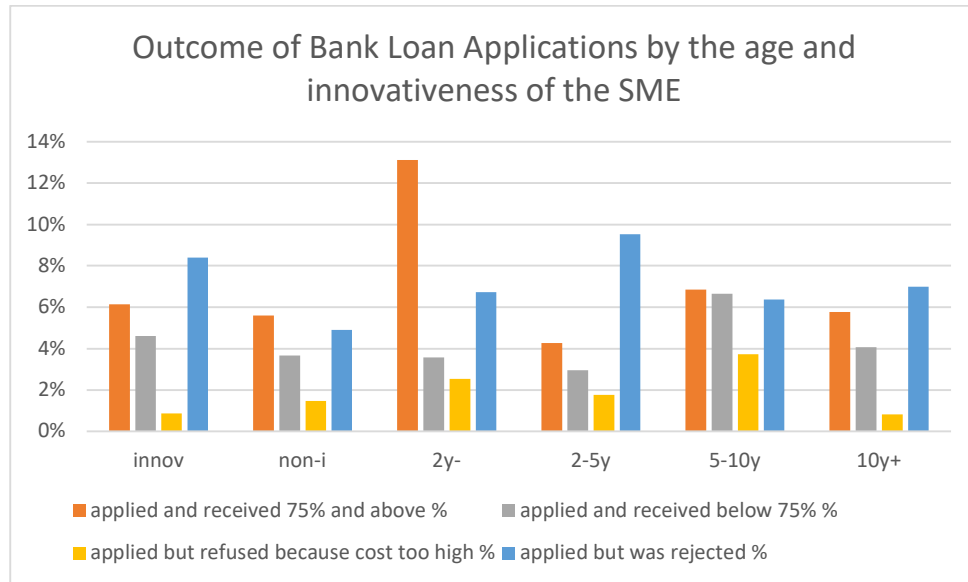

Figure 16 - Outcome of bank loan applications for SMEs divided by age and innovation characteristic at European level. Data Source: European Commission SAFE results for April – September 2019.

Another discriminant for the difficult access to credit is the concentration of banks. In countries where the presence of banks is limited to the "big" ones, such as Ireland, Netherlands and Finland where the big groups hold the vast majority of contracts with SMEs, credit rationing is hard to be overcame, since the attractiveness on one side and the information asymmetries on the other make the bank to not grant loans to small applicants, and to not make favorable financing terms to them.

On the other hand, countries like Germany, Denmark and France and Italy can rely on vast and widespread network of banks within the country which have a deeper and easiest access to local realities.

Furthermore, the rationing phenomenon can be assessed from two different perspective: the demand side and the supply side.

From the demand side it emerges that the access to external financing is often more difficult for smaller and younger SMEs, even in those countries where the financial environment is flourishing.

In particular, the main problems are faced by micro-businesses and young SMEs which usually have insufficient collaterals and suffer from information asymmetries since they are too young or too little to be sufficiently known from the lenders (Figure 17). Another

problem is the little financial knowledge from the entrepreneurs, who sometimes do not perfectly know how to move in the field of financing opportunities. Ireland is an example of this situation, since it reports this issue as one of the most important for loan rejection: small entrepreneur may encounter difficulties in presenting loan applications that fit exactly with the requirements of the bank's decision system.
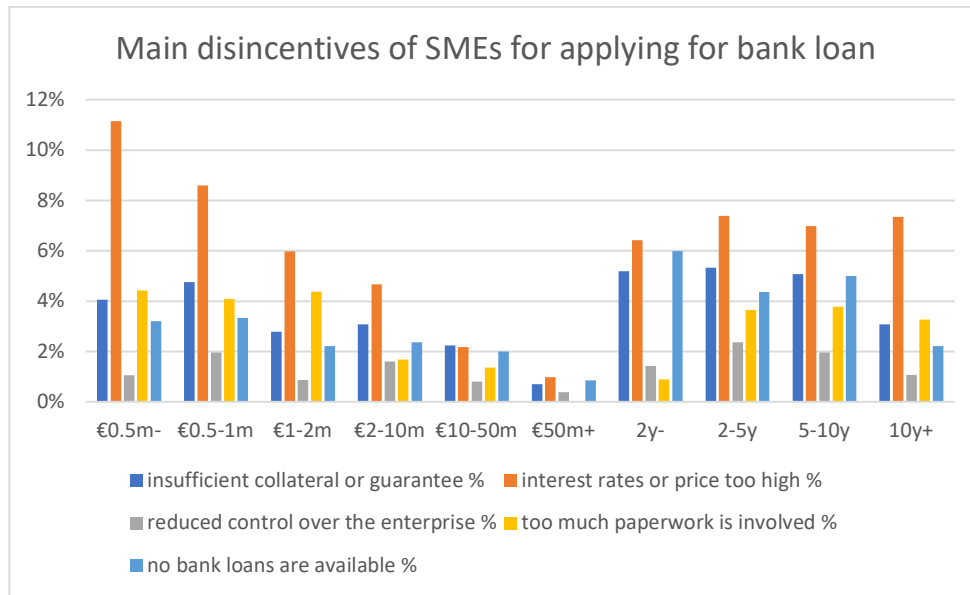

Figure 17 - Main problems faced by SMEs when avoiding to apply for bank loans. Data Source: European Commission SAFE results for April – September 2019.

Then, usually the requested amounts are not so big such that it is not convenient from the lenders point of view to supply some types of loan due to the high processing costs, which make it inefficient for the lenders (Figure 18).
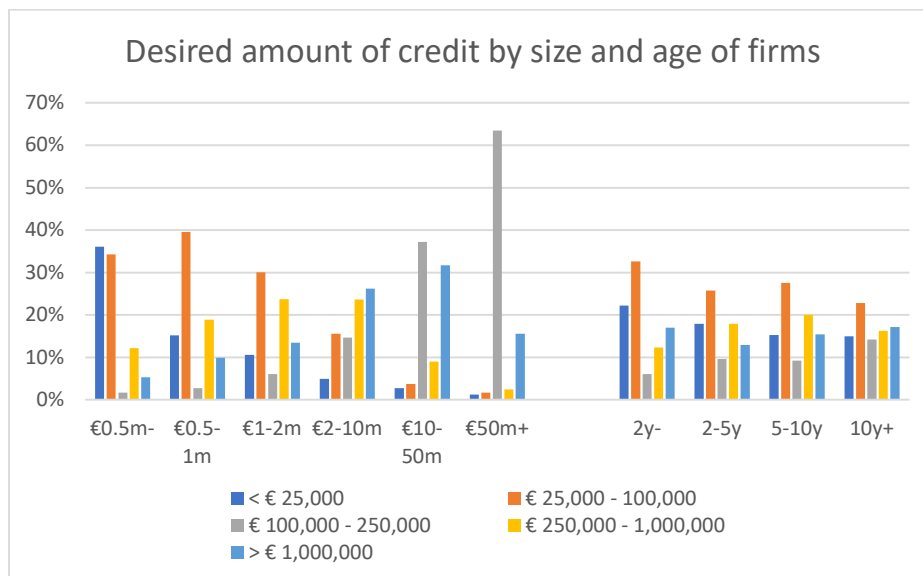
Figure 18 – Desired amount from external financing by age and turnover of SMEs. Data Source: European Commission SAFE results for April – September 2019.

Concrete examples about these issues are given by countries like Croatia, where it is reported that the interest rates are too high to be sustained by the smallest SMEs, and Netherlands where application for loans are mostly rejected due to lack of quality in financing plans and weak assets position.

From the supply side, legislation has an impact in the behavior of the banks, impacting in turn the credit access for SMEs. In the same way, in those country that are in a sensitive economic situation, banks are more reluctant in granting loan to small enterprise which cannot guarantee a solid financial position.

Regulations can impose to banks to respect some minimum equity requirements, usually defined based on the credit risk of each position in the portfolio. When the rating of the borrowers decreases for some reason, the minimum requirement for capital increases. Thus, in order to maintain the same proportions when these changes do happen, banks are forced to reduce their supply of credit towards the market.

In particular, the Third Basel Accord strengthens the requirements on the minimum capital ratios of banks and introduces liquidity and funding stability requirements.

Basel III was the result of a reviewing process of the previous directives about the prudential requirements that must be respected by the banks, and it was developed in response to the financial crisis of 2008 that revealed some of the weaknesses of financial sector.

The major risk banks face by offering loans is precisely that of credit, thus the aim of the directives is that of making the capital of banks adequate for the risks it assumes.

The agreement imposes banks' capital (Common Equity Tier 1, *CET1*) to be at least 4.5% of risk-weighted assets (*RWAs*). In other words, the ratio between the regulatory capital and the sum of the assets weighted for the risk should be always maintained above the minimum requirement, under penalty of reduction of the loans to be granted:

$$\frac{CET1}{RWAs} \geq 4.5\%$$

Then, Basel III also introduces a minimum "leverage ratio" calculated by dividing the core capital (essentially common stock and retained earnings) by the bank's average total consolidated assets and it should be maintained above 3%.

Liquidity requirements, such as "liquidity coverage ratio", are also introduced with the aim of monitoring the quality of bank's liquid assets, which should be sufficient to cover net cash outflows over 30 days in a "worst case" scenario. Furthermore, another instrument called "net stable funding ratio" is introduced requiring banks to be able to manage the amount requested for financing in a hypothetic stressed period of one year by holding sufficient stable pecuniary resources.

In 2017 the Basel IV standards were agreed as the outcome of the reforms in the Basel III, and their implementation has been delayed for one year to January 2023 due to the Covid-19 pandemic. The aim is to limit the use from large banks of internal models for calculating credit risk. Capital requirements will be more stringent as well as the leverage ratio will be higher; moreover, financial statistics disclosure should be more detailed.

Therefore, banks must comply with a very severe set of rules that oblige them to carefully assess the risk associated when granting loans, that is, in the end, the capability of the debtor to repay the entire borrowed amount. These rules could lead to a more restricted supply of credit and a more selective screening process, that in the end would slow the economic recovery. Indeed, if it is true that the aim of the directives is to foster the availability of credit by also increasing the quality of capital hold by banks, on the other side the adjustments performed by banks to be in line with the agreements could go in the opposite way. SMEs represent one of the riskiest categories of borrowers for banks' lending, thus they may be the first to see credit shortages.

