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The Case of Portugal**

Pedro Pita Barros
Universidade Nova de Lisboa and CEPR
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Pedro Pita Barros*

Universidade Nova de Lisboa and CEPR

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Abstract

The deregulation of the Portuguese banking industry from a system with administratively fixed interest rates and entry controls to a freer market regime has been steady over the last decade. Removal of entry constraints has given rise to strong growth in branches as the result of a post-entry game.

Behavior differences between incumbents and entrants are observed. Surprisingly, no response of incumbents to entrants is found. Incumbent banks seem to follow each other in expansion patterns. Among incumbents, privatized banks were more prone to branch expansion, revealing a strong effect associated with entry by acquisition.

JEL Classification: G21

Key Words: Banking, Post-entry Performance, Branching

* Correspondence to: Pedro Pita Barros, Faculdade de Economia, Universidade Nova de Lisboa, Travessa Estêvão Pinto, P-1000 Lisboa, Portugal, Phone: 351-1-69 36 24, Fax: 351-1-388 60 73, Email: ppb@feunl.fe.unl.pt.

1 Introduction

The evolution of the Portuguese banking sector provides a natural environment in which to study episodes of entry and the subsequent post-entry game. Entry was forbidden for the decade before 1984. After removal of legal barriers, the market experienced entry of new, private, institutions, followed shortly thereafter by a strong branching episode, featuring incumbents and entrants alike. Entry was both *de novo* and by acquisition (privatization of state-owned banks).

Firms' growth pattern after entry has received some attention in the economics literature, with emphasis on cross-section studies. Analysis of post-entry effects over a cross-section of industries has found several stylized empirical facts. Two of them, pointed out in Geroski (1995), are: (a) marketing activities are frequently used by incumbents in post-entry games against entrants; (b) the response of incumbents to entry is selective. These empirical facts have a clear counterpart in banking. Branching strategies are a main feature of post-entry games in the banking sector, playing the role of marketing activities in other industries as a response variable to entry. Entrants are usually small and grow slowly and by increase in the number of branches. Incumbents may react to entry by matching branch growth of new banks.

Several reasons make the exercise interesting. First, individual industry studies are likely to generate different insights than cross-section studies of industries. A line of theoretical literature argues that incumbents' reactions to entry may play a role in entrants' growth patterns.¹ Second, the banking sector provides a very clear variable for the testing of reactions to entry, i.e. the number of branches. Third, integration of European economies and the construction of the Common Market implies almost free entry into all European Union countries by banks located in other member states. Incumbents' likely reaction remains largely unknown. This episode of post-entry growth of new banks and incumbents reaction to it may help to identify effects of the new European banking Directives.

The empirical analysis suggests that incumbents and entrants have behaved differently. Estimates show significant differences between these groups of banks. Also, a more intense expansion pattern can be attributed entrants by acquisition than to *de novo* entry.

The paper is organized as follows. The next section presents a brief description of the Portuguese banking industry, with particular focus on branching. Section 3 presents the empirical model. Section 4 discusses the data and econometric procedures. Next, in Section 5, the results are reported. Finally, Section 6 concludes.

2 The Portuguese banking sector

The last two decades have witnessed very profound changes in the Portuguese banking sector. Most of them have been induced by changes in the regulatory environment. In addition, the emergence

¹See Cubbin and Domberger (1988), Dunne, Roberts and Samuelson (1989b), Gilbert (1989) and Lieberman (1987).

of new technologies and competition from other financial institutions, together with fluctuations in economic conditions, have modified the economic environment for banking operations.

One year after the April 25th Revolution in 1974, Portuguese banks were nationalized (foreign institutions were not affected). For nearly a decade the bulk of the Portuguese banking system was state-owned (more than 95 % of the market). Regulation was present in every aspect of the banking industry: interest rates were set by the central bank (Banco de Portugal), credit ceilings and several restraints to entry in the market and to the opening of new branches were imposed. In particular, private banks were banned by law. The scope for competition was rather limited.

The second half of the eighties was characterized by further fundamental changes in the industry, this time in the opposite direction. A gradual process of deregulation started in 1984, with a law re-opening banking activities to private banks. A privatization program was initiated in 1989 and is still under way.

Since only a few entrants are observed, the usual age cohorts groups are collapsed into just two categories: 'old' and 'new' banks. Old banks are defined as institutions that were present in the market before 1984. New banks are defined as those that started operating in the Portuguese market after 1984.

In the first year following legal approval new private banks entered the market. Entrants were both domestic and foreign-owned. The former have been more successful in building a branch network. Foreign banks have restricted themselves, in the majority of cases, to wholesale activities. Only two of the latter have tried to enter retail markets. Their experience has been disappointing when compared with other new Portuguese banks.

Privatization programs for state-owned banks have made entry by acquisition possible. The change in ownership may also mean a change in managerial expertise or objectives. This constitutes a type of entry which is distinct from *de novo* entry.

