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Banks, Distances and Firms' Financing Constraints

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Abstract. Bank deregulation and progress in information technology altered the geographical diffusion of banking structures and instruments, and reduced *operational distance* between banks and local economies. However, the consolidation of the banking industry promoted the geographical concentration of banking decision-making centres and increased *functional distance* between local banking systems and local borrowers. This paper focuses on the impact that these spatial diffusion-concentration phenomena had on the financing constraints of Italian firms over the period 1996–2003. Our findings show that greater functional distance stiffened financing constraints, especially for small firms, while smaller operational distance did not always enhance credit availability.

JEL Classification: G21, G34, R51

1. Introduction

Following the deregulation of credit markets and progress in information and communication technologies, geographical diffusion of banking structures and instruments has increased in almost every industrialized country. This trend has reduced *operational distance* between banks and borrowers and boosted competition in local credit markets. At the same time, due to the spectacular wave of bank mergers and acquisitions experienced in the banking industry, bank decision-making centres and strategic functions have been concentrated in few places within each

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country. The spatial concentration of banking power has greatly increased the *functional distance* of the control centre of lending decisions from local branches and borrowers.

Despite the ubiquity of these contrasting trends of spatial diffusion-concentration in the banking industry, their consequences for local economies have not yet been examined in depth. A large body of research has been devoted to studying the impact of the structure of local banking systems on local firms and economic development. However, these studies have failed to investigate the relative importance for lending decisions of distance within banks vis-à-vis distance between banks and borrowers. In this paper, we contribute to this literature by controlling for both operational and functional distances to provide a comprehensive account of the effects of the changing geography of local banking systems on local economies.

We focus on the effects of functional and operational distances on the financing constraints of Italian firms. We build aggregate indexes of operational and functional distance for local banking systems at the provincial level. Operational distance is measured with two proximity indexes (henceforth, operational proximity): the number of bank branches in the province in proportion to the local population or the provincial area. As a measure of functional distance we introduce a new index that takes account of the ownership structure of the local lending offices. Specifically, we calculate functional distance as the ratio of local branches weighted by, alternatively, the physical, economic and socio-cultural distance which separates them from the locus where their own bank is headquartered, to the total number of local branches. Moreover, we combine these three distance indicators by factorial analysis and obtain a composite latent measure of functional distance of the local banking system.

Four different econometric exercises are employed to quantify firms' financing constraints. The first two exercises are conducted at the firm level and evaluate the likelihood of credit rationing and the sensitivity of investment to cash flow. The third and fourth exercises are conducted at the market level and examine to what extent lines of credit granted to local firms are actually used as well as the flexibility of credit supply for local firms as proxied by the ratio of overdrawn to credit lines granted.

On the whole, our results corroborate the hypothesis that the lengthening of functional distance adversely affects credit availability to local firms; this effect is particularly significant for small businesses in the less developed provinces of southern Italy. In contrast, the effect of shortening operational proximity on firm financing constraints is ambiguous: in some specifications positive, while in others insignificant or outright negative. Interestingly, these results are consistent with those of Petersen and Rajan (2002), indicating decreasing importance over time of physical proximity between lenders and borrowers for the probability of loan approval.

A policy-oriented implication of our findings is that undifferentiated consolidation of the banking industry, not balanced by the presence of a strong local bank competitor, may be unable to drive competition towards the needs of small local firms, especially in peripheral regions. The negative externalities of increasing functional distance could be reduced by favouring a change in emphasis in bank organization from the search for economies of scale by standardized, arm's-length lending technologies, to economies of scope by making specialized credit instruments available to local firms (Berger and Udell, 2006).

While the theoretical reasons justifying the influence of functional and operational distances on credit allocation tend to be bank-firm specific, in this paper we adopt a market-based approach. Other studies have followed a market-based approach to investigate the effects of banking consolidation processes.[1] This approach has the advantage of being able to assess the impact of the changing structure of local credit markets on local borrowers, net of the reactions of incumbent banks. For example, the entry of banks in local credit markets may drive incumbents to focus more on their core lending market, where they enjoy informational advantages, so that financing constraints for local borrowers either increase or decrease according to the importance of that geographical market for incumbent banks (Hauswald and Marquez, 2003). Also, with increasing competition from outside, transactional lenders compel local lenders to leave a higher proportion of cash flow to their borrowers and thus may induce them to give up funding small but positive net present value projects (Inderst and Muller, 2007). However, a serious limitation of the market-based approach is that local firms could be actually indifferent to the structure of the local banking system. Insofar as firms are borrowing from bank branches located outside the province where they are headquartered, the correlation between our aggregate indexes of distance and firms' financing constraints would be spurious. Nevertheless, from Bank of Italy statistics, in Italy more than 90 per cent of credit to borrowers located in a province is granted by branches located in the same province. Thus, although we do not know the distribution of either subset, we can confidently assume that the phenomenon of out-of-market loans does not drastically affect our conclusions.

The paper proceeds as follows. Section 2 discusses the reasons why operational and functional distance should impact on lending relationships and selectively reviews the related empirical findings in the literature. Section 3 describes the data

[1] See, for example, Avery and Samolyk (2004), Collender and Shaffer (2003), Berger, Rosen and Udell (2007) for market-based studies on the US experience; Bonaccorsi and Gobbi (2001), Bonaccorsi and Dell'Ariccia (2004), Guiso et al. (2004a), Benfratello et al. (2008) for market-based studies on Italy.

and the distance variables. Sections 4, 5 and 6 display our four empirical exercises, illustrating for each of them the dependent and control variables, the empirical models and results. Section 7 discusses robustness checks and Section 8 concludes.

2. Why should operational and functional distances affect financing constraints?

2.1 OPERATIONAL PROXIMITY: THE THEORY

By operational proximity we refer to the physical proximity between the borrower and its lending office. The theoretical reasons why operational proximity may affect financing constraints for firms rest on (*i*) informational asymmetries underlying bank-firm relationships and (*ii*) transportation costs that fall on borrowers and shape competition in local credit markets.

Physical proximity to the local economy allows banks to supplement 'hard' data on borrowers with relevant 'soft' information collected locally. Soft information improves the quality of screening and monitoring borrowers, makes these actions less costly and facilitates relationship lending (Petersen and Rajan, 1994). Furthermore, informationally opaque borrowers may indirectly benefit from the presence of many competitors in local credit markets because local banks, in an effort to reduce the rigor of competition, redirect their lending towards borrowers for whom they have more informational rents (Boot and Thakor, 2000; Dell'Ariccia and Marquez, 2004).

However, close bank proximity to borrowers may also have negative consequences on financing constraints. Physical proximity translates into additional market power to the lending bank that can charge higher interest rates to close borrowers, either because of information rents (Hauswald and Marquez, 2006) or transportation costs (Degryse and Ongena, 2005). Furthermore, closer operational proximity may prompt "winner's curse" behaviour, inducing banks to be more conservative in terms of loan approval standards and interest rates (Broecker, 1990; Shaffer, 1998).

2.2 OPERATIONAL PROXIMITY: THE EVIDENCE

Empirical findings on the effects of physical proximity of banks to borrowers are mixed. At the bank level, Degryse and Ongena (2005) find that the physical proximity of borrowers to the lending office is associated with higher interest rates, as in spatial competition models. A negative relation between loan rates and distance is also found by Petersen and Rajan (2002) and Agarwal and Hauswald (2008) who, however, emphasise the role of proprietary information and firms' transparency. With regard to credit availability, Carling and Lundberg (2005) find no evidence of a relation between proximity and the probability that a bank may give a borrower a

low rating. By contrast, Agarwal and Hauswald (2008) find that the closer a firm is to a bank branch the more likely that the loan application is approved. In the same vein, Brevoort and Hannan (2006) find that the probability of a bank lending in a given area decreases with physical distance from the nearest office of that bank.

At the market level, Avery and Samolyk (2004) report that the number of banks operating in a market is only weakly associated with small business lending growth in that market, whereas the number of offices has no impact at all on such a variable. Using Italian data, Bonaccorsi and Gobbi (2001) find that the ratio of branches to population in a province is positively associated with credit to firms located in that province, whereas it is negatively associated with bad loans. Benfratello et al. (2008) show that a higher branch density in Italian provinces increases the probability of firms introducing innovations, but reduces the sensitivity of investment to cash flow of small firms. However, Herrera and Minetti (2007), after controlling for the duration of the lending relationship, find that the effect of branch density on firm innovation is not significantly different from zero.

2.3 FUNCTIONAL DISTANCE: THE THEORY

By functional distance we refer to the distance between a local branch, where information is collected and lending relationships are established, and its headquarter, where lending policies and ultimate decisions are typically taken. From a theoretical point of view, the importance of functional distance for the lending policies of local branches has its roots in (*i*) the asymmetric distribution of information and the costs of communication within an organisation, and (*ii*) the economic, social and cultural differences across communities.

In recent years, it has become customary among banking scholars to emphasize the critical role of organizational issues for lending activities (Berger and Udell, 2002; Stein, 2002; Novaes and Zingales, 2004). Information on local borrowers, it is claimed, is in the hands of local bank managers and to a large extent this information is soft and not easily transferable to the upper echelons of the bank. This raises agency problems and stimulates behaviour that tends to hinder the collection and dissemination of soft information in large and hierarchically organised banks (Aghion and Tirole, 1997; Dessein, 2002; Harris and Raviv, 2005). Whatever the combination of delegation and centralisation of lending decisions chosen at the parent bank, significant organisational diseconomies arise that reduce the profitability of soft information loans (Stein, 2002; Takáts, 2004).

Others have emphasised effort and resources spent by a loan officer to influence decisions of senior managers at the headquarters of a large bank on the distribution of resources, job assignments and power within the organization (Milgrom and Roberts, 1990; Scharfstein and Stein, 2000). Such influence activities generate costs and credit misallocation for the bank. For example, to limit influence activities

and induce accurate reporting on loan quality, loan officers are frequently rotated within the bank (Hertzenberg et al., 2007). The internal mobility of loan officers, in turn, reinforces incentives for the branch to produce short-term results. This may induce local managers to be too conservative about small and new borrowers who require a lot of soft information and to be too liberal about larger and well-established borrowers who are evaluated with hard information (Hirschleifer and Thakor, 1992; Palley, 1997; Berger and Udell, 2002).

The severity of agency costs and influence activities as well as their impact on credit allocation grow with the complexity of a bank's organisation. According to the literature, organisational diseconomies are shaped by bank characteristics such as size or organizational form (McAfee and McMillan, 1995; Berger et al., 1999; Berger et al., 2005). However, it is reasonable to assume that most organisational diseconomies are bank-firm specific and associated to the geographical dispersion of the bank organisation through branches and subsidiaries. In this respect, what matters is the distance between local and decision centres (Brickley et al., 2003; Mian, 2006), where distance encompasses physical, economic and socio-cultural attributes. For example, the greater the physical distance between the parent bank and local branch, the more costly it is to gather reliable information from loan officers, monitor their actions and enforce a lending policy designed at the bank's headquarters. At the same time, as differences increase in the economic structure of the regions where the parent bank and local branch are located, so does the informational rent of local loan officers who can accumulate specific knowledge of the local economy. Similarly, for branches located in socially and culturally diverse areas from bank headquarter, the bank-wide common business culture may succumb to the group-interaction effect as the root of individual behaviour.[2] In the absence of shared cultural values, senior bank officials and local managers find it hard to trust each other and communication between them becomes noisy, especially when dealing with soft information that is inaccessible to higher bank levels. In this vein, banks that open or acquire branches in a location where the culture and social environment drastically differ from those of its headquarters show a tendency to limit their activities to cherry-picking large and safe borrowers and selling asset management and other transactional products (Mian, 2006; Alessandrini et al., 2008).

[2] There is a huge literature on the importance of neighbourhood effects for disparate individual behaviours (from criminal actions to labour supply). An interesting application to banks is provided by Ichino and Maggi (2000) who show that shirking behaviours within a large Italian bank have significant regional differences due to group interactions and the different civicness which characterizes the area where bank branch employees work.

2.4 FUNCTIONAL DISTANCE: THE EVIDENCE

While there is robust evidence supporting the importance of agency and influence costs in banking organisations[3] and the disadvantages of large, complex bank organisations in small business and relationship-based loans[4], the role of functional distance on credit allocation has been much less extensively studied.

At the loan level, Mian (2006) shows that in Pakistan branches of foreign banks are less involved in small business and relational lending than branches of domestic banks, and that among the former the branches of non-Asian banks are the least involved. Jiménez et al. (2007) show that in Spain the likelihood of pledging collateral decreases with the distance between the lending branch and its bank headquarters, consistent with the hypothesis that functionally distant banks specialize in transaction-based loans. In the same vein, Casolaro and Mistrulli (2007) find that in Italy functional distant banks charge a lower interest rate to firms, especially when the latter are small sized. Finally, Liberti and Mian (2006) analyze a large multinational bank operating in Argentina and find that the sensitivity of the amount of credit facility granted to soft information available is statistically lower when the officer who approves the loan sits in a different location from that of the officer who collects the soft information.

At the bank level, Alessandrini et al. (2005) report that stand-alone banks headquartered in southern Italian regions are more involved in small business lending than southern banks affiliated to centre-northern holding groups. In a similar vein, Alessandrini et al. (2008) find that in Italy restructuring strategies pursued by the acquirer with respect to the asset portfolio of the acquired bank depend on the cultural distance between the provinces where the dealing partners are headquartered: the greater this distance, the stronger and more persistent is the decrease in acquired banks' loans to small business and the increase in transaction-based financial activities.

