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LOCAL SURVIVAL OF BANKS' BRANCHES IN BRAZIL

SOBREVIVÊNCIA LOCAL DE AGÊNCIAS BANCÁRIAS NO BRASIL

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Abstract

The aim of this study is to better understand the determinants of the local survival of bank branches in Brazil. The banking system has undergone several changes, especially with the advent of new information technologies, which directly affect the logic of the existence of bank branches. However, bank branches are still important channels for accessing financial services, especially in peripheral regions in the country, and the reduction in their number may affect local development in different municipalities. The analysis offers a bank branch survival indicator, at the municipal level, from which it is intended to verify, through a panel data model, the determinants of branch survival, including elements related to portfolio management branches, and the characteristics of local banking markets and municipalities. Results indicate the importance of local demand and the good management of assets and liabilities as fundamental elements of local branch survival. However, the concentration of resources in municipalities tends to increase competition between branches and accelerate the replacement of less effective ones by other agents and services available, reducing the local survival rate. These results point to the importance of understanding the local dynamics in the current processes of change in the banking system in order to inform sectoral and public development strategies.

Keywords: Financial Services. Banks' branches. Survival. Financial and regional development.

Resumo

Este estudo busca compreender os determinantes da sobrevivência local das agências bancárias no Brasil. O sistema bancário tem passado por diversas mudanças, em especial com o advento de novas tecnologias de informação, que afetam diretamente a própria lógica da existência de agências bancárias. Por outro lado, as agências bancárias ainda são importantes canais de acesso a serviços, especialmente em regiões periféricas do país, e a redução de seu número pode afetar o

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desenvolvimento local nesses espaços. A análise parte da construção de um indicador de sobrevivência das agências bancárias, em nível municipal, a partir do qual pretende-se verificar, por meio de um modelo de dados em painel, os determinantes da sobrevivência de agências, incluindo elementos respectivos ao gerenciamento do portfólio das agências e das características do mercado bancário local e dos municípios. Resultados apontam para a importância da demanda local e o bom gerenciamento de ativos e passivos nas agências como elementos de sobrevivência. Entretanto, a concentração de recursos nos munícipios tende a aumentar a concorrência entre agências e a acelerar a substituição de agências por outros agentes e serviços disponíveis, reduzindo a taxa de sobrevivência. Esses resultados apontam para a importância de entender a dinâmica local nos atuais processos de mudança no sistema bancário para informar as estratégias de desenvolvimento setorial e público.

Palavras-chave: Serviços financeiros. Agências bancárias. Sobrevivência. Desenvolvimento financeiro e regional.

Introduction

The Brazilian banking system has undergone countless changes in the last three decades, restructuring itself in diverse different national and international contexts. This system suffered a significant impact with the advent of the *Plano Real*, which eliminated revenues accruing from high inflation (*floating*) and forced banks to change their performance strategies. Such changes have drastically affected the financial health of several banks, both public and private, forcing the government to resort to public programs that would prevent the system from being dismantled. The *Programa de Estímulo à Reestruturação e do Fortalecimento do Sistema Financeiro Nacional* (PROER, Program of Incentives to the Restructuring and Strengthening of the National Financial System) and the *Programa de Incentivo à Redução do Setor Público Estadual na Atividade Bancária* (PROES) (PROES, Program for the Reduction of the State Public Banking Sector) were crucial to sustain banking activity in the country by providing liquidity to some institutions, debt management in others and a set of mergers and acquisitions that ended up consolidating a more robust banking system, but at the expense of a high degree of concentration that, at the end of the 90s, presented both a reduction in *market share* and in the number of public institutions, especially those of a regional character (PAULA; OREIRO; BASILIO, 2013).

Growth in the 2000s boosted banking activity, not only due to the growing demand for financial services (credit) and the consequent increase in the percentage of banking clients in the country, but also for offering a financial structure that combines interest and liquidity in order to provide a consistent base for the profit of the activity. The decade also saw an increase in the capillarization of the bank branch network, an increase in the number of electronic service outlets and banking correspondents (LOUREIRO, MADEIRA and BADER, 2016) and the growth of the sector's segmentation, much in part due to the different performance between public and private retail banks, as well as development banks (SLIVNIK; FEIL, 2017). However, the expansion of the banking network was not balanced, with the vast majority of banks concentrated in more developed regions (MARTINS, 2012).

The late 2000s saw a more consolidated banking system, known to be efficient (LAURETO; OREIRO, 2010), of low financial fragility (MENDONÇA; CAVALCANTE, 2019) and highly profitable. However, the economic crises eventually affected banks' performance. During this period, the banking system also experienced more intensively with the growth of information and communication technologies, offering new operating platforms, such as remote telephone services, internet banking and, more recently, the growth of financial technologies (fintechs) and of digital banks. The way in which banking services are offered, therefore, has changed rapidly, imposing new and more customized business models, making outdated certain parts of the industry practices. These changes already affect the configuration of the banking system: in recent years, the closing of bank branches in the country has increased.

In this context, this paper aims to analyze the factors that affect the functioning of bank branches in Brazil. More specifically, this study seeks to understand what would be the determinants of the survival of bank branches in Brazil, starting from the idea that, on the one hand, bank branches

have operating costs and constantly live with the possibility of replacing their services with other more modern means; on the other hand, it is also necessary to consider the characteristics of the spaces where the branches are located: these must have attractive characteristics for banks to be interested in opening branches and, once installed, the location spaces must offer support in terms of service demands, so that they present a satisfactory performance and remain active over time. The analysis starts from the construction of a bank branches survival indicator, at the municipal level, from which it is intended to verify a set of factors that may prompt the closure of branches. Among this set of factors, in which stands out variables that bring information about municipalities, the local banking market and the performance of branches, the main contribution is in the computation, unprecedented for Brazil, of a functional distance indicator that captures the effects of banks' organizational structure on the functioning of their branches across different regions. The work is still essential for understanding the current dynamics of the system, especially in view of the importance of bank branches, in many Brazilian municipalities, as a physical element that promotes financial inclusion and supplies financial services that, to a certain degree, can support local economic development.

