FOREIGN ACQUISITION OF BANKS

by

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To Noël

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1
INTRODUCTION

The objective of this dissertation is to contribute to a rich literature on foreign entry into banking with three papers that shed a new light on foreign acquisitions of banks in emerging markets. The papers present foreign acquisition as a mode of entry that is fundamentally distinct from "greenfield" entry, the establishment of a new bank by foreign entrants, and explore both theoretical and empirical meaning of this distinction.

A significant body of existing theoretical work on (foreign) entry into banking explicitly or implicitly focuses on greenfield entry (e.g. Dell'Ariccia, Friedman and Marquez, 1999; Dell'Ariccia and Marquez, 2004; Sengupta, 2007; Detragiache, Tressel and Gupta, 2008; Gormley, 2008). This work provides important insights into the informational benefits of incumbency, the scope for entry by foreigners and the potential for disruption of credit markets due to crowding out of incumbents that have better information but a higher cost of capital than their foreign competitors (Detragiache et al., 2008). This literature can also explain a number of important regularities in the pattern of foreign entry into banking and post-entry performance. For instance, it is well-established that foreign-owned banks from advanced economies do well in emerging markets, but not in other advanced economies (e.g. Claessens, Demirguc-Kunt and Huizinga, 2001; Lensink and Hermes, 2004). This is consistent with a model in which foreigners need cost-of-capital advantages to compensate for informational disadvantages (Miller and Parkhe, 2002; Mian, 2006). Other predictions however, receive mixed support in the

empirical literature, chief among them the prediction that foreign ownership of banks should negatively affect lending to "opaque" borrowers. In one way or another, the theoretical papers cited above all assume that foreign-owned banks have difficulty processing soft information about borrowers. The very careful study by Mian (2006), who uses a large database of loan-level data, confirms that foreigners avoid opaque, usually approximated as "small", borrowers. Other papers come to similar conclusions (Berger, Klapper and Udell, 2001; Berger, Klapper, Peria and Zaidi, 2008; Detragiache et al., 2008). However, in a sample of Latin-American countries, large foreign-owned banks were found to expand lending to small borrowers faster than domestically owned banks (Clarke, Cull, Peria and Sanchez, 2005). In Central and Eastern Europe (the CEE region) foreign-owned banks lend less to large domestic firms, but not to small borrowers (De Haas, Ferreira and Taci, 2007).

The CEE region and Latin America also happen to be the regions where foreign ownership and in particular foreign acquisition of banks are more prevalent than in Africa (Detragiache et al., 2008), Pakistan (Mian, 2006) or India (Berger et al., 2008). By definition, foreign acquisition involves a transfer of control of a pre-existing institution rather than the creation of a new financial institution. This implies that the acquirer gets access to the resources of the acquired bank, which include the knowledge and information held by incumbent employees as well as a client network. But there are several other characteristics that distinguish greenfield entry from entry by acquisition. To begin with, greenfield entry of banks in emerging markets usually involves banks with a small footprint that focus on a limited market segment, such as corporate banking. Acquisition by contrast, frequently involves universal banks with large branch networks,

which are only useful if the new owners intend to serve retail and SME clients. Indeed, it appears as though getting access to these clients is an important rationale for acquisitions (Guillén and Tschoegl, 2000). In the CEE region for example, foreign banks first became interested in retail and SME banking when competition reduced profit margins in the market for corporate banking services (De Haas and Naaborg, 2005). More broadly, empirical research on foreign acquisitions of banks has found that acquirers are attracted to countries that have a solid regulatory framework, but are otherwise "underbanked" (Buch and DeLong, 2004; Focarelli and Pozzolo, 2005).

Another difference between acquisition and greenfield entry, or at least an important characteristic of acquisition, is that there is often a surge in foreign ownership following a period of economic turmoil (Tschoegl, 2005). This is obviously true for the transition economies in the CEE region, where foreign ownership is now the dominant type of ownership, but it is also true for Mexico, South Korea and Indonesia to some extent. With some delay, all three of these countries experienced an increase in foreign acquisitions after the financial crises of 1994/5 and 1997 respectively.

Dissertation Papers

The three papers in my dissertation address, with changing emphasis, the three key characteristics of foreign acquisition just mentioned: (i) the fact that the acquirer obtains an existing institution with all its resources, (ii) the focus on retail and SME banking and (iii) the timing of acquisitions following periods of economic turmoil.

The first paper, "Post-Acquisition Restructuring, HRM Policies and Performance: Insider Econometrics in a Multi-Unit Firm", the product of joint work with Jan Svejnar,

starts from a slightly negative perspective on the resources that acquirers obtain. In particular, the paper studies how the foreign acquirer of a bank in the CEE region addressed deficiencies in performance through organizational reforms at the branch level. In doing so, the paper makes contributions to the insider econometrics literature, which seeks to evaluate the impact of modern human resource management practices on the basis of detailed data and a precise understanding of the production process (Ichniowski and Shaw, forthcoming). I leave the discussion of that contribution to the paper itself however and use the introduction to focus on what ties the papers together.

The bank that we study had performed reasonably well throughout the nineties because its owners implemented a conservative strategy, which was beneficial in an environment of politicized lending and soft budget constraints (e.g. Buch, 1997; Bokros, 2001; Berglof and Bolton, 2002). When the bank was acquired around the turn of the century however, with better regulation, a more stable economy and rising incomes, success required different skills. It did not take long after acquisition until the new owner realized that the bank's conservatism came with a reluctance to engage with customers and an inability to recognize which clients might give the bank the most profitable business.

Consequently, the new owner decided to implement a new organizational model at the branch level that was inspired by its practices at home. The model involved stricter segmentation of clients into retail and SME categories as well as a stratification of both clients and branch employees. A subset of employees got high-powered incentives to engage with high-value clients, while the remaining employees focus on "normal" clients and takes care of cash transactions and administration. In the paper we show that, with a

few caveats, these reforms were effective and raised the volume of sales made by the branches.

Within the broader context of research on foreign acquisitions of banks our study or organizational reform is important for two reasons. First, the results, or even just the descriptive history of the bank, highlight that the assumption that domestic banks are better informed about the quality of borrowers is not necessarily appropriate when we study foreign acquisitions of banks. On the one hand, this should not be surprising. It is well-known that banks were poorly informed about their borrowers in advance of the crisis in Mexico, in Asia and during the nineties in the CEE region (e.g. Haber, 2005; Buch and Lipponer, 2007; Lehner and Schnitzer, 2008). On the other hand, both theoretical research on acquisitions (e.g. Van Tassel and Vishwasrao, 2007), or empirical work on foreign banks in countries where foreign acquisition is the dominant mode of entry (e.g. Haselmann, Pistor and Vig, 2006; Lensink, Meesters and Naaborg, 2008) assumes that, or interprets findings on the basis of the assumption that, foreign-owned banks are less well informed than domestically owned banks.

The second reason why the paper is important is that it provides insight into the mechanisms through which foreign ownership improves the performance of banks. While numerous papers have argued that foreign-owned banks in the CEE region improve efficiency or other measures of performance (Grigorian and Manole, 2002 and these are just the multi-country studies; Bonin, Hasan and Wachtel, 2005b; Fries and Taci, 2005; Yildirim and Philippatos, 2007) very few of them provide insight into the actions that new owners take to achieve these improvements in performance. In this regard the paper emphasizes that an important role of foreign owners is to provide banks with access to

knowledge about banking (see also Guillén and Tschoegl, 2000; Tschoegl, 2005). It also emphasizes that organizational reforms to achieve higher performance are a long-term process, which gives rise to a very different perspective on foreign acquisition than one would glean from models of foreign entry that rely on access to low-cost capital as the key benefit of foreign ownership.

The second paper in my dissertation, "Economic Transformation and Foreign Acquisition of Banks", explores the theoretical implications of the hypothesis that access to knowledge is an important factor in foreign acquisition of banks. In this context, the paper focuses in particular on the timing of foreign acquisitions following structural economic shocks and the dynamics of post-acquisition performance. The paper builds on the literature that models competition between banks as Bertrand competition for borrowers under asymmetric information (Broecker, 1990; Von Thadden, 2004) and in particular on several papers that consider banks' incentives to invest in improving the quality of the information they receive about borrowers (Banerjee, 2005; Hauswald and Marquez, 2006). The quality of information is captured as the reliability of banks' screening effort. In the model, banks can only make profit if they have better information about a borrower than their competitors. As a result, investments in screening capacity are strategic substitutes.

The paper treats the quality of information that the banks generate as a knowledge asset, "screening capacity", and extends the existing literature by treating strategic investments in screening capacity as part of a dynamic process that has the form of a capital accumulation game (Spence, 1979; Fudenberg and Tirole, 1984; Athey and Schmutzler, 2001; Jun and Vives, 2004). Because investments in new screening capacity

are strategic substitutes, the investment game looks like Cournot competition (lending competition on the basis of screening capacity is akin to Bertrand competition with quantity pre-commitments, Kreps and Scheinkman, 1983; Jun and Vives, 2004). I conceptualize structural economic change as an increase in the rate of depreciation of the knowledge asset and the fact that foreign owners provide access to knowledge as a reduction in the marginal cost of investment in new screening capacity. Intuitively, banks' competitiveness at any period in time depends on their pre-existing screening capacity and the cost of new investments. When the rate of depreciation increases the commitment value of pre-existing capacity increases and consequently, we would expect that the benefits of having low marginal costs of investment increases – such that foreign ownership becomes more attractive.

Formalizing this intuition is more complicated than one might expect and involves unconventional comparative statics that involve both asymmetric costs and the impact of a shift in the starting point of the game. Generally, the capital accumulation literature has assumed that costs are symmetric. Also, while research has considered the scope for pre-emptive investment, it has not studied how the level of initial capacity affects pre-emption.[1] However, based on formal analysis and simulations of a two-bank-two-period model, I am able to show that there is a reasonable set of conditions under which a temporary increase in the rate of depreciation makes foreign ownership more attractive.

[1] An important purpose of capital accumulation games has been to analyze the scope for "increasing differences" in investment, which arise if a firm with high initial capacity relative to its competitors invests more in additional capacity than its competitors (e.g. Reynolds, 1991; Athey and Schmutzler, 2001). In my paper the focus is not on initial differences in capacity, but on the impact of an across-the-board reduction in the level of capacity at the start of the game on the relative benefits of low marginal costs of investment.

The third paper in my dissertation uses a large sample of banks in Central and Eastern Europe to assess the empirical validity of key predictions of the model in the second paper. In particular, the paper focuses on the performance of foreign-owned banks over time, both relative to domestically owned banks and as a function of the extent of structural economic change. The most important prediction is obviously that the performance of foreign-owned banks should improve relative to domestically owned banks when structural economic change becomes more severe. Furthermore, the model predicts that the impact on performance should be most evident over the longer term. In the short term, profitability can be reduced by the cost of investment in new screening capacity or a fixed cost associated with (foreign) acquisition. Incidentally, the fact that the relative performance of foreign-owned banks improves over time is also what distinguishes my model from cost-of-capital explanations for a surge in foreign ownership of banks following structural economic change. If the main motivation for foreign acquisitions was the fact that foreign-owned banks have lower cost of capital, we would expect convergence over time between foreign-owned and domestically owned banks. Differences in the cost of capital usually spike in the immediate aftermath of economic crises and then gradually fall over time. Finally, the model can only rationalize a surge in foreign acquisitions following structural economic change if there is a fixed cost of acquisition – in the model, foreign-owned banks always perform better than domestically owned banks, a fixed cost creates a threshold for acquisition which will be met only if the increase in performance under foreign ownership is sufficiently large. The model is silent on the form of these fixed costs, but a reasonable assumption is that acquisition, foreign or otherwise, involves some disruption of operations. In that case, we

would see an initial dip in performance before things get better. Also, it might be optimal to allow for some initial slack in order to facilitate restructuring (Meyer and Lieb-Doczy, 2003).

