Bank branch closures in industry restructuring

April 10, 2017

Abstract

Branch closings increase the distance between retail customers and banks. In credit markets, distance increases the transportation costs and the costs of collecting information on the credit quality of borrowers. This paper defines local markets around the geo-location of branches in Spain during 2007-2014, and examines the supply side factors that influence the banks' strategic decision to close a branch. We find that the restructuring of banks through M&A accelerates the closures of branches but, at the same time, the market's concentration reduces the speed of the closures. This finding supports the regulatory scrutiny of the decisions to close branches.

JEL: G21

Keywords: Banks, branch closure, industry restructuring, market structure, relational banking.

1 Introduction

The banking industry around the world is in a process of capacity reduction. In the case of retail banking, this process involves the closing of a large number of branches[1]. A lower density in bank branches increases the distance between retail customers and banks. In credit markets, distance increases the costs of traveling to the branch, and the costs of collecting information on the credit quality of borrowers (Agarwal and Hauswald, 2010; DeYoung et al., 2008; Degryse and Ongena, 2005), which affects the efficiency and wealth creation of banking transactions (Almazan, 2002; Hauswald and Marquez, 2006). Some recent papers provide evidence on the benefits of the proximity between banks and borrowers on different dimensions: Bellucci et al. (2013) and Gambacorta and Mistrulli (2014) in the form of lower interest rates of loans; Hollander and Verriest (2016) in less restrictive covenants; and Degryse et al. (2015) in improving access to credit during the 2007 financial crisis. There is also direct evidence that branch closings lower availability of credit for borrowers more sensitive to information acquisition costs, such as small firms and low-income families (Nguyen, 2015), and causes the loss of soft information built during the borrower-lender relationship (Bonfim et al., 2016).

More broadly, there is evidence of a link between the distance that separates borrowers and lenders and the nature of their relationships, and that closer distances contribute to stronger banking relationships (Beck et al., 2016; Ono et al., 2015; Herpfer et al., 2016). Depending on the nature of the relationship, the literature has extensively studied and compared relationship versus transactional banking (Sharpe, 1990; Berger and Udell, 1992; Boot and Thakor, 2000; Bolton and Freixas, 2006). Relationship banking is based on exclusive, trust-driven exchanges between customers and banks that repeat over time. In contrast, transactional banking is based on non-exclusive, price-cost driven exchanges that are based on a short-term relationship. Although the comparison of benefits and costs between the two forms of banking cannot be generalized (Kysucky and Norden, 2015), Bolton and Freixas (2006) use Italian data and find that relation-

[1] According to the 2016 Report on Financial Structures of the ECB, the number of branches in the Euro area has decreased by 17.6% or 33,274 bank units between 2008 and 2015. During the same period, the FDIC reports a decrease by 5.94% or 5,891 branches in the United States.

ship banking "is an important mitigating factor of crisis". Hombert and Matray (2016) find evidence that relationship lending increases intensive and extensive innovation in young firms. Also, the research shows that the distance to bank branches (Ho and Ishii, 2011) and the density of branches (Dick, 2008) influence the demand for banking services and welfare.

Depending on the location of branches and the characteristics of customers, the closing of bank branches can result in geographic gaps in the availability of formal banking services: so-called bank deserts. The fact that bank deserts concentrate mainly in rural areas and in low-income urban neighborhoods (DeYoung et al., 2008; Kashian et al., 2015) is consistent with the evidence that the lack of access to finance is positively correlated with countries' levels of poverty (Beck and De La Torre, 2007; Demirgüç-Kunt et al., 2008) and inequality (Honohan, 2008). When the demand for bank services in a local market is insufficient to cover the fixed costs of a branch, cost-efficient considerations recommend exit from the market. But if there is only one branch in the area and the market becomes a bank desert after the exit, then these closing decisions might work against the social goal of preventing financial exclusion. Why does a bank branch close is a relevant question because it can have efficiency and distributional consequences. In unregulated markets, the decision to open or close branches is a response to a bank's profit maximization that it makes in strategic interaction with other banks in the market. Transportation and information acquisition costs generate incentives for banks to minimize the distance to the consumers, so as to increase their respective competitive advantage. As a result, the markets for bank services are spatially local, with few competitors and with strong strategic interdependency among their individual decisions. This spatiality applies to the decision to close branches too.

The severe negative shock and the fall in demand for bank services during the financial crisis altered the equilibrium number of branches in many local markets, resulting in the massive numbers of branch closings. Private interests in strategic rivalry with the private interests of other competitors dictate whether a given branch closes or not in response to the external shock. For example, in oligopoly markets, whether less cost-efficient plants close earlier under declining demand than more efficient ones is not always certain (Ghemawat and Nalebuff, 1985).

We examine the determinants for closing bank branches with an emphasis on supply-side effects, such as the structure of the local market and the restructuring of the banking industry (i.e., M&A). The research strategy consists in using geo-location techniques to spatially locate each branch operating in Spain and check several years later to find out whether or not the branch closes. For each open branch, we identify the relevant local market and construct the market structure variables that should condition the closing decision from a theoretical point of view. In the empirical analysis, we use an identification strategy similar to that used by Jiménez et al. (2012) to separate supply effects from demand effects in the decision to grant a loan. Jiménez et al. (2012) exploits the variability across observations of the *same firm* that applies for a loan in different banks during the *same time period*. In our case, we exploit the variability of observations across branches that operate in the *same geographic area* (i.e., census tract) during the *same time period*.

We apply the proposed conceptual and methodological framework to explain the closures of branches in Spain. The Spanish case provides a natural experiment to investigate branch closings because of the magnitude of its capacity reduction, 2007-2014, the banking industry reduced more than 30% of the branch network, and also because the opening and closing of branches are unregulated in Spain and respond only to market forces. Besides, the Spanish banking sector is also of interest because it has undergone an extensive and intensive restructuring process, including the transformation of savings banks (the so-called cajas) into shareholder banks.

We find that the probability of a bank closing a given branch increases with the total number of branches in the relevant market (a proxy for size and competitive conditions in the market), the density of branches of the same bank in the local market, and with restructuring. On the other hand, the probability of a branch closing is lower if the branch has no competitors in its relevant market; is in more concentrated local markets; and if the branch belongs to more profitable, solvent, and safer banks. Older branches are less likely to close, and the probability of closing increases with the size of the bank. When controlling for the rest of the variables, savings banks and credit cooperatives are less likely to close branches than commercial banks. Banks with activities abroad are less likely to close a branch in the domestic market, while foreign subsidiaries are more likely to close a branch than domestic banks.

These results indicate that industry restructuring through M&As can speed up and possibly reduce inefficiencies due to delays in the process of reducing the excess capacity. However, we also find that if restructuring increases the concentration in local markets, M&As could have the opposite effect and delay the closing decision. Additionally, we also find further evidence that supports the view that branch closures can reduce the banks' credit because of the destruction of soft information that branches have (Bonfim et al., 2016). This result is based on the finding that the age of the branch, which is a proxy for relational capital, is negatively associated with the decision to close.

The rest of the paper is structured as follows. Section 2 presents a review of the theoretical and empirical literature on the decision to exit and plant closings. Section 3 presents the propositions. Section 4 describes the database and the statistics. In Section 5 we describe the empirical model and the variables used in the analysis, and Section 6 comments on the results from the regressions. Section 7 summarizes the main results of the paper.