Considering these objectives, this work is divided into three sections in addition to this introduction and a brief conclusion. The next section presents the theoretical framework discussing the performance of banking firms, the functionality of branches and the relation between their performance and local development. The following sections present and discuss the data and indicators used, the econometric methodology and the results obtained for the determinants of the survival rate of bank branches.

The banking firm

Even though conferring a relevant role for money and for financial institutions within the economic system, theoretical approaches that deal with the banking firm have fundamental differences in the treatment of monetary relations in economic systems. On the one hand, there are approaches that attribute to money only the role of unit of transaction and value, indicating its inability to affect real variables, such as employment and gross product, in the long run (SANTOMERO, 1984). In this approach, the financial system is a mere intermediary between savings and investment, operating under restrictions imposed exogenously with low degrees of autonomy. In turn, other approaches attribute to the financial system a more fundamental, but ambiguous role, inasmuch as it has the capacity to stimulate economic growth via the provision of liquidity, but nevertheless acquires a destabilizing role in secondary markets via speculation, as it affects the allocation of *ex post* savings, whose flows should be in the direction of consolidating the liabilities created by the investments made (PAULA, 1999). Among all the existing approaches, in common, only the fact that financial agents exercise the function of intermediation of resources, the provision of services that channel financing and savings of economic agents.

Tobin (1987) criticized the mechanistic conception of the functioning of the banking firm and proposed that, in the existence of a competitive financial system and with different types of financial intermediaries, banks would exhibit a maximizing behavior that, according to the circumstances of lending and of interest rate movements, would determine its volume of assets and obligations. The banking firm would have its expansion conditioned by the availability of assets and by obtaining earnings that offset the costs of attracting and retaining deposits. Since only part of the resources created by loans returns to banks in the form of deposits, there is nothing to guarantee a symmetrical expansion of the volume of bank assets and obligations when analyzing the entire banking system. The volume of reserves, which acts as a factor that limited the action of banks, loses relevance in this sense, once there is the possibility of banks obtaining additional reserves by other means, such as selling bonds or using central bank facilities; in this sense, the banking activity is defined in order to reach an optimal operating point in which there is equality between the marginal revenue from its assets and the marginal cost of its obligations.

Given the evolution of the banking system and its conformation to market developments and increased financial relations (CHICK, 1992), it is more appropriate to understand the complexity of banks' performance based on the assumption that they are active agents that have their own expectations and manage their balance sheet aiming to reconcile profitability with its liquidity preference scale. The active management consequently affects the financing conditions of the economic activity, since it determines the volume and conditions of the credit supply necessary for the acquisition of capital and its accumulation. The provision of financial services by banks, such as

insurance, pension plans, and other services also support economic activity, whether through the reduction of risks or the guarantees generated to economic activities. It is important to highlight the pro-cyclical role of banks that, in a moment of optimism, reduce their liquidity preference and change the structure of their liabilities by increasing their leverage, thus becoming more subject to risks in search of greater profitability. On the other hand, in the phase of increasing uncertainty and economic slowdown, their expectations deteriorate and the liquidity preference increases, which leads to a contraction in the credit granted and the adoption of a more defensive strategy, which ends up intensifying the decline of the economic activity (MINSKY, 1986).

The banking firm, inserted in a monetary production economy, has restrictions related to uncertainty about the future, because they make *ex ante* loan commitments based on expectations of *ex post* variables, among which the funding levels and the reserves of the banking system (DYMSKI, 1988). The precaution regarding the uncertainty of future results is expressed by the way banks manage their portfolio. The management of bank assets depends on the bank's willingness to absorb risks, the state of its expectations about the return on its activities, the maintenance of the value of the required collateral and the behavior of market interest rates. Once expectations are pessimistic, banks will opt for more liquid assets, affecting economic activity in general. In addition, portfolio management is not limited to the control of assets, but also assumes a dynamic character in the administration of liabilities, as banks adopt measures to attract customers and modify their preference scale, creating instruments for raising funds and managing their requirements for reservations, in order to avoid the restraining rules established by the monetary authorities (PAULA, 2013).

The possibility for banks to manage their product portfolio, strategically differentiating the ways of acquiring revenue is verified through the management of their subsidiaries (bank branches). Financial results that are below expectations and the possibility of being substituted by other channels offering banking services are factors that can lead banks to close their subsidiaries, since they do not fulfill their main function, which is to be profitable over time. The absence of banking facilities acts as a local restriction on access to financial services (DEGRYSE and ONGENA, 2004), which aggravates the conditions of financial exclusion present in several countries. Financial exclusion is an impediment, to varying degrees, to certain social groups for not only accessing financial services (unbanked) but also for accessing certain types of services (under-banked) (CROCCO; SANTOS; FIGUEIREDO, 2011).

It is also possible to highlight that, if, on the one hand, bank branches are important physical elements of access to financial services and relevant to local development in several regions, on the other hand the growing use of alternative financial sources has put bank branches functionality and the bank physical model in question. The banks (and their branches) are constantly looking for measures to circumvent operating cost restrictions and expand the offer of their services, an essential factor in maintaining the sector's profits. In this sense, the constant innovations in the sector put in check the very existence of bank branches, given that new information and communication technologies, the expansion of a low cost and complex service network through banking correspondents and the adoption of a digital access system for financial services (internet, smartphones, tablets) become alternatives of greater operational viability for banks (LOUREIRO, MADEIRA and BADER, 2016).