Moreover, a study performed in 2019 by B. Fisera, R. Horvath and M. Melecky confirms this concern for developing countries and emerging markets. In particular, they found that Basel III had a negative effect on the access to finance of SMEs in those areas, albeit moderate. Moreover, this affects more those SMEs who were already rationed or excluded from the access to credit, rather than those who already have established some relationship with banks.

Firms' characteristics are also determinant when assessing the implications of Basel III, thus it results that the age and the size are important when facing the restrictions implemented by banks: for instance, in order to reduce credit risk, banks may require collaterals which makes less accessible the financing to startups.

Indirect effects are also taken into consideration, such as the perception of SMEs about the future credit availability that can induce self-rationing or may change the financing strategy of firms.

In the end, the differences in the impact of the Basel Accord may depend on the type of the banking system as well as the type of SMEs. If the former is healthy and well-capitalized, the impact could be positive, allowing SMEs to better access to finance, otherwise it could have the opposite result.

4.4. The importance of collateral from empirical data

The positive effects of requiring collateral from borrowers to reduce moral hazard find empirical evidence in the available data. Bester (1985) talked about a relation between the collateral requirements and the interest rates, and from the SAFE survey of 2019 this relation comes out.

On average, collateral requirements have increased all over Europe for a net percentage of 12% of the respondents, with Denmark, Netherlands, France and Finland reporting the highest net percentages. Italy is below the average with a net percentage of 10%.

At the same moment, the net percentages of respondents[2] report a decrease in interest rates in the vast majority of the selected countries that are shown in Figure 19 and Figure 20, except for Italy, Spain and Sweden, in which the respondents report a net increase in the interest rates in the surveyed period.

The case of Italy is particularly interesting because there is no correlation between the collateral requirement and credit rationing according to the empirical evidence as the model proposed by M. Agostino, D.B. Silipo e F. Trivieri points out. It will be better explained in the following Chapter.

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[2] With "net percentage of respondents" is intended the difference between the percentage of the respondents who reported an increase in the interest rate and those who reported a decrease in the 6 months preceding the survey.

However, in general terms, the increase in collateral requirements lead to a decrease in interest rates, as expected, since lenders can better assess the riskiness of the borrowers.
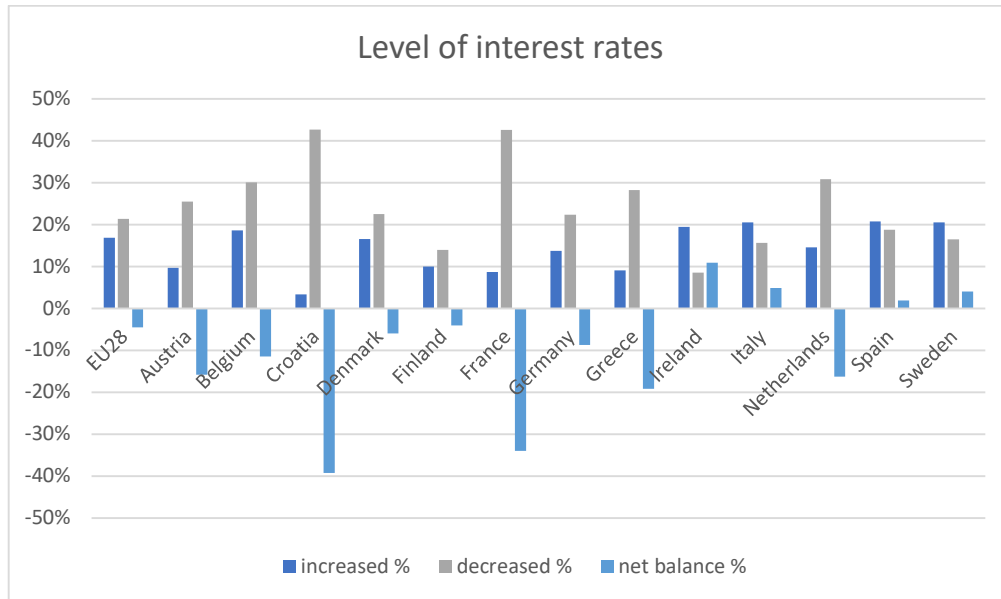

Figure 19 – Perceived changes in the level of interest rates for a group of selected countries in EU. Data Source: European Commission SAFE results for April – September 2019.
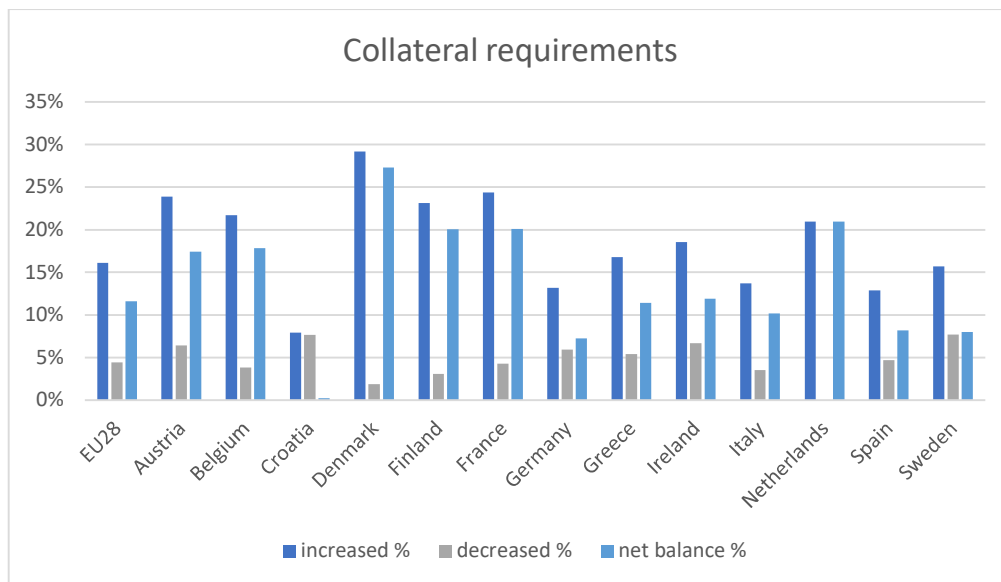

Figure 20 – Perceived changes in the collateral requirements for a group of selected countries in EU. Data Source: European Commission SAFE results for April – September 2019.

Moreover, considering the size of the SMEs being related to the collateral requirements (Figure 21), it came out from the survey that the larger the company, the less the extent to which collateral represents a limit to access financing, since

the larger companies do have at disposal greater assets.

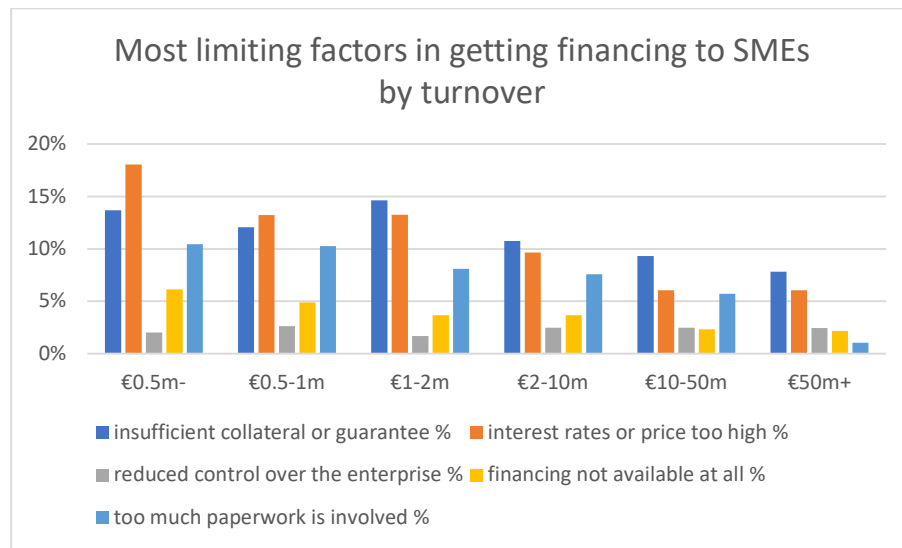Most limiting factors in getting financing to SMEs by turnover

Figure 21 - Most limiting factors in getting financing for SMEs divided by turnover as a proxy of the size of the company. Data Source: European Commission SAFE results for April – September 2019.

4.5. The empirical model for Italy: "Credit Rationing in Italy"

Credit rationing is determined by a wide pool of factors that weigh both on demand and supply sides. The difficulty stands in finding these factors and relate them quantitively to the studied phenomenon. A successful attempt, in this sense, was given by M. Agostino, D.B. Silipo e F. Trivieri in 2008 which provided an empirical analysis on measuring credit rationing in Italy. Their paper "Credit rationing in Italy" provides new evidence on the determinants of demand, supply and external factors such as the environment that have an impact on both lenders' decisions and borrowers' decisions.

These results will pair with those of their second paper "The Effects of Screening and Monitoring on Credit Rationing of SMEs" (2008), in which the analysis is focused on identifying the factors which explain credit rationing related to the incentives of banks to screen and monitor Italian SMEs. Thus, the focus shifts to the supply side, and the analysis starts from the assumption that banks may be different from each other in their capability and incentives to screen and monitor the borrowers. Larger banks should be more able to adopt screening and monitoring actions since they can afford these costs better than small banks.

Their analysis is based on data collected between 1995 and 2003 both on households and SMEs. For the current analysis will be only investigated the results concerning SMEs.

The determinants for credit rationing to SMEs that are considered are essentially grouped in three macro areas that are the characteristics of the firm and of the bank, together with the peculiarities of the local credit market.

More specifically, in the firm's characteristics are taken into account the age, the dimension, the turnover, the risk profile, collateral, the ongoing loan applications, the equity portfolio value and the configuration of corporate governance.

As already said, the age and the dimension are expected to have a negative relationship with credit rationing: the smaller the firm, the more likely it is going to be rationed, as well as the younger the more likely the rationing.

Regarding the factors which have not been taken into account so far, this analysis says that the performance indicators, when they signal that the company is well performing, are likely to reduce the probability of being rationed, since they function as business card for lenders.

Furthermore, stable and durable relationships between SMEs and banks are a positive aspect, since they reduce the information asymmetries between the parties, which constitute the main problem as already discussed. In this way, the bank can better assess the quality of its client and thus can offer and grant loan on this basis.

Finally, a good management and a profitable equity portfolio are important, not only for accessing to bank loans, but also for having access to alternative sources of financing.