At the market level, Bonaccorsi and Dell'Ariccia (2004) and Collender and Shaffer (2003) construct a measure of what we call functional distance of the banking system from the local economy, taking into account the ownership structure of the local lending offices. Both papers find that the proportion of the local loan or deposit market held by in-market institutions (i.e., the functional proximity of the banking system) has some positive effect on local credit availability. With regard to the United States, Collender and Shaffer (2003) find that functional distance, under some circumstances, has a negative impact on local economic growth. Bonaccorsi and Dell'Ariccia (2004) find that in Italian provinces firm creation in industries

[3] Amongst others, see Udell (1989); Liberti (2004); Berger and DeYoung (2006); Liberti and Mian (2006); Hertzenberg et al. (2007).

[4] Amongst others, see Keeton (1995); Berger et al. (1998); Peek and Rosengren (1998); Sapienza (2002); Cole et al. (2004); Berger et al. (2005).

that are informationally opaque is positively associated with the share of deposits held by chartered banks in the same province.

In this paper, we make four contributions to this literature. First, we systematically address the issues of endogeneity of functional distance and omitted variables by using instrumental variables and system GMM estimations. Second, we focus on firms' financing constraints, whereas previous studies have analysed lending activities (Mian, 2006; Alessandrini et al., 2008), loan conditions (Casolaro and Mistrulli, 2007; Jiménez et al., 2007), firm birth rates (Bonaccorsi and Dell'Ariccia, 2004) and economic growth (Collender and Shaffer, 2003). Third, and more importantly, we introduce a new measure of local banking structure that takes into account the distance of local branches from their own headquarters. Previous studies have focused on the share of the local credit market controlled by out-of-market banks, based on the assumption that functional distance is a characteristic that banks either have or do not have, regardless of their location. Instead, we suggest that functional distance is better measured as a continuous property: all banks are subject to functional distance, albeit to different degrees. Although functional distance of a banking system is clearly correlated with the share of out-of-market owned branches, the two measures might lead to very different predictions. For instance, in our sample there are provinces where the share of out-of-market owned branches is the same, but the ultimate control of local branches is in the hands of banks that are headquartered at different distances from those provinces.[5] Finally, we control for other banking development and competition variables.

3. Data and variables

3.1 DATA

Our dataset relies on three sources. Firm-specific data come from a well-known survey on Italian manufacturing firms run every three years by the Observatory on SMEs by Capitalia, an Italian banking group (formerly Mediocredito Centrale).[6] This survey (henceforth, MCC survey) gathers information from a representative sample of firms with 11–500 employees[7] and from the universe of Italian manufacturing firms with more than 500 employees. Company balance sheet data are attached to the survey. We use the last three waves

[5] However, following the same argument, it is important to note that a bank-loan-level functional distance measure, which one cannot build with publicly available data, might lead to quantitatively different indications than our estimates based on aggregate functional distance measure.

[6] With regard to the banking literature, this dataset is employed, amongst others, by Benfratello et al. (2008), Herrera and Minetti (2007) and Huynh and Rotondi (2007).

[7] Firms are randomly selected and stratified by size (five classes of employees), industry (Pavitt classification) and geographical area (North and Centre-South).

covering the period 1995–2003. Taken together, they have 13,004 observations (9,674 with balance sheet data), but only 526 firms are present in all three waves due to the resampling rule followed in the survey. Data on bank and branch location, bank group composition, credit lines granted, credit used and overdrawn at the provincial level are from the Bank of Italy. Credit line information covers the period 1997–2003. Institutional and macroeconomic data at the provincial level on the functioning of the judicial system, value added and population are from the Italian National Institute of Statistics (ISTAT).

3.2 MEASURING DISTANCES

3.2.1 Operational Proximity

We use two measures of operational proximity of the banking system to a province j. First, we build a branch density index in terms of population, $OPERATIONAL\_PROXIMITY\_POPULATION = Branches_j \times 10{,}000/Population_j$. This is the most widely used index of bank presence in an area and allows straight comparison of our results with the literature. However, as has been noted by a referee, *OPERATIONAL_PROXIMITY_POPULATION* is only loosely associated with transportation and information costs embedded in our notion of operational proximity. A branch density index measured in proportion to the provincial surface area, $OPERATIONAL\_PROXIMITY\_AREA = Branches_j/Surface\ Area_j$, is an alternative and more straightforward proxy of transportation and information costs borne by borrowers and lenders.[8]

3.2.2 Functional Distance

Functional distance depends on ownership and organizational structure of banks operating locally. We compute functional distance of the banking system in province j by weighting the number of branches operating in that province by a distance indicator that captures the severity of informational and organizational frictions between the local branch and the headquarters of their parent bank:

$$FUNCTIONAL\_DISTANCE_j = \frac{\sum_{b=1}^{B_j}\left[Branches_b \times \ln\left(1 + D_{jz_b}\right)\right]}{\sum_{b=1}^{B_j} Branches_b}, \quad \text{with } j, z = 1, \ldots, 103$$

[8] For example, in a standard circular city competition model with n branches equidistantly distributed over a circle of circumference S and linear transportation costs, in equilibrium a firm located at distance x from a branch i incurs transportation costs $t(S/n - x)$ to go to i or, equivalently, $t(1/OPERATIONAL\_PROXIMITY\_AREA - x)$, where t is the transportation cost per unit of length.

where B_j is the number of banks operating in the province j, $Branches_b$ is the number of branches belonging to the bank b, and D_{jz_b} is the distance indicator between the branch and its bank.

We build three alternative functional distance indexes: (*i*), $FUNCTIONAL\_DISTANCE\_KM_j$, where the weighting distance indicator D_{jz_b} is measured in physical distance between branch of bank b located in province j and its headquarter located in province z (KM_{jz_b}, with $KM_{jj_b} = 0$;) (*ii*) $FUNCTIONAL\_DISTANCE\_SOCIAL\_CAPITAL_j$, where D_{jz_b} is the absolute difference between the social capital of provinces j and z, $|SOCIAL\_CAPITAL_j - SOCIAL\_CAPITAL_{z_b}|$; and (*iii*), $FUNCTIONAL\_DISTANCE\_ECONOMIC\_STRUCTURE_j$, where the distance indicator is an index of economic dissimilarity between provinces j and z measured by shares of workers employed by m economic sectors, $\sum_{h=1}^{m} |W_{hj} - W_{hz_b}|$ for the absolute value.

Kilometric distances across 103 Italian provinces are calculated with respect to provincial capitals using an extension of Jenness' (2005) ArcView GIS software, Distance Matrix. Social capital is computed as the average voter turnout at the 21 referenda held in Italy in 1993, 1995 and 2001 as published by the Home Department.[9] The share of workers employed by sector h in province j is drawn from the VIII Industry and Services Census (ISTAT 2001). We consider 14 economic sectors (NACE one digit), but we checked the robustness of our results by using different levels of data desegregations and also reclassifying the share of manufacturing sectors according to the PAVITT classification.

Functional distance indexes are positively and highly correlated with one another and negatively correlated with operational proximity (Table I). This corroborates the idea that functional distance includes physical, cultural and economic distances; to take account of the simultaneous impact of these distances on functional distance, we combine *FUNCTIONAL_DISTANCE_KM*, *FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL* and *FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE* indexes into a single latent distance index (*FUNCTIONAL_DISTANCE_LATENT*) by taking the first component from a FActorial Matrices Analysis (FAMA; Fachin et al., 2002). This first component explains 81 per cent of the global variance of the three distance indexes.[10]

The underlying assumption of these functional distance indexes is that local branches are controlled by the chartered banks owning them, regardless of their

[9] See Guiso et al. (2004b) and Alessandrini et al. (2008). Following Guiso et al. (2004b), we also use the number of blood bags per million population voluntarily donated in each province to the Italian Association of Blood Donors (AVIS) in 1995.

[10] Only the first eigenvalue is greater than one, with the corresponding eigenvectors equal to 0.60, 0.58 and 0.55 for, respectively, *FUNCTIONAL_DISTANCE_KM*, *FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL* and *FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE*, and showing a similar contribution of the three distance indicators in the latent index *FUNCTIONAL_DISTANCE_LATENT*.

Table I. Banking distance variables, pairwise correlations

The table reports the pairwise correlations for the banking distance variables. * significant at 5%. Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j*. The weighting distance between the two provinces is measured: in kilometric distance (*FUNCTIONAL_DISTANCE_KM*), as the absolute difference in social capital (*FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL*), and as a dissimilarity index of the economic structure in terms of shares of workers employed by *m* economic sectors (*FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE*). A fourth index of functional distance (*FUNCTIONAL_DISTANCE_LATENT*) is obtained by taking the first component from a Factorial Matrices Analysis run on the three basic functional distance indexes. The *FUNCTIONAL_DISTANCE* indexes are reckoned assuming that control of local branches is in the hands of the chartered banks that own them, regardless of their affiliation to a multibank holding company. *FUNCTIONAL_DISTANCE_KM_G*, *FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL_G*, *FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE_G* and *FUNCTIONAL_DISTANCE_LATENT_G* are built assuming that the holding company is in command of local branches. The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches (× 10,000) over the surface area (*OPERATIONAL_PROXIMITY_AREA*)

	FUNCTIONAL_DISTANCE_KM	*FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL*	*FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE*	*FUNCTIONAL_DISTANCE_LATENT*	*FUNCTIONAL_DISTANCE_KM_G*	*FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL_G*	*FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE_G*	*FUNCTIONAL_DISTANCE_LATENT_G*	*OPERATIONAL_PROXIMITY_POPULATION*	*OPERATIONAL_PROXIMITY_AREA*
FUNCTIONAL_DISTANCE_KM	1									
FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL	0.8227*	1								
FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE	0.6949*	0.6538*	1							
FUNCTIONAL_DISTANCE_LATENT	0.9811*	0.9140*	0.7308*	1						
FUNCTIONAL_DISTANCE_KM_G	0.8158*	0.7062*	0.5342*	0.8083*	1					
FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL_G	0.7229*	0.8738*	0.4974*	0.7990*	0.8505*	1				
FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE_G	0.6278*	0.5868*	0.8035*	0.6553*	0.7807*	0.6787*	1			
FUNCTIONAL_DISTANCE_LATENT_G	0.7997*	0.7838*	0.5491*	0.8237*	0.9637*	0.9199*	0.7766*	1		
OPERATIONAL_PROXIMITY_POPULATION	−0.5618*	−0.6117*	−0.3872*	−0.5975*	−0.5591*	−0.6559*	−0.4281*	−0.6043*	1	
OPERATIONAL_PROXIMITY_AREA	−0.1610*	−0.2335*	−0.1040*	−0.1917*	−0.1876*	−0.2650*	−0.1605*	−0.2194*	0.1609*	1

affiliation to a multibank holding company. As parent banks typically preserve a certain influence on the decisional process of affiliated banks, this is a conservative assumption that probably undervalues the impact of functional distance on financing constraints to firms.[11] Nevertheless, we will check the robustness of our findings by analyzing the opposite situation, in which the holding company is assumed to be in command of local branches, and we calculate functional distance indexes consistently (hereafter, *FUNCTIONAL_DISTANCE_G*). Moreover, since our results are qualitatively robust to changes in functional distance indexes, to save space in the sections below we primarily discuss regressions with *FUNCTIONAL_DISTANCE_KM* and *FUNCTIONAL_DISTANCE_LATENT*.

3.2.3 Descriptive Statistics

All distance measures show a great variability over time and across provinces (Table II). The increase in operational proximity and functional distance indexes from 1996 to 2003 was statistically significant and more so in southern provinces, where the geography of banking has had deeper changes than in the North of the country. The provincial distribution of distance indicators mirrors the well known Italian geographical divide between northern-central and southern regions: banks in the North and the Centre are functionally and operationally less distant than banks in the South. The North-South divide is even sharper when functional distance is computed with respect to the headquarters of parent banks.

3.3 MEASURING FINANCING CONSTRAINTS

Due to the lack of an established method in measuring financing constraints to firms, in this paper we have adopted a robust approach. We run different econometric exercises using four alternative indicators of financing constraints as dependent variable. The first two indicators are computed at the firm level from survey and balance-sheet data; the third and fourth at the market level. In the first exercise, we use self-reported answers to a question on credit rationing in the MCC Survey: a dummy variable, *RAT*, takes the value of 1 if the firm answered yes to the question

[11] In Italy the headquarters of parent banks are much more geographically concentrated than those of chartered banks. According to the Register of Banks and Banking Groups held by the Bank of Italy, by 2004, 148 chartered banks had their headquarters in one of the southern regions, whereas no banking group had their holding company or parent bank in the these regions. Among the 148 southern banks, 111 were small Credit Cooperatives, 21 were affiliated to Northern-Central banking groups and only 16 were independent, stand-alone banks. Considering only the distance within chartered banks, therefore, reduces the geographical and time variability of functional distance indexes and underestimates the distance to southern provinces where few holding groups are located (see Table II)

Table II. Banking distance variables: Summary statistics

The table reports the summary statistics for the banking distance variables. Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the kilometric distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j* (*FUNCTIONAL_DISTANCE_KM*) and as a latent distance (*FUNCTIONAL_DISTANCE_LATENT*) obtained by taking the first component from a Factorial Matrices Analysis run on the three basic functional distance indexes. The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches ($\times$ 10,000) over surface area (*OPERATIONAL_PROXIMITY_AREA*). For *FUNCTIONAL_DISTANCE_KM* we also report, in parenthesis, the mean and the standard deviation of the index built by weighting the number of branches by the actual kilometric distance between the province of the branch and that where the parent bank is headquartered. The last four rows report a two-tailed test of the null hypothesis that (1) the values of the banking distance variables in 1996 and in 2003 are equal, and (2) the averages of the banking distance variables over the period 1996–2003 in the North and in the Centre-South are equal. Actual differences are reckoned, with *** indicating a statistical significance at 1% level, while the t-statistics are reported in parenthesis.

