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Switching costs and the extent of potential competition in Brazilian banking☆

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Abstract

Switching costs are a leading cause of customer lock-in in banking, reducing the extent of competition and increasing market power in this industry. This paper tries to estimate these costs using a methodology that does not require customer microdata. The estimates obtained here—using bank accounting information collected on a quarterly basis from 2009 to 2011—indicate substantial switching costs in the deposit market, and such costs tend to be lower for customers of larger banks. Additionally, there is some evidence that much of a bank's market share is due to its continued relationships with customers over time (a lock-in effect). Thus, the extent of potential competition in Brazilian banking could be severely limited by these costs.

JEL classification: L13; G21

Keywords: Switching costs; Banking; Industrial organization

Resumo

Custos de mudança são uma das principais causas de retenção de clientes na indústria bancária, reduzindo a competição e aumentando o poder de mercado nesta indústria. Este artigo tenta mensurar tais custos usando uma metodologia que não necessita o uso de microdados. As estimativas obtidas aqui - utilizando informações contábeis dos bancos em uma base trimestral entre 2009 e 2011 - indicam custos de mudança substanciais no mercado de depósitos à vista, e tais custos tendem a ser menores para clientes de bancos maiores. Além disso, existe alguma evidência que a maior parte da participação de mercado de um banco é devido às suas relações com os consumidores ao longo do tempo (efeito lock-in). Portanto, a extensão da competição potencial na indústria bancária brasileira pode ser fortemente limitada por tais custos.

Palavras-chave: Custos de Mudança; Banking; Organização Industrial

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1. Introduction

Although there is anecdotal and incomplete evidence that switching costs are important in the Brazilian banking sector, academic studies regarding the relevance of switching costs are scarce. The present paper investigates the role of switching costs in explaining some puzzling facts about the competitive structure of Brazilian banking.

After dealing successfully with high inflation for more than 50 years, the Brazilian financial system finds itself the largest and most sophisticated in Latin America (The World Bank, 2007). To survive inflation rates of more than 3000% in some years during the 1980s, Brazilian banks had to develop strategies to reap gains from floating. However, adapting to a low-inflation environment was not an easy or costless task.

Despite being larger than its Latin American peers, according to The World Bank (2007), the banking sector is not much more concentrated, with a Herfindahl index value of 900 and similar efficiency and capital adequacy ratios. The same study also reports some puzzling findings regarding retail banking products, which are much less sensitive to changes in the cost of funds than corporate products. Besides, the retail business line exhibits higher returns than the corporate line.

There are many possible explanations for such findings—for instance, Lucinda (2010) concludes that there is evidence of market power in Brazilian banking. This market power, at least in retail banking, could be related to high customer switching costs, of which there are some striking examples of a high value of a customer to a bank. The first example is the existence of so-called "university accounts", which reduce a customer's bank fees throughout his or her college education. The second is the aggressiveness of banks bidding for the right to manage public institutions' payroll services. The third is the requirement, passed in 2006[1] and in place until 2012 for some public servants, that employees receive their wages only through an employer-defined bank account.

Such costs increase incentives to capture customers, may grant market power to incumbent companies and act as a barrier to potential entrants, with important consequences for banking sector competitiveness. They may also explain, to some extent, the difficulties faced by new entrants trying to gain market share. An example is HSBC, which although a major global player, has a somewhat small market share in Brazil. Despite having a presence in Brazil since 1997 and reaching the sixth-largest market share, HSBC's total assets (BRL 146.6 billion) are only 34.0% of the value of the next largest bank (Santander, with assets of BRL 431.8 billion).[2] The largest banks in this ranking are institutions that were already large or have become so by acquiring other large institutions.

The model used here to estimate switching costs, developed by Kim et al. (2003), has two advantages. The first is that it does not require microdata on individual customers' behaviors, and the second is that it makes possible the estimation of some implications for the market competitive structure. These implications shed light on the market power derived from switching costs.

This paper is divided into six sections, including this introduction. Section two presents a literature review, indicating how the methodology to be employed here relates to previous papers. This section is followed by the details of the methodology used to estimate switching costs. Section four presents both the dataset and the baseline specification, followed by a discussion of the results. Finally, section six concludes.

2. Literature review

Switching costs are perceived by economic agents when they change suppliers, and they are generated by the human and physical capital invested by each customer of a particular brand—sometimes even if the products of all suppliers are identical ((Kim et al., 2003)). The suppliers are identical before purchase but not after, which creates switching costs and may confer some market power.

The literature on switching costs is quite large, and major theoretical works include Klemperer (1987a,b). Klemperer (1995) conducts a comprehensive review of studies related to switching costs, and Shapiro and Varian (1998) gathers examples of their effects on market behavior.

An early study that is more directly related to this paper is Von Weizsäcker (1984), which proposes a model to measure the "competitive distance" between two products with switching costs. Klemperer (1987c), in turn, considers

[1] Resolution 3424 of the National Monetary Council.

[2] According to information from December 2011 from the Central Bank of Brazil (Accounting Information from the 50 largest banks).

a two-period duopoly and shows that prices are lower in the first period when firms compete for market share, which is valuable in the second. However, due to switching costs, prices can be higher in both periods than they would be otherwise. This conclusion implies that markets with switching costs can be far from competitive, even with a large number of suppliers, which might explain the emphasis place by companies on maximizing market share.