2 Literature review

2.1 Theoretical Research

The Industrial Organization literature provides some theoretical background on how the market structure affects the probability of a plant exiting that in part, explains the closing of bank branches. In markets with many competitors and a structure close to perfect competition, the closure of a given plant might not affect the decisions of the rest of plants because the profit expectations of one branch do not change with the closing of other branches. Instead, closing decisions only respond to the comparison of the present values of the future cash flows of staying or exiting. The literature predicts an outcome where high-cost plants close earlier than low-cost plants and industry production costs are minimized (Fudenberg and Tirole, 1986).

In oligopolistic markets with few competing plants, the decision to close a given plant depends on the expectation about what other firms will do with their plants in the same market. In this setup, the sequence of exiting plants might not follow cost minimization. Ghemawat and Nalebuff (1985) first proved that the equilibrium solution in an exit game played in oligopoly markets with declining demand is one where the size of the plant, not its cost, determines the sequence of exits. The reasoning is that all plants in the market know that at some point, the demand will be so low that only the smallest plant will be able to break even. When one firm has two or more plants in the same market, the solution of the game is not straightforward and multiple equilibriums might arise (Whinston, 1988; Reynolds, 1988). Only one prediction seems clear: if costs are similar across plants, the firm with the largest number of plants in the market will be the first one to close a plant. The reason is that it will be able to capture a higher stake of the externalities (i.e., industry profits) derived from the closing of a given plant (see also Sutton (1991)).

The age of the plant can also be an observable attribute that is relevant to why it closes. The reason is the relationship that can be established between age and the acquisition of information. Under incomplete and asymmetric information conditions, entrepreneurs start a business without knowing their true entrepreneurial skills and learn about them with experience. Those that realize their skills and have the right ones continue and the rest of entrepreneurs exit the market (Jovanovic, 1982). Thus, older plants are less likely to exit than young ones because the entrepreneurs-owners of the old plants have learnt that they are among the highly skilled ones, while the owners of the young ones are still in the learning process.

In the case of banks, the age of the branches can be a proxy for the experience in relationship banking and the accumulation of soft information on the credit quality of borrowers. If a parent bank can transfer the relational capital accumulated in one branch without relevant loss to another branch, then the decision to close a given branch would be independent of its age in markets where a bank has more than one branch. However, age is an important determinant of closing if the transfer of relational capital is costly (Bonfim et al., 2016), and the investment in such capital is a sunken cost (i.e., the value of the asset is specific to the branch). Banks can delay the closing of older branches as much as possible to protect the value of the relational capital. From the value of real options (Dixit, 1989), age also negatively affects the probability of closure because the value of waiting in the closing decision increases with the uncertainty about the evolution of future demand.

Relationship capital can also be a key variable in responding to the open question in banking of whether the application of Information and Communication Technologies depreciates the value of soft information, and whether distance is less relevant to the provision of banking services (Petersen and Rajan, 2002). If transactional banking dominates relationship banking, then the decision to close a branch will be independent of relationship capital. Overall, the relevance of relationship capital in the decision to close a branch is then an empirical question.

2.2 Empirical Research

Most of the empirical research on the determinants of plant closings refers to manufacturing and is exploratory, probably because of the lack of robustness in the theoretical predictions. Here is a summary of some of the empirical results on the determinants of plant closings.

Less profitable and less efficient plants are likely to close first before more profitable and efficient ones (Bernard and Jensen, 2007), while the size and age of the plant lowers the likelihood of closing (Bernard and Jensen, 2007; Meyer and Taylor, 2015). Salvanes and Tveteras (2004) use Norwegian data and confirm that, controlling for capital age, the probability of a plant closing decreases (increases) with the age of the plant. Plants owned by multinational firms are more likely to close than plants owned by national firms (Baden-Fuller, 1989; Lieberman, 1990; Alvarez and Görg, 2009), while domestic plants of multinational firms are less likely to close than plans of domestic firms (Bernard and Jensen, 2007). Another regularity in empirical studies is that plants owned by multi-plant firms are more likely to close than a plant owned by one firm (Lieberman, 1990; Bernard and Jensen, 2007; Meyer and Taylor, 2015). The influence of the firm's market share in the plant closing decision is mixed: it is positive in Lieberman (1990) and not statistically significant in Meyer and Taylor (2015). Further, controlling for the characteristics of the plant, plants of firms bought by other firms in the recent past are more likely to close than plants owned by the buying firm (Bernard and Jensen, 2007).

Elfenbein and Knott (2015) examine the exit timing of US banks in the period between 1984 and 1997. They find supportive evidence that banks delay the exit decision because of uncertainty on ability, but no evidence that demand uncertainty influences the exit decision[2]. O'Brien and Folta (2009) test real options, demand uncertainty, and sunken costs as determinants of exit decisions by using data on exiting lines of business in US corporations.

3 Hypotheses Formulation

In this section, we briefly present the conceptual framework used as guidance in the formulation of the hypotheses on the determinants of branch closings that we empirically test in the paper. The decision of closing a branch depends on the expected future profits of staying or leaving the market. We first consider the case of branch i with no competitors and ignore potential strategic interactions with other branches. Branch i will exit market m if the net present value of the profits of continuing in the market are negative. That is,

$$E(\Pi_i) < 0 \Rightarrow E(\pi_i) + R_i < 0 \quad (1)$$

where Π_i are the total expected net present profits, which can be decomposed in π_i and R_i. The component R_i, captures the rents from relationship banking. The component π_i stands for the profits of the branch without the intangible and market specific assets, that is, profits due to the operating performance and profitability of the branch. Further, the total expected profits of a new branch are equal to $E(\Pi_i) = E(\pi_i)$.

Under perfect competition, the probability of closure is explained by $E(\pi_i)$. In this paper, we depart from pure competitive market conditions and consider the role of the relationship capital

[2]This paper also tests for cognition biases and separation between ownership and control as determinants of exit timing. They find that banks respond asymmetrically to positive and negative information updates, evidence of cognition bias, and that holding companies presumably with managers different from owners, take more than twice as long to exit compared to independent banks.

in the generation of economic rents. Thus, for a given operational profit, a bank is less likely to close branch i if the stock of relationship capital, R_i, is large. The proxy variable of relationship capital and attributed rents is the age of the branch. Then,

Proposition 1. *The probability of closing a branch decreases with age.*

If there are two or more branches in the market and every branch belongs to a different bank, then the expected profit of staying also depends on strategic decisions. The exit of a branch generates positive externalities for the surviving branches (i.e., attract former customers of the exiting branch). Thus, the decision to close branch i in this setup depends on (i) the belief of branch i about the potential exit of one or more competitors, and (ii) the capacity of branch i to absorb part of the industry profits generated when other branches exit first. If branch i assigns a probability p_i to the scenario of k competing branch leaving the market first, then the exit condition for branch i is:

$$\begin{aligned} E\left(\pi_i\right) + R_i < 0 &\Rightarrow (1-p_i)\pi_i\left(N\right) + p_i\pi_i\left(N-k\right) + R_i < 0 \\ &\Rightarrow \pi_i\left(N\right) + R_i + p_i\left(\pi_i\left(N-k\right) - \pi_i\left(N\right)\right) < 0 \end{aligned} \tag{2}$$

The new term $p_i\left(\pi_i\left(N-k\right) - \pi_i\left(N\right)\right)$ depends on the total number of branches in the market, N. As the number of branches increases and the market becomes more competitive, strategic considerations progressively weigh less in the individual closing decision because $\pi_i\left(N-k\right) - \pi_i\left(N\right)$ tends to zero. Therefore,

Proposition 2. *The probability of branch closings increases with the total number of branches in the market.*

As said, $p_i\left(\pi_i\left(N-k\right) - \pi_i\left(N\right)\right)$ also depends on p_i, that is, the probability that branch i attaches to the scenario of other branches closing first. It can be interpreted as a measure of perceived relative strength. The value of this probability decreases if branch i perceives its competitors as stronger.