The other group of determinants is represented by the local credit market and its characteristics. These are identified with the estimates of the efficiency of the legal system, the underground economy and GDP pro-capita and are used as a proxy for the measurement.

The efficiency of the legal system, indeed, does have repercussion on the transaction costs that in the end are determinant for credit rationing. In the same way, an over-diffused irregular economy leads to credit rationing to the extent which financial information or securities availability are distorted when applicating for a loan and the legal enforcement is weak.

Regarding the characteristic of the banks, those are identified in the impact of banks' market power, their dimension, their performance and cost structure, together with their capillary diffusion in the local market. More specifically it results that the availability of credit is positively affected by good performance indicators, low costs and greater number of branches all over the territory.

4.5.1. The empirical model

The empirical model studied in "Credit rationing in Italy" (2009) presents a proxy variable of credit rationing RAT, that is a dummy variable coded 1 if a firm i is rationed in a period t and 0 otherwise, and the probability of a firm of being rationed is:

$$Prob \ (RAT_i) \ = \ f(F_i, B, R_A, R_B)$$

Where F_i are the characteristics of the firm, B are the ones of the offer, R_A are the determinants of credit rationing relating to the characteristics of the local market, while R_B the determinants related to the loan relationship.

The econometric model is based on the assumption of non-randomness of the sample of rationed agents and on the adoption of a *probit* model, where RAT is defined as follows:

$$Rat_{it} = 1 \ if \ r^* = \beta_0 + X_{it}\beta_1 + \sum \delta_t \ T_t \ + \ \eta_{it} > 0;$$

$$Rat_{it} \ = \ 0 \ otherwise,$$

Where r^* represents the disutility of being rationed, while X is a vector that includes the determinants of rationing, η is the vector that include the error term, that is the determinants that are not considered in X and T_t represents the time fixed effects which have the role of controlling for variables that vary over time while are constant across entities, allowing to eliminate the bias of omitted variables.

When the values of the represented variables are positive it means that they are determinants of rationing, while if negative there is no correlation.

Another *probit* is considered, for distinguishing the cases in which the borrower does apply for a loan or not:

$$Dem_{it} \ = \ 1 \ if \ d^* = \theta_0 + Z_{it}\theta_1 + \sum \theta_t T_t + v_{it} > 0;$$

$$Dem_{it} = 0 \ otherwise.$$

Where DEM is a dummy variable which represents the demand for credit and Z and v are the analogous of the previous.

Regarding the source of data, they come from surveys produced by Capitalia (a former Italian bank, now being part of UniCredit S.p.a.) from 1995 to 2003 on a representative sample of manufacturing companies.

Other sets of data regard information about Italian banks, the market of credit and the distribution of branches around the territory. Finally, from ISTAT are retrieved information

about the characteristics of local markets, and from the Ministry of Welfare the information about underground economy at local level.

4.5.2. The results

Table 4 - Description of the variables. Source: M. Agostino, D. Silipo, F. Trivieri, "Credit rationing in Italy", 2008.

Dependent variables	
RAT	Dummy =1, if in the last 12 months, company *i* has requested credit without receiving it, =0, otherwise
DEM	Dummy =1, if in the last 12 months, company *i* has requested credit, =0, otherwise
SME' characteristics	
TA	Total assets of the firm
AGE	Difference between the current year and the year of establishment of the firm
ROA	Ratio between Gross profit and Total assets
LEV	Ratio between Total debts and Total assets
PROD	Value added per worker
LIQUI	Cash, accounts receivable and other current assets
RISK	One-year *ex-ante* probability of default, calculated by Riskcalc™ Italy, developed by Moody's KMV
COLL	Ratio between Tangible assets and Total assets
QUOT	Dummy = 1 if the company is listed on the stock exchange, = 0 otherwise
GROU	Dummy = 1 if the company belongs to a group, = 0 otherwise
PAV1	Dummy = 1 if the company belongs to a traditional sector, = 0 otherwise
PAV2	Dummy = 1 if the company belongs to scale sector, = 0 otherwise
PAV3	Dummy = 1 if the company belongs to a specialized suppliers sector, = 0 otherwise
SOUTH	Dummy = 1 if the company is located in the South Italy, = 0 otherwise
Loan relationships	
MAIN	Percentage of credit obtained from the main bank
NBAN	Number of banks from whom the company borrows
Characteristics of Supply	
TAB	Total assets of the bank
LBCpca	Measurement of competition between local banks
EXP	Ratio between Administrative expenses and Bank's total assets
BADL	Ratio between Bad loans and Bank's net capital
DEP	Total deposits in the local market
BRANCH	Banking branches × 10,000 on population
Characteristics of the Market	
GDP	Gross domestic product per capita
POP	Population
JUDCO	Ratio between Backwardness of civil trials and Upcoming trials (first degree of judgment)
UNDEGR	Ratio between Number of irregular workers and Population

Table 4 reports a legend of the main variables adopted in the econometric model, while the results of the analysis are reported in Table 5.

The results show that the majority of the adopted coefficients is statistically significant and with the expected sign, thus they have an influence in determining credit rationing.

In particular, as expected, the probability of being rationed increase with low values of size (TA), profitability (ROA), productivity (PROD) and liquidity (LIQUI), while the impact of age is not linear: the younger is the company the more likely is rationing, however beyond a certain threshold of age, this probability starts to increase again, perhaps due to the start of a declining phase in the life cycle of the company. Then, from the results of the model it seems that presence of collaterals does not have a huge impact on credit rationing, conversely to what described before. This underlines the fact that the determinants are very site-specific. Then, membership negatively affects credit rationing.

Regarding the coefficients for loan relationships, it does emerge that the probability of being rationed increases in the case there are different ongoing loans with different banks, since it does increase the probability of the firm to apply for funds, while the hypothesis that a relationship between the firm and a main bank leads to reduced credit rationing should be rejected.

Then, the analysis about the characteristics of supply reveals that the main determinants for credit rationing are the competition among banks (LBC_{pca}) and their capillary presence in the market (BRANCH). The first is positive, i.e. credit rationing is more likely when competition is fiercer, and the second is negative, i.e. the more the presence of branches is capillary, the less credit rationing arises.

This is in line with the results obtained in the model exposed in "The Effects of Screening and Monitoring on Credit Rationing of SMEs", where the average banking size and multiple banking relationships significantly affect credit rationing, impacting on the incentives and the capability of the bank in screening and monitoring the SMEs.

Finally, the characteristic of the market seems to not respect the expectations.

Thus, in the end, the main determinants are given by the demand side, while on the side of supply, except for density of branches and local competition, they are generally statistically not significant.

Table 5 - Results for SMEs. Source: M. Agostino, D. Silipo, F. Trivieri, "Credit rationing in Italy", 2008. Note: the variables TAB, TA, UNDEGR, POP and DEP are in natural logarithms.

Dependent variable: RAT			Dependent variable: DEM		
Coefficient	Estimation	p-value	Coefficient	Estimation	p-value
TA	-0.1601	0.0010	TA	-0.2531	0.0000
AGE	-0.0117	0.0990	AGE	0.0176	0.0340
AGE (square)	0.0002	0.0420	AGE (square)	-0.0002	0.1360
ROA	-0.0453	0.0000	ROA	-0.0343	0.0010
LEV	0.0074	0.0050	LEV	-0.0087	0.0020
PROD	-0.4530	0.0780	PROD	-0.7394	0.0170
LIQUI	-0.0061	0.0110	LIQUI	-0.0162	0.0000
RISK	0.4078	0.0000	RISK	1.2280	0.0000
COLL	-0.0037	0.2510	COLL	-0.0080	0.0310
MAIN	0.0028	0.1420	QUOT	0.0857	0.8360
NBAN	0.0651	0.0000	GROU	-0.0603	0.5620
LBC$_{pca}$	0.1021	0.0710	MAIN	0.0060	0.0010
LBC$_{pca}$ (square)	0.0336	0.1340	NBAN	0.0569	0.0000
TAB	0.4228	0.5560	LBC$_{pca}$	0.0385	0.5360
EXP	0.0818	0.8070	LBCpca (square)	-0.0050	0.8330
BADL	0.0045	0.3080	TAB	-0.4902	0.4730
DEP	-0.7207	0.4540	EXP	-0.1580	0.5920
BRANCH	-0.1551	0.0230	BADL	-0.0015	0.8180
GDP	0.4186	0.4490	DEP	0.5814	0.5860
JUDCO	0.1633	0.1260	BRANCH	-0.0984	0.1330
UNDEGR	-0.2883	0.3510	GDP	0.5251	0.3470
POP	0.6243	0.3610	JUDCO	0.0304	0.8140
SOUTH	-0.2008	0.4080	UNDEGR	-0.0375	0.9050
			POP	-0.0183	0.8930
			SOUTH	0.2566	0.3420

5. The COVID-19 crisis in Europe and Italy 2020: reported variations

The Covid-19 pandemic has caused a major social and economic crisis, thus it is interesting to compare the data reported previously referring to the period prior to Covid-19 with those reported in 2020, the year in which the pandemic began to spread. In this regard, data that are going to be presented are retrieved from SAFE surveys of 2020. The focus will be on Europe, with particular attention to Italy.

Market conditions have been hugely influenced by the pandemic which has increased the uncertainty towards the future and, in turn, the availability of external finance. The general economic outlook has deteriorated, and this caused a problem in accessing external finance. In the same way, the willingness of banks to provide financing is perceived as reduced in 2020, however the good news is given by the support of public financing, i.e. the measures taken by governments that have risen in order to alleviate the negative circumstances (Figure 22).
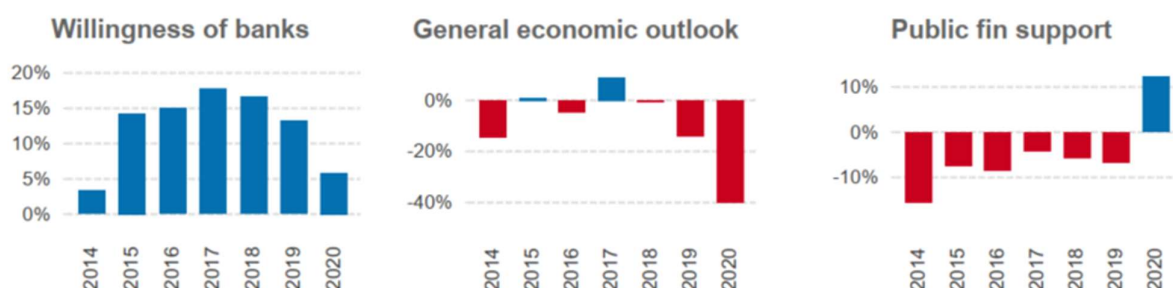
Figure 22 – Evolution of perceived "willingness of banks" to provide credit, the general economic outlook and the public financial support. Net increase/improvement in blue, Net decrease/deterioration in red. Source: European Commission SAFE results for April - September 2020.