Soon after entry of these new institutions, a rapid increase in branch networks took place, beginning roughly in 1988. Between 1988 and 1992, the number of branches almost doubles (from 1566 to 2839). Curiously, this increase was due not only to new banks. Incumbent banks have also expanded their networks heavily.

Restrictions on network growth have decreased over the last decade and reached complete freedom in 1993. In the first years of the deregulation process, in the late eighties, the requirement of opening one branch out of five in an area designated by the Portuguese authorities kept the costs of branch expansion high. More importantly, these costs were not just sunk costs. Opening an extra branch imposed a permanent extra cost on of banks.

Later, that requirement was removed. Instead, a flat fee was to be paid by the bank when opening a branch. The change to an explicit fee implies a very different effect upon banks' decisions. It is a sunk cost. The branching trend was reinforced following this change. Finally, in 1993, all restrictions on branching were removed.

Table 1: International Comparison

Country	Number of inhabitants per branch	Population density	Branch density
Belgium (1987)	1807	323	0.179
Denmark (1987)	1497	119	0.079
France (1987)	2176	101	0.046
Italy (1987)	4192	190	0.045
FR Germany (1987)	1530	245	0.160
Netherlands (1987)	1978	427	0.216
Spain (1987)	1191	76	0.063
U.K. (1987)	1896	231	0.122
Portugal (1992)	3641	113	0.031

Source: Neven (1990) and Portuguese Bankers Association

Despite the considerable increase in the number of branches, the Portuguese network is still short of the branch density achieved in other countries. Some international comparisons are shown in Table 1. Portugal is the country with the lowest number of branches per square kilometer. When looking at the ratio of population to branches, Portugal exhibits one of the highest values, despite the considerable dispersion across countries. Comparison with countries with a similar geographic dispersion, France and Denmark, reveals a considerably lower intensity of branching in Portugal. The comparison can be somewhat misleading in that it does not take differences in the level of economic development into account. Nevertheless, the broad picture is one of lower branching intensity in Portugal.

Models of spatial location suggest that free-entry market allocations will give rise to excessive entry.² Restrictions and 'extra-costs' in the opening of new branches may have held back over-branching in the Portuguese market, making it a case more favorable from a social viewpoint. More important, however, is that unleashing market forces presumably leads to a steep increase in the number of branches. Structural elements may help to shape the behavior patterns, but strategic interaction with rivals is also a potentially important explanation of the branching pattern.

The branching decision may vary across broad groups of banks. Two distinct partitions of banking institutions may be relevant: according to ownership or according to the age of the bank.

Three groups of banks can be identified by the type of ownership: state-owned, private and foreign banks. The state-owned banks group is made up solely of old banks, which were, mostly, nationalized in the aftermath of the 1974 Revolution. The group of private banks includes both new and old (re-privatized) banks. Finally, in the foreign-owned group, banks are mainly newcomers to the market.³

The next table presents some statistical information on presence in local markets according to type of institution. Besides the total number of branches, Table 2 presents the number of markets covered, defined simply as the sum of the number of markets where a bank operates divided by the

²See Tirole (1988) for a presentation of such models.

³Foreign banks were not nationalized in the revolutionary period. Only one foreign had a retailing strategy.

Table 2: Summary sample information

		Age		Ownership			Total
		Old	New	State-owned	Private	Foreign	
Branches	1992	2270	494	1173	1470	121	2764
	1991	2020	416	1097	1261	78	2436
	1990	1743	194	1007	901	29	1937
Average number of branches	1992	174.6	82.3	195.5	163.3	30.3	145.5
	1991	155.4	69.3	182.8	140.1	19.5	128.2
	1990	134.1	32.3	167.8	100.1	7.3	101.9
Markets Covered	1992	1352	225	743	769	65	1577
	1991	1259	179	724	677	37	1438
	1990	1186	93	706	558	15	1279
Banks		13	6	6	9	4	19

number of banks in group S . It is defined algebraically as $\sum_{i \in S} \sum_{m \in M} 1(i, m)$, where $1(i, m)$ is the indicator function of the presence of bank i in market m . The last indicator in Table 2, 'spatial coverage,' measures the extent of market coverage. It is defined as the number of markets covered divided by the number of markets multiplied by the number of banks in set S .⁴ Market coverage is complete if each bank has at least one branch in every local market. It ranges from zero to one. It should be noted that intensity of presence is not captured by in this measure. All local markets have at least one branch of some bank operating there. In this sense, market coverage is complete as long as every market is served by at least one branch. Our notion of complete market coverage requires more than this: every market should be served by at least one branch of each bank.⁵

Despite the very significant difference in network size between old and new banks, expansion patterns reveal several important facts. As expected, old firms have a more extensive network of branches than new firms. In terms of dynamic effects, expansion was much stronger in 1991 than in 1992 for new banks, while the effort remained fairly constant for old banks. A response by incumbent banks appears to have been triggered. Nevertheless, their share of total branches declined (90% in 1990; 82% in 1992). The relative expansion effort was stronger for new banks. In two years, they increased 2.5 times their overall network. It is also worth noting the relatively more important effort of branching by foreign banks, even if small in absolute value.