Proposition 3. *The probability of branch closings decreases with the perceived relative strength of bank branch i with respect to that of other banks competing in the same market.*

We now consider markets where the same bank has more than one branch. Given the potential interactions across branches of the same bank, we expect that banks consider the situation of all their branches to decide which one to close. Thus, the distribution of branches among banks might affect the decision to close a branch. The reasoning is as follows: If a bank closes a branch in the market, but it has more branches operating there, these branches can collect the benefits derived from the closure of the former branch. More formally, consider that bank j owns $n \leq N$ branches in the market and it is considering the closure of branch i. Bank j will close i if the present value of profits of not closing the branch are lower than the profits of closing:

$$\begin{aligned} E\left(\Pi_i\left(N\right)\right) < (n-1)[\pi\left(N-1\right) - \pi\left(N\right) + \\ + p_i\left(\pi\left(N-k-1\right) - \pi\left(N-1\right)\right)] + \lambda R_i \end{aligned} \tag{3}$$

where λ is the proportion of the relationship capital that can be transferred from branch i to other branches of bank j operating in i's relevant market. We observe that the benefits from closing i (right-hand side of the inequality) increase with n.

Proposition 4. *The probability of branch closings increases with the share of branches of the parent bank in the same market.*

The previous equation also predicts the expected effect of relationship capital in markets where there are at least two branches of the same bank. We derive that, *ceteris paribus*, the more relationship capital transferred from the closing branch to the remaining branches of the parent bank, the higher the likelihood of closing. If intangible assets derived from relationship banking can be fully transferred[3] to other branches (i.e., $\lambda = 1$), the probability of closing is independent of the level of relationship capital. However, if some or all the relationship capital

[3]Bonfim et al. (2016) examine the factors that condition the transfer of relational capital across branches of the same bank.

is lost, then the bank will close the branch(es) with lower relationship capital. The limitations in the transfer of relationship capital indicate that the probability of closing an old (new) branch decreases (increases) as the number of branches of the parent bank increases.

Proposition 5. *If the relationship capital is fully transferable, the negative effect of the age on the probability of closing a branch will be independent of the number of branches that the parent bank has in that market. If the transfer is nil or partial, the negative effect increases in absolute value with the number of branches of the parent bank.*

So far, we assume that strategic interactions among the decisions of bank branches in the same market respond to Nash-like competitive behavior. However, we cannot discard the existence of some collusive practice in response to the strategic interactions in banking markets. Collusive behavior allows banks to earn higher gross profit margins, and possibly higher revenues per branch. A higher margin and/or higher demand per branch could delay the exit decision because branches can cope with a higher decline in the aggregate market demand before incurring losses. The standard assumption in industrial organization (Tirole, 1988) is that the viability of tacit collusion practices among bank branches in the same market is directly related with the degree of market concentration. Therefore,

Proposition 6. *The probability of a branch closing decreases with the concentration of banks in the local market.*

4 Banking industry database

We have information on the addresses of the branches of Spanish banks between 2007-2017 from *Guía de la Banca of Maestre Ediban.* We also can identify the bank owner of every branch. Using GIS software, we have translated the geographic coordinates of every branch into geo-locations, which enables us to exploit the characteristics of the location of each branch and its surroundings. For this purpose, we map the location of each branch and year with the census tract. Census tracts are partitions of the municipality areas that are characterized by easily identifiable boundaries (e.g., rivers, roads) and with a population between 1,000 and 2,500 people. To better illustrate the concept of a census tract, Figure 1 presents the census tracts of downtown Madrid. Spain has 38,226 census tracts and 8,117 municipalities. The identification of the census tracts and the match the to a branch with the corresponding census are important in this paper because this they will enable us to control for unobserved local demand conditions in the estimation of the main model on supply supply-side determinants of branch closings.

Another basic element of the analysis in the paper is the definition of the relevant market for each and every bank branch open in each of the years from 2007 to 2014. The GIS software allows us to define the relevant local market of branch i, from now on defined as m_i, as the circular area with a radius of 150 meters around the branch[4]. After drawing the circumference with the GIS we identify all bank branches located within the circumference, the potential competitors of branch i. Figure 2 illustrates the area of the relevant market of every branch as well as the number and location of competing branches in downtown Madrid in 2007. For each bank branch, we collect information on the number of years since it opened; relevant information on whether the parent bank is restructuring or not (public information from Banco de España); and information on profitability, size, and risk profile obtained from the SNL database.

The Spanish banking industry

The Spanish banking sector has undergone a deep restructuring during 2007-2014. On the one hand, there were market factors related with the excess of branches accumulated in the years of high economic growth that can explain part of the restructuring. During the years of the Euro, 2000-2007, retail banking activity grew at a fast rate in Spain, spurred by the growth in the real state sector, and banks expanded their branch networks at rates quite above historical ones. The sudden arrival of the crisis proved that the size of the branch networks was over-dimensioned because of two reasons. One had to do with the deleveraging process in the private sector after

[4]The length of the radius is justified because the resulting area, (70,686m2), is very close to the median area of the Spanish census tracts.

asset prices fell, given that the bank debt was the most relevant form of debt in Spain. The other reason is the uncertainty in growth given the customers' use of Internet and related technologies to access bank services[5]. Both factors explain the closures of branches during the crisis.

As well as the demand factors, the restructuring also resulted from the intervention of national and supranational authorities that enhanced the consolidation of banks through M&As or bailouts and the closure of branches for the sake of efficiency. Market forces will interact with the managed restructuring process to determine where to reduce capacity and by whom. One of the structural changes was the transformation of Spanish savings banks, cajas, into for-profit commercial banks in 2012.

Table 1 presents the information on the structural changes that took place in the Spanish banking system during 2007-2014. The number of branches of depositary institutions[6] decreased from a peak of 45,165 in 2008 to 31,876 in 2014, whereas the system reduced the number of banks from 285 in 2008 to 223 in 2014. There are two other ownership forms of banks worth mentioning in Spain, credit cooperatives and the subsidiaries of foreign banks, although their total market share of retail banking is rather modest.

The reduction of branches has decreased density from 12 to 8.3 branches per 10,000 people between 2008 and 2014. Nonetheless, the density of branches per inhabitant in 2015 remained the highest among Euro countries according to the ECB's Report of Financial Structures (ECB, 2016). Further, in terms of the number of employees per branch, the restructuring process does not seem to have affected it.

Structural determinants of branch closing

In Table 2, we present the results of an analysis of variance ($ANOVA$) that quantifies the relative contribution of the variables of census area, time, and bank to explain the closures of branches.