Furthermore, grants and subsidies have assumed relevant importance for the 62% of the interviewed in Italy, absolutely above the EU average of 44%. Furthermore, in Italy the 39% of SMEs declared that they have obtained new financing of this type in the six months of reference, much above EU average (24%). These values have hugely increased with respect to previous years (Figure 23).
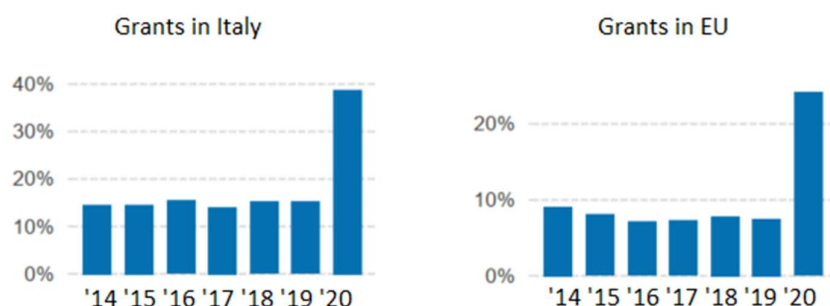
Figure 23 - Grants as financing type used by the interviewed. Source: European Commission SAFE results for April - September 2020.

Regarding the characteristics of loans, the perceived changes are not significant, except for the maturity that is hugely increased, according to the respondents, and this is probably attributable to the willingness of taking into consideration the difficulties encountered by SMEs (Figure 24).
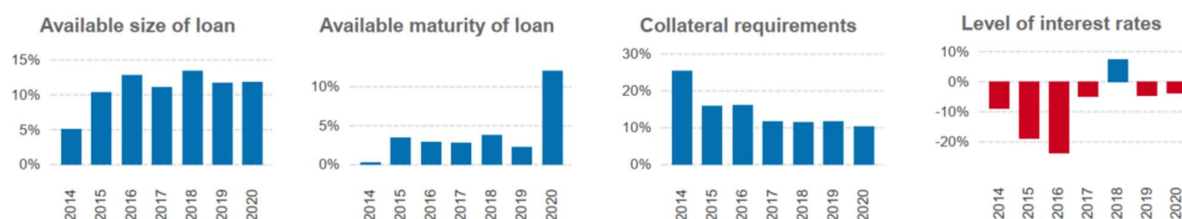

Figure 24 - Loan terms and conditions: improved or deteriorated? Source: European Commission SAFE results for April - September 2020.

The deterioration in the economic environment in Europe in 2020 is testified by the responses of firms to the survey concerning their conditions and performances. As it is shown in Figure 25, 2020 registered a net decline in almost all the indicators. Among the others, profits, turnover, fixed investments and number of employees seems to be representative of the economic crisis carried by Covid-19.
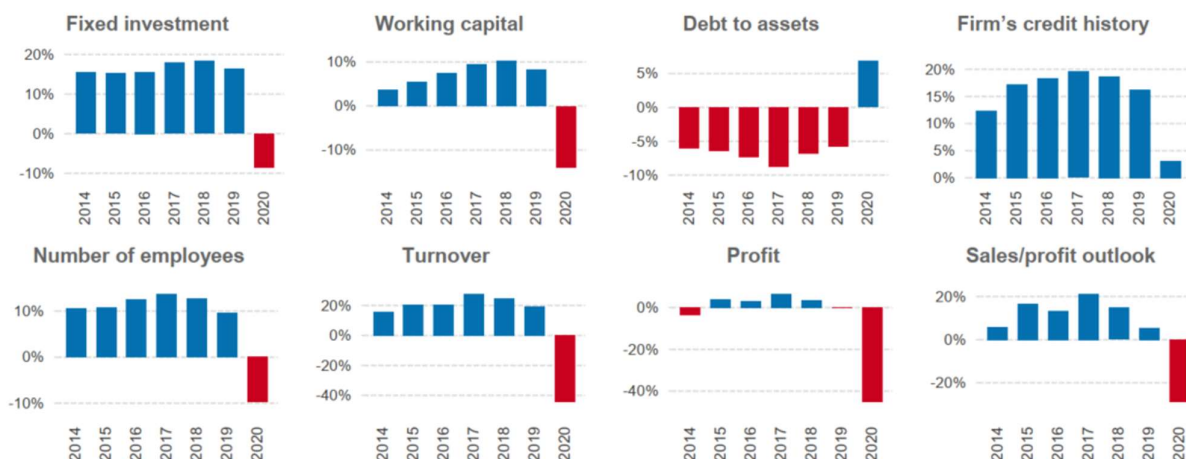
Figure 25 – Aggregate SMEs factors at European level in the last seven years. Net increase/improvement in blue, Net decrease/deterioration in red. Source: European Commission SAFE results for April - September 2020.

In Italy those values are even worse, indeed the related percentages are above the EU average and indicate a deterioration in profits (56%), turnover (56%) and fixed investments (11%).

The prohibitive conditions in which SMEs were forced to operate, including the sanitary restrictions activities that were adopted in many European countries, especially in Italy, and that forced them to stop their activities partially or completely, increase their need for external credit to survive. Indeed, at European level, the access to finance registered an increasing importance for SMEs, as shown in Figure 26: in 2020 a higher net percentage of SMEs responding to the survey attributed to this issue the highest importance, with respect to the other factors (finding customers, competition, costs of production or labor, availability of skilled staff or experienced managers, regulation, others).
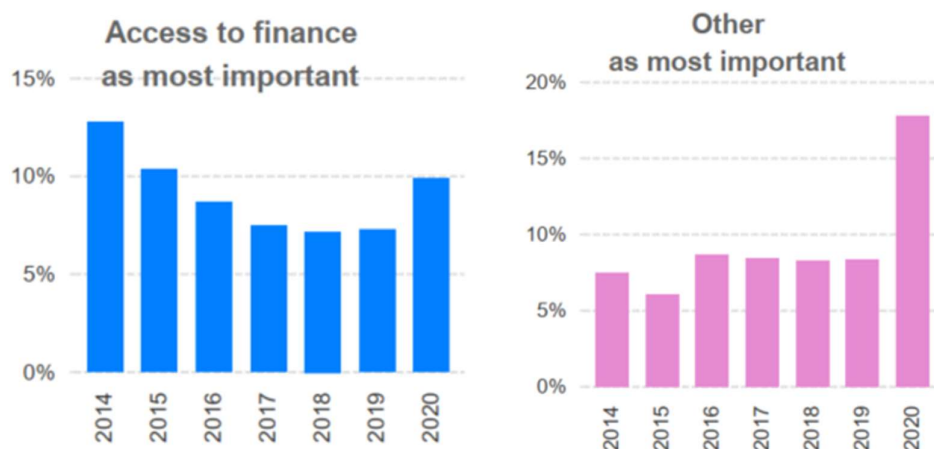

Figure 26 – Access to finance on the left, and "Other" on the right, as the most important problem facing by SMEs at European level. Source: European Commission SAFE results for April - September 2020.

In particular, in Italy this value is attested to 14%, above the European average (10%) and overtaken only by Greece (22%).

The same increase is reported in answering "Other" to the same question, since this answer includes any other issue related to Covid-19.

In addition, the need for external financing is soared, in particular the need for bank loans, while its availability is not perceived to be increased as well, indeed the expectations about future availability of bank loans collapsed dramatically, as shown in Figure 27.
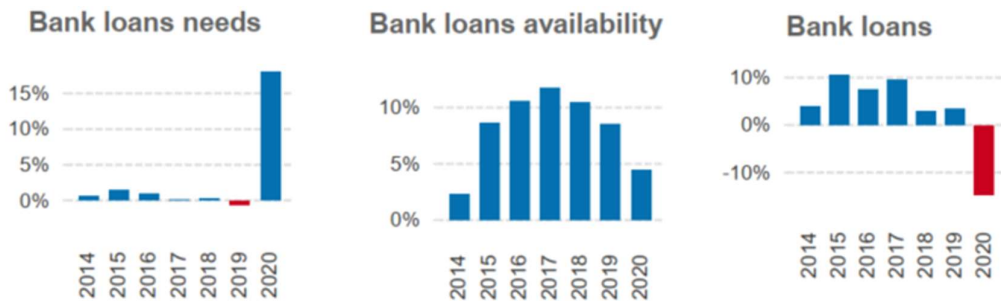
Figure 27 - On the left reported increase in needs for bank loan. In the middle the perceived bank loans availability. On the right the expectations about the future availability of bank loan. All results are referred as net percentage of respondents that identified an increase/decrease in the relative feature. Source: European Commission SAFE results for April - September 2020.

In Italy, the need for bank loans increase from 5% in 2019 to 29% in 2020, while its availability is perceived as increased but with less force (from 9% to 15%), indeed the expectations about future availability of bank loans decreased (from 9% to 2%), however revealing less pessimism than the European average.

Furthermore, in the reference period (April-September 2020), the percentage of SMEs that applied for a bank loan in the European Union increased with respect to the previous year (35% versus the 24% of the same reference period in 2019), while the percentage of SMEs that did not apply because of fear of rejection remained unchanged (4%). Then, the results of the applications seem to be in line with those of the previous year: the 6% of the applicant SMEs was rejected, and among those who were approved, the 13% received a smaller amount than desired, while the 1% declined the loan offer due to the unaffordable costs. This means that the 20% of SMEs at European level that were fully or partially rationed during 2020, slightly more than 2019 (18%), as shown in Figure 28.
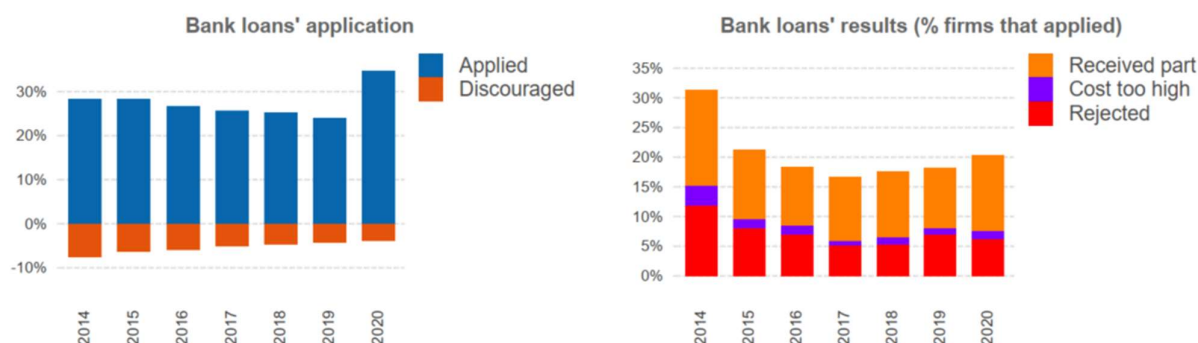
Figure 28 - Bank loans application from SAFE surveys of each year. Source: European Commission SAFE results for April – September 2020.

