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## Distance, bank heterogeneity and entry in local banking markets

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# DISTANCE, BANK HETEROGENEITY AND ENTRY IN LOCAL BANKING MARKETS

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## Abstract

We examine the determinants of entry into Italian local banking markets during the period 1991-2002 and build a simple model in which the probability of branching in a new market depends on the features of both the local market and the potential entrant. Our econometric findings show that, all else being equal, banks are more likely to expand into those markets that are closest to their pre-entry locations. We also find that large banks are more able to cope with distance-related entry costs than small banks. Finally, we show that banks have become increasingly able to open branches in distant markets, probably due to the advent of information and communication technologies.

JEL classification: G21, L13, L22, R30.

Keywords: entry, barriers to entry, local banking markets, geographical distance.

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## 1. Introduction[1]

At the beginning of the 1990s the Italian banking sector was affected by a series of changes in the regulatory regime.[2] Many pre-existing constraints on bank branching across local markets were lifted. These changes spurred a rapid increase in the number of branches throughout the country. Banks expanded both by opening new outlets in the local markets where they were already operating and by branching in new markets. This paper examines entry decisions of a pool of about 300 Italian banks from 1991 to 2002.

We concentrate on entry as we think that decisions regarding this matter represent a strong discontinuity in a bank's running of current affairs and in the competitive conditions prevailing in a local market.[3] Crossing the borders of geographically defined markets imposes additional efforts on potential entrants compared with geographical expansion within the areas where a bank already had a market presence. Moreover, the entry of a new competitor may have a strong influence on market equilibrium and change competitive conditions in that market. All these remarks suggest that a separate analysis should be made of entry processes, adopting a sort of partial equilibrium approach.

The decision to look at entry in geographically defined banking markets seems to be justified by the importance of space in moulding competition across banks. First, asymmetries of information between lenders and borrowers usually increase with distance, thereby enhancing screening and monitoring costs and adverse selection problems. Second, traditional transport and transaction costs in retail banking are additional sources of market segmentation.

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[2] The process of branching deregulation was started by the Bank of Italy in the late 1980s. In particular, from March 1990 on, entry through a new branch could not be denied on discretionary economic grounds.

[3] On branching in the Italian banking sector see Calcagnini et al (2001) and Cerasi et al (2000). These papers do not distinguish between entry and branch expansion in markets where banks are already located.

In this paper, we focus on a specific determinant of entry in local banking markets: the distance of a potential entrant from its target market. Distance may discourage entry because of transport costs, increasing agency costs in relations between corporate headquarters and local branch managers, and finally adverse selection problems due to increasing informational disadvantages over incumbent banks.

To analyze the entry-distance relationship we use a unique data-set including 300 Italian banks and 103 provincial markets and covering a time span from 1990 to 2002. In a multivariate discrete choice model in which entry probability is a function of bank and market characteristics, we show that distance has a negative and statistically significant effect on entry. Moreover, our econometric findings show that the entry-distance relationship depends in a non-linear way on a bank's size: large banks are less sensitive to distance-related entry costs, probably because they make more use of hard information than soft information. Last, we show that the linkage between entry and distance has been weakening in recent times, particularly since the second half of the 1990s. The contemporaneous advent of information and communication technologies in banking might explain why banks have been increasingly able to open branches in distant markets. As far as we know, the latter two effects are documented for the first time.

Our work is related to different streams of literature. A group of papers deals with the effects of distance in the banking sector. Petersen and Rajan (2002) look at the determinants of the lender/small-borrowers distance and its evolution over time. They find that, all else being equal, this distance has been increasing, probably due to technological progress. Berger et al (2002) offer theoretical arguments and find empirical evidence of the fact that large banks lend at greater distance than small banks. They interpret these findings as consistent with the idea that large banks are better equipped to collect and act on hard information. Degryse and Ongena (2005) focus on spatial price discrimination related to distance. Their empirical findings show that loan rates decrease with the distance between the firm and the lending bank and instead increase with the distance between the same bank and its competitors. They argue that this evidence clearly shows the importance of spatial pricing discrimination in the banking sector.

Although these contributions investigate the role of distance in banking, they do not focus on a bank's location choices and restrict their analysis to the distance between borrowers and financial institutions that already operate in the market.

Other papers examine the effects of distance on relations between a bank holding company and its affiliates. Here the emphasis is on the difficulties and agency problems that corporate headquarters may encounter in controlling the activity of distant affiliate managers. In two related papers, Berger and De Young (2001 and 2002) show that control over affiliates dissipates with distance and that bank headquarters have been increasing their ability to exert this control at distance over time, perhaps because of technical progress. These results are interesting from our point of view, although they refer to the relationship between a bank holding company and individual banks belonging to same group, rather than to the relationship between a single bank corporate headquarters and its local branches.

Finally, our work is also related to the literature that emphasizes the role of potential entrants' heterogeneity as a determinant of entry decisions. As noted by Geroski (1995), entries tend to come in waves. This means that one has to study entry processes within a dynamic set-up. But structural market variables usually change at a slow pace and therefore may not give a complete explanation for entry decisions over time. On the contrary, variables at individual bank level, such as profitability, size, location and many others, may be subject to sudden changes because of the evolution in the market strategies followed by individual banks. From this perspective, individual bank characteristics may help to explain the irregular time patterns of entry processes. In other words, it is difficult to undertake a study of entries, either cross-section or over time, that completely ignores the issue of economic agents' heterogeneity.

Building on previous papers by Berry (1992) and Scott Morton (1999), Juan (2002) estimates a model of entry probability combining very detailed geographical and individual bank data for Spain.[4] She shows that the size of the entrant bank has only a modest economic impact on entry as compared to the effects of market conditions. A potential problem with this result, however, is that there are too few controls for individual bank characteristics.

[4] Gobbi and Lotti (2003) examine entry decisions in the Italian banking markets concentrating on market characteristics only. Conigliani and Lanciotti (1978) investigate entry decisions in the Italian banking sector before the deregulation of the early 1990s.

In another paper on Spanish banks, Fuentelesaz and Gomez (2001) combine two distinct lines of research on entry. The first is the traditional industrial economics approach according to which differences in entry patterns depend on the structural characteristics of the markets. The second looks at entry as a diversification decision taken by an individual firm. In this way entry can be linked to a series of variables that pin down organizational factors within a bank. In the empirical Section of their paper they concentrate on a specific bank category (savings banks). They find that entry in local markets is positively related to the availability of internal funds, bank profitability and the size of the initial business. They also find that savings banks enter into markets which are closer to their pre-entry locations. Moreover, they model entry decisions in a single ten-year time span, assuming that these decisions may be related to explanatory variables taken at the beginning of the period. This means that entry in the final year may depend on factors observed ten years before.

The rest of the paper is organized as follows. Section 2 lays out a simple model of entry choices. Section 3 describes the main features of the data-set and of the entry definition. The specification used in the econometric analysis and the definitions of the explanatory variables are illustrated in Section 4. Section 5 comments the main econometric results. The relations between entry costs, distance and bank size are investigated in Section 6, while Section 7 examines the role of information and communication technologies in banking in removing entry barriers due to distance. Section 8 contains concluding remarks and indications for future research. A final appendix reports a set of additional controls.

## 2. A framework for the analysis of entry decisions

In this Section we describe the entry decisions of a set of potential entrants in local banking markets. Our focus on a single sector rules out explanations of entry behaviour based on sectoral differences in the degree of economies of scale, product substitutability or expenditure on R&D activities.

We assume that the banking sector is segmented in many geographically defined local markets. This assumption is in line with the observed low spatial mobility of bank customers and with the consequent relatively narrow geographical scope of the supply of many banking services. Hence we assume that a bank willing to enter a market has to open an outlet in that location.

We identify entry with the decision of a bank to open a branch in a market at time *t*, provided it owned no branches in the same market at time *t-1*. We follow Berry (1992) and assume that entry decisions can be represented as a two-stage game. In the first stage, a potential entrant decides whether to enter a market.[5] If it does, it then has to incur fixed sunk costs due to the opening of a branch in the new market. These costs may vary with individual banks and market characteristics or with a combination of the two. Differences in entry costs are assumed to be the only source of entrants' heterogeneity. The distribution of these costs is assumed to be exogenous and known to each potential entrant.[6]

Regarding entry sunk costs, an entry decision requires a series of activities aimed at evaluating business opportunities in a market. These activities will be undertaken before accessing the market and hence before knowing the profit opportunities that will arise. Moreover, these entry costs may be difficult to recover should a bank decide to exit that market.[7] Thus we can assume that banks sink these costs before knowing the returns from their investment.

In the second stage of the game, banks participating in the market (both previous incumbents and new entrants) set prices and this determines post-entry profits and market equilibrium. We skip the analysis of this second stage and focus on the investigation of players' entry strategies in the first stage.

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[5] Our definition of entrants differs from the one adopted in Berry (1992). He includes among the entrants those firms that were incumbents in a market at time t-1 and decide to remain in the same market at time *t*. The differences between new entrants and incumbents strategic positions suggest that the analysis of their choices should be separate. As observed by Toivanen and Waterson (2001), the inclusion of incumbents in the pool of potential entrants would be at odds with the presence of entry sunk costs. Thus we restrict our analysis to the strategies followed by a set of potential new entrants identified with the pool of banks which were not previously operating in a specific market.

[6] For an alternative way of modelling entrants' heterogeneity see Melitz (2003).

[7] This conclusion may extend to the case of an exit decision carried out by selling the branch to another bank. Indeed, it is unlikely that the price paid for the goodwill will allow the seller to recover entry costs. Note also that, due to informational problems which affect bank-firm relationships, entry costs in the banking market can become very relevant (Dell'Ariccia et al, 1999). Hence, a new entrant has to spend resources to build relations with local lenders based on soft information.

Let $K_i$ denote the maximum number of potential entrants for market $i$ $(i=1,\ldots,M)$. The set of potential entrants in the first stage of the game can be ranked according to the level of their entry costs, $F$, (starting from the lowest cost bank) in the following way:

$$F_{i1} < F_{i2} < \ldots.. < F_{iK_i}$$

If a bank $b$ decides to enter, its profits will be:

(1) $$\Pi_{ib} = \Pi(N_i, X_i) - F_{ib}$$

where $N_i$ indicates the number of actual entrants (with $N_i \leq K_i$), $X_i$ is a vector of variable varying with market characteristics, $\Pi(N_i,X_i)$ are profits gross of entry costs and $F_{ib}$ are fixed entry sunk costs.