We observe that in specification I the three groups of dummy variables are all statistically

[5]Nonetheless, according to data from recent surveys, there is unanimity among Spanish bankers in that the branch is the most important distribution channel, and banks view the alternative channels more as complements than as substitutes of brick and mortar branches.

[6]We do not include the so-called *establecimentos financieros de crédito*, credit institutions that are not allowed to collect deposits.

significant, although their joint explanatory power is relatively low, 11.35%. We observe that 61% of the total variance comes from the census, and the rest is evenly split between the time and bank effects. The census variable captures the differences in supply and demand in the local market. Thus, the results show that these conditions matter in explaining the closure of branches. The time varying conditions and idiosyncratic characteristics of banks seem to matter less, although their contributions to variance is statistically significant. Specification II accounts for the possibility that the changes over time in market and bank conditions differ across census areas and banks. The new specification includes the interactive effects of $Bank \times Time$ and $Census \times Time$ as explanatory of the branch closings. The explanatory power of the model increases to 49.28%. The interaction of $Census \times Time$ is the variable with a higher contribution to the explained variance, though when corrected by the degrees of freedom, the value of the F statistic is the lowest. The interaction of $Bank \times Time$ is also jointly statistically significant, probably because during the sample period several banks experience restructuring to restore the damage of the financial crisis.

5 Empirical model and variables

5.1 Empirical Strategy

The models are estimated at the branch level. We use the variability in the branches that operate in the same census tract to control for the observed and unobserved heterogeneity in the demand with census-time fixed effects. The empirical specification assessing the probability of closing a branch is:

$$\begin{aligned} Pr\left(y_{it}=1\right) = & f\left(MktStruct_t^{m_i}, Branch_{it}, Restruct_{it}, \bar{X}_t^{m_i}, B_{it}\right) + \\ & + \eta_{Bank} + \eta_{Census \times Time} + \epsilon_{it} \end{aligned} \tag{4}$$

where $MktStruct_t^{m_i}$ is a vector of variables for the market structure of the relevant market of branch i, m_i; $Branch_{it}$ is a vector of the branch's characteristics (mainly, the age of the branch),

$Restruct_{it}$ identifies whether branch i belongs to a bank that is restructuring or whether it has been acquired after a bailout. The $\bar{X}_t^{m_i}$ is a vector of the characteristics of the competitors in the market, and B_{it} is a vector of the bank characteristics. The $\eta_{Census \times Time}$ are census-time fixed effects, and η_{Bank} are bank fixed effects that substitute for the return and risk characteristics of the bank in some specifications.

The time-census fixed effects $\eta_{Census \times Time}$ are captured by a dummy variable that takes the value of one for each census and year and zero otherwise. In the econometric estimation, the census tracts with only one branch are dropped from the sample estimation.

5.2 Variables

Table 3 presents the definition of the variables used in the analysis and the main statistics.

$\mathbf{MktStruct}_t^{m_i}$

$MktStruct_t^{m_i}$ is the vector of variables that identify the market structure, number of branches, number of banks, market share, concentration of the relevant market of each individual branch. More specifically, it contains:

$NBRANCHES_{it}$ is equal to the total number of branches in i's relevant market in year t. According to Proposition 2, we expect a positive association between the number of branches and the probability of closing one. Exit games determine the time of the exit strategically only if the interdependencies are sufficiently intense; otherwise the decision of each firm on exiting ignores the decision of others without strategic delays. Nonetheless, the effect of $NBRANCHES$ could decrease as the number of branches increases once the number is sufficiently high for practical perfect competition. To account for these potential nonlinear effects, we add $NBRANCHES$ and $NBRANCHES^2$ to the empirical model as explanatory variables. To be consistent with the proposition, we expect positive and negative coefficients for the respective variables.

$Id(NOCOMPETITORS)_{it}$ is a variable with the value of one if there are no other branches around branch i and zero otherwise. Thus, this variable identifies branches that operate as a local monopolist. Given that branches in our sample operate with free entry, branches operating without competitors are most likely natural monopolists: with positive sunken entry costs, a potential entrant anticipates negative economic profits and decides not to open. The natural monopolists earn economic profits without the threat of entry, so we expect a negative sign for the coefficient for the $NOCOMPETITORS$ variable.

$\%SAME\_GROUP_{it}$ is the ratio between, the number of branches of the parent bank in market i, and the total number of bank branches in the market of branch i. In other words, the market share of the bank in the local market is calculated in terms of their number of branches. According to Proposition 4, we expect a positive coefficient for this variable.

$CONCENTRATION_{it}$ is the HHI of concentration for the banks in local market i in time period t. The index is calculated for market i as the sum of the squared values of the market shares of each banking group (unit of command) in terms of the number of branches that fall within i's market. Proposition 6 predicts a negative sign for this variable.

Market concentration is an important policy variable to assess the potential level of competition in a market. In Table 4, we present specific information on the evolution over time of this variable obtained from all census tracts with at least one bank branch. The information on the value of the HHI concentration index is separated for census tracts with less than five branches in 2007, and tracts with five or more branches in 2007. Branch closings during this period increased market concentration, though the increase is higher in census tracts with more branches. In particular, in larger census tracts the inverse of the HHI index (number of equivalent equal-size banking groups in the market) has decreased from an average of six in 2007 to an average of four in 2014.

Branch variables ($\boldsymbol{Branch_{it}}$)

AGE_{it} is the number of years since the branch was first opened. We expect that this variable will capture the accumulated relationship capital. According to Proposition 1, we expect a negative association between the age of the branch and the probability of closing. The variable AGE also interacts with the share of bank branches of the parent bank in the market, $\%SAME\_GROUP_{it}$, to test for the prediction of Proposition 5. A negative estimated coefficient for the interactive variable indicates a positive cost to transfer relational capital among branches of the same bank.

Restructuring process of the bank (*Restruct*$_{it}$)

$Id(RESTRUCTURED)_{it}$ takes the value of one if the bank that owns branch i is restructuring in year t and zero otherwise. Restructuring banks are likely to be low performers compared with those that are not. The closing process could accelerate if customers abandon the branch if, consciously or unconsciously, they associate the disappearance of the bank with the closing of the branch. With these arguments, branch i could perceive a lower relative strength (p_i) if it is restructuring. Thus, according to Proposition 3, we expect a positive sign for $Id(RESTRUCTURED)_{it}$.

We define variables that identify the different restructuring processes to analyze if they have different effects on p_i and the probability of closing. The $Id(M\&A)_{it}$ takes the value of one if the branch operates for a bank that is the result of a M&A and zero otherwise. The $Id(ABSORBED)_{it}$ takes the value of one if branch i has been absorbed by the banking group. For instance, Grupo Santander absorbed the subsidiary Banesto in December 2012. Finally, $Id(ADJUDICATION)_{it}$ identifies branches that belonged to bailed out banks that have been sold under auctions to other banks. We expect a positive coefficient for all different types of restructuring processes that affect i's bank.

Characteristics of branch i's competitors ($\bar{X}_{it}^{m_i}$)

C: AVG AGE$_{it}$ is the average value of the age of all the competitors of branch i. The strategic behavior of branch i could lower the values of p_i for a higher average age of the competitors. That is, the older the branches of competitors, the higher their relationship capital. Thus, according to Proposition 3, branch i expects a lower probability of competitors exiting the market.