In the paper, I show that indeed, foreign acquisition causes an initial dip in performance of banks (lower ROA, higher cost-to-income ratio). After a few years, foreign-owned banks outperform otherwise similar banks that remained in domestic hands. So far, the literature has not settled on the question as to whether foreign ownership improves the performance of banks. On the one hand, a range of papers studying bank-efficiency has found that foreign-owned banks are more efficient than domestically owned ones (Grigorian and Manole, 2002; Bonin, Hasan and Wachtel, 2005a; Bonin et al., 2005b; Fries and Taci, 2005; Yildirim and Philippatos, 2007). However, controlling for pre-acquisition performance of banks, others have found little evidence of improvements in performance associated with foreign ownership (Poghosyan and Borovicka, 2006; Lanine and Vander Vennet, 2007). Unless ownership changes, none of these studies allows performance of banks to change over time and my results imply that this is an important omission (Majnoni, Shankar and Varhegyi; Brown, Earle and Telegdy, 2006).

Using reallocation of labor as an indicator of structural economic change, I also show that foreign banks do better, as compared to domestically owned banks, in countries that experienced deeper structural change. Interestingly, when I measure structural economic change as "improvement in creditor rights", I do not find a significant impact of structural change on the relative performance of foreign-owned banks. This is at odds with the argument that foreign-owned banks are poorly informed entrants who should

benefit more from improvements in transparency and creditor rights than well-informed domestic incumbents (Dell'Ariccia and Marquez, 2004; Haselmann et al., 2006; Sengupta, 2007).

My papers focus on the banking industry and are grounded in the experiences of Central and Eastern Europe. However, the key principle underlying my research – structural economic change benefits forms of ownership that provide firms with access to relevant resources – is relevant in other industries and regions.

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CHAPTER 2
POST-ACQUISITION RESTRUCTURING, HRM POLICIES AND PERFORMANCE: INSIDER ECONOMETRICS IN A MULTI-UNIT FIRM

1. INTRODUCTION

In order to survive and stay competitive in a rapidly changing economic environment, firms engage in defensive restructuring, such as layoffs, and strategic restructuring, such as development of new products and introduction of new management practices (Aghion, Blanchard and Carlin, 1997; Grosfeld and Roland, 1997) In view of the importance of firm survival and competitiveness, several literatures have been trying to assess the effects of different types of restructuring.

An important micro approach is "insider econometrics," which has emerged from the Personnel Economics literature and relies on a precise understanding of the production process inside the firm to assess the relationship between firm performance and introduction of modern HRM practices (Ichniowski and Shaw, 2003; Ichniowski and Shaw, forthcoming). Typically, insider econometric studies examine the effectiveness of the so-called "high-performance work practices" including specific incentives, reliance on self-management or team-work and better and broader training. They often find that high-performance work practices enhance productivity, although they do not necessarily improve profitability (Cappelli and Neumark, 2001). In addition, it has been argued and found that practices are complementary to each other (Macduffie, 1995; Milgrom and

Roberts, 1995; Ichniowski, Shaw and Prennushi, 1997) or to other organizational characteristics such as the use of Information Technology (Brynjolfsson and Hitt; Bresnahan, Brynjolfsson and Hitt; Bartel, Ichniowski and Shaw, 2007).

A subset of the literature that is especially relevant for the present context has found that performance incentives improve worker performance (Lazear, 2000). In addition, it has been found that concerns about free riding in teams (Alchian and Demsetz, 1972) may be overstated as team-based incentives are surprisingly effective (Wageman, 1995; Hansen, 1997; Hamilton, Nickerson and Owan, 2003). So far, this literature has studied workers with fairly homogeneous tasks, the outcome of which is measurable. We extend the literature by studying teams (bank branches) in which tasks are heterogeneous, often complementary to each other and differentiated in the extent to which their contribution to output is measurable. This situation is common in manufacturing or organizations that combine sales and services, but it is difficult both in theory and in practice to design optimal compensation schemes (e.g. Besanko, Regibeau and Rockett, 2005; Corts, 2007).

Another important literature examines the effects of foreign acquisition of domestic firms on the assumption that foreign owners overcome inertia that often hinders defensive and strategic restructuring (Meyer and Estrin, 2001; Djankov and Murrell, 2002; Filatotchev, Wright, Uhlenbruck, Tihanyi and Hoskisson, 2003). With the rapid rise in foreign ownership in emerging market economies – especially those of Central and Eastern Europe (CEE) – a sizable literature estimating the effects of foreign ownership on performance has emerged. This includes research into the impact of foreign ownership on performance in banking (e.g. Bonin, Hasan and Wachtel, 2005b; e.g. Bonin, Hasan and

Wachtel, 2005a; Fries and Taci, 2005; Yildirim and Philippatos, 2007) as well as in other sectors (see Hanousek, Kocenda and Svejnar, 2009 for a survey).

While the literature has often found that foreign ownership contributes to better performance, the underlying factors – e.g., better management, stronger corporate governance and superior incentive schemes – have usually been treated as a black box. In this paper, we take advantage of an unusual data set that we have collected to advance the insider econometrics and ownership-governance-performance literatures by carrying out a study of HRM reforms in a foreign-owned CEE bank. The objective of our investigation is to assess if this restructuring improved the sales performance of the bank's branches. While there are several insider econometric studies looking at the efficacy of HRM policies in banking (Bartel, Freeman, Ichniowski and Kleiner, 2003; Bartel, 2004; Jones, Kalmi and Kauhanen, 2008) we are among the first to use the insider econometrics approach outside of the context of advanced economies. A paper closely related to ours studies the relationship between incentives and loan sales in a Polish bank (Frank and Obloj, 2009). However, whereas Frank and Obloj focus on the agency relationship between bank management and branches (or rather, branch managers), we focus on the internal organization of the branches themselves.[2].

An important issue in the insider econometrics literature is the potential endogeneity of the HRM and other policy reforms, which arises due to heterogeneity in the marginal benefits of the adoption of these reforms (Ichniowski et al., 1997; Athey and Stern, 1998). The appropriate solution for this endogeneity is context-specific. For example, Ichniowski et al. (1997) make a credible claim that the implementation of

[2] Chan, Li and Pierce use an insider econometrics approach to study peer effects in a Chinese department store.

modern HRM practices in their sample is affected by heterogeneity in the cost of adoption, but not in their benefits across firms. However, a number of studies fail to address endogeneity of reforms or do so inadequately.[3] In this paper, we exploit the unique features of our data, which are that it comprises the population of branches potentially eligible for HRM reforms and that the decision to implement the reforms is made at the level of the bank rather than in the branches. Therefore, for each branch we can use the implementation of reforms at other branches to construct instruments for the reforms in the given branch. This enables us to deal with endogeneity bias more satisfactorily than many other studies. In principle, our approach is available whenever there is a set of observable exogenous variables that factors into the adoption of the HRM practices of interest.

The organizational reforms that we analyze involve the introduction of high-powered incentives for a subset of employees ("Bankers" and "Advisors") at the branches. Retail and SME (small and medium enterprise) Bankers and Advisors are expected to increase sales of savings and lending products and to encourage clients to complement the use of "bread-and-butter" bank services with more sophisticated financial services such as mutual fund investments and mortgage loans. We find that branches with Bankers and Advisors tend to have higher sales than other branches after controlling for the total number of staff and operational expenditures of a branch. However, there is little evidence that the Bankers and Advisors improve the quality of sales, whether measured in terms of the product mix or in terms of profitability. Furthermore, we find evidence of free riding by employees with low-powered incentives

[3]Fixed effects (mean-difference) or first-difference estimation is generally insufficient to address endogeneity of HRM practices, see section 4

and we show that the Bankers and Advisors were least productive in poorly performing branches. We argue that the combination of Bankers and Advisors with high-powered incentives, and other employees with low-powered incentives, creates inherent tensions between employees that require skillful management. It appears that branch managers were not quite prepared for this challenge.

In what follows we first discuss the bank and our data (section 2) and research questions (section 3). Subsequently we present our empirical approach (section 4) and our key findings (section 5). We then discuss the results and implications in section 6 and conclude in section 7.

2. BANK PROFILE AND DATA

Banking in the CEE region has changed dramatically since the early 1990s. At the time, universal banks were primarily state-owned, had an overhang of bad debts and were known for poor management and poorer service (Buch, 1997; Berglof and Bolton, 2002) . Today, all countries in the region have a modern banking sector with a range of client-friendly products on offer and relatively well-managed banks with foreign ownership. In many CEE countries, foreigners (generally Western European banks) own more than fifty percent of banks weighed by assets and essentially control universal banking.

With some caveats (Poghosyan and Borovicka, 2006; Lanine and Vander Vennet, 2007) , studies find that foreign ownership is good for corporate performance. However, these studies treat banks largely as a black box and do not study how foreign ownership contributes to performance. Existing case studies of foreign acquisition of banks in the CEE region do little to fill the gap as they focus on the process of acquisition,

competition or innovation in banking, and do not establish a link between specific aspects of organizational restructuring and subsequent performance (Abarbanell and Bonin, 1997; Bonin and Ábel, 2000; Simkuté, 2007; Szczesniák, 2007; Tóth, 2007).

The Bank that we study is one of the leading financial institutions in its home market in both the retail and SME segments and now has over 200 branches. Upon privatization in the late 1990s, a majority of its shares were acquired by a Western European bank. Shortly thereafter, a second local bank was acquired and merged into the organization. This substantially strengthened the branch network. The Western European bank gradually expanded its ownership share and now owns virtually all shares. The other large banks in the country have also been privatized to foreign owners with a home base in Western Europe.

The bank provided us with access to quarterly branch-level balance sheets and profit and loss accounts covering the five-year period from 2003 to 2007. In addition, we have a quarterly overview of branch staff, broken down by functions, for each branch. The branches focus on retail and SME clients and their overall objective is to maximize "sales" of savings (including short term deposits), loans and insurance products. In the context of this paper it is probably best to think of branches as "outlets" rather than as "mini-banks". For example, a branch's ability to lend is restricted by rules with regard to the assessment of creditworthiness but not by its allocation of capital or its intake of deposits – capital adequacy and the balance between deposits and loans are monitored at the bank-level.

Recent history and reforms

As a result of conservative management prior to privatization, the Bank had a relatively healthy portfolio of loans compared to other banks in the CEE region. However, the organization was bureaucratic and not conducive to commercial operations. Moreover, the second bank that was merged into the main bank shortly after the initial privatization had been poorly run. Therefore, between merging the two banks and straightening out the second bank, the first few years of post-privatization reforms were focused on rationalization and on improving internal controls and governance. Organizational innovation at the branch-level was limited.

Our data start at the beginning of the second phase of reforms during which management sought to transform the branch network into a true sales network. At the beginning of our sample period, in 2003, most branches had a branch manager, some people with a focus on SME clients and some employees serving retail clients (the left panel of Figure 2.1). While there were differences in seniority, function profiles were not well-defined. Insofar as employees received performance bonuses these put a significant weight on branch profits, which were far removed from the day-to-day activities of branch employees.

The lack of stratification among employees mirrored a lack of differentiation between more and less valuable clients. The decision to develop a new functional structure was spurred by the realization that high-value clients (clients who have the potential to generate significant income for the bank) were departing. Branch employees had no skills to identify these clients before it was too late.

The first step towards stratification of the functional structure of the branches was the introduction of “Banker” positions. Retail Bankers and SME Bankers focus on the high-value clients within their market segments. Each banker’s bonus depends largely on his/her own sales rather than on the performance of the branch as a whole. The bank formulated a function profile for the Banker positions and created specific training programs. Most Bankers were recruited from within the branch network. This emphasized in a fairly dramatic manner that the bank was moving to a new business model in which different skills were valued: one of the most successful Retail Bankers was initially a cashier while several senior branch employees moved to support roles in Banker teams.

In the third year of our sample period, 2005, the bank introduced the “Advisor” function. As with the introduction of the Bankers, this involved a transfer of employees from jobs with low-powered incentives to jobs with high-powered sales incentives. Advisors occupy a position between tellers and Bankers (see the right panel in Figure 2.1). They focus on a limited set of products for all clients (either loans or savings and investment funds), unlike the Bankers who cater to the full set of banking needs of their clients.

Bonus system

The basic structure of the bonus system is fairly straightforward (Figure 2.2). Each branch has a set of sales targets for product groups such as retail deposits and savings, SME loans and cross-selling of insurance. The branch-level bonus is based on a weighted average of the realization-to-target ratios for all of the product groups. There is no bonus

if average performance is below 70 percent. The reward for meeting that threshold is 10 percent of base salary. Above this level, the bonus is a continuous function of plan fulfillment, such that employees receive a bonus of 16 percent of base salary if branch performance is according to plan (100 percent). If they sell twice as much as planned, they receive the maximum bonus of 40 percent.