Klemperer (1995) follows up and notes that switching costs are quite common and can lead to important consequences, such as welfare losses similar to those observed in an oligopoly and barriers to new entrants. Padilla (1992) develops a model in which ex ante identical firms have ex post asymmetric market shares, while Padilla (1995) shows that in an infinite horizon model with stationary Markovian strategies, the strength of competition is reduced.

Although the literature on switching costs is extensive, empirical research encounters difficulties in obtaining information on changes in the suppliers used by each individual, especially in the case of the banking sector. These switching costs are viewed in the corporate finance literature as stemming from an asymmetric information problem between the borrower and the lender, as noted in a review of the relationship banking literature by Boot (2000). Another issue faced in the corporate finance literature that creates switching costs is moral hazard, as noted by Boot et al. (1993). Empirical evidence supporting this channel is provided by Bharath et al. (2007).

The scarcity of studies accurately estimating supplier change is due to the mostly customer-specific unobserved opportunity costs. They reflect human capital requirements for changing suppliers, as well as some informational advantage that the incumbent supplier has over its competitors, and represent a utility loss that sometimes cannot be directly calculated from the data, as highlighted by Shy (2002). As noted by Kim et al. (2003), the transition individual-level data required are rarely available to researchers. In this context, both papers develop methods based on equilibrium assumptions about the effect of switching costs on market conduct. Shy (2002) develops an equilibrium concept, called Undercut Proofness, and Kim et al. (2003) start from the assumptions developed in Klemperer (1987c) and proposes some extensions, such as relaxing the assumption of no switching in equilibrium.This advance has some important empirical consequences, since empirical evidence indicates that there is a substantial amount of switching, as also noticed in the Klemperer (1995) review.

Kim et al. (2003) start by considering an n firm oligopoly that competes in prices (à la Bertrand) for a non-storable good. Consumers have inelastic demands and maximize their utilities by choosing which firm to buy from given a price vector. It is assumed that consumers have in mind that changing suppliers is costly and add switching costs to the prices charged by the firms from which they did not buy earlier. This behavior produces transition probabilities, which are functions of prices and switching costs, that are in turn aggregated to generate firm demand. The details will be provided in the next section.

3. Methodology

The methodology used here follows the framework developed by Kim et al. (2003), with a focus on the provision of bank deposit services. The model is formulated to allow the estimation of the structural parameters using aggregate data and is based on the theoretical analysis of customer switching cost effects in the market by Klemperer (1987b), with an additional assumption the customer can change banks in every period.[3]

The starting point is the probability that a customer continues purchasing from the same firm:

$$\underset{i\to i,t}{Pr} = f\left\{p_{i,t}, \vec{\mathrm{p}}_{\mathrm{iR},t} + \vec{\mathrm{s}}\right\} \tag{1}$$

where $\underset{i\to i,t}{Pr}$ is the probability that a customer who bought in the previous period from firm i keeps buying from the same firm in next period, and $p_{i,t}$ is the price charged by firm i. Here, $\vec{\mathrm{p}}_{\mathrm{iR},t}$ is an $(n-1)$ vector of prices offered by rivals other than i, and $\vec{\mathrm{s}}$ is a vector of switching costs equal to the scalar s multiplied by a unit vector $(n-1)$: $\vec{s} \equiv s.\vec{I}$. Thus, Eq. (1) means that the probability that the consumer continues his relationship with bank i depends on the price charged by all banks, taking switching costs into account.

Since switching costs are probably different for each customer, s can be interpreted as an average switching cost. Customer-specific deviations from this mean are captured by the slope of the transition probability function, while bank-specific changes in average cost are captured at the level of the function.

[3] The derivation details are available in Kim et al. (2003).

The model only considers switching between banks due to price differences and switching costs—implicitly, it is assumed there are no differences in perceived bank risk to incentivize switching due to such risk. Thus, the model presented here is closer to the conclusion of Demirgüç-Kunt and Detragiache (2002) that increased deposit insurance implies reduced monitoring from depositors than to the results of Martinez Peria and Schmukler (2001) for Latin America. The dataset used in the latter paper includes periods during which there were severe banking crises, whereas the assumption of no effect of bank risk in customer switching used here for a period during which there were no severe bank crises seems appropriate. Furthermore, the relationship between deposit insurance and customer discipline is mediated by several other variables, as noted by Laeven and Levine (2009).

To obtain demand as a function of firms' market shares, a linear first-order approximation of the transition probabilities has been applied. From this linearization, the aggregation of transition probabilities results in the demand faced by firms, which determines the market share (σ) of each firm[4]:

$$\sigma_{i,t} = -\sigma_{i,t-1}\frac{n}{n-1}s\alpha_1 + \alpha_0^i + \alpha_1\left(p_{i,t} - \vec{p}_{iR,t} + \frac{s}{n-1}\right). \tag{2}$$

This result, which follows directly from Kim et al. (2003), implies an inelastic total demand, adopting the hypothesis that $\alpha_1 = -\alpha_2$ and implying that a small increase in $p_{i,t}$ would have the same effect as a decrease of the same order in $\vec{p}_{iR,t}$.[5]

On the supply side, it is assumed that the firm acts to maximize the present value of profits. Solving the maximization problem, the price-cost margin equation for period t is obtained:

$$pmc_{i,t} = -\delta.\sigma_{i,t+1}\frac{n}{n-1}sg_{t+1} - \frac{\sigma_{i,t}}{\alpha_1}, \tag{3}$$

where $pmc_{i,t} \equiv p_{i,t} - mc_{i,t}$, and $mc_{i,t}$ is the marginal cost.