$Id(C : RESTRUCT)_{it}$ it takes the value of one if at least one of the competing branches is restructuring. In the strategic exit game, bank j may delay the closing of branch i under the expectation that the branch owned by a competitor bank that is restructuring will be more likely to exit the market (higher p_i). Therefore, the sign of the coefficient for this explanatory variable is expected to be negative.

For competing branches, we can also identify if they belong to banks that are restructuring. Thus, $Id(C : RESTRUCT)_{it}$ identifies branches with at least one competitor that is restructuring. Further, we also construct the variables that identify each type of restructuring process, that is, $Id(C : M\&A)_{it}$, $Id(C : ABSORBED)_{it}$, and $Id(C : ADJUDICATION)_{it}$. From Proposition 3, we expect a negative coefficient for these variables. A competitor that is restructuring is likely to be in a troubled position so the branch i will perceive a relatively high strength (high p_i) in front of competitors and exit will be delayed.

Characteristics of branch i's bank (B_{it})

This vector of variables explores how different characteristics of the bank owning branch i (bank j) influence the probability of its closure. From Proposition 3, low performing banks and branches are likely to exit earlier than high performers. We apply estimation strategies to account for differences in the banks' performance. One consists in adding bank fixed effects, η_{BANK} , to explain the likelihood of closing. The other consists on excluding the fixed effect from the list of explanatory variables, and instead adding the observable characteristics of banks.

$SHAREASSETS_{it}$: Market share in terms of total assets in the Spanish banking system of the bank that owns branch i. The sign of this variable could be positive if larger banks present a higher excess of capacity, or negative if they can cope better with the fall in the demand for banking services.

$RWA/ASSETS_{it}$: Risk-weighted assets with respect to total assets of bank j. If closures are more acute in less efficient, riskier banks, we expect a positive sign.

$EQUITY/ASSETS_{it}$: Capital ratio of bank j. We expect a negative coefficient if banks' soundness improves the capacity of the bank to cope with lower demand.

ROA_{it}: Returns on Assets. By the same token, we expect a negative coefficient.

$Id(INTERNATIONAL_{it})$: Dummy variable that takes the value of one for domestic banks with a significant volume of assets (branches) overseas. Following Bernard and Jensen (2007) we test if the presence of plants abroad influences the closing decision of plants in the home country; the sign and significance of the estimated coefficient are an empirical issue, although if international diversification helps in absorbing negative demand shocks at home the estimated coefficients of this variable should have a negative sign.

$Id(FOREIGN_{it})$: Dummy variable that identifies branches belonging to foreign banks. A positive coefficient means that foreign banks are more likely to exit the market if the conditions in the host country worsen.

$Id(BAILEDOUT)_{it}$ identifies branches that belong to bailed out banks. It differs from $Id(ADJUDICATION)_{it}$ in that banks are not necessarily sold to others through auction processes (i.e., Bankia was bailed out but it keeps on operating)

$Id(SAVINGSBANK)_{it}$ and $Id(CREDITCOOP)_{it}$ identify savings banks and credit cooperatives. The sign of the coefficients indicates whether the ownership form of the bank affects the decision to close and in what direction.

6 Results

6.1 Main specifications

Table 5 presents the results of the estimation of the model with time-census fixed effects to control for the evolution of observed and unobserved heterogeneity in demand conditions and the bank fixed effects to control for heterogeneity across banks. The table presents several specifications to account for possible differences in the measurement of the explanatory variables. The number of observations falls from 326,424 in the ANOVA analysis (Table 2) to 260,503 because the number of branches in the census tract for an observation is at least two in the data set.

Market Structure. The estimated coefficients for the market structure variables are in general statistically significant across all specifications, with a sign in line with that predicted in the theory section.

$NBRANCHES_{it}$ and $NBRANCHES^2_{it}$ are positive and negative and both statistically significant, respectively. These results mean that the effect on the probability of closing is positive and concave, and it decreases if $NBRANCHES$ >29 (only 1% of the local markets have more than 29 branches). This evidence is consistent with the prediction of Proposition 2 that the strategic interactions among closing decisions of individual branches become more and more independent as the market becomes larger.

The estimated coefficient for $Id(NOCOMPETITORS)$ is negative and statistically significant and shows that in local markets where a branch has no competitors, the probability of closing decreases by 4.4%. As the average probability of branch closing equals 4.4%, the estimated semi-elasticity equals 100%. The probability that branch i exits the market increases as the market share of the number of branches of the parent bank increases ($\%SAMEGROUP$ positive and statistically significant). This result is consistent with the prediction of Proposition 4. The negative estimated coefficient for the variable $CONCENTRATION$ indicates that the likelihood of branch closing is lower in markets where bank concentration is high. The explanation of this result is that market concentration facilitates tacit collusion, which supports Proposition 6.

Branch variables. The age of the branch decreases the probability of closing, which is in line with Proposition 1. Further, the negative and statistical significance of the coefficient for the interaction between the log of the age and the proportion of owned banks points towards a loss in the transfer of soft information among branches belonging to the same parent (Proposition 5).

Bank: Restructuring. Specification (1) introduces the dummy that identifies if the parent bank is restructuring or not, without differentiating the type of restructuring. The positive and statistically significant (at 1%) estimated coefficient for the restructuring variables shows that branches of restructuring banks are more likely to close. Proposition 3 relates this result to the consideration that banks that are restructuring are in a weaker situation than the rest of banks and, thus, they decide to close branches and exit the market.

Specification (2) replaces the dummy of restructuring with several dummies that each identifies a different type of restructuring. For the three kinds of processes considered, the coefficient is positive and statistically significant, though with different magnitudes. The increase in the probability of closing branches among bailed-out and adjudicated banks is almost three times as high as the probability of closing among banks involved in a M&A (0.193 and 0.068, respectively). The increase in the probability of closing is 11.6% in branches of banks that have been absorbed by the group.

Competitors. Specification (3) shows that a branch is more likely to close if the competitor is restructuring. Although one could expect a negative sign if restructuring is a signal of weaker competitors and, thus, a higher p_i (Proposition 3), Specification 4 shows that the positive contribution to the probability of closing comes from the restructuring of competitors via M&A. If competitors' restructuring has the form of absorption of the bank by the banking group, it decreases the probability of closing the reference branch, whereas it has no effects if the branch comes from a bailed-out, adjudicated bank. A potential explanation is that the resulting bank is perceived as stronger and, thus, the perceived relative strength of pi decreases. There were many M&As during the years of study (see Table 1) that were conducted to strengthen the financial position of the merging banks during the years of the crisis. If the M&A did not create redundancies in production capacity, banks could decide to close branches if one of their competitors becomes a branch of the bank resulting from the M&A.

Finally, in Specifications (3) and (4) we observe that the probability of closing a branch is not affected by the accumulated soft information of competitors, given that the average age of the competing branches is not statistically significant.

6.2 Effects of bank observed heterogeneity

Table 6 presents the results of the estimations when we include the explanatory variables of the bank. These specifications do not include bank fixed effects (only census-time fixed effects) because some of the variables present little of no variation over time. The remaining unobserved heterogeneity does not seem to bias the results, given that there are no significant changes in the sign and statistical significance of the coefficients of the variables included in Table 5.