For Advisors and Bankers, the bonus is based on a 70/30 weighted average of individual sales targets and the branch targets. In addition, Bankers have a steeper bonus curve with a maximum bonus of 75 percent of their base salary.[4] Bonuses for members of the Bankers' teams (assistants and team managers) are also based on the sales-to-target performance of the Bankers.

Branch managers are rewarded for performance on a mix of branch level and individual targets that can differ per branch.[5] Over time, the emphasis on individual targets has replaced more general performance indicators such as profit and volume of bad loans.

Sales targets for retail products are derived from an econometric model that estimates the sales potential of a branch on the basis of a number of local economic variables and sales experience in the region. This limits the scope for ratchet effects and strategic behavior to influence targets (Weitzman, 1980; Murphy, 2000). The sales performance of any individual branch has only limited impact on the central tendency in the regression line that establishes future sales targets. Low performance in the current

[4] In the final year, Retail Bankers had an 80/20 ratio
[5] We do not have information on these objectives, or on any individual bonuses for that matter.

period leads to an immediate drop in bonuses and has at best a marginal effect in terms of lower future targets.[6]

The set of products for which the branches had sales targets as well as the relative weight attached to these products changed slightly over the years. The most important change, introduced in the final two years of the sample period, implied that branches had to meet certain standards with regard to quality of services such as client friendliness and response to phone and email inquiries. If they failed to meet certain standards, bonuses were cut by 50 percent (almost all branches met the standard).

Skills improvement

Over the five years during which we follow the branches, the bank implemented a number of additional initiatives to improve the sales skills of branch staff. In our empirical analysis we focus on the impact of the Leadership Academy for branch managers. The bank rolled out this executive education program in 2006, the fourth year of our sample period. The objective of the program was to promote client orientation, responsibility for results and more attention to employee motivation and development.

There were several other training programs, including programs to improve client acquisition and retention, which focused in particular on Retail Bankers and the retail segment more generally. A key purpose of these programs was to promote long term relationships with clients and take the focus off efforts to make a quick sale.

[6] The regression approach did not work to the bank's satisfaction for SME products. Targets for SME loans and Assets under Management are based on assumptions about achievable sales per employee.

3. EVALUATING THE IMPACT OF REFORMS

The objective of our econometric analysis is to assess whether the reforms worked. The bank's management appears to be fairly comfortable that they did. According to the people we talked to, the Bankers and Advisors generally perform well and book a significant portion of sales at the branches. That being said, in 2007 the bank decided to reduce the number of Advisor positions in the smaller branches as they were perceived to be too expensive relative to the added value of the business they generated.

From standard economic theory and existing evidence on the efficacy of incentives, there are several reasons to expect that the new organizational model should have improved sales performance. First, in terms of the standard principal-agent model, the Banker and Advisor functions introduced a stronger relationship between effort and the signal (sales) that is used to determine the bonus. The new system de-emphasizes profits and is more individualized. Second, the incentive structure is aligned with the view that Bankers and Advisors should focus on making sales, while administrative staff and cashiers ("cashiers" henceforth) are multitaskers who make sales but also engage in support services (Holmstrom and Milgrom, 1991; Besanko et al., 2005). Third, the stratification and improved delineation of function profiles enabled the bank to improve matching of employees and jobs.

That being said, the organizational structure and bonus system also carries a number of potential drawbacks, which become apparent when we look at the branch as a team rather than as a group of individuals with independent tasks. In the team, we can think of the Bankers and Advisors as the dedicated sales force of the branch. The cashiers are responsible both for support services, which are complementary to what the Bankers

and Advisors do, and for sales to low-value clients. These sales are substitutes for the sales made by the Bankers and Advisors, both because there is probably a gray area between high-value and low-value clients and because sales by either group of employees contribute to the branch-level sales targets.

In general, the presence of complements and substitutes in functions makes it difficult to design a good incentive structure, especially if there is only one measure of performance (sales – see Corts, 2007). From the empirical literature, we might be tempted to conclude that the old system of team (branch) incentives should have worked quite well. Hansen (1997) and Hamilton et al. (2003) find that team incentives do not suffer from free riding and Wageman (1995) finds that hybrid organizational systems with a mix of individual and team tasks and individual and team incentives perform worse than purely individual systems and purely team systems.

However, this empirical evidence comes from teams in which the members perform relatively homogenous tasks. Wageman's results do not imply that purely team or purely individual incentives are optimal in a team with heterogeneous tasks. As we discussed above, the bank had good reasons to abandon the old organizational model with homogenous tasks. When employees have heterogeneous tasks, it might be more difficult to exercise peer pressure, which may be the reason that team incentives have been found to work reasonably well (see Kandel and Lazear, 1992; Batt, 1999; Knez and Simester, 2001). Besanko et al. (2005) argue that a "functional" organization becomes more desirable if one function (say, sales) makes a higher marginal contribution to performance than another (support services) and if certain activities focused on one

product generate externalities to another (cashiers service both retail and SME customers and support performance in both product segments).

Looking more specifically at the bank branches, there are two potential problems that may arise due to the heterogeneity in tasks and incentives for Bankers and Advisors on the one hand and cashiers on the other hand. First, because the sales made by the Bankers and Advisors count towards the branch-level sales targets that determine the bonus of the cashiers, the cashiers have an incentive to free ride. Indeed, this incentive may be larger than under a team bonus system because cashiers know that Bankers and Advisors have strong incentives to make up for any slack. This problem is compounded by the fact that the link between the cashiers' tasks and sales, the signal that determines bonuses, is less strong than the link between the Bankers' and Advisors' tasks and sales. A second potential problem is that Bankers and Advisors may be tempted to "bribe" cashiers to book to the Banker's account a sale that the cashier was about the make anyway. This does not affect the cashier's bonus – which depends on total branch sales – and saves a Banker the effort to find truly new clients. According to bank managers we spoke to, independent agents who used to sell the bank's products on commission had occasionally engaged in bribery. In a similar setting, Frank and Obloj find that branch managers seek to game the system of incentives for loan sales in a Polish bank.

It is important to note that the bank took several steps that reduce the risks that are inherent to the combination of employees with high-powered incentives and others with low-powered incentives. First, the fact that Bankers and Advisors are supposed to focus on "high-value" clients reduces the scope for bribery because cashiers only make sales to

clients that would not normally qualify to be in the Banker's portfolio.[7] Second, the introduction of the standards for service quality essentially introduced an additional signal that was especially useful to measure the performance of the tellers. This limited the tellers' ability to free ride and, assuming it led to better service, should also have increased the marginal productivity of Bankers and Advisors.

It follows from the preceding discussion that the impact of the reforms should be measured not at the level of the individual Banker or Advisor, but at the level of the branch. In our empirical analysis we estimate the marginal impact of Bankers, Advisors and the Leadership Academy on branch-level sales per employee. We also look at some more detailed indicators of the impact of the reforms. For example, if free riding is a problem under a regime with team incentives, this problem should be larger in larger branches. In that case, we expect the introduction of Bankers and Advisors to have a greater impact on productivity in large branches. In addition, we assess whether there are increasing or decreasing benefits from raising the proportion of branch employees in Banker and Advisor functions. On the one hand, if bribery is a problem, we expect increasing benefits: as there are more employees with high-powered incentives, there are fewer employees willing to “sell their sales”. On the other hand, when there are more Bankers and Advisors, the remaining employees may be more likely to free ride. This would lead to decreasing benefits. Finally, we evaluate developments in the quality of sales. One of the objectives of the Bankers and in particular the Advisors was to encourage clients to switch from bread-and-butter savings accounts to fancier products such as mutual funds and to get mortgages and other products that attach them to the

[7] There is still scope for bribery or "client shifting" in so far as Bankers can take on clients whom they expect to be potential high-value clients. This involves some judgment and it is up to branch managers to ensure that Bankers do not abuse this possibility.

bank over the long term. However, the incentive system primarily (though not exclusively) rewards sales volume. Hence, we estimate whether branches with more Bankers and Advisors have a higher proportion of mortgages and mutual funds in their product portfolio.

4. EMPIRICAL STRATEGY

Table 2.1 provides an initial perspective on the relationship between key reforms and branch performance. While the average number of employees per branch has declined slightly over the five-year 2003-2007 period, outstanding loans and deposits[8] per employee rose sharply and profit per employee increased steadily. Productivity in terms of both sales and profits per employee is lower at small branches than at large ones. The presence of Bankers and Advisors is associated with better performance (panel B) and the same holds for Branch Manager's participation in the leadership academy. Of course, none of these simple correlations controls for other factors that might affect branch performance or indeed the relation between initial performance and the implementation of reforms at the branch level.

To assess the impact of the reforms, we specify an econometric model that uses "footing" to measure sales performance (Bartel et al., 2003). Footing is the sum of deposits and loans, i.e. the sum of products the branches are incentivized to sell. The choice of footing as an output measure is in line with the so-called production approach

[8] "Deposits" include money in checking and saving accounts, as well as other saving products and assets under management. We refer to money in checking accounts as "short-term deposits" and identify other specific product groups when relevant.

to measuring the output of banks, which assumes that both loans and deposits are outputs of a bank (Berger, Hanweck and Humphrey, 1987).[9]

Our data on lending and deposit taking comes from quarterly branch balance sheets. At the end of each quarter, total footing is equal to the stock of outstanding loans and deposits in the previous quarter minus net repayments and withdrawals plus new sales. With Y denoting footing and with branch, region and period indexed by i, j and t respectively, we can write the model as:

$$Y_{ijt} = \alpha Y_{ij,t-1} + f(Z_{ijt}, X_{ijt}) \tag{2.1}$$

Where the vectors Z_{ijt} and X_{ijt} contain measures of reforms at the branch-level and controls, respectively. The term $\alpha Y_{ij,t-1}$ represents the amount of loans and deposits that is carried over from the previous period, plus any natural growth in footing. $1 - \alpha$ is the average rate of repayment/withdrawal and $f(Z_{ijt}, X_{ijt})$ represents new sales. As control variables, we include the number of employees, representing branch size, and in some specifications also operational expenses. These expenses include personnel costs, marketing expenses and the cost of the branch office. We also include region x quarter x year fixed effects in the model.

In our baseline specification, we measure branch-level reforms in Z_{ijt} by the number of Bankers or Advisors in a branch and a dummy that equals 1 when a branch manager has participated in the Leadership Academy.

[9] The alternative is the asset or intermediation approach that claims that banks' key output is the production of assets and treats deposits as an input (Sealey and Lindley, 1977). The intermediation approach has merit at the level of the bank, but not at the level of the branches since branch lending is not constrained by the ability to raise deposits, nor is their performance judged on the basis of the cost of deposits.

Assuming that equation (2.1) is linear in the controls and branch-level reforms and with ε as the error term, we obtain an estimating equation of the form:

$$Y_{ijt} = \gamma + \alpha Y_{ij,t-1} + X_{ijt}^{T} \cdot \beta + Z_{ijt}^{T} \cdot \theta + region_{j} \times period_{t} + \varepsilon_{ijt} \qquad (2.2)$$

There are two issues with regard to the estimation of equation (2.2): (i) the consistency of the estimate of the coefficient α on the lagged dependent variable and (ii) the endogeneity of reforms. We deal with α first. If there is a branch fixed effect, it is well-known that OLS estimates of α are biased upwards, while fixed effects (mean-difference, FE) estimates are biased downwards (Nickell, 1981). [10] We present the OLS and FE estimates in the first four columns of Table 2.2 and observe that the respective OLS and FE estimates of α are quite similar – the biases are relatively small. In each case the estimate of α is close to 1, meaning that the effects of repayments and withdrawals on footing are more or less matched by average quarterly growth in lending and deposit taking. In fact, none of the estimates is significantly different from 1 at conventional levels of significance.[11]

If we are willing to assume that α is equal to 1, we can move $Y_{ij,t-1}$ to the left side of the equation and use ΔY_{ijt} as our dependent variable. As a final check to ensure that this is indeed a reasonable assumption, we implemented the Arellano-Bond difference GMM estimator, which is not subject to the bias that is inherent in OLS and FE (Arellano and Bond, 1991). Although we have to interpret the results of this estimator carefully, the estimates of α reported in columns 5 and 6 of Table 2.2, are again close to and not

[10] In fixed effects estimation, $\tilde{y}_{i,t-1} = y_{i,t-1} - (1/T)\sum_{t} y_{it}$ is correlated with $\tilde{\varepsilon}_{i,t-1} = \varepsilon_{i,t-1} - (1/T)\sum_{t} \varepsilon_{it}$, when T is large, one can ignore this correlation, but our panel may not be long enough to do so (Judson and Owen, 1999).

