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ENTRY DECISIONS AND ADVERSE SELECTION: AN EMPIRICAL ANALYSIS OF LOCAL CREDIT MARKETS

by Giorgio Gobbi* and Francesca Lotti*

Abstract

During the last decades there has been a widespread relaxation of legal entry barriers into the banking industry, with potential benefits for financial integration and competition. Obstacles to banks' geographical and business expansion have been removed and branching has been substantially liberalized. This paper analyzes the determinants of entry decisions into local credit markets using a unique data set before and after deregulation of the Italian banking industry. We estimate an entry model *à la Poisson* and find evidence that spreads between loan and deposit rates drive entry only for newly chartered banks, but does not affect the decision to open branches of banks operating in other markets. Branching by outside banks is instead positively correlated with business opportunities in the provision of financial services which do not require the acquisition of substantial proprietary information. Both these results are consistent with the hypothesis that in credit markets incumbents have an informational advantage over new entrants.

JEL Classification: G21, L22,C25.
Keywords: Entry, deregulation, informational barriers, count data, overdispersion.

Contents

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1 Introduction[1]

During the last two decades a large number of countries have lifted legal barriers to entry in the banking industry. Starting from the 70s, geographical and business segmentations have been removed or relaxed in the United States (Berger et al., 1995) and in Europe, where the European Union market integration has been fostered by the Single Market Program in 1992 (Vives, 1991) and the Monetary Union in 1999 (Gual, 1999). According to standard economic theory, removing restrictions to free entry should increase competition, thus improving the welfare of borrowers and savers through lower loan interest rates and higher deposit interest rates (Besanko and Thakor, 1992). This view is consistent with the consolidated evidence stemming from the empirical literature, i.e. that there exist a positive correlation between market concentration on prices and banks margins (Berger and Hannan, 1989; Berger, 1995). On the other hand, lending is a central activity in banking and several studies have emphasized that the incentives to entry in credit markets can be dampened by adverse selection and by incumbents superior information about borrowers creditworthiness. As long as this possibility is incorporated into rational decision making, entry can be deterred, and incumbents can exploit informational rents (Dell'Ariccia et al., 1999; Marquez, 2002). Also when entry occurs, the persistence of some degree of market power in certain areas of business can still dampen competition.

There are three basic ways in which a bank can enter in a market which differ substantially with respect to information barriers. First, an outside established bank can open a branch or a subsidiary in a new market. Second, a new bank can be started. Third, an outside bank can acquire one of the banks operating in the market. The case of a new branch opened by an external bank is the one in which asymmetric information is likely to be most important because the entrants' potential borrowers are more likely to be the ones that were turned down by the incumbents. In fact, the latter have an advantage over potential entrants due to a better knowledge of the market. By contrast, the decision to establish a new bank usually ripens within the local business communities and therefore the information gap with respect to incumbent banks is likely to be small.

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Lastly, information asymmetries have little effects on entry through mergers and acquisitions (M&A, hereinafter), because when a bank enters a new market by M&A, it inherits the information held by the target institution and the number of competitors remains unchanged. Nevertheless, consolidation in the banking industry can lead to information losses when it's followed by substantial restructuring of loans' portfolios.

In this paper, we focus on the first two types of entry[2] and we argue that *de novo* banks are more informed entrants than banks entering opening a branch. We therefore test whether the two types of entry are driven by profit opportunities in different activities as predicted by the theory. In particular, high interest rate margins on lending should be associated with *de novo* entry.

Conversely, business opportunities in those area characterized by a lower amount of proprietary information should attract entry by outside banks via the opening of branches. Consistently with pervious research on Italian banking markets (Bonaccorsi di Patti and Gobbi, 2001; Focarelli and Panetta, 2003), local markets are defined as the 95 provinces (roughly corresponding to the U.S. MSA). We use data on entry in Italian local credit markets between 1990 and 2002: this sample period consists of a unique span of 12 years in which legal and regulatory constraints were absent both for branching and for forming new banking businesses. The number of *de novo* chartered banks totalled to 131 and there were 1284 cases of entry via branching. We estimate an entry model *à la Poisson* and we find evidence that spreads between loan and deposit interest rates drive entry only for newly chartered banks, but not for branch opening. Moreover, branching by outside banks results strongly hampered by higher credit risk. Both these results are consistent with the hypothesis that, in credit markets, incumbents have an informational advantage over new entrants. Since *de novo* banks are characterized by high mortality rates and imply larger set-up costs than opening a branch, our findings suggest that extra profits may be a persistent feature in local credit markets. However, we argue that since lending is just one of the many source of revenues for banks, entry barriers due to asymmetric information can be overcome when-

[2]In doing so, we stick to the mainstream approach established by Joe S. Bain (1956): "[...] As a first approximation, entry of a new firm may be taken to mean the combination of two events: (1) the establishment of an independent legal entity, new to the industry [...]; and (2) the concurrent building or introduction by the new firm of physical production capacity that was not used for production in the industry prior to the establishment of the new firm. [...] This definition excludes two related events from the concept of "entry". The first is the acquisition of existing producing capacity by a new legal entity [...]. The second exclusion is is the expansion of capacity by an established firm [...] (p.9).

ever banks compete also for the supply of a wide range of services which do not require proprietary information.

The paper is organized as follows. In Section 2 we survey the empirical contributions related to entry in banking markets. Section 3 describes the data and the methodology used, whereas Section 4 summarizes the main empirical findings. Finally, in Section 5 some concluding remarks are drawn.

2 Entry and Information

Bank lending is based on bilateral contracts, where borrowers usually are better informed than lenders on their ability to repay the loan. Banks can partially overcome this gap gathering information on borrowers through screening tests and repeated interactions. In most cases, this kind of information is proprietary, so that entrants in credit markets are likely to face severe adverse selection problems. Adverse selection is greater for new entrants because the pool of their applicants is likely to include those potential borrowers previously rejected by mature banks in the market (Shaffer, 1998). Furthermore, a relevant amount of information used by banks for screening loan applicants and for monitoring borrowers is generated through repeated interaction with their customers (Sharpe, 1990; Rajan, 1992; Boot and Thakor, 2001). A large number of studies, both of theoretical and of empirical nature, has documented that long term relationships established between lenders and borrowers are an important feature of most bilateral credit markets. Since this kind of valuable information can be acquired only on a market-specific "learning by doing" basis, incumbents creditworthiness assessments are likely to be more precise than those of the entrants.