The coefficients for *SHARE ASSETS* and *SHARE ASSETS*^{2} (positive and negative, respectively) show that the size of the bank has positive and marginally decreasing effects on the probability of closing a branch. We also find that the subsidiaries of foreign banks are more likely to close branches than domestic banks and that the probability of closing a branch owned by domestic banks operating internationally is around three percentage points lower than the rest of the banks. The branches of bail-out banks are 1% more likely to close than the rest of the branches. As for the effect of ownership, Specifications (3) and (4) of Table 6 show that the probability of closing is lower in savings banks (*cajas*) and credit cooperatives than among branches of commercial banks. Finally, we find that the financial strength and soundness of the parent bank also affect the decision to close a branch. Banks with higher profits (ROA), higher capital ratios ($EQUITY/ASSETS$), and lower risks ($RWA/ASSETS$) are less likely to close branches. That is, more profitable, more solvent, and less risky banks seem to have more strength to delay the decision to close a branch.

7 Discussion and conclusion

Massive closings of bank branches can cause two external negative effects that profit-maximizing banks likely ignore when making their individual closing decisions. First, the stabilizing effects of relationship banking in the working of the real economy (Bolton and Freixas, 2006) are weaker when distance between banks and their customers increases and banking relationships at the branch level is lost. Second, a branch closing might contribute to the spread of bank deserts (DeYoung et al., 2008) and, thus, to financial exclusion and poverty. The presence of these external effects could justify some regulation of branch closures.

A substantial reduction in banks' operating capacity through branch closings might be in response to a severe and time-enduring contraction of demand for bank services, or some other external shock that reduces the private value of branches as strategic assets (i.e., technological developments that lower transportation and information acquisition costs). Industry profits might deteriorate if strategic considerations lead banks to delay their individual decisions on branch closings; thus, sustaining the industry's operating capacity above market demand. Even in the absence of these external effects, the time path of branch closings that result from the rational individual decision of banks might not match the welfare-maximizing path that the regulators want.

The goal of this paper is to gain a better understanding of the factors that explain why a branch closes down during a delimited time period. It provides some insights on the potential conflicts between private and social goals on the size and spatial location of the branches. First, we acknowledge that the relevant markets in retail banking are local because distance matters. Therefore, there are few competing bank branches in a given local market, and, consequently, there are strategic considerations when banks decide whether or not to close a given branch. From the IO literature, general results on games of market exit in oligopoly markets highlight that under imperfect competition, the time to exit is not necessarily determined by the rule that less efficient plants close before more efficient ones (Ghemawat and Nalebuff, 1985; Fudenberg and Tirole, 1986; Whinston, 1988; Reynolds, 1988).

Second, we use the age of the branch as a proxy variable for the importance of relationship banking. We assess whether relationship capital matters in the decision on closing a bank that profit-maximizing banks make because they want to protect relational banking. For example, we assess whether relationship capital is easy to transfer from one branch to another branch of the same parent by comparing the effect of the age of the branch on the probability of closing when the parent bank has only one branch in the market or when it has two or more.

We test the postulated strategic interdependencies among banks' decisions to close branches and the mediation effects of the distance with data on the geo-location of the population of branches in Spain during the period from 2007 to 2014. During this period, the industry has reduced the size of the network of bank branches in Spain by more than 30%, after years of two-digit growth in bank credit. During the years of the crisis, the balance sheets of Spanish banks have shrunk mainly because of the negative growth in credit. Besides, industry concentration has increased due to M&As, and the cajas have become for-profit banks. Given the deep industry restructuring might influence the decision on branch closure, we also address some research questions related to this issue. In particular, regulators view M&As as a way to speed up the capacity reduction through branch closing, reducing costs, and increasing current profits. But M&As also increase market concentration and, if market concentration slows down the process of branch closures, then M&As could be an ineffective tool to enhance capacity reduction. Additionally, the cajas were not-for-profit commercial banks (Hansmann, 2009) with the social mission of contributing to financial inclusion, so it makes sense to analyze whether the probability to close a branch is different in cajas than in the rest of banks.

The empirical strategy follows Jiménez et al. (2012) and exploits the variability observed across local markets that belong to the same census area whose changing demand conditions are controlled for. The results of the empirical analysis confirm that closure decisions respond to the strategic interdependencies that could be expected when the structure of markets are oligopolies and natural monopolies. In particular, we find evidence that the probability of a branch closing is lower in branches with no competitors in their local market, probably because the entry of a new competitor would imply losses for the two branches, and one branch standing alone can earn monopoly rents without being challenged by new entrants. In markets with two or more branches, we also observe that interdependencies decrease with the size of the market and that the probability of closing is lower in more concentrated local markets than in less concentrated ones. Therefore, branch closures are similar to the theory in the IO literature that in oligopoly markets, the exit pace is not necessarily the one that minimizes the cost of the industry. The empirical results also support the premise that the probability of closing is higher among branches that belong to restructuring banks, which is in line with the target of regulators of increasing the speed of capacity reduction. However, this effect could be at least partially offset by another effect with the opposite sign: M&As favor banking concentration and, as we have just said, more concentration lowers the probability of closing. Therefore, the restructuring of the excess of capacity in banks will be more effective if it minimizes the increase of their concentration in local markets.

The age of the branch and the market share of the parent bank in the local market are negatively correlated with the probability of that branch exiting the market. On the one hand, the first result might indicate that some assets of older branches are more valuable in the local market and that younger branches do not have sufficient time to accumulate it. Also, it might mean that older branches have already passed the evaluation test about their true efficiency while younger firms are still uncertain, or that younger branches do not meet the demand expectations under which they opened. On the other hand, the finding that branches of banks with higher market share are more likely to close is consistent with the existence of strategic interdependencies among branches, and the hypothesis that banks with higher market share close a branch to capture a larger fraction of the increase in market profits from the resulting capacity reduction. For further clarification on the meaning of the negative effect of age of the branch in the likelihood of closing, we include the interaction of the age of the branch and the market share of the parent bank in the local market as an explanatory variable of the model. If relationship capital can be transferred from one branch to another of the parent bank, then there would be no reason to delay the closing of older branches because the relationship capital could be preserved. However, we obtain a negative coefficient for this variable, where parent banks are more likely to close (if any) younger branches; that is, relationship capital matters and it cannot be fully preserved.

Another result of the paper is that the probability of closing is lower among branches of cajas than among branches of for-profit banks. This result is obtained after controlling, among other factors, for the financial strength of the bank and for whether the branch belongs to a bank that is being bailed out or not. One plausible explanation is that cajas contributed to financial inclusion because of their social mission, and they internalized the negative social externalities of branch closings more than for-profit banks. The old cajas that survived the crisis became shareholder banks. Given that the mission of contributing to financial inclusion is no longer binding for these banks, public authorities should consider whether financial inclusion is a social goal to be pursued and, if so, provide alternative means to the cajas.