The discussion about the functionality of physical branches has also been held in other countries. In the case of the USA, the banking system, since the beginning of the 1990s, has shown a steady growth in the number of branches, a trend that has been reversed since 2010 (NGUYEN, 2014). The closure of branches had different effects in the USA according to the density of the local banking network: locations with lower income and lower density of the banking network suffer substantial credit contractions due to the reduction in the volume of soft information (more informal and local) absorbed by banks. The UK banking system, on the other hand, still has a high use of bank branches even with the increase in digital access (TSB BANK, 2014), forcing banks to efficiently offer a sophisticated and accessible digital system combined with a network of physical branches whose location is strategic to meet the demand for its services. The German banking system has also shown a negative variation in the number of physical branches, generating estimates that, until the beginning of this decade, only one third of the existing branches will remain open (BERNHARDT, 2014).

In most cases, the closing of branches is motivated by the search or need to reduce costs and/or increase profitability, with emphasis on the weight of fixed costs in relation to real estate and

personnel. The increase in professionalization and the elimination of idle capacities are also shown to be important causes along with the mergers and acquisitions processes. The "Digital Revolution" in the banking sector plays an important role in this process, both in terms of increased competition, due to the rise of digital banks, and the fact that customers are increasingly turning to digital distribution channels to obtain more and more financing and investment products.

Financial system and regional development

Empirical evidence over time brings strong indications that financial development contributes to national and regional aggregate growth (LOUREIRO, MADEIRA and BADER *apud* e.g. LEVINE, 1997; 2005; GUISO, SAPIENZA and ZINGALES, 2004b; BLACK, STRAHAN, 2002; BURGESS and PANDE, 2005, 2016). However, there is a substantial differentiation in access to financial services between developed and developing countries and, in many cases, between regions and between individuals in the same country (LOUREIRO, MADEIRA and BADER, 2016). Therefore, it is necessary to understand in what magnitude the alternative means of accessing bank services are capable of promoting financial inclusion and capturing information about regional markets, since the volume of information obtained by banks is fundamental in the decision to grant credit and in determining their local portfolios (BERGER and DEYOUNG, 2001; ALESSANDRINI.; PRESBITERO; ZAZZARO, 2007; ZHAO and JONES-EVANS, 2016). Regional finance can then be analyzed in terms of interregional differences caused by information asymmetry and market incompleteness (DOW AND RODRÍGUEZ-FUENTES, 1997) and the basis of the studies becomes the ability of financial agents to provide financial services, as credit, given the local information set that is available.

The regional analysis of the performance of the financial and banking system becomes more appropriate when it recognizes money and monetary relations as essential and active elements in economic processes, offering a more adequate framework[3] for analyzing financial and monetary relations and reaffirming the regional conceptions of studies on such relations (CROCCO; JAYME JR., 2006). Inserted in an environment of fundamental (not probabilistic) uncertainty, agents form expectations about the future and behave in order to avoid losses of income and wealth. Pessimistic expectations, for example, increase the demand for more liquid assets, with emphasis on money, which is the most liquid asset available. Consequently, liquidity preference implies the possibility of production factors becoming idle (FEIJÓ, 1999), once agents will not allocate their income to investment projects if expectations for the future are not optimistic, therefore limiting the effective demand and endogenously alters the real income (AMADO, 2000).

Thus, changes in the agents' liquidity preference (or of the confidence in expectations regarding the value of the relevant assets) directly affect banks' regional capacity to offer credit (DOW, 1993) and services. An increase in the liquidity preference can generate an increase in credit prices (interest) or even full credit rationing in peripheral regions, since the public, when looking for portfolio management with shorter maturities, induce banks to also adjust their finances, offering shorter-maturity products. Therefore, it is clear that the limited supply of services derives from local demand conditions and, fundamentally, from the decision of the providers of these services, which may ostensibly deny the offer or impose impeding prices (CAVALCANTE, 2018).

The installation of bank branches and the guarantee of access to financial services assume a crucial role in the credit creation process since access to these services facilitates the implementation of productive investment projects and the efficient allocation of resources (BANERJEE and MOLL, 2010). The availability of local financial agents also provides face-to-face contacts and greater confidence in carrying out financial transactions (APPLEYARD, 2013). However, the possibility of enjoying the benefits of regional agglomerative factors enhances the process of spatial concentration of the financial system, which restricts access to credit in peripheral regions and generates a clear distinction between the place where decisions are made over the allocation of resources and services and the locations that require these resources to finance their activities. Therefore, in the most vulnerable regions, in socioeconomic terms, the already low demand for credit risks not being fully satisfied, reinforcing, through a vicious cycle of cumulative

[3] The approach of liquidity preference and currency as an active element in defining allocations in the economy (in particular investment) is opposed to models where the demand for money is seen only as a means of executing transactions, deriving from consumption choices (under income restriction) of individuals. For more details on the different approaches, see Carvalho (1992).

causation, the region's backwardness in relation to the central regions, since the level of liquidity preference is reduced according to the lack of dynamism presented by the regional economy (DOW, 1993).

Database and analysis methodology

After discussing the role of the banking firm, the functionality of its branches and the effects of both for local development, this section aims to present and analyze the relation between the local survival rate of bank branches and the economic characteristics of municipalities and branch performance. In order to understand the local functionality of bank branches, it is necessary to check the relation between their existence and operational performance, in addition to analyze the behavior of indicators that reflect the management format adopted, especially in terms of liquidity, once banks are economic agents strongly subject to uncertainty. In view of this argument, information (annual averages) from the branches' balance sheets, made available by the Central Bank of Brazil, in the period between 2000 and 2015 was used to estimate the following model

$$\ln LOCSURV_{it} = \beta_0 + \beta_{1i} \ln REV_{it} + \beta_{2i} \ln EXP_{it} + \beta_{3i} \ln PORTF_{it} + \beta_{4i} ln\, TDEPDDEPP_{it} + \beta_{5i} ln\ BRANCHAGE_{it} + \beta_{6i} ln\, FUNCDIST_{it} + \beta_{6i} ln\, PROVCRED_{it} + \beta_{7i} Z_{it} + \varepsilon_{it} \quad (1)$$

The econometric analysis consists of a panel data model, containing a spatial and a temporal dimension. The model is suitable for analyzing cross-sections that present a considerable number of individuals (Wooldridge, 2002), which is suitable for the set of information available for this work. The time series considers the time period in windows of two years each and a large number of municipalities that hosts bank branches in Brazil (N = 3,835) in the entire period analyzed. The method of estimation via panel data has the advantage of controlling the presence of possibly correlated and time-invariant heterogeneity in the individuals studied, in addition to reducing the collinearity of explanatory variables and increasing the efficiency of the estimators (PESARAN, 2015).