Year	*FUNCTIONAL_ DISTANCE_KM*		*FUNCTIONAL_ DISTANCE_ LATENT*		*OPERATIONAL_ PROXIMITY_ POPULATION*		*OPERATIONAL_ PROXIMITY_ AREA*	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
1996	2.972 (133.14)	1.082 (94.97)	2.308	0.955	4.509	1.612	10.441	12.503
1997	3.035 (138.25)	1.094 (100.54)	2.363	0.969	4.656	1.677	10.839	13.023
1998	3.078 (141.92)	1.101 (102.02)	2.401	0.982	4.885	1.678	11.234	13.417
1999	3.158 (150.52)	1.116 (115.41)	2.474	1.003	5.087	1.734	11.621	13.855
2000	3.213 (154.67)	1.121 (122.52)	2.525	1.014	5.267	1.789	12.070	14.330
2001	3.277 (161.16)	1.137 (129.23)	2.581	1.033	5.449	1.843	12.516	14.832
2002	3.394 (172.53)	1.132 (135.06)	2.672	1.031	5.533	1.875	12.803	15.154
2003	3.451 (172.82)	1.151 (135.51)	2.720	1.038	5.538	1.904	12.957	15.301
	1996–2003 Growth rates							
Italy	16.10		17.83		22.09		24.10	
North	15.31		16.40		21.95		25.77	
Centre	14.26		14.37		21.44		25.60	
South	17.57		20.37		26.46		17.48	
	t-test on the differences between:							
1996 vs 2003	−0.478*** (9.755)		−0.411*** (9.426)		−1.029*** (15.901)		−2.516*** (8.287)	
North vs Centre-South	−0.903*** (4.544)		−0.899*** (5.150)		2.485*** (10.141)		8.808*** (3.316)	

"*In [the last year of the survey] would the firm have desired more credit at the interest rate agreed with the bank?*" and 0 otherwise (Capitalia, 2005).[12]

The second exercise tries to identify the effect of distances on financing constraints, following the large literature on the sensitivity of firm investment to cash flow (Fazzari et al., 1988).

In the third and fourth exercises, financing constraints are computed at the provincial level as: (*i*) the ratio of credit lines used by in-province borrowers to credit lines made available to them (*CREDIT_DRAWN*), and (*ii*) the ratio of overdrawn to credit lines available to in-province borrowers (*OVERDRAWN*). They are widely employed indicators of credit market tightness.[13] In many countries, including Italy, firms typically negotiate with banks credit lines that ensure a certain degree of flexible use. For example, borrowers have the option of either not fully utilizing the credit line, free of any charge, or overdraw up to a certain amount, subject to fees and penalty interest rates on the overdrawn. When the credit market is tight, firms have a lower credit buffer and use a higher proportion of the negotiated credit line (i.e., *CREDIT_DRAWN* is higher); moreover, the right to overdraw is narrower and the flexibility of credit supply smaller (i.e., *OVERDRAWN* is lower).

4. Credit rationing

4.1 THE ECONOMETRIC MODEL

We estimate the probability of a firm being credit rationed as a function of operational proximity, functional distance and other firm-specific and geographical control variables:

$$\Pr(RAT_{ij}) = f(OPERATONAL\_PROXIMITY_j,\ FUNCTIONAL\_DISTANCE_j,\ FIRM_i, PROV_j) \quad (1)$$

where i is the firm, *FIRM* stands for m firm-specific control variables and *PROV* for n control variables at the provincial level, which should affect the likelihood of being financially constrained.

4.1.1 Control Variables

All firm-specific variables come from the MCC survey and balance-sheet data. In our basic specification, *FIRM* includes variables such as firm size (*SIZE*),

[12] The survey contains two other questions concerning the firms' willingness to pay a slightly higher interest rate than the current one and the actual rejection of a loan application. Since the order and method in which these questions are reported change with the survey waves, responses are not perfectly comparable across the three datasets and we have decided to concentrate our analysis only on the more general question on credit rationing, though it mixes quantity with price rationing.

[13] Amongst others, credit drawn by borrowers is employed at the market level by Bonaccorsi (2003) and at the firm level by Agarwal et al. (2006) and Bonaccorsi and Gobbi (2007).

propensity to innovate (*R&D*), return on investment (*ROI*), degree of indebtedness (*DEBT*) and bank-firm relationships (*BANK_NUMBER* and *BANK_PROVINCE*).

SIZE is measured by the logarithms of the current number of employees and is expected to be negatively associated with the likelihood of credit rationing. The profitability of firms, *ROI*, is computed as gross operating earnings on invested capital and is expected to reduce the probability of being rationed. *DEBT* is measured by the logarithm of the debt to equity ratio. As usual, we assume that it is positively correlated with firm riskiness and hence expect that the higher *DEBT* the higher the probability of being credit rationed. *R&D* is computed as the share of workers employed in Research and Development departments on the total labour force. Following the literature, we expect that more innovative firms are likely to be credit rationed, because they are more informationally opaque and perceived as riskier by banks. To mitigate possible endogeneity problems all these variables are pre-dated to the starting year of the survey.

Finally, among the firm-specific controls we include two indicators of the bank-firm relationship: (*i*) the number of banks with which the firm does business (*BANK_NUMBER*) and (*ii*) a dummy variable which takes a value of 1 if the firm's main bank is headquartered in the same province and 0 otherwise (*BANK_PROVINCE*). The *a priori* expectations on both *BANK_NUMBER* and *BANK_PROVINCE* are ambiguous. The former is a measure of multiple lending. This, in one way, should reduce financing constraints by putting lending banks in competition with each other but, in another way, could exacerbate financing constraints for firms by lessening banks' incentives to engage in relational lending. In the same way, relying on a physically close bank could help to overcome information asymmetries. But it could also make the firm more likely to be informationally captured by the local bank with negative effects on its financing constraints (Ongena and Smith, 2000).

PROV includes control variables for both the characteristics of the banking system and the institutional environment at the provincial level. As regards the former, we consider the concentration of the local credit market and the degree of localism of the banking system. Lacking data on the geographical distribution of bank deposits and loans, we measure concentration by the Herfindahl-Hirschman Index (*HHI*) computed on the number of branches in the province. The degree of localism is proxied by the share of branches held by Credit Cooperative Banks (*COOPERATIVE_BANKS*) in the province.[14] The expectation on the coefficient signs of these variables is uncertain. According to conventional wisdom, higher market concentration should go hand-in-hand with higher loan rates and a lower quantity of credit to borrowers. However, as the recent literature has pointed out,

[14] The inclusion of *COOPERATIVE_BANKS* aims to separate localism from functional distance. While a province with a banking system formed by only credit cooperatives banks has zero functional distance, it is also true that two banking systems with the same functional distance may show very different degrees of localism.

market concentration could also be beneficial for small firms due to the closer relationships with banks in a less competitive environment (Petersen and Rajan, 1995). In a similar vein, a high proportion of local banks in the credit market could increase credit availability to small local firms by reducing informational costs, but it might also be indicative of a closed and non-competitive banking system, less inclined to lend to young and riskier firms (Alessandrini and Zazzaro, 1999).

As regards institutional aspects, we consider the efficiency of courts in recovering bad loans measured by the logarithm of the average length (in days) of bankruptcy trials (*FAIL*).[15] Moreover, to take account of the unobserved specificity of Italian regions we add geographic dummies for the five Italian macro regions.[16] Finally, we add three time (wave) dummies.

4.1.2 Sample and Methodology

We look at the determinant of *Pr*(*RAT*) pooling the three MCC surveys. From the original sample, we excluded a number of observations due to missing data in balance-sheet entries, inconsistencies or extreme values. In particular, we excluded all firms which failed to indicate their headquarter location and which had an *R&D* value exceeding 100; firms with an *ROI* below the first and above the last percentile of its distribution; firms with a negative *DEBT* or with values greater than the last percentile. After this trimming process, our dataset decreased to 7,844 observations.

To address possible endogeneity and omitted variable problems in estimating the effect of banking variables (*OPERATIONAL_PROXIMITY* and *FUNCTIONAL_DISTACE* indexes, *HHI*, and *COOPERATIVE_BANKS*) on the likelihood of credit rationing, we also use instrumental variable techniques. In choosing instruments that may be correlated with banking development variables, but uncorrelated with the error term, we follow Guiso et al. (2004a) and exploit the fact that: (*i*) the number of branches in Italian regions and their distribution by size in 1936 were strictly regulated by the Bank of Italy and unrelated to regional economic development at that time; (*ii*) the geographical distribution of branches in 1936 remained substantially unaltered until the end of the 1970s and is significantly correlated with the local banking development in the 1990s. In this spirit, we construct a set of instrumental variables at the provincial level:[17] *OPERATIONAL_PROXIMITY_POPULATION* and

[15] The variable is available from ISTAT not at the provincial level, but only for larger Judiciary Districts (Corte d'Appello), each covering more than one province.

[16] Macro areas are: North-West, North-East, Centre, South and Island.

[17] The Guiso et al. (2004a) approach has been extended at the provincial level also by Benfratello et al. (2008) and Herrera and Minetti (2007). The provincial distribution of branches at the bank level is available from 1971 onwards.

OPERATIONAL_PROXIMITY_AREA in 1936 and 1971; *FUNCTIONAL_DISTANCE_KM* in 1971; *COOPERATIVE_BANKS* in 1936 and 1971; the share of branches owned by large banks, i.e., the former banks of national interest ("Istituti di Interesse Nazionale") and state-owned banks ("Istituti di Diritto Pubblico") in 1936 and 1971; and the value of *HHI* in 1971.

To take into account the possible endogeneity of *BANK_NUMBER* (Degryse and Ongena 2001), we add three more instruments proposed by Montoriol Garriga (2006) and Herrera and Minetti (2007): the ratio of bank debt to total assets at the industry level (*BANK_DEBT*); the average annual number of branches opened by entrants in a province over the period 1980–1985 (*ENTRANT_*Δ*BRANCHES_80-85*); the average annual number of branches opened net of branches closed by incumbents banks in a province over the period 1980–1985 (*INCUMBENT_*Δ*BRANCHES_80-85*). The first of such instrumental variables, (*BANK_DEBT*), captures the average degree of a firm's dependence on external finance due to exogenous industry-specific technological features. Therefore, it should be uncorrelated with the error term in Equation (1) and, to the extent that higher credit requirements necessitate more lenders, positively correlated with *BANK_NUMBER*. The rationale for the other two instruments lies in the effects that the numbers of competitors have on the opportunity to establish stable and exclusive lending relationships. In this vein, the opening of branches by incumbents in the past is expected to be negatively correlated with the number of bank relationships while, conversely, the *ENTRANT_*Δ*BRANCHES_80-85* should be positively correlated with *BANK_NUMBER*.

4.2 RESULTS

According to Table III, 15 per cent of firms in our sample claim to be rationed. This proportion decreases with firm size. Furthermore, while the average number of employees in rationed firms is 67, non-rationed firms have 110 employees. This difference is statistically significant at the 1 per cent level. Apart from size, rationed and non-rationed firms differ in a number of other features: firms facing credit constraints are, on average, significantly more indebted, less profitable and more likely linked to a bank located in the same local area. Furthermore, rationed firms are generally located in provinces where there are fewer cooperative banks (the one-tailed test for the *COOPERATIVE_BANKS* coefficient is significant at 6% level) and concentration is higher.

Finally, there are also significant differences with respect to our key distance variables. Rationed firms are usually located in provinces with a lower branch density (in terms of population) and greater functional distance.

Table V shows the results of probit and IV probit estimates of model (1) for the whole sample, while Table VI reports the results of IV probit for the two

Table III. Credit rationing: Univariate analysis on averages

The table reports the summary statistics of the explanatory variables of Equation (4) for rationed and non-rationed firms. The last column reports the p-values of a two-tailed t-test of the null hypothesis that the averages are equal in the two sub-samples of rationed and non-rationed firms. * significant at 10%; ** significant at 5%; *** significant at 1%. *RAT* is equal to one if the firm is credit-rationed and zero otherwise. Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j*, where the distance is proxied by the kilometric distance (*FUNCTIONAL_DISTANCE_KM*), the difference in social capital (*FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL*) or by a dissimilarity index in the economic structure (*FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE*), and as a latent distance (*FUNCTIONAL_DISTANCE_LATENT*) obtained by taking the first component from a Factorial Matrices Analysis run on the three basic functional distance indexes. The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches (× 10,000) over surface area (*OPERATIONAL_PROXIMITY_AREA*). *COOPERATIVE_BANKS* is the share of branches held by Credit Cooperative Banks on total branches in the province. *HHI* is the logarithm of the Herfindahl-Hirschman Index calculated on the number of branches in the province. *BANK_NUMBER* is the number of banks with which the firm does business. *BANK_PROVINCE* is a dummy equal to one if the firm and its main bank are headquartered in the same province, and zero otherwise; *SIZE* is the logarithm of the number of workers; *R&D* is the ratio of those employed in R&D to total workers; *ROI* is the Return on Investment; *DEBT* is the logarithm of (1 + Debt-equity ratio); and *FAIL* is the logarithm of the average length, in days, of a bankruptcy trial, by judicial district.