Dell'Ariccia et al. (1999) and Marquez (2002), present formal models in which asymmetric information acts as a barrier to entry in the credit market and incumbents extra profits are proportional to their informational advantage. Lenders can effectively capture borrowers' creditworthiness when the latter cannot credibly communicate to third parties. Dell'Ariccia and Marquez (2003) show that competition from outside (uninformed) lenders can induce incumbents to reallocate their loan portfolios towards more opaque borrowers.

The strength of information barriers in preventing entry depends on the weight of lending and other "relationship intensive" activities over total banking activities. A large number of services provided by banks do not involve acquisition of specific proprietary information.

Both in the U.S. and in Europe a substantial proportion of gross revenues comes from non interest income, i.e. from fees and securities trading (OECD, 2003). Also within the lending business, the importance of proprietary information varies according to the characteristics of borrowers and markets. Granting credit to small and medium-sized firms or highly innovative young firms usually requires a larger amount of soft information than that required for participating into syndicated loans to a multinational corporation.

Different types of entering lenders can be expected to cope in diverse ways with proprietary information. *De novo* banks are potentially in a better position than outside established banks to compete with incumbents in lending to opaque borrowers, for several reasons. First of all, in the vast majority of cases, *de novo* banks are started within the local business community, and they share most of the soft information available to the incumbents. Secondly, *de novo* banks are typically small institutions. Both theoretical and empirical work has shown that small institutions have a comparative advantage in processing soft information with respect to large, hierarchical organizations (Stein, 2002; Berger et al., 2003). Moreover, there is evidence that *de novo* banks tend to allocate a higher percentage of their loan portfolio to small business than other banks of similar size and characteristics (Goldberg and White, 1998). This finding is consistent with the fact that the establishment of a new bank responds to business opportunities with opaque borrowers. We should therefore expect that entry is more likely to be hampered where lending is relatively more important with respect to other banking activities and publicly available information about borrowers is scarce.

To our knowledge, the sharp predictions of the theoretical models about the role of asymmetric information as a source of barriers to entry have not yet been empirically tested. Marquez (2002) argues that informational asymmetries are a key factor in explaining the fact that foreign banks enter into a domestic markets via M&As and not through the opening of branches (see also Vesala, 1995). Focarelli and Pozzolo (2003) find that financial centers attract branches of foreign banks, but not subsidiaries, while lower regulatory restrictions on banking activities are associated with a stringer presence of foreign subsidiaries, but not of branches. Shaffer (1998) and Bofondi and Gobbi (2003) provide indirect evidence about the role of information in rising the costs of entry showing that the loan default rates experienced by the entrants is higher than those of the incumbents.

Specific studies on entry in local banking markets have addressed two main issues. The first one is the responsiveness of entry to extra-profits of the incumbent firms. Amel and

Liang (1997) estimate a two-equation model of entry and profits for the U.S. Metropolitan Statistical Areas (MSAs) and non-MSA counties over the period 1977-88. However, entry is defined either by the chartering of *de novo* banks or the opening of new branch offices by existing banks, and therefore it is not possible to disentangle the effects across different types of entry. The main finding is that entry is positively correlated with market size, profits and market growth.

The second issue is related with the outburst of *de novo* chartered banks in the U.S. over the past two decade (De Young, 1999). Moore and Skeleton (1998) provide evidence that the birth rate of *de novo* banks has been particularly high in concentrated local markets, where the presence of small banks is low. This is consistent with the idea that *de novo* banks have an incentive to enter markets where profits' opportunities come from lending to small and medium size enterprises. A few papers have investigated the relationship between merger activity and *de novo* entry. Analyzing *de novo* chartered banks and thrifts during the period 1995-98, Seelig and Critchfield (2003) find a positive correlation between entry and merger activity. They conclude that M&A activity causes *de novo* entry because it enhances business opportunities. Berger et al. (2000) investigate the same topic over a longer period, from 1980 to 1998, and find opposite results. Mergers observed in that period explain about one fifth of *de novo* entry in MSAs and about one tenth of entry in rural counties. The result is interpreted as evidence that the reduction in small business lending following M&As may be, at least partially, compensated by *de novo* entry.

3 Data and Methodology

3.1 Data

In this study we use a unique data set with annual information on entry in local bank markets over the period from 1990 to the second quarter of 2002. The choice of our sample period is motivated by two major changes in regulation. In 1989 the law implementing the First Banking Directive removing the impediments to the establishment of new banks was fully enforced in Italy. This change in regulation represented a marked change from the experience of the previous decades: from 1966 to 1990, in fact, the chartering of new banks had been restricted to mutual institutions and to subsidiary of foreign banks. The new legislation

ensured the possibility of chartering new banks, provided the fulfillment of requirements in terms of by-laws, minimum capital endowments and personal standards both of the founders and of the management.[3]

In March 1990, also bank branching was fully liberalized: a longstanding policy of structural controls on entry in local banking markets came to an end. Legal barriers to entry were justified on the view that "[T]he prior authorization for the establishment of new bank branches is justified by the fact that market forces alone are insufficient to spontaneously produce structures which are both stable and efficient. Its use is intended to prevent the instability that could ensue for the banking markets from a disorderly proliferation of branches and thus to limit the costs for the system" (Bank of Italy, 1984, p. 229). According to the new regulation, the Bank of Italy, which is in charge of supervising the banking system, can deny its permission to the opening of a new branch on the grounds of financial inadequacy.

