# Bank Loans and Employment in Italian Firms

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**Abstract**

This work analyzes the links between credit and labour markets highlighting the influence of credit market inefficiencies on employment. We argue that if banks are not efficient in monitoring the borrowers in the presence of asymmetric information, credit market imperfections have real effects. We estimate dynamic equations for bank loans and employment using panel data for Italian firms. The results indicate that the impact of credit market on employment is higher where the local financial market is less developed, asymmetric information is widespread, bank managers are less efficient in assessing the firms' solvency and do not use appropriate methods to evaluate the borrowers payback capacity.

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# 1 Introduction

The characteristics and the structure of internal financial markets, and their link with the labour market performance, are without any doubt relevant aspects to investigate in order to explain disparities in employment and unemployment rates across regions and countries. Most of the economists believe that financial development crucially affects the speed and pattern of economic growth. Another question is if imperfections in credit markets spill over in the labour market influencing employment/unemployment rates and growth, labour force participation and wages. There exists some evidence that firms that rely heavily on external financing grow disproportionately faster in countries with well developed financial systems. Rajan and Zingales (1998), identify an industry's technological demand for external financing and examine whether industries that are more dependent on external financing grow relatively faster in countries that *a priori* are more financially developed, finding significant positive results. Acemoglu (2001), considers how imperfections in the credit market may have played some role in limiting European employment growth. The idea is that job creation may be constrained by credit market imperfections inducing unemployment growth and persistence. Economies with better credit markets should respond to the arrival of new technologies without showing increases in unemployment since availability of funds may help new firms to develop. The relevance of imperfect information, and the occurrence of moral hazard and adverse selection problems, for the links between labour and credit markets have been highlighted by Wasmer and Weil (2000).

In this paper we analyze specifically the links between labour and credit markets in Italy evaluating if there exists any possible impact of credit market on the evolution of employment rates in different geographical areas. We focus on differences in the banks' loan policies among Italian regions and we relate labour demand to the external financial dependence of the firms. We argue that if banks are not efficient in monitoring the borrowers, in the presence of asymmetric information, credit market imperfections have real effects. We consider the bank efficiency as its aptitude to use advanced methodologies to evaluate the borrowers' payback capacity. As it is well known, the bank's loan analysis may be based on different criteria (Ruozi, 2000). The static assets criterion is based on the real guaranties that the bank may obtain in case of bankruptcy. This method is rather simple to apply since only recent balancesheets are used to establish the firm's external financial dependence. The most important index used in this case is leverage. On the other hand, the dynamic revenue criterion is based on the evaluation of the firm's ability to generate cashflows in the future so that debts may be repaid on

time. Typically, the evaluation of the riskiness of a real investment is made by means of the evaluation of its present value based on the estimation of the cash flows that it generates. Obviously, this analysis is more difficult to apply since it requires a deeper investigation and a reclassification of balancesheets as well as a competent understanding of specific industries behaviors. We consider the use of the static criterion by financial intermediaries as a signal of lower efficiency. We develop a theoretical model where we show that, in a Stiglitz-Weiss economy, efficient credit markets, induced by the appropriate use of methods to evaluate the borrowers payback capacity, can reduce asymmetric information and credit rationing leading to a better employment performance in the labour markets. This is due to the fact that if the credit market is efficient the labour demand of the firm is not credit constrained and employment is independent on the extent of financial dependence.

This topic may be relevant in explaining regional labour market disparities in the presence of differences in the development of the local banking systems. In the light of the existing debate in the economic literature on the interrelationships among institutions, macroeconomic shocks and employment (unemployment) differentials we argue that the characteristics and the structure of internal financial markets, and their link with the labour market performance, are crucial in order to explain regional disparities.

We believe the issue is relevant to asses the impact of monetary and banking policy and its role in determining regional economic development. Moreover, the research may be of some help in refining the economic policy instruments targeted to regional convergence.

In the next section we present some characteristics of the Italian credit and labour markets. Section 3 discusses the theoretical links between labour and credit markets in a Stiglitz-Weiss setting. In Section 4 the empirical implementation of the theoretical model is discussed. Section 5 illustrates the result of the empirical analysis based on panel data of Italian manufacturing industries. Section 6 concludes. Data description is provided in the Appendix.

# 2 Labour and credit markets in Italy

Regional labour market disparities are a well-documented feature of the Italian economy.[1] Local unemployment differentials are huge and increasing throughout the last 25 years. Many explanations have been posited to explain these differentials. Brunello *et al.* (2001) report how the employment

[1] See, among other Baici and Samek Lodovici (2001), Brunello *et al.* (2001), Sestito (2002).

performance in the South has worsened in the presence of sustained labour force growth. According to the authors, the fall in labour mobility from the South to the Northern areas has undoubtedly contributed to determine this result. The decline in earning differentials and the increase of social transfers per head, arising after the labour market policies of the eighties, are probably at the root of the observed phenomenon. The existing differences in the performance of employment in the Italian regions can be explained either by the fact that regional shocks are more important than common aggregate shocks or by the fact that regional employment responds asymmetrical to common shocks. Brunello *et al.* (2001) suggest that regional employment changes are only partially accounted for by national employment changes, especially in the South. This evidence suggests that the Northern and the Southern areas responded in an asymmetric way to common aggregate shocks.