Thus, profits obtained from the decision of bank $b$ to enter market $i$, $\Pi_{ib}$ can be split into two parts: $\Pi(N_i,X_i)$ are profits gross of entry costs varying only with a set of market characteristics represented by vector $X_i$ and with the number of entrants, given by $N_i$. The second component consists of entry fixed costs $F_{ib}$ that, as mentioned before, may vary with individual bank characteristics and their interaction with market features. These costs may help explain why specific banks enter specific markets.

The lack of independence of entry decisions may entail many difficulties in the estimation procedure.[8] To address this problem we follow Scott Morton (1999) and assume that banks take their entry decisions simultaneously.[9] Consequently, each bank does not know $N_i$ and has to make some conjectures about its level.

We assume that banks base their predictions about $N_i$ on the pre-entry market size, included in the vector $X_i$. Thus, we use a sort of reduced-form model in which the expected number of entering rivals is predicted using the size of a market before entry. We expect that the number of entrants will increase with market size. Concerns about the lack of

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[8] See Berry (1992) for a discussion.

[9] About the simultaneous nature of banks' entry decisions, note that an Italian bank which wants to open a new branch notifies its decision to the Bank of Italy, which can oppose within 60 days. No answer from the central bank implies that the bank is free to open its new branch. News of the opening of new branches is passed to the market every six months by the central bank. Until that moment, decisions on the new outlets are kept secret. Thus, branching decisions are taken by each bank without knowing their rivals' choices. This explains why branching decisions are simultaneous and not sequential.

independence may also extend to entry decisions taken by each bank across different markets. For the moment, we assume that entry in a market is completely independent from decisions taken in other markets by the same bank. This is equivalent to assuming that banks are free to set the total number of markets they enter.

In this framework we can define a very simple entry decision rule. Entry in market *i* will take place when entrants' profits defined by (1) are non-negative. Potential entrants with negative expected profits stay out of the market and earn zero profits. Under this rule and previous assumptions, it can be shown that a Nash equilibrium in pure strategies exists such that, holding the strategies of the rivals constant, all entering banks earn positive profits and all those staying out of the market have zero expected profits. This equilibrium only defines the number of potential entrants but not their specific identities (see Berry, 1992).

Finally, we have to parameterize both profit and cost functions. We introduce the following assumptions:

$$\Pi(N_i, X_i) = X_i \cdot \alpha$$

(2)

$$F_{ib} = Z_b \cdot \beta + W_{ib} \cdot \gamma + \varepsilon_{ib}$$

where $\alpha, \beta$ and $\gamma$ are vectors of unknown parameters.

Note that profits gross of entry costs are equal for all the banks that decide to enter the market. They linearly depend on a vector of explanatory variables varying only with market characteristics, $X_i$.

Fixed entry costs are assumed to depend linearly on a set of individual bank characteristics, given by vector $Z_b$, and on a combination of both market and individual bank features, represented by the vector $W_{ib}$. We assume that the entry decisions of each bank across different local markets are independent. Last, $\varepsilon_{ib}$ represents an error term with a logistic distribution.

Substituting expressions in (2) in equation (1) we get:

(3) $$\Pi_{ib} = X_i \cdot \alpha - Z_b \cdot \beta - W_{ib} \cdot \gamma - \varepsilon_{ib}$$

## 3. The data-set and entry definition

Our data refer to geographical units, individual banks and different time periods. We identify local banking markets with the 103 Italian provinces as defined in 1995.[10] This choice is partially motivated by the fact that the Italian supervisory authorities use provinces as proxies for the local markets for deposits. We have data on population, value added, geographical co-ordinates, loans, deposits, number of bank branches, interest rates on loans and deposits, all spanning from 1990 to 2002 and referring to each province.

Data on individual banks include their locations, loans, deposits, branches, total assets, profits, a set of dummies indicating if a bank has been involved in merger activities. All the banking statistics come from the Bank of Italy, while the remainder come from the Italian National Institute of Statistics (ISTAT).

Entry can take place through branching by existing banks, through the creation of *de novo* banks, through M&A or through the acquisition of branches from established banks. In this paper we concentrate only on entry through branching by existing banks. The peculiarities of *de novo* banks and of entry through M&A or through branch acquisitions from other banks suggest that these cases should be dealt with separately.[11] We also drop co-operative banks from our data-set. Nowadays, these banks are still subject to some regulatory constraints in their branching activity and for this reason we do not include them in our sample.[12]

We define entry into a province $i$ at time $t$ by bank $b$ as the event occurring when bank $b$ opens a new branch in province $i$, provided it owned no branches at time $t-1$ in the same province and held branches in provinces different from $i$.

The data-set for the regression analysis is built in the following way. For each bank, we consider the subset of provinces where it had no branches at time $t-1$. If entry occurs at

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[10] Until 1994 there were 95 Italian provinces,; their number was raised to the present 103 in 1995. The availability of data at municipal level, however, allows us to define the variables for the 103 provinces even for the years before 1995. For interest rates, we do not have data at municipal level and hence these variables are partially estimated before 1995.

[11] As observed in Gobbi and Lotti (2003) *de novo* banks are usually created under the initiative of local communities and this fact gives them a special nature.

[12] These banks have been included when we have computed variables describing the structure of local banking markets.

time $t$ in province $i$ according to our definition, we create an entry variable which equals 1. If entry does not occur this variable equals 0 for the same bank and province.

Entry is a rare event in our data-set. In addition, the span of the lag between entry decision and its occurrence can be long and erratic. For these reasons, we prefer to group data on entry for each bank into four time intervals denoted by $\Delta_p$ ($p$=1991-1993, 1994-1996, 1997-1999, 2000-2002). Our entry variable now equals 1 if bank $b$ has a branch in province $i$ in the time interval $\Delta_p$ and it had no branch in the same province in the initial year of the time interval. As before, the same variable equals 0 if no entry occurs for that bank in province $i$ during period $\Delta_p$. Data for provinces, individual banks and different time periods are pooled.

## 4. Model specification and definition of variables

Following equation (3) and entry rule as defined in Section 3, the probability of entry will be determined as follows:

(4) $$pr(Y_{ib\Delta_p} = 1) = pr(\Pi_{ib\Delta_p} \geq 0) = f(X_i, Z_b, W_{ib})$$

where $Y_{ib\Delta p}$ is a dichotomous variable equal to 1 if bank $b$ enters into province $i$ at time interval $\Delta_p$ and zero otherwise, $X_i$, $Z_b$ and $W_{ib}$ are vectors of variables summarizing, respectively, the characteristics of provinces, individual banks and their interaction. To avoid the problems that may arise with the potential endogeneity of some regressors, all the explanatory variables are considered at the year preceding the initial year of each time interval (for instance, entry in the period 1991-1993 depends on explanatory variables in 1990 and so on).

We have now to define the elements of the three vectors.[13]

1) Variables at provincial level

All other things being equal, a larger demand in the local market may increase incumbent profits and encourage entry. In the traditional Cournot-type oligopoly models, for instance, the number of competing firms in equilibrium increases with the size of total

[13] See Table 1 for a more detailed description of these variables.

demand (Tirole, 1988). We proxy this effect on entry with two variables: the log of the residential population in a province (LNPOP) and the log of per capita bank deposits (LNPCDEP). The latter variable tries to pin down the intensity of demand for banking services. Thus, we expect that both LNPOP and LNPCDEP positively affect entry.

In the theoretical debate there is no agreement about the way in which rivalry within a local market affects entry. Assume that the toughness of competition may be proxied by market concentration. According to some authors, seller concentration in a local market may increase the likelihood of non-competitive pricing and thus enhance profit margins for the incumbents. This circumstance may encourage entry by new competitors. Demsetz (1973) criticized this approach by arguing that higher profit margins of large incumbents in highly concentrated markets may simply reflect their superior productive efficiency. In this case, market concentration would have no effect on entry. A similar conclusion is reached by the Chicago School by assuming that sunk costs are negligible (Baumol, Panzar and Willig, 1988). Finally, according to the traditional structure-conduct-performance approach (SCP), highly concentrated markets may facilitate co-ordination of incumbents' strategies aimed at deterring entry (Bain, 1956, and Sylos Labini, 1962).[14] This implies that there will be an inverse relation between the degree of market concentration and the probability of entry.

The degree of competition on provincial markets is approximated by the Herfindahl concentration index (HERF). As explained above, this variable may have *a priori* a positive, negative or a null effect on entry.

2) Variables varying with bank characteristics

Entry into a new market may require competencies and capabilities that are more easily found in large organizations. Due to scale economies, a large bank is able to specialize part of its internal resources in tasks tied to geographical diversification. Thus, entry costs related to the evaluation of business opportunities in a new market or to the recruitment of resources to be used to open a new outlet may decrease with the size of the bank.

[14] According to the well-known Sylos postulate, incumbents may threaten entrants to maintain output at the pre- entry level thereby determining a fall in prices should entry occur.

Moreover, high profit margins may reflect high quality of bank managers, strong market position in established markets, good luck or a combination of all these factors (Cotterill and Haller, 1992). Hence, we can expect that a more profitable intermediary may have better chances of overcoming entry barriers.

But causality can also run in the opposite direction. Entry by a large or successful organization can threaten the market position of incumbents, while entry of a small or low-profit bank could be regarded by them as not dangerous. Accordingly, entry costs could be lower for small (unprofitable) banks than for large (profitable) ones.

We expect that a bank's decision to enter a new province is positively affected by its size, measured by the log of its total assets (LNBSIZE), and by its profitability, defined as net income on assets (ROA), although, as explained before, these variables may have an effect on entry running in the opposite direction.

Last, we introduce a dummy variable MONO taking value 1 if the bank is located in only one province and 0 otherwise. In this way, we control for the possibility that banks located in only one market face additional costs when they decide to increase their geographical diversification.

3) Variables varying jointly with provinces and individual bank characteristics.

Individual banks may find it easier to enter specific markets which are less 'distant' from their own previous experience. In this perspective, entering a nearby target market can be an advantage for a bank with respect to having access to more distant locations.

We consider at least three different factors that may explain why entry costs increase with distance. The first group is related to traditional transport costs. The interactions within the geographical network of a bank generate transaction costs increasing with distance between the parties. Dealing with a distant outlet enhances transport costs, travel expenses, communication costs and whatever. Accordingly, an entrant branching in a new market has to invest in transport and communication technologies a volume of resources that increases with the remoteness of the target market.[15]

[15] For papers comparing transport and information costs in banking see Buch (2001) and Degryse and Ongena (2003).