In our analysis, we assume that local credit markets are defined as the 95 Italian provinces.[4] The identification of local markets with provinces is supported by the available evidence on the reach of bank-firm relationships. For instance, Bonaccorsi di Patti (2003) shows that more than 80 percent of non-financial firms' credit relations is established with banks branches in the same province. We identify a case of entry when a new bank or a branch is established, and, in the case of branching, the bank did not have a branch in that market before, in line with other empirical studies (Amel and Liang, 1997). Taking a further step, we keep the analysis on two levels, defining two types of entry, which are affected by different informational asymmetries. The first is represented by pure entry, that means a newly chartered bank (or *de novo*) entering a market, while the second encompasses entry through branching. We do not consider branch offices of foreign banks, because they tend to locate in large metropolitan areas and to develop relations mostly with large multinational corporations.[5] In identifying *de novo* entry, we consider all the newly chartered banks in our sample period, with three exceptions. First, we exclude new charters arising from M&A deals. Second, we also exclude institutions which were newly chartered as special-purpose

[3]See the "Testo Unico Bancario", Second Edition July 2000, Capo II, Art. 14 and 15.

[4]Presently, Italy is divided in 103 provinces. However, since 8 provinces were established in 1995 and our sample period ranges from 1990 to 2002, we use the old administrative boundaries for the definition of local markets.

[5]We also exclude entry through acquisition of pre-existing branches, since, in this case, the number of competitors in each market is not subject to change.

affiliates of existing banks or banking groups. Third, we do not treat as *de novo* entrants those non bank financial companies which successfully applied for a full banking license. Using this set of restrictions, we identify among the new charters those institutions which have been established following a true entry decision.[6] Since *de novo* entry is a relatively low frequency event, we divide the time interval in three sub-periods: 1990-1993, 1994-1997 and 1998-2002.[7]

In the time frame considered, 131 new banks have been chartered, which amounts to an yearly average of 10.5, which compares with 11.8 during the decade 1980-89 (Figure 1). As suggested also by Santarelli (2000), the regulatory reform introduced in the Italian banking sector fostered a "pre-entry" selection process, leading to a higher average start-up size after deregulation. Moreover, the slight decline of the number of newly founded banks is not surprising when compared with the enormous expansion of branch offices. Between 1990 and 2002, there have been 1281 cases of entry through branching, corresponding to an annual average of 113 entry cases. In the 80s the number of entries through branch opening averaged to 50 per year (Figure 2). Also in the post liberalization period the vast majority of *de novo* banks have been chartered as mutual banks (88 out of 131) or as co-operative banks (26) and only a few as joint stock corporations.

The mortality rate of *de novo* banks has been very high: only one half of them was still chartered at the end of the sample period. Looking at the post-entry performance of newly chartered banks, the progress of building up market shares has been rather slow for both type of entrants. Table 1 reports the situation of the average entrant in the market it entered after three years. The number of available observations is lower with respect to the full sample because of the truncation problem and because of exit, due to several reasons. For *de novo* banks, the most frequent reason for exit is infant mortality. The fall in the number of entrants through branching for which data on market share becomes available is due to the M&A wave occurred in that period. Nonetheless, we can observe about 73 percent of total *de novo* entrants and 42 percent of entrants via branching. After three years, market

[6] A similar approach has been adopted by Seelig and Critchfield (2003).

[7] In this, we follow Amel and Liang (1997) who also use three-years time windows. One one hand, counting the number of entries every year would have led to a great disproportion of zeros. On the other, letting the time frame being the whole interval 1990-2002 would have drastically reduced the number of observations. It's worth to remind that the unit of observation is the number of entries in one province in a given time frame.

shares of entrants remain below one half percentage point of lending to non financial firms within the local market. The same holds in the business of saving management services, here proxied by the amount of securities held on customers' accounts. Although the analysis of post-entry performance falls beyond the scope of this paper, it is worth noting that *de novo* entrants, on average, have gained larger market shares than entrants through branching in small business lending.[8] The opposite occurs for lending to non financial corporations and for saving management services, where entrants through branching seems to have a competitive advantage with respect to *de novo* banks. This evidence supports the idea that *de novo* banks may be more suited to serve opaque borrowers.[9]

3.2 Methodology

From a methodological point of view, since the number of entries is typically a count data, Poisson regression models provide a standard framework for econometric analysis. Let y be a random variable denoting the number of occurrences of a certain phenomenon during a time interval; y is said to have a Poisson distribution $P(\lambda)$, with $\lambda > 0$, if for $y = 0, 1, 2, \ldots$:

$$Pr(y|\lambda) = \frac{exp\,(-\lambda)\,\lambda^y}{y!} \tag{1}$$

The Poisson distribution has some peculiar properties: the first two are necessary conditions for a random variable to be Poisson distributed, while the latter are descriptive features. The parameter λ, known as the *unobserved rate of incidence*, is the expected number of times that an event occurred per unit of time. In particular, it can be thought as the mean of the expected counts, $E\,(y) = \lambda$. The variance is equal to the mean, $V\,(y) = \lambda$. We refer to this property as *equidispersion*. Very often count data exhibit a variance greater than the mean, that indicates overdispersion: specific models were built to deal with it. As the parameter λ increases, the probability that a zero event occurs decreases: in spite of that, in many empirical situations, there are often more observed zero events than a Poisson model would predict. Again, if the parameter λ increases, the Poisson distribution approximates to the

[8] Small businesses are defined as sole proprietorships and partnerships with less than 20 employees. In Italy, this kind of firms account for about one fifth of total bank lending to non financial firms.

[9] The pattern of market shares gained by entrants through branching is also consistent with the predictions in Dell'Ariccia and Marquez 2003, that incumbents tend to reallocate their loan portfolio towards more opaque borrowers.

Normal distribution.

We assume that the dependent variables $y_1, y_2, \cdots, y_n$, i.e. the number of banks which enter a local market in a given time interval, have independent Poisson distributions with parameters $\lambda_1, \lambda_2, \cdots, \lambda_n$.

Thus:

$$Pr(y_i|x_i) = \frac{exp\left(-\lambda_i\right)\lambda_i^{y_i}}{y_i!} \tag{2}$$

The conditional mean of the dependent variable is supposed to depend on an individual's characteristics (x_i) according to the following model:

$$\lambda_i = E\left(y_i|x\right) = exp\left(x_i\beta\right) \tag{3}$$

While the conditional mean of the error terms is zero, the errors are heteroskedastic by construction, since $V\left(\varepsilon\right) = E\left(y|x\right) = exp\left(x_i\beta\right)$.