Some important results from the model are presented below. From market share Eq. (2), we have the following effects:

1. *Lock-in* effect: The effect of $t-1$ market share on the firm's current market share is positive: $\frac{\partial\sigma_{i,t}}{\partial\sigma_{i,t-1}} = -\frac{n}{n-1}s\alpha_1 > 0$[6]
2. The impact of the existing market share (period $t-1$) on the current market share is increasing with switching costs: $\frac{\partial(\partial\sigma_{i,t}/\partial\sigma_{i,t-1})}{\partial s} = -\frac{n}{n-1}\alpha_1 > 0$
3. Switching cost effect: The impact of switching costs on market share is not clear:

$$\frac{\partial\sigma_{i,t}}{\partial s} = \left(\frac{1}{n} - \sigma_{i,t-1}\right)\frac{n}{n-1}\alpha_1 \begin{cases} < 0 & se\ \sigma_{i,t-1} < 1/n, \\ > 0 & se\ \sigma_{i,t-1} > 1/n. \end{cases} \tag{4}$$

The switching costs favor larger than average firms over smaller than average firms. Thus, the existence of switching costs results in even larger market shares for firms of above average size and increases divergence in bank size.

From Eq. (3), the margin of price over marginal costs:

1. The first term on the right side of the equation represents the benefit to the firm of capturing customers in period t, which will be locked in for future periods. The higher this benefit (the higher s or g_{t+1}), the lower the optimal price–marginal cost margin in period t to capture customers.
2. The second term of the equation represents the firm's market power in current period. The larger the market share, the greater the price-marginal cost margin.

A possible shortcoming of this model is that it does not take into account the so-called "transfer price of funds". This weakness will be addressed in the empirical analysis by experimenting with different values of c_{it}.

[4] Here, α_0^i denotes the firm-specific intercepts, which capture the heterogeneity of the firm. The a_1 coefficient measures the sensitivity of the probability of transition to the price charged by the firm itself, and a_2 is the cross-price sensitivity.

[5] This assumption can be easily relaxed, as done in Nakane (2003), to test it directly on estimation.

[6] Here, α_1 is less than zero, and s is always positive.

4. Data and model specification

4.1. Data

Two databases have been used here. The main data source for the paper is the accounting information of financial institutions operating in Brazil obtained from the Central Bank of Brazil (in Portuguese, Banco Central do Brasil or BCB). The database contains quarterly accounting information for financial institutions by Brazilian tax ID number (Report 4010) between 2009 and 2011. Additional information was obtained from the Central Bank, also on a quarterly basis by Brazilian tax ID number, for the number of active and inactive accounts and the number of branches. From this dataset, only commercial banks, or multiple banks with commercial activities, with 20 or more accounts and one or more branch were considered. Thus, the final sample contains 57 institutions, 46 multiple banks and nine commercial banks, together with the publicly owned Bank of Brasil and Caixa Economica Federal.

An important issue to be addressed during the estimation is the product dimension of the market, with implications for which banks that should be in the sample. As observed in (Kim et al., 2003, p. 43), "if the size of the branch network affects the state and the degree of competition, for example, due to location preferences, then banks that have a very small number of agencies cannot be a good matching in a model that has the chance to mutual competition". A first filter was applied to limit the sample to banks that are potential competitors in the retail banking market and offer current account and related services. Investment banks, multiple banks with no retail services,[7] credit unions, development banks that are not part of a conglomerate and conglomerates and independent institution non-bank were excluded from the sample at this time.

The next issue in the construction of the variables was defining deposit services, with implications for how the derivation of the correct price measure. We experimented with two alternative definitions of price of deposit services. The first one, p_{serv}, was derived in a similar way to Nakane et al. (2006), as the ratio of revenues from services and the balance of bank deposits. An alternative measure considers revenues from keeping a checking account open and transaction fees only, denoted as p_{ca}. These definitions lead to quite different values. For the former, the average revenue from services is BRL 215.00 million, with an average p_{serv} of BRL 0.0085 for each deposited BRL.

The revenue items considered in defining p_{ca} were earned income from services provided to individuals and priority services to businesses (e.g., registration costs, account statement provision, transfers, credit cards) and revenues from registration, deposit accounts, transfer funds, loans and other banking fees. Based on this narrower concept of income, the average p_{ca} is BRL 0.0368 for each BRL in a sight deposit account.

As a comparison, the latter measure of revenues is approximately 30% of the former. Since there is uncertainty regarding which of the two concepts is more appropriate, estimates were provided using both price definitions.[8]

It is important to note that, since the opportunity cost of resources held in the account is not considered, this measure understates the effective economic cost of keeping the account open.