Disparities in the labour market performances are only occasionally related to the functioning of the credit market. A recent paper of Guiso *et al.* (2004) studies the effect of differences in local financial development within an integrated financial market. They estimate an indicator of financial development and show that local financial development is an important determinant of the economic success of an area enhancing the probability an individual starts his own business, favoring entry, increasing competition, and promoting growth of firms. Their index of local financial development for Italian regions confirms the existence of a segmented credit market being the Northern regions at the top of the ranking. This result is also present in Lucchetti *et al.* (2001). These authors use a microeconomic and parametric approach in order to evaluate the efficiency of a sample of banks in the Italian regions and they confirm the existence of geographical disparities in the efficiency of the credit markets. Other studies, aimed at investigating the efficiency of the Italian credit market are Destefanis (1996), Favero and Papi (1995), Olivei (1992), and Resti (1993).[2] In Destefanis (1996), the banks' microeconomic efficiency is evaluated by implementing a non parametric approach. The results seem to confirm the higher credit market inefficiency in the South of the country. In particular, inefficiencies seem to be due to larger economic-enviromental difficulties. Moreover, these inefficiencies seem to affect more the "local cooperative-banks" than the banks that have a national relevance. In Favero and Papi (1995), a non parametric estimate of banks' efficiency (estimated with the same methodology used by Olivei, 1992 and Resti, 1993) is regressed on a vector of explanatory variables. The most

[2]These works refer to the microeconomic efficiency as technical efficiency: given some inputs a production plan is efficient if there is no way to produce more output with the same inputs or to produce the same output with less inputs.

important results of this work are that the efficiency is positively correlated with a measure of the bank's specialization and the dimension of the local banks crucially affects their efficiency. The low efficiency of banks located in the south of Italy seems to be due to a combination of these two effects. Notwithstanding, the measure of efficiency resulting from these studies is not a measure of macroeconomic efficiency. In practice, these kind of analyses do not allow us to evaluate if banks really finance projects with a positive present value. Indeed, in order to asses the macro-efficency it is necessary an evaluation of the present value of the projects obtained by means of estimates of the freecashflows.

None of these works develop a model to motivate the inefficiency of the credit market in the southern regions. We agree with many of these authors, that the inefficiencies are the possible outcome of many years of credit market's public management in the Mezzogiorno. This area has been characterized by some peculiarities during the privatization process started in the late 80's. Some phenomena, such as *bad banking,* may have influenced the achievement of a higher efficiency level.[3] The numbers contained in Table 1 show the disparities that characterize the North-Center and the South areas in terms of credit system efficiency. The banks' Return on Equity in the southern regions has been dramatically negative until 10 years ago. On the contrary, the financial market in the North of the country, is characterized by positive returns.

We also have evidence that firms are more credit constrained in the South of the country. In Table 2 we show that the percentage of firms with credit denied by banks is far higher in the South. Furthermore, the percentage of firms, which would have asked more credit and the percentage of firms which would have paid an higher interest rate in order to obtain more credit is bigger in the South. Table 2 also gives information on banks having the legal situs in the same district of the firm. It is apparent that on average 65% of firms are located close to the banks although in the South we recode a lower percentage.

[3]The privatization of the bank system in Italy starts with the so called "legge Amato". At the time, many banks in the South, such as CariCal, CariPuglia, CariSalerno, were in disastrous conditions so that they have been incorporated in other banking groups and they became the legal owners of all the "bad credits" of the group. Interestingly enough, CariCal proposed to the workers near their pension to exchange their golden handshake with the employment of one of their sons. For a reference see *La struttura Bancaria del Mezzoggiorno*, Documenti ABI, 2000.

# 3 Theory

In what follows we set a model where we show that the production and employment levels of a specific area may depend on the efficiency of the credit market and on the extent of asymmetric information. The model considers two different scenarios where firms and banks have different information about the riskiness of projects that need to be financed. Our starting point for the analysis of the real effect of credit market imperfections is the Stiglitz and Weiss model (Stiglitz and Weiss, 1981) where the interest rate is set by the bank in order to generate a screening device. This result comes from the hypothesis of asymmetric information on the probability of success of the financed projects. As a consequence, in this kind of economy credit rationing arises. In this framework, it is clear that if the bank management is more skilled in assessing the risk of the projects then asymmetric information is reduced and the interest rate is not used as a screening device but is set as a function of the riskiness of each financed project. The skill of the bank management is strictly related to the development of the credit market which is in turn related to the institutional setting. The political and historical factors that shape the bank system are then crucial in determining the evolution and efficiency of the credit market in different geographical areas.

We consider a two periods economy ($t = 0, 1$) with different local markets where a large number of firms, $i = 1, 2, ...n$, operate. In each of these markets a few number of identical banks operate colluding perfectly, so we consider a degeneration of this setting where in each market a single bank operates as a monopolist. We assume that each firm may apply for credit only to the local bank.[4] At $t = 0$ there is a credit demand for $n$ projects by firms (each firm has one project) and the bank decides which projects will be financed. At $t = 1$ the financed projects are realized and produce their outcomes. The probability of success of each project is $\theta_i \in (0, 1)$, distributed with a density function $g(\theta_i)$. The aggregate production level at $t = 1$, $Y$, depends on the number of projects that are realized, $N$, and the employment level, $\Lambda$, is simply given by:

$$\Lambda = Y(N), \qquad \frac{\partial \Lambda}{\partial N} > 0 \tag{1}$$

We assume that banks and firms are risk neutral. If the interest rate free of risk is $\rho$, a project which costs $K_i$ has a safe return $K_i(1 + \rho)$.We define $R_i$ as the expected net return of project $i$, $R_i^s$ the net return of the project in case of success, $R_i^f$ the net return of the project in case of failure, with

[4]This assumption may be sustained for Italy considering the data in Table 2 where it is shown that about 65% of firms have the main bank located in the same district.