[11] Note that the stars in Table 2.3 indicate whether variables are significantly different from zero.

significantly different from 1.[12] Overall, the results in Table 2.2 do not allow us to reject the hypothesis that α is equal to 1. In what follows, we will impose this assumption, using ΔY_{ijt} as the dependent variable. In addition, we divide the equation by *FTE* to facilitate the interpretation of the results in terms of sales per employee and allow for non-linearities in the impact of reforms by including squared terms and interactions as appropriate. Our specification differs slightly from the two studies that are most similar to ours (Bartel et al., 2003; Bartel, 2004), which implicitly assume that α equals 1 in equation (2.2) and estimate a loglinear rather than a linear model. These papers analyze employee attitudes (2003) or HRM practices (2004) that are expected to affect the productivity of all workers. In their case, it is natural to think of the impact of improvements in HRM practices on productivity in terms of (semi-) elasticities. In our context, a linear specification is the natural choice because we examine the contribution of new HRM practices to sales in terms of the additional sales that a Banker or an Advisor makes.[13]

Endogeneity of reforms

There are two problems related to the potential endogeneity of HRM practices. The first is that innovative practices may be adopted in organizational units that are systematically more or less productive. Consequently, several studies insider econometrics studies use fixed effects estimation to control for unobserved heterogeneity (e.g. Huselid and Becker,

[12] Arellano-Bond uses lagged levels of Y_{ijt} as instruments for its first difference and when α is close to 1 these instruments tend to be weak (Blundell and Bond, 1998). The Blundell-Bond system estimator that was designed to overcome the weak instrument problem requires that $|\alpha < 1|$ for consistency, which rules out Blundell-Bond as an estimator to test whether $\alpha = 1$.

[13] Estimation of a loglinear specification of the model in Table 2.3 produces results that are consistent with what we present. However, partially due to multicollinearity, IV estimates of the loglinear model exhibit weak instrument problems.

1996; Ichniowski et al., 1997; Bartel, 2004; Jones, Kalmi and Kauhanen, 2006; Jones et al., 2008). The second problem is that the practices are likely to be adopted where their marginal effect on productivity is largest. To see how this affects the estimates, assume for the moment that there is just one independent variable, x_{ijt}, and write the model as follows:

$$\Delta Y_{ijt} = \alpha + \beta x_{ijt} + \mu_{ij} + \nu_{ij} x_{ijt} + \omega_{ijt} \tag{2.3}$$

decomposes the error term ε_{ijt} into a branch fixed effect μ_{ij}, a purely random error ω_{ijt} and a term $v_{ij}x_{ijt}$, where v_{ij} is the branch specific contribution of x to productivity (i.e. for each branch, the marginal contribution of a unit of x to productivity is the average productivity of x, the parameter β, plus the branch specific contribution v_{ij}). Unlike μ_{ij}, v_{ij} cannot be differenced out. Any time there is a change in x_{ijt}, first differencing leaves $v_{ij}(x_{ijt} - x_{ij,t-1})$ in the error term. If the allocation of x_{ijt} is optimal, the reform is more likely to be introduced where v_{ijt} is high, such that $(x_{ijt} - x_{ij,t-1})$ and v_{ij} are positively correlated.[14] This introduces an upward bias in the estimate of β. In fact, Lazear (2000) shows that the positive impact of incentives is partially due to self-selection of more productive workers into a regime with higher powered incentives. Similarly, Hamilton et al. (2003) find that the effectiveness of teams can be attributed partially to the fact that more productive workers are more likely to join teams. While such findings can enrich our understanding of the origins of productivity improvements, these selection effects also introduce bias in the estimates.

[14] There is an important exception to this. If one can measure a reform with a dummy variable (e.g. the introduction of new software) and if all units in the population ultimately implement the reform and there are no reversals, first differencing solves the endogeneity problem. After differencing the data, all v_{ij}'s show up exactly once and in all cases, $x_{ijt} - x_{ij,\,t-1} = 1$. Hence, there can be no correlation between v_{ij} and $x_{ijt} - x_{ij,\,t-1}$. This is true even if units with the lowest v_{ij} are laggards with regard to the implementation of the reform.

The most appropriate approach to dealing with endogeneity bias is context specific. In general, Inchniowski et al. (2003) argue that the collection of data from a narrowly defined production process contributes to the elimination or reduction of selection bias. More specifically, Ichniowski et al, (1997) make the case that endogeneity in the adoption of modern HRM practices in their sample is related to the costs of implementation, but that the benefits of the practices are similar across firms. Athey and Stern (2001) use fixed effect estimation and implement a set of specification tests to address concerns about endogeneity and Bartel, Ichniowski and Shaw (2007) show that only very specific and highly implausible unobserved heterogeneity would bias their results once fixed effects are removed. However, without such further justifications, differencing out fixed effects is not universally adequate to address concerns about endogeneity bias.

Therefore, we implement an IV approach that exploits the fact that the reforms at all branches in our data are part of a bank-wide program, mandated from headquarters. In many insider econometric studies, the level at which "treatment" is implemented is also the level at which decisions are made. This is true of firm-level studies, but also of the branch-level studies of Bartel (2004) and Bartel et al. (2003), which focus on implementation of HRM policies by branch managers and employee attitudes respectively. In our data however, the implementation of a reform at one branch is informative about the likelihood that another branch will implement the same reform. This provides us with an obvious set of instruments. In particular, the number of Bankers and Advisors in all branches $k \neq i$, where $k, i \in K$, should be uncorrelated with v_{ij} and we can use information about the implementation of reforms in these branches as

instruments. This approach to constructing instruments was introduced by Hausman and Taylor (1981) and was used more recently by Hausman (1997), Nevo (2001) and Shirley and Xu (2001).

While the precise set of instruments differs across specifications, our general approach to constructing instruments is as follows: for each of the independent variables in the model, for each quarter and for each branch *i*, we calculate the average value of that variable for all branches $k \neq i$. The group of branches *K* is defined as all branches in the same region or all branches in the same size (see Table 2.1 for the definition of size classes). In order to reduce collinearity between instruments, we also use 4-quarter lags of our instruments and we define Banker and Advisor dummies (for example, the Advisor dummy equals 1 if a branch has at least one advisor) and use the averages of these dummies for branches $k \neq i$ as instruments. In some specifications, we also include the initial number of employees per branch as an instrument as well as a categorical variable for size class and a categorical variable that indicates the phases of the rollout of the program that first introduced the Bankers.

We estimate our models in Stata using standard IV regression or GMM, implemented with the *ivreg2* command (Baum, Schaffer and Stillman, 2007). In each case, we report Hansen's J-test to show that the instruments can be omitted from the equation.[15] We also inspected the first-stage regressions to ascertain that our estimates do not suffer from underidentification.

[15] The null hypothesis of the J-test is that the excluded instruments have no explanatory power in the main equation. Therefore, if we reject the null hypothesis, the instruments are not valid.

5. RESULTS

In Table 2.3 we report various specifications of our model under different assumptions about the endogeneity of the controls and organizational reforms. In the first three columns, we report one OLS and two alternative GMM regressions that control for branch size by including *FTE* and measure the reforms as *Bankers + Advisors / FTE* and the *Leadership Academy* dummy.[16] This specification imposes the assumption that the number of Bankers and Advisors per employee has a linear impact on sales and that the impact is the same regardless of branch size – it reveals no significant impact of the reforms on performance. In the next three columns, we add the squares of our main variables as well as the number of *Bankers + Advisors*, which is the interaction of *FTE* with *Bankers + Advisors / FTE*. This specification produces very interesting results. To begin with, sales per employee are smaller in large branches (i.e. branches with high *FTE*), which is consistent with the hypothesis that the problem of free riding becomes more severe with size. In addition, sales per employee are concave in the number of Bankers and Advisors per employee, as evidenced by the negative coefficient on the square of *Bankers + Advisors / FTE*. If "bribery" were a big problem we would expect a positive coefficient on this term: when there are more Bankers and Advisors, fewer employees are willing to give up any sales they are about to book for their own account. However, the negative coefficient is consistent with the presence of free riding by tellers, who have an increasing incentive to do so when a larger share of their colleagues have high-powered incentives.

[16] In specification tests, we found no evidence we should treat the *Leadership Academy* dummy as endogenous and we treat it as exogenous throughout our analysis.

The point estimates in column 5 imply that the presence of Bankers and Advisors raises sales by a third of a standard deviation at branches with the median ratio of Bankers and Advisors per employee (which is 0.22, conditional on there being at least one Banker or Advisor). The increase is over half a standard deviation at the 25th percentile of *Bankers + Advisors / FTE*, but there is a decrease of about half a standard deviation at the 75th percentile. However, this does not yet take into account the positive coefficient on *Bankers + Advisors*. Taken on its own, this coefficient implies that the benefits of Bankers and Advisors increase with the size of a branch. This is consistent once again with the idea that large branches have a free rider problem that can be solved to some extent by giving a subset of employees high-powered incentives. Taking this coefficient into account, we find that branches at the 75th percentile of the *Bankers + Advisors / FTE* ratio as well as the 75th percentile of the number of Bankers and Advisors are predicted to have net sales per employee that are multiple standard deviations higher than they would have had without Bankers and Advisors.[17]

In columns 7 to 9, we add *Operational Expenses / FTE* and its square to the equation and find that our conclusions from the previous set of estimates are largely unchanged. This is remarkable because operational expenses include personnel expenses, i.e. these results imply that Bankers and Advisors are more productive than other employees even after we take into account the quality and performance differences reflected in their pay. That being said, the introduction of *Operational Expenses / FTE* into the equation leads to weak instrument problems in column 9, where we treat all

[17] Obviously, branches that are at the 75th percentile of *Bankers + Advisors* are not necessarily at the 75th percentile of the *Bankers + Advisors* to employee ratio. However, the two variables are positively correlated such that we expect branches that have a large number of Bankers and Advisors to have a high share of these employees in the total workforce as well.

variables as potentially endogenous. Because the inclusion of *Operational Expenses / FTE* does not fundamentally change the results, we focus on the model in column 4 to 6 as our baseline. To assess which of these three results is preferred we implement a "Difference-in-J" test to assess whether the instrumented variables should indeed be treated as endogenous.[18] In column 6, we cannot reject the hypothesis that *FTE* and its square can be treated as exogenous, while in column 5, we do reject the hypothesis that *Bankers + Advisors / FTE* and its square and *Bankers + Advisors* are exogenous. These test results are representative of what we find in other specifications and we use the model in column 5 as our baseline specification.

It is worth noting that the OLS estimates in column 4 are qualitatively similar to the GMM estimates in column 5. And although the magnitude of the coefficients is smaller in the OLS regressions, the estimated impact of Bankers and Advisors on sales at the median of *Bankers + Advisors* and *Bankers + Advisors / FTE*, is about double the size of what we find in the GMM regressions. Hence, our instrumental variables approach provides an important correction for the endogeneity bias in OLS estimates.