The partition of the sample along age cohorts conceals other important differences. The partition according to ownership adds some new facts. Private banks, whether old or new, have been a significant driving force of branch growth. On the other hand, the 1992 slowdown in expansion is common to all three categories. An implication is that 'reaction' of old banks to entrants' growth can be found mainly in private banks.⁶ An explanation is that privatization *per se* may have changed the objective functions of managers. A direct result of this could be the desire to increase

⁴This normalizes the measure relative to the set size.

⁵In economic terms, it ensures that customers have access to the full range of services and prices offered in general in the market.

⁶Note that old private banks are re-privatized banks. To a considerable extent they have inherited the branch network.

the number of branches. The empirical application will try to identify whether motivations of privatized banks are different from other banks (pure effect of privatization versus strategic effects shared by other private or old banks).

Spatial coverage has increased in all partitions. Nevertheless, private banks exhibit a more spatially-concentrated network. Despite a higher absolute number of branches, their market coverage is considerably smaller than that of state-owned banks. Consequently expansion patterns may have differed between private and state-owned banks. Foreign banks clearly lag behind in their spatial coverage.

Substantial differences in branching strategies seem to underlie the evolution of the Portuguese banking industry. In addition, strategic interaction elements appear to permeate branching decisions. A more careful analysis of branch growth is thus warranted. The next section is devoted to such analysis.

3 An empirical model of branch growth

As mentioned above, strong branch growth followed the entry of new banks. Moreover, the pattern of network expansion differed across types of institutions.

The pattern of branching in Portuguese commercial banking has motivated earlier work by Cabral and Majure (1993) (for the period 1988–91). These authors present a theoretical model of branching, addressing to the main stylized features of the observed branch expansion. They find customer loyalty and bank efficiency to be substitute motives as growth motivations. Banks with a strong and loyal customer base may wish to expand its branch network at the threat of entry. On the other hand, more efficient banks have a higher expected profit from expansion. The empirical results of Cabral and Majure lend some support to the hypothesis that old banks expanded due to the first effect and efficiency arguments underlied new banks' expansion. We depart from their analysis in two ways. First, no structural model of the post-entry game is estimated. Refraining from the imposition of a particular functional form, a greater richness of possible behavior is allowed. Second, the cross-section of markets is finer.

Expansion of banking networks can be due to either supply- or demand-side effects. A higher demand for banking services leads naturally to a profitable expansion of networks. Satisfying new needs is the motivation for branch increase. The economic growth experienced since 1988 in the Portuguese economy can be one reason for the strong network growth, as well as increased sophistication of national consumers.

On the supply side, competition in non-price variables, especially for deposits, may also justify a high rate of branching expansion. Branching can be seen as a way of providing product differentiation. And in a context of increased competition, product differentiation allows the firm to retain some market power. Non-price competition through location can be quite relevant in the deposits market, where the introduction of short term, highly remunerated, deposit accounts has

been the main visible effect of increased price competition.⁷

The post-entry game between incumbents and entrants was characterized, to a considerable extent by competition in branching decisions. The fundamental decision of a bank with respect to its branch network consists in the choice of markets in which to open branches, and how many to open. A full structural model of the design of a bank's network of branches implies the modeling of profits as a function of own and competitors' network choices. A bank might be modeled as choosing a new network structure in each period, taking into account both its own sunk investments in the existing network and its expectation of rivals' choices. However, a model with such features would be too complex to analyze econometrically. Instead, a partial equilibrium approach is followed and banks are assumed to make independent decisions of presence in each particular local market.

Post-entry decisions over branching (expansion/contraction of networks) are more easily captured by flow variables, such as the change in the number of branches.⁸ The modeling of banks' behavior is based on two simple assumptions: (1) banks have branches in a market if it is profitable to do so; and (2) the number of branches in a market is chosen so that it maximizes local market profits. A Nash equilibrium is defined, which implies a myopic behaviour of banks. They do not anticipate rivals' reactions.

As to post-entry reactions, this means that expansion/contraction of existing networks should be observed whenever it is profitable. Opening and closing branches entail adjustment costs to the bank which need not be symmetric (that is, entry and exit costs may differ). Expansion in the number of branches by a given bank is set so that maximizes local market profits, net of adjustment costs. Bank i 's profits are determined by its number of branches, rivals' branches and demand-intensity variables, that is:

$$\Pi_{itm} = \Pi_t(n_{im}(t), n_{-im}(t), X_m), \quad (1)$$

where $n_{im}(t)$ is own branches in market m at moment t , $n_{-im}(t)$ is rivals' branches and X_m is a vector of market demand variables.