$R_i^s > R_i^f$. Hence:

$$R_i = \theta_i R_i^s + (1 - \theta_i) R_i^f \tag{2}$$

with $R_i^f = R^f \geq 0$. We assume, as in De Meza and Webb (1987) that $K_i = K$ and that $R_i = R$. This implies that the more risky is a project the higher is its return in case of success.

Obviously, the following relationship must hold:

$$R \geqslant K(1 + \rho)$$

According to De Meza and Webb (1987) if firms are not liquidity constraint all $n$ projects will be realized since all projects have the same expected return.

These $n$ projects determine the production and employment levels of the economy at time $t = 1$:

$$\Lambda^* = Y(N^*) = Y(n) \tag{3}$$

These employment and production levels, $\Lambda^*$and $Y(N^*)$ respectively, are the first-best solution in term of social efficiency.

- *Bank loans with asymmetric information.*

If the bank does not know $\theta_i$ but just $g(\theta_i)$ we are in a Stiglitz-Weiss context and credit rationing arises. In the Stiglitz-Weiss model it is assumed that the borrower has a given amount of equity $L < K$ and $B = K - L$ is the value of the loan. In this theoretical framework the bank sets an interest rates that gives rise to credit rationing.

In our model, only a fraction $\alpha_i$ of the equity, $L_i$, is invested in the project while $(1 - \alpha_i)L_i$ is invested in other real activities, with $0 < \alpha < 1$. These activities have, for simplicity, a rate of return equal to zero.

In order to be financed the firm has to offer real guaranties to the bank. The amount of real guaranties to offer to the bank is a fraction, $\delta_i$, $0 < \delta_i \leq 1$, of the firm's real activities $(1 - \alpha_i)L_i$ and it is chosen by the bank.

We assume that in case of failure the bank may obtain the sum of the real value of posited guaranties. The amount of real guaranties that the bank may obtain depends on $L$, the amount of equity, on $\alpha$, the share of equity not involved in the project $i$ and, of course, it depends on $\delta$. Hence, for the bank, the return, in case of project's failure may be expressed as $\Omega_i(\delta, \alpha, L)$ where $\Omega(\cdot)$ is a generic function that indicates the firm's guaranties with $\partial\Omega_i/\partial\delta_i > 0$.

We assume that:

$$B_i(1+r_i) > \Omega_i(\delta, \alpha, L) \tag{4}$$

where $r_i$ is the interest rate set for the project $i$.

We solve the model by using backward induction, that is, we first consider the firm decisions given $r_i$ and $\delta_i$ and then we solve the bank's maximization problem to set $r_i$ and $\delta_{i.}$

The expected net return of the project for the firm is given by:

$$E[\pi_i] = \theta_i [R_i^s - B_i(1+r_i) + \Omega_i(\delta, \alpha, L)] - (1-\theta_i)\Omega_i(\delta, \alpha, L) \tag{5}$$

where we have assumed for simplicity that $R^f = 0$. A firm will apply for a loan only if the expected net return of a project is greater than what the firm can obtain without any risk:

$$E[\pi_i] \geq \alpha_i L_i (1+\rho) + \Omega_i(\delta, \alpha, L) \tag{6}$$

since the opportunity cost of the project is given by the sum of the safe return on investment and the value of the real guaranties that will not be lost by the firm.

If $R^f = 0$ then $\theta R_i^s = R$, and we obtain the following result:

$$\theta_i \leq \frac{-R + \alpha_i L_i(1+\rho) + 2\Omega_i(\delta, \alpha, L)}{-B_i(1+r_i) + 2\Omega_i(\delta, \alpha, L)} \tag{7}$$

Only firms that have got projects with a probability of success that satisfy condition (7) will decide to apply in order to be financed. This condition shows that any increase in the interest rate $r_i$ reduces the quality of the projects that will apply ($\partial\theta_i/\partial r_i < 0$) as long as $R > \alpha_i L_i(1+\rho) + 2\Omega_i(\delta, \alpha, L)$. Moreover, we have that $\partial\theta_i/\partial\delta_i > 0$.[5] These results indicate that, as in the Stiglitz and Weiss model, increasing the interest rate, the bank has an adverse selection problem, because it will attract the more risky projects. In our setting, the bank can reduce the adverse selection by asking for greater real guaranties.

Consider now, the bank's maximization problem. The expected profit for the bank, $E[\pi^b]$ on each project $i$, is given by:

$$E\left[\pi_i^b\right] = (1+r_i) B_i E[\theta_i] + [\Omega_i(\delta, \alpha, L)] E[1-\theta_i]. \tag{8}$$

In the presence of asymmetric information the bank cannot evaluate the riskiness of each project. Hence, the interest rate and the dimension of the real guaranties are set in order to maximize the expected profits:

[5] The computations are shown in Appendix2.