During the period 2009–2011, it is observed that there is high variability in bank size and that most of them are relatively small. In the sample, 50% of banks have nine or fewer dependencies and less than 1881 active accounts on their balance sheets. Considering market share, measured by deposit value, 50% of banks have up to 0.147% of market share.

Only 5% of banks have more than 3375 branches and more than 14.7 million active accounts. However, each of these banks holds 16.41% or more market share, an indication that few banks dominate the banking market.

Between 2009 and 2011, the country's largest banks were Banco do Brasil, Bradesco, Itaú, CEF, HSBC and Santander. From the point of view of assets, Banco do Brasil was the largest in 2009 and 2011; in 2010, this position was taken by Itaú.

[7] Those banks were selected by checking whether the banking institution belonged to a group (*Conglomerado Bancário*) without positive balances in the sight deposits accounts.

[8] To work with the information on a quarterly basis, it was necessary to adjust the revenue and expenditure information. According to the Brazilian Central Bank methodology, the accounting data relating to revenue and expenditure for June and December record the balances accumulated between January and June and between July and December, respectively. The values reported in June and December refer to the whole year. However, as the March and September data correspond to balances accumulated between January and March and between July and September, it was possible to compute information relating to the second and fourth quarters.

If the number of total accounts (or active accounts) is used to rank the institutions, the ordering may change but not by much. In 2009, the three criteria indicate that Banco do Brasil was the largest bank; in 2010, while Itaú had the largest asset base, Banco do Brasil had the largest number of accounts, regardless of the criterion used. In 2011, Bradesco had the largest number of active accounts, while the total number of accounts and the value of assets was still higher for the BB.

Second place is held by Bradesco or Itaú, depending on the year and criteria used. HSBC ranks sixth in the ranking of banks, regardless of the criteria.

The market shares of banks show a quite stable pattern over time. The correlation between current market share and that of the previous quarter is 0.9969; The correlation between market share and that of two quarters ago is is 0.9960; three quarters ago, 0.9952; four quarters ago, 0.9948; five quarters ago, 0.9944; and six quarters ago, 0.9929.

Such a pattern may indicate that few customers change from one bank to another in a quarter or even in a year. However, as noted by (Kim et al., 2003, p. 42), "*strictly speaking, a high correlation between intertemporal market shares can also results from intensive switching between banks, resulting in (near) zero change in net market share*". The model to be estimated aims to unveil the actual changes that hide the evolution of market share.

In terms of the funding profile, Fig. 1 presents the shares of different funding sources for banks of different sizes (measured as the number of branches). For all bank sizes, an important feature is that deposits are still an important share of funding, indicating that deposits are relevant to the business of the banks in our sample.

4.2. Model specification

The starting point of the econometric analysis is the system of equations formed by Eqs. (2) and (3), presented here again for the sake of convenience, which are used to obtain estimates of s, the switching costs and α_1, the slope of the transition probability:

$$\sigma_{i,t} = -\sigma_{i,t-1}\frac{n}{n-1}s\alpha_1 + \alpha_0^i + \alpha_1\left(p_{i,t} - \vec{p}_{iR,t} + \frac{s}{n-1}\right)$$

$$pmc_{i,t} = -\delta.\sigma_{i,t+1}\frac{n}{n-1}sg_{t+1} - \frac{\sigma_{i,t}}{\alpha_1}.$$

Kim et al. (2003) estimated these equations simultaneously using nonlinear 3SLS.[9] In this system, variables $\sigma_{i,t}$, $\sigma_{i,t+1}$, time differences in prices, in deposits and in market shares are endogenous. The instrument used were lags of deposits, of the number of branches and of market shares. Since both equations above are structural equations coming from the optimization problems of firms and consumers, the exclusion restrictions ensuring instrument validity come directly from the model in Section 3. The instrument strength conditions required for the validity of the instrumental variables approach are tested separately.

As noted in the previous section, the coefficient s indicates the magnitude of switching costs. Another check on the adequacy of estimates is the sign of the α_1 coefficient, as demand is expected to be negatively related to prices.

In the original model estimated by Kim et al. (2003), *pmc* is defined as the difference between price and marginal cost. In this paper, it is assumed the marginal cost to a bank for the provision of services is 20.03% of the service price,[10] similarly to Nakane et al. (2006), who apply this assumption to the marginal cost of borrowing. A robustness check was conducted to determine the sensitivity of results to different assumptions about this share.

The 20.03% figure was computed from two studies: FIPECAFI (2004) and Nakane et al. (2006). The results suggest that 33% of interest income on loans is used to pay administrative costs. However, as 38.89% of the administrative costs would be related to funding activity, 20.03% of income from lending activities would be used to cover administrative costs. The same proportion is assumed to hold for deposit provision.

[9] The second equation is estimated on first differences to eliminate fixed effects.

[10] Initially, we tested several specifications of the cost function to obtain the necessary parameters for estimating the marginal cost of banks. However, it was not possible to obtain reasonable results, which was desired. The estimation led to marginal costs that predicted much higher prices for the vast majority of banks in the sample, which does not seem reasonable.