	RAT = 1			*RAT* = 0			*t*-test (*p*-value)
	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	
FUNCTIONAL_DISTANCE_KM	1,179	2.988	0.975	6,665	2.782	0.874	0.000***
FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL	1,179	0.989	0.495	6,665	0.865	0.413	0.000***
FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE	1,179	0.241	0.084	6,665	0.228	0.080	0.000***
FUNCTIONAL_DISTANCE_LATENT	1,179	2.281	0.872	6,665	2.078	0.761	0.000***
OPERATIONAL_PROXIMITY_POPULATION	1,179	5.350	1.655	6,665	5.807	1.440	0.000***
OPERATIONAL_PROXIMITY_AREA	1,179	23.675	28.600	6,665	24.622	29.07	0.3011
COOPERATIVE_BANKS	1,179	9.540	8.849	6,665	9.961	8.563	0.121
HHI	1,179	1.125	0.553	6,665	1.087	0.443	0.008***
BANK_NUMBER	1,179	6.120	3.867	6,665	6.134	4.015	0.914
BANK_PROVINCE	1,179	0.644	0.479	6,665	0.599	0.490	0.004***
SIZE	1,179	3.681	0.901	6,665	3.912	1.060	0.000***
R&D	1,179	0.766	2.696	6,665	0.675	2.612	0.275
ROI	1,179	10.343	6.75	6,665	12.962	7.605	0.000***
DEBT	1,179	6.223	0.995	6,665	5.820	0.986	0.000***
FAIL	1,179	7.821	0.184	6,665	7.830	0.161	0.074*

Table IV. Credit rationing (whole sample): First-stage regression results of IV Probit (Table V, column 5)

The table reports the OLS coefficients and, in brackets, the associated standard errors of the first stage regressions associated with the IV Probit estimates reported in column 5 of Table IV. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variables are the endogenous variables of Equation (1): *FUNCTIONAL_DISTANCE_KM* is the functional distance index, computed as the ratio of branches weighted by the logarithm of 1 plus the kilometric distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j*; *OPERATIONAL_PROXIMITY_POPULATION* is the operational proximity index, computed as the number of bank branches in the province per 10,000 inhabitants; *COOPERATIVE_BANKS* is the share of branches held by Credit Cooperative Banks on total branches in the province; *HHI* is the logarithm of the Herfindahl-Hirschman Index calculated on the number of branches in the province; *BANK_NUMBER* is the number of banks with which the firm does business. The set of instrumental variables includes a measure of *FUNCTIONAL_DISTANCE_KM* in 1971, *OPERATIONAL_PROXIMITY_POPULATION* in 1936 and 1971, *HHI* in 1971, *COOPERATIVE_BANKS* in 1936 and 1971, the share of branches held by large banks (*SHARE_LARGE_BANKS*) in 1936 and 1971, the average number of new branches held by incumbent and entrant banks in the province over the period 1980–1985 (*INCUMBENT_ΔBRANCHES_80–85* and *ENTRANT_ΔBRANCHES_80–85*), the average ratio of bank debt over total asset at industry level (Ateco, 2 digit) over the period 1995–2003 (*BANK_DEBT*). The other exogenous controls are: *BANK_PROVINCE* is a dummy equal to one if the firm and its main bank are headquartered in the same province, and zero otherwise; *SIZE* is the logarithm of the number of workers; *R&D* is the ratio of those employed in R&D to total workers; *ROI* is the Return on Investment; *DEBT* is the logarithm of (1 + Debt-equity ratio); and *FAIL* is the logarithm of the average length, in days, of a bankruptcy trial, by judicial district. All regressions include the constant and wave, geographic (five macro-areas) and industry (Pavitt classification) dummies. As diagnostic, the table reports the Adjusted-R^2, the p-values for the F-tests that the Instrumental Variables, the Pavitt dummies and the Geographic dummies are jointly equal to zero.

	Endogenous variables				
	FUNCTIONAL_DISTANCE KM	*OPERATIONAL_PROXIMITY_ POPULATION*	*COOPERATIVE_ BANKS*	*HHI*	*BANK_NUMBER*
Instrumental variables					
COOPERATIVE_BANKS_1936	0.880***	−0.966***	−19.036***	−0.365***	0.118
	[0.098]	[0.093]	[0.944]	[0.029]	[0.615]
COOPERATIVE_BANKS_1971	−0.368***	0.264***	3.092***	0.105***	−0.142
	[0.037]	[0.035]	[0.351]	[0.011]	[0.229]
SHARE_LARGE_BANKS_1936	0.259***	−1.284***	−9.930***	−0.338***	−1.285**
	[0.100]	[0.094]	[0.955]	[0.030]	[0.622]
SHARE_LARGE_BANKS_1971	−1.325***	0.425***	−10.074***	0.919***	1.415**
	[0.115]	[0.109]	[1.106]	[0.034]	[0.721]
OPERATIONAL_PROXIMITY_POPULATION_1936	−0.051***	−0.040***	3.118***	−0.054***	−0.176**
	[0.012]	[0.012]	[0.120]	[0.004]	[0.078]

Table IV. (Continued)

	Endogenous variables				
	FUNCTIONAL_DISTANCE KM	*OPERATIONAL_PROXIMITY_ POPULATION*	*COOPERATIVE_ BANKS*	*HHI*	*BANK_NUMBER*
OPERATIONAL_PROXIMITY_POPULATION_1971	−0.453***	1.008***	2.526***	0.074***	0.362***
	[0.017]	[0.016]	[0.162]	[0.005]	[0.106]
HHI_1971	−0.224***	0.180***	−5.556***	0.642***	−0.387***
	[0.023]	[0.022]	[0.218]	[0.007]	[0.142]
FUNCTIONAL_DISTANCE_KM_1971	0.397***	−0.123***	−1.550***	0.035***	−0.098
	[0.010]	[0.010]	[0.099]	[0.003]	[0.064]
BANK_DEBT	0.365	0.566***	0.373	−0.100	9.161***
	[0.224]	[0.213]	[2.151]	[0.067]	[1.401]
INCUMBENT_ΔBRANCHES_80–85	−0.086***	0.073***	1.526***	−0.012***	−0.070**
	[0.005]	[0.005]	[0.052]	[0.002]	[0.034]
ENTRANT_ΔBRANCHES_80–85	−0.078***	0.039***	−1.545***	−0.001	−0.030
	[0.004]	[0.004]	[0.041]	[0.001]	[0.027]
Exogenous variables					
BANK_PROVINCE	−0.079***	−0.006	0.172	0.006	−0.301***
	[0.013]	[0.012]	[0.122]	[0.004]	[0.080]
SIZE	−0.005	0.007	0.163***	0.004**	1.826***
	[0.006]	[0.006]	[0.059]	[0.002]	[0.039]
R&D	0.000	−0.001	0.012	−0.000	0.030**
	[0.002]	[0.002]	[0.023]	[0.001]	[0.015]
ROI	−0.002**	0.001	0.015*	0.000	−0.037***
	[0.001]	[0.001]	[0.008]	[0.000]	[0.005]
DEBT	0.003	0.006	0.150**	−0.002	0.534***
	[0.007]	[0.006]	[0.063]	[0.002]	[0.041]
FAIL	0.385***	0.480***	−4.653***	−0.479***	1.711***
	[0.057]	[0.054]	[0.547]	[0.017]	[0.356]
Observations	7,844	7,844	7,844	7,844	7,844
Adjusted-R^2	0.633	0.880	0.636	0.806	0.283
F-test on IV	0.000	0.000	0.000	0.000	0.000
F-test on Pavitt dummies	0.014	0.219	0.000	0.498	0.000
F-test on Geographic dummies	0.000	0.000	0.000	0.000	0.000

Table V. Credit rationing (whole sample): Probit estimation of Equation (1)

The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable (*RAT*) is equal to one if the firm is credit-rationed and zero otherwise. Columns 1–4 report the estimates of the standard probit model, while columns 5–8 refer to the Instrumental Variable (IV) estimates. To control for endogeneity of the distance and banking variables, all IV regressions are estimated with Newey's two-step estimator (IVPROBIT using Stata 10 SE package). Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the kilometric distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j* (*FUNCTIONAL_DISTANCE_KM*) and as a latent distance (*FUNCTIONAL_DISTANCE_LATENT*) obtained by taking the first component from a Factorial Matrices Analysis run on the three basic functional distance indexes. The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches (× 10,000) over surface area (*OPERATIONAL_PROXIMITY_AREA*). *COOPERATIVE_BANKS* is the share of branches held by Credit Cooperative Banks on total branches in the province. *HHI* is the logarithm of the Herfindahl-Hirschman Index calculated on the number of branches in the province. *BANK_NUMBER* is the number of banks with which the firm does business. In columns 5–8, all these variables are taken as endogenous and, as instruments for these variables, we include a measure of *FUNCTIONAL_DISTANCE_KM* in 1971, *OPERATIONAL_PROXIMITY_POPULATION* (columns 5–6) and *OPERATIONAL_PROXIMITY_AREA* (columns 7–8) in 1936 and 1971, *HHI* in 1971, *COOPERATIVE_BANKS* in 1936 and 1971, the share of branches held by large banks in 1936 and 1971, the average number of new branches held by incumbent and entrant banks in the province over the period 1980–1985, the average ratio of bank debt over total asset at industry level (Ateco, 2 digit) over the period 1995–2003. The other exogenous controls are: *BANK_PROVINCE* is a dummy equal to one if the firm and its main bank are headquartered in the same province, and zero otherwise; *SIZE* is the logarithm of the number of workers; *R&D* is the ratio of those employed in R&D to total workers; *ROI* is the Return on Investment; *DEBT* is the logarithm of (1 + Debt-equity ratio); and *FAIL* is the logarithm of the average length, in days, of a bankruptcy trial, by judicial district. All regressions include the constant and wave, geographic (five macro-areas) and industry (Pavitt classification) dummies. As diagnostic, the table reports the p-values of the Wald χ^2-statistic for the likelihood ratio test of the goodness of fit of the regression, of the test for over-identifying restrictions (OIR, the null is the validity of the instrument set), and of the F-test of the null hypothesis that the geographic dummies are jointly equal to zero. The bottom lines report the estimated change in the probability of *RAT* due to a change in the *FUNCTIONAL_DISTANCE* indexes: (1) from the first to the third quartile of the sample distribution, and (2) from their actual provincial values in 1995 to those in 2003, both for the representative firm located in the Centre-North and in the South.

Dep Var: Pr(*RAT*)	Probit				IV Probit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Banking distance variables								
FUNCTIONAL_DISTANCE_KM	0.045*		0.068**		0.169***		0.201***	
	[0.024]		[0.027]		[0.057]		[0.061]	
FUNCTIONAL_DISTANCE_LATENT		0.063**		0.090***		0.197***		0.230***
		[0.029]		[0.032]		[0.064]		[0.068]
OPERATIONAL_PROXIMITY_POPULATION	−0.064**	−0.062**			0.046	0.026		
	[0.026]	[0.026]			[0.072]	[0.067]		
OPERATIONAL_PROXIMITY_AREA			0.001	0.001			0.003*	0.002
			[0.001]	[0.001]			[0.002]	[0.002]

Table V. (Continued)

Dep Var: Pr(*RAT*)	Probit				IV Probit			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Other banking variables								
COOPERATIVE_BANKS	0.005*	0.005*	0.003	0.003	0.002	0.004	0.011*	0.010*
	[0.003]	[0.003]	[0.003]	[0.003]	[0.006]	[0.006]	[0.006]	[0.006]
HHI	−0.018	−0.019	0.004	0.001	−0.121	−0.116	0.09	0.049
	[0.053]	[0.053]	[0.072]	[0.071]	[0.076]	[0.075]	[0.122]	[0.114]
BANK_NUMBER	0.015***	0.015***	0.014***	0.014***	−0.112*	−0.106*	−0.067	−0.07
	[0.005]	[0.005]	[0.005]	[0.005]	[0.063]	[0.062]	[0.054]	[0.054]
BANK_PROVINCE	0.115***	0.117***	0.115***	0.117***	0.093**	0.095**	0.108**	0.107**
	[0.037]	[0.037]	[0.037]	[0.037]	[0.044]	[0.044]	[0.043]	[0.043]
Other control variables								
SIZE	−0.111***	−0.110***	−0.109***	−0.108***	0.122	0.111	0.04	0.046
	[0.022]	[0.022]	[0.022]	[0.022]	[0.116]	[0.114]	[0.099]	[0.099]
R&D	0.014**	0.014**	0.014**	0.014**	0.018***	0.017***	0.017**	0.017**
	[0.006]	[0.006]	[0.006]	[0.006]	[0.007]	[0.007]	[0.006]	[0.006]
ROI	−0.016***	−0.016***	−0.016***	−0.016***	−0.021***	−0.021***	−0.019***	−0.019***
	[0.003]	[0.003]	[0.003]	[0.003]	[0.004]	[0.004]	[0.004]	[0.004]
DEBT	0.213***	0.213***	0.213***	0.214***	0.281***	0.279***	0.257***	0.260***
	[0.019]	[0.019]	[0.019]	[0.019]	[0.039]	[0.039]	[0.035]	[0.035]
FAIL	−0.379**	−0.368**	−0.419**	−0.401**	−0.351*	−0.286	−0.221	−0.189
	[0.183]	[0.181]	[0.189]	[0.188]	[0.186]	[0.181]	[0.189]	[0.192]
Observations	7844	7844	7844	7844	7844	7844	7844	7844
Pseudo-R^2	0.067	0.067	0.066	0.067				
Wald test					0.000	0.000	0.000	0.000
OIR test					0.387	0.452	0.398	0.498
F-test on Geographic dummies	0.004	0.008	0.000	0.000	0.106	0.147	0.002	0.016
	Estimated effect on Pr(*RAT*) *due to a change in FUNCTIONAL_DISTANCE*:							
from 25° to 75° percentile, whole sample	1.290	1.410	1.960	2.010	4.870	4.400	5.750	5.100
from 1996 to 2003, centre-northern sample	0.351	0.389	0.535	0.555	1.340	1.240	1.580	1.430
from 1996 to 2003, southern sample	0.919	1.230	1.420	1.780	3.540	3.930	4.370	4.740