Further evidence

Building on the result that giving a subset of branch employees high-powered incentives raises sales, we perform a number of additional analyses, both to ascertain the robustness of our findings and to "unpack" the results. By way of simple robustness checks, we estimate the model while excluding the regions one-by-one to ensure that none of the

[18] The Difference-in-J test compares Hansen's J-statistic for the regression in which the suspected regressors are treated as endogenous to the J-statistic in the regression in which they are treated as exogenous. Under the null-hypothesis that they are exogenous, this difference between the two statistics is distributed $\chi^2(k)$, where *k* is the number of suspected regressors (Hayashi, 2000 pp. 218-220).

regions or branches dominated the results.[19] None does. Similarly, we estimate the model with the years eliminated one-by-one. Again, the results are largely consistent with what we find in Table 2.3, except when we exclude 2005, the first year. We also estimate a model in which we include the members of the Banker teams (assistants and managers) in the count of employees with high-powered incentives. Again, the results are unchanged. Finally, we note that, if there is positive correlation between *Bankers + Advisors* and v_{it} in equation (2.3), there will, in theory, be some negative correlation between the instrumental variables and v_{it} . The validity of our instrumental variables is based on the assumption that the sample is large enough that we can ignore this correlation and Hansen's J-test suggest that this is indeed the case. To provide further – although not complete – assurance on this point, we also estimated our model with the Jackknife Instrumental Variables Estimator (JIVE Angrist, Imbens and Krueger, 1999). The JIVE estimator excludes both the instrumental variables and the instrumented variable for observation *i* from the estimation of the first-stage equation for observation *i*. This eliminates any correlation between v_{it} and the instrumented variables from the first stage. The JIVE estimates were quantitatively and qualitatively almost identical to the estimates in Table 2.3.

In order to assess whether performance improved in all market segments, Table 2.4 reports estimates of our model with retail footing and SME footing as well as with loans and deposits as dependent variables. While the coefficient on *Bankers + Advisors* loses its significance in these regressions, the conclusion that sales are concave in the ratio of *Bankers + Advisors* to employees remains true. Only with the change in loans per

[19] In some of the regressions, the coefficient on *Bankers + Advisors* is not significant at conventional levels. However, the p-value is generally close to 10%, just like the p-value in Table 2.3

employee as a dependent variable (column 4) are all coefficients insignificant. [20] The insignificant impact of Bankers and Advisors on loan sales is interesting in light of the fact that in the first two years of our sample, the branches did not have sales targets for SME deposits, partially because they felt that these deposits were difficult to predict or manage. The results in Table 2.4 suggest that Bankers and Advisors contribute to the sales of precisely these "difficult" products. Indeed, when we split retail and SME deposits and loans (unreported), we find that the presence of Bankers and Advisors promotes retail lending, but not SME lending. Consequently, SME bankers may have been rewarded with bonuses for loan sales that would have been made anyway.

While Bankers and Advisors are incentivized primarily to raise the volume of sales, they were expected to raise the quality of sales as well. For example, when Advisors first started in 2005, they were assigned to mortgage sales. In Table 2.5 we investigate whether Bankers and Advisors indeed contributed to sales quality.

In the first two columns, we find no evidence that the presence of Bankers and Advisors in a branch raises the sales of mortgages. [21] Because mortgages are largely a retail product and in order to be sure that the estimates are correct, we re-estimated the model after replacing Bankers with Personal Bankers only and after replacing *Bankers + Advisors* with Advisors only.[22] Neither of these variations changes our conclusion that Bankers and Advisors have no measurable impact on the sales of mortgages. The estimates with the sales of mutual funds per employee as a dependent variable mimic the results in Table 2.3. However, higher sales of mutual funds do not translate in an increase

[20] An F-test shows that the coefficients are insignificant jointly as well as individually.
[21] The number of observations for mortgage and fund sales is lower because they are not separately reported on the branch balance sheets before 2005.
[22] We change the definitions of *Bankers + Advisors / FTE* and its square accordingly.

in the share of mutual funds in overall savings and deposits (column 4). Again, excluding SME Bankers or all Bankers from the measure of *Bankers + Advisors* does not affect this conclusion. Finally columns 5 and 6 of Table 2.5 reveal that the presence of Bankers and Advisors has no measurable impact on the profitability of branches.

6. DISCUSSION

The key findings with regard to the impact of Bankers and Advisors on Performance are first that, yes, the Banker and Advisor functions have contributed to the volume of sales. This is important and concrete evidence that organizational reforms introduced by new foreign owners have a tangible impact on performance. We do not have overwhelming evidence that the Leadership Academy has had a similar impact. However, the bank never anticipated that this program would have an immediate impact. The fact that it was rolled out in a relatively short time towards the end of the sample period works against the identification of any effects. Second, Bankers and Advisors have a higher impact on productivity in large branches. This is consistent with the presence of free riding under a system that relies solely on team incentives. At the same time, the concavity in the relationship between *Bankers + Advisors / FTE* and net sales per employee suggests that a cashiers, free ride on the efforts of the Bankers and Advisors. Third, there is no evidence that Bankers and Advisors had any impact on, let alone improved the composition of the product portfolio or the profitability of the branches. One the one hand, this is good news: despite the fact that the bonus system primarily rewards volume, loan standards have not been compromised. Also, higher sales volume and market shares were key objectives of the bank's management in the anticipation that profits will follow

over the medium to longer term.[23] On the other hand, one of the reasons to promote the sale of mortgages and sophisticated savings products was precisely to tie customers to the bank.

How should we interpret these findings and what do they mean for further organizational reform? As we mentioned above, the combination of high-powered incentives for Bankers and Advisors and low-powered incentives for cashiers and others is suitable if one looks at it with the lessons from the multi-tasking principal-agent model in mind. At the same time, the organizational model also has inherent tensions, relating to the interaction between branch staff and the quality of sales that need to be carefully managed by the branch manager. However, in so far as we know, Bankers and Advisors were assigned to branches on the basis of anticipated sales potential at the location, not on the basis of the performance of individual branch managers.

As we discussed above, the introduction of the standards for service quality could have alleviated the managerial problem because it provided bank and branch managers with an additional signal to assess the performance of tellers. Yet, although the bank reported great improvements in the indicators of service quality, we find no change in the marginal productivity of Bankers and Advisors when we split the sample in "before" and "after" periods. If anything, the impact of Bankers and Advisors on Sales seems to be higher in the first three years of the sample period than in the last two years.

One way to assess the role of branch managers further is to analyze the distribution of the sales contribution of Bankers and Advisors across branches. If the divergence in incentives creates problems, we would expect these problems to be worse

[23] In an assessment of bank efficiency in Poland, Nikiel and Opiela find that foreign-owned banks had relatively low profits. They attribute this to efforts to capture market share through low pricing (Nikiel and Opiela, 2002)

in poorly-managed (poorly performing) branches than in well-managed branches. In Figure 2.3, we report the estimated sales contribution of Bankers and Advisors from a series of quantile regressions on the first to the ninth decile for 3 configurations of the number of Bankers and Advisors and the ratio of Bankers and Advisors to employees – one configuration takes the 25th percentile of the *Bankers + Advisors / FTE* ratio and the 25th percentile of the number of *Bankers + Advisor* and the other configurations use the median and the 75th percentile of the variables. With the obvious caveat that the quantile regressions do not control for endogeneity, the estimates strongly suggest that the contribution of Bankers and Advisors to sales performance is highest between the fifth and the seventh decile of the productivity distribution. This is also the region in which the coefficient on *Bankers + Advisors / FTE* is significant (see Table 2.6).[24] Taken at face value, these results imply that both the most productive and the least productive branches did not benefit from the reforms. At the higher end of the productivity distribution, there are branches or branch managers that had apparently did not need additional incentives to do better. At the lower end of the productivity distribution weak branch managers appear to have difficulty managing the tensions inherent in the system. Incidentally, this is in line with what we heard during meetings at the bank's headquarters, when it was mentioned that some of the weaker branch managers had trouble managing the Bankers.

[24] Although, the coefficient on *Bankers + Advisors* is never significant in Table 2.6, we use this specification in order to be consistent with Table 2.3. A specification that excludes *Bankers + Advisors* produces very similar results.

7. CONCLUSION

We conclude with three implications for future research, beginning with methodology. Almost by definition, insider econometrics research encounters endogeneity problems. The solution to these problems is context specific, but researchers can shape their context when collecting data. In this paper, we benefit from the fact that our data comprise the entire population of units eligible for a set of reforms to HRM policies, which provides us with readily available instruments. The instruments, constructed from the implementation of reforms in other branches, work because the implementation of specific reforms is correlated with observable characteristics of the branches and the timing of reforms in these other branches is informative as well. Even if it is not possible to collect data on an entire population of firms for insider econometric studies, researchers could construct their samples in a way that enables them to generate similar instruments.

Second, we have now seen that the introduction of Bankers and Advisors is not a "quick fix" for poor management. This holds a lesson for the sequencing of organizational reforms. In our bank, the introduction of the Banker positions was driven by events, notably the departure of high-value clients. In general however, it is preferable to improve branch management before implementing an operational system that requires a firm managerial hand such as a hybrid system of incentives. In a broader context, this adds a timing dimension to the debate about the optimal level of adaptation by multinational companies of organizational models to local circumstances (Ghemawat, 2007; Siegel and Zepp Larson, 2008). Even if little adaptation of the home-country organizational model is desirable in the long term, it is important (i) to allow new subsidiaries time to grow into the new model and (ii) to ensure that the right

"infrastructure" (in this case: good branch managers) is in place when complicated elements of the model are implemented.[25]

Third, this paper provides input for future work on foreign acquisition and subsequent organizational reform. In particular, our findings can feed into the design of surveys among a larger group of banks. The role of these surveys would be to validate our results, but also to understand the wider context. For example, we would like to know how competition informed the choice of particular HRM approaches, what role foreign parents played, and whether distance between parent and subsidiary leads foreign-owned banks to implement different organizational models than domestically owned banks. Further research into the organizational choices made by banks would also complement some of the existing survey work into the financial relationships between CEE banks and their foreign parents (De Haas and Naaborg, 2005b) as well as the extent to which banks in the CEE engage with SME and retail clients (De Haas and Naaborg; De Haas, Ferreira and Taci, 2007).

[25] Lest we give the wrong impression: the foreign owner has in fact permitted local managers (including expats) significant freedom in designing and implementing specific organizational reforms.

Table 2.1: Summary Statistics and Correlations

Panel A: Branch Staffing and Labor Productivity, by Year

Year	Branches	Employees	Retail Bankers	SME Bankers	Advisors	Leadership Academy	Loan Growth / Employee	Dep. Growth / Employee	Profit / Employee
		(FTE, Average)	(% FTE, Average)	(% FTE, Average)	(% FTE, Average)	(% Br. Mng., Average)	(1,000s Loc. Ccy., Median)	(1,000s Loc. Ccy., Median)	(1,000s Loc. Ccy., Median)
2003	182	15.8	3.7%	2.4%					1,198
2004	179	15.9	7.0%	4.3%			1,948	10,772	1,349
2005	180	15.3	6.9%	4.5%	0.5%		4,225	6,379	1,401
2006	180	14.6	8.5%	4.6%	10.8%	23.2%	8,445	11,971	1,827
2007	178	14.1	8.3%	4.7%	10.2%	79.8%	10,699	14,289	2,214

Panel B: Branch Staffing and Labor Productivity, by Year and by Size

Large Branches (20 employees or more)									
2003	49	34.4	6.0%	7.2%					1,404
2004	48	34.8	10.1%	11.5%			2,341	12,265	1,500
2005	45	34.0	10.0%	12.4%	0.4%		4,593	6,831	1,653
2006	47	31.6	11.8%	12.2%	9.1%	36.7%	9,779	12,676	2,077
2007	43	32.3	12.1%	12.9%	12.0%	89.0%	10,385	14,674	2,320
Medium-sized Branches (8 to 20 employees)									
2003	78	11.6	4.4%	1.0%					1,221
2004	77	11.6	9.0%	2.8%			1,628	10,732	1,371
2005	72	12.1	9.5%	3.4%	0.7%		4,482	7,620	1,399
2006	63	11.9	10.7%	4.0%	14.1%	28.6%	8,348	12,969	1,934
2007	64	11.7	10.7%	4.3%	16.0%	89.5%	12,063	14,277	2,203
Small Branches (7 employees or fewer)									
2003	55	5.4	0.8%						830
2004	54	5.4	1.4%				1,635	9,472	977
2005	63	5.6	1.8%		0.4%		3,356	4,767	1,156
2006	70	5.6	4.5%		8.9%	9.3%	8,204	10,938	1,564
2007	71	5.2	3.8%		3.8%	65.5%	9,537	14,552	2,208