The likelihood function for the Poisson Regression Model (PRM hereinafter) is defined as:

$$L\left(\beta|y,x\right) = \prod_{i=1}^{n} Pr\left(y_i|\lambda_i\right) = \prod_{i=1}^{n} \frac{exp\left(-\lambda_i\right)\lambda_i^{y_i}}{y_i!} \tag{4}$$

Maximum likelihood estimation can be easily used (see Maddala 1982 for the corresponding expressions of the Hessian), since the likelihood function is globally concave. As pointed out before, the mean-variance equality condition is very restrictive: for this reason, a large number of techniques for detecting and modelling overdispersion were developed in the last years (Hausman, Hall and Griliches, 1984; Dean and Lawless 1989; Cameron and Trivedi, 1990, among others). In some cases the data generating process adds more mass at the zero value than a Poisson Regression Model would predict[10]: this excess of zeros may be explained by the presence of a *dual regime*[11] data generating process. The first stage is ruled by a model that assigns some probability of moving from the *zero state* to another state in which the event may occur. Then, this second stage is characterized by a true event-count process. In other words (Zorn, 1996), we have a transition stage when the observation moves

[10] Actually, the same applies to every shift of the probability mass, towards zero or every other admissible outcome.

[11] Here we are not referring to the "regime switching" models and the related literature, but to a model with two stages that resemble more to a split population model.

from one state in which the event cannot occur to another stage in which the event occurs at some rate λ_i.

$$\begin{cases} y_i = 0 & \text{with probability } \delta_i \\ y_i \sim P(\lambda_i) & \text{with probability } (1-\delta_i) \end{cases} \tag{5}$$

Accordingly, the probability of obtaining a zero count is defined as:

$$Pr(y_i = 0) = \delta_i + (1-\delta_i)\, exp(-\lambda_i) \tag{6}$$

and the probability of obtaining a non zero count is :

$$Pr(y_i = k) = (1-\delta_i)\frac{exp(-\lambda_i)\,\lambda_i^k}{k!} \tag{7}$$

One should note that this parameterization with excess zeros, implies overdispersion by construction. In fact, $V(y_i) = (1-\delta_i)(\lambda_i + \delta_i\lambda_i^2) > E(y_i)$.

Following Lambert (1992), we parameterize the probability δ_i as a logit, allowing it to depend on a set of different covariates with respect to the Poisson model. This class of models is known as Zero Inflated Poisson Model (ZIP hereinafter).

$$\delta_i = \frac{exp(z_i'\gamma)}{1 + exp(z_i'\gamma)} \tag{8}$$

If we denote with $\Psi_{y_i=0}$ the indicator function that takes value 1 if $y_i = 0$ and zero otherwise, we can write the joint log likelihood function as:

$$\begin{aligned} lnL(\beta,\gamma) &= \sum_{i=1}^{n} \Psi_{y_i=0} ln\left(exp(z_i'\gamma) + exp(-exp(z_i'\gamma))\right) + \\ &+ \sum_{i=1}^{n} (1-\Psi_{y_i=0})\left(y_i x_i'\beta - exp(x_i'\beta)\right) - \sum_{i=1}^{n} ln\left(exp(z_i'\gamma)\right) \end{aligned} \tag{9}$$

Since the parameters λ_i and δ_i are functionally independent, the joint log likelihood in 3.2 can be maximized by conventional methods.

In order to test overdispersion in our data, we estimate first a Negative Binomial Regression Model (hereinafter, NBRM). This model allows for a simple variance specification as:

$$V(y|x) = \lambda + \alpha\lambda^2 \tag{10}$$

Then, a one-tailed t-test of the hypothesis $H_0 : \alpha = 0$ is used to detect overdispersion. Note that, if α is zero, the NBRM reduces to the Poisson Regression Model.

4 Empirical Analysis

4.1 Variables

We estimate separately two entry models: one for *de novo* banks and the other for an outside bank opening a new branch. The unit of observation is a market in one of the three time intervals 1990-93, 1994-97 and 1998-2002. We include period dummies[12] to control for business cycle and other common factors which may have influenced entry decisions. In our basic model, we assume that entry depends on market size and the degree of market competition. Market size is measured by the population in the province, in log scale (LNPOP). The degree of competition is approximated alternatively by the standard Herfindahl-Hirschmann concentration (HERF) index computed using banks' market shares, or the spread between average interest rates on loans and average interest rates on deposits (SPREAD). We have computed the Herfindahl-Hirschmann index using banks' market shares in terms of loans, deposits and branches. The results are substantially unaffected and we present only those estimates with the Herfindahl-Hirschmann index based on branches' concentration, which is more robust with respect to demand fluctuations.[13]

To avoid problems with structural differences in loan's maturity across provinces, we use interest rates charged on short term lending, with original maturity under 18 months.

Since we do not have reliable measures of prices for other banking activities in the several local markets, we proxy the potential business from the provision of services by the sum of the deposits and the amount of securities deposited at the banks by the household sector,

[12]Even if not reported in the tables for sake of clarity, their coefficients are significant.

[13]Let n_{ij} be the number of branches of bank i $(i = 1 \dots N)$ in the local market j, n_j the number of branches present in market j. The Herfindahl-Hirschmann index is given by $HERF_j = \sum_{i=1}^{N} \left(\frac{n_{ij}}{n_j}\right)^2$.

standardized by the number of branches (in the log scale, SERVICES). This variable should capture business opportunities related to payment securities (through the quantity of deposits) and, more importantly, the scope for expanding the activities related to household asset management. The latter has been one of the major sources of income growth for Italian banks in the second half on the 1990s and a key driver of M&A deals (Focarelli et al., 2002). Differences in income across the provinces are accounted by per capita GDP (in log scale; LNGDPpc) and those in credit risk by average loan default rate (RISK).