In Italy, more SMEs applied for bank loan with respect to the EU average. Indeed the 49% of respondents declared to have applied, then the 17% was rationed (12% partially rationed, 4% rejected, 1% refused due to high costs).

In the end, from these data is not possible to determine the longer-term implications for SME access to finance. However, the negative effects of the pandemic are evident, especially on SMEs profitability and cash flow management, with probably long-term implications in the access to finance.

Furthermore, the second important evidence is that European Governments are quite active in designing policies able to respond to SMEs' financial difficulties, by granting public subsidies and incentives allowing SMEs to survive the recession.

5.1. An overview on Italian trade sector

Covid-19 pandemic leads the world to an economic crisis that caused performance indicators for SMEs to fall. However, since this widespread worsening is induced by an external and unexpected factor it is difficult and not completely statistically significant to relate the performance of a firm with its attractiveness for external credit in the reference period, as it was done instead before in the analysis when looking at 2019. In this context, indeed, the supply of credit is much more determined by the aid provided by governments that have to interfere in the market due to the economic crunch that has damaged the health of SMEs.

A deeper analysis is now conducted for evaluating the impact of the pandemic in a specific sector in Italy. Indeed, the "trade sector" is one of the most affected by the crisis, especially in Italy where, due to lockdown restrictions, many of the SMEs have had to reinvent their

business plans and to make investments when available, for instance to introduce e-commerce in their activities. Therefore, it is interesting to see how many of them tried to push towards acquiring new competences.

Figure 29 shows a comparison between 2019 and 2020 in the trade sector at European level, relating to the same semester (April-September), regarding the introduction of new products or services, changes in the organization or in the methods of providing the service relating to the SME. The most relevant result is given by the latter point, which highlights an increase from 24% to 30% of SMEs that declare that they have introduced a new way of selling the good or service, that is, that have invested in this characteristic. This is explained by the need to adapt to the restrictions introduced to prevent the spread of Covid-19 in the vast majority of EU member states.
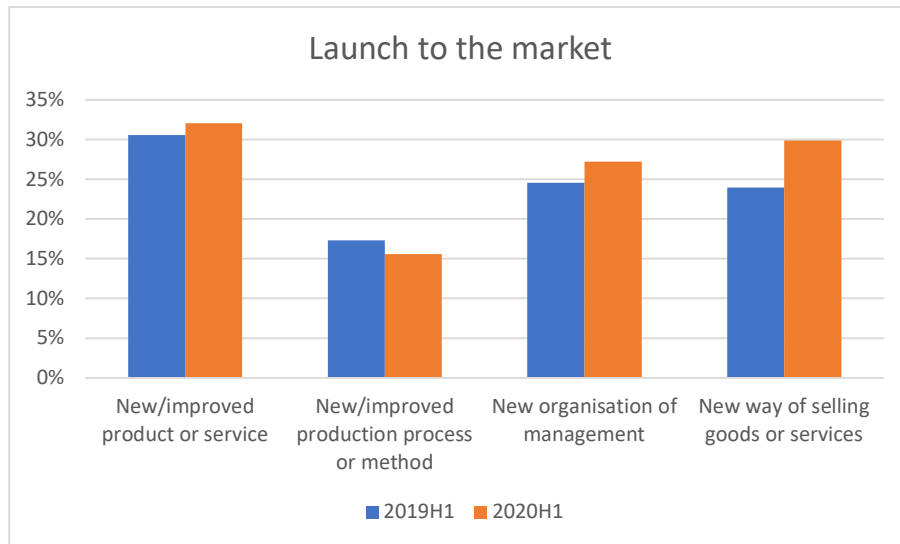

Figure 29 - Percentages of SMEs that declared to have introduced in their businesses the descripted features in the 12 months before the survey. Data Source: European Commission SAFE results for April – September 2019 and 2020.

Focusing on the trade sector in Italy, the purposes of financing reveal that fixed investments and the introduction of new product/services are decreased in the first part of 2020, and the priority was given to other purposes related to Covid-19 situation, that allows SMEs to survive rather than to grow, from a general overview (Figure 30). This is not in line with the results at European level, and it signals that Italian SMEs are more reluctant than average in innovating or simply changing when financial difficulties come out.
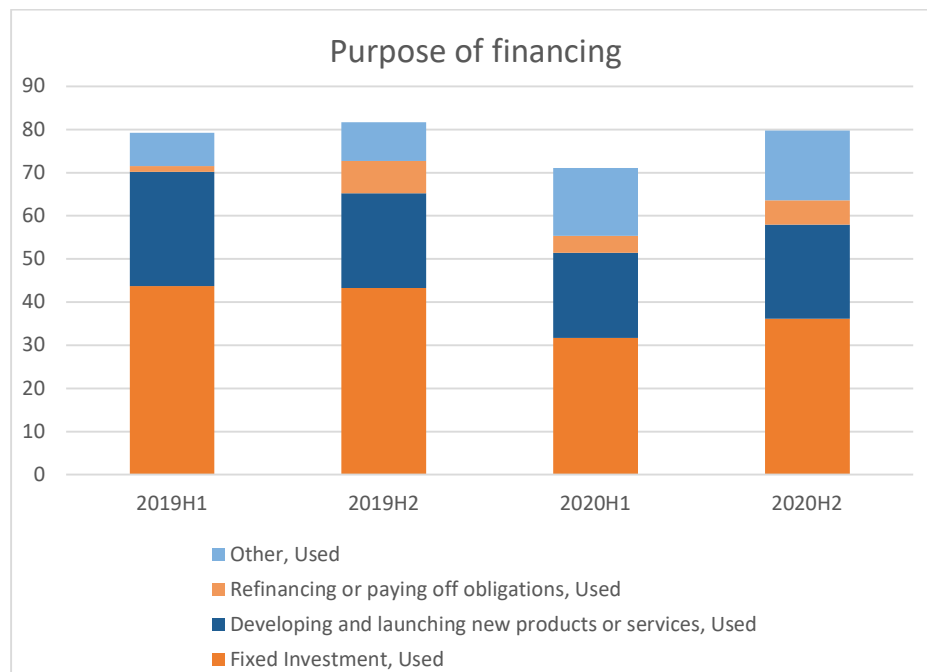
Figure 30 - For which purpose the financing has been requested. Data Source: European Commission SAFE results, "H1" refers to period April-September and "H2" refers to period October-March of the following year.

Indeed, fixed investments fell sharply in 2020 in this sector in Italy: the percentage of respondents that declared to have not engaged any fixed investments largely exceeded that which declared to have made use of them (Figure 31).
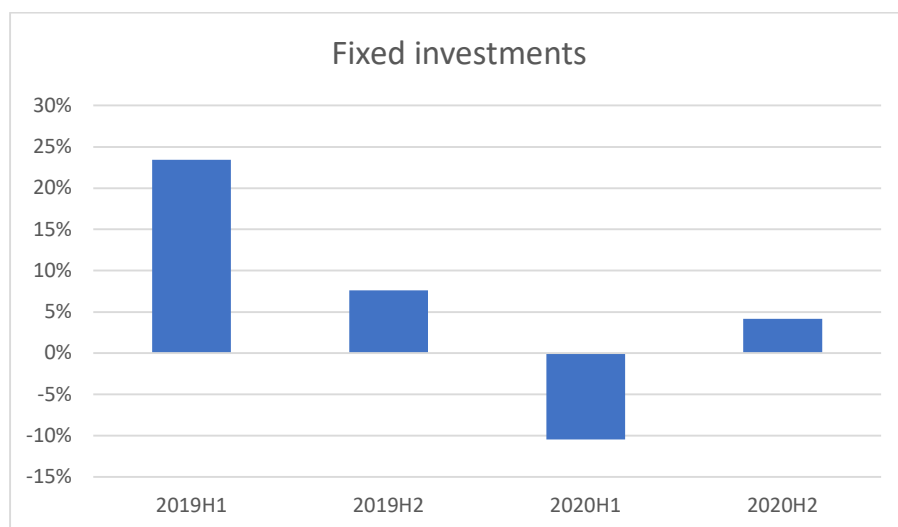

Figure 31 - Evolution of net percentage of respondents on performed fixed investments in the 6 months before the survey. Data Source: European Commission SAFE results, "H1" refers to period April-September and "H2" refers to period October-March of the following year.