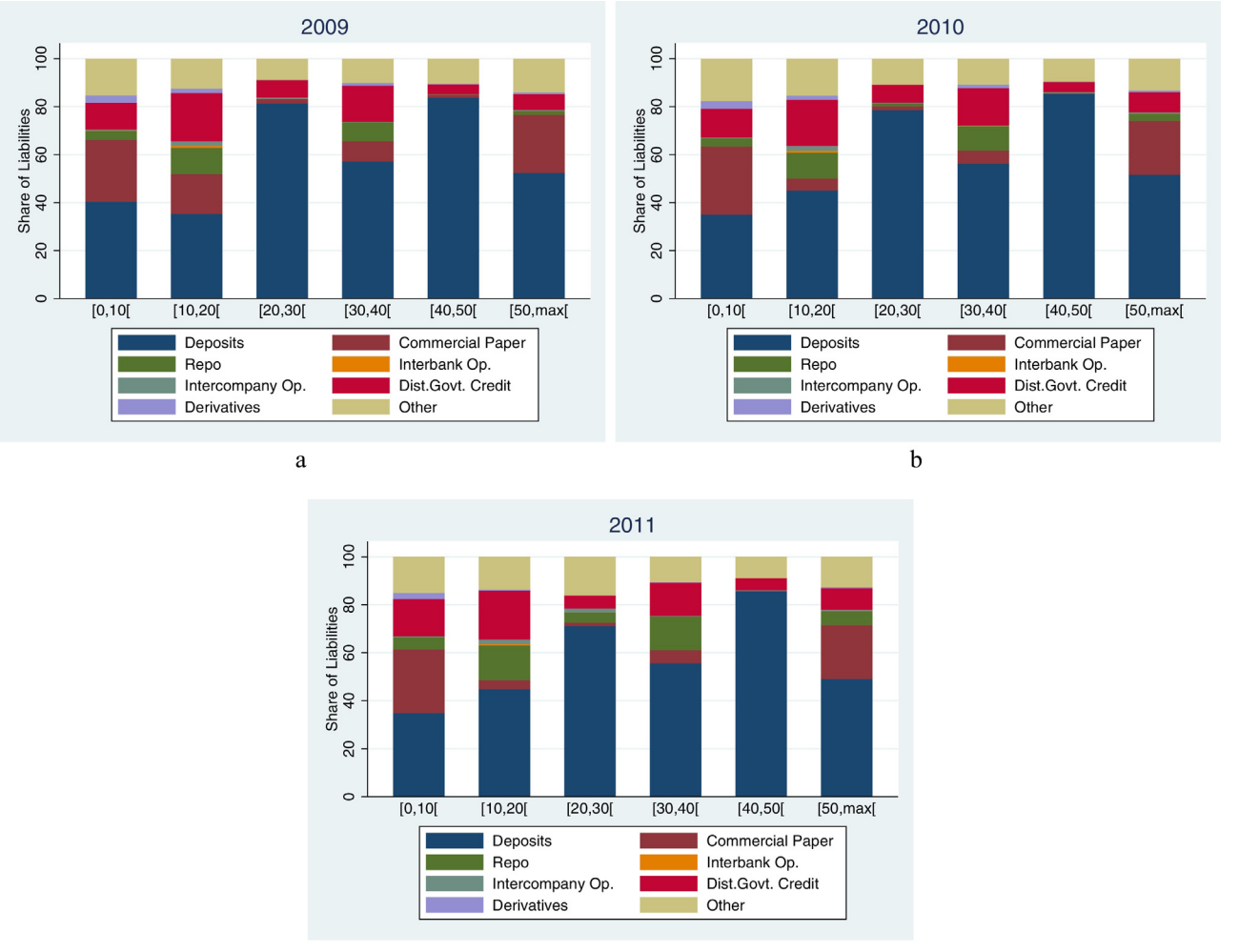

Fig. 1. Funding Profile in 2009, 2010 and 2011.

Source: Central Bank of Brazil.

Table 1
Model estimates—price variable p_{serv}

	All Banks	More than 10	More than 20	More than 30	More than 40	More than 50
s	0.741***	0.354***	0.393***	0.386***	0.409***	0.262***
	(452.54)	(2292.07)	(751.17)	(593.45)	(530.70)	(79.63)
α	-1.184***	-2.131***	-1.949***	-1.975***	-1.881***	-2.688***
	(-448.37)	(-2497.12)	(-1143.44)	(-541.90)	(-578.62)	(-110.67)
N	495	243	180	171	153	135
Q-stat	.72	.9802	.9645	.9084	.8846	.9072

Source: t Stat in parentheses. * p<0.05, ** p<0.01.
*** p<0.001.

Table 2
Model estimates—price variable p_{ca}

	All Banks	More than 10	More than 20	More than 30	More than 40	More than 50
s	0.401***	0.335***	0.317***	0.322***	0.302***	0.323***
	(421.11)	(1950.86)	(765.35)	(726.53)	(1212.08)	(644.98)
α	-2.187***	-2.600***	-2.709***	-2.659***	-2.752***	-2.598***
	(-464.94)	(-2315.44)	(-854.63)	(-703.93)	(-953.56)	(-602.73)
N	513	261	189	180	153	135
Q-stat	.7817	.9755	.9551	.9715	.9882	.9155

Source: t Stat in parentheses. * p<0.05, ** p<0.01.
*** p<0.001.