We also control for possible effect of M&A in driving entry. According to a large stream of literature, M&As within the banking industry can affect the supply side in several ways: increasing efficiency (Focarelli and Panetta, 2003), changing business focus of the emerging intermediaries (Berger et al., 2000), altering the incentives between relationship-based and other types of lending (Bonaccorsi di Patti and Gobbi, 2003). Henceforth, entry through acquisition of an existing bank is likely to have substantial indirect effects on other kind of entry decisions. The intensity of M&A activity is measured as the share of branches interested by this phenomenon. In particular, we consider two types of M&As: high and low (M&AH and M&AL, respectively). In the former, a total acquisition occurs, with a full "brand change" and very likely the market strategies of the head bank are transmitted to the acquired one. In the latter, the bank interested in the acquisition maintains its identity. Our hypothesis is that in the second case the informational advantage of the acquired incumbent is not dispersed: this can be relevant in those cases where soft information matters.

In some specifications we also take into account market characteristics which should approximate borrowers degree of opaqueness, i.e. the weight of small firms (SMALL) in that province in terms of employment.[14]

To circumvent endogeneity problems and to smooth potential outliers, according to data availability, some variables refer to the year before the time interval considered (like HERF, SERVICES, SPREAD, M&A) and the others are the averages of the three yearly observations before the time interval (LNGDPpc, LNPOP, RISK, SMALL). Our testing strategy consists of estimating the same models using as left hand variable alternatively the number of entry via the establishment of *de novo* institutions and the opening of branches from outside banks. According to the theory of informational barriers, the set of right hand side variables we have

[14]The ratio between the number of employees in firms with less than 20 employees and the total employment.

identified should have different effects on the two types of entry. The market concentration index (HERF) is expected to have positive effect in driving *de novo* entry. It may also have a positive effect on entry via branches, and these are still the most important delivery channels for the whole range of banking services, since relatively prosperous local economies present both lower credit risks and a higher demand for financial services other than lending and fund-raising.

SERVICES should affect mainly entry through branching since it captures the opportunities for low information intensity business, meanwhile its effect on the creation of *de novo* institutions is a priori uncertain. On the opposite, SMALL should have positive coefficients on the *de novo* equation because it should be correlated with information intensive lending activities. By the same argument, these variables should be negatively correlated with entry through branching. Finally, regarding the two variables related to mergers and acquisitions (M&AH) and (M&AL) there are two factors to be considered. On the one hand M&A deals usually originate larger and more complex institutions which may be less willing to lend to informational opaque borrowers and hence attracting *de novo* entry. On the other hand, whenever the cut-off borrowers belong to the riskier categories, the adverse selection faced by the entrants via branches is amplified.
Table 3 summarizes the overall pattern of expected signs of the estimated coefficients.

4.2 Empirical Findings

The variables RISK, SPREAD, LNGDPpc and SERVICES are strongly correlated among them as well as SPREAD and HERF and hence, a full-fledged specification would incur in serious problems of multicollinearity. Moreover, the equidispersion hypothesis is always rejected: accordingly, we estimate a two-stages model as in equation (5).[15] Thus we estimate several parsimonious specifications in which alternatively we use HERF or SPREAD and only a subset of the other variables. In Tables 5 and 6 estimation results are reported.
In the first specification we simply regress (using a ZIP model) the number of entry on the concentration index (HERF) and market size (LNPOP). The results for the *de novo* model are reported in column 1 of Table 4 and those for the branching entry in column 1 of Table

[15]For sake of brevity, we did not report the results of Poisson and NBRM, as well as the first logit regression. In this first stage model - the inflation stage - we used time dummies, the number of banks active in the province and its square as covariates. These results are available from the authors upon request.

5. Concentration has a positive effect on *de novo* entry statistically different from zero and a negative one, albeit estimated in a rather imprecise way on attracting branches of outside banks. Using SPREAD as a measure of market profitability (columns 2, Tables 4 and 5) the pattern is reinforced: large margins in the lending activity stimulate the establishing of new banks but seem to be an obstacle to the opening of branch offices by existing banks. The latter results can be spurious because SPREAD is positively correlated with risk. We therefore introduce RISK as a control variable which turns out to have a strong positive effect only on *de novo* entry, while a highly negative one on branching.

Then, including per capita GDP as a control both for risk and for overall market economic conditions, SPREAD has still a positive effect on *de novo* entry (column 3, Table 4), meanwhile its coefficient is negative but not different from zero in the branching equation (column 4, Table 5). Overall, from this first block of estimates we derive evidence that market concentration and, more effectively, interest rate margins influence *de novo* entry but not entry through the opening of branch offices.

A further step is to introduce a variable which captures market opportunities for expanding services not related to lending (SERVICES). As it can be seen from columns 4 in Tables 4 and 5, this variable has no impact on *de novo* entry, but it is a powerful factor in attracting entry via branching.

We also investigated the effects of variables which proxy for the opaqueness of the business sector, in terms of average firm size (SMALL). The estimated effects are negligible and not statistically different from zero in the case of *de novo* entry, but negative (column 5, Table 4), and substantial for entry through branches (column 5, Table 5).

Finally we also checked for effects of M&As, finding that they have no effects on the formation on new banks (column 6, Table 4) and that in the case of "soft" acquisitions they may have deterred entry with branches (column 6, Table 5). This result is consistent with the finding of Focarelli et al. (2002) that a major determinant of acquisition is the expansion of fees and commission services. More aggressive policies of the acquired banks in this area of business is likely to reduce the incentives for entry through branches.