The analysis starts from the construction of the branches' annual survival rate ($LOCSURV_{it}$), the main variable under analysis, given by

$$LOCSURV_{it} = 1 - MORTALITY_{it} \quad (2)$$

where $MORTALITY_{it}$ is the proportion of branches that closed in municipality i in the year t in relation to the total of existing branches in municipality i in the year t. Since it is a proportion, its values are between 0, when all bank branches in the municipality closed in the year, and 1, when there were no branch closings. Bank branch location data were obtained from the Central Bank of Brazil[4].

Table 1 shows the differences between survival rates by municipality size and by bank ownership. It is noted that municipalities with a smaller population have higher survival rates compared to municipalities with a higher number of inhabitants. This statistically significant difference is associated with the fact that municipalities with a smaller number of inhabitants, with less economic dynamics, make banks have less optimistic expectations regarding the provision of services and the ability of borrowers to earn sufficient revenues to meet their financial commitments. In turn, banks adopt more cautious stances while managing their branches, prioritizing operations with more liquid assets reducing the risk of insolvency. In addition, the highest averages of survival rate are from bank branches of public banks, indicating possible differentiated operating strategies for these entities.

[4] Data were analyzed and treated to make the mergers and acquisitions of the period compatible.

Table 1: Survival rate of bank branches in Brazil

Group (thousands of inhabitants)	Average	Standard Error	Hypothesis Test H0: Difference = 0 Ha: Difference ≠ 0
Up to 50	0.974	0.00011	t = 41.2977***
Greater than 1000	0.960	0.00031	
Average	0.967	0.00016	
Private	0.973	0.00017	t = 42.4092***
Public	0.963	0.00016	
Average	0.967	0.00012	

Source: Own elaboration.

The first group of determinants of branch survival is composed of variables related to the financial operations of the branches. The variable REV_{it} includes revenues obtained through active operations and the provision of services related to usual activities, including bank fees and interest on assets. EXP_{it}, in turn, corresponds to operating expenses arising from usual activities and interest payments on financial liabilities of the branches. It is expected that branches with higher levels of revenues and lower expenses are more likely to remain in the same location over time.

Then, for the set of operational factors related to survival, bank liquidity indicators were constructed, expressed in the way bank branches manage their assets and liabilities portfolio. Based on bank branch balance sheets provided by the Central Bank of Brazil, the objective is to verify the relation between bank branches' survival over the years and the way their portfolios are managed. The proportion between the volume of resources provisioned for risky loans and total loans ($PROVCRED_{it}$) is a measure of credit quality in a region that consists of the ratio between the monetary volume set aside by the branches according to the expected default and the total credit granted. The lower this indicator, the better the quality of credit granted and the lower the risk of operations (CROCCO, 2014), which can lead to a higher rate of local survival. The ratio of time deposits to demand deposits ($TDEPDDEP_{it}$) captures the preference of creditors for conditioning their resources in a more or less liquid way. The greater this measure, the lower the liquidity of bank branches' liabilities and the greater the ability to lengthen their assets and, therefore, the greater the possibilities of supplying long-term credit. According to the literature discussed in the previous sections, a region with a greater liquidity preference reduces the possibilities' space in which banks operate, decreasing the diversity and complexity of the products offered, which can negatively affect the chances of adaptation and survival of bank branches.

The bank branch Portfolio Index ($PORTF_{it}$) is a way of capturing the management of the bank branch portfolio based on the degree of complexity of the products offered. The index captures the proportion, on bank branches' balance sheets, of assets of greater complexity, such as operations with bonds and securities and interbank liquidity assets that depend on more qualified treatment of information and whose operations are usually concentrated in branches of higher hierarchical level within the organizational structure of banks; and less complex assets, such as loans and discounted securities, which are offered at any bank branch (CAVALCANTE; SANTOS, 2019). In this sense, the portfolio index represents the strategic portfolio management decisions adopted by bank branches, with higher values indicating that branches allocate resources to securities and bonds of greater operational complexity compared to simpler and more common assets, such as less complex credit operations. Therefore, it is hoped that $PORTF_{it}$ can indicate which liquidity management strategy affects bank branches' survival rate[5].

Finally, the Functional Distance ($FUNCDIST_{it}$) is given, as ALESSANDRINI et al. (2009), by

[5] According to studies on bank liquidity differentiated in regions, it is expected that for lower income municipalities the liquidity of bank assets and liabilities will be lower (CROCCO; FIGUEIREDO; SANTOS, 2010). However, there is still a need to ascertain better if greater liquidity is the usual strategy for the survival of a bank branch.

$$FUNCDIST_{it} = \frac{A_{ij} * ln\left(\frac{\sum_{n=1}^{N} D_{nij}}{A_{ij}}\right)}{\sum_{j=1}^{J} A_{ij}} \quad (3)$$

where A_{ij} is the number of branches of bank j in the region i, D_{ij} is the distance between branches of bank j in the region i to the bank's headquarters, N is the total bank branches of the bank j and J is the total number of banks in region i. This indicator, unprecedented for studies in Brazil, was calculated from travel times (by road) between the branches and the bank's headquarters (including air travel time for banks with foreign headquarters). Functional distance acts as a *proxy* for the amount of local information obtained by the branches' headquarters, both soft information, that is dependent on closer contacts, and hard information, those that are quantifiable and, therefore, codifiable and easily transferable[6]. Greater functional distances imply a greater degree of autonomy for bank branches in dealing with information and adapting their portfolio strategies to local conditions (DEGRYSE *et al*, 2008). It is expected, hence, that this indicator will present a positive relation with the survival rate of bank branches, since there is less interference from headquarters and the greater the possibility of branches adapting to local demands for banking services.