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Table 1: Bank restructuring in Spain

Year	Number Deposit Institutions	Number Banking Groups	Number M&A (a)	Number Branches					Branches per 10,000 inhab (b)	Number Employees per Branch
				(1)+(2)	Commercial Banks(1)	Savings Banks(2)	Credit Coop	Foreign		
2006	276	87	2	37,292	13,835	23,457	4,771	1,297	11.8	4.6
2007	282	89	7	38,850	14,213	24,637	4,953	1,362	12.0	4.5
2008	285	88	4	39,193	14,158	25,035	5,097	1,457	12.0	4.4
2009	283	88	8	37,718	13,466	24,252	5,043	1,413	11.6	4.4
2010	278	62	12(23)	36,593	13,843	22,750	5,019	1,408	11.2	4.4
2011	247	59	6 (10)	33,714	-	-	4,890	1,311	10.4	4.5
2012	232	55	11 (16)	32,033	-	-	4,732	1,222	10.0	4.5
2013	227	50	8 (11)	27,848	-	-	4,511	1,223	8.9	4.7
2014	223	51	8 (8)	25,790	-	-	4,416	1,670	8.3	4.7

Notes: (a) In parentheses, number of banks involved in M&As, (b) Number of branches per 10,000 inhabitants aged 16 years or older

Table 2: Analysis of Variance (ANOVA) of closure of branches

$Dep_{it} = 1$ **if branch** i **exits at** t								
	Specification I				Specification II			
	Partial SS	df	F	p-value	Partial SS	df	F	p-value
CENSUS	60.91%	18,329	1.28	0.00	14.01%	18,329	1.30	0.00
BANK	19.89%	208	36.97	0.00	3.28%	208	25.88	0.00
TIME	19.20%	7	1,060	0.00	4.71%	7	1,060	0.00
CENSUS × *TIME*				69.00%	109,967	1.11	0.00	
BANK × *TIME*				8.99%	1,104	14.34	0.00	
R^2	11.35%				49.28%			
N	326,424				326,424			

Note: All the groups of variables are jointly statistically significant at 1%

ANOVA of the probability of closing explained with dummy variables that identify census tract, year, bank and their interactions

Table 3: Closure of branches with census tract-year fixed effects

Variable	Units	Definition	Mean	Std.Dev.	$p10^{th}$	$p50^{th}$	$p90^{th}$
Dependent Variable							
BRANCH CLOSED	0/1	=1 if branch is closed at time t and 0 otherwise	0.044	0.206	0	0	0
Independent Variables							
Market Structure							
Id(NO COMPETITORS)	0/1	=1 if there are no competitors around the branch within a radius of 150m	0.196	0.397	0	0	1
%SAME GROUP	$[0, 1]$	Proportion of branches competing with branch i that belong to i's banking group	0.429	0.320	0.118	0.333	1
NBRANCHES	Units	Number of branches competing with i, located within the radius of 150m around i	4.656	3.742	1	4	10
CONCENTRATION	$[0, 1]$	HHI of the number of branches competing with i by banking groups	0.430	0.316	0.133	0.333	1
Bank:Restructuring							
Id(RESTRUCTURED)	0/1	=1 if bank j is under any of the restructuring processes detailed below	0.142	0.349	0	0	1
Id(ABSORBED)	0/1	=1 if the brand of bank j is absorbed by its bank group, and 0 otherwise	0.026	0.160	0	0	0
Id(M&A)	0/1	=1 if bank j results from the M&A with another bank, and 0 otherwise	0.084	0.277	0	0	0
Id(ADJUDICATION)	0/1	=1 if branch i belonged to a bank that has been bailed out and sold to bank j, and 0 otherwise	0.032	0.175	0	0	0
Branch							
AGE	Units	Number of years that branch i has been operating	18.51	1.880	9	22	28
Competitors							
Id(C:RESTRUCT)	0/1	=1 if at least one competitor of branch i belongs to a bank under restructuring, and 0 otherwise	0.276	0.447	0	0	1
Id(C:ABSORBED)	0/1	=1 if at least one competitor of branch i belongs to a bank whose brand is absorbed by its banking group, and 0 otherwise	0.089	0.285	0	0	0

(*Continues next page*) ...

Table 3: (Cont.)

Variable	Units	Definition	Mean	Std.Dev.	p10th	p50th	p90th
Id(C:M&A)	0/1	=1 if at least one competitor of branch i belongs to a bank resulting from a M&A, and 0 otherwise	0.179	0.383	0	0	1
Id(C:ADJUDICATION)	0/1	=1 if at least one competitor of branch i belonged to a bailed-out bank sold to another bank, and 0 otherwise	0.089	0.285	0	0	0
Id(C:AVG AGE)	Units	Average age of branch i's competitors	22.47	1.548	13.33	23.17	27
Bank:Characteristics							
SHARE ASSETS	[0.1]	Market share of the bank in terms of total assets held in Spain	0.084	0.106	0.008	0.040	0.342
Id(INTERNATIONAL)	0/1	=1 if bank j is a domestic bank with significant international presence, and 0 otherwise	0.168	0.373	0	0	1
Id(FOREIGN)	0/1	=1 for domestic banks with significant international presence, and 0 otherwise	0.027	0.161	0	0	0
ROA	$[0, 1]$	Return on assets of bank j	0.002	0.013	-0.003	0.004	0.011
EQUITY/ASSETS	$[0, 1]$	Ratio of own funds over total assets of bank j	0.058	0.020	0.038	0.060	0.077
RWA/ASSETS	$[0, 1]$	Ratio of risk-weighted assets over total assets of bank j	0.591	0.121	0.439	0.564	0.768
Id(SAVINGS BANK)	0/1	=1 if bank j is a savings bank, and 0 otherwise	0.532	0.499	0	1	1
Id(CREDIT COOP)	0/1	=1 if bank j is a credit cooperative, and 0 otherwise	0.117	0.322	0	0	1
Id(BAILED OUT)	0/1	=1 if bank j has been bailed out, and 0 otherwise	0.338	0.473	0	0	1

Table 4: Bank restructuring in Spain

Year	TOTAL				N> 5 in 2007				N≤ 5 in 2007			
	Ncens	Avg	Sd.Dev	1/HHI	Ncens	Avg	Sd.Dev	1/HHI	Ncens	Avg	Sd.Dev	1/HHI
2007	18,089	0.648	0.326	1.543	1,372	0.169	0.056	5.907	16,717	0.687	0.307	1.455
2008	18,119	0.647	0.326	1.545	1,372	0.169	0.056	5.920	16,747	0.686	0.308	1.457
2009	18,040	0.648	0.326	1.543	1,372	0.170	0.057	5.882	16,668	0.688	0.307	1.455
2010	17,733	0.661	0.323	1.514	1,372	0.187	0.067	5.351	16,361	0.700	0.304	1.428
2011	17,560	0.668	0.322	1.498	1,372	0.197	0.074	5.087	16,188	0.708	0.302	1.413
2012	17,023	0.681	0.318	1.469	1,372	0.214	0.084	4.663	15,651	0.721	0.298	1.386
2013	16,686	0.687	0.317	1.455	1,372	0.223	0.091	4.482	15,314	0.729	0.296	1.372
2014	15,956	0.701	0.313	1.426	1,371	0.247	0.116	4.042	14,585	0.744	0.292	1.345