Adjustment costs are given by $C(\Delta n_{im}(t), n_{im}(t-1), X_m)$ where $\Delta n_{im}(t)$ is the change in the number of branches of bank i in market m from moment $t-1$ to moment t . This function allow for asymmetry between expansion and contraction costs.⁹

Expansion of a bank's network in market m should be observed if

$$\begin{aligned} \Pi(n_{im}(t-1) + \Delta n_{im}(t), n_{-im}(t-1) + \Delta n_{-im}(t), X_m) - C(\Delta n_{im}(t), n_{im}(t-1), X_m) &\geq (2) \\ &\geq \Pi(n_{im}(t-1), n_{-im}(t-1) + \Delta n_{-im}(t), X_m). \end{aligned} \quad (3)$$

⁷Between 1991 and 1992 there was a substantial increase in deposits market competition. See Barros and Leite (1994).

⁸This presumption was confirmed by preliminary model estimates with the number of branches as the dependent variable. Taking as a regressor the number of branches in the previous period, a unitary coefficient could not be statistically rejected.

⁹A period may correspond to more than a calendar year. Profit and cost functions can be regarded as discounted values of expected future flows.

Whenever this condition is fulfilled, the optimal value of expansion is determined by

$$\Delta n_{im}^*(t) = \arg \max_{\{\Delta n_{im}(t)\}} \Pi(n_{im}(t-1) + \Delta n_{im}(t), n_{-im}(t), X_m) - C(\Delta n_{im}(t), n_{im}(t-1), X_m). \quad (4)$$

Two main sets of explanatory variables are included as profit determinants. The first one has demand-related variables. The other one includes supply-side variables capturing elements of strategic interaction between banks.

The demand-side variables are local-market permanent characteristics, which presumably determine differences in intensity of demand for banking services across regions. The relevant market characteristics should include population, level of personal income, level of economic activity and so on.

The specific variables considered are population per square kilometer, *POP*, income per capita proxied by income tax payments per capita, *TAX*, and average manufacturing wage, *WAV*, the number of firms in the market (normalized for geographical size), *FIRM*, the number of tourist nights spent within the market (normalized for geographical size), *TOUR*, a dummy variable for administrative district capitals, *CAP*, a dummy variable for the two main cities, Lisbon and Oporto, which function as the financial centers of the country, *LP*, and dummy variables for the status of the market as urban or rural. Two definitions of urban status were employed. In the first definition, the criterion to classify regions in urban or rural categories is based on a population threshold. Local jurisdictions with more than ten thousand inhabitants are classified as urban markets. The variable is denoted by *HAB*. The second definition is also constructed upon a population criterion. A local market is tagged urban if it has a population density (per square kilometer) equal to or higher than the lowest one for district capitals. The variable is represented by *URBAN*.

Supply-side variables included are rivals' relative position in the market, according to its type (state-owned, private and foreign; or old and new), with both linear and quadratic terms. Variables are denoted by *BROLD* and *BRNEW* for branches (relative to total branches in the market) of old and new banks, respectively.

Besides rivals, the density of branches in the market, *BRANCH*, defined as the total number of branches per square kilometer, as well as last period own market position, *OWN*, defined as the local market share of branches, may influence the expansion decision.

The theoretical model predicts that demand intensity variables should have a positive sign. A higher demand for banking services motivates, naturally, a bigger expansion of networks. Qualitative variables such as dummies for urban status, capital of administrative districts and Lisbon and Oporto markets are also expected to be positively associated with more intense branch growth, as other elements associated with them may exist which give rise to a more intense demand for banking services.

With respect to supply-side variables, initial coverage of the market (evaluated as its branch density) and position of the bank should carry a negative sign. Banks are expected to invest more

effort in expanding branches in markets with a low density of branches and in markets where the bank has a relatively weak presence. Otherwise, much of the gain accruing to the new branch would be to a considerable extent a transfer from other branches of the same bank. That is, a bank always has an incentive to expand its branch network more heavily in markets where it has a weaker relative position.

Demand for banking services in a newly-opened branch has several sources: previously unserved customers, customers diverted from rivals' branches and customers diverted from other own branches. To see the strategic effects at play, one might consider what happens to the marginal profit of opening an extra branch. Under the natural hypothesis of more branches (meaning a lower revenue for each bank) as demand is split among more banks, the variable "number of branches" turns out to be a strategic substitute. However, for a small number of rivals' branches, its increase may result in an increase of marginal profit of a new branch as more of the gains of the extra branch will accrue from a "business-stealing" effect.¹⁰

Implications for a cross-sectional analysis of markets follow. One should see a stronger expansion in markets characterized by a relatively weak position of rivals. In our empirical model, the distinction between incumbents and entrants as rivals is made.

The simplest way to incorporate ownership considerations is the inclusion of dummy variables, reflecting the ownership status of the bank. Since three types of owners are considered, state, private and foreign, two dummies in the intercept parameter are included. One for branch expansion of state-owned banks, *STATE*, and another for private banks, *PRIVATE*. The benchmark value corresponds, thus, to foreign-owned banks. The dummy variables allow us the test of basic growth differences across ownership categories.