The age of the bank branch ($BRANCHAGE_{it}$) which assumes 1995 as the initial mark, captures the relevance of a branch's time in operation in the bank's decision to keep it running. In this regard, branches with longer times in operation tend to consolidate a volume of clients and operations that make them important in the spaces they occupy, in addition to tradition and local trust they entails in local economies.

The second set of determinants of bank branches' survival rate includes control variables (Z_{it} in equation 1) for the characteristics of the municipalities where the branches are located. Along with the branches' portfolio management variables, it is important to control the characteristics of the municipalities, since these are essential in the formation of the banks' profitability expectations and, therefore, influence the way they manage their subsidiaries. The Regional Credit Quotient (RCQ_{rt}) is given by the ratio between the relative share of the municipality r in the total volume of credit granted in the microregion to which it belongs and the relative share of the GDP of the same municipality in the total GDP of the microregion. If this ratio is greater than 1, the relative credit granting in the municipality is greater than expected for its productive structure, indicating conditions of polarization and regional centrality that are important for the analysis (CAVALCANTE, 2018).

Still as a measure of the characteristics of the banking system in the municipalities, a Hirschman-Herfindahl index will be used, given by

$$HHI_j(x) = \sum_{i=1}^{n} \left(\frac{x_i}{x}\right)^2 \quad (4)$$

where n is the number of branches considered in the analysis, x_i is the absolute share of resources of a branch i in a bank j, and x represents the total volume of resources in the analyzed banking market. This index was calculated for the volume of demand deposits at branches ($HHIDEP_{it}$) and for the volume of credit ($HHICRED_{it}$) granted by branches in the municipality. These indicators complement the analysis of the concentration in the local credit and deposit markets. Still in this regard, the local proximity variable ($LOCALPROX_{it}$) is a *proxy* for the amount of information acquired by banks, in particular *soft information,* due to the proximity to customers and other individuals in the region (RODRIGUES, 2013), being defined by

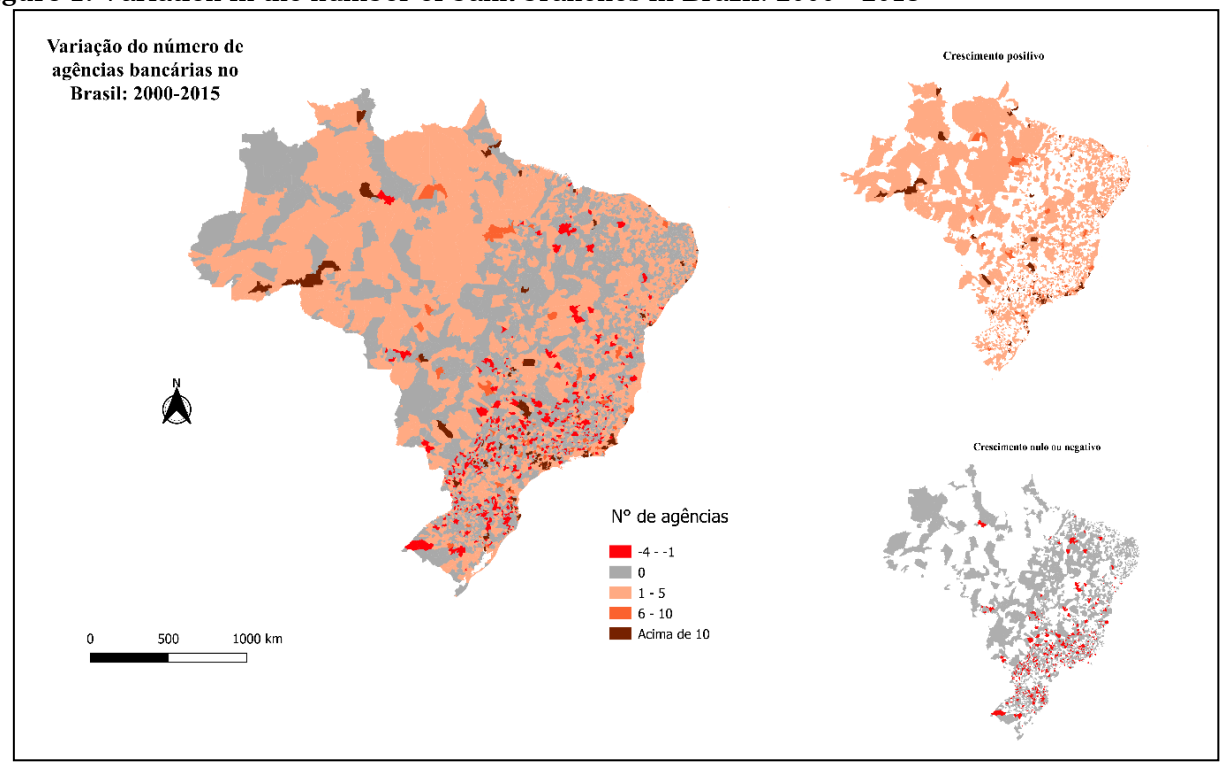
$$LOCALPROX_{it} = \frac{i_{bj}}{P_j} \quad (5)$$

where i_{bj} is the number of branches located in the market j that belong to the bank b and P_j is the total population of the region corresponding to the local market j. The recent expansion in the number of bank branches in the period analyzed promoted an increase in this indicator, which also suggests an increase in bank access (number of branches per capita) in the municipalities analyzed.

