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Dynamic branching and interest rate competition of commercial banks: Evidence from Hungary

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ABSTRACT

I supplement previous models of bank competition by incorporating the endogenous branching choices of commercial banks. I apply a dynamic structural model of banks' branching and interest rate choices to a unique bank-level dataset on Hungarian commercial banks during 2004–2007. I find that banks charge a premium in interest rates for relative branch network dominance, and banks with relatively smaller networks are less likely to close branches. I present significant and robust estimates of branch setup costs and scrap values, and discuss the potential use of branching restrictions as regulatory tools to alter lending rates and consumer surplus.

1. Introduction

Commercial banks compete with each other by building up branch networks in addition to competing through lending and deposit rates (Kim and Vale, 2001). Banks can enjoy several advantages from maintaining sizable branch networks relative to competitors, ranging from scale-related revenue improvements (Berger and Mester, 2003) to building and retaining retail clientele (Dick, 2007; Ho and Ishii, 2011; Molnar et al., 2013).[1] Banks' branching choices affect interest rates and therefore consumer surplus. Furthermore, these branching choices are inherently dynamic and driven by setup costs.

In this paper, I supplement existing models of bank competition with endogenous branching choices to examine: How are banks' lending and deposit rates affected by the size of their branch networks over time? How are banks' branching choices affected by their competitors' branch networks, and their own past branching choices? What are the magnitudes of branch setup costs and scrap values that drive branching decisions? Answering these questions brings new insights to the use of branching restrictions as market-based regulatory tools to impact banks' interest rates and consumer surplus.

In order to answer these questions, I draw on the industrial organization literature on dynamic entry. I apply a version of Bajari et al.'s (2007) dynamic structural estimation framework to a model of spatial bank competition. I estimate the model using a unique bank-level regulatory dataset on the branching and interest rate choices of the largest Hungarian commercial banks during the 2004–2007 period. In the first (reduced-form) stage of the estimation, I examine the roles of branch networks and the macroeconomic environment in banks' interest rate and branching choices. I find strong branch network effects on banks' choices of interest rates. Banks with a bigger scale of branch networks use their locational market power to charge a premium in their lending rates. In the retail and mortgage markets, where branch networks are especially important in serving clients, a one percent higher branch network size of a bank relative to its peers (equivalent to a difference of 2 branches) corresponds to 0.48 to 1.05 percentage point higher lending rates. The premium banks charge for branch networks decreases in competitors' branch network size: Banks whose competitors have relatively more branches charge 0.72 percentage points lower retail lending rates. There is evidence of the pricing impact of locational market power in deposit markets as well: A one percent higher branch network size relative to peers corresponds to 0.65 to 0.89 percentage point lower deposit rates. I also find that the pass-through from interbank rates into lending rates is lower in markets where banks enjoy more locational market power through branch networks.

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[1] Indeed, the location and size of branch networks account for 45 to 55% of deposit formation (Hopson and Rymers, 2003).

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Results on branching confirm the role of dynamics: I find that established branch networks influence additional branching choices. Banks with bigger branch networks are more likely to open and close branches. Even a one percent increase in branch network size corresponds to a 58 to 69% increase in the probability of branch opening, and a 12 to 23% increase in the probability of branch closing. A bigger scale of competitors' branch networks relative to the bank's own network makes the bank 14% less likely to close branches. In the second stage of the Bajari et al. (2007) estimation framework, I use the structural model of profit-maximizing banks to derive significant and robust estimates of branch setup costs and scrap values that rationalize banks' observed behavior. My estimate of the per-branch setup cost is 0.63 million U.S. dollars in Hungary. The scrap value of closing a branch is 0.33 million U.S. dollars, implying that banks in Hungary are able to recover approximately 53% of the setup costs of branch building upon closing a branch.

The IO-based analytical framework of this paper brings new insights to the formation of effective market-based bank regulatory tools.[2] My results imply that branching regulations which are focused on preventing banks from using branching to build locational market power relative to their peers can increase consumer welfare by lowering lending rates and raising deposit rates. Furthermore, the negative relationship between interbank rate pass-through into lending rates and locational market power implies that limiting branch network dominance can also improve the strength of the bank lending channel of monetary policy. An important way in which regulators can affect branching choices is through manipulating branch setup costs (inclusive of administrative and legal expenses). Such market-based methods are much less distortive than the imposition of interest rate floors and caps or moratoria on certain types of borrowing, which were some examples of post-crisis government responses in several Central and Eastern European countries.

The paper proceeds as follows. Section 2 provides a brief overview of the literature. Section 3 presents the model and Section 4 describes the data and the estimation method. Section 5 discusses the estimation results. Section 6 summarizes and concludes the paper.