$$\max_{r,\delta} E\left[\pi_i^b\right] = (1+r_i)\, B_i \int_0^{\overline{\theta}} g(\theta_i)\theta_i d\theta_i + \Omega_i(\delta,\alpha,L) \int_0^{\overline{\theta}} g(\theta_i)(1-\theta_i)d\theta_i \qquad (9)$$

where $\overline{\theta}$ represents the limit value of $\theta$ for which condition (7) holds as an equality. The first order conditions are obtained by applying the Leibintz rule to the RHS of equation (9):

$$\partial/\partial\delta_i = (1+r_i)B_i \frac{\partial\overline{\theta}}{\partial\delta_i}\overline{\theta}g\left(\overline{\theta}\right) + \frac{\partial\Omega_i}{\partial\delta_i}\int_0^{\overline{\theta}} \theta_i g(\theta_i)d\theta_i + \Omega_i(\delta,\alpha,L)\left[\frac{\partial\overline{\theta}}{\partial\delta_i}\left(1-\overline{\theta}\right)g\left(\overline{\theta}\right)\right] = 0 \qquad (10)$$

$$\partial/\partial r_i = B_i \int_0^{\overline{\theta}} \theta_i g(\theta_i)d\theta_i + \frac{\partial\overline{\theta}}{\partial r_i}\left\{B_i(1+r_i)\overline{\theta}g\left(\overline{\theta}\right) + \Omega_i(\delta,\alpha,L)\left(1-\overline{\theta}\right)g\left(\overline{\theta}\right)\right\} = 0 \qquad (11)$$

Consider equation (10) first. Since $\frac{\partial\overline{\theta}}{\partial\delta_i}$ and $\frac{\partial\Omega_i}{\partial\delta_i}$ are both greater than zero the partial derivative with respect to $\delta_i$ is always increasing. So the bank maximizes its expected profit by setting $\delta_i$=1 independently on $g(\theta)$. To reduce the adverse selection the bank will ask guaranties as high as possible. The solution of equation (11) represents the interest rate set by the bank for the project $i$. This interest rate does not necessarily coincides with the interest rate accepted by the firm which is, according to (7):

$$r_i \leqslant \frac{R - \alpha_i L_i(1+\rho) - 2\Omega_i(\delta,\alpha,L)(1-\theta_i) - \theta_i B_i}{\theta_i B_i} \qquad (12)$$

The bank can reduce the adverse selection by asking real guaranties, but, given asymmetric information on $\theta_i$, the optimal interest rate generates credit rationing. The extent of credit rationing is strictly related to $\Omega(\cdot)$, which represents the financial structure of the firm and it is related to the form of $g(\theta)$. In the Appendix2 we study the case for $g(\theta)$ distributed with a uniform density.

The number of project financed is then different by $N^*$ and the employment level is a function of $\Omega(\cdot)$.

- *Bank loans with full information.*

By backward induction, we start with the firm problem which is identical to that solved in the presence of asymmetric information. We express condition (7) in term of the interest rate:

$$r_i \leqslant \frac{R - \alpha_i L_i(1+\rho) - 2\Omega_i(\delta,\alpha,L)(1-\theta_i) - \theta_i B_i}{\theta_i B_i} \tag{13}$$

This expression indicates that a firm applies for a bank loan only if the interest rate set by the bank gives rise to a positive profit on the project.

The problem for the bank is the maximization of profits subject to the constraint that the firm makes profits and applies for a loan:

$$\max_{r,\delta} E\left[\pi_i^b\right] = B_i\left(1+r_i\right)\theta_i + \Omega_i(\delta,\alpha,L)\left(1-\theta_i\right) \tag{14}$$

$$s.t. E\left[\pi_i\right] \geq \alpha_i L_i\left(1+\rho\right) + \Omega_i(\delta,\alpha,L)$$

which leads to:

$$\max_{r,\lambda,\delta} \mathcal{L}\left(r_i,\lambda,\delta_i\right) = B_i\left(1+r_i\right)\theta_i + \Omega_i(\delta,\alpha,L)\left(1-\theta_i\right) + \lambda\left\{E\left[\pi_i\right] - \Omega_i(\delta,\alpha,L) - \left(1+\rho\right)\alpha_i L_i\right\} \tag{15}$$

with F.O.C.:

$$\frac{\partial}{\partial r_i} = B_i\theta_i\left(1-\lambda\right) \leq 0 \tag{16}$$

$$\frac{\partial}{\partial \delta_i} = \frac{\partial \Omega_i}{\partial \delta_i}(1-\theta_i)(1-2\lambda) \leq 0 \tag{17}$$

$$\frac{\partial}{\partial \lambda} = \theta_i\left[R_i^s - B_i\left(1+r_i\right) + \Omega_i(\delta,\alpha,L)\right] - (1-\theta)\Omega_i(\delta,\alpha,L) - \Omega_i(\delta,\alpha,L) - \left(1+\rho\right)\alpha_i L_i \geqslant 0 \tag{18}$$

$$r_i\frac{\partial}{\partial r_i} = 0, \qquad \lambda\frac{\partial}{\partial \lambda} = 0 \qquad \delta_i\frac{\partial}{\partial \delta_i} = 0 \tag{19}$$

Since $\frac{\partial \Omega_i}{\partial \delta_i} > 0$, taking (16) and (18) as equalities we have that the bank will set:

$$r_i = \frac{R - \alpha_i L_i(1+\rho) - \theta_i B_i}{\theta_i B_i} \tag{20}$$

$$\delta_i = 0 \tag{21}$$

The implication should be clear: since the bank can perfectly discriminate and can observe $\theta_i$ the interest rate is set as a function of $\theta_i$ and all the projects will be financed. If the bank is efficient in setting $\theta_i$, it will not ask for any real guaranty in order to retain the most safe projects. In this framework the production and the employment levels do not depend on the borrowing constraints and on the granted loans. The production and the employment levels are again the levels that satisfy the social optimum condition.