[6] On *hard* and *soft* information, see Petersen (2004).

As an illustration, Figure 1 shows the net variation in the number of branches in Brazilian municipalities between 2000 and 2015. There is a significant expansion in the number of bank branches, with emphasis on the peripheral regions, especially in the North, Northeast and Center-West regions. A significant expansion in the number of bank service posts and bank correspondents is added to this increase in the number of bank branches, what contributed to increase access to banking services (BCB, 2015) in the country.

Figure 1: Variation in the number of bank branches in Brazil: 2000 - 2015



Source: Own elaboration based on data from the Central Bank.

On the other hand, Figure 1 also shows a reduction in the number of branches concentrated in some regions in the period, with emphasis on municipalities in the southeast and south of the country. Thus, a preliminary analysis indicates an increase in the number of bank branches, in the period analyzed, in peripheral and less developed regions, while in better structured regions there was a reduction in the number of branches.

Still regarding the economic characteristics of the municipalities, information was collected on the population (POP_{it}, provided by the Brazilian Institute of Geography and Statistics, IBGE) and the average annual income per capita ($PCINC_{it}$), obtained in the Annual List of Social Information of the Ministry of Labor and Employment (RAIS-MTE), important factors for location of branches (SICSÚ e CROCCO, 2003). The numbers of bank service posts ($POSTS_{it}$) and credit cooperatives ($COOPCRED_{it}$) in the municipalities between 2007 and 2015 were also included in the model. Once installed, both posts and cooperatives function as substitute providers for bank branches: bank posts offer simpler financial services at lower maintenance costs for banks (ASSUNÇÃO, 2013), while credit unions increase competition for customers, such as rural or housing borrowers, as they offer substitute services that, under certain conditions, are cheaper than those provided by banks' brick-and-mortar branches.

In addition to the variables above, the participation of public expenditure in the Gross Domestic Product (GDP) of the municipality ($GOVGDP_{it}$, data from IBGE) was also included in order to understand whether the government's participation in the municipality's activity enables rent-seeking from banks for resources from the public activity (consumption, public investments and payroll). Also, the model includes the share of industrial income in the total revenue of the municipality ($INDUSTGDP_{it}$, data from RAIS-MTE), since the industrial sector is an important agent that demands financial resources and is also a significant capacitor of local income flows, which stimulates banking activity; the proportion of micro, small and medium-sized enterprises in relation to the total number of firms ($MSME_{it}$) (RAIS-MTE) in the municipality, an indicative to understand

whether the size of the firms present locally affects survival rates (POLLARD, 2003; ZHAO e JONES-EVANS, 2017); and finally, a *dummy* ($CRISIS2008_{it}$), which aims to capture a possible significant change between the pre and post *Subprime* crisis periods 2007/8.

Results analysis

Table 3 indicates the results found from the specification proposed. Three models were estimated to ascertain the robustness of the results, the second including additional variables for controlling the productive structure of the municipalities and a third model including cooperatives and banking service posts (which reduces the time series for 2007-2015).

Table 3: Panel Models with Fixed Effects

	1	2	3
REV	0.0163***	0.0173***	0.0177***
	(0.00)	(0.00)	(0.00)
EXP	-0.0092***	-0.0095***	-0.0073***
	(0.00)	(0.00)	(0.00)
PROVCRED	-0.0490***	-0.0495***	0.0056
	(0.00)	(0.00)	(0.00)
TDEPDDEP	0.0092***	0.0080***	0.0120***
	(0.00)	(0.00)	(0.00)
PORTF	0.0047***	0.0043***	0.0104***
	(0.00)	(0.00)	(0.00)
FUNCDIST	0.4544***	0.4555***	0.4591***
	(0.04)	(0.04)	(0.04)
BRANCHAGE	0.0140***	0.0108**	-0.0107**
	(0.00)	(0.00)	(0.00)
LOCALPROX	-0.1723***	-0.1540***	-0.0205
	(0.03)	(0.03)	(0.04)
RQC	-0.0267***	-0.0277***	-0.0291***
	(0.00)	(0.00)	(0.00)
HHICRED	-0.3878***	-0.3868***	-0.5815***
	(0,09)	(0,09)	(0.10)
HHIDEP	0.3526***	0.3566***	0.4264***
	(0,09)	(0,09)	(0.11)
POP	-0.1438***	-0.1372***	0.0395
	(0.03)	(0.03)	(0.04)
PCINC	0.0237***	0.0250***	0.0269***
	(0.00)	(0.00)	(0.00)
MSME		0.1447***	0.1081***
		(0.03)	(0.03)
INDUSTGDP		-0.0016	-0.0003
		(0.00)	(0.00)
GOVGDP		0.0172*	0.0179*
		(0.01)	(0.01)
CRISIS2008		0.0041	0.0118***
		(0.00)	(0.00)
COOPCRED			-0.0404*
			(0.02)
POSTS			0.0571***
			(0.01)
Constant	-0.9680***	-0.7997***	-1,1306***
	(0.19)	(0.20)	(0.26)
N	21368	21366	17761
Adjusted R2	0.1542	0.1598	0.1579
Hausman	2551.13***	2565.94***	2565.94***

Source: own elaboration in Stata 14. Note: * p<0.05; ** p0.01; *** p0.001. Robust regressions. The Hausman and Breusch-Pagan tests indicated the use of the fixed effects model and therefore results from the random effects models were not reported.

In general, the results confirm the discussions in the previous sections. Volumes of revenue and expenses are fundamental for the survival of the branches, having robust estimated coefficients with the expected signs. There are also indications that the increase in the volume of higher-risk credit (PROVCRED) puts the branch's survival in check. In terms of liability management, TDEPDDEP indicates that the relative lengthening of longer-term obligations opens up room for balance sheet management that, on average, increases the survival rate of bank branches.