The second factor works through the increasing asymmetry of information between incumbents and potential entrants due to distance. For instance, during a lending relationship a bank acquires proprietary information on borrowers. This gives the incumbents an informational advantage over potential entrants. The latter may be unable to distinguish between potential borrowers rejected by competing banks and those seeking finance for new untested projects (Dell'Ariccia, 2001). It is likely that this adverse selection problem may be exacerbated by the distance of the potential entrant with respect to the target market. Hence, entrant efforts aimed at screening potential borrowers in the new market will also be increasing with distance.

Third, opening a branch in a distant market may increase the costs of control over the activities of the local branch managers. Bank corporate headquarters may find it harder to evaluate the performance of a local manager operating in a remote and new market. For instance, it could be more difficult to discriminate between cases in which a bad performance of the local branch may be due to managers' incompetence and to factors negatively affecting the local economy. More generally, agency costs generated by the relationship between local branch managers and corporate headquarters are likely to increase with the distance between the interacting parties.

The disadvantages of entering a distant market can be partially compensated by the benefits of increased diversification. This can happen when correlation of business cycles across different local markets are expected to fall with distance. In any case, it is unlikely that this effect will invert the negative correlation between distance and entry costs.

Each bank may own branches across several local markets. This multi-market nature of banking organization posits the question how to measure its distance with respect to the target market. If the influence of distance on entry is mainly conveyed through asymmetries of information between entrant and incumbents, it is advisable to use one of the local markets where a bank owns branches as a reference point for computing distance. Alternatively, if distance-based explanations of entry can be mostly traced to the problem of control over local managers, the right reference point for the calculation of distance should be the location of corporate headquarters. As regards transport costs, it is difficult to say which location might be selected for the distance computation, depending on the structure of the transactions within a bank's geographical network.

To address these problems we use two different reference points for computing distance. The first is based on the log of distance from the nearest bank's pre-entry location (LNDISTBR), the second on the log of distance from the location of the bank's corporate headquarters (LNDISTHQ). We represent the effect of distance on entry as non-linear since we assume decreasing marginal effects. In other words, we assume that increases in entry costs are larger when comparing entry in markets distant 50 and 100 kilometers, than in a circumstance in which this comparison concerns markets distant 950 and 1000 kilometers.

We expect all these alternative indicators of distance to have a negative impact on entry.

'Economic distance' existing between the entrant and its target market can also affect entry decisions. Lending activity is strongly influenced by informational problems. If a bank specializes in extending loans to some specific sectors, it may have an advantage in entering a market with a similar sectoral specialization.[16] Thus, we expect that the probability of entry may increase with similarity (proximity) between the sectoral composition of the loan portfolio of a specific potential entrant and that of the target market. Alternatively, a bank might want to increase the sectoral diversification of its loan portfolio by entering markets with a different sectoral composition. *A priori* the effect of this variable on entry may be ambiguous. To this end, we introduce the variable DISTSECT, which measures the distance between the sectoral composition of the bank's loan portfolio and that of the target market.

Finally, OUTLOANS denotes the amount of loans offered by a bank to a target market. By construction, our data-set includes those provinces where a bank owns no branches. Hence, a positive value of OUTLOANS should help a potential entrant to overcome informational barriers to entry, and therefore we expect a positive effect.

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[16] Lending to a different sector may lower the incentives to monitor for the bank (Winton, 1999). Furthermore, it may increase monitoring costs and create adverse selection problems (Acharya, Hasan, Saunders, 2002).

We also introduce an additional set of dummy variables. One group indicates whether a bank has been acquired through M&A by other banks within a given time span (MT=1 for the incorporated banks and MT=0 otherwise) or if it gains control over another bank through these operations (MB=1 or MB=0 otherwise). Other dummies account for different time intervals (P1-P4) and for provinces located in the south of Italy (SOUTH=1).

We estimate (4) using a binomial logit model. As explained before, we pool data referring to provinces, individual banks and different time intervals. Thus, we adopt the following logit specification for the probability of entry:

$$\begin{aligned} pr(Y_{ib\Delta p}=1) = F(&\alpha_0 + \alpha_1 \cdot LNPOP_i + \alpha_2 \cdot LNPCDEP_i + \alpha_3 \cdot HERF_i + \alpha_4 \cdot SOUTH_i + \\ &\beta_1 \cdot ROA_b + \beta_2 \cdot LNBSIZE_b + \beta_3 \cdot MONO_i + \gamma_1 \cdot LNDISTBR_{ib} \\ &+ \gamma_2 \cdot DISTSECT_{ib} + \gamma_3 \cdot OUTLOANS_{ib} + \omega_1 \cdot P1 + \omega_2 \cdot P2 + \omega_3 \cdot P3) \end{aligned} \tag{5}$$

where $F(z) = \frac{e^z}{1+e^z}$, $\alpha_0$-$\alpha_4$,$\beta_1$-$\beta_3$,$\gamma_1$-$\gamma_3$, $\omega_1$-$\omega_3$ are parameters to be estimated.[17]

## 5. Analysis of the main econometric results

Descriptive statistics and the correlation matrix between regressors are shown in Tables 1 and 2, while Table 3 reports our main econometric results.

We first describe results for all the right-hand variables excluding LNDISTBR and LNDISTHQ and then move to comment on distance.

As expected, the number of users of banking services in a province, LNPOP, has a positive and significant impact on the probability of entry. Provinces with higher per capita deposits (LNPCDEP) also seem to attract entry, although the coefficient of this regressor is only weakly significant.

The degree of market concentration (HERF) has no statistically significant effect on entry. This result is due to the collinearity existing between variables measuring the size of the market in absolute terms, such as LNPOP, and the degree of market concentration (see

[17] To save on notation we omit the time subscript for the regressors. We also omit time period dummy P4 due to perfect collinearity.

Table 2). In other words, given that larger markets are also less concentrated, it is difficult to disentangle the effects of the two variables on entry.[18]

Moving to the regressors varying with individual bank characteristics, we find that a bank of larger size, higher profitability and with a wider geographical scope of operations is more likely to enter a new market. The decision to diversify seems to require skills and capabilities that are typical of large and successful organizations and of banks with previous experience of geographical diversification. Note that the banks operating in only one province (MONO=1) are of smaller size than those operating across many markets. Despite their positive correlation, our results show that MONO and LNBSIZE exert distinct effects on entry.

Banks are more likely to enter markets with a sectoral composition of loans which is different from that of their pre-entry loan portfolio. This is shown by the positive and statistically significant coefficient of DISTSECT. This result is partially at odds with those obtained in other sectors.[19] However, the positive effect of DISTSECT on entry is obtained only after conditioning for LNDISTBR (or LNDISTHQ). If we drop this variable from the regression, the coefficient of DISTSECT becomes negative and continues to be significant. This evidence is partially explained by the fact that the two variables covariate (their correlation is positive and significantly different from zero). Thus, in some circumstances economic distance may be a proxy for geographical distance. In any case, according to our evidence, once we hold physical distance between potential entrant and the target market constant, banks seem to prefer markets with a sectoral specialization that is different from that of their loan portfolios. Hence banks may use geographical diversification to change the initial sectoral composition of their lending activity.

OUTLOANS has a positive impact on entry. Establishing relations with customers in a province where the bank has not yet branched gives the potential entrant some advantages in overcoming informational barriers to entry.

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[18] In unreported evidence we have used population density, defined as total provincial population divided by its surface (PDENS), to proxy for the size of demand. We obtained estimates with a negative and statistically significant coefficient for HERF (correlation between PDENS and HERF is equal to -0.22).

[19] For the pharmaceutical sector see Scott-Morton (1999).

As to the additional controls based on dummy variables, we find that the probability of entry increases if a province is located in southern Italy (see the positive and statistically significant coefficient of SOUTH). Some large banks with headquarters in the South of Italy underwent substantial restructuring throughout the 1990s as a result of financial distress. This process limited their ability to expand into new markets. It follows that, all else being equal,  entry decisions were made mostly by banks already operating in the Northern and Central regions of the country, which could therefore only expand geographically towards southern markets. Moreover, a bank that falls under control of another bank through M&A operations during the period (MT=1) has a lower probability of entering a new province,[20] whereas a bank which gains control over another bank (MB=1) is more likely to enter a new market. This last piece of evidence shows that market penetration strategies based on M&A and those linked to branching in new markets can be complements and not substitutes.

Before commenting on geographical distance, we show two graphs summarizing what we consider to be the major findings of this paper. In Figure 1, we plot the number of entries against the deciles of the distribution of the variables LNDISTBR and LNDISTHQ.

It is evident that there is a strong negative correlation between distance and the frequency of entries. Note, however, that although the number of entries shrinks rapidly as LNDISTBR increases, it does not go to zero even at long distances. This effect is more evident for the variable LNDISTHQ.

Figure 2 reports the average distance at which entries occur in each period. There is a quite clear time pattern in which banks are increasingly able to enter at long distances. Moreover, this tendency does not seem to be correlated with the total number of entries per period.

These two pieces of  evidence are consistent with our *a priori* that distance discourages entry and also with the idea that the tyranny of distance has been weakening, probably due to technological progress in the banking sector during the second half of the 1990s.

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[20] Obviously, this is also a consequence of fact that the majority of target banks are acquired by the bidder before the end of  time intervals in which we consider entries.

As expected and all else being equal, banks are less likely to enter distant markets. Estimates on LNDISTBR and LNDISTHQ yield negative and statistically significant coefficients (see columns 1 and 2 of Table 3).

As shown above, the two different measures of distance may partially correspond to different economic mechanisms. Specifically, LNDISTBR should be more closely correlated with the asymmetries of information between incumbents and potential entrants, while LNDISTHQ should pinpoint more the agency costs generated by the relationship between corporate headquarters and local managers. Given that the two measures yield very similar results, we conclude that perhaps all these different mechanisms are at work in shaping the effects of distance on entry.

In place of LNDISTBR we use a discrete measure of distance based on contiguity (ADIAC). The coefficient for this variable is positive and statistically different from zero, confirming previous results. Foreshadowing their collinearity, we use ADIAC and LNDISTBR in the same regression. Even when controlling for contiguity, LNDISTBR maintains a negative and statistically significant coefficient. We interpret these results as evidence in favour of the use of a continuous measure of distance.

Whatever controls one might think of, there is still the possibility of having omitted relevant market and individual bank characteristics affecting entry. For this reason, we introduce provincial and individual bank fixed effects in our regression. Due to collinearity, we drop those regressors varying with either one of the two dimensions, namely LNPOP, LNPCDEP, HERF and SOUTH, when introducing provincial fixed effects, and ROA, FIT, MONO, MB and MT, when using individual bank fixed effects.[21] Results are reported in columns 3, 4, 5 and 6 of Table 3.

A broad overview of results shows that the main findings do not change much after the introduction of fixed effects. In most cases estimated coefficients preserve the same sign they had in the basic specification. The only exception is given by the parameter on DISTSECT, which takes on a negative sign in columns 5 and 6 and is no longer significant.