Table VI. Credit rationing (small vs large firms): IV Probit estimation of Equation (1)

The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. *Small* is the sub-sample of firms employing 11–50 workers, while *Large* refer to firms with more than 50 employees. The dependent variable (*RAT*) is equal to one if the firm is credit-rationed and zero otherwise. To control for endogeneity of the distance and banking variables, all probit regressions are estimated with Newey's two-step estimator (IVPROBIT using Stata 10 SE package). Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the kilometric distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j* (*FUNCTIONAL_DISTANCE_KM*) and as a latent distance (*FUNCTIONAL_DISTANCE_LATENT*) obtained by taking the first component from a Factorial Matrices Analysis run on the three basic functional distance indexes. The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches ($\times$ 10,000) over surface (*OPERATIONAL_PROXIMITY_AREA*). *COOPERATIVE_BANKS* is the share of branches held by Credit Cooperative Banks on total branches in the province. *HHI* is the logarithm of the Herfindahl-Hirschman Index calculated on the number of branches in the province. *BANK_NUMBER* is the number of banks with which the firm does business. All these variables are taken as endogenous. As instruments for these variables, we include a measure of *FUNCTIONAL_DISTANCE_KM* in 1971, *OPERATIONAL_PROXIMITY_POPULATION* (columns 1–4) and *OPERATIONAL_PROXIMITY_AREA* (columns 5–8) in 1936 and 1971, *HHI* in 1971, *COOPERATIVE_BANKS* in 1936 and 1971, the share of branches held by large banks in 1936 and 1971, the average number of new branches held by incumbent and entrant banks in the province over the period 1980–1985, the average ratio of bank debt over total assets at industry level (Ateco, 2 digit) over the period 1995–2003. The other exogenous controls are: *BANK_PROVINCE* is a dummy equal to one if the firm and its main bank are headquartered in the same province, and zero otherwise; *SIZE* is the logarithm of the number of workers; *R&D* is the ratio of employed in R&D activities on total workers; *ROI* is the Return on Investment; *DEBT* is the logarithm of (1 + Debt-equity ratio); and *FAIL* is the logarithm of the average length, in days, of a bankruptcy trial, by judicial district. All regressions include the constant and wave, geographic (five macro-areas) and industry (Pavitt classification) dummies. As diagnostic, the table reports the p-values of the Wald χ^2-statistic for the likelihood ratio test of the goodness of fit of the regression, of the test for over-identifying restrictions (OIR, the null is the validity of the instrument set), and of the F-test of the null hypothesis that the geographic dummies are jointly equal to zero. The bottom lines report the estimated change in the probability of *RAT* due to a change in the *FUNCTIONAL_DISTANCE* indexes: (1) from the first to the third quartile of the sample distribution, and (2) from their actual provincial values in 1995 to those in 2003, both for the representative firm located in the Centre-North and in the South. § indicates that the null hypothesis that the estimated change in the probability of *RAT* is equal for small and large firms is rejected at a 2.5% level of significance under a two-tailed *t*-test.

Dep Var: Pr(*RAT*)	(1) Small	(2) Large	(3) Small	(4) Large	(5) Small	(6) Large	(7) Small	(8) Large
Banking distance variables								
FUNCTIONAL_DISTANCE_KM	0.211**	0.166*			0.212**	0.217**		
	[0.083]	[0.085]			[0.084]	[0.098]		
FUNCTIONAL_DISTANCE_LATENT			0.243***	0.190**			0.240***	0.240**
			[0.092]	[0.096]			[0.093]	[0.107]

Table VI. (Continued)

Dep Var: Pr(*RAT*)	(1) Small	(2) Large	(3) Small	(4) Large	(5) Small	(6) Large	(7) Small	(8) Large
OPERATIONAL_PROXIMITY_POPULATION	0.134	−0.045	0.107	−0.067				
	[0.106]	[0.101]	[0.096]	[0.095]				
OPERATIONAL_PROXIMITY_AREA					0.002	0.003	0.002	0.002
					[0.002]	[0.003]	[0.002]	[0.003]
Other banking variables								
COOPERATIVE_BANKS	−0.004	0.008	−0.003	0.01	0.011	0.009	0.01	0.007
	[0.008]	[0.009]	[0.008]	[0.008]	[0.008]	[0.010]	[0.008]	[0.009]
HHI	−0.168	−0.061	−0.162	−0.054	0.051	0.096	0.009	0.046
	[0.103]	[0.122]	[0.101]	[0.121]	[0.161]	[0.208]	[0.150]	[0.195]
BANK_NUMBER	−0.232**	0.06	−0.217**	0.059	−0.191**	0.082	−0.187**	0.073
	[0.098]	[0.069]	[0.094]	[0.069]	[0.085]	[0.065]	[0.085]	[0.064]
BANK_PROVINCE	0.071	0.157**	0.075	0.155**	0.082	0.168**	0.083	0.164**
	[0.059]	[0.067]	[0.058]	[0.067]	[0.058]	[0.068]	[0.057]	[0.067]
Other control variables								
SIZE	0.274*	−0.271**	0.253*	−0.270**	0.206	−0.313**	0.202	−0.299**
	[0.152]	[0.135]	[0.146]	[0.135]	[0.134]	[0.129]	[0.133]	[0.128]
R&D	0.017*	0.011	0.017*	0.011	0.017**	0.01	0.017**	0.011
	[0.009]	[0.011]	[0.009]	[0.011]	[0.009]	[0.010]	[0.009]	[0.010]
ROI	−0.021***	−0.016***	−0.021***	−0.016***	−0.020***	−0.015**	−0.020***	−0.015**
	[0.004]	[0.006]	[0.004]	[0.006]	[0.004]	[0.006]	[0.004]	[0.006]
DEBT	0.317***	0.184***	0.311***	0.187***	0.299***	0.164**	0.298***	0.173***
	[0.047]	[0.067]	[0.046]	[0.067]	[0.042]	[0.065]	[0.042]	[0.065]
FAIL	−0.552**	−0.344	−0.466**	−0.275	−0.28	−0.342	−0.248	−0.313
	[0.246]	[0.298]	[0.236]	[0.292]	[0.242]	[0.323]	[0.245]	[0.326]
Observations	4674	3170	4674	3170	4674	3170	4674	3170
Wald test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OIR test	0.394	0.957	0.430	0.960	0.345	0.790	0.379	0.788
F-test on Geographic dummies	0.044	0.759	0.049	0.837	0.001	0.089	0.004	0.293
	Estimated effect on Pr(*RAT*) *due to a change in FUNCTIONAL_DISTANCE*:							
from 25° to 75° percentile, whole sample	6.680§	4.130	6.420§	3.580	6.700§	5.420	6.360§	4.520
from 1996 to 2003, centre-northern sample	1.810§	1.140	1.640§	1.040	1.810§	1.510	1.620§	1.320
from 1996 to 2003, southern sample	4.330§	3.360	4.760§	3.660	4.480	4.470	4.810	4.720

subsamples of small and medium-large firms (i.e., firms with less and more than 50 employees, respectively). In all specifications, the Wald test is significant and the over-identification test supports the validity of the instruments. In addition, first-stage regression results, reported in Table IV, show that, once net of the effect of the other explanatory variables, instruments are generally significantly correlated with the endogenous variables and the coefficients have the expected signs. In particular, the banking market structure prior to deregulation is a significant predictor of current structure, while firms' dependence on external finance and the opening of banks by incumbents significantly affect multiple lending, respectively increasing and reducing the number of banks the firm operates with. Finally, the F-test always rejects the hypothesis that instruments are jointly insignificant and the Adjusted-R^2 is satisfactorily high.[18]

To assess the differential impact of functional distance on credit availability, we report in the last three rows of Tables V and VI the change in the probability of credit rationing for the average firm and for the representative firms headquartered in centre-northern and southern provinces associated with, respectively, the theoretical increase in *FUNCTIONAL_DISTANCE* indexes from the first to the third quartile of its sample distribution, and with the observed increase from 1996 to 2003 in the Centre-North and in the South. Our expectation is that credit availability to small firms, whose borrowing relies greatly upon soft, proprietary information, is more negatively affected by functional distance. In the same vein, we expect that in southern regions, where bank consolidation process has led to the almost complete disappearance of an autonomous banking system and where the economic environment is extremely weak, the increase in functional distance has exacerbated financing constraints to local firms.

4.2.1 Banking Distance Variables

Overall, what emerges from the regression analysis is that functional distance makes access to credit significantly harder for local firms, while operational proximity, though somewhat negatively correlated with credit rationing, is not significantly different from zero once the endogeneity issue is taken into account.

The sign of the *FUNCTIONAL_DISTANCE* coefficients is positive both in the probit and IV probit estimates and its effect on credit rationing is larger when operational proximity is measured with respect to province size. The statistical and economic significance of *FUNCTIONAL_DISTANCE_KM* and *FUNCTIONAL_DISTANCE_LATENT* greatly increase after instrumenting these variables. For example, if we consider the probit estimates the change experienced

[18] For the sake of space, in Table IV we report only results of first-stage regressions relative to the whole sample basic specification (Table V, column 5). All the other first-stage regressions provide virtually identical results and are available on request.

by functional distance in Italy from 1996 to 2003 led to an increase in the likelihood of credit rationing for the centre-northern (southern) firm that varies from 0.35 to 0.56 per cent (from 0.92 to 1.78 per cent) according to the operational proximity index used. These numbers rise by more than a factor of three in IV estimates, arriving at a sizeable 4.74 per cent for the average southern firm (Table V, column 8). Operational proximity has the expected beneficial effect on the probability of credit rationing only in probit estimates when the number of branches is scaled by population. In all other cases, the *OPERATIONAL_PROXIMITY* coefficient is statistically insignificant.

When we split our sample into small and large firms, the adverse effect of functional distance is, statistically and economically, stronger for small firms. To illustrate, a small firm in a province with a local banking system having *FUNCTIONAL_DISTANCE_KM* within the first quartile of its distribution has about 7 per cent less likelihood of being rationed than a small firm in a province with *FUNCTIONAL_DISTANCE_KM* in the third quartile; for large firms this effect is slightly above 4 per cent (Table VI, columns 1 and 2). If we focus on the actual increase in functional distance from 1996 to 2003, the impact of this change on *Pr*(*RAT*) was higher for southern than centre-northern firms: 4.3 per cent versus 1.8 per cent for the representative small firm and 3.4 per cent versus 1.1 per cent for the representative large firm, respectively[19]. This differential impact of functional distance across small and large firms is statistically significant at the 1 per cent level, except for southern firms when operational proximity is scaled by province area. A possible explanation for this relatively small difference between small and large borrowers in the South lies in the differences between the average large (small) centre-northern and southern firms, which drive the magnitude of the marginal impact of *FUNCTIONAL_DISTANCE* on *Pr(RAT)*. For example, the average size of large southern firms is smaller than that of large average firms (174 versus 224 employees, respectively), whereas the average size of southern small firms is slightly higher (27 versus 26 employees). Thus, these differences shrink the gap between small and large firms in the sample of southern firms, relative to the sample of centre-northern firms. By same token, *R&D*, whose estimated coefficient is positive, is more than twice as high in large centre-northern than in large southern firms, whereas this difference decreases to around 70 per cent for small firms located in the two areas. By contrast, the geographical difference in variables reducing the probability of credit rationing, like *ROI*, are relatively higher for small than for large firms.

The positive correlation between *Pr*(*RAT*) and *FUNCTIONAL_DISTANCE* is confirmed when we weight the latter by cultural and economic distance indicators.

[19] For small (large) firms, these numbers are computed as the mean of the estimated effects on *Pr(RAT)* due to a change in *FUNCTIONAL_DISTANCE* reported in the odd (even) columns of Table VI.

In these specifications, the differential effect between small and large firms is still greater and always statistically significant at the 2.5 per cent level (Table VII).

On the whole, regression results are broadly consistent with the theoretical prediction by which larger firms suffer less from the lack of banks' decisional centres in the province where they are located.[20] However, they also suggest that *FUNCTIONAL_DISTANCE* is especially harmful in peripheral regions, where large firms often show economic weakness, financial fragility and information opaqueness similar to those of small firms.

4.2.2 Banking Control Variables

Moving on to the results with banking control variables, the probit estimates show that the larger the number of banks with which a firm does business the higher is the probability of credit rationing (Table V, columns 1–4). This evidence is consistent with previous findings for Italy by Angelini et al. (1998) and Guelpa and Tirri (2006), who, however, do not allow for the endogeneity of multiple lending relationships. By contrast, after instrumenting, *BANK_NUMBER* has a negative impact on *Pr*(*RAT*), even if it is not always significant. When we split our sample according to firm size (Table VI), we find that multiple lending has the effect of increasing credit availability to small firms, while for large firms the effect is statistically not different from zero. Such diversity suggests that informational capture by the main bank is a concrete risk for small firms, from which they can escape by borrowing from other banks. We also find that having the main bank headquartered in the same province (*BANK_PROVINCE*) raises difficulties in securing adequate amounts of finance. This result holds no matter what estimation technique is used, but it appears to be driven especially by large firms. It suggests that relationship loans may be harmful to firms when the lender is a local bank that may informationally capture their customers.

The adverse impact of a banking system with a large share of local banks on the probability of being credit-rationed is partly confirmed by the sign of the *COOPERATIVE_BANKS* coefficient. For the whole sample, it is positive and significant in the probit estimates with *OPERATIONAL_PROXIMITY_POPULATION* and in the IV probit estimates with *OPERATIONAL_PROXIMITY_AREA*, and insignificant in other cases.