Moreover, as anticipated, despite the worsening in the performance indicators, firms operating in the Italian trade sector have increased their applications for bank loans. The first wave of 2020 reveals this attitude of relying more on bank loans, indeed the percentage of applications did grow and simultaneously the percentage of non-application attributable to sufficient internal funds decrease as well (Figure 32).
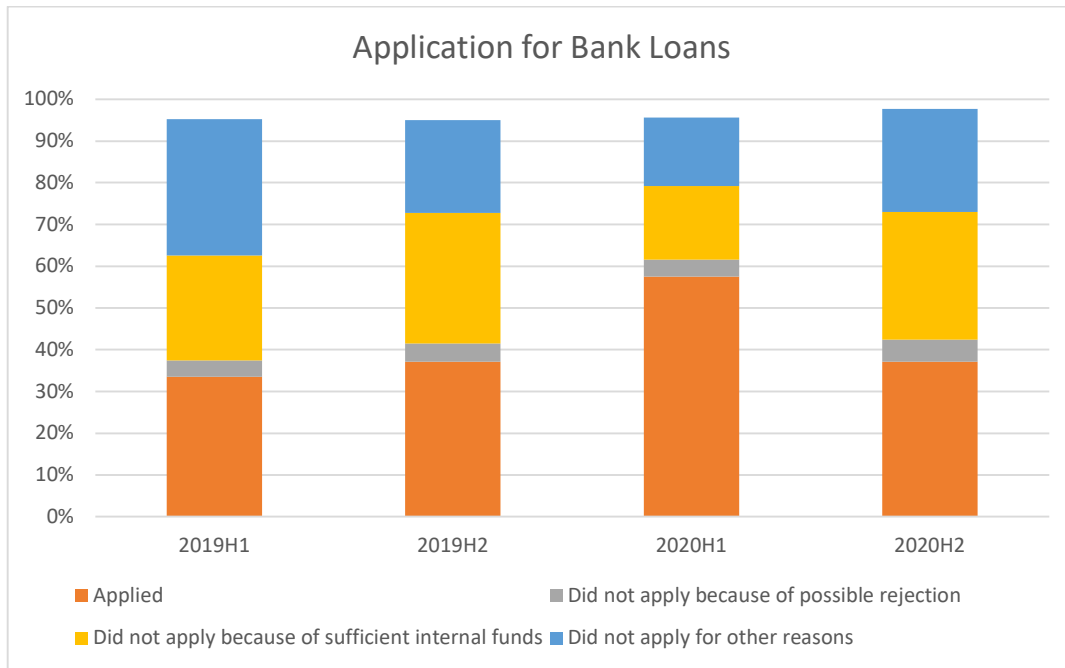

Figure 32 - Application for bank loans. Data Source: European Commission SAFE results, "H1" refers to period April-September and "H2" refers to period October-March of the following year.

The conditions for external financing, then, reveal that the demand for guarantees and information obligations increased in the first wave of 2020. This can be read as the banks, having encountered some financial difficulties, are forced to pay more attention in granting loans to SMEs (Figure 33). However, the larger information and guarantees requirements didn't decelerate the external funding to SMEs, as data will show later on, probably thanks to the intervention of the Guarantee Fund, that, as will be explained in the next Chapter, has helped SMEs in obtaining external financing in the difficult period of Covid-19.
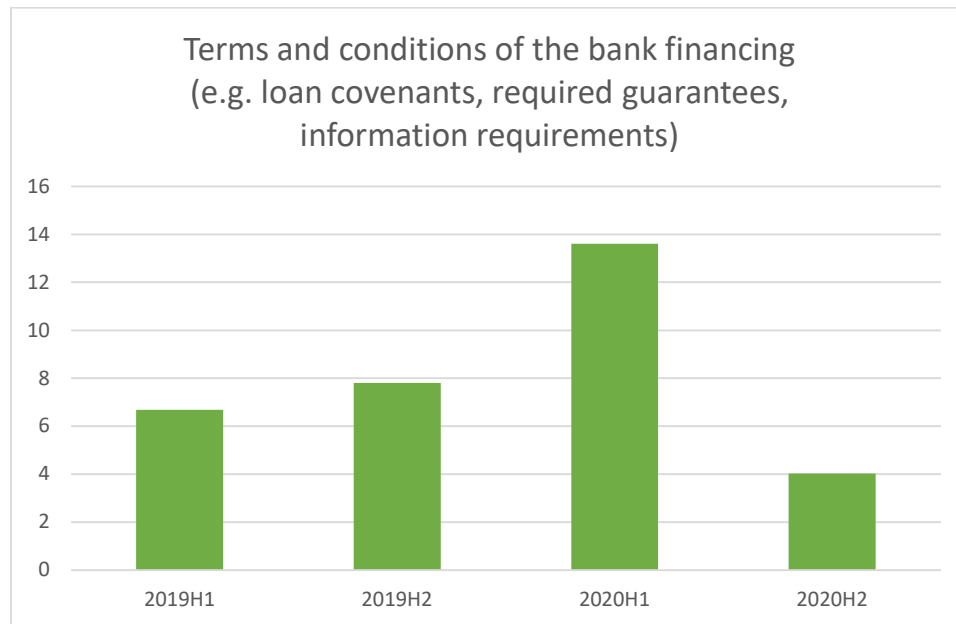
Figure 33 - Financing conditions e.g. loan covenants, required guarantees, information requirements, procedures, time required for loan approval. Data Source: European Commission SAFE results, "H1" refers to period April-September and "H2" refers to period October-March of the following year.

A first confirmation to this fact is given by the positive net balance in interviewed SMEs that declared to have applied to public financial support, including guarantees, which have increased from a deficit of -17% to a positive value of 2%. This means that the percentage of SMEs that have applied overcome the one that have not applied: a positive net value was registered for the first time in the first wave of 2020 (Figure 34).
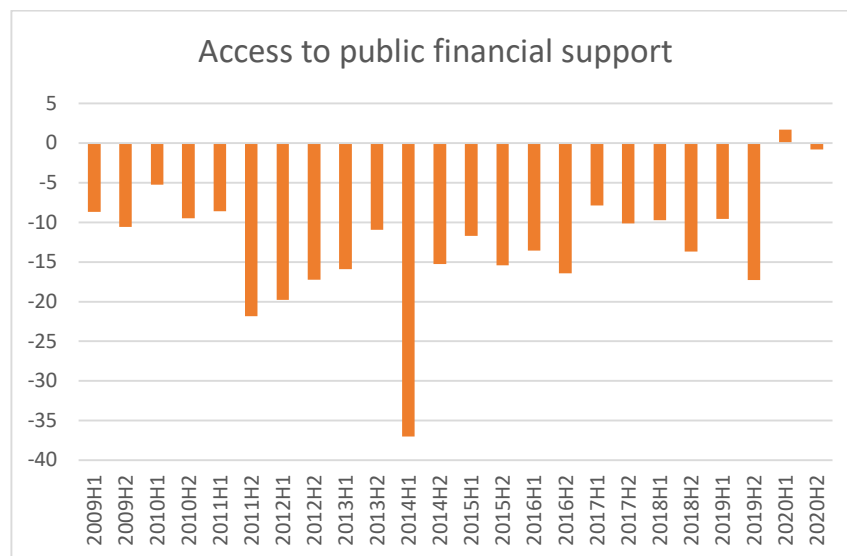

Figure 34 – Access to public financial support. Data Source: European Commission SAFE results.

Furthermore, as said, the access to financing was helped in this difficult period, and this is reflected by the perception of SMEs operating in the Italian trade sector that have seen an increase in the willingness of banks to provide credit with respect to the previous waves of interviews (Figure 35).
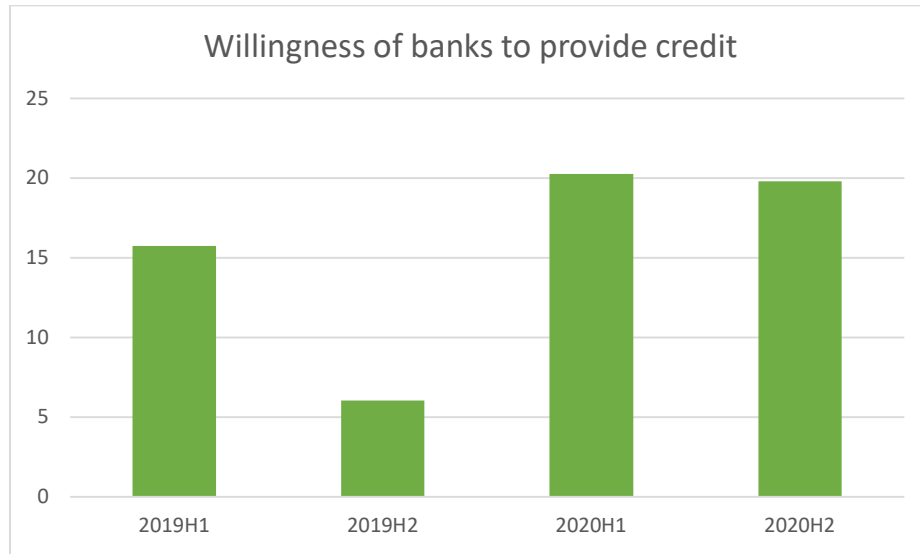
Figure 35 – Willingness of banks to provide credit to SMEs as perceived by the SMEs themselves. Data Source: European Commission SAFE results, "H1" refers to period April-September and "H2" refers to period October-March of the following year.

In the same way, the results in the perceived availability of bank loans by SMEs in the same context, confirms these implications, by registering an increase with respect to 2019 (Figure 36).
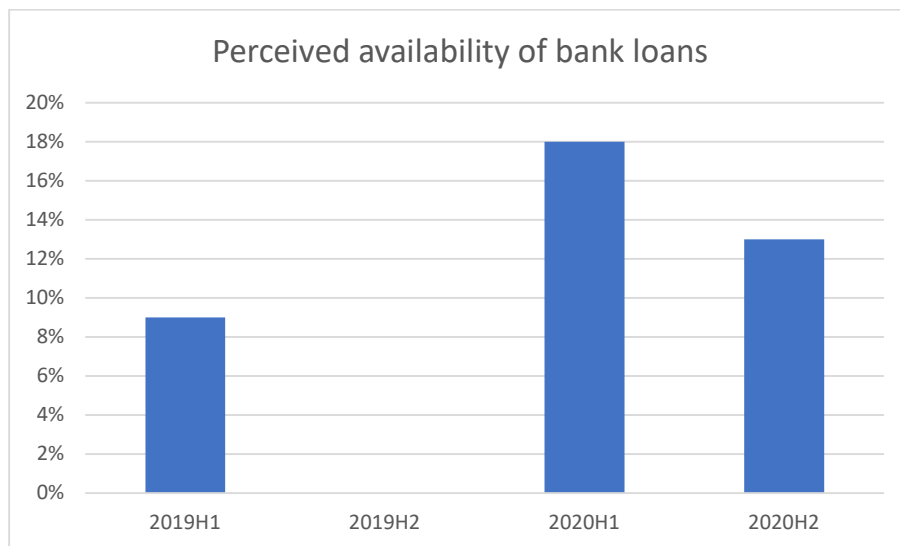
Figure 36 – Perceived availability of bank loans from SMEs in Italy and operating in the trade sector. Data Source: European Commission SAFE results, "H1" refers to period April-September and "H2" refers to period October-March of the following year.

The last indicator regarding the access to credit of SMEs operating in the trade sector in Italy is derived from the debt-to-asset ratio, that, as Figure 37 shows, has increased in 2020.