5 Concluding Remarks

In this paper, we analyze the determinants of bank entry decisions in local banking markets using a proper count data estimation technique which allows for overdispersion in the data. The marginal contribution to the existing literature, is that we define two different types of entry: a newly founded bank and an outside bank opening a branch in a market in which it was not present before. We argue that, since *de novo* banks - in the vast majority of cases - are sprouts of the local business communities, they are less exposed to adverse selection effects predicted by the theory for entry of outside institutions through the opening of branch offices.[16] Our results are, to a large extent, consistent with the prediction of the theory. We find that *de novo* entry, but not entry through branches, is positively correlated with gross margins in lending activity. In contrast, entry through branch offices, but not *de novo* entry, is positively correlated with business opportunities in which proprietary information is likely to be less important than in lending. We draw two major implications from our analysis. First, consistently with the findings of other papers (Berger et al., 2000), *de novo* banks fill market niches which existing banks find difficult to enter and they play an important role in fostering competition in local markets (Moore and Skeleton, 1998). However, mortality rates of *de novo* banks are very high (De Young, 1999; Maggiolini and Mistrulli, 2004) and hence both private and social costs (via deposit insurance) can also be high. Last, the multi-output nature of the banking firm is an important factor in comparing the degree of competition across markets. The strength of market forces in seeping away extra-profits is very likely to depend on the relative weight of low and high proprietary information services.

[16] A similar result can be found in Degryse and Ongena (2003), even if they proxy information with physical distance.

Table 1. **Entrants' Market Shares in Different Business Lines Three Years after Entry (percentages).**

"Small businesses" are defined as sole proprietorships and partnerships with less than 20 employees. Source: Bank Supervisory Reports.

	De Novo Banks		*New Branches*	
	Mean	Range	Mean	Range
Lending to Small Firms				
Farming	0.22	0-5.54	0.25	0-6.39
Manufacturing and Energy	0.49	0-2.51	0.43	0-7.65
Trade and Other Services	0.46	0-5.51	0.38	0-5.70
Construction	0.40	0-7.36	0.34	0-7.33
Total	0.43	0-4.91	0.39	0-6.60
Lending to Large and Medium-Sized Firms				
Farming	0.12	0-3.96	0.31	0-19.60
Manufacturing and Energy	0.21	0-6.45	0.44	0-11.08
Trade and Other Services	0.26	0-4.95	0.48	0-5.76
Construction	0.26	0-5.70	5.66	0-12.73
Total	0.21	0-5.43	0.47	0-6.43
Saving Management Services				
Securities on Customers Accounts	0.12	0-2.22	0.27	0-6.85
Number of banks	96		518	

Table 2. **Expected sign of the estimation results.**

HERF is the Herfindahl-Hirschmann concentration ratio; SPREAD is the difference between average interest rates on loans and deposit; RISK is the average loan default rate; LNGDPpc is the natural logarithm of per capita GDP; SERVICES is the sum of the deposits and the amount of securities deposited by the household sector, standardized for the number of branches; SMALL is the small firms' weight, in terms of employment. Source: Bank Supervisory Reports.

Types of Entry	*HERF*	*SPREAD*	*RISK*
De novo	+	+	+/?
Branches	+/?	-	-
	LNGDPpc	*SERVICES*	*SMALL*
De novo	+/?	?	+
Branches	+	+	-

Table 3. **Descriptive Statistics**

DENOVO is the number of *de novo* entries; NEW BRANCH is the number of entries through branching in province; HERF is the Herfindahl-Hirschmann concentration ratio; SPREAD is the difference between average interest rates on loans and deposit; LNPOP is the natural logarithm of the resident population; LNGDP is the natural logarithm of per capita GDP; RISK is the average loan default rate; SERVICES is the sum of the deposits and the amount of securities deposited by the household sector, standardized for the number of branches, in log scale; M&AH is the share of branches in a province interested in M&As, with a total acquisition occurring; M&AL is the share of branches in a province interested in M&A, with only a partial acquisition occurring; SMALL is the small firms' weight, in terms of employment; NBANKS is the number of banks active (with headquarters) in a province. Source: Bank Supervisory Reports.

Variable	Mean	Std. Dev.	Min	Max
DENOVO	0.460	0.969	0.000	7.000
NEW BRANCH	4.951	6.364	0.000	48.000
HERF	0.150	0.068	0.032	0.391
SPREAD	7.485	1.303	3.890	10.980
LNPOP	13.021	0.688	11.432	15.189
LNGDPpc	2.545	0.274	1.932	3.107
RISK	0.035	0.022	0.004	0.135
SERVICES	10.884	0.514	9.673	12.069
M&AH	0.025	0.060	0.000	0.449
M&AL	0.020	0.055	0.000	0.415
SMALL	48.132	9.417	24.563	78.425
NBANKS	29.712	21.706	6.000	163.000

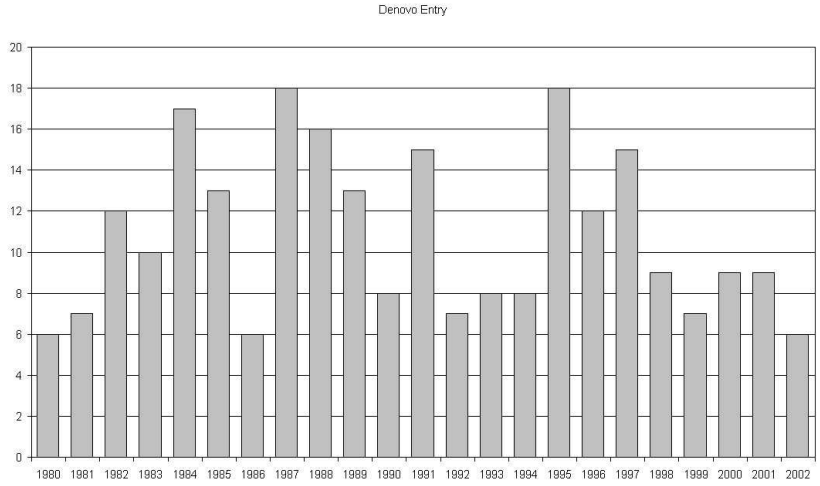

Figure 1. **Total number of de novo entries over time.**
Simple count of *de novo* entries, i.e. the number of new banks started in the period from 1980 to 2002. Source: Bank Supervisory Reports.