4 Data and Econometric Procedures

The data set comprises 19 banks operating in the Portuguese banking sector over 304 local markets (defined by Portuguese administrative jurisdictions for reasons of data availability). An observation is constituted by a bank in a local market. This means that results are to be interpreted as reflecting differences across markets.

The sample covers 97% of branches deployed (1992 figures). At the end of 1992, thirty-five banks were authorized to operate in Portugal. Twelve had only a few branches, all in Lisbon or Oporto, the two main cities. Branching is not a primary consideration to these banks since their activities are mainly in wholesale. Other considerations seem to have guided four other banks. For example, one of them operates only in the Azores. This naturally excludes it from the sample. Local markets are defined by Portuguese local jurisdictions.

Data on the number of branches for each bank in every local market is provided by Portuguese Bankers Association publications. Variables characterizing local markets, except number

¹⁰Cabral and Majure (1993) formalize this intuition.

of firms and average manufacturing wage, can be found in *Administração Autárquica em Números*, published by the *Direcção Geral da Administração Autárquica*, a Portuguese governmental department. The number of firms and the average manufacturing wage in each local market were obtained from the Ministry of Employment.

The dependent variable is set as the opening of new branches, normalized for the size of the market (the total number of branches). In order to provide a better assessment of the strategies pursued, the change in the number of branches is taken over a two-year period (1991/1992). That is, one time period in our model corresponds to a two-year span.

Profit and adjustment cost functions are approximated by Taylor expansions around $\Delta n_i = 0$. First-order terms are collected for all variables, except rivals' branches, where a second-order approach is taken. The empirical model consists thus of a selection equation and a first-order condition. In Amemiya's (1984) terminology, it corresponds to a type 2 Tobit. The equations to be estimated are:

$$\begin{cases} Y_1 = 1 & \text{if } \Delta\Pi > 0 \\ Y_1 = 0 & \text{if } \Delta\Pi \leq 0 \end{cases} \quad (5)$$

where

$$\begin{aligned} \Delta\Pi = & \Pi(n_{im}(t-1) + \Delta n_{im}(t), n_{-im}(t), X_m) - \Pi(n_{im}(t-1), n_{-im}(t), X_m) - \\ & - C(\Delta n_{im}(t), n_{im}(t), X_m), \end{aligned} \quad (6)$$

which operationally is taken as

$$\begin{aligned} \Delta\Pi = & \beta_0 + \beta_1 STATE + \beta_2 PRIVATE + \beta_3 POP + \beta_4 TOUR + \beta_5 TAX + \beta_6 CAP + \\ & + \beta_7 WAV + \beta_8 HAB + \beta_9 URBAN + \beta_{10} LP + \beta_{11} FIRM + \beta_{12} OLD + \\ & + \beta_{13} BROLD + \beta_{14} BROLD^2 + \beta_{15} BRNEW + \beta_{16} BRNEW^2 + u_{1i}, \end{aligned} \quad (7)$$

and

$$\begin{aligned} \Delta n_{im} = & \alpha_0 + \alpha_1 MILLS + \alpha_2 BRNEW + \alpha_3 BRNEW^2 + \alpha_4 BROLD + \\ & + \alpha_5 BROLD^2 + \alpha_6 OWN + \alpha_7 BRANCHES + \alpha_8 POP + \alpha_9 TAX \\ & + \alpha_{10} FIRM + \alpha_{11} TOUR + \alpha_{12} WAV + \alpha_{13} HAB + \alpha_{14} URBAN + \alpha_{15} CAP + \\ & + \alpha_{16} LP + \alpha_{17} OLD + \alpha_{18} STATE + \alpha_{19} PRIVATE + u_{2i}. \end{aligned} \quad (8)$$

The residuals $\{u_{1i}, u_{2i}\}$ are iid from a bivariate normal distribution with zero mean, finite variances and covariances. The linear approximation to the profit equation establishes that expansion is observed if it is profitable at the margin, in the starting situation. Concavity of the expression is implied by the concavity of the profit function and convexity of the adjustment cost function. Therefore, the linear approximation, evaluated at $\Delta n_i = 0$, captures the fundamental features of the expansion/contraction decision of banks.

The regression equation to be estimated includes, on the right-hand side, the number of branches of rival banks in the same period. This variable may exhibit a strong contemporaneous correlation with the residual term. To cope with this problem, the lagged value of the variable is used. One may also argue that banks react to observable actions of rivals and thus react to past values.

The two step procedure proposed by Heckman is used to estimate the model. The first step is to compute of Probit maximum likelihood estimators in the selection equation. The second step consists of applying the least squares estimator to the positive observations in the regression equation, augmented with an additional regressor, the inverse Mills ratio obtained from the first step.¹¹ Consistent estimates for the variance-covariance matrix are obtained following White (1980). Selection of regressors is based on likelihood ratio tests.

Our primary interest lies in expansion patterns. We do not stress the interpretation of the Probit estimators of the selection equation. They should be viewed as a linear approximation to a concave (net of adjustment costs) profit function, useful for estimation purposes.