As for the portfolio index, the results obtained in the estimation indicate that a financial management that favors operations involving less liquid assets increases the local survival rate of the branches. This is a result that confirms hypotheses addressed by Crocco *et al.* (2005) e Nogueira *et al.* (2013) of greater liquidity preference in less developed regions and greater uncertainty. It is possible to infer that, once the characteristics of the local markets are controlled, a greater liquidity of assets in bank branches guarantees lower survival rates on average, possibly accompanied by lower assets' rentability and lower local income generation. This result also indicates the weaknesses of less developed economies, since the banking system operates in these locations offering less complex and more liquid services, which can hinder more mature investment prospects, usually related to development.

Regarding the functional distance variable, the estimated coefficients indicate that a longer functional distance increases the bank branch's survival rate. According to the results obtained, it is possible to infer that the distance from the bank's headquarters makes the management of the branch more cautious in terms of liquidity and complexity of services, since the objective is to maintain the branch's operation. Since there are differences in the services offered in more and less developed regions, this result also indicates that the distribution of the branches may serve to capture flows of financial resources in some regions that will be redirected towards enabling less liquid investments in some other regions, as pointed out by Crocco *et al* (2012).

As for the variables referring to municipal characteristics, it is worth mentioning that credit saturation (RQC) and concentration (HHI) in a municipality reduce the branches' survival rate, an indicator that in more developed regions, where there are usually higher relative volumes of bank credit, the competition between branches increases, leading to the relocation of customers among some branches and the closing of others. In terms of the concentration of deposits (HHIDEP), the effect on survival is the opposite, indicating that the greater possibility of capturing deposits stimulates the survival of branches in the period. As for the proportion of micro, small and medium-sized enterprises (MSMEs), the correlation is positive with the survival rate, which indicates that, once the functional distance is controlled, the increase of MSMEs in a municipality tends to improve the survival rate of bank branches. This result is in line with studies that point out the importance of banks that operate adapted to local conditions as a means of providing services for the development of small and medium-sized enterprises.

Finally, as for potential branch substitutes, the results show that, while credit cooperatives reduce the survival rate of branches, acting as substitutes, bank service stations, in turn, tend to be complementary to branches, which may be related to the fact that there are legal restrictions on the how the service stations can operate.

Conclusions

The evolution of the banking system's operating model has been the source of numerous debates in recent years. The new information technologies and the emergence of digital banks have increased the pressure on traditional banks, and many have predicted that the functioning model of bank branches is bound to end. However, there is a need to clarify the factors that determine the survival of branches in this new context, since there are still functions performed by bank branches that are important for local development.

Based on the formulation of a survival index for bank branches, this study was able to corroborate the importance of some factors for their operation, particularly variables related to their functioning and variables related to the characteristics of the municipalities in which they are located. It is possible to observe that the survival of branches is associated with the way in which the local banking system operates in the face of expectations of profitability. Factors such as per capita income, size of firms and the participation of the public administration in the municipality's revenue play an important role in the banks' perception of opportunities to obtain revenues and, therefore, influence the decisions of banks to hierarchize their operations locally and carry out less or more risky procedures, implying decisions to keep branches active or not in the municipalities. In this sense, the results obtained are able to foster the debate about regional finance as a promoter of development, especially in the maintenance of bank agents in low-income municipalities, in addition to indicating which characteristics are significant to support development plans that could boost local economic activity and generate virtuous growth cycles.

Among the main results found, it is evident that higher survival rates are linked to branches in municipalities whose operating strategies prioritize greater liquidity of their assets and ability to

raise funds (of greater maturity). However, in credit-concentrating municipalities, usually those that are more developed, there is a tendency to generate more competition between branches and, consequently, a lower survival rate. These results deserve further research, but it is already possible to align them with the current reductions in branches in higher-income municipalities, such as the capitals of Brazilian states, and it remains to be seen whether the branches will survive in less affluent municipalities.

References

ALESSANDRINI, P.; PRESBITERO, A. F.; ZAZZARO, A. Banks, Distances and Firms' Financing Constraints. *Review of Finance*, v. 13, n. 2, p. 261–307, 18 nov. 2007. Disponível em: <https://academic.oup.com/rof/article-lookup/doi/10.1093/rof/rfn010>.

ALESSANDRINI, Pietro; CROCI, Manuela; ZAZZARO, Alberto. The Geography of Banking Power: The Role of Functional Distance. *The Banks and the Italian Economy*. Heidelberg: Physica-Verlag HD, 2009. p. 93–123. Disponível em: <http://www.springerlink.com/index/10.1007/978-3-7908-2112-3_4>.

AMADO, Adriana. Limites monetários ao crescimento: Keynes e a não-neutralidade da moeda. *Ensaios FEE*, v. 21, n. 1, p. 44–81, 2000. Disponível em: <https://revistas.fee.tche.br/index.php/ensaios/article/view/1960>.

APPLEYARD, Lindsey. The Geographies of Access to Enterprise Finance: The Case of the West Midlands, UK. *Regional Studies*, v. 47, n. 6, p. 868–879, 2013. Disponível em: <http://dx.doi.org/10.1080/00343404.2012.748979>.

BCB. *Relatório de Inclusão Financeira*. . Brasilia: [s.n.], 2015. Disponível em: <http://www.bcb.gov.br/Nor/relincfin/RIF2015.pdf>.

CARVALHO, F. *Mr. Keynes and the Post Keynesians: Principles of Macroeconomics for a Monetary Production Economy*. Aldershot, UK e Brookfield, US: Edward Elgar, 1992.

CAVALCANTE, Anderson. Investment and the banking system: a Kaleckian approach for regions in Brazil. *Regional Studies*, p. 1–14, 19 mar. 2018. Disponível em: <https://www.tandfonline.com/doi/full/10.1080/00343404.2018.1441528>.