With regard to market concentration, the estimated coefficient for *HHI* is never statistically different from zero at conventional confidence levels, even if for small firms its impact is beneficial at a significance slightly above the 10 per cent level (Table VI, columns 1 and 3).

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[20] In the working paper version of this paper we also estimate a probit model for the whole sample including an interaction term between functional distance and firm size and find that the sign of this regressor is significantly negative (Alessandrini et al., 2006).

Table VII. Credit rationing (small vs large firms): IV Probit estimation of Equation (1)

The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. *Small* is the sub-sample of firms employing 11–50 workers, while *Large* refer to firms with more than 50 employees. The dependent variable (*RAT*) is equal to one if the firm is credit-rationed and zero otherwise. To control for endogeneity of the distance and banking variables, all probit regressions are estimated with Newey's two-step estimator (IVPROBIT using Stata 10 SE package). Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j*, where the distance is proxied by the difference in social capital (*FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL*) or by a dissimilarity index in the economic structure (*FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE*). The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches (× 10,000) over surface (*OPERATIONAL_PROXIMITY_AREA*). *COOPERATIVE_BANKS* is the share of branches held by Credit Cooperative Banks on total branches in the province. *HHI* is the logarithm of the Herfindahl-Hirschman Index calculated on the number of branches in the province. *BANK_NUMBER* is the number of banks with which the firm does business. All these variables are taken as endogenous. As instruments for these variables, we include a measure of *FUNCTIONAL_DISTANCE_KM* in 1971, *OPERATIONAL_PROXIMITY_POPULATION* (columns 1–4) and *OPERATIONAL_PROXIMITY_AREA* (columns 5–8) in 1936 and 1971, *HHI* in 1971, *COOPERATIVE_BANKS* in 1936 and 1971, the share of branches held by large banks in 1936 and 1971, the average number of new branches held by incumbent and entrant banks in the province over the period 1980–1985, the average ratio of bank debt over total assets at industry level (Ateco, 2 digit) over the period 1995–2003. The other exogenous controls are: *BANK_PROVINCE* is a dummy equal to one if the firm and its main bank are headquartered in the same province, and zero otherwise; *SIZE* is the logarithm of the number of workers; *R&D* is the ratio of employed in R&D activities on total workers; *ROI* is the Return on Investment; *DEBT* is the logarithm of (1 + Debt-equity ratio); and *FAIL* is the logarithm of the average length, in days, of a bankruptcy trial, by judicial district. All regressions include the constant and wave, geographic (five macro-areas) and industry (Pavitt classification) dummies. As diagnostic, the table reports the p-values of the Wald χ^2-statistic for the likelihood ratio test of the goodness of fit of the regression, of the test for over-identifying restrictions (OIR, the null is the validity of the instrument set), and of the F-test of the null hypothesis that the geographic dummies are jointly equal to zero. The bottom lines report the estimated change in the probability of *RAT* due to a change in the *FUNCTIONAL_DISTANCE* indexes: (1) from the first to the third quartile of the sample distribution, and (2) from their actual provincial values in 1995 to those in 2003, both for the representative firm located in the Centre-North and in the South. indicates that the null hypothesis that the estimated change in the probability of *RAT* is equal for small and large firms is rejected at a 2.5% level of significance under a two-tailed t-test.

Dep Var: Pr(*RAT*)	(1) Small	(2) Large	(3) Small	(4) Large	(5) Small	(6) Large	(7) Small	(8) Large
Banking distance variables								
FUNCTIONAL_DISTANCE_SOCIAL_CAPITAL	0.482***	0.379*			0.465***	0.449**		
	[0.175]	[0.198]			[0.177]	[0.205]		
FUNCTIONAL_DISTANCE_ECONOMIC_STRUCTURE			1.968**	1.654*			2.184**	1.844*
			[0.863]	[0.930]			[0.946]	[1.065]

OPERATIONAL_PROXIMITY_POPULATION	0.028	−0.131	0.057	−0.088				
	[0.078]	[0.083]	[0.087]	[0.093]				
OPERATIONAL_PROXIMITY_AREA					0.000	0.000	0.001	0.001
					[0.002]	[0.002]	[0.002]	[0.002]
Other banking variables								
COOPERATIVE_BANKS	0.002	0.013	0.001	0.012	0.005	0.002	0.009	0.004
	[0.007]	[0.008]	[0.007]	[0.008]	[0.007]	[0.008]	[0.008]	[0.009]
HHI	−0.131	−0.029	−0.154	−0.055	−0.101	−0.075	−0.053	−0.043
	[0.095]	[0.119]	[0.100]	[0.123]	[0.132]	[0.177]	[0.140]	[0.188]
BANK_NUMBER	−0.178**	0.058	−0.165*	0.068	−0.183**	0.053	−0.165*	0.082
	[0.087]	[0.069]	[0.087]	[0.069]	[0.085]	[0.065]	[0.084]	[0.065]
BANK_PROVINCE	0.082	0.145**	0.087	0.161**	0.080	0.147**	0.091	0.168**
	[0.057]	[0.066]	[0.057]	[0.068]	[0.057]	[0.066]	[0.058]	[0.069]
Other control variables								
SIZE	0.196	−0.269**	0.182	−0.281**	0.200	−0.266**	0.177	−0.310**
	[0.137]	[0.135]	[0.136]	[0.135]	[0.133]	[0.129]	[0.133]	[0.129]
R&D	0.017*	0.010	0.017*	0.010	0.017*	0.011	0.017**	0.011
	[0.009]	[0.011]	[0.009]	[0.011]	[0.009]	[0.010]	[0.009]	[0.010]
ROI	−0.020***	−0.016***	−0.020***	−0.016***	−0.020***	−0.017***	−0.020***	−0.015**
	[0.004]	[0.006]	[0.004]	[0.006]	[0.004]	[0.006]	[0.004]	[0.006]
DEBT	0.295***	0.190***	0.288***	0.183***	0.297***	0.193***	0.287***	0.171***
	[0.043]	[0.067]	[0.042]	[0.067]	[0.042]	[0.065]	[0.042]	[0.065]
FAIL	−0.296	−0.138	−0.252	−0.120	−0.243	−0.300	−0.091	−0.238
	[0.229]	[0.292]	[0.232]	[0.296]	[0.243]	[0.328]	[0.282]	[0.359]
Observations	4,674	3,170	4,674	3,170	4,674	3,170	4,674	3,170
Wald test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
OIR test	0.438	0.935	0.206	0.892	0.398	0.739	0.239	0.530
F-test on Geographic dummies	0.049	0.644	0.034	0.374	0.002	0.327	0.000	0.003
	Estimated effect on Pr(*RAT*) *due to a change in FUNCTIONAL_DISTANCE*:							
from 25° to 75° percentile, whole sample	5.060§	2.950	4.830§	3.300	4.890§	3.470	5.350§	3.680
from 1996 to 2003, centre-northern sample	0.985§	0.637	0.973§	0.666	0.952§	0.755	1.080§	0.748
from 1996 to 2003, southern sample	5.590§	4.250	2.410§	1.880	5.360§	5.190	2.680§	2.100

4.2.3 Other Control Variables

Looking at firm-specific characteristics, we find, as expected, that more profitable firms are less likely to be rationed, while those with a large R&D department and with a high degree of leverage encounter more difficulties in accessing bank credit. These effects are statistically highly significant and, *ceteris paribus*, stronger for small firms. The impact of *SIZE* on the probability of credit rationing is negative only in probit estimation. After instrumenting banking variables, the effect of *SIZE* is statistically nil on average, but is qualitatively different and significant in our two subsamples. For large firms, an increase in the number of employees is associated with a decrease in the likelihood of being rationed. Conversely, within the sample of small firms, it is the smallest ones which are less likely to be rationed. Arguably this finding might reflect the fact that the credit requested by micro firms is usually very small for banks that consequently prefer to reject unworthy borrowers instead of negotiating a reduction in the amount of loan granted.

Concerning geographical unobserved effects, we find that only South and Islands dummies are statistically significant. In particular, firms located in southern regions face a 6–10 per cent higher probability of being rationed than those in the North; this effect is even greater (between 10 and 16 per cent) for firms in Sicily and Sardinia. Finally, the efficiency of courts in recovering bad loans increases the rationing probability even if with IV probit estimations this effect is statistically significant only for small firms. Albeit unexpected, this finding is consistent with a sort of "laziness effect" (Manove et al., 2001; Zazzaro, 2005): where the enforcement of credit contracts by courts is stricter banks find it profitable to reduce their costly screening effort; this increases the probability of evaluating borrowers erroneously and rationing credit to worthy borrowers.

5. Investment-Cash Flow Sensitivity

5.1 THE ECONOMETRIC MODEL

Our second econometric exercise is aimed at testing the impact of distance on the sensitivity of investment to cash flow. In particular, we estimate a dynamic panel investment model in which we include cash flow interacting with operational proximity and functional distance.[21]

[21] We also consider a possible direct effect of distance on investment by introducing *FUNCTIONAL_DISTANCE* and *OPERATIONAL_PROXIMITY* indexes as isolated terms in equation (2). However, since they prove to be statistically insignificant without affecting the other estimation coefficients, we prefer to follow our topic strictly and limit analysis to the indirect effect of distance on financial constraints for firm investment.

Data on capital stock and cash flow come from firm balance-sheets. Merging the three waves, we obtain data over the period 1996–2003 for 526 firms. Furthermore, to get a balanced panel we drop 245 firms and end up with a sample of 279 firms for a total of 2,232 observations.

The basic investment equation we estimate is:

$$\begin{aligned}\left(\frac{INVESTMENT_t}{K_{t-1}}\right)_{ij} = \alpha + \beta_1 \left(\frac{INVESTMENT_{t-1}}{K_{t-2}}\right)_{ij} + \beta_2 \left(\frac{CASH\_FLOW_t}{K_{t-1}}\right)_{ij} \\ + \beta_3 \left(\frac{CASH\_FLOW_t}{K_{t-1}}\right)_{ij} \times OPERATIONAL\_PROXIMITY_{jt} \\ + \beta_4 \left(\frac{CASH\_FLOW_t}{K_{t-1}}\right)_{ij} \times FUNCTIONAL\_DISTANCE_{jt} \\ + \beta_5 GROWTH_{ijt-1} + \eta_i + \nu_t + \varepsilon_{i,t} \qquad (2)\end{aligned}$$

where the subscripts refer to the *i*-th firm, located in province *j* at time *t*, *K* is the capital stock at the end of the fiscal year, computed as the tangible and intangible assets gross of depreciation allowances; *INVESTMENT* is defined as the variation between time *t* and *t-1* of the firm's capital stock; *CASH_FLOW* is defined as net income plus depreciation allowances; *GROWTH* is the growth rate of sales which is a proxy of firm profitability; η_i are time-invariant individual effects; ν_t is the time-specific effect, and ε_{it} is an idiosyncratic shock. Finally, in the basic specification of Equation (2) we include Pavitt's industry classification dummies to control for firm specificity, and geographic dummies to control for other unobserved local fixed effects.

We expect a financially constrained firm to exhibit a positive correlation between cash flow and investment and consider as a measure of financing constraints the marginal effect of cash flow on investment, $\partial(INVESTMENT/K)/\partial(CASH\_FLOW/K)$. Given the inclusion of the two interaction terms between distances and cash flow, the sensitivity of investment to cash flow becomes:

$$\begin{aligned}\frac{\partial(INVESTMENT/K)}{\partial(CASH\_FLOW/K)} = \beta_2 + \beta_3 OPERATIONAL\_PROXIMITY \\ + \beta_4 FUNCTIONAL\_DISTANCE \qquad (3)\end{aligned}$$

Thus, according to $\beta_3 \gtrless 0$ and $\beta_4 \gtrless 0$, operational proximity and functional distances may increase or reduce firms' financing constraints. We also consider specifications with the additional interaction term *CASH_FLOW*×*FUNCTIONAL_DISTANCE*×*SIZE* to check whether the effect of functional distance on financing constraints is stronger for small than for large firms, where firm size is measured by classes of employees to allow for possible non-linearities.

Due to the dynamic structure of the model and the short time dimension of the panel, the LSDV estimator is biased and inconsistent (Nickell, 1981). For that reason, and to control for endogeneity and omitted variable bias, we use the Generalized Method of Moments (GMM) and, in particular, the System-GMM (Blundell and Bond, 1998).

5.2 RESULTS

To interpret a positive (negative) impact of distance indexes on (3) as strengthening (weakening) financing constraints for firms we have to assume that the sensitivity of investment to cash flow is a reliable measure of financing constraints. This assumption has been challenged by Kaplan and Zingales (1997), who present evidence that investment by financially constrained firms may exhibit significantly lower sensitivity to cash flow than investment by non-financially constrained firms. To address this important criticism, we estimate Equation (2) excluding the interaction terms and discriminating rationed from non-rationed firms on the ground of the variable *RAT*. The estimation results show that rationed firms report a greater elasticity of investment with respect to cash flow than non-rationed ones, suggesting that $\partial(INVESTMENT/K)/\partial(CASH\_FLOW/K)$ is a good proxy for financing constraints.[22]

On the whole, the results on the sensitivity of investment to cash flow are consistent with those on credit rationing described in the previous section. Investment of firms in provinces with a functionally more distant banking system is more sensitive to cash flow, and this effect decreases with firm size.