Table 5: Closure of branches with bank & census-year fixed effects

$Dep_{it} = 1$ if branch i exits at t	(1)	(2)	(3)	(4)
Market Structure				
Id(NO COMPETITORS)	-0.044***	-0.044***	-0.044***	-0.044***
	(0.007)	(0.007)	(0.007)	(0.007)
%SAME GROUP	0.408***	0.399***	0.408***	0.398***
	(0.020)	(0.020)	(0.020)	(0.020)
NBRANCHES	0.007***	0.007***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)
NBRANCHES^2	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
CONCENTRATION	-0.213***	-0.209***	-0.212***	-0.207***
	(0.018)	(0.018)	(0.018)	(0.018)
Bank:Restructuring				
Id(RESTRUCTURED)	0.119***		0.121***	
	(0.003)		(0.004)	
Id(ABSORBED)		0.116***		0.111***
		(0.005)		(0.006)
Id(M&A)		0.068***		0.072***
		(0.005)		(0.005)
Id(ADJUDICATION)		0.193***		0.195***
		(0.007)		(0.007)
Branch				
ln *AGE*	-0.055***	-0.056***	-0.055***	-0.055***
	(0.002)	(0.002)	(0.002)	(0.002)
ln *AGE*×*%SAME GROUP*	-0.032***	-0.031***	-0.032***	-0.031***
	(0.004)	(0.004)	(0.004)	(0.004)
Competitors				
Id(C:RESTRUCT)			0.008***	
			(0.003)	
Id(C:ABSORBED)				-0.008**
				(0.003)
Id(C:M&A)				0.009***
				(0.003)
Id(C:ADJUDICATION)				0.003
				(0.004)
ln(*C:AVG AGE*)	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)
N.Observations	260,503	260,503	260,503	260,503
Fixed Effects				
Census x Time	Yes	Yes	Yes	Yes
Bank	Yes	Yes	Yes	Yes

Notes: Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

All models are estimated with linear probability models using least squares. Standard errors clustered at census tract-year level. Variable definitions and statistics are in Table 3

Table 6: Closure of branches with bank characteristics

$Dep_{it} = 1$ if branch i exits at t	(1)	(2)	(3)	(4)
Market Structure				
Id(NO COMPETITORS)	-0.049***	-0.047***	-0.049***	-0.047***
	(0.009)	(0.009)	(0.009)	(0.009)
%SAME GROUP	0.460***	0.444***	0.457***	0.443***
	(0.026)	(0.026)	(0.026)	(0.026)
NBRANCHES	0.006***	0.007***	0.006***	0.006***
	(0.002)	(0.002)	(0.002)	(0.002)
$NBRANCHES^2$	-0.000***	-0.000***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
CONCENTRATION	-0.235***	-0.230***	-0.236***	-0.229***
	(0.024)	(0.024)	(0.024)	(0.024)
Bank:Restructuring				
Id(RESTRUCTURED)	0.113***		0.113***	
	(0.003)		(0.004)	
Id(ABSORBED)		0.124***		0.125***
		(0.006)		(0.006)
Id(M&A)		0.078***		0.076***
		(0.004)		(0.004)
Id(ADJUDICATION)		0.189***		0.186***
		(0.008)		(0.008)
Branch				
$\ln AGE$	-0.057***	-0.059***	-0.058***	-0.059***
	(0.002)	(0.002)	(0.002)	(0.002)
$\ln AGE \times$ *%SAME GROUP*	-0.039***	-0.037***	-0.038***	-0.037***
	(0.006)	(0.006)	(0.006)	(0.006)
Competitors				
Id(C:RESTRUCT)	0.009***		0.009***	
	(0.003)		(0.003)	
Id(C:ABSORBED)		-0.009**		-0.009**
		(0.004)		(0.004)
Id(C:M&A)		0.011***		0.011***
		(0.004)		(0.004)
Id(C:ADJUDICATION)		0.003		0.003
		(0.005)		(0.005)
ln(*C:AVG AGE*)	0.003	0.002	0.002	0.002
	(0.002)	(0.002)	(0.002)	(0.002)
Bank: Characteristics				
SHARE ASSETS	0.447***	0.496***	0.456***	0.503***
	(0.044)	(0.044)	(0.046)	(0.045)
$SHARE\ ASSETS^2$	-0.843***	-0.930***	-0.884***	-0.958***
	(0.086)	(0.086)	(0.090)	(0.089)
Id(INTERNATIONAL)	-0.028***	-0.033***	-0.034***	-0.035***
	(0.004)	(0.004)	(0.005)	(0.005)
Id(FOREIGN)	0.018***	0.017***	0.014***	0.017***
	(0.004)	(0.004)	(0.004)	(0.004)
ROA	-0.683***	-0.717***	-0.776***	-0.761***

(*Continues next page*) ...

Table 6: (Cont.)

$Dep_{it} = 1$ if branch i exits at t	(1)	(2)	(3)	(4)
	(0.135)	(0.135)	(0.139)	(0.140)
EQUITY/ASSETS	-0.509***	-0.654***	-0.396***	-0.568***
	(0.060)	(0.059)	(0.068)	(0.067)
RWA/ASSETS	0.085***	0.091***	0.062***	0.075***
	(0.011)	(0.011)	(0.013)	(0.013)
Id(SAVINGS BANK)			-0.014***	-0.007**
			(0.003)	(0.003)
Id(CREDIT COOP)			-0.011***	-0.004
			(0.004)	(0.004)
Id(BAILED OUT)			0.010***	0.010***
			(0.003)	(0.003)
N.Observations	198,353	198,353	198,353	198,353
Fixed Effects				
Census x Time	Yes	Yes	Yes	Yes
Bank	No	No	No	No

Notes: Standard errors in parentheses

* p<0.1, ** p<0.05, *** p<0.01

All models are estimated with linear probability models using least squares. Standard errors clustered at census tract-year level. Variable definitions and statistics are in Table 3

Figure 1: Census tracts in Madrid downtown

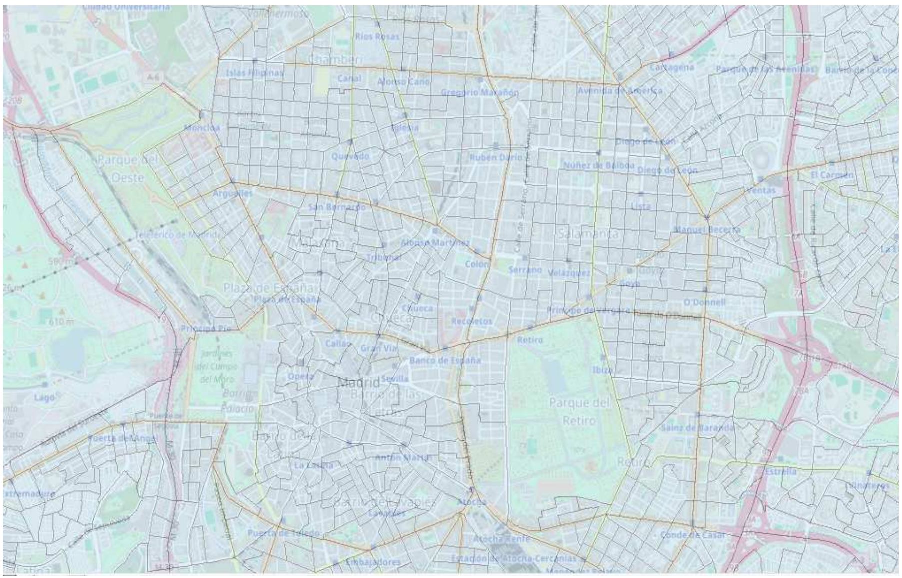

Figure 2: Branches and their relevant markets in Madrid downtown, 2007