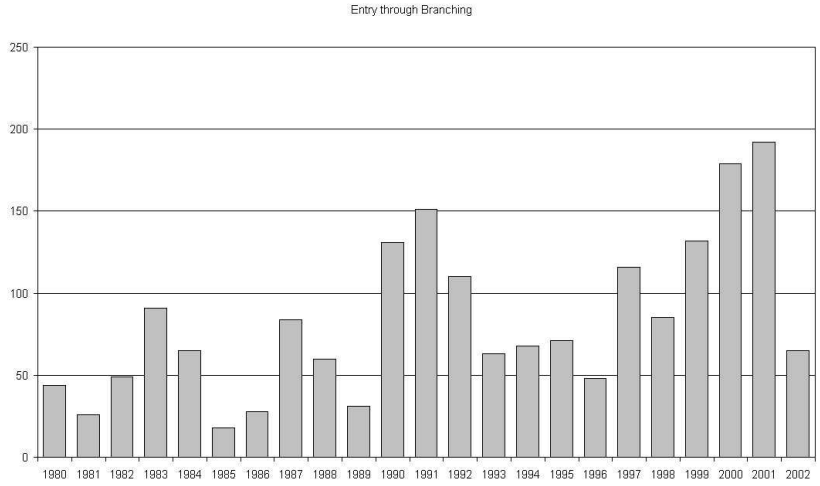

Figure 2. **Total number of entries through branching over time**
Simple count of entries through branching, i.e. the number of branch opened by an outside established bank in a new market from 1980 to 2002. Source: Bank Supervisory Reports.

Table 4. **Determinants of *de novo* entry.**

Zero Inflated Poisson Regressions. Dependent variable: DENOVO (the number of *de novo* entries). Covariates: HERF (Herfindahl-Hirschmann index); SPREAD (the difference between average interest rates on loans and deposit); LNPOP (the log of the resident population); LNGDP (the log of per capita GDP); RISK (the average loan default rate); SERVICES (as a proxy of the potential business from services' provision); SMALL (small firms' weight, in terms of employment); M&AH (the share of branches in a province interested in M&As, with a total acquisition occurring); M&AL (the share of branches in a province interested in M&A, with only a partial acquisition occurring). The results from the first-stage logit model are not reported for sake of brevity. Robust standard errors in brackets. ***, **, * mean statistically significant at $\alpha = 0.01$, $\alpha = 0.05$ and $\alpha = 0.10$ respectively. Marginal effects in italic.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
HERF	4.919**		3.640**			
	(2.336) *2.102*		(1.744) *1.573*			
SPREAD		0.278***		0.498***	0.583***	0.534***
		(0.105) *0.112*		(0.173) *1.180*	(0.164) *0.200*	(0.162) *0.199*
LNPOP	0.616***	0.590***	0.532***	0.825***	0.911**	0.879***
	(0.170) *0.263*	(0.203) *0.238*	(0.178) *0.23*	(0.297) *0.298*	(0.429) *0.338*	(0.305) *0.327*
LNGDPpc				2.388***	2.135*	2.057**
				(0.939) *0.862*	(1.222) *0.793*	(0.959) *0.765*
RISK			11.611**	*9.957*		
			(5.567) *5.019*	6.768 *3.596*		
SERVICES				-0.551	-0.531	-0.531
				(0.477) *-0.199*	(0.614) *-0.197*	(0.564) *0.198*
SMALL					0.338	
					(0.861) *0.125*	
M&AH						-0.521
						(1.795) *-0.194*
M&AL						-0.132
						(1.048) *-0.049*
CONST	-8.967***	-10.158***	-8.197***	-15.374***	-16.188***	-15.352***
	(2.381)	(0.568)	(2.408)	(3.980)	(5.205)	(4.427)
Num. of obs.	285	285	285	285	285	285
Nonzero obs.	82	82	82	82	82	82
Zero obs.	203	203	203	203	203	203
Wald test	16.22***	24.26***	22.95***	34.73***	31.79***	28.56**

***Table 5.* Determinants of entry through branching.**

Zero Inflated Poisson Regressions. Dependent variable: NEW BRANCH (the number of entries through branching). Covariates: HERF (Herfindahl-Hirschmann index); SPREAD (the difference between average interest rates on loans and deposit); LNPOP (the log of the resident population); LNGDP (the log of per capita GDP); RISK (the average loan default rate); SERVICES (as a proxy of the potential business from services' provision); SMALL (small firms' weight, in terms of employment); M&AH (the share of branches in a province interested in M&As, with a total acquisition occurring); M&AL (the share of branches in a province interested in M&A, with only a partial acquisition occurring). The results from the first-stage logit model are not reported for sake of brevity. Robust standard errors in brackets. ***, **, * mean statistically significant at $\alpha = 0.01$, $\alpha = 0.05$ and $\alpha = 0.10$ respectively. Marginal effects in italic.

Variable	(1)	(2)	(3)	(4)	(5)	(6)
HERF	-0.551		-0.233			
	(0.733) *-2.349*		(0.695) *-1.013*			
SPREAD		-0.256***		-0.044	-0.025	-0.042
		(0.036) *-1.068*		(0.046) *-0.167*	(0.045) *-0.095*	(0.047) *-0.162*
LNPOP	0.793***	0.691***	0.815***	0.568***	0.513***	0.572***
	(0.077) *3.388*	(0.048) *2.877*	(0.080) *3.531*	(0.050) *2.176*	(0.061) *1.946*	(0.048) *2.177*
LNGDPpc				1.075***	0.795***	0.903***
				(0.266) *4.114*	(0.249) *3.014*	(0.226) *3.434*
RISK			-6.560**	*2.484*		
			(2.571) *-28.415*	(2.340) *9.503*		
SERVICES				0.525***	0.554***	0.611***
				(0.085) *2.010*	(0.087) *2.103*	(0.087) *2.324*
SMALL					-1.071**	
					(0.495) *-4.064*	
M&AH						0.819
						(0.665) *3.113*
M&AL						-1.220**
						(0.565) *-4.636*
CONST	-8.770***	-5.655***	-8.883***	-14.28***	-12.69***	-14.758***
	(1.072)	(0.746)	(1.128)	(1.229)	(1.537)	(1.316)
Num. of obs.	285	285	285	285	285	285
Nonzero obs.	257	257	257	257	257	257
Zero obs.	28	28	28	28	28	28
Wald test	135.86***	310.23***	162.16***	513.91***	481.69***	451.27**