Table VIII displays the estimation results of our basic (columns 1 to 4) and augmented (columns 5 to 8) specifications. For each regression, the over-identification test supports the validity of the instrument set at 5% and the Arellano and Bond (1991) autocorrelation tests show the expected values at the 5% level of confidence. Across every specification, the positive coefficient on the interaction term $CASH\_FLOW \times FUNCTIONAL\_DISTANCE$ indicates that the marginal effect of cash flows on investment is increasing with functional distance. It is worth noting that even if the coefficient on cash flow is negative (albeit insignificant), the estimated marginal effect of *CASH_FLOW* is positive and the corresponding elasticity of investment to cash flow for the average firm is, as expected, around unity.[23]

[22] Since we have data on *RAT* only for the year of the survey, we assume that the same rationing condition holds for the entire three-year period and calculate robust standard error. Results are available in the working paper version of this paper (Alessandrini et al., 2006).

[23] From equation (2), it is easy to calculate the threshold value of *FUNCTIONAL_DISTANCE* indexes beyond which the marginal effect of cash flows on investment becomes positive: the corresponding values for *FUNCTIONAL_DISTANCE_KM* and *FUNCTIONAL_DISTANCE_LATENT* are below the second percentile, showing that the marginal effect $\partial(INVESTMENT/K)/\partial(CASH\_FLOW/K)$ is positive in at least 98% of cases.

Table VIII. Investment-cash flow sensitivity: One Step System-GMM estimation of Equation (2)

The table reports regression coefficients and, in brackets, the associated standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable *(INVESTMENT/K)* is the ratio between investment and the capital stock. *GROWTH* is the annual growth rate (in percentage) of total sales, *(CASH_FLOW/K)* is the ratio between cash flow and capital stock. Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the kilometric distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j* (*FUNCTIONAL_DISTANCE_KM*) and as a latent distance (*FUNCTIONAL_DISTANCE_LATENT*) obtained by taking the first component from a Factorial Matrices Analysis run on the three basic functional distance indexes. The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches (× 10,000) over surface (*OPERATIONAL_PROXIMITY_AREA*). *SIZE* is the number of workers categorized if five classes: 11–20 workers ($SIZE_1$, taken as benchmark), 21–50 workers ($SIZE_2$), 51–250 workers ($SIZE_3$), 251–499 workers ($SIZE_4$) and more than 500 workers ($SIZE_5$). *(CASH_FLOW/K)*×*FUNCTIONAL_DISTANCE*×$SIZE_i$ refers to the interaction with *FUNCTIONAL_DISTANCE_KM* (columns 5–7) and *FUNCTIONAL_DISTANCE_LATENT* (columns 6–8). All regressions include the constant and time, size, geographic (five macro-areas) and industry (Pavitt classification) dummies. The model is estimated by One-Step System GMM using Stata 10 SE package. As instruments, we use lagged values of endogenous variables from t-1 to t-5. Geographic, industry and time dummies are taken as strictly exogenous regressors. As diagnostic, the table reports the p-values of the Wald-test for the significance of the regression, of the Hansen test for over-identifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The bottom lines report the estimated elasticity of investment to cash flow: the first four column refer to the average firm' elasticity, while the last four columns report the elasticities according to the firm dimensional class, reckoned at the average values of *(INVESTMENT/K)*, *(CASH_FLOW/K)*, *FUNCTIONAL_DISTANCE_KM*, *FUNCTIONAL_DISTANCE_LATENT*, *OPERATIONAL_PROXIMITY_POPULATION* and *OPERATIONAL_PROXIMITY_AREA*. The asterisks report the significance level of a two tailed t-test of annulment.

Dep Var: (*INVESTMENT/K*)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(*INVESTMENT/K*)(-1)	0.002***	0.002***	0.002***	0.002***	0.002***	0.002**	0.002**	0.002**
	[0.000]	[0.001]	[0.000]	[0.000]	[0.001]	[0.001]	[0.001]	[0.001]
GROWTH(-1)	0.147***	0.147***	0.150***	0.149***	0.152***	0.150***	0.154***	0.154***
	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.007]	[0.008]	[0.008]
(*CASH_FLOW/K*)	−2.086**	−2.030**	0.315	0.292	−2.190***	−1.982***	−0.718	−0.595
	[0.856]	[0.866]	[0.244]	[0.220]	[0.753]	[0.742]	[0.820]	[0.669]
(*CASH_FLOW/K*) × *FUNCTIONAL_DISTANCE_KM*	0.456***		0.177*		0.816***		0.635*	
	[0.167]		[0.095]		[0.186]		[0.352]	

Table VIII. (Continued)

Dep Var: (INVESTMENT/K)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(*CASH_FLOW/K*) × *FUNCTIONAL_DISTANCE_LATENT*		0.575***		0.253**		0.960***		0.802**
		[0.200]		[0.114]		[0.219]		[0.392]
(*CASH_FLOW/K*) × *OPERATIONAL_PROXIMITY_POPULATION*	0.245**	0.252**			0.167*	0.177*		
	[0.113]	[0.114]			[0.098]	[0.095]		
(*CASH_FLOW/K*) × *OPERATIONAL_PROXIMITY_AREA*			−0.004**	−0.004**			−0.002	−0.002
			[0.001]	[0.001]			[0.004]	[0.003]
(*CASH_FLOW/K*) × *FUNCTIONAL_DISTANCE*×*SIZE*$_2$					−0.111**	−0.132*	−0.063	−0.079
					[0.054]	[0.077]	[0.121]	[0.171]
(*CASH_FLOW/K*) × *FUNCTIONAL_DISTANCE*×*SIZE*$_3$					−0.195**	−0.227*	−0.085	−0.100
					[0.095]	[0.119]	[0.106]	[0.139]
(*CASH_FLOW/K*) × *FUNCTIONAL_DISTANCE*×*SIZE*$_4$					−0.160**	−0.223*	−0.112	−0.141
					[0.078]	[0.133]	[0.069]	[0.114]
(*CASH_FLOW/K*) × *FUNCTIONAL_DISTANCE*×*SIZE*$_5$					−0.412***	−0.677***	−0.425**	−0.691***
					[0.142]	[0.179]	[0.192]	[0.266]
Observations	1,953	1,953	1,953	1,953	1,953	1,953	1,953	1,953
Number of firms	279	279	279	279	279	279	279	279
OIR test	0.184	0.234	0.178	0.112	0.289	0.313	0.122	0.167
AR(1)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2)	0.639	0.627	0.641	0.636	0.651	0.629	0.669	0.650
Wald-test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elasticities of investment to cash flow according to firm size:								
Average firm	1.014***	1.047***	1.117***	1.133***				
11–20 workers					1.198***	1.132***	1.127***	1.101***
21–50 workers					1.413***	1.450***	1.469***	1.532***
51–250 workers					0.845**	0.918**	1.209***	1.266***
251–499 workers					0.842***	0.817**	0.863**	0.913**
More than 500 workers					−0.239	−0.591	−0.308	−0.612

With respect to the operational proximity indexes, we find that *OPERATIONAL_PROXIMITY_POPULATION* and *OPERATIONAL_PROXIMITY_AREA* have opposite effects on investment-cash flow sensitivity, with the former raising and the latter easing the sensitivity of investment to cash flow, even if this effect vanishes in the augmented specification. Altogether, these results confirm the results of previous literature: namely, the ambiguous effects that the number of banks operating in a region may have on local borrowers.

The results of the augmented specification point to significant differences in the impact of functional distance on investment-cash flow sensitivity according to firm size: from columns 5 and 6, we can observe that the larger the firm, the lower is the contribution of functional distance to the marginal effect of cash flow on investment. This relation is non-linear and is especially weak for the largest firms. When considering *FUNCTIONAL_DISTANCE_LATENT* (columns 7 and 8), the impact on $\partial(INVESTMENT/K)/\partial(CASH\_FLOW/K)$ is significantly lower only for firms employing more than 500 workers. The diminishing marginal effect of functional distance is reflected in a declining path of the elasticity of investment to cash flow, as shown by the last rows of Table VIII. In particular, investment choices are very elastic to internal financing for firms employing less than 50 workers, while the relationship becomes inelastic for large firms with more than 500 workers.

6. Credit lines drawn and overdrawn

6.1 THE ECONOMETRIC MODEL

The last two empirical exercises are carried out at the market level and consider as dependent variables the percentage of credit drawn from available credit lines (*CREDIT_DRAWN*) and the ratio of overdrawn to actual credit granted (*OVERDRAWN*). The former is a measure of liquidity constraint, while the latter is an indicator of the flexibility of credit supply, i.e., the ability (capacity) of the banking system to provide borrowers with liquidity. Therefore, in a functionally distant banking system that tightens local credit market conditions, functional distance indexes must be positively correlated with *CREDIT_DRAWN* and negatively correlated with *OVERDRAWN*.

Data on *CREDIT_DRAWN* and *OVERDRAWN* are available at the provincial level by borrower location for the period 1997–2003. Given the high time persistence shown by these indexes, we estimate a dynamic balanced panel model, in which the dependent variable (*CREDIT_DRAWN* and *OVERDRAWN*, alternatively) is regressed against its lagged value, functional distance and operational proximity

indexes, and n control variables at the provincial level (*PROV*):

$$\ln Y_{jt} = \alpha + \beta_1 \ln Y_{jt-1} + \beta_2 OPERATIONAL\_PROXIMITY_{jt} + \beta_3 FUNCTIONAL\_DISTANCE_{jt} + \sum_n \varphi_n PROV_{njt} + \eta_j + \nu_t + \varepsilon_{jt} \quad (4)$$

To be consistent with previous exercises, we include in *PROV* control variables for credit market concentration (*HHI*) and localism (*COOPERATIVE_BANKS*). As a measure of local economic development, we add the logarithm of real per capita value added (*VALUE_ADDED*) to capture the average degree of creditworthiness of local borrowers, and we include the dummies for the five Italian macro-regions. Finally, η_j and ν_t take into account time and individual fixed effects, whereas ε_{jt} is the idiosyncratic error term.

Given the dynamic structure of the model, and to control also for potential endogeneity of right-hand side variables, we estimate Equation (4) using the System-GMM. We consider separate models for three loan size classes, as a proxy for borrowers' size in order to test whether distances matter more for small than for large firms.[24]

6.2 RESULTS

6.2.1 Credit Lines Drawn

Consistent with previous analysis, estimation results of model (4) provides evidence of a positive and significant relationship between functional distance and credit shortage limited to small and medium loan classes (Table IX). All specifications pass the standard Hansen test of overidentification, suggesting that the lag structure of the instruments is correct. Moreover, we reject the hypothesis of no first-order autocorrelation, while we cannot reject that of no second-order autocorrelation.

Considering distance variables, functional distance makes the local credit market tighter for small borrowers, regardless of the *FUNCTIONAL_DISTANCE* indexes used. The steady-state elasticity of *CREDIT_DRAWN* with respect to functional distance ranges from 0.06 to 0.11. By contrast, we find that operational proximity has ambiguous effects on *CREDIT_DRAWN*. Relying on branches per capita, we find that the higher the *OPERATIONAL_PROXIMITY_POPULATION*, the lower is the share of available credit lines (the elasticity being -0.09, as from column 1 of Table IX; result not reported). By contrast, the coefficient of *OPERATIONAL_PROXIMITY_AREA* is positive and statistically significant, even if its

[24] Loan classes are: € 75,000–125,000; € 125,000–500,000; more than € 500,000. For robustness we also consider a five loan class classification where loans above € 125,000 are divided into € 125,000–250,000; € 250,000–500,000; € 500,000–2,500,000; more than € 2,500,000.

Table IX. Credit lines drawn: One Step System-GMM estimation of Equation (4)

The table reports regression coefficients and, in brackets, the associated robust standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable (*CREDIT_DRAWN*) is the logarithm of the ratio between utilized and available credit lines. *CREDIT_DRAWN*(-1) is the lagged value of the dependent variable. To obtain more readable coefficients, *CREDIT_DRAWN* and *CREDIT_DRAWN*(-1) are multiplied by 10. Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the kilometric distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j* (*FUNCTIONAL_DISTANCE_KM*) and as a latent distance (*FUNCTIONAL_DISTANCE_LATENT*) obtained by taking the first component from a Factorial Matrices Analysis run on the three basic functional distance indexes. The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches (× 10,000) over surface (*OPERATIONAL_PROXIMITY_AREA*). *COOPERATIVE_BANKS* is the share of branches held by Credit Cooperative Banks on total branches in the province. *HHI* is the logarithm of the Herfindahl-Hirschman Index calculated on the number of branches in the province. *VALUE_ADDED* is the logarithm of per capita real value added in the province. All regressions include the constant and time and geographic (five macro-areas) dummies. The model is estimated by One-Step System GMM using Stata 10 SE package. As instruments, we use lagged values (t-1 and t-2) of *CREDIT_DRAWN*(-1) and the available lagged values after t-2 for the other variables. Geographic and time dummies are taken as strictly exogenous regressors. As diagnostic, the table reports the p-values of the Wald-test for the significance of the regression, of the Hansen test for over-identifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The bottom lines report the estimated long-run elasticity of *CREDIT_DRAWN* with respect to *FUNCTIONAL_DISTANCE* indexes, reckoned at the average values of *FUNCTIONAL_DISTANCE_KM* and *FUNCTIONAL_DISTANCE_LATENT*.