Continued next page

Table 2.1: Summary Statistics and Correlations (continued)

Panel C: Correlations (correlations in bold, p-values in *italics*, number of observations in regular **print)**

	Employees	Retail Bankers	SME Bankers	Advisors	Leadership Academy	Loan Growth / Employee	Dep. Growth / Employee	Profit / Employee
Retail Bankers	**0.402**	**1**						
	0.000							
	898	898						
SME Bankers	**0.618**	**0.242**	**1**					
	0.000	*0.000*						
	898	898	898					
Advisors	**0.030**	**0.222**	**0.062**	**1**				
	0.492	*0.000*	*0.152*					
	537	537	537	537				
Leadership Academy	**0.2124**	**0.1306**	**0.1777**	**0.1138**	**1**			
	0.000	*0.014*	*0.001*	*0.032*				
	358	357	357	357	358			
Loans / Employee	**0.022**	**0.092**	**0.099**	**0.282**	**0.156**	**1**		
	0.570	*0.018*	*0.011*	*0.000*	*0.005*			
	658	658	658	490	320	658		
Deposits / Employee	**0.076**	**0.041**	**0.048**	**0.035**	**0.083**	**0.470**	**1**	
	0.052	*0.288*	*0.222*	*0.441*	*0.141*	*0.000*		
	658	658	658	490	320	658	658	
Profit / Employee	**0.209**	**0.248**	**0.164**	**0.296**	**0.158**	**0.227**	**0.031**	**1**
	0.000	*0.000*	*0.000*	*0.000*	*0.003*	*0.000*	*0.427*	
	897	897	897	536	357	658	658	897

Notes FTE is Full Time Equivalent. Loan Growth / Employee and Deposit Growth / Employee are based on loans and deposits outstanding as reported on the balance sheet in local currency at the end of each year. Profit per Employee reflects annual profits per branch (branches with less than 4 quarterly observations in a year are excluded from the calculation of median profit). The correlations in Panel C are based on yearly averages and exclude pre-2005 observations for Advisors and pre-2006 observations for Leadership Academy because Advisors were first introduced in 2005 and the Leadership Academy started in 2006.

Table 2.2: Footing

	(1) OLS	(2) OLS	(3) FE	(4) FE	(5) AB	(6) AB
Lagged Footing	1.013	1.015	1.019	0.991	1.141	1.261
	[0.008]***	[0.012]***	[0.025]***	[0.042]***	[0.112]***	[0.866]
FTE	0.014	-0.070	0.064	0.176	0.225	-0.788
	[0.015]	[0.030]**	[0.086]	[0.093]*	[0.232]	[2.076]
FTE squared		0.001		-0.001		0.018
		[0.001]**		[0.002]		[0.032]
Operating Expenses	0.069	0.477	0.055	0.514	0.012	2.177
	[0.050]	[0.141]***	[0.051]	[0.165]***	[0.044]	[3.787]
Operating Expenses squared		-0.005		-0.006		-0.037
		[0.002]***		[0.002]***		[0.082]
FTE x Operating Expenses		-0.005		-0.005		-0.016
		[0.001]***		[0.002]***		[0.009]*
Constant	0.402	0.135	-0.908	-2.760		
	[0.283]	[0.316]	[1.388]	[1.055]***		
Observations	3259	3259	3259	3259	3070	3070
Number of Branches	189	189	189	189	185	185
R-squared	0.99	0.99	0.90	0.90		
Hansen J test					77.62	32.21
p-value					0.00	0.00
Arellano-Bond Test for Autocorrelation in First Differences (p-values)						
AR (3)					0.13	0.53
AR (4)					0.16	0.53

Notes *Footing*, the dependent variable, is the sum of Loans and Deposits. *FTE* is the number of employees in a branch. *Operating Expenses* include personnel expenses and other expenses for e.g. marketing, rent, et cetera. OLS is ordinary least squares estimation and FE stands for fixed effects. AB is the Arellano-Bond Difference GMM estimator with the difference of the lagged dependent variable instrumented by the third and fourth lags of its levels. All models include region x quarter x year fixed effects. Robust standard errors, clustered by branch, in brackets. * significantly different from 0 at 10%; ** significant at 5%; *** significant at 1%

Table 2.3: Sales and Branch Characteristics

	(1) OLS	(2) GMM	(3) GMM	(4) OLS	(5) GMM	(6) GMM	(7) OLS	(8) GMM	(9) GMM
Bankers + Advisors / FTE	0.036	-0.033	-0.059	0.103	0.462	0.473	0.099	0.378	0.459
	[0.019]*	[0.031]	[0.041]	[0.046]**	[0.135]***	[0.113]***	[0.047]**	[0.149]**	[0.138]***
Bankers + Advisors / FTE squared				-0.217	-1.785	-1.738	-0.187	-1.328	-1.622
				[0.125]*	[0.638]***	[0.435]***	[0.128]	[0.684]*	[0.540]***
Bankers + Advisors				0.004	0.019	0.017	0.004	0.012	0.015
				[0.003]*	[0.011]*	[0.006]***	[0.003]	[0.012]	[0.007]**
Leadership Academy	0.004	0.007	0.007	0.006	0.009	0.013	0.008	0.011	0.013
	[0.006]	[0.006]	[0.007]	[0.006]	[0.008]	[0.008]	[0.006]	[0.008]	[0.007]*
FTE	0.000	0.000	0.001	-0.002	-0.005	-0.005	-0.002	-0.003	-0.004
	[0.000]	[0.000]	[0.000]*	[0.001]**	[0.003]*	[0.002]***	[0.001]**	[0.003]	[0.002]**
FTE Squared				0.000	0.000	0.000	0.000	0.000	0.000
				[0.000]***	[0.000]	[0.000]	[0.000]***	[0.000]	[0.000]
Operating Expenses / FTE							0.416	0.465	0.051
							[0.162]**	[0.129]***	[0.689]
Operating Expenses / FTE squared							-0.208	-0.245	0.074
							[0.088]**	[0.071]***	[0.557]
Instrumented?									
Bankers + Advisors / FTE Operating Expenses	No/No	Yes/No	Yes/Yes	No/No	Yes/No	Yes/Yes	No/No	Yes/No	Yes/Yes
Observations	3245	3245	3236	3245	3245	3236	3245	3236	3236
Number of Branches	188	188	187	188	188	187	188	187	187
Hansen J test		0.15	0.69		1.50	2.22		3.04	5.75
p-value		0.699	0.405		0.220	0.136		0.219	0.125

Notes *Footing* is the sum of Loans and Deposits. The dependent variable is Δ*Footing /FTE*, the change in footing per employee from period t - 1 to period t. *Bankers + Advisors* is measured as the number of Retail and SME Bankers and Advisors in a branch. *Leadership Academy* is a dummy that equals 1 when a branch manager has finished the Academy and 0 otherwise. In the GMM estimates, instruments for *Bankers + Advisors*, *Bankers + Advisors/FTE* and its square and for *FTE* and *Operational Expenditures/ FTE* and their squares are constructed from the average value of the instrumented variables for other branches in the same region or the same size class. Additional instruments include the number of employees at the beginning of the sample period and categorical variables identifying (i) the size-class of a branch and (ii) the phases in the rollout of the program that introduced the Banker positions. All models include a constant and region x quarter x year fixed effects. Robust standard errors, clustered by branch, in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.4: Sales and Branch Characteristics - Alternative Specifications

	(1) Δfooting / FTE (Retail)	(2) ΔFooting / FTE (SME)	(3) Δdeposits / FTE	(4) Δloans / FTE
Panel A				
Bankers + Advisors / FTE	0.218	0.223	0.340	0.0609
	[0.083]***	[0.089]**	[0.132]***	[0.038]
Bankers + Advisors / FTE squared	-0.852	-0.855	-1.242	-0.253
	[0.368]**	[0.415]**	[0.614]**	[0.163]
Bankers + Advisors	0.00889	0.00863	0.0104	0.00323
	[0.006]	[0.007]	[0.011]	[0.002]
Leadership Academy	0.00208	0.00802	0.00428	0.00536
	[0.005]	[0.004]*	[0.007]	[0.002]**
Observations	3236	3236	3236	3236
Number of Branches	187	187	187	187
Hansen J test	4.939	0.0103	3.407	1.747
p-value	0.0846	0.995	0.182	0.417

Note *Footing* is the sum of Loans and Deposits. *ΔFooting /FTE* is the change in footing per employee from period t - 1 to period t. *Bankers + Advisors* is measured as the number of Retail and SME Bankers and Advisors in a branch. *Leadership Academy* is a dummy that equals 1 when a branch manager has finished the Academy and 0 otherwise. In the GMM estimates, instruments for *Bankers + Advisors*, *Bankers + Advisors/FTE* and its square and for *FTE* and *Operational Expenditures/ FTE* and their squares are constructed from the average value of the instrumented variables for other branches in the same region or the same size class. Additional instruments include the number of employees at the beginning of the sample period and categorical variables identifying (i) the size-class of a branch and (ii) the phases in the rollout of the program that introduced the Banker positions. All models include *FTE, FTE squared* and region x quarter x year fixed effects. Robust standard errors, clustered by branch, in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.5: The Quality of Sales and Branch Characteristics

	(1)	(2)	(3)	(4)	(5)	(6)
	Δ Mortgage /FTE	Δ Mortgage / Loans	Δ Funds / FTE	Δ Funds / Deposits	Δ Profit / FTE	Δ Profit / Footing
Bankers + Advisors / FTE	0.0113	-0.191	0.482	-0.0729	-0.0558	0.00459
	[0.020]	[0.198]	[0.114]***	[0.082]	[0.204]	[0.030]
Bankers + Advisors / FTE squared	-0.0231	0.628	-1.833	0.300	-0.270	-0.0383
	[0.070]	[0.787]	[0.429]***	[0.308]	[0.953]	[0.095]
Bankers + Advisors	-5.23e-05	-0.00623	0.0210	-0.00398	0.0138	0.000432
	[0.001]	[0.011]	[0.005]***	[0.003]	[0.016]	[0.001]
Leadership Academy	0.00109	-0.00828	0.00319	0.00339	-0.0205	-0.00139
	[0.001]	[0.006]	[0.004]	[0.003]	[0.018]	[0.001]
Constant	0.0148	0.0293	0.0150	0.00703	0.0403	0.00271
	[0.002]***	[0.010]***	[0.007]**	[0.006]	[0.036]	[0.002]
Observations	2574	2578	2574	2578	3236	3238
Number of Branches	187	187	187	187	187	187
Hansen J test	0.131	0.830	0.318	2.251	1.110	2.197
p-value	0.718	0.362	0.573	0.134	0.574	0.333