Appendix

All the estimates reported in Tables 4 - 5 may suffer from some degree of endogeneity, even if lagged variables were used. In order to test empirically the presence of this problem, an Instrumental Variables (IV) technique has been implemented. To our knowledge, no IV technique has been developed so far for this class of models, and for this reason, a transformation was required. For skewed data, standards transformations are the *log transformation* or the *square-root transformation*. Due to the presence of lots of zeros, the squared-root transformation was employed. Following McCullagh and Nelder (1989), we let $y = \lambda(1+\varepsilon)$. Then, taking the fourth-order Taylor series expansion in a neighborhood of $\varepsilon = 0$, one gets:

$$\sqrt{y} \simeq \sqrt{\lambda}\left(1 + \frac{1}{2}\varepsilon - \frac{1}{8}\varepsilon^2 - \frac{1}{6}\varepsilon^3 - \frac{5}{128}\varepsilon^4\right).$$

If y is Poisson distributed, the error term $\varepsilon = \frac{(y-\lambda)}{\lambda}$, has the first four moments respectively equal to 0, $\frac{1}{\lambda}$, $\frac{1}{\lambda^2}$ and $\left(\frac{3}{\lambda^2} + \frac{1}{\lambda^3}\right)$.

In turns, this imply that:

$$E[\sqrt{y}] \simeq \sqrt{\lambda}\left(1 - \frac{1}{8}\lambda + O\left(\frac{1}{\lambda^2}\right)\right),$$

$$V[\sqrt{y}] \simeq \frac{1}{4}\left(1 - \frac{3}{8}\lambda + O\left(\frac{1}{\lambda^2}\right)\right),$$

and

$$E\left[\left(\sqrt{y} - E[\sqrt{y}]\right)^3\right] \simeq -\left(\frac{1}{16}\right)\sqrt{\lambda}\left(1 + O\left(\frac{1}{\lambda}\right)\right).$$

Accordingly, if y is Poisson distributed, $\sqrt{y}$ is close to be homoskedastic and symmetric and, $\sqrt{y_i}$ can be regressed on x_i simply by OLS. The usual t-statistics can be used for inference, but caution is needed for the interpretation of the coefficients.[17]

In section 3.2 the right estimation procedure was presented; here the model has been linearized in order to check for possible endogeneity of some variables. We took into account the basic specifications of our model, i.e. *(Number of entries)*$= f(HERF, LNPOP)$, or alternately, *(Number of entries)*$= f(SPREAD, LNPOP)$.[18] The testing strategy consists

[17] The estimated coefficients give the impact of one unit change in the covariates on $E[\sqrt{y}]$ instead of $E[y]$, and recalling Jensen's inequality, $E[y] \neq \left(E[\sqrt{y}]\right)^2$.

[18] We are aware that, in this way, the estimates would not be efficient, but the only aim of this analysis is

in estimating the same model with OLS and IV and to test whether the coefficients are significatively different. For this purpose, a simultaneous estimate of the two equations is required (in a seemingly unrelated regression model spirit). As instrument, pre-deregulation market structure was used (the Herfindahl-Hirschmann concentration index in 1986). Then, given the arrays containing the two sets of estimates, a χ_2 test was performed in order to evaluate the significance level of the differences between the corresponding parameters. The results are shown in Table A, and looking at the χ_2 test, one can conclude that there is no significant difference in the coefficients produced by OLS and IV estimates, supporting the hypothesis that there is no endogeneity problem concerning market structure.

to test the presence of some endogeneity problems.

Table A1. **Comparison of OLS and IV estimates for both types of entry.**

OLS and IV estimates of the linearized model with the square-root transformation, basic specifications. Covariates: HERF (Herfindahl-Hirschmann index); SPREAD (the difference between average interest rates on loans and deposit); LNPOP (the log of the resident population). As instruments, pre-deregulation market structure was used (as of 1986).

	de novo entry				*entry through branching*			
Variable	OLS	IV	OLS	IV	OLS	IV	OLS	IV
HERF	0.060	-0.050			0.226	-1.526		
	(0.519)	(1.834)			(0.828)	(4.495)		
SPREAD			0.058*	-0.026			-0.278***	-0.795***
			(0.030)	(0.139)			(0.044)	(1.188)
LNPOP	0.255***	0.231*	0.268***	0.246	0.890***	0.217	0.810***	0.678**
	(0.064)	(1.341)	(0.060)	(0.038)	(0.128)	(1.928)	(0.101)	(0.309)
Num. of obs.	285	285	285	285	285	285	285	285
χ^2 test	0.180		0.600		0.130		0.200	

Table A2. **Correlation matrix.**

Correlation matrix of the following variables: HERF (Herfindahl-Hirschmann index); SPREAD (the difference between average interest rates on loans and deposit); LNPOP (the log of the resident population); LNGDP (the log of per capita GDP); RISK (the average loan default rate); SERVICES (as a proxy of the potential business from services' provision); SMALL (small firms' weight, in terms of employment); M&AH (the share of branches in a province interested in M&As, with a total acquisition occurring); M&AL (the share of branches in a province interested in M&A, with only a partial acquisition occurring).

Variable	HERF	SPREAD	LNPOP	LNGDPpc	RISK	SERVICES	SMALL	M&AH	M&AL
HERF	1.000								
SPREAD	0.147	1.000							
LNPOP	-0.440	-0.134	1.000						
LNGDPpc	-0.092	-0.709	0.062	1.000					
RISK	0.020	0.528	0.042	-0.586	1.000				
SERVICES	-0.073	-0.348	0.289	0.397	0.015	1.000			
SMALL	0.203	0.450	-0.392	-0.541	0.294	-0.280	1.000		
M&AH	-0.056	-0.059	-0.090	-0.039	-0.031	-0.201	-0.012	1.000	
M&AL	0.049	0.015	0.009	-0.047	0.036	0.117	0.010	-0.092	1.000

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