This means that the considered SMEs have experienced an increase in indebtedness due to the need for financial resources and it also means that they have obtained this external financing despite poor performance and the intensification of access barriers imposed by banks, which have been somewhat mitigated by the government's external aid (e.g. Guarantee Fund).
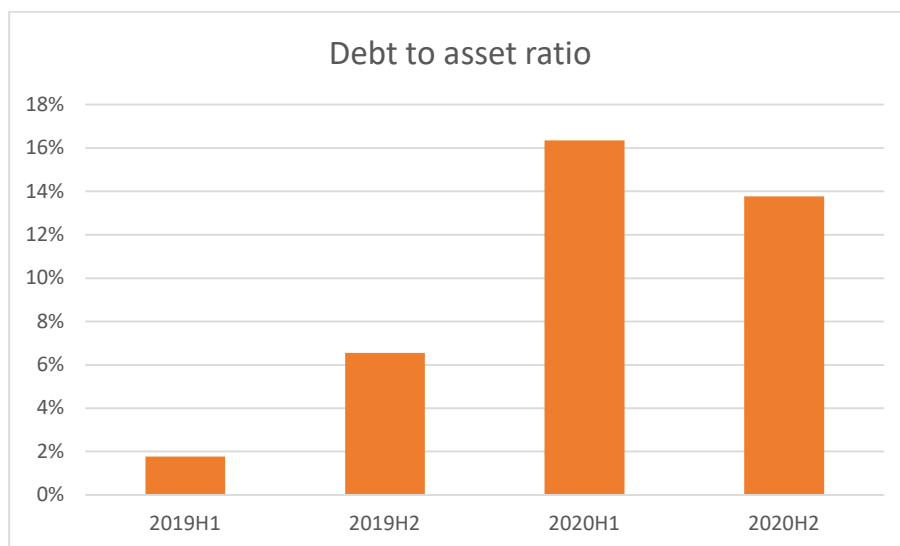

Figure 37 – Debt-to-Asset ratio for Italian SMEs operating in the trade sector. Data Source: European Commission SAFE results, "H1" refers to period April-September and "H2" refers to period October-March of the following year.

6. Policy solutions

In general terms, policy interventions can have a positive impact on credit rationing, as said. First of all, from a macroeconomic standpoint, the theory (Stiglitz and Weiss, 1981) says that expansive monetary policy, i.e. increase the supply of money, can reduce credit rationing by shifting the supply curve upwards.

This has been applied at European level by the European Central Bank (ECB), however the mechanism of monetary transmission that should lead to an increase in investments, especially from SMEs, has worked only partially. Basel Accords seems to have the effect of making banks more risk-adverse, and since they have to meet regulatory capital requirements, they are induced to accumulate funds, and this complicates the access to loan from SMEs. In the end, these factors result in having negative effects for credit rationing, as they lead to increase risk premiums on interest, collateral requirements and transaction costs.

As a result, these policies do not fully have the expected impact on real economy, however they have contributed to limiting the problem of rationing, as data reveals. Indeed, the number of SMEs excluded from loan application due to excessive interest rate has declined in the past decade, prior to Covid-19.

Therefore, monetary policy only partially contributes to solve this problem. It should be accompanied by a bottom-up approach, i.e. a microeconomic intervention for enhancing credit lending.

In this sense, another possible measure to be adopted to stem the credit rationing is given by acting on the tool that has been described previously, that is the collateral.

As explained, the collateral requirements allow the lender to better assess the risk of the borrower because it moves the risk to assets which convey more objective information that facilitates the task of the lender, who can set a more accurate interest rate on the contract loan. This acts in the sense of reducing the information asymmetries, in particular it prevents the adverse selection problem.

Indeed, as Bester affirmed, when borrowers can be sorted according to the risk of their project thanks to collateral requirements, there will be no rationing.

This screening mechanism operated by the bank can work when the terms of the contract are well designed and are such to enable the incentive compatibility, that makes every party to achieve the best individual outcome by following the established rules. In this sense, collaterals are crucial. Then, the choice of the contract will reveal the risk type of any specific borrower, allowing the bank to

avoid adverse selection and to not give ways to credit rationing.

In this sense, the legislation should not be too intrusive in regulating collateral law, since an excessive protection towards weaker parties could conversely cause a slowdown in supplying credit to SMEs.

6.1.   Solutions from Governments

Since it can be affirmed that SMEs constitute the core of the economy within a country, it is in the interests of governments to provide aids to them in retrieving financial resources.

In this sense, the "Small Business Administration" (SBA) a government agency that provides support to entrepreneurs and small businesses, which operates in the USA, can be applied as a benchmark. It was founded in 1953 to promote the growth of SMEs and to facilitate their competitiveness in the markets. Their activity is to provide a guarantee on loans, thus going to thin the gap of information asymmetry between SMEs and banks, mitigating the associated risk. In the period between 1991 and 2020, more than 1,8 million[3] of loans have been approved to SMEs and entrepreneurs thanks to the activity of the agency, for an overall guaranty amount of over 400 billion dollars approved by the SBA.

The activity of the SBA, i.e. the possibility for SMEs to obtain guarantees that facilitate the access to credit, are correlated to the economic growth that have characterized the areas of competence of those SMEs. However, it is not possible to directly relate these two trends because there could be other factors, such as geographical or cultural conditions that gave superior contribution to the economic growth.

Similarly in Italy, a Guarantee Fund has been established by the Ministry of Economic Development in 1996. It is financed with both internal and European resources and its aim is to provide public guarantees to SMEs needing for external financing and that have encountered some obstacles in this process, since they are not able to provide the same stable guarantees if lonely. Indeed, the Fund does not offer cash contributions but only additional guarantees, in exchange for some requirements that must be met by SMEs for the access to the Fund, such as SMEs to demonstrate an improve in their conditions following the financing.

In 2020, as has been highlighted by the surveys previously reported, the presence of public aids has been of crucial importance, and many SMEs needed to rely on this support. In this

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[3] Data from https://data.sba.gov/ and are referred to loan types coded 7(a) and 504 by the SBA and are the most popular loan programs.

context, data from the Guarantee Fund reveal how its activity has hugely increased: in light of over 1.5 million accepted applications (98% of submitted ones), more than 1.1 million different SME relied on the guarantee provided by the Fund, numbers that have completely surpassed those of the previous year, as shown in Figure 38. At the beginning of 2020, numbers were lower than those of 2019, however when the pandemic started and Italy went lockdown, the government intervened strengthening the support provided by the Fund and making the requirements less restrictive, and applications started to increase dramatically in April 2020.
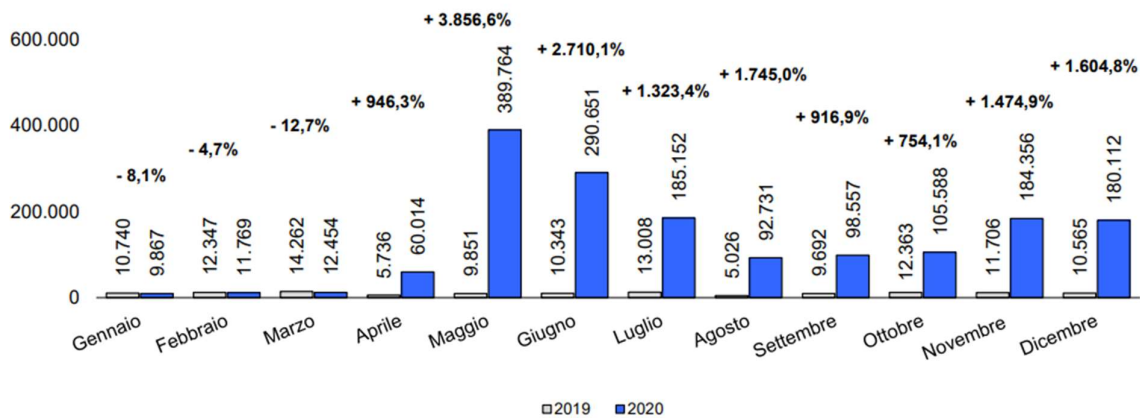

Figure 38 - Applications to the Guarantee Fund month by month, 2019 vs. 2020. Data Source: Mediocredito Centrale.

In monetary terms, in 2020 the loans accepted amounted for € 124.4 billion (+543.9% with respect to 2019) and the guaranteed amount equaled more than € 105 billion (+696.1%).

The subdivision of the applications by size of the SMEs reveals that the 73.8% of applications came from micro-enterprises, followed by small (15.1%), medium (10.4%) and "mid cap" (0.7%). This represents a confirmation of theory and empirical evidence shown previously, i.e. the lower the size of the company, the higher the barriers in accessing to finance, a result made more evident in dramatic situations such as the crisis caused by the pandemic.

7. Conclusions

Credit rationing phenomenon represents a relevant obstacle to SMEs' growth and performances, and in turn has negative effects in the economic growth of the entire system, since SMEs constitute the most important part of the engine that moves the economy within a country.

Theory predicts some of the causes of this phenomenon, that are primarily identified in the asymmetric information that represent the most important barrier when lending credit. They cause adverse selection and moral hazard problem that disincentivize and limit lenders from supply credit to borrowers.

Empirical research confirms these problems and try to verify if the possible solutions are effectively working, enhancing the availability of credit. Relationship banking, multiple relationship lending and collateral requirements seem to be the instruments that can affect positively the availability of credit.

However, empirical evidence underlines the fact that these remedies are not objectively guarantee of good results, since their adoption depend both on the characteristics of lenders and borrowers (size, age, innovativeness) and on geographic, cultural and economic conditions that are specific to the country. For instance, in Italy collateral requirements seem to not hugely affect the availability of credit to SMEs (Agostino *et al*. 2009).

Other than supply issues, there are determinants of demand in the access to credit. Indeed, uncertainty towards the economy may lead SMEs to self-exclude themselves from external credit, because of their fear of rejection. Then, in those countries where economic knowledge is not so spread, entrepreneurs may not have the sufficient instruments to successfully access to credit. In the same way, they may be excluded from external financing when collateral requirements are too stringent (i.e. the case of startups).

The advent of Covid-19 pandemic has completely reversed the trend that until 2019 have seen a moderate recovery in the economic conditions.

Profitability and liquidity for SMEs have collapsed dramatically, making the access to credit even more important for them to survive. In this sense, governments and European Union seem to have taken the right direction in supporting SMEs, at least in the short-term. With the Recovery Fund, European Union has allocated various aids to member States, and this has contributed to alleviate the negative effects of the crisis.