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[21] Given that our data also have a temporal dimension we could have introduced fixed effects together with variables varying only with markets or banks. We have not opted for this possibility because we only have four observations for each market and bank.

To evaluate the economic impact of some of the regressors, particularly those varying with individual banks, we run a simulation of the model. Results are reported in Table 4. Reducing the mean value of LNDISTBR by one standard deviation raises the predicted probability of entry by nearly 1.3 times (predicted probability of entry is equal to 0.16% at the mean values of the regressors). This is the most important effect that we obtain in our specification. MONO also has a substantial impact on entry: banks operating in more than one market raise their entry probability by nearly 70% compared with banks with branches in only one market. Moreover, a reduction by one standard deviation of LNPOP lowers the probability of entry by 52 per cent. All the remaining regressors have much smaller effects.

In the appendix, we report a set of additional robustness checks based on alternative specifications, different definitions of the set of potential entrants and of geographical units. Results on distance are robust to all these checks.

## 6. Bank size and the distance-entry relation

In previous Sections, we discussed the importance of bank size as a determinant of entry. Here, we want to go more deeply into the relations between bank size, distance and entry.

Building on a recent paper by Stein (2002), Berger et al (2002) argue that large banks are at a comparative advantage with respect to small banks regarding the use of hard information and hence also lending to large firms. The reason for this advantage is rooted in the internal working of a bank's organization. Specifically, branch managers in a large bank will have an incentive to lend to those borrowers displaying hard information since, in the allocation of resources within the bank, they can more easily get funds on the basis of verifiable information. In a small bank this effect is weakened as corporate headquarters and branch managers are closer. Thus, a local manager investing in lending to small business can be sure that it will be able to recover its investment due to the fact that soft information can easily be transmitted to the corporate headquarters.

This argument has at least two implications for our analysis of entry. On the one hand, if large banks are specialized in lending to (large) customers with a well-documented track record, they should be at a comparative advantage in entering distant markets as hard information can be more easily transmitted at distance. On the other hand, large banks will resort more to hard information in controlling the activities of their local managers. It follows that these costs of control will be less sensitive to increasing distance.

To test these propositions we add a new variable to the regression defined by the interaction between size and distance: *INT = LNBSIZE*LNDISTBR*. With this interaction, marginal effects in our discrete choice model change as follows. Let $\overline{p}$ denote the probability of entry predicted by the model at the median value of the regressors. The marginal effect of *LNDISTBR* on $\overline{p}$ in our logistic model will now be given by:[22]

$$(6) \qquad \left.\frac{\partial p}{\partial LNDISTBR}\right|_{at\ median} = [\text{coef\_LNDISTBR} + \text{coef\_INT} * \overline{\text{LNBSIZE}}] \cdot \overline{p} \cdot (1 - \overline{p})$$

In a similar way for size:

$$(7) \qquad \left.\frac{\partial p}{\partial LNBSIZE}\right|_{at\ median} = [\text{coef\_LNBSIZE} + \text{coef\_INT} * \overline{\text{LNDISTBR}}] \cdot \overline{p} \cdot (1 - \overline{p})$$

In this new formulation, the signs of the marginal effects of distance and size are not exclusively determined by *coef_LNDISTBR* or *coef_LNBSIZE*, but also depend on *coef_INT* and on the level of *LNBSIZE* and *LNDISTBR,* respectively.

We expect that the first derivative will take on a negative value, while the second derivative should be positive. Moreover, following previous theoretical remarks, we expect that the negative effect of distance on entry to be lower in absolute terms as bank size grows. Similarly, we conjecture that the positive effect of *LNBSIZE* on the probability of entry will increase with distance.

According to our unreported evidence, the coefficient of *INT* takes on a positive value and is also statistically different from zero. At last, we tabulate the values of $\frac{\partial p}{\partial LNDISTBR}$ computed at the deciles of the distribution of LNBSIZE and keeping the other regresssors constant at their median values. In a similar way, we calculate

[22] The bar over the variables indicates that they are computed at their median values.

$\frac{\partial p}{\partial LNBSIZE}$ by varying LNDISTBR and keeping the other regressors constant at their median values (see Table 5).

The two derivatives take their expected signs. Moreover, our findings are fully consistent with the idea that large banks are at a comparative advantage in entering distant markets. All else being equal, the marginal effect of distance on the probability of entry is decreasing in absolute value as size increases; similarly, the positive impact of LNBSIZE on $\bar{p}$ is increasing with distance, i.e. the competitive advantages of large banks are enhanced when considering access to distant locations.

All in all, these findings offer a clear-cut picture in which size and distance interact in a complex way in moulding entry decisions. In particular, they show that small banks are less able to cope with distance-related entry costs, probably because of their greater use of soft information in dealing with their borrowers and with their local managers.

## 7. The distance-entry relationship and technical progress in banking

Up to now we have been assuming that the distance-entry relationship does not change across different periods. Even a coarse look at the events occurring in the banking sector during the 1990s suggests that an alternative hypothesis should be taken into account. Italian banks underwent a series of organizational and technological changes that deeply influenced their ability to expand geographically. In particular, we want to test whether Italian banks have been increasingly able to enter distant markets, i.e. whether the distance-entry relationship has weakened throughout the 1990s. Moreover, we want to investigate whether technical progress, and in particular the development of information and communication technologies (ICT) in banking, played a role in this process.

Probably the most important impact following the introduction of ICT has been the dramatic fall in the costs of acquiring, storing and processing hard information (Berger, 2003). This circumstance has a consequence on different factors influencing the distance-entry relationship.

First, the development of ICT reduced expenses for mail, telephone and other communication instruments. Moreover, these technologies might also have reduced the number of face-to-face interactions between local branch managers and corporate headquarters. Second, changes in the relative prices of different information sources brought about by ICT might have induced a substitution process in which controls on local managers are now implemented through processes that use more intensely hard than soft information. The same change in relative prices might also have induced a shift towards borrowers displaying verifiable information and also a more intense use of hard information in assessing the creditworthiness of borrowers. The latter effects obtain only if a bank is able to rapidly relocate its loans across different borrower types and also if the elasticity of substitution between hard and soft information for each customer is sufficiently high. It is evident that all these effects should reduce the importance of distance as a hurdle to entry in remote markets.

To address these issues we rerun our logit model by letting the estimated coefficient on LNDISTBR vary across different time spans.[23]

Results for the estimated parameters of the other regressors are substantially unaffected by this change, thus we graphically report only the marginal effects of LNDISTBR on the probability of entry across different time intervals (see Figure 3).

Note that the new estimates yield a negative and statistically significant coefficient on LNDISTBR in each period. A Wald test on the joint equality of these parameters for the four periods rejects this hypothesis at 1 per cent probability level. Moreover, we also test separately the equality of coefficients for two periods. We cannot reject the null when comparing parameters for 1991-1993 and 1994-1996, but we do reject the equality assumption in all the other cases.

Our findings clearly show that the strength of the effects of distance on entry has been decreasing over time. To give an idea of this trend, reducing by 1 standard deviation LNDISTBR would have increased probability of entry by 1.6 times in the period 1991-1993, while the increase would have been equal to 1 in the time interval 2000-2002.

As a further control we run separate regressions for each period, results are very similar to those reported above. Moreover, our findings could be driven by a sort of mechanical effect. As banks open branches in new markets, they get closer to the

[23] We also run this regression using LLS as geographical units (see Appendix). Results are similar to those reported in the text.

remaining potential target markets. Thus, the decreasing effect of distance could result from the increasing proximity of potential entrants to their target markets. To control for this effect, we add to the regression the log of the number of provinces in which a bank owned branches before entry (LNPROV). If previous conjectures are true, we expect that the decreasing time pattern in LNDISTBR coefficient to disappear due to the presence of LNPROV in the regression. Unreported evidence shows that this is not the case. The coefficient on LNDISTBR is still decreasing in absolute value even after the introduction of LNPROV.

In Figure 3, we also report the stock of ICT capital per employee in the banking sector. This new evidence clearly shows that the ICT capital deepening in the Italian banking sector accelerated in second half of the 1990s and at a faster pace towards the end of the decade. The clear-cut negative correlation between the line and the histogram suggests that diffusion of ICT in the banking sector might explain why banks, all else being equal, have been increasingly able to enter distant markets.

To test more directly the role of ICT capital in fostering entry in distant markets, we run a new regression in which the dependent variable is defined by the log of distance in kilometres (LNDISTBR1) between the entrant and the target market conditional on entry. This variable is regressed against the log of per employee ICT capital at individual bank level (LNICT), period dummies, and a set of additional controls given by LNPOP, the dummy SOUTH, LNBSIZE and LNPROV. The latter variables control for the fact that, since large banks are usually more widely spread, they are also on average closer to their target markets. Given that our distance measure is observed conditional on entry, we adopt a two-step Heckman regression model. In the first stage, the probability of entry is estimated using the same regressors as shown in Table 3 (LNDISTBR and LNDISTHQ excluded). The second stage consists in the specification described above conditional on the event of entry. A Wald test on the independence between the two equations can be rejected at 1 per cent probability level, thus signalling that Heckman’s model has to be preferred to a standard OLS regression.

In unreported evidence, we obtain a positive and statistically significant parameter for LNICT (the estimated coefficient is equal to .08 with a t=2.61). All else being equal, banks that are equipped with more ICT capital are also able to enter markets at longer distances. This evidence is fully consistent with the idea that the advent of these new technologies reduced distance-related entry costs.

**8. Concluding remarks**

In this paper we examine the entry decisions of approximately 300 Italian banks across different local markets and time periods. The features of a unique data-set enabled us to carry out an extensive econometric analysis of the determinants of entry, including a set of controls based on alternative specifications, different definitions of the pool of potential entrants and of geographical units. It turns out that that there are significant distance-related entry costs in the banking sector: all else being equal, potential entrants that are closer to a target market are more likely to enter that market.

Seen from a market perspective, our results imply that distance contributes to the existence of entry barriers in competition through branching in the banking sector. As discussed above, transport costs, asymmetries of information between incumbents and potential entrants and between corporate headquarters and local branch managers may all explain why entry costs increase with distance. In the near future, we will try to identify these different economic mechanisms behind distance-related entry costs.

Our results are also consistent with the ‘function follows organization principle’ recently proposed by Berger et al (2002). Large multi-market banking organizations are better equipped to branch in distant markets, while small and geographically concentrated banks have to face a sharp increase in entry costs if they attempt to enter distant markets.