A technical point must be mentioned. The endogenous variable in the regression equation should also be present in the Probit equation. However, this creates an identification problem since this is the same variable that defines the dichotomous endogenous variable. The Probit estimates are presented in the Appendix.

5 Results

Estimates for the selected sample and for old and new banks subsamples are presented in Table 3.¹² Coefficients give the unconditional effects of regressors. They differ from the marginal effect of regressors on the dependent variable in the observed sample. In the latter case, the effect consists of two components: a direct effect and an indirect effect through the influence of the variable on the selection mechanism.

Old and new banks seem to have followed different signals in network growth. Whole sample estimates are dominated by the old banks pattern and conceal differences between both types of banks.

Demand intensity variables have, in general, a positive sign, indicating that expansion was more pronounced in markets characterized by higher demand for banking services. Nevertheless, differences between old and new banks are clear.

Old banks' expansion occurred primarily in more populated markets, while capitals of administrative districts were relatively neglected. Corporate demand for banking services was not a driving force in old banks expansion.

New banks, on the other hand, have expanded relatively more in markets where tourism is

¹¹See Amemiya (1984: 31-33).

¹²Only selected specifications are shown. Full estimates can be found in the Appendix.

Table 3: Estimation results

	Old banks	New banks	Private banks
Const.	-0.624 (-8.80)	3.082 (2.35)	-0.226 (-3.28)
<i>BROLD</i>	0.167 (2.44)	-7.408 (-2.58)	0.288 (5.11)
<i>BROLD</i> ²		4.420 (2.72)	
<i>BRANCHES</i>	-0.037 (-1.95)	-0.211 (-2.30)	
<i>POP</i>	0.028 (3.93)		0.023 (9.28)
<i>TAX</i>		-0.002 (-3.43)	
<i>TOUR</i>		2.770 (4.19)	1.42 (3.16)
<i>FIRM</i>		0.286 (2.38)	
<i>CAP</i>	-0.063 (-6.68)		-0.071 (-2.41)
<i>LP</i>		0.637 (2.63)	
<i>URBAN</i>		-0.119 (-2.23)	-0.101 (-2.41)
<i>WAV</i>		2.285 (2.28)	
<i>STATE</i>	0.254 (6.64)		
<i>PRIVATE</i>	0.343 (3.20)	0.074 (6.95)	
<i>MILLS</i>	0.227 (7.99)	0.055 (2.12)	0.184 (14.22)
Obs.	382	178	368
$\bar{R}^2$	0.494274	0.537994	0.507008
Likelihood	319.793	192.618	321.723

important and in markets with a higher density of firms. The positive value of the average wage variable corroborates the perception that banks have pursued strategies of branching in order to attract customers, although the negative value of the income tax variable, *TAX*, casts some doubt on this effect (since both variables should reflect similar basic forces). Qualitative variables reveal that new banks have put greater emphasis on the two main cities, Lisbon and Oporto. This conforms to the usual view that new banks have opened branches mainly in those two cities and is in accordance with previous findings by Cabral and Majure (1993) for the period 1988–91.

With respect to ownership status, both private and state-owned banks expanded more than foreign banks. Private banks appear to be more active in network growth, whether old or new. The significance of the dummy variable *PRIVATE* generates some interesting implications.

Since before 1984 only state-owned and foreign banks were present in the market, all private banks are entrants in some way. Entry can be of two types: *de novo* or by acquisition. Generally speaking, *de novo* entry implies, addition of capacity to the market, while entry by acquisition is just a transfer of capacity from one set of owners to another. Privatization programs of state-owned banks provided a natural manner of to entry by acquisition. The difference in the coefficients of the dummy variables *STATE* and *PRIVATE* in the old banks' estimates identifies a privatization effect. Privatized banks were characterized by a more-intense branch growth than the remaining state-owned banks. The results point out clearly that entry *by acquisition* (of Portuguese private managers) may have been as important as entry *de novo* (new banks).

The issue is further explored by estimation of the model for the subsample of private banks. The results are shown in the last column of Table 3.

Significant effects collect some factors from old banks and some from new banks. Coefficient signs are fairly robust and the previous interpretation holds.¹³

Comparison of total entry effects with *de novo* entry (second and third columns of Table 3) reveals that some effects be solely attributed to entry by acquisition (namely, effects associated with population and capitals of administrative districts). On the other hand, there are effects that disappear in total entry regressions, showing their specificity to *de novo* entry. This is the case of the proxies for per capita income levels, *TAX* and *WAV*, the Lisbon and Oporto dummy, *LP*, and the density of existing networks, *BRANCHES*.

After controlling for demand intensity for banking services, supply-side variables shed some light on strategic interactions between banks. A supply-side effect common to both sets of banks is that expansion was relatively more intense in markets with lower branch density. Less covered markets are naturally more attractive to network expansion (for the same demand conditions).