However, in the long-term, these actions do not necessarily imply an improve in the economic conditions to SMEs. In particular, for enhancing the availability of credit, the focus

should be in incentivizing lenders to increase their supply of credit to SMEs. In this sense, Basel Accords are relevant, since it has been revealed that the counter-effects of this agreement were, among the others, that of limiting the supply of credit from lenders, due to the restrictions imposed.

On the other hand, collaterals represent a valuable instrument that lenders heavily rely on, since they allow to break down information barriers. Thus, it should be another feature on which regulations should give priority. Indeed, although the previous empirical results, also in Italy the drastic increased access to the Guarantee Fund during the Covid-19 emergency revealed the importance of collaterals in accessing external credit.

Bibliography

Agostino, M., Silipo, D.B., Trivieri, F., "Credit rationing in Italy", 2009.

Agostino, M., Silipo, D.B., Trivieri, F., "The Effects of Screening and Monitoring on Credit Rationing of SMEs", 2008.

Akerlof, G. A., "The market for "lemons": Quality uncertainty and the market mechanism", The Quarterly Journal of Economics, 1970, Vol. 84, No. 3, pp. 488-500.

Angelini, P., Di Salvo, R., Ferri, G., "Availability and cost of credit for small businesses: Customer relationships and credit cooperatives", Journal of Banking & Finance, 1998, Volume 22, Issues 6–8, Pages 925-954.

Baglioni, A., "Multiple Banking Relationships: Competition among "inside" Banks", Rivista italiana degli economisti, Società editrice il Mulino, 2002, issue 2, pages 165-196.

Baltensperger, E., "Credit Rationing: Issues and Questions." Journal of Money, Credit and Banking, 1978, Vol. 10, No. 2, pp. 170-183.

Beck, T., Demirguc-Kunt, A., Maksimovic, V., "Financial and Legal Constraints to Firm Growth : Does Size Matter?", 2005, Policy Research Working Paper No. 2784, World Bank, Washington DC.

Bellier, A., Sayeh, W., Serve, S., "What lies behind credit rationing? A survey of the literature", THEMA, University of Cergy-Pontoise, Paris, France, 2012.

Berger, A. N., Rosen, R.J., Udell, G. F., "Does market size structure affect competition? The case of small business lending", Journal of Banking and Finance, 2006, Elsevier, vol. 31(1), pages 11-33.

Berger, A. N., Udell, G. F., "A More Complete Conceptual Framework for SME Finance", Journal of Banking and Finance, 2006, Volume 30, Issue 11, Pages 2945-2966.

Berger, A. N., Udell, G. F., "Relationship lending and lines of credit in small form Finance", The Journal of business, 1995, Vol. 68, No. 3, pp. 351-381.

Berger, A. N., Udell, G. F., "Small business credit availability and relationship lending: the importance of bank organizational structure", Finance and Economics Discussion Series 2001-36, 2002, Board of Governors of the Federal Reserve System (U.S.).

Besanko, D., Thakor, A., "Collateral and Rationing: Sorting Equilibria in Monopolistic and Competitive Credit Markets", International Economic Review, 1987, vol. 28, issue 3, 671-89.

Bester, H., "Screening vs. Rationing in Credit Markets with Imperfect Information", The American Economic Review, 1985, Vol. 75, No. 4, pp. 850-855.

Bester, H., "The role of collateral in credit markets with imperfect information", European Economic Review, 1987, Volume 31, Issue 4, Pages 887-899.

Boot A.W.A., Thakor A.V., "Can Relationship Banking Survive Competition?", The Journal of Finance, 2000, Volume 55, Issue 2, 679-713.

Boot, A.W.A., "Relationship Banking: What Do We Know?", in Journal of Financial Intermediation, 2000, Volume 9, Issue 1, Pages 7-25.

Burlon L., Fantino D., Nobili A., Sene G., "The quantity of corporate credit rationing with matched bank-firm data", 2016, Banca d'Italia Working Papers N. 1058.

Carletti, E., Cerasi, V., Daltung, S., "Multiple-Bank Lending: Diversification and Free-Riding in Monitoring", Journal of Financial Intermediation, 2007, Volume 16, Issue 3, Pages 425-451.

Calomiris, C.W., D. Longhofer, S. D., "Credit Rationing", The New Palgrave Dictionary of Economics, 2008, pp 1211-1217.

Cole, R. A., "The Importance of Relationships to the Availability of Credit", Journal of Banking and Finance, 1998, Volume 22, Issues 6–8, Pages 959-977.

Degryse, H., Van Cayseele, P., "Relationship Lending within a Bank-Based System: Evidence from European Small Business Data", Journal of Financial Intermediation, 2000, Volume 9, Issue 1, January 2000, Pages 90-109.

Del Prete, S., Pagnini, M., Rossi, P., Vacca, V., "Getting organized to lend in a period of crisis: findings from a survey of Italian banks", 2013, Banca d'Italia Working Papers N. 154.

Detragiache, E., Garella, P., Guiso, L., "Multiple Versus Single Banking Relationships", Journal of Finance, 2000, Volume 55, Issue 3, Pages 1133-1161.

Elsas, R., Krahnen, J. P., "Collateral, default risk, and relationship lending: An empirical study on financial contracting", 1999, CFS Working Paper Series 1999/13, Center for Financial Studies (CFS).

Fi-compass, "Gap analysis for small and medium-sized enterprises financing in the European Union. Final report at December 2019", 2019, Report from fi-compass ERDF.

Fisera, B., Horvath, R., Melecky, M., "Basel III Implementation and SME Financing: Evidence for Emerging Markets and Developing Economies." Policy Research working paper, World Bank Group, 2019.

Harhoff, D., Korting, T., "Lending Relationships in Germany: Empirical Results from Survey Data", 1998, CEPR Discussion Paper No. 1917.

Hauswald, R., Marquez, R., "Competition and Strategic Information Acquisition in Credit Markets", Review of Financial Studies, 2006, Volume 19, Issue 3, Pages 967–1000.

Helsen, F., Chmelar, A., "Collateral and Credit Rationing - The role of collateral in explaining and remediating the limited flow of credit to households and SMEs", ECRI Policy Brief No. 7, 2014.

Jaffee, D. M., Modigliani, F., "A theory and test of credit rationing", American Economic Review, 1969, vol. 59, issue 5, 850-72.

JAFFEE, D. M., RUSSELL, T., "Imperfect Information, Uncertainty, and Credit Rationing", The Quarterly Journal of Economics, 1976.

Jaffee, D. M., Stiglitz, J. E., "Credit Rationing", In B. M. Friedman and F. Hahn, Eds., Handbook of Monetary Economics, North Holland, Amsterdam, 1990, vol. 2, pp 837-888.

Kon, Y., Storey, D. "A Theory of Discouraged Borrowers", 2003, Small Business Economics 21, 37–49.

Kwaak, T., Cheikh, N., de Kok, J., Kruithof, B., Snijders, J., Stoilova, V., "Survey on the access to finance of enterprises (SAFE). Analytical Report 2019", 2019, Report from European Commission.

Kwaak, T., Cheikh, N., Clarke, M., Snijders, J., "Survey on the access to finance of enterprises (SAFE). Analytical Report 2020", 2020, Report from European Commission.

Lehmann, E. E., Neuberger, D., "Do Lending Relationships Matter? Evidence from Bank Survey Data in Germany", 2000, EFMA 2001 Lugano; University of Konstanz, Center of Finance and Econometrics Working Paper No. 00/04.

Levenson, A.R., Willard, K.L. "Do Firms Get the Financing They Want? Measuring Credit Rationing Experienced by Small Businesses in the U.S.", 2000, Small Business Economics 14, 83–94.

Liberti, J. M., Petersen, M. A., "Information: Hard and Soft", The Review of Corporate Finance Studies, 2019, Volume 8, Issue 1, Pages 1–41.

Manove, M., Padilla, J. A., Pagano, M., "Collateral versus Project Screening: A Model of Lazy Banks", The RAND Journal of Economics, 2001, Vol. 32, No. 4, pp. 726-744.

Marcato, G., "Razionamento Del Credito E Microcredito: Alcune Evidenze Empiriche", 2018, Università Degli Studi Di Padova.

Ministero dello Sviluppo economico, "Il Fondo di garanzia per le PMI: Report al 31 Dicembre 2020", 2020, Public report from Italian Ministry of Economic Development.

Ongena S., Smith D.C., "The duration of bank relationships", Journal of Financial Economics, 2001, Volume 61, Issue 3, Pages 449-475.

Ongena S., Smith D.C., "What Determines the Number of Bank Relationship? Cross-Country Evidence" in Journal of Financial Intermediation, 2000, Volume 9, Issue 1, Pages 26-56.

Padoan, G., "Credit Crunch: Gli Effetti Della Crisi Finanziaria Sulle Pmi In Italia", 2018, Università Degli Studi Di Padova.

Parker, S. C., "Do banks ration credit to new enterprises? And should governments intervene?", Scottish Journal of Political Economy, 2002, Volume 49, Issue 2.

Petersen, M. A., Rajan, R. G., "The Benefits of Lending Relationships: Evidence from Small Business Data", 1994, The Journal of Finance 49, no. 1: 3-37.

SME Envoys Finance, "SME access to finance situation in EU Member States. Final Report 2019", 2019, Report from European Commission.

Smith, D. C., Ongena, S., "Bank Relationships: A Review." Banking & Insurance eJournal, 1998.

Stiglitz, J. E., Weiss, A., "Credit rationing in markets with imperfect information", The American Economic Review, 1981, Vol. 99, No. 4, pp. 869-872.

Thakor, A. V. "Capital Requirements, Monetary Policy, and Aggregate Bank Lending: Theory and Empirical Evidence", The Journal of Finance, vol. 51, no. 1, 1996, pp. 279–324.

Williamson, S. D., "Costly monitoring, financial intermediation, and equilibrium credit rationing", Journal of Monetary Economics, 1986, Volume 18, Issue 2, Pages 159-179.

Williamson, S. D., "Costly Monitoring, Loan Contracts, and Equilibrium Credit Rationing", The Quarterly Journal of Economics, 1987, Volume 102, Issue 1, February 1987, Pages 135–145.

Web references

https://www.ecb.europa.eu/stats/ecb_surveys/

https://www.fi-compass.eu/

https://www.bis.org/bcbs/basel3.htm

https://data.sba.gov/

https://www.fondidigaranzia.it/

https://www.ilsole24ore.com/