Eq. (3), after the incorporation of marginal cost, is defined by:

$$\hat{pmc}_{i,t} = -\delta.\sigma_{i,t+1}\frac{n}{n-1}sg_{t+1} - \frac{\sigma_{i,t}}{\alpha_1}, \tag{5}$$

where $\hat{pmc} = \quad p - c\hat{mg}_{y1}$.

Eq. (2) is estimated by first differences to eliminate numerous firm-specific fixed effects:

$$d\sigma_{i,t} = -\frac{n}{n-1}s\alpha_1(d\sigma_{i,t-1}) + \alpha_1\left(dp_{i,t} - d\vec{\mathrm{p}}_{\mathrm{iR},t}\right) \tag{6}$$

Eqs. (5) and (6) were jointly estimated by nonlinear generalized method of moments (GMM).[11] The variables relating to price, market share and product are endogenous and were instrumented using two to four lags of deposits, of the number of branches (agencies) and of the market share.

5. Results

Despite the previously described filters of the initial database, our final sample still includes banks of very different sizes. Thus, the strategy suggested by Kim et al. (2003) was followed here: estimating the system of equations with several subsamples defined by different minimum numbers of branches in order to compare the estimated costs.[12]

The first set of estimates (marked as Estimation 1 in Table (1)) considers the broader definition of services and the price variable is p_{serv}. For the second set of estimates (estimation 2), the price variable is c_{ca}. The estimated coefficients are shown in Table 2.[13]

[11] The estimates were conducted in STATA/MP Software 12 using the heteroskedasticity-robust weighting matrices, with initial values of −0.5 for α_1 and 0.5 for s. The estimated values were not sensitive to the initial values, and the algorithm usually converged after less than six iterations for the first stage and four iterations for the second stage.

[12] The authors also suggest running estimates by loan size as a way to measure bank capacity to provide all banking services. Since our focus is on deposit services, this test was not performed.

[13] With the lag structure of the model and identification strategy, the number of observations reported in these tables differ from the ones in the Descriptive Statistics table before.

As for identification, since all equations are estimated by first differences, the part of unobserved heterogeneity that is constant across banks is addressed. Moreover, the instruments for market shares are strong—when considering the whole sample, the lowest first-stage F statistic is over 19.

The column marked 1st is conducted with the full sample, the column marked 10 uses banks with ten or more branches, and so forth. First, it is important to note that the range of s coefficient implies transition probabilities between [0,1] in all estimations, so additional restrictions are not required.

In all estimates—for different concepts and subsamples—the parameter obtained for the average cost of changing providers s is positive and significant, which indicates the existence of switching costs in the Brazilian service banking market. Likewise, α_1 (the gradient of the transition probability function) is statistically significant for all models. The negative sign on α_1 is also in line with expectations.

Besides being positive and significant for the Brazilian banking market, the estimated s coefficient indicates that switching costs are high. The estimated coefficient suggests that switching costs account for 40% of deposits in Table 1, using the full sample.

Since the average deposit by current account is close to BRL 11,400 for the full sample, the estimated coefficient indicates that the cost of change would be, on average, BRL 4,574 per account.

A possible criticism of this estimate would be this is a result of the implied market definition, since the variables used are related to a broad definition of deposits, considering not only sight deposits, but also savings accounts, interbank accounts, among others.

The estimated parameters in Table 2 imply an average switching cost for the full sample of 74% of the balance in the sight deposit accounts. For an average deposit of BRL 1,123 per account, this implies an average switching cost of BRL 832 per account.

As in Kim et al. (2003), the switching cost decreases when we consider only the largest banks but remained significant for all subsamples. Switching costs reach 30.2% of deposits in estimation 1 and 26.2% of sight deposits in estimation 2.

According to these authors, lower switching costs for larger banks may be related to the fact that "banks with a larger network most often serve a greater portion of larger and more mobile clients (wholesalers) than smaller retail clients" (Kim et al., 2003, p. 44).

This, however, does not seem to be a plausible explanation for the Brazilian Banking market, since in the sample used, smaller banks have, on average, customers with higher deposits per account.

One possible explanation for the results found here is that customers of small banks have longer relationships than those of large banks. This may be because large Brazilian banks are essentially retail banks, while smaller banks are generally more specialized. Service specificity can increase the importance of maintaining bank-customer relationships, thus justifying higher switching costs.

An important conclusion is that estimated coefficients are similar regardless of the definition of services considered: total or sight deposits. The decrease in switching cost for larger banks is also observed in both sets of estimates.

The most significant differences between estimates were observed (i) in the estimated coefficients from the whole sample, which was significantly higher in Table 2 and (ii) in the estimated coefficients from the sample containing only the largest banks, which was lower in Table 2.

An additional robustness check was performed by varying the percentage of tariff revenue implied by the marginal costs. We varied this share from 0.5% to 65% of tariff revenue and performed the analyses above. The results are presented in Table 3:

The results presented in the Table 3 indicate that the maximum change in switching costs from the previously presented results (Presented in Table 2) is approximately 100 BRL for the first sample. For the second sample, switching costs vary from 4900BRL to 2775BRL.