An explanation of these differences in behaviour can be traced to the fact that large banks collect and act on hard information, while small banks rely more on soft information. If this interpretation is correct, one can expect the coexistence of banking organizations with different entry strategies to be a persistent and structural feature of the banking sector.

We also show that distance-related trade costs have been falling during the 1990s because of the advent of information and communication technologies in the Italian banking sector. The growing ability of banks to open branches in distant locations enhances competition in local banking markets and their integration.

Yet the fall in trade costs due to distance does not imply that they are about to disappear. Distance continues to have a negative and significant impact on entry through branching even in recent times. Moreover, the introduction of information technologies is specially useful in the banking sector because of the peculiar nature of its activities. Thus, the impact of new technologies in other sectors might be less relevant. In other words, we do agree with a recent remark by Degryse and Ongena (2004) that 'distance dies another day'.

Our work can be extended in different directions. We should be able to pinpoint organizational factors within a bank that may influence entry behaviour. The hierarchical structure of a bank, the delegation of authority to local managers and, more in general, of control rights may play an important role in this perspective. Furthermore, entry strategies based on branching and on M&A could be dealt within a unified framework instead of being examined as independent issues. We leave all these topics for future research.

**Tables and Figures**

## TABLE 1 – VARIABLE DEFINITIONS AND DESCRIPTIVE STATISTICS

The table shows the descriptive statistics for variables used in the regression. The statistics are computed for years preceding different time-spans in which we group entries (1991-1993, 1994-1996, 1997-1999, 2000-2002). *Market variables*: LNPOP is the log of residential population; LNPCDEP is the log of per capita bank deposits; HERF is the Herfindahl index computed on branches held by each bank in the local market; SOUTH is a dummy variable equal to 1 for markets located in the South of Italy. *Bank variables*: ROA is the ratio of net income to total assets; LNBSIZE is the log of total assets; MONO is a dummy variable taking value 1 if a bank's branches are located in only one local market; MT and MA are dummy variables equal to 1 for banks respectively target and bidder in mergers. *Bank-market variables*: LNDISTBR is the log of distance in kilometres between target market and the nearest bank's pre-entry location, LNDISTHQ is the log of distance in kilometres between target market and a bank's corporate headquarters location. To show how to compute LNDISTBR, consider the set of local markets where the bank is located at the beginning of the period and the complementary set of local markets where the bank has no branches. For each local market belonging to the second set, we calculate the minimum distance with respect to a bank's prior locations. We also used a binary measure of distance. Namely, ADIAC equals 1 when potential entrant location and the target market have a common border and 0 otherwise. DISTSECT is the distance between the sectoral composition of the bank's loan portfolio and that of the target market. Let $q_{sb}$ be the share of loans granted by bank $b$ to sector $s$ on bank $b$'s total loans. $q_{si}$ denotes the share of loans extended to sector $s$ in province $i$ on the total amount of loans offered to province $i$ by the whole banking system. Hence DISTSECT will be equal to $\sum_s |q_{sb} - q_{si}|$. Differences are in absolute value and not squared to prevent extreme observations from having too much influence. OUTLOANS measures the outstanding loans offered by a bank to the target market, where it has no branches, over a bank's total loan portfolio. *Time-period dummies*: P1=1 for 1991-1993 and P1=0 otherwise. In a similar way, we define dummies P2 –P4.

| Variables | No. of Obs. | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| | | *1st period (1990)* | | | |
| LNPOP | 103 | 6.01 | 0.70 | 4.52 | 8.23 |
| LNPCDEP | 103 | 15.58 | 0.40 | 14.58 | 16.24 |
| HERF | 103 | 0.16 | 0.07 | 0.03 | 0.37 |
| ROA *(x100)* | 302 | 0.62 | 0.96 | -13.12 | 3.19 |
| LNBSIZE | 303 | 6.34 | 1.64 | 2.36 | 10.92 |
| LNDISTBR | 29496 | 5.66 | 0.88 | 2.51 | 7.06 |
| LNDISTHQ | 29496 | 5.88 | 0.73 | 0.00 | 7.06 |
| DISTSECT | 29116 | 0.70 | 0.23 | 0.14 | 1.92 |
| OUTLOANS (*x100*) | 29496 | 0.10 | 0.78 | 0.00 | 34.58 |
| | | *2nd period (1993)* | | | |
| LNPOP | 103 | 6.02 | 0.70 | 4.53 | 8.24 |
| LNPCDEP | 103 | 15.80 | 0.39 | 14.85 | 16.43 |
| HERF | 103 | 0.15 | 0.06 | 0.03 | 0.37 |
| ROA *(x100)* | 271 | 0.37 | 0.87 | -8.91 | 2.24 |
| LNBSIZE | 272 | 6.68 | 1.66 | 2.70 | 11.18 |
| LNDISTBR | 26021 | 5.63 | 0.87 | 2.51 | 7.06 |
| LNDISTHQ | 26021 | 5.88 | 0.72 | 0.00 | 7.06 |
| DISTSECT | 25819 | 0.67 | 0.21 | 0.14 | 1.73 |
| OUTLOANS (*x100*) | 26021 | 0.10 | 0.68 | 0.00 | 23.23 |
| | | *3rd period (1996)* | | | |
| LNPOP | 103 | 6.02 | 0.70 | 4.52 | 8.24 |
| LNPCDEP | 103 | 15.91 | 0.37 | 15.00 | 16.52 |
| HERF | 103 | 0.14 | 0.06 | 0.04 | 0.33 |
| ROA *(x100)* | 252 | 0.27 | 0.74 | -4.71 | 1.72 |
| LNBSIZE | 257 | 6.77 | 1.91 | 2.36 | 11.52 |
| LNDISTBR | 24356 | 5.63 | 0.87 | 2.51 | 7.06 |
| LNDISTHQ | 24356 | 5.87 | 0.73 | 0.00 | 7.06 |
| DISTSECT | 23949 | 0.70 | 0.25 | 0.10 | 2.00 |
| OUTLOANS (*x100*) | 24356 | 0.12 | 0.80 | 0.00 | 34.64 |

**Table 1** – *Continued*

| | | | | | |
|---|---|---|---|---|---|
| | | *4th period (1999)* | | | |
| LNPOP | 103 | 6.02 | 0.71 | 4.52 | 8.24 |
| LNPCDEP | 103 | 15.82 | 0.37 | 14.98 | 16.80 |
| HERF | 103 | 0.15 | 0.08 | 0.04 | 0.65 |
| ROA *(x100)* | 251 | 0.42 | 2.03 | -25.13 | 6.03 |
| LNBSIZE | 252 | 6.98 | 1.86 | 2.72 | 11.57 |
| LNDISTBR | 23901 | 5.56 | 0.88 | 2.51 | 7.06 |
| LNDISTHQ | 23901 | 5.83 | 0.74 | 0 | 7.06 |
| DISTSECT | 22688 | 0.75 | 0.33 | 0.18 | 2.00 |
| OUTLOANS (*x100*) | 23901 | 0.16 | 1.06 | 0.00 | 45.13 |
| | | *All periods* | | | |
| LNPOP | 412 | 6.02 | 0.70 | 4.52 | 8.25 |
| LNPCDEP | 412 | 15.78 | 0.40 | 14.58 | 16.80 |
| HERF | 412 | 0.15 | 0.07 | 0.03 | 0.65 |
| ROA *(x100)* | 1076 | 0.43 | 1.25 | -25.13 | 6.03 |
| LNBSIZE | 1084 | 6.68 | 1.77 | 2.36 | 11.57 |
| LNDISTBR | 103774 | 5.62 | 0.88 | 2.51 | 7.06 |
| LNDISTHQ | 103774 | 5.87 | 0.73 | 0.00 | 7.06 |
| DISTSECT | 101572 | 0.70 | 0.26 | 0.10 | 2.00 |
| OUTLOANS (*x100*) | 103774 | 0.12 | 0.83 | 0.00 | 45.13 |

## TABLE 2 – CORRELATIONS BETWEEN THE EXPLANATORY VARIABLES

| | LNPOP | LNPCDEP | HERF | ROA | LNBSIZE | LNDISTBR | LNDISTHQ | DISTSECT | OUTLOANS |
|---|---|---|---|---|---|---|---|---|---|
| LNPOP | 1.000 | | | | | | | | |
| LNPCDEP | 0.076 | 1.000 | | | | | | | |
| HERF | -0.442 | -0.162 | 1.000 | | | | | | |
| ROA | -0.001 | -0.048 | 0.017 | 1.000 | | | | | |
| LNBSIZE | -0.033 | 0.003 | 0.005 | 0.046 | 1.000 | | | | |
| LNDISTBR | 0.070 | -0.269 | -0.003 | 0.006 | -0.311 | 1.000 | | | |
| LNDISTHQ | 0.042 | -0.309 | 0.008 | -0.007 | -0.031 | 0.801 | 1.000 | | |
| DISTSECT | -0.043 | 0.048 | 0.028 | -0.017 | -0.152 | 0.164 | 0.121 | 1.000 | |
| OUTLOANS | 0.186 | 0.094 | -0.069 | -0.012 | -0.006 | -0.107 | -0.139 | 0.034 | 1.000 |

## TABLE 3 - LOGIT ANALYSIS OF ENTRY: 103 PROVINCES

(t statistics in brackets)

The table contains estimates from a logit model. The dependent variable is the probability of entry, defined as a dummy $Y_{ib\Delta p}$ which equals 1 if bank *b* enters province *i* at time interval *Δp* and 0 otherwise. Each observation represents a province-bank-period combination. Specifications in columns 3,4,5 and 6, correspond to the so-called fixed effect conditional logit model. With this procedure, the probability of entry in a market is conditional upon the total number of entries in a market when using market fixed effects or upon the total number of entries of a bank when individual bank fixed effects are introduced. Observations for which a bank enters in all the remaining target markets or never enters do not contribute to the likelihood function, and are therefore dropped from the regression. For this reason, regressions in columns 5 and 6 have a smaller number of observations.