# 4 Empirical Implementation

According to the model set in Section 3 we should observe that employment depends on granted loans if there are credit market imperfections, banks are not efficient in assessing the riskiness of the projects and asymmetric information is widespread. As illustrated in previous sections, the use of real guaranties in order to select projects is a signal of asymmetric information and credit market inefficiency. In this case, the banks apply a static assets criterion in order to establish the firm's external financial dependence. This criterion is based on the real guaranties that the bank may obtain in case of bankruptcy,. The most important index used in this case is leverage. Nevertheless, a more efficient criterion in order to evaluate a project needs to be based on the evaluation of the associated present value. In this sense, the dynamic revenue criterion, is based on the evaluation of the firm's ability to generate cashflows in the future so that debts may be repaid on time. Obviously, this analysis is more difficult to apply in the presence of asymmetric information since it requires a deeper investigation and a reclassification of balancesheets as well as an understanding of specific industries behaviors.[6]

In order to asses the real impact of credit market inefficiency on regional labour markets, we estimate two sets of dynamic panel data regressions for firms located in different geographical areas.

First, we estimate equations where loans are related to different measures of credit rating:

$$bl_{ict} = \alpha_{ic} + \sum_{s=1}^{T} \beta_s bl_{ict-s} + \sum_{s=0}^{T} \gamma_s fcash_{ict-s} + \sum_{s=0}^{T} \delta_s rev_{ict-s} + \sum_{s=0}^{T} \lambda_s lev_{ict-s} + \epsilon_{ict} \tag{22}$$

[6] See Hirschleifer (1958), Brealey and Mayers (1996).

where $bl$ represents bank loans to firm $i$ in region $c$ at time $t = 0, 1, 2...T$, $fcash$ is freecashflow, $rev$ is profit before tax, $\alpha, \beta, \gamma, \delta, \lambda$ are parameters to be estimated. We assume that the bank estimates of future cashflows are based on the evaluation of past cashflows. We consider the significance of the parameter $\lambda$ as a measure of the bank inefficiency in granting loans.

Second, we estimate an employment equation:

$$emp_{ict} = \xi_{ic} + \sum_{s=1}^{T} \phi_s emp_{ict-s} + \sum_{s=0}^{T} \theta_s bl_{ict-s} + \sum_{s=0}^{T} \varphi_s w_{ict-s} + \sum_{s=0}^{T} \mu_s \pi_{ict-s} + u_{ict} \tag{23}$$

where $emp$ stands for employment, $w$ is real wage per worker, $\pi$ represents real productivity measured as value-added per worker, $\xi, \phi, \theta, \varphi, \mu$, are parameters to be estimated. This a rather standard employment equation where we add a term representing the amount of bank loans. We interpret the $\theta$ coefficient as a measure of the real impact of credit market inefficiencies.

# 5 Empirical Results

In order to estimate the model set in Sections 3 and 4 we use panel data for Italian firms during the period 1990-2000. A description of the data and of the variables used in the estimated models is contained in the Appendix1. The empirical models are estimated separately for firms located in North-West, North-East, Center and South areas.

We estimate dynamic equations (22) and (23) using a GMM procedure as in Arellano and Bond (1991). A main general point in estimating employment and bank loans equations refers to the endogeneity of some explanatory variables. The method consists in first differencing the equations in order to eliminate the fixed effect and dealing with endogeneity by making use of the moments restrictions implied by the assumed absence of serial correlation in the error term. The validity of the GMM procedure crucially depends on the absence of serial correlation in the error term, i.e. $E[\Delta\epsilon_{it}, \Delta\epsilon_{is}] = 0$ for $t \neq s$. In particular, since $\Delta\epsilon_{it}$ are first difference of serially uncorrelated errors, $E[\Delta\epsilon_{it}, \Delta\epsilon_{it-1}]$ need not to be zero but the consistency of the GMM estimator is based on the assumption that $E[\Delta\epsilon_{it}, \Delta\epsilon_{it-2}] = 0$. In order to overcome endogeneity problems we use as instruments lags on employment, value added per worker, and wages in the employment equation, and lagged values of before tax profits, freecashflow and leverage in the bank loans equations.

Estimation results are given in Tables 3- 4. Before turning to the discussion of the estimated parameters it is first pointed out that the equation

diagnostics, in all equations, do not provide any indication of the presence of second order serial correlation.