Another finding is the identification of a selective response in expansion. Old banks' growth seems to be unrelated to the presence of entrants, and it appears to be positively associated with

¹³Testing the whole 'private' banks sample against a partition of old/new banks yields a test value of 17.844, which follows a χ^2 distribution with 16 degrees of freedom. For a significance level of 5%, the test does not reject the null hypothesis of homogeneous behaviour.

old rivals' branches.

The quadratic relation found for the behavior of new banks suggests that relative size of rivals also matters. Behavior is characterized by a negative relation for low values of old banks' branches and a positive one for high values. However, the positive range is never achieved.¹⁴ The effects of entry on expansion are less clear. Unconditional effects show that for branch market shares of incumbents higher than 84%, there is an increase in branching by entrants following old banks' expansion. Taking the broader definition of entry, by acquisition and *de novo*, the relationship is linear and positive. The positive association seems to be a robust finding.

The rationale for this pattern has to be found in non-standard explanations, since the pattern contradicts usual oligopoly model comparative statics.¹⁵ In particular, the finding of a positive relation of branch expansion to markets where incumbents hold a stronger position can be explained by resorting to 'herd behavior' considerations in branching decisions.¹⁶ Imperfect information about profitability at the local market level and inferences based upon decisions of others as well as the desire to maintain market share may induce this phenomenon. A location choice by an 'old' bank may trigger a process of expansion in the same market by other banks in a way that resembles stories of 'herd behavior.'

Overall, the post-entry game was characterized by some unusual features. Reaction of incumbents to entrants was indeed selective and in a direction opposite to that noticed in other studies: no significant strategic effect is found. On the other hand, new and old banks behaved differently in expansion patterns.

The results also point out that the distinction between entrants and incumbents, based on *de novo* entry, is insufficient. Entrants by acquisition seem to have followed a distinct branch growth strategy. Thus ownership can be as important as age in explaining branch growth in Portuguese commercial banking.

6 Final Remarks

This paper has addressed the issue of the existence of a systematic pattern in branching of Portuguese banking institutions. Of special interest are the growth of new banks and incumbents' reaction to it.

The particular econometric characteristics of the model advised the use of the two-step procedure of Heckman. Findings constitute an average across observations, and behavior of individual banks in the sample varies to a considerable extent. The richness of all possible patterns of behavior cannot be captured by a single stylized model. Results must be interpreted with caution

¹⁴Remember that rival branches are normalized for market size and therefore belong to the interval $[0,1]$.

¹⁵See Cabral and Majure (1993). For example, if total deposits in the market are given and allocated on the basis of branch market share, comparative statics imply strategic complementarity for low values and strategic substitutability for high values.

¹⁶We do not claim to have performed a test for herd behavior. This can only be done in a full-fledged model, which is beyond the scope of the present paper. For a model introducing 'herd behavior' when agents are uncertain about choices, see Banerjee (1992).

since they may reflect a disequilibrium situation.

Nevertheless, some significant regularities emerge. Networks' growth is found to differ between groups of banks. Overall, the results point to the absence of reaction of incumbents to new banks.

Two phenomena seem to underlie the observed pattern of network growth. First, old banks follow each other. That is, the location of one bank in a particular market induces further expansion in that same market. Imperfect information about profitability at the local market level and the desire to maintain market share may induce this phenomenon.

The second fact emerging from the analysis is that entrants expanded more in other markets than the ones where incumbents have increased networks most. On the margin, however, they follow incumbents expansion when the latter have a near monopoly in the local market.

A final finding is the importance of ownership. Private banks, whether old or new, have grown faster than other institutions. Since some private banks were originated by privatization programs of state-owned institutions, this finding indicates that entry by acquisition may be as important as *de novo* entry to explain the branching pattern in Portugal.

The empirical evidence on the post-entry expansion patterns of both entrants and incumbents seems to call for further research, namely on the strategic interaction in location decisions. At a more general level, it suggests that more attention should be given to entry by acquisition in post-entry performance studies.

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Appendix

Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
Δn_{im}	0.015	0.067	0.000	1.000
<i>BRANCHES</i>	0.060	0.294	0.000	3.548
<i>OWN</i>	0.052	0.125	0.000	1.000
<i>BROLD</i>	0.942	0.123	0.000	1.000
<i>BRNEW</i>	0.039	0.082	0.000	0.400
<i>POP</i>	0.292	0.939	0.005	9.899
<i>TAX</i>	12.451	15.074	0.469	156.700
<i>FIRM</i>	0.025	0.090	0.000	0.958
<i>TOUR</i>	0.000	0.003	0.000	0.043
<i>WAV</i>	0.060	0.009	0.006	0.096
<i>CAP</i>	0.066	0.248	0.000	1.000
<i>HAB</i>	0.697	0.459	0.000	1.000
<i>URBAN</i>	0.770	0.421	0.000	1.000

First-step (Probit) Estimates

This section presents the Probit estimates of the linearized selection mechanism. As mentioned above, the terms associated with first-order and second-order expansion for the dependent variable are omitted. This implies that coefficients in the Probit estimates are not related directly to regression equation coefficients. Therefore, the interpretation of the estimated coefficients must be in that light. In particular, with the Taylor expansion around $\Delta n_{im} = 0$, the linearized selection mechanism is related to adjustment costs and not directly to profits. Hence, the estimates are to be regarded as a first-step in the econometric procedure necessary to obtain consistent estimates in the regression equation.