| Explanatory variables | No provincial and individual bank fixed effects | | Provincial fixed effects | | Individual bank fixed effects | |
|---|---|---|---|---|---|---|
| LNPOP | 0.763 *** | 0.565 *** | | | 0.879 *** | 0.824 *** |
| | *(12.76)* | *(9.60)* | | | *(13.58)* | *(12.70)* |
| LNPCDEP | 0.224 | -0.090 | | | 0.497 ** | -0.053 |
| | *(1.17)* | *(-0.47)* | | | *(2.41)* | *(-0.25)* |
| HERF | 0.384 | -0.272 | | | 0.736 | -0.178 |
| | *(0.53)* | *(-0.42)* | | | *(1.02)* | *(-0.26)* |
| ROA | 19.282 *** | 12.295 *** | 19.166 *** | 12.152 *** | | |
| | *(4.4)* | *(2.68)* | *(4.25)* | *(2.63)* | | |
| LNBSIZE | 0.168 *** | 0.537 *** | 0.151 *** | 0.558 *** | | |
| | *(6.35)* | *(18.44)* | *(5.75)* | *(18.93)* | | |
| LNDISTBR | -1.504 *** | | -1.914 *** | | -1.443 *** | |
| | *(-34.75)* | | *(-33.92)* | | *(-27.90)* | |
| LNDISTHQ | | -1.181 *** | | -1.260 *** | | -1.464 *** |
| | | *(-25.46)* | | *(-24.67)* | | *(-24.16)* |
| DISTSECT | 0.530 *** | 0.246 | 0.653 *** | 0.312 * | -0.402 | -0.413 |
| | *(3.67)* | *(1.59)* | *(4.24)* | *(1.88)* | *(-1.52)* | *(-1.54)* |
| OUTLOANS | 12.037 *** | 14.005 *** | 10.205 *** | 13.777 *** | 21.911 *** | 22.757 *** |
| | *(8.10)* | *(8.64)* | *(7.08)* | *(8.07)* | *(9.91)* | *(9.79)* |
| MONO | -0.835 *** | -1.089 *** | -0.797 *** | -1.132 *** | | |
| | *(-5.76)* | *(-6.98)* | *(-5.51)* | *(-7.08)* | | |
| MT (1) | -1.378 *** | -1.229 *** | -1.381 *** | -1.215 *** | | |
| | *(-6.63)* | *(-5.95)* | *(-6.63)* | *(-5.88)* | | |
| MB (1) | 0.697 *** | 0.723 *** | 0.702 *** | 0.732 *** | | |
| | *(7.41)* | *(7.76)* | *(7.39)* | *(7.84)* | | |
| SOUTH | 0.453 *** | 0.267 ** | | | 0.478 *** | 0.347 ** |
| | *(2.86)* | *(1.70)* | | | *(2.79)* | *(1.99)* |
| P2 (2) | -0.698 *** | -0.717 *** | -0.627 *** | -0.725 *** | -0.864 *** | -0.573 |
| | *(-5.41)* | *(-5.52)* | *(-5.10)* | *(-5.90)* | *(-6.36)* | *(-4.14)* |
| P3 (2) | -0.170 | -0.217 ** | -0.058 | -0.231 ** | -0.313 ** | 0.246 * |
| | *(-1.36)* | *(-1.73)* | *(-0.53)* | *(-2.11)* | *(-2.35)* | *(1.81)* |
| P4 (2) | 0.534 *** | 0.413 *** | 0.632 *** | 0.413 *** | 0.498 *** | 1.103 *** |
| | *(5.14)* | *(3.99)* | *(6.63)* | *(4.41)* | *(4.25)* | *(9.15)* |
| CONSTANT | -7.406 ** | -4.333 | | | | |
| | *(-2.47)* | *(-1.43)* | | | | |
| Log Likelihood | -3509.23 | -3821.11 | -3161.24 | -3563.52 | -3509.23 | -2682.29 |
| Pseudo $R^2$ | 0.271 | 0.206 | | | | |
| Number of obs. | 100771 | 100771 | 100771 | 100771 | 63260 | 63260 |

(1) Dummy variable relative to banks not involved in M&A operations omitted. (2) Dummy variable relative to first period omitted.
*** indicates significance at 1% level.
** indicates significance at 5% level.
* indicates significance at 10% level.

**TABLE 4 - ECONOMIC EFFECTS FROM LOGIT ANALYSIS**
(103 provinces)

| Explanatory variables | Sign of the effect (1) | | Change in predicted probability (2) |
|---|---|---|---|
| LNPOP | + | *** | 52% |
| LNPCDEP | + | n.s. | 9% |
| HERF | + | n.s. | 3% |
| ROA | + | *** | 25% |
| LNBSIZE | + | *** | 27% |
| LNDISTBR | - | *** | 132% |
| DISTSECT | + | *** | 13% |
| OUTLOANS | + | *** | 14% |
| MONO | - | *** | 72% |

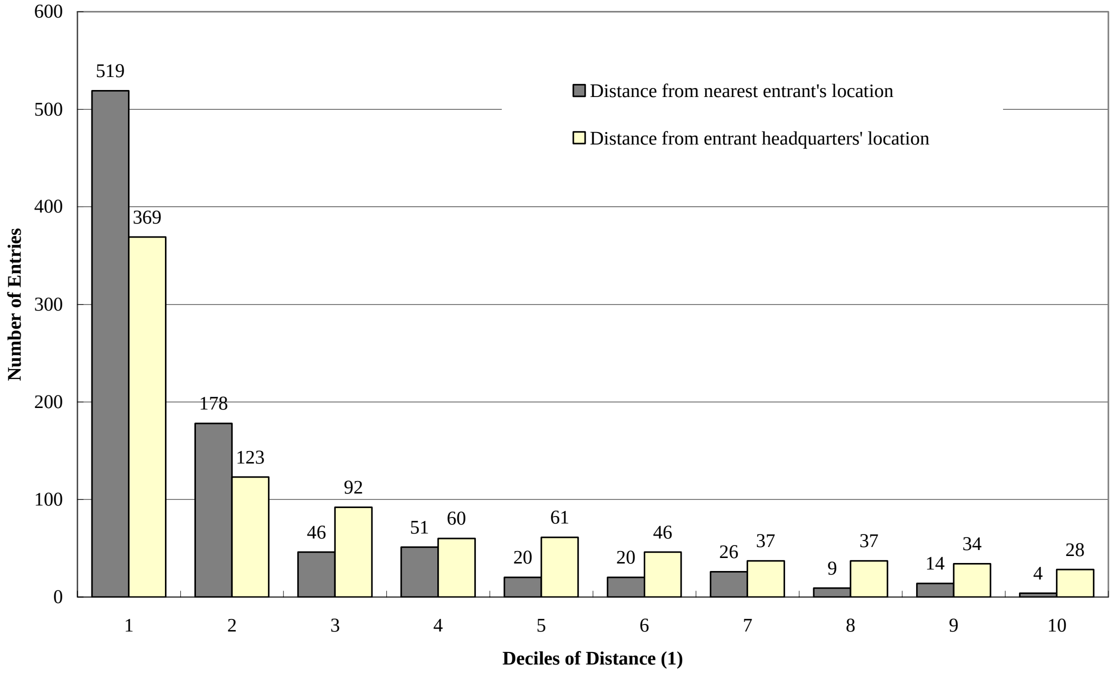
(1) *** Indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level.
(2) Obtained by moving regressors by one standard deviation.

**TABLE 5 - MARGINAL EFFECTS ON THE PROBABILITY OF ENTRY**

| Deciles of LNBSIZE (1) | $\frac{\partial p}{\partial LNDISTBR}$ (1) | Deciles of LNDISTBR (1) | $\frac{\partial p}{\partial LNBSIZE}$ (1) |
|---|---|---|---|
| 1 | -0.02707 | 1 | 0.00012 |
| 2 | -0.01059 | 2 | 0.00021 |
| 3 | -0.00579 | 3 | 0.00030 |
| 4 | -0.00358 | 4 | 0.00039 |
| 5 | -0.00223 | 5 | 0.00048 |
| 6 | -0.00150 | 6 | 0.00059 |
| 7 | -0.00109 | 7 | 0.00073 |
| 8 | -0.00074 | 8 | 0.00090 |
| 9 | -0.00046 | 9 | 0.00126 |

(1) For the formulas of these derivatives in the logistic model see the text. Derivatives have been computed at different deciles and refer to the distribution of LNBSIZE (first column) and LNDISTBR (third column).

# FIGURE 1 - NUMBER OF ENTRIES BY DISTANCE

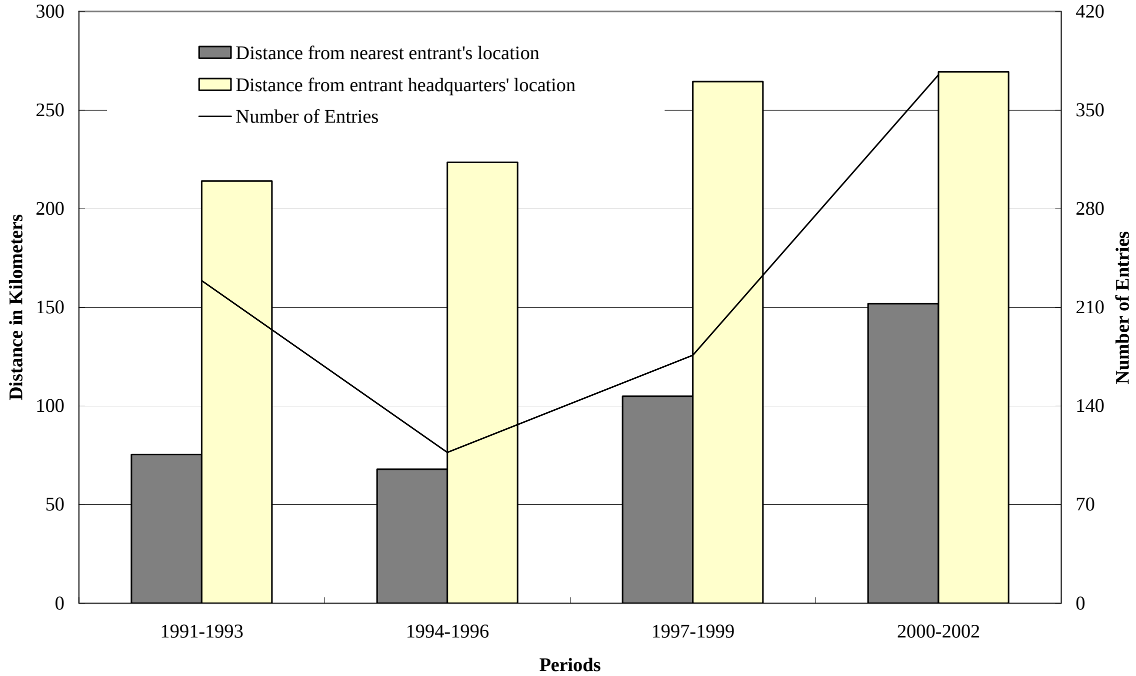



(1) The deciles of distance are computed by considering all the observations in the data-set. The values are listed in the table below.