Some points are worth noting. Firstly, we notice that measures of freecash-flow always influence positively the amount of bank loans granted to firms. Moreover, the coefficient is similar (about 0.02) in the four geographical areas. On the other hand, the evidence on the coefficient representing before tax profits is mixed and this may reflect the fact that this variable represents both an index of firm's solvency for the bank as well as a measure of the extent of self-financing. Bank loans present a significant degree of persistence, being the coefficient on the lag of the dependent variable always positive and significant through equations for different geographical areas. The interesting result is that only for the South of Italy the coefficient associated to the variable measuring the leverage, i.e. the firm's external financial dependence, appears significant with a negative sign. In accordance with our theoretical model, this may be considered as a signal of credit market inefficiencies pointing for the existence of credit constraints. We are aware that our results could be affected by problems induced by the truncation of the dependent variable. In fact, we just observe the amount of credit granted to firms but we do not know the amount of credit actually asked to the bank. In order to control for truncation, we check the robustness of our results including dummies which explicitly consider if the firm had credit denied by the bank, if the firm would have asked more credit to the bank, if the firm would have paid an higher interest rate in order to obtain more credit. These variables are described in the Appendix. No one of these dummies is significant and their inclusion do not change our results. On the employment side, the results show that employment has a significant persistence in all geographical areas. At the same time the relationship of employment and wages and productivity is significant and has the expected sign. It is worth noting the significance of the coefficient which relates wages to employment in the South of the country. Many studies in the past, report that in this area wages are only weakly related to employment. Our result may be due to the new institutional setting of the labour market arising after the introduction of flexibility measures and the reduction of the extent of employment protection legislation during the 90's. The very interesting results is that just in the South of Italy employment appears to be determined by the amount of loans granted by banks. Our results indicate that employment is positively affected by loans and that hiring policies may be curbed by credit constraints. Hence, we observe that the impact of the external financial dependence on employment is higher where the local financial market is less developed, asymmetric information is widespread, bank managers are less efficient in assessing the firms' solvency and do not use appropriate methods to evaluate the borrowers

payback capacity. As a result, real effects of monetary variables are related to the efficiency and development of the market. In this sense, a change in the financial pressure or a change in the cost of borrowing have an amplified effect in less developed regions and monetary policy appears to be extremely relevant in determining the employment performance.

# 6 Conclusions

In this paper we investigate the impact of financial factors on firm's employment. Our goal is to assess if the impact of credit on labour market is related to the development of the credit market and to its inefficiencies. We set a theoretical model showing that the impact of the credit on the labour market depends on the extent of asymmetric information and on the efficiency of the banking system in assessing the riskiness of the projects to be financed. We show that the achievement of the social optimum production level (and then of the employment level) may depend on the extent of the banking sector efficiency. We take the case of credit and labour markets of different geographical areas in Italy to find evidence of this hypothesis. We estimate panel data models for Italian firms in four geographical areas over the period 1990-2000 and we show that:

- The freecashflow analysis is relevant in determining bank loans in the four geographical areas.
- Only in the less developed South of Italy the leverage index, a measure of the external financial dependence of the firm, is relevant in determining bank loans. We consider this finding a signal of bank and credit market's inefficiency in this area.
- Employment is related to bank loans only in the South of Italy confirming our hypothesis that in less developed credit markets the impact of financial on real variables is significant.

In the case of Italy, regional employment disparities may be related to the characteristics and peculiarities of the credit markets. We argue that among the institutions relevant in determining the asymmetric response of regional economies to common aggregate shocks, the credit market setting has to be taken into account. We relate these findings to a more general issue concerning the impact of banking and monetary policy on regional convergence and local growth. An aspect neglected in this paper is a precise evaluation of the extent to which credit market inefficiencies are responsible

of regional disparities. Moreover, we do not study the implication of these results for the cyclicality of labour market variables. These topics are left to future research.

# Appendix1: Data Description and Variables Definition

### Data

The data set comes from the survey "Indagine sulle Imprese Manifatturiere" by Mediocredito Centrale. The survey contains 4680 manufacturing firms. Data are available from 1990 to 2000. This survey contains standard balancesheets data for each firm and many informations concerning the relationship between the firm and the banking sector. We deflated all the nominal variables with the appropriate production price index provided by the National Statistical Bureau (Istat).

### Variables definition and description

Value added per worker ($\pi$): computed as the value added divided by the number of employees at the end of the year.

Wage ($w$): computed as the labour cost divided by the number of employees at the end of the year.

Leverage ($lev$): computed as the ratio between total financial debts and the equity as indicated in the balancesheets.

Revenue ($rev$): computed as revenue before tax (over the total assets value).

Bank loans ($bl$): computed as banks' short term loans plus banks' long term loans (over the total assets value).

Employment ($emp$): computed as the number of employees at the end of the year.

Free Cash Flow ($fcash$): computed as

$[AFP - \Delta CCN + \Delta TFR - \Delta(Total\ Assets\ Value) - \Delta(Total\ Financial\ Liabilities) + \Delta(Equity) - IonD - TAX]/\ Total\ Assets\ Value$

where:

$AFP$: potential self-financing given by the operational return plus the capital depreciation allowance indicated in the balancesheets.

$CCN$: net working capital (commercial).

$TFR$: pension fund allowance.

$IonD$: interests paid on the financial liabilities.

$TAX$: taxes paid by the firm at the end of the period.

$CC$: dummy variable taking value 1 if the firm asked more credit but the banks denied it.

$DC$: dummy variable taking value 1 if the firm would have asked more credit to the bank.

$IC$: dummy variable taking value 1 if the firm would have paid an higher interest rate in order to obtain more credit.

Geographical areas: the geographical division is made by using the Nielsen index: 1 - North-West; 2 - North-East; 3 - Centre; 4 - South.