CAVALCANTE, Anderson; SANTOS, Mateus. Sistema financeiro e distância funcional: análise do portfólio regional dos bancos no brasil. 2019, IE-UNICAMP, Campinas (SP): Associação Keynesiana Brasileira, 2019. p. 1–19. Disponível em: <https//www.even3.com.br/anais/akb/172896-SISTEMA-FINANCEIRO-E-DISTANCIA-FUNCIONAL---ANALISE-DO-PORTFOLIO-REGIONAL-DOS-BANCOS-NO-BRASIL>.

CHICK, Victoria. The Evolution of the Banking System and the Theory of Saving, Investment and Interest. In: ARESTIS, PHILIP; DOW, SHEILA C. (Org.). . *On Money, Method and Keynes*. London: Palgrave Macmillan UK, 1992. p. 193–205. Disponível em: <http://link.springer.com/10.1007/978-1-349-21935-3>.

CROCCO, Marco *et al.* Banks and Regional Development: An Empirical Analysis on the Determinants of Credit Availability in Brazilian Regions. *Regional Studies*, v. 48, n. 5, p. 883–895, 4 maio 2014. Disponível em: <http://www.tandfonline.com/doi/abs/10.1080/00343404.2012.697141>.

CROCCO, Marco; CAVALCANTE, Anderson; BARRA, Cláudio. The behavior of liquidity preference of banks and public and regional development: the case of Brazil. *Journal of Post Keynesian Economics*, v. 28, n. 2, p. 217–240, 1 jan. 2005. Disponível em: <http://www.tandfonline.com/doi/full/10.2753/PKE0160-3477280204>.

CROCCO, Marco; FIGUEIREDO, Ana Tereza Lanna; SANTOS, Fabiana Borges Teixeira. Differentiated banking strategies across the territory: an exploratory analysis. *Journal of Post*

Keynesian Economics, v. 33, n. 1, p. 127–150, 2010. Disponível em: <http://www.tandfonline.com/doi/abs/10.2753/PKE0160-3477330107>.

CROCCO, Marco; JAYME JR., Frederico. *Moeda e Território: Uma interpretação da dinâmica regional brasileira*. 1. ed. Belo Horizonte: Autêntica, 2006.

DOW, Sheila. *Money and the Economic Process*. Cheltenham: Edward Elgar, 1993.

FEIJÓ, Carmem. Decisões empresariais em uma economia monetária de produção. In: LIMA, GILBERTO TADEU; SICSU, JOÃO; PAULA, LUIZ FERNANDO DE (Org.). . *Macroeconomia Moderna*. 1a. ed. Rio de Janeiro: Campus, 1999. p. 109–132.

LAURETO, Camilo; OREIRO, José Luís da Costa. Rentabilidade e concentração do setor bancário brasileiro no período 2002-2009. 2010, São Paulo: [s.n.], 2010. p. 1–23.

MENDONÇA, M.; CAVALCANTE, A. Fragilidade financeira do setor bancário brasileiro. *Revista da Sociedade Brasileira de Economia Política*, n. 54, p. 148–182, 2019. Disponível em: <http://www.revistasep.org.br/index.php/SEP/article/view/465>.

MINSKY, H. *Stabilizing an Unstable Economy*. New Haven: Yale University Press, 1986.

NOGUEIRA, Mara *et al.* Financial hierarchy and banking strategies: A regional analysis for the Brazilian case. *Cambridge Journal of Economics*, v. 39, n. 1, p. 139–156, 2013.

PAULA, Luiz Fernando De. *Sistema financeiro, bancos e financiamento da economia: uma abordagem keynesiana*. Rio de Janeiro: Elsevier, 2013.

PAULA, Luiz Fernando De; OREIRO, José Luis; BASILIO, Flavio A C. Estrutura do setor bancário e o ciclo recente de expansão do crédito: o papel dos bancos públicos federais. *Nova Economia*, v. 23, n. 3, p. 473–520, dez. 2013. Disponível em: <http://www.scielo.br/scielo.php?script=sci_arttext&pid=S0103-63512013000300001&lng=pt&tlng=pt>.

PETERSEN, Mitchell a. Information: Hard and Soft. *Northwestern University document de travail*, n. July, p. 20, 2004.

POLLARD, Jane S. Small firm finance and economic geography. *Journal of Economic Geography*, v. 3, n. 4, p. 429–452, 2003. Disponível em: <http://www.scopus.com/inward/record.url?eid=2-s2.0-0142091250&partnerID=40&md5=0936e2bf61eb3ecb11c4fe9f27e64ba4>.

SANTOMERO, Anthony M. Modeling the Banking Firm: A Survey. *Journal of Money, Credit and Banking*, v. 16, n. 4, p. 576–602, nov. 1984. Disponível em: <https://www.jstor.org/stable/1992092?origin=crossref>.

SICSÚ, João; CROCCO, Marco Aurélio. Em busca de uma teoria da localização das agências bancárias: algumas evidências do caso brasileiro. *EconomiA*, v. 4, n. 1, p. 85–112, 2003.

SLIVNIK, A.; FEIL, F. CAIXA, BB E BNDES - notas sobre sua evolução patrimonial recente. 2017, Brasilia: Associação Keynesiana Brasileira, 2017. p. 1–25.

TOBIN, J. The commercial banks as creators of 'money'. In *Essays in Economics*, v.1. Cambridge, MIT Press, 1987.

TSB Bank. Why branches matter in a digital age. Disponível em: https://www.tsb.co.uk/.../why-branches-matter-in-a-digital-age.pdf. Access on: 04/26/2018.

ZHAO, T.; JONES-EVANS, D. SMEs, banks and the spatial differentiation of access to finance in the UK. 28p, 2017.