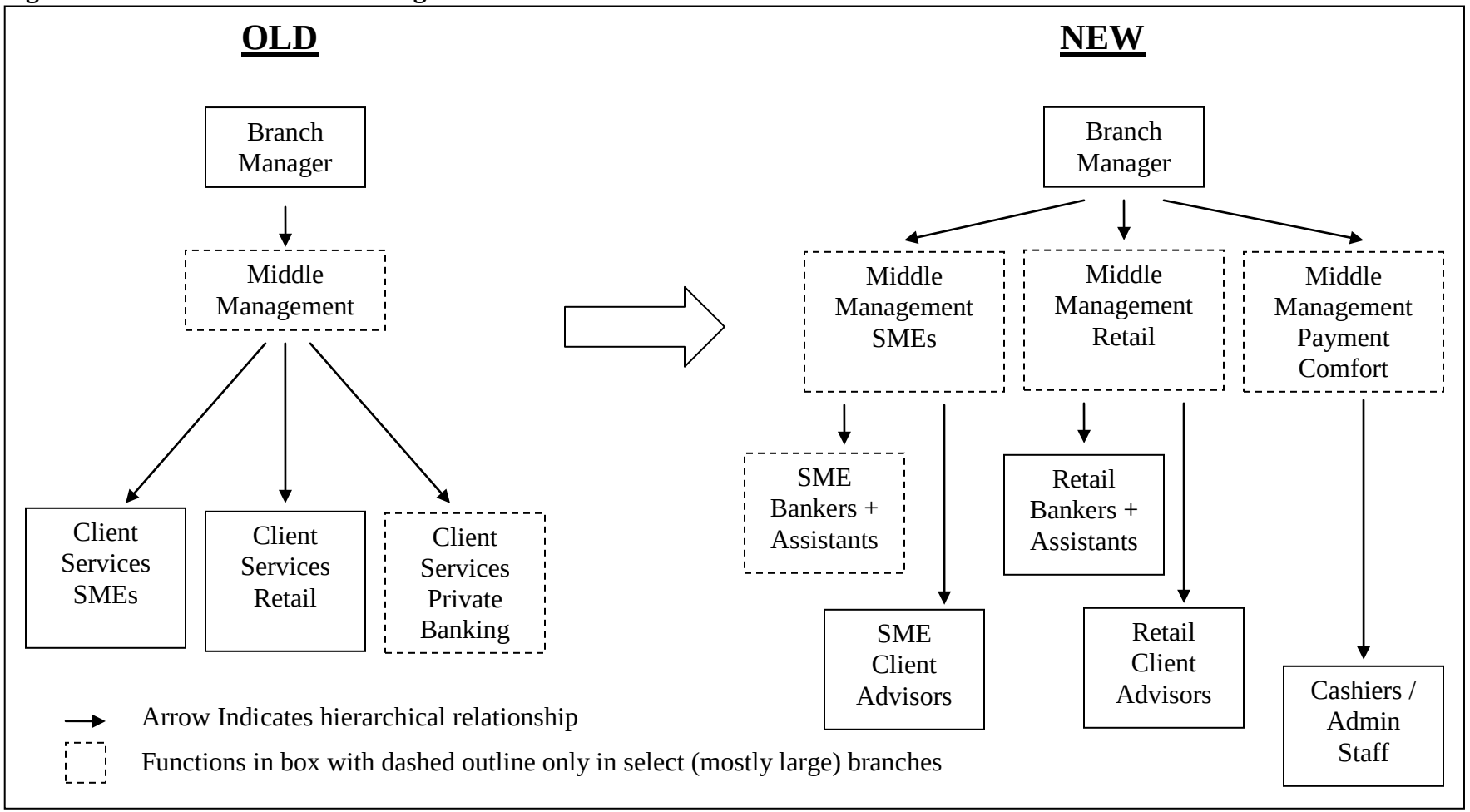
Notes Δ is the difference operator. *Bankers + Advisors* is measured as the number of Retail and SME Bankers and Advisors in a branch. *Leadership Academy* is a dummy that equals 1 when a branch manager has finished the Academy and 0 otherwise. *FTE* is the number of employees in a branch. All estimates are done by GMM. *Bankers + Advisors*, Bankers + Advisors / FTE and is square are treated as endogenous. Instruments are constructed from the average value of the instrumented variables for other branches in the same region or the same size class. Additional instruments include the number of employees at the beginning of the sample period and categorical variables identifying (i) the size-class of a branch and (ii) the phases in the rollout of the program that introduced the Banker positions. All models include *FTE*, *FTE squared* and region x quarter x year fixed effects. Robust standard errors, clustered by branch, in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 2.6: Sales and Branch Characteristics - Quantile Regression

	(1) ΔFooting QREG	(2) ΔFooting QREG	(3) ΔFooting QREG	(4) ΔFooting QREG	(5) ΔFooting QREG	(6) ΔFooting QREG	(7) ΔFooting QREG	(8) ΔFooting QREG	(9) ΔFooting QREG
Quantile	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
FTE	0.000	0.000	0.000	0.000	-0.001	-0.001	-0.001	-0.001	-0.002
	[0.001]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]**	[0.001]*	[0.001]*	[0.001]**
FTE squared	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]**	[0.000]***
Bankers + Advisors / FTE	0.031	0.029	0.023	0.037	0.067	0.095	0.110	0.064	0.116
	[0.055]	[0.035]	[0.034]	[0.030]	[0.030]**	[0.031]***	[0.035]***	[0.047]	[0.073]
Bankers + Advisors / FTE squared	-0.131	-0.090	-0.043	-0.068	-0.121	-0.177	-0.175	0.000	-0.067
	[0.144]	[0.109]	[0.107]	[0.094]	[0.092]	[0.095]*	[0.118]	[0.138]	[0.187]
Bankers + Advisors	0.001	0.001	0.001	0.001	0.001	0.001	0.001	-0.001	-0.002
	[0.002]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.002]	[0.002]	[0.003]
Leadership Academy	0.010	0.005	0.006	0.010	0.009	0.007	0.006	0.015	0.010
	[0.007]	[0.006]	[0.005]	[0.005]**	[0.006]	[0.008]	[0.009]	[0.009]	[0.011]
Constant	0.002	0.021	0.024	0.048	0.061	0.082	0.103	0.112	0.149
	[0.017]	[0.015]	[0.014]*	[0.017]***	[0.018]***	[0.020]***	[0.021]***	[0.022]***	[0.047]***
Number of Observations	3245	3245	3245	3245	3245	3245	3245	3245	3245
Pseudo R-Squared	0.14	0.13	0.14	0.15	0.17	0.18	0.20	0.22	0.25

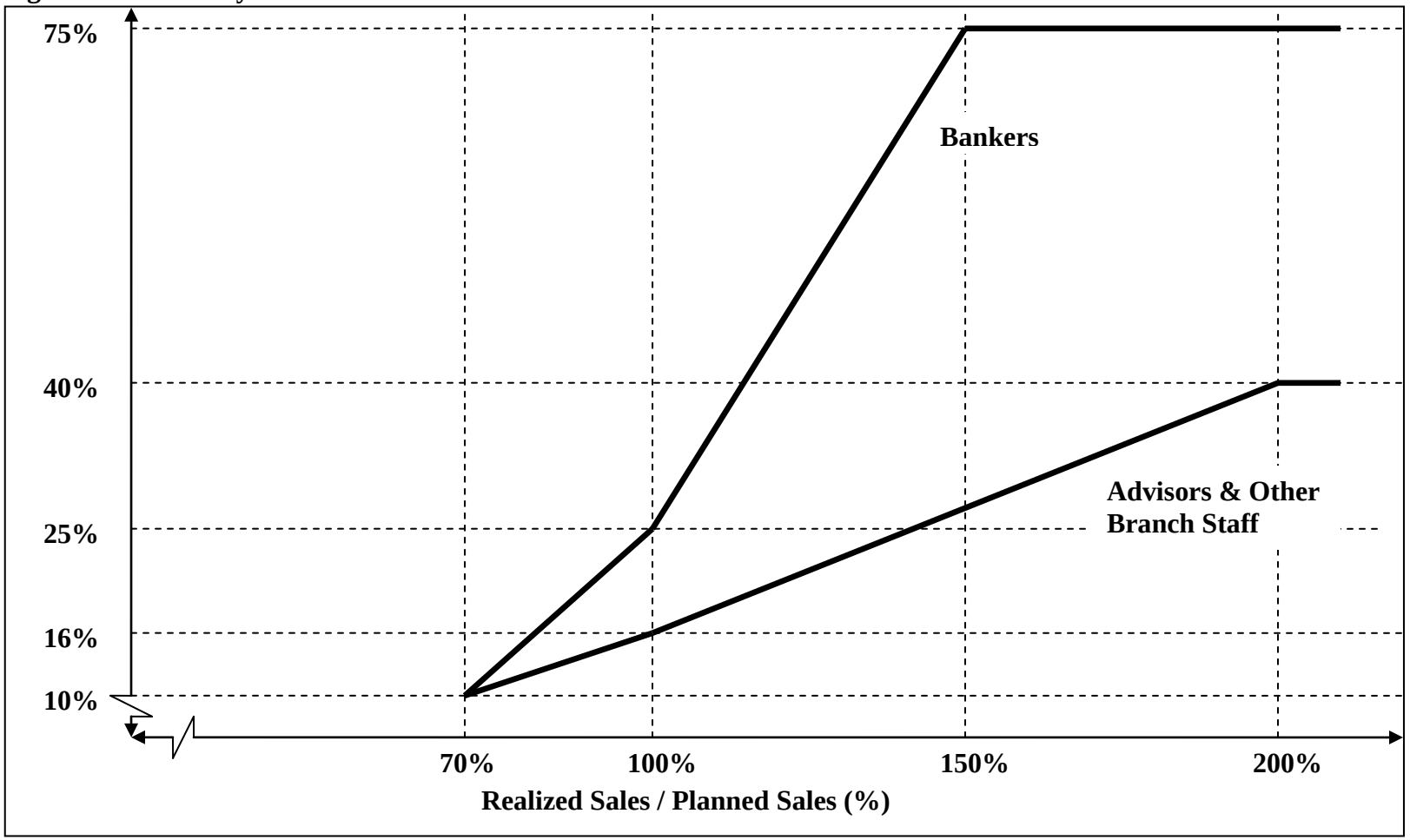
Notes *Footing* is the sum of Loans and Deposits. The dependent variable is Δ*Footing /FTE*, the change in footing per employee from period t - 1 to period t. *Bankers + Advisors* is measured as the number of Retail and SME Bankers and Advisors in a branch. *Leadership Academy* is a dummy that equals 1 when a branch manager has finished the Academy and 0 otherwise. All models include region and quarter x year fixed effects. Bootstrapped standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Figure 2.1: Old and New Branch Organizational Models



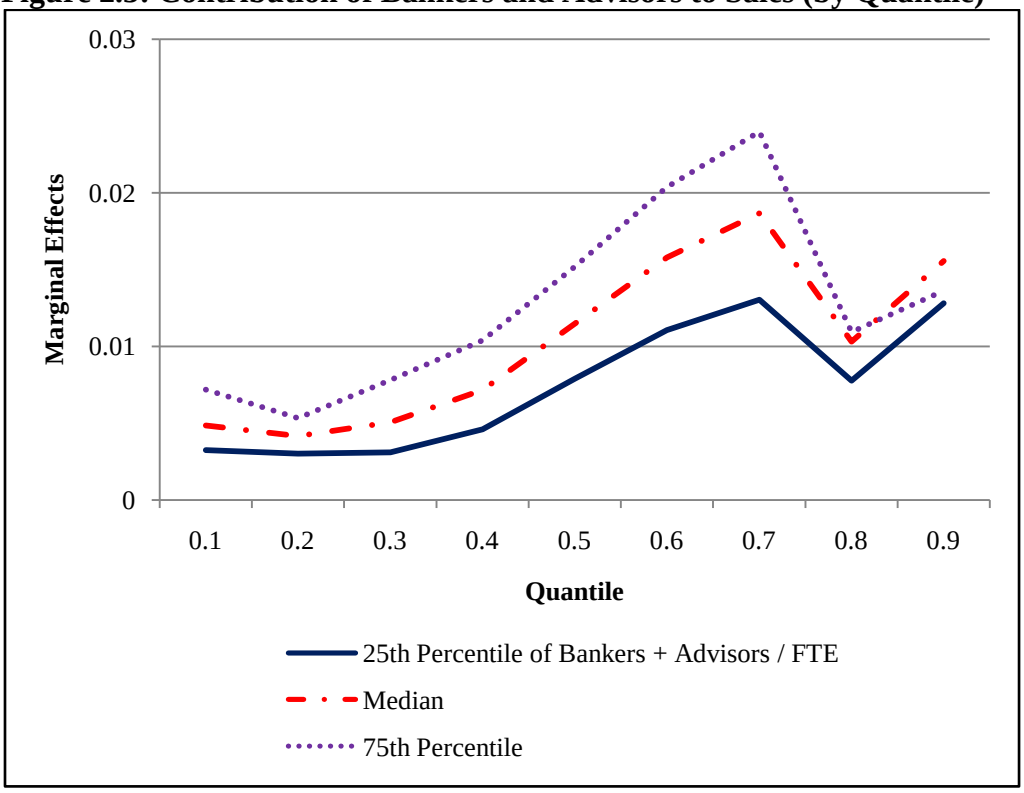
Notes In the new branch organizational model, the smallest branches have only a branch manager and staff at the Cashier level.