# Appendix2

- Study of the sign of derivatives in (7). Suppressing subscripts and writing $\Omega_i(\delta, \alpha, L) = \Omega$:

$$\frac{\partial\theta}{\partial\delta} = \frac{\left\{-2\frac{\partial\Omega}{\partial\delta}\left[B(1+r) - 2\Omega\right]\right\} - \left\{-2\frac{\partial\Omega}{\partial\delta}\left[R - \alpha L(1+\rho) - 2\Omega\right]\right\}}{\left[-B(1+r) + 2\Omega\right]^2}$$

$$\frac{\partial\theta}{\partial\delta} = \frac{-2\frac{\partial\Omega}{\partial\delta}\left\{\left[B(1+r) - 2\Omega\right] - \left[R - \alpha L(1+\rho) - 2\Omega\right]\right\}}{\left[-B(1+r) + 2\Omega\right]^2}$$

$$\frac{\partial\theta}{\partial\delta} = \frac{-2\frac{\partial\Omega}{\partial\delta}\left\{B(1+r) - R - \alpha L(1+\rho)\right\}}{\left[-B(1+r) + 2\Omega\right]^2}$$

since$\frac{\partial\Omega}{\partial\delta}$is positive while the argument in parenthesis is negative, $\frac{\partial\theta}{\partial\delta}$ is positive.

$$\frac{\partial\theta}{\partial r} = \frac{-B\left\{R - \alpha L(1+\rho) - 2\Omega\right\}}{\left[-B(1+r) + 2\Omega\right]^2}$$

which is negative if the argument in parenthesis is positive.

- Study of the solution of (11) for $\theta \sim U(0,1)$:

Considering that $\int_0^{\overline{\theta}} \theta_i g(\theta_i) d\theta_i = \frac{\overline{\theta}^2}{2}$, $g\left(\overline{\theta}\right) = 1$, $\frac{\partial\overline{\theta}}{\partial r} = B\frac{-R+\alpha L(1+\rho)+2\Omega}{\left[2\Omega - B(1+r)\right]^2}$, we obtain:

$$\frac{B}{2}\left[\frac{-R + \alpha L(1+\rho) + 2\Omega}{-B(1+r) + 2\Omega}\right]^2 + B\frac{-R + \alpha L(1+\rho) + 2\Omega}{\left[-B(1+r) + 2\Omega\right]^2} +$$
$$+\left\{\frac{-R + \alpha L(1+\rho) + 2\Omega}{-B(1+r) + 2\Omega}\left(B(1+r) - \Omega\right) + \Omega\right\} = 0$$

which leads to:

$$r = \frac{-4\Omega^2}{B\left(-R + \alpha L\right)} - 1$$

Notice that $\frac{\partial r}{\partial\Omega}$ is positive. This means that an higher interest rate attracts more risky projects so that the bank requires higher guaranties in order to grant the loan. Notice that for the firm the relationship between the interest rate and the value of guaranties has the opposite sign, as may be easily seen

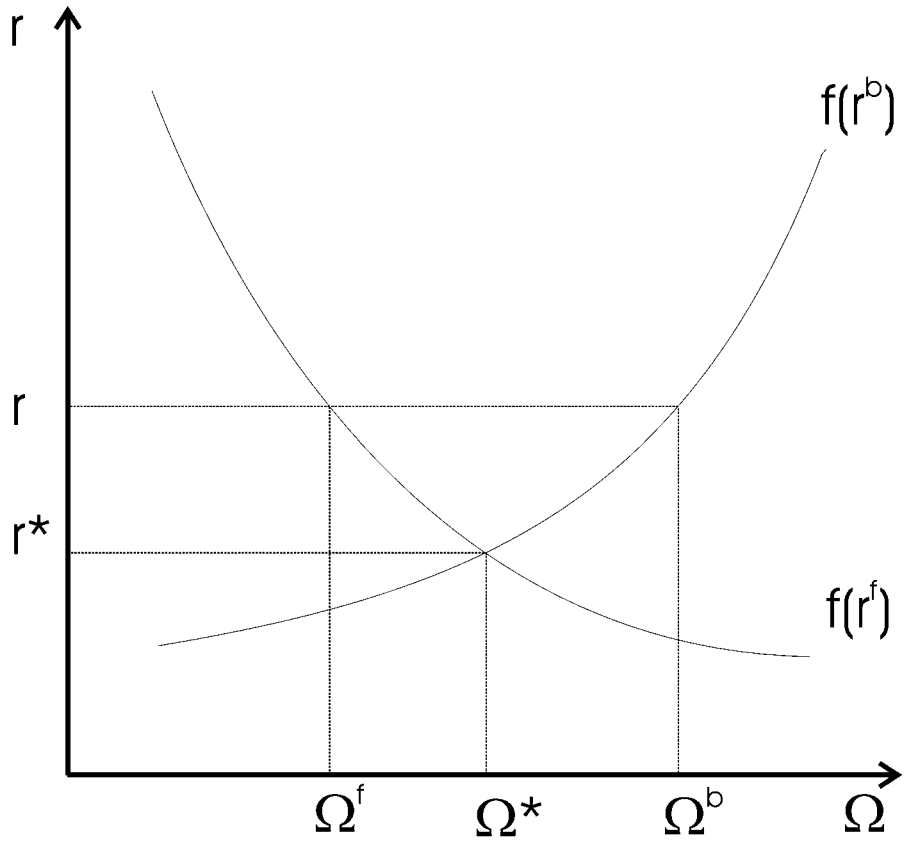


Figure 1: Fig. A1

from equation (12), and this may lead to credit rationing if the interest rate set by the bank is higher than the interest rate that the firm is willing to pay. In fig. A1 we show that if $f\left(r^b\right)$ describes the relationship between $\Omega$ and $r$ for the bank while $f\left(r^f\right)$ describes the relationship between $\Omega$ and $r$ for the firm, when $r > r^*$ the amount of real guaranties that the bank requires in order to finance the project is higher than the amount of guaranties that the firm may provide so that the project is not financed and credit rationing arises.