Dep Var: *CREDIT_DRAWN*	Loan size (thousands €)			Loan size (thousands €)			Loan size (thousands €)			Loan size (thousands €)		
	75–125	125–500	>500	75–125	125–500	>500	75–125	125–500	>500	75–125	125–500	>500
CREDIT_DRAWN(-1)	0.613***	0.827***	0.286**	0.617***	0.828***	0.286**	0.614***	0.824***	0.284**	0.623***	0.826***	0.286**
	[0.092]	[0.044]	[0.140]	[0.091]	[0.045]	[0.138]	[0.094]	[0.042]	[0.139]	[0.092]	[0.043]	[0.138]
FUNCTIONAL_DISTANCE_KM	0.097**	0.057**	−0.036				0.085**	0.045	−0.029			
	[0.042]	[0.027]	[0.158]				[0.039]	[0.028]	[0.161]			

Table IX. (Continued)

Dep Var: (*INVESTMENT/K*)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)				
FUNCTIONAL_DISTANCE_LATENT				0.121**	0.070**	0.033				0.085**	0.063*	0.061
				[0.056]	[0.033]	[0.191]				[0.043]	[0.037]	[0.188]
OPERATIONAL_PROXIMITY_POPULATION	−0.063**	−0.021	−0.201	−0.058	−0.020	−0.197						
	[0.032]	[0.026]	[0.158]	[0.036]	[0.027]	[0.155]						
OPERATIONAL_PROXIMITY_AREA							0.003**	0.002***	−0.001	0.003**	0.002**	−0.001
							[0.001]	[0.001]	[0.004]	[0.001]	[0.001]	[0.004]
COOPERATIVE_BANKS	0.242	0.409	0.623	0.321	0.417	0.985	−0.066	0.348	−0.485	−0.174	0.370	0.000
	[0.392]	[0.282]	[1.330]	[0.439]	[0.298]	[1.343]	[0.368]	[0.359]	[1.541]	[0.390]	[0.397]	[1.494]
HHI	0.687**	0.817***	2.454***	0.674*	0.791***	2.539***	0.561*	0.853***	2.009**	0.533	0.848***	2.107**
	[0.335]	[0.244]	[0.875]	[0.358]	[0.255]	[0.904]	[0.312]	[0.267]	[0.862]	[0.326]	[0.289]	[0.931]
VALUE_ADDED	0.559**	0.137	0.263	0.559*	0.136	0.326	0.157	−0.082	−0.35	0.131	−0.064	−0.227
	[0.254]	[0.153]	[0.841]	[0.288]	[0.162]	[0.815]	[0.211]	[0.180]	[1.001]	[0.218]	[0.188]	[0.939]
Observations	618	618	618	618	618	618	618	618	618	618	618	618
OIR test	0.454	0.337	0.310	0.665	0.354	0.399	0.397	0.319	0.210	0.484	0.309	0.224
AR(1)	0.108	0.002	0.021	0.108	0.002	0.020	0.108	0.001	0.024	0.107	0.001	0.023
AR(2)	0.166	0.789	0.197	0.167	0.788	0.188	0.168	0.781	0.149	0.165	0.778	0.142
Wald-test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elasticity wrt *FUNCTIONAL_DISTANCE*	0.082	0.107	−0.017	0.081	0.105	0.012	0.072	0.083	−0.013	0.058	0.093	0.022

economic effect is negligible (the elasticity is 0.01, as from column 7 of Table IX; result not reported).

Moving on to the control variables, we find strong evidence of path dependence for *CREDIT_DRAWN*, while, contrary to what we expected, the coefficient of per capita value added is either significantly positive or insignificant. As regards the characteristics of the local credit market, we find that the *HHI* coefficient is positive and significant, while the share of branches held by credit cooperative banks in the provinces does not have any effect on *CREDIT_DRAWN*.

6.2.2 Overdrawn

Table X reports the results of model (4) with the overdrawn ratio as a dependent variable. The diagnostic tests support the model specification and the lag structure of the instruments. Focusing on distance variables, branch density has no effect on *OVERDRAWN*, while functional distance, however measured, has a significant negative impact for the smallest loan class. In particular, the high elasticity of *OVERDRAWN* to functional distance, which ranges between 0.42 and 0.55, suggests that the proximity of the banks' decisional centres has a major role in determining the flexibility of credit supply for small borrowers.

The coefficients on *VALUE_ADDED* and *HHI* are consistent with previous results on credit lines drawn. In richer provinces and in credit markets where the banking system is more concentrated, credit supply is less flexible to the immediate liquidity needs of small borrowers who show restrained opportunities to overdraw. Furthermore, we also find that, at the aggregate level, a larger share of credit cooperative banks are associated with a tighter credit market.

7. Robustness Checks

We undertake a number of robustness checks concerning the functional distance indexes, econometric specification, and the estimation methodology.[25] Overall, results on the distance variables appear to be robust across all these additional exercises.

With regard to functional distance, assuming that in the case of multibank holdings power on lending policy is in the hands of the parent bank, we use *FUNCTIONAL_DISTANCE_G* indexes based on distance between the local branch and the headquarter of the parent bank. In all exercises the results are qualitatively similar to those obtained with *FUNCTIONAL_DISTANCE* indexes.

With regard to econometric specification, in the credit rationing model we estimate Equation (1) with contemporaneous or one year lagged firm-specific variables

[25] To save space, results and tables are not reported but are available on request from the authors.

Table X. Overdraft: One Step System-GMM estimation of Equation (4)

The table reports regression coefficients and, in brackets, the associated robust standard errors. * significant at 10%; ** significant at 5%; *** significant at 1%. The dependent variable (*OVERDRAWN*) is the logarithm of the ratio between utilized and available credit lines. *OVERDRAWN*(-1) is the lagged value of the dependent variable. To obtain more readable coefficients, *OVERDRAWN* and *OVERDRAWN*(-1) are multiplied by 10. Functional distance indexes are computed as the ratio of branches weighted by the logarithm of 1 plus the kilometric distance between the province of the branch and that where the parent bank is headquartered, over total branches in province *j* (*FUNCTIONAL_DISTANCE_KM*) and as a latent distance (*FUNCTIONAL_DISTANCE_LATENT*) obtained by taking the first component from a Factorial Matrices Analysis run on the three basic functional distance indexes. The operational proximity indexes are computed as the number of bank branches in the province per 10,000 inhabitants (*OPERATIONAL_PROXIMITY_POPULATION*), and the ratio of branches (× 10,000) over surface (*OPERATIONAL_PROXIMITY_AREA*). *COOPERATIVE_BANKS* is the share of branches held by Credit Cooperative Banks on total branches in the province. *HHI* is the logarithm of the Herfindahl-Hirschman Index calculated on the number of branches in the province. *VALUE_ADDED* is the logarithm of per capita real value added in the province. All regressions include the constant and time and geographic (five macro-areas) dummies. The model is estimated by One-Step System GMM using Stata 10 SE package. As instruments, we use all the available lagged values after t-3 of the endogenous variables and the lagged values in t-1, t-2 and t-3 of in the *FUNCTIONAL_DISTANCE* indexes. Geographic and time dummies are taken as strictly exogenous regressors. As diagnostic, the table reports the p-values of the Wald-test for the significance of the regression, of the Hansen test for over-identifying restrictions (OIR, the null is the validity of the instrument set) and of the Arellano and Bond autocorrelation tests of first and second order (AR(1) and AR(2), the null is no autocorrelation). The bottom lines report the estimated long-run elasticity of *OVERDRAWN* with respect to *FUNCTIONAL_DISTANCE* indexes, reckoned at the average values of *FUNCTIONAL_DISTANCE_KM* and *FUNCTIONAL_DISTANCE_LATENT*.

Dep Var: *OVERDRAWN*	Loan size (thousands €)			Loan size (thousands €)			Loan size (thousands €)			Loan size (thousands €)		
	75–125	125–500	>500	75–125	125–500	>500	75–125	125–500	>500	75–125	125–500	>500
OVERDRAWN(-1)	0.564***	0.661***	0.392**	0.572***	0.660***	0.397***	0.531***	0.647***	0.417**	0.529***	0.645***	0.430**
	[0.086]	[0.073]	[0.154]	[0.086]	[0.071]	[0.151]	[0.092]	[0.073]	[0.170]	[0.093]	[0.074]	[0.168]
FUNCTIONAL_DISTANCE_KM	−0.731**	0.075	0.733				−0.605*	0.198	0.476			
	[0.347]	[0.292]	[0.493]				[0.337]	[0.321]	[0.513]			
FUNCTIONAL_DISTANCE_LATENT				−0.876**	0.209	0.982				−0.769*	0.280	0.648
				[0.415]	[0.387]	[0.614]				[0.442]	[0.432]	[0.675]

Table X. (Continued)

Dep Var: *OVERDRAWN*	Loan size (thousands €)			Loan size (thousands €)			Loan size (thousands €)			Loan size (thousands €)		
	75–125	125–500	>500	75–125	125–500	>500	75–125	125–500	>500	75–125	125–500	>500
OPERATIONAL_PROXIMITY_POPULATION	0.224	−0.140	0.112	0.265	−0.098	0.102						
	[0.239]	[0.205]	[0.444]	[0.257]	[0.205]	[0.464]						
OPERATIONAL_PROXIMITY_AREA							−0.005	0.012	0.034*	−0.006	0.014	0.038*
							[0.012]	[0.013]	[0.020]	[0.012]	[0.014]	[0.021]
COOPERATIVE_BANKS	−9.136***	−4.305	−1.614	−8.828***	−3.661	−0.727	−9.318**	−5.402	−4.660	−9.311**	−5.054	−3.608
	[3.186]	[3.016]	[3.813]	[3.255]	[2.992]	[3.894]	[3.642]	[3.474]	[4.731]	[3.966]	[3.703]	[5.095]
HHI	−3.519**	−0.937	1.005	−3.396**	−0.738	1.109	−3.798**	−1.732	1.187	−3.837**	−1.484	1.541
	[1.712]	[1.671]	[2.167]	[1.687]	[1.709]	[2.147]	[1.681]	[1.764]	[2.126]	[1.679]	[1.832]	[2.119]
VALUE_ADDED	−5.654***	−4.046***	−6.104*	−5.858***	−4.350***	−6.142*	−5.306**	−5.283***	−7.294*	−5.479**	−5.497***	−7.488*
	[1.801]	[1.469]	[3.480]	[1.847]	[1.482]	[3.532]	[2.398]	[1.827]	[3.938]	[2.535]	[1.826]	[3.928]
Observations	618	618	618	618	618	618	618	618	618	618	618	618
OIR test	0.471	0.260	0.289	0.485	0.299	0.387	0.498	0.354	0.563	0.516	0.422	0.617
AR(1)	0.001	0.002	0.001	0.001	0.002	0.001	0.001	0.004	0.001	0.001	0.004	0.001
AR(2)	0.086	0.265	0.311	0.085	0.270	0.308	0.084	0.280	0.297	0.086	0.282	0.288
Wald-test	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Elasticity wrt *FUNCTIONAL_DISTANCE*	−0.547	0.073	0.393	−0.524	0.158	0.417	−0.421	0.183	0.266	−0.418	0.202	0.291

and include additional controls like *ROE* (whose coefficient is significantly positive), firm age, length of the bank-firm relationship and the quadratic terms of the Herfindahl-Hirschman index (not significant). None of these changes modify the sign or significance of distance coefficients. In the investment-cash flow sensitivity analysis we find that the results are unaffected by the inclusion of the firm's leverage (*DEBT*), which has a positive but not significant effect on investment, and by geographical dummies at the regional level. In the credit lines drawn and overdrawn regressions we include *FAIL* as an additional control variable which is not significant and does not affect the positive correlation between functional distance and credit tightness. Moreover, we control for geographic fixed effects at the regional level.

Finally, with regard to econometric methodology, in the probit analysis we try to exploit the time dimension of the dataset, building a balanced panel for 195 firms over three time periods, corresponding to the years of the surveys. Random effect logit estimation confirms the negative sign of the coefficient of functional distance, even if it is no longer significant. As already noted, this result might be due to the reduced sample size and to the very limited number of changes in rationed status by firms included in our sample. Besides, the rotating panel of Capitalia survey suffers from a high degree of attrition that creates a bias in the estimates, possibly outweighing the efficiency gains of exploiting unobserved firm-specific heterogeneity (Nese and O'Higgins 2007). Finally, we are further persuaded about the validity of the pooled estimator by the fact that we cannot always reject at 5% level of significance the hypothesis that the fraction of total variance contributed by the panel-level variance component, the rho index, is equal to zero.

We estimate the investment equation also with a static specification with the within-group estimator. Results confirm the positive effect of cash flow on investment and also the positive marginal effect of functional distance on the sensitivity of investment to cash flow. However, controlling for firm-specific invariant effects, we find that operational proximity reduces the marginal impact of cash flow on investment. Finally, both in the investment-cash flow, and credit drawn and overdrawn exercises our findings are generally confirmed by using a two-step system-GMM estimator.

8. Conclusions

Bank deregulations, progress in information technology and incessant financial innovation have stimulated geographical diffusion of banking structures and instruments that have greatly increased operational proximity of banks to local economies. Working in the opposite direction, the consolidation of the banking industry has also produced a geographical concentration of decision and strategic centres of

banking institutions that has tended to increase functional distance of the banking system from local communities.

In this paper, we assess the impact of this spatial diffusion-concentration trends on financing constraints for firms, focusing on the Italian experience over the period 1996–2003. Our analysis consistently shows that greater functional distance has hardened firms' financing constraints. Functional distance is positively associated with the probability of firms being rationed, investment-cash flow sensitivity and share of credit lines actually drawn, and negatively associated with overdrawing. These adverse effects are particularly evident for small firms and for firms located in less developed southern Italian provinces.

Although one should be wary of extending country-specific results to other contexts, our findings suggest a more general policy conclusion. The intense bank consolidation process in the last twenty years has not made retail credit markets fully integrated even at the country level. On the contrary, it has made access to credit for informationally opaque firms in peripheral regions still harder. As Mortimer-Schutts (2005) has recently pointed out, in order to bring the benefits of market deregulation to local borrowers, what is needed is to promote the entry and creation of new banks and non-bank competitors struggling to capture a share of the local credit market by offering new services and not by merely incorporating local incumbents. Only by pursuing this track firmly will it be possible for banking competition to focus on the real needs of local economic development.

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