Table 5 presents full estimates for the regression equation. Selection of regressors was performed through the use of likelihood ratio tests. The main difference between the significant regressors in Table 5 and the ones reported in the main text lies in the non-significance of *BROLD* in the old banks partition. This is due to the high collinearity with *BROLD* squared (correlation of 0.98). Removal of this last term renders the linear effect statistically significant.

Table 4: Probit Estimates

	Old banks	New banks	Private banks
<i>Const.</i>	-4.845 (-9.22)	-7.777 (-5.07)	-2.811 (-2.40)
<i>STATE</i>	1.471 (4.25)		
<i>PRIVATE</i>	1.885 (5.45)	0.751 (6.74)	
<i>POP</i>	0.417 (3.92)	0.833 (4.97)	0.529 (4.21)
<i>TOUR</i>	-14.757 (-1.80)	-22.492 (-1.66)	-8.79 (-0.92)
<i>TAX</i>	0.019 (7.91)	0.019 (4.86)	0.022 (7.98)
<i>CAP</i>	-0.104 (-0.90)	0.793 (4.95)	-0.064 (-0.51)
<i>BRANCHES</i>	1.103 (1.67)	2.378 (2.22)	0.950 (1.13)
<i>URBAN</i>	0.244 (2.06)	0.518 (2.17)	0.401 (2.05)
<i>HAB</i>	0.834 (6.39)	0.943 (3.66)	1.034 (6.59)
<i>LP</i>	-4.982 (-2.82)	-9.255 (-3.23)	
<i>FIRM</i>	-3.103 (-2.07)	-7.719 (-3.20)	-3.333 (-1.78)
<i>OLD</i>			-0.010 (-0.13)
<i>BROLD</i>			-4.499 (-1.34)
<i>BROLD^a</i>	0.444 (1.22)	4.073 (2.75)	4.439 (1.88)
<i>BRNEW</i>	9.568 (7.06)	16.810 (4.38)	10.940 (5.45)
<i>BRNEW^a</i>	-30.063 (-6.12)	-38.929 (-3.92)	-26.536 (-4.97)
Obs.	3952	1824	2776
Positive Obs.	382	178	368
% Correct Predictions	0.908	0.912	0.880

Table 5: Full regression estimates

	Old sample	New sample	
<i>Const</i>	-0.596 (-1.26)	7.35 (3.97)	-0.400 (-0.87)
<i>MILLS</i>	0.263 (3.40)	-0.006 (-0.09)	0.177 (4.66)
<i>BROLD</i>	-0.229 (-0.24)	-16.792 (-3.83)	0.736 (0.55)
<i>BROLD²</i>	0.221 (0.34)	9.757 (3.74)	-0.319 (-0.36)
<i>BRNEW</i>	0.543 (0.80)	0.963 (0.83)	-0.351 (-0.55)
<i>BRNEW²</i>	-2.272 (-1.06)	-4.158 (-1.28)	0.914 (0.55)
<i>OWN</i>	0.006 (0.07)	-0.074 (-0.67)	-0.018 (-0.19)
<i>BRANCHES</i>	-0.006 (-0.06)	-0.339 (-2.16)	-0.037 (-0.46)
<i>TAX</i>	0.001 (-1.11)	-0.002 (-2.75)	-0.000 (-0.33)
<i>POP</i>	0.041 (-1.85)	-0.016 (-0.47)	0.038 (2.58)
<i>FIRM</i>	-0.128 (-0.54)	0.446 (1.22)	-0.127 (-0.72)
<i>HAB</i>	0.056 (-0.81)	-0.068 (-1.19)	0.047 (0.81)
<i>TOUR</i>	-0.603 (-0.58)	4.018 (2.80)	1.48 (2.13)
<i>CAP</i>	-0.07 (-5.62)	-0.052 (-1.47)	-0.066 (-5.72)
<i>LP</i>	-0.111 (-0.30)	1.094 (2.07)	0.074 (0.30)
<i>URBAN</i>	-0.055 (0.96)	-0.107 (-1.56)	-0.129 (-2.25)
<i>WAV</i>	0.449 (0.57)	2.293 (2.19)	0.696 (0.88)
<i>STATE</i>	0.29 (3.08)		
<i>PRIVATE</i>	0.394 (3.48)	0.044 (1.63)	
Obs.	382	178	368
R ²	0.491975	0.533142	0.502947
Likelihood	322.177	193.922	325.382

Notes: t-statistics in brackets.

The new banks' sample has no state-owned banks.

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