Figure 2.2: Bonus System



Notes Bankers' and Advisors' final bonus is a 70/30 weighted average of personal and branch performance. All other non-managerial staff receives a bonus based on branch performance

Figure 2.3: Contribution of Bankers and Advisors to Sales (by Quantile)



Notes See text for a discussion and Table 2.A.1 for Estimation Results

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CHAPTER 3
ECONOMIC TRANSFORMATION AND FOREIGN ACQUISITION OF BANKS

1. INTRODUCTION

Over the past two decades or so, many emerging markets have seen a rise in foreign ownership of banks, with owners typically coming from advanced economies (Claessens, Van Horen, Gurcanlar and Mercado Sapiain, 2008). Notable examples are Brazil, Mexico, Pakistan, almost all countries in Central and Eastern Europe (the CEE region) and more recently South Korea, Turkey and Ukraine (Figure 3.1). That being said, large differences between countries remain and foreign ownership of banks remains limited in countries such as India, China, Russia and South Africa. In Argentina, the asset share of foreign-owned banks dropped from 52 percent in 2000 to just 25 percent in 2005.

Differences in the level of foreign ownership of banks reflect differences in the mode of entry as well as in the characteristics of the banks that are owned by foreigners. In countries with low levels of foreign ownership, entry is typically in the form of foreign greenfield investments (i.e. the establishment of a new bank by foreigners). Greenfield banks generally focus on a limited range of services such as corporate banking or international banking and operate at most a small number of branches. Conversely, high levels of foreign ownership are frequently the result of a relatively brief surge in foreign acquisitions of domestic banks with significant branch networks and a wide range of services and clients including retail and SME clients (Guillén and Tschoegl, 2000; De Haas, Ferreira and Taci, 2007).

Looking at the levels of foreign ownership across countries and in particular at the timing of the surge in foreign ownership it is hard not to notice a pattern: more often than not, dramatic increases in foreign ownership of banks follow, with some delay, periods of economic turmoil and structural change (Figure 3.2). This is true for Mexico, South Korea, Indonesia and obviously for the CEE economies.

The objective of this paper is to study foreign acquisition of banks and specifically the significance of the timing of acquisitions following a period of structural economic change. We develop a dynamic model of competition between banks in which the competitive strength of banks is a function of their capacity to screen borrowers (e.g. Banerjee, 2005; Hauswald and Marquez, 2006). Screening capacity is treated as a knowledge asset that is subject to depreciation. Investments in screening capacity are akin to strategic investments in physical assets in a capital accumulation game with strategic substitutes (Spence, 1979). In the model, banks with foreign owners have a lower marginal cost of investment in new knowledge. This reflects the fact that their corporate parents can transfer knowledge from their home base to subsidiaries rather than having to develop knowledge assets from scratch (Kogut and Zander, 1993; Un and Cuervo-Cazurra, 2008; Bogaard and Svejnar, 2009).

I conceptualize structural economic change as a process that changes the way in which economic agents interact with each other. For banks, this would be associated with new (banking) regulation or changes in the client population. Therefore, structural economic change reduces the value of the knowledge that banks employ to develop client relationships and to screen prospective borrowers. In the model, this is equivalent to a temporary increase in the rate of depreciation of the knowledge asset. Depreciation limits

the extent to which pre-existing capacity represents a commitment to have a certain level of capacity in the future and makes the marginal cost of investment more important as a determinant of competitive strength and profits. Therefore, foreign acquisition of banks, which reduces the marginal cost of investment, becomes more attractive when the rate of depreciation increases. Provided foreign acquisition has some fixed cost (otherwise there should be acquisitions regardless of the level of depreciation), the model explains why we observe a surge in foreign acquisition of banks following periods of structural economic change.

Formalizing this intuitive result requires the introduction of unconventional comparative statics involving changes in the level of initial capacity and asymmetric cost.[26] In a two-period model, we analyze the conditions under which foreign ownership leads to higher investment in new screening capacity as structural shocks become more severe. The conditions require that the pre-existing capacity of the competing bank, which remains under domestic ownership, is sufficiently large relative to the pre-existing capacity of the acquired bank – when a bank has high capacity, a given increase in the rate of depreciation causes a substantial weakening in its competitiveness.

In simulations of the model, we show that the results that we derive for investment tend to carry over to the value of discounted profits: a temporary increase in the rate of depreciation of screening capital increases the difference in value between a bank under domestic ownership and the same bank under foreign ownership. We also

[26] The literature has studied how differences between firms in initial capacity affect investment strategies, in particular to determine under what conditions there can be "increasing differences" such that firms consolidate or even expand initial advantages (Reynolds, 1991; Athey and Schmutzler, 2001). However, we are interested not in initial differences in capacity between firms but in the effect of across-the-board changes in the initial capacity of firms, some of which may have lower marginal cost of investment in new capacity.

study how the relationship between the cost of investment and pre-existing capacity affects investment behavior and the benefits of foreign acquisition. This is an important issue in the context of foreign acquisitions. In general, we would expect that adding capacity becomes more difficult when it is already high. However, if banks with higher capacity also have a greater capacity to learn, they may be better positioned to absorb knowledge from foreign parent companies (Gupta and Govindarajan, 2000).

We find that if costs increase with pre-existing capacity investment is lower in both periods, but profits may rise as compared to the case in which the cost of investment is independent of capacity. The reduction in investment is the result of higher cost, but also of the fact that strategic benefits of investment are muted when cost increases with capacity – investment in the first period makes banks soft in the second. Furthermore, the relationship between depreciation and the benefits associated with foreign acquisition is weaker under this cost-structure. Hence, the more the marginal cost of investment increases with capacity, the harder it is to rationalize a surge in foreign acquisitions following a period of structural economic change.

The results have several empirical implications, not the least of which is that the impact of foreign acquisition on performance varies over time (e.g. Brown, Earle and Telegdy, 2006). Many papers implicitly or explicitly assume that the impact is constant. In addition, the model explains how temporary economic turmoil may lead to lasting differences between firms under different types of ownership (e.g. Desai, Foley and Forbes, 2008).

This paper makes a number of contributions to the literature. First, while it is widely recognized that foreign ownership of banks often increases following economic

turmoil (e.g. Tschoegl, 2005), I am not aware of a theoretical model that explicitly studies the relationship between foreign acquisitions and the role of knowledge transfers in this context. Indeed, much of the theoretical literature on foreign entry into banking essentially models greenfield entry: foreign-owned banks are seen as outsiders with limited or no access to proprietary information about the quality of prospective borrowers (Dell'Ariccia and Marquez, 2004; Sengupta, 2007; Gormley, 2008). As a result, foreigners can only enter the market if their opportunity cost of lending is significantly lower than that of domestically owned banks. While the cost of capital is obviously important, the assumption that foreigners are poorly informed as compared to domestic owners is not necessarily appropriate in the context of acquisitions. To begin with, one needs to explain why foreigners cannot build on the pre-existing knowledge of incumbent employees (as in Van Tassel and Vishwasrao, 2007).[27] More importantly, it is well documented that banks in countries such as Mexico, Thailand, South Korea and in the CEE region were poorly informed about the quality of their borrower pools before disaster struck (e.g. Buch, 1997; Berglof and Bolton, 2002; Haber, 2005). My model builds on this observation and suggests how foreign acquisition can improve banks' capacity to generate information about borrowers.

Second, the paper explicitly considers acquisition partially because foreign-acquired banks operate in different market segments (retail and SME) than foreign greenfield banks. Therefore, the (often implicit) assumption that foreign-acquired, foreign greenfield and domestic banks compete for the same borrowers may not be realistic. This focus enables me to think more carefully about the process of post-acquisition

[27] In this context, partially building on Stein (2002), Berger et al (2005), Mian (2006) and Berger et al (2008) have argued that greater physical, cultural and hierarchical distance between loan officer and management causes information to get "lost in translation".

restructuring. In doing so, my paper complements recent work by Claeys and Hainz (2007), Van Tassel and Vishwasrao (2007) and Lehner and Schnitzer (2008). These papers study the choice between foreign greenfield entry and foreign acquisition and their relative impact on competition in a single market for loans. In doing so, they make very different assumptions about access to information among foreign-owned and domestically owned banks. Van Tassel and Vishwasrao (2007) assume that foreign owners have no private information but “inherit” all information controlled by domestic banks they acquire. Lehner and Schnitzer (2008) by contrast, assume that foreign banks have perfect screening ability while domestically owned banks have no information about creditors at all, except for the information that is generated through spillovers from foreign entrants. Claeys and Hainz (2007) assume that foreigners are better at screening banks while domestically owned banks have some private information from previous banking relationships. Our paper contributes to this emerging literature by replacing the rather extreme assumptions about banks' ability to generate information with a more flexible framework that enables us to study the benefits of foreign acquisitions under different assumptions about the contributions of foreign acquirers to knowledge.

Finally, while the model is geared towards the banking sector, the underlying principles – competition based on "production" capacity, adjustment costs and the potential of loss of capacity due to external economic circumstances – is valid in other sectors as well. Recent papers by Foley and Desai (2008) and Cuervo-Cazurro and Dau (2008a, b) establish a link between financial crises and structural adjustment and the performance of domestic firms relative to that of foreign firms. This paper provides

further insight into this link and can serve as a basis for future empirical research in banking and other sectors.

In what follows, the paper lays out a dynamic model of bank competition between two banks. Section 2 discusses the general characteristics of the model and in particular competition in the market for loans. Section 3 studies the case of myopic banks and section 4 analyzes the two-period model. Section 5 discusses extensions and empirical implications and section 6 concludes.

2. PRELIMINARIES

The model consists of two components. The first describes lending competition between two banks which takes place in each period and in which competitiveness is based on banks' screening capacity. The second component is a dynamic game in which banks invest in new screening capacity. Building on Broecker (1990), we treat competition between banks for borrowers as Bertrand competition. In each period, banks screen borrowers and make interest rate offers (or refrain from lending) on the basis of the information they receive. The reliability of information depends on a bank's screening capacity, denoted γ_i^t $(0 \leq \gamma_i^t \leq 1)$. While the information about a project and a borrower is valid for one period only, screening capacity is a state variable in a dynamic game that, after accounting for some depreciation, carries over from one period to the next.[28] Depreciation may be the result of turnover in staff, which requires training replacements, or the need to adapt screening procedures to changes in the external economic

[28] Dell'Ariccia (2001) develops a model gain access to proprietary information through lending and use that information in subsequent periods. Banks "invest" in information through their interest rate offers to new borrowers. My model is more general in the sense that we don't restrict opportunities to learn to lending transactions.

environment. For example, changes in bankruptcy or labor laws not only affect the creditworthiness of borrowers, but also the information banks need to evaluate creditworthiness. As a result, existing procedures for credit assessment may no longer be optimal. To compensate for depreciation, or to strengthen their competitive position, banks can invest in new capacity at the beginning of each period – investment is the control variable in the dynamic game. Hence, for any period, the screening capacity of bank *i* is:

$$\gamma_i^t = I_i^t + (1-\delta^{t-1})\gamma_i^{t-1} = I_i^t + \tilde{\gamma}_i^{t-1} \tag{3.1}$$

Figure 3.3 describes the timing of the model. After depreciation takes place at the end of period *t – 1*, banks play a two-stage game in period *t*. They first invest in new capacity at the beginning of the period and, after learning each other's capacity, they compete for borrowers.

Before we define screening capacity more precisely, we need to discuss how banks compete for borrowers.

Lending competition

The market for loans is represented by a mass of borrowers of size 1. Each borrower has a project that requires $1 in funding. Borrowers are risk neutral and have zero opportunity cost, limited liability and no private capital. Projects can be of high quality (type $\theta = H$ projects) in which case they generate a verifiable return of $R > 1$ with certainty or they can be of low quality ($\theta = L$) and generate a return of zero. The proportion of good projects in the economy is equal to q.

There are two risk neutral banks. Both banks have a branch network that is sufficiently dense that borrowers apply for loans at both banks.[29] If borrowers receive two loan offers, they accept the one with the lowest interest rate. Banks have an opportunity cost of lending ρ, which is measured as a gross interest rate ($\rho \geq 1$) and is so high as to make uninformed lending unprofitable:

$$qR - \rho < 0 \tag{3.2}$$

However, banks can screen borrowers at no cost. Screening generates a signal $s \in \{h, l\}$. The signals that banks receive are unobservable by the other bank and independent conditional on the true type of a project. Signals are characterized by signal strength σ, which is defined as the probability that the signal coincides with the