2. Literature review

Regarding the role of branch networks in banks' choices, previous literature has established that location provides banks with market power (Barros, 1999; Dell'Ariccia, 2001) and highlighted that banks' branching choices closely interact with the competitive pressures facing them (Cohen and Mazzeo, 2010). With respect to the role of branch networks in interest rate choices, several papers in the previous literature captured the impact of branch networks on interest rate decisions (Calem and Nakamura, 1998; Chiappori et al., 1995), doing so either by taking branch structure as given or excluding multi-branching. Kim et al. (2007) took an important step forward by incorporating simultaneous price and branching competition in a static setting.

Studying the interaction of pricing and branching decisions, previous models in the literature were either static, or captured the multi-period effects of branching by assuming that location and interest rate choices happen in separate stages. In Estrada and Rozo's (2006) analysis of the Colombian market, banks choose interest rates in the first period and make branching decisions in the second period, taking interest rates as given. Alternatively, in Cerasi et al. (2002) and Coccorese's (2012) model banks make branching decisions in the first stage, followed by interest rate choices in the second stage. Importantly, Repullo (2004) uses a dynamic model to study the deposit market in a Salop circle model. Given the paper's different focus, Repullo (2004) does not incorporate loan rates, branching choices or empirical estimation. Lastly, with respect to previous evidence on the setup costs of branching, earlier reports established that the brick-and-mortar costs of branch opening are substantial, amounting to as much as 2 million U.S. dollars in the U.S. (Bancography, 2003, 2006; Spieker, 2004).

Table 1
Description of model variables: summary of notation.

Variable name	Model notation
Retail loan, corporate loan and deposit rates, set by each bank each period	$(r_l^h; r_l^f; r_d^h)$
Bank-specific number of own branches, chosen by each bank each period	n_j
Discount factors of households, firms and banks	$(\beta^h; \beta^f; \gamma)$
Total number of bank branches and productive firms in market	$(N;F)$
Per-capita retail client wealth	W
Aggregate loan demands and deposit supply (retail & corporate)	$(L^h;D^h;L^f)$
Retail clients' per-capita savings & deposits	$(s^h;d^h)$
Retail & corporate clients per-capita loan demands	$(l^h;l^f)$
Required reserve ratio; share of deposits bank must hold in reserves at central bank	ϕ
Base interbank interest rate	$\bar{r}$
Retail client's distance to nearby branch	x
Aggregate consumption of clients and production of firms	$(C;Y)$
Firm's capital input (per firm)	k
Proportional retail lending and deposit costs	$(c_l^h; c_d^h)$
Proportional corporate lending and branch operational costs	$(c_l^f; c_n)$
Branch setup cost & scrap value (per branch)	$\rho; \delta$
Change in number of bank's branches	a_j
Set of exogenous state variables	Θ
Markov process of evolution of state variables	Ω
Firm's variable & total profit; constructed in structural stage from first-stage estimates	$(\pi; \Pi)$
Firm output & equity (per-firm)	(y,e)
Bank-specific unobserved private shocks	ϵ_j

3. Model

3.1. Setup and notation

The economy consists of banks, households and corporations. This section provides an outline of the interactions of banks with the retail and corporate sectors. Details are presented in the Model Appendix, and the notation is summarized in Table 1.

3.2. Loan demand and deposit supply facing banks

The economy consists of an infinite horizon of overlapping generations of clients (consumers), each of whom lives for two periods. Clients are referred to as 'young' in the first period of their life, and as 'old' in the second period. A continuum of young and old consumers are uniformly distributed along a Salop circle. A total of J banks service these clients, with $j = 1\ldots J$ indexing the individual bank. There are a total of N bank branches which are uniformly distributed along the Salop circle, as shown in Fig. 1. Each bank j's branch network (number of branches) is denoted by n_j, such that $\sum_j n_j = N$. Let $n = (n_1;\ldots;n_J)$ denote the vector of bank-specific network sizes.

Each period, the continuum of young consumers solve their optimal consumption-saving problem, and decide how much to deposit or borrow from banks.[3] Let $l^h(r_l^h; \Theta^h)$ denote the individual loan demand function l^h of borrowing retail clients, which is a function of the lending

[2] Market-based bank regulations, which are based on the principle of affecting banks' behavior through incentives, market discipline and peer pressure, have become prevalent in the post-financial crisis international bank regulatory framework of the Single Rulebook of the European Banking Authority, or the Basel III Accord in general.

[3] Consumers repay their loans, and collect yields on deposits, in the second period of their life ('old' age). It is assumed the both consumers and firms survive from young to old age with probability one.