5.1. Additional implications of switching costs

The estimated parameters from the model developed by Kim et al. (2003), as reported in the previous section, can be used to compute various characteristics of the relationship between the bank and the customer. Table 4 provides short descriptions of the characteristics explored and information on how to compute these values from the estimates.

Table 3
Robustness analysis: different marginal costs

		Full	10	20	30	40	50
Price variable: p_{serv}							
Maximum	s	0.433	0.387	0.355	0.354	0.366	0.384
	SC (BRL/Acct)	4934.400	4286.160	3752.831	3739.427	3772.499	3961.724
Minimum	s	0.243	0.328	0.303	0.309	0.257	0.314
	SC (BRL/Acct)	2775.691	3639.706	3200.342	3256.430	2650.709	3245.712
Price variable: p_{ca}							
Maximum	s	0.853	0.442	0.435	0.456	0.472	0.305
	SC (BRL/Acct)	956.503	490.919	482.328	505.265	520.802	336.156
Minimum	s	0.657	0.343	0.365	0.371	0.394	0.249
	SC (BRL/Acct)	736.691	381.083	404.515	410.551	434.267	274.608

Table 4
Implications of the model

Probability of remain in the same bank	$\hat{P}r_{i\to i,t} = \bar{a}_0^i + \hat{a}_1(p_{i,t} - \bar{p}_{iR,\ t} - \hat{s})$
Probability of changing to any other bank	$\hat{P}r_{iR\to i,t} = \bar{a}_0^i + \hat{a}_1\left(p_{i,t} - \bar{p}_{iR,\ t} + \frac{\hat{s}}{n-1}\right)$
Average length of relationship between bank and customer	$\lambda_{k=0.99} = ln(1-k) \div ln(1-\theta)$
Contribution of last period share to current period share	$\frac{\partial\sigma_{i,t}}{\partial\sigma_{i,t-1}} = -\frac{n}{n-1}s\alpha_1$
Contribution of *lock-in* to bank's marginal profit	$\frac{mvl_{i,t}}{\partial V_{i,t}/\partial y_{i,t}} = -\delta\frac{n}{n-1}s\alpha_1$
Annual rate of abandonment	$\theta = 1 - \left(\hat{P}r_{i\to i,t}\right)^4$

Source: Kim et al. (2003).

Table 5
Model implication—various subsamples

	$\hat{P}r_{i\to i,t}$	$\hat{P}r_{iR\to i,t}$	θ	$\frac{\partial\sigma_{i,t}}{\partial\sigma_{i,t-1}}$	$\frac{mvl_{i,t}}{\partial V_{i,t}/\partial y_{i,t}}$	$\lambda_{k=0.99}$
Price variable: p_{serv}						
All Banks	0.923	0.029	0.274	0.894	0.810	14.364
More than 10	0.839	0.056	0.504	0.783	0.709	6.571
More than 20	0.860	0.054	0.453	0.806	0.731	7.643
More than 30	0.859	0.055	0.454	0.804	0.729	7.601
More than 40	0.871	0.053	0.424	0.818	0.741	8.361
More than 50	0.831	0.077	0.522	0.754	0.683	6.234
Price variable: p_{ca}						
All Banks	0.910	0.019	0.314	0.892	0.808	12.216
More than 10	0.925	0.023	0.268	0.902	0.817	14.762
More than 20	0.926	0.025	0.264	0.901	0.816	15.019
More than 30	0.928	0.025	0.260	0.902	0.818	15.301
More than 40	0.910	0.028	0.315	0.882	0.799	12.175
More than 50	0.925	0.026	0.267	0.899	0.814	14.834

Column definitions in Table 4.

Table 5 uses the parameters obtained in the estimations ($\hat{a}_1$ e $\hat{s}$) in the previous section and presented in Tables 1 and 2 for average banks of different sizes. An additional assumption referring to the value of $\bar{a}_0^i$ is necessary for these calculations, which is not directly estimated in the equations. As in Kim et al. (2003), it is assumed $\bar{a}_0^i = 1/n$.

Here, $\lambda_{k=0.99}$ represents the length of the relationship based on the time required for $k\%$ of customers to change banks, and $\frac{\partial\sigma_{i,t}}{\partial\sigma_{i,t-1}}$ represents the contribution of the last period's market share to the market share of period t. The term $\frac{\mathrm{mvl}_{i,t}}{\partial \mathrm{V}_{i,t}/\partial \mathrm{y}_{i,t}}$ represents the share of the marginal value of the locked in customer to the increase in the present value of the bank, and θ is the annual rate of abandonment.

The estimates above suggest that the average probability that a customer continues using the bank's services from one quarter to the next is between 91.0% and 93%. Using the p_{ca} definition for prices, the probability is between

83% and 92%. The average probability that a customer use the services of rivals and migrate to a specific bank varies between 1.8% and 2.8%, averaging 2.4% based on the first definition of prices and 2.9–7.7% for the second. Note that such probabilities increase for samples with the largest banks, while the probability of remaining with the same bank decreases.