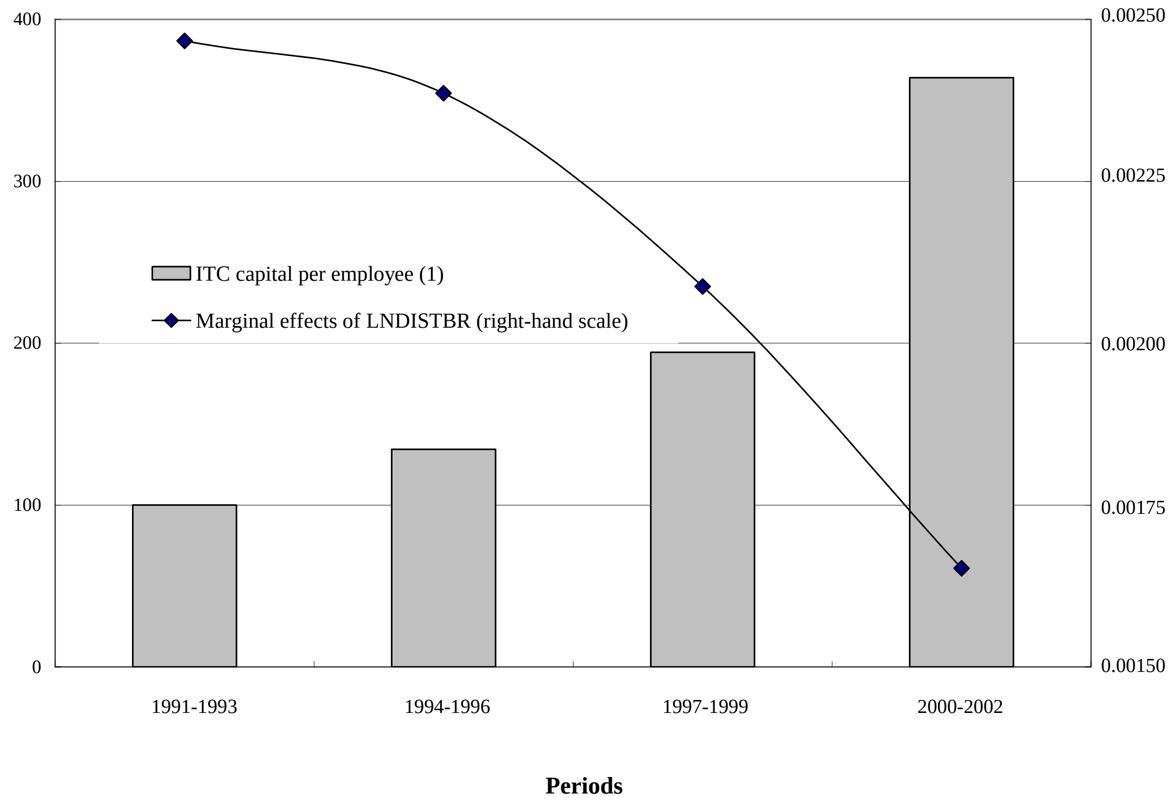
Values of deciles of distance used in Figure 1 (kilometers)

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| Nearest entrant's location | 75 | 132 | 187 | 247 | 326 | 410 | 491 | 611 | 786 | >786 |
| Entrant headquarters' location | 129 | 192 | 248 | 318 | 396 | 477 | 565 | 691 | 858 | >858 |

# FIGURE 2 – AVERAGE DISTANCE OF ENTRIES BY PERIOD



## FIGURE 3 – MARGINAL EFFECTS OF LNDISTBR AND ICT CAPITAL ACROSS TIME




(1) Marginal effects are obtained from a logit model where the parameter on LNDISTBR can vary across different time periods. The ITC capital stock has basis=100 in 1990. The value has been deflated using price indexes of software and hardware developed by the Bureau of Economic Analysis and adjusted for the variation in the ITL/USD exchange rate. See Casolaro and Gobbi (2004).

## Appendix

We devised three different sets of controls for our econometric results. The first group is related to different specifications of the determinants of the entry processes, the second to alternative definitions of the potential entrant set; the third is concerned with the issue of alternative definitions of geographical units or local markets.

*1. Controls based on alternative specifications*

In discussing the problem of lack of independence of entry choices in the same market, we assumed that banks form their expectations about the number of potential entrants looking at the pre-entry market size. Here we conjecture that these expectations may also depend on the observed number of past entrants. To this aim, we add to the regression the lagged value of the number of entrants divided by the number of banks operating in the market (LNNENTR). *A priori* this variable could have a positive or a negative effect on entry, depending on the mechanisms driving potential entrants' expectations. In unreported evidence, we show that LNNENTR is never statistically significant at the usual probability levels. Thus previous results are robust to this control.

Regarding the independence of the entry decisions of each bank across different markets, we introduce a further check based on the following argument. Assume that our previous regressors at bank level control also for the total growth opportunities of a bank. A bank can expand either by opening a new outlet in its pre-entry locations or by branching in a new market. Having controlled for its total growth opportunities, the two expansion strategies may be independent, complements or substitutes. In the latter case, to enter a new market a bank should give up some expansion projects in its pre-entry locations. Thus, it is likely that this bank will be subject to some constraints to its expansion strategies and that these constraints may reflect a lack of independence of entry decisions.

To control for this effect, we introduce a variable defined by the ratio between the number of pre-entry locations where a bank opened a new outlet (net of those in which it closed branches) and the total number of its pre-entry locations (NMBRANCH). To avoid problems with endogeneity we take the lagged value of this variable. According to our unreported evidence, NMBRANCH has a positive and statistically significant effect on entry (the estimated coefficient is .54 with a t = 3.31), although its introduction does not change previous results. The complementary between expansion strategies in a bank's pre-entry locations and those based on entry into new markets suggests that a bank should not be constrained in its branching activity.

In unreported evidence we substitute LNPCDEP for the log of per capita gross domestic product (LNPCPIL) without affecting previous results. To measure the degree of competition, we replace HERF with the difference between interest rates on loans and on deposits on local credit markets (SPREAD).[1] SPREAD has a negative and significant effect on entry when market size is approximated by PDENS, whereas it has a coefficient not significantly different from zero when LNPOP is used. Hence, results are similar to those obtained using HERF (see footnote 18).

We also add a measure of borrower risk in each province, proxied by the ratio of bad loans to total loans (RISK), to the basic specification. *A priori*, one can expect that banks may not want to enter markets filled with high-risk borrowers, for instance, because of higher *ex ante* informational barriers. The coefficient for this variable turns out to be not significantly different from zero and results for the other variables do not change.

Finally we introduce a variable representing supply conditions, i.e. the density of branches held by incumbents (total number of branches in a province divided by its surface, BRDENS). We expected a negative impact of this variable on entry, since the increasing ability of incumbents to cover a market area should discourage entry. The coefficient on BRDENS has the expected sign and is also significantly different from zero (the coefficient is -108.15 with a t=-3.11). Results related to the other regressors are left unchanged. Despite these encouraging results, we do not introduce BRDENS into the main specification because of collinearity with the other regressors.

*2. Controls based on different definitions of potential entrants*

Until now the pool of potential entrants has included all existing banks with no branches in a specific market at the beginning of a predetermined time interval. One can wonder whether this definition is too comprehensive. Some banks may not consider a market

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[1] This variable could also reflect the degree of risk of local borrowers or the information asymmetries between lenders and their customers across different local banking markets.

as a target for their entry decisions independently of the area’s attractiveness in terms of profits gross of entry costs. This happens when bank entry costs are so high as to prevent entry in any market or when entry costs rapidly increase with the number of entry decisions.

These special cases may drive our previous findings in many ways. First, the explanatory power of the variables representing market characteristics is obviously reduced by the presence of these special banks. Second, insofar as the regressors varying with bank characteristics are not able to catch the peculiarities of these potential entrants, we are faced with a problem of omitted variables.

To address this problem we define four groups of special banks. We then drop these individuals from the regression and compare the results with those of Table 3 for which the broadest definition of the pool of potential entrants is used.

The four groups of special banks include: a) banks who never enter during a period; b) small-sized banks located at great distance from their target markets; c) banks with low free capital; d) banks entering a market through mergers.

The banks belonging to group a) may have an exceptionally high level of fixed entry costs. Regardless of size, profitability and previous location choices, they may think, for instance, that they have the managerial resources to operate only in markets where there are already branches.

Banks in group b) are meant to represent the cases in which small banks do not consider distant markets actual targets for their entry decisions. Consequently, we drop from the regression those observations for which banks have total assets below the first quartile of LNBSIZE and are located at a distance from their target markets greater than the first quartile of LNDISTBR (corresponding approximately to a distance of 250 kilometres).

For the banks in group c), a low level of free capital may constrain entry decisions because of lack of financing. Hence, entry costs may start increasing after a few entries. In this circumstance, entry decisions cannot be assumed to be independent across markets. A bank subject to strong financial constraints can consider only a limited subset of market areas to be potential targets. In financial literature it is usually assumed that small entities are more likely to face financial constraints. Thus, as far as this relationship holds, the size variable in our regression should control for the influence of these constraints on entry. Yet, given the special nature of banks, the correlation between size and financial constraints may be looser than the corresponding relationship holding for non-financial firms. For this reason, we drop banks with a ratio of free capital to total assets below the first quartile of the same variable.

Last, we drop observations relating to banks entering a market via merger or by acquiring branches from incumbents (group d). In previous regressions ENTRY for these banks equals 0. Although we control for the special nature of these banks with a dummy variable, they may still drive previous results. Thus, we estimate the probability of entry conditional on those banks entering only through branching.

Note that that there is only a partial overlapping between the different groups of banks defined above. Results are reported in Table A1. The main findings are the same as in Table 3 even after dropping bank-market cells as defined before. In particular, previous conclusions should not be driven by including in the set of potential entrants those banks with an exceptionally high level of entry sunk costs or those entities whose entry decisions across markets are not independent and who may therefore restrict their entry decisions only to a narrow subset of local markets.

*3. An alternative definition of local markets*

A correct identification of market borders is essential to the definition of entry. A wrong delimitation of market areas would imply that branching in the same market can be considered an entry decision or, vice versa, a true entry decision may be identified as branching in a market where a bank has already opened an outlet. The so called ‘border effects’ may have serious consequences for the validity of econometric results using spatial data and therefore it is important to control for their influence.

To this end, we replicate our estimates by identifying geographical units with 784 local labour systems (LLS) instead of provinces. These are self-contained clusters of municipalities, whose boundaries are defined on the basis of daily commuting patterns so that the majority of workers living in a geographical unit have their own workplace within the same area. They are a good starting point to identify local banking markets, given that most banking services have a limited geographical scope. Their usage comes at a cost, however, since at this level of aggregation we do not have the availability of data to compute DISTSECT and OUTLOANS.