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Table 1: Return on Equity of Italian Banks, 1994-1998

| Years | North-Center | South |
|---|---|---|
| 1994 | 2.80 | -12.40 |
| 1995 | 4.70 | -30.90 |
| 1996 | 5.40 | -12.00 |
| 1997 | 1.80 | 1.30 |
| 1998 | 7.90 | 3.00 |

Source: Documenti ABI (2002)

Table 2: Banks and firms: measures of credit constraint and location, 2000

| | North-West | North-East | Center | South |
|---|---|---|---|---|
| Local Bank | 66.30 | 64.10 | 65.20 | 50.92 |
| Desired Credit | 18.41 | 15.00 | 21.00 | 32.00 |
| Denied Credit | 04.98 | 03.01 | 05.28 | 10.00 |
| Pay more | 26.34 | 25.99 | 22.94 | 24.15 |

Notes i) Local Bank indicates the percentage of firms having the main bank with legal situs in the same discrict where the firm is located. ii) Desired Credit indicates the percentage of firms that would have asked more credit. iii) Denied Credit indicates the percentage of firms that asked more credit but the banks denied it. iv) Pay more indicates the percentage of firms that would have paid an higher interest rate to obtain more credit.

Table 3: Dynamic panel data estimate of bank loans equations for manufacturing firms (1990-2000)

| Indep.Vars | North-West | North-East | Centre | South |
|---|---|---|---|---|
| $bl_{it-1}$ | 0.535 (0.000) | 0.286 (0.000) | 0.475 (0.000) | 0.382 (0.000) |
| $lev_{it}$ | 0.001 (0.292) | 0.001 (0.953) | 0.001 (0.601) | −0.001 (0.080) |
| $fcash_{it}$ | 0.015 (0.000) | 0.021 (0.002) | 0.020 (0.002) | 0.024 (0.001) |
| $fcash_{it-1}$ | − | 0.017 (0.001) | − | − |
| $rev_{it-1}$ | −0.226 (0.000) | 0.171 (0.003) | −0.270 (0.000) | 0.007 (0.856) |
| Constant | −0.003 (0.000) | −0.002 (0.257) | −0.001 (0.628) | −0.003 (0.050) |
| $2^{nd}$ order S.C. test | 0.283 | 0.462 | 0.242 | 0.623 |
| Sargan Test | $56.97(\chi^2_{16})$ | $47.73(\chi^2_{20})$ | $62.18(\chi^2_{16})$ | $41.97(\chi^2_8)$ |
| Wald Test | $229.20(\chi^2_4)$ | $34.54(\chi^2_6)$ | $137.97(\chi^2_4)$ | $33.45(\chi^2_4)$ |
| N | 4896 | 1701 | 2679 | 1075 |
| T | 10 | 10 | 10 | 10 |

Notes: i) $bl$= bank loans, $lev$=leverage, $fcash$=freecashflow, $rev$=before tax profit. The subscript $i$ refers to firms, the subscrit $c$ refers to geographical areas. $t$ is a time index.ii) For estimation, the equations are first differenced to eliminate the fixed effect. All explanatory variables are treated as potentially endogeneous. Instruments used are those implied by a GMM procedure and include all lags of endogeneous variables from $t-2$ backward. iii)Probability value under the null in parenthesis.

Table 4: Dynamic panel data estimate of employment equations for manufacturing firms (1990-2000)

| Indep.Vars | North-West | North-East | Center | South |
|---|---|---|---|---|
| $emp_{t-1}$ | 0.324 (0.000) | 0.313 (0.000) | 0.318 (0.007) | 0.283 (0.000) |
| $emp_{it-2}$ | −0.091 (0.049) | 0.157 (0.382) | 0.203 (0.121) | 0.058 (0.489) |
| $emp_{it-3}$ | −0.043 (0.534) | −0.093 (0.280) | 0.448 (0.098) | - |
| $bl_{it}$ | −0.038 (0.308) | −0.038 (0.328) | −0.040 (0.528) | 0.049 (0.036) |
| $wage_{it}$ | −0.867 (0.000) | −0.835 (0.000) | −0.940 (0.000) | −1.021 (0.000) |
| $\pi_{ict-1}$ | 0.133 (0.000) | 0.044 (0.000) | 0.046 (0.000) | 0.128 (0.000) |
| Constant | 0.014 (0.000) | −0.152 (0.000) | −0.195 (0.000) | 0.017 (0.034) |
| $2^{nd}$ order S.C. test | 0.307 | 0.407 | 0.124 | 0.964 |
| Sargan Test | $68.69(\chi^2_5)$ | $37.84(\chi^2_4)$ | $14.61(\chi^2_4)$ | $17.59(\chi^2_8)$ |
| Wald Test | $1915.39(\chi^2_6)$ | $662.52(\chi^2_6)$ | $440.27(\chi^2_6)$ | $1430.28(\chi^2_5)$ |
| N | 2298 | 1628 | 1156 | 959 |
| T | 10 | 10 | 10 | 10 |

Notes: i) *emp*= employment, *bl*=bank loans, *wage*=wage per worker, $\pi$=value-added per worker, . All variables are in logs. The subscript $i$ refers to firms, the subscrit $c$ refers to geographical areas. $t$ is a time index.ii) For estimation, the equations are first differenced to eliminate the fixed effect. All explanatory variables are treated as potentially endogeneous. Instruments used are those implied by a GMM procedure and include all lags of endogeneous variables from $t-2$ backward. iii) Probability value under the null in parenthesis.