Once the estimates made are on a quarterly basis, the annual defection rate is given by $\theta = 1 - (Pr_{i \to i,t})^4$. Thus, on average, 31.4% of customers change banks every year in estimation 1; 44.3%, in estimation 2. The time required for k percent of customers to switch can be defined as $\lambda = \ln(1-k) \quad \div \ln(1-\theta) \quad$. For k = 99%, λ changes from 14.36 to 6.57 years. As for the second group of estimates, the results suggest a minimum value of 12.216 years and a maximum of 14.834 years.

This result is in line with estimates of the average length of the customer-bank relationship in other countries. For example, Kim et al. (2003) found that the average relationship in Norway is between 11.3 and 16.7 years long if markets are defined by the size of the branch network or between 7.5 and 19.4 years if markets are defined by the size of the loans.[14]

For Brazil, the results found by Alencar et al. (2005) suggest that the average relationship would be 5.03 years long, which is shorter than the results found here. However, the authors themselves considered their results somewhat low. Other features of the bank-customer relationship can be derived from the estimated model.

From market share Eq. (5), the contribution of the previous period's market share to that of the current period (lock-in effect) is given by $\frac{\partial \sigma_{i,t}}{\partial \sigma_{i,t-1}} = -\frac{n}{n-1} s\alpha_1 > 0$.[15] According to the results, the lock-in effect in the market for banking services in Brazil is 0.894 for the first definition of the price variable. In other words, 89.4% of the market share in a given quarter is due to the relationship between banks and their clients in the previous quarter. For the second definition, the lock-in effect is 0.892.

Another important result is the ratio of the marginal value of customer captured (locked-in) to the growth of the present value of the bank. The estimates suggest that the value of this ratio is, on average, 0.810 for the first definition of prices p_{serv}. Thus, 81.0% of value added by the client is derived from the lock-in phenomenon generated by switching costs. For the other definition of prices, p_{ca}, this value was 80.8%, on average.

With the proposed approach, it is also possible to observe that the effect of switching costs on market shares is ambiguous, favoring firms that are larger than average over firms that are smaller than the average:

$$\frac{\partial \sigma_{i,t}}{\partial s} = \left(\frac{1}{n} - \sigma_{i,t-1}\right) \frac{n}{n-1} \alpha_1 \begin{cases} < 0 & if \quad \sigma_{i,t-1} < 1/n, \\ > 0 & if \quad \sigma_{i,t-1} > 1/n. \end{cases}$$

For example, the impacts of switching costs for banks with higher and lower market shares were estimated. In September 2011, the largest volume of services income was observed for Itaú Unibanco (21.6%), while the lowest was for La Nacion Argentina Bank (0.00011%). Considering the estimated coefficients, the impact of switching costs on market share is negative for La Nacion Argentina bank, corresponding to about −0.04. On the other hand, the contribution of switching costs to the market share of Itaú Unibanco is estimated at +0.44. In this sense, switching costs tend to generate greater banking concentration.

6. Conclusions

Several examples suggest that switching costs may be relevant for the Brazilian banking sector. The existence of college accounts, the aggressiveness of bidding for the right to manage public servants' payroll and the requirement, in force until the beginning of 2012, that salaries be paid through employer-defined bank accounts are just some of these examples.

Despite the anecdotal and incomplete evidence that the Brazilian banking sector has significant switching costs presented above, studies regarding their magnitude and implications for the competitive structure remain scarce.

[14] Kim et al. (2003) note that these estimates are in line with findings for other countries, citing that the average duration of the customer-bank relationship is 14 years in Italy, 13 years in Germany, seven years in the United States, and 7.8 years in Belgium.

[15] Since α_1 is less than zero and s is always positive.

In this context, the present study aimed to estimate the costs of switching suppliers in the bank deposit market in Brazil, using the methodological approach developed by Kim et al. (2003). This methodology allowed us to test the existence of switching costs without requiring the use consumer data, which are rarely available.

The database used in this study contains financial information, on a quarterly basis from 2009 to 2011, on commercial banks, multiple banks with commercial activities, and public banks with commercial banking activities (Banco do Brasil and Caixa Economica Federal) with more than 20 accounts.

In general, the results show that the cost of change is significant for deposit services in the Brazilian banking sector. The estimates suggest that customers with sight deposits have an average switching cost of approximately BRL 471.17 per account. Switching costs appear to be inversely proportional to bank size, indicating that customers of larger banks have lower switching costs. One explanation is that customers of smaller banks place a higher value on their existing banking relationship, which may be associated with the greater specialization of smaller banks.

As for features derived from switching costs, it was estimated that the average duration of the customer relationship with the bank is 12.2 years in Brazil, with evidence that for smaller banks it is even greater.

The estimates also indicate that 89.2% of market share in a given period is due to the relationship between the bank and the client in the previous quarter (lock-in effect), and 80.8% of value added by the client is derived from the lock-in generated by switching costs, further evidence that the switching costs are relevant in the Brazilian banking market. Although switching costs are lower for larger banks customers, they remain high enough to restrict potential competition between banks—latecomers at the national scale or at a limited scale.

Finally, it is noteworthy that switching costs favor firms that are larger than average over firm that are smaller than average. Switching costs tend to encourage greater banking concentration, and an unexpected effect of the recent wave of subnational governments auctioning rights to manage their payrolls could be reduced competition. It is possible that part of the funds paid to acquire these payroll services were raised by higher mark-ups—with known negative effects on economic efficiency.

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