Apart from the latter regressors, Table A2 replicates the estimates in Table 3 using LLS definition. In columns 1 and 2 we report the basic specification and in columns 3 and 4 and 5 and 6 we introduce unobservable LLS and individual bank fixed effects. The new findings are qualitatively similar to those reported in Table 3. Minor variations concern the impact of HERF on entry, which is positive and significantly different from zero in the specification with LNDISTBR and without fixed effects, and the estimated parameter of ROA, which is not significantly different from zero in the second column using LNDISTHQ instead of LNDISTBR.

To get an idea of the magnitude of the economic effects implicit in the estimated coefficients, we simulate the model (see Table A3). Compared with the market definition based on provinces, we get stronger effects for the variables varying with market characteristics and for LNDISTBR. These results may be due to the fact that LLS offer a better representation of banking markets at local level.

## TABLE A1 - LOGIT ANALYSIS OF ENTRY: 103 PROVINCES

(t statistics in brackets)

The table contains estimates from a logit model. The dependent variable is the probability of entry, defined as a dummy $Y_{ib\Delta p}$ which equals 1 if bank *b* enters into province *i* at time interval $\Delta p$ and 0 otherwise. Each observation represents a province-bank-period combination.

| Explanatory Variables | Without banks who never entry (3) | Without small and distant banks (4) | Without banks with low free capital (5) | Without banks who enter by merger (6) |
|---|---|---|---|---|
| LNPOP | 0.806 *** | 0.709 *** | 0.822 *** | 0.792 *** |
| | *(12.57)* | *(11.55)* | *(11.27)* | *(11.99)* |
| LNPCDEP | 0.166 | 0.152 | 0.216 | 0.401 * |
| | *(0.83)* | *(0.79)* | *(0.91)* | *(1.86)* |
| HERF | 0.373 | 0.281 | 0.973 | 0.844 |
| | *(0.51)* | *(0.39)* | *(1.08)* | *(1.06)* |
| ROA | 24.382 *** | 27.923 *** | 19.906 *** | 29.321 *** |
| | *(5.49)* | *(6.05)* | *(3.79)* | *(6.28)* |
| LNBSIZE | 0.081 *** | 0.182 *** | 0.228 *** | 0.196 *** |
| | *(2.73)* | *(6.64)* | *(6.74)* | *(6.65)* |
| LNDISTBR | -1.510 *** | -1.482 *** | -1.586 *** | -1.566 *** |
| | *(-31.29)* | *(-33.55)* | *(-29.42)* | *(-32.73)* |
| DISTSECT | 0.295 ** | 0.232 | 0.506 *** | 0.738 *** |
| | *(1.99)* | *(1.50)* | *(2.79)* | *(5.01)* |
| OUTLOANS | 27.369 *** | 13.914 *** | 12.606 *** | 11.782 *** |
| | *(10.79)* | *(8.80)* | *(7.16)* | *(8.01)* |
| MONO | -0.077 | -0.654 *** | -0.759 *** | -0.677 *** |
| | *(-0.5)* | *(-4.36)* | *(-4.56)* | *(-4.59)* |
| MT (1) | -0.663 *** | -1.357 *** | -1.437 *** | -1.395 *** |
| | *(-2.96)* | *(-6.50)* | *(-5.51)* | *(-6.68)* |
| MB (1) | 0.458 *** | 0.665 *** | 0.599 *** | 0.268 |
| | *(4.75)* | *(7.03)* | *(4.65)* | *(1.44)* |
| SOUTH | 0.546 *** | 0.400 ** | 0.515 *** | 0.610 *** |
| | *(3.32)* | *(2.51)* | *(2.61)* | *(3.40)* |
| P2 (2) | -0.199 | -0.661 *** | -0.621 *** | -0.590 *** |
| | *(-1.46)* | *(-5.11)* | *(-3.89)* | *(-4.16)* |
| P3 (2) | 0.330 ** | -0.147 | -0.164 | -0.440 *** |
| | *(2.5)* | *(-1.17)* | *(-1.05)* | *(-3.03)* |
| P4 (2) | 0.646 *** | 0.502 *** | 0.647 *** | 0.432 *** |
| | *(5.91)* | *(4.78)* | *(4.85)* | *(3.74)* |
| CONSTANT | -5.364 * | -5.978 ** | -7.881 ** | -10.577 *** |
| | *(-1.7)* | *(-1.98)* | *(-2.12)* | *(-3.14)* |
| Log Likelihood | -2785.3162 | -3401.35 | -2329.48 | -2863.88 |
| Pseudo $R^2$ | 0.2654 | 0.2509 | 0.2789 | 0.2708 |
| Number of obs. | 29713 | 80078 | 76187 | 95691 |

(1) Dummy variable relative to banks not involved in M&A operations omitted. (2) Dummy variable relative to first period omitted. (3) Excluding banks with ENTRY=0 across all markets in a period. (4) Excluding banks with total assets below the first quartile of LNBSIZE and distance greater than the first quartile of LNDISTBR.(5) Excluding banks with a ratio of free capital to total assets below the first quartile of the same variable.(6) Dropping banks entering in the period through mergers.

*** indicates significance at 1% level.
** indicates significance at 5% level.
* indicates significance at 10% level.

# TABLE A2- LOGIT ANALYSIS OF ENTRY: 784 LLS
(t statistics in brackets)

The table contains estimates from a logit model. The dependent variable is the probability of entry, defined as a dummy $Y_{ib\Delta p}$ which equals 1 if bank *b* enters into LLS *i* at time interval *Δp* and 0 otherwise. Each observation represents a LLS-bank-period combination. According to the Italian National Institute of Statistics (ISTAT), in 1991 there were 784 LLS in Italy covering the whole of the country. These are self-contained clusters of municipalities, whose boundaries are defined on the basis of daily commuting patterns so that the majority of workers living in a geographical unit have their own workplace within the same area. Specifications in columns 3,4,5 and 6, correspond to the so-called fixed effect conditional logit model. With this procedure the probability of entry in a market is conditional upon the total number of entries in a market when using market fixed effects or upon the total number of entries of a bank when individual bank fixed effects are introduced. Observations for which a bank enters in all the remaining target markets or never enters do not contribute to the likelihood function, and are therefore dropped from the regression. For this reason, regressions in columns 5 and 6 have a smaller number of observations.

| Explanatory variables | No LLS and individual bank fixed effects | | LLS fixed effects | | Individual bank fixed effects | |
|---|---|---|---|---|---|---|
| LNPOP | 0.932 *** | 0.804 *** | | | 0.987 *** | 0.915 *** |
| | *(42.07)* | *(38.16)* | | | *(43.20)* | *(41.73)* |
| LNPCDEP | 0.654 *** | 0.120 | | | 0.645 *** | 0.188 ** |
| | *(7.68)* | *(1.47)* | | | *(7.44)* | *(2.23)* |
| HERF | 0.957 *** | 0.270 | | | 0.973 *** | 0.317 |
| | *(4.92)* | *(1.38)* | | | *(5.00)* | *(1.61)* |
| ROA | 17.678 *** | 2.864 | 21.829 *** | 4.566 * | | |
| | *(6.14)* | *(1.13)* | *(7.16)* | *(1.74)* | | |
| LNBSIZE | 0.075 *** | 0.702 *** | 0.045 *** | 0.761 *** | | |
| | *(5.58)* | *(46.25)* | *(3.32)* | *(48.06)* | | |
| LNDISTBR | -1.633 *** | | -2.095 *** | | -1.653 *** | |
| | *(-69.17)* | | *(-65.55)* | | *(-65.26)* | |
| LNDISTHQ | | -1.563 *** | | -1.803 *** | | -1.722 *** |
| | | *(-60.72)* | | *(-60.75)* | | *(-59.18)* |
| MONO | -0.999 *** | -1.331 *** | -0.839 *** | -1.334 *** | | |
| | *(-5.08)* | *(-6.29)* | *(-4.22)* | *(-6.08)* | | |
| MT (1) | -1.104 *** | -0.992 *** | -1.124 *** | -0.984 *** | | |
| | *(-10.46)* | *(-9.42)* | *(-10.59)* | *(-9.35)* | | |
| MB (1) | 0.553 *** | 0.565 *** | 0.548 *** | 0.567 *** | | |
| | *(10.52)* | *(10.74)* | *(10.27)* | *(10.72)* | | |
| SOUTH | 0.617 *** | 0.806 *** | | | 0.605 *** | 0.851 *** |
| | *(7.78)* | *(10.15)* | | | *(7.01)* | *(9.94)* |
| P2 (2) | -0.799 *** | -0.767 *** | -0.640 *** | -0.732 *** | -0.969 *** | -0.626 *** |
| | *(-11.60)* | *(-11.25)* | *(-9.63)* | *(-11.16)* | *(-14.04)* | *(-9.1)* |
| P3 (2) | -0.552 *** | -0.592 *** | -0.299 *** | -0.546 *** | -0.852 *** | -0.291 *** |
| | (-8.08) | (-8.73) | (-4.77) | (-8.78) | (-12.39) | (-4.27) |
| P4 (2) | 0.009 | -0.175 *** | 0.182 *** | -0.139 ** | -0.357 *** | 0.306 *** |
| | *(0.16)* | *(-3.06)* | *(3.29)* | *(-2.54)* | *(-5.87)* | *(5.09)* |
| CONSTANT | -15.231 *** | -12.433 *** | | | | |
| | *(-18.93)* | *(-16.20)* | | | | |
| Log Likelihood | -10767.94 | -11909.29 | -8962.865 | -10392.69 | -9787.305 | -10468.32 |
| Pseudo $R^2$ | 0.338 | 0.268 | | | | |
| Number of obs. | 809136 | 809136 | 611765 | 611765 | 666696 | 666696 |

(1) Dummy variable relative to banks not involved in M&A operations omitted. (2) Dummy variable relative to first period omitted.
*** indicates significance at 1% level.
** indicates significance at 5% level.
* indicates significance at 10% level.

**TABLE A3 - ECONOMIC EFFECTS FROM LOGIT ANALYSIS**

(784 LLS)

| Explanatory variables | Sign of the effect (1) | Change in predicted probability (2) |
|---|---|---|
| LNPOP | + *** | 107% |
| LNPCDEP | + *** | 38% |
| HERF | + *** | 22% |
| ROA | + *** | 22% |
| LNBSIZE | + *** | 13% |
| LNDISTBR | - *** | 163% |
| MONO | - *** | 69% |

(1) *** Indicates significance at 1% level; ** indicates significance at 5% level; * indicates significance at 10% level.
(2) Obtained by moving regressors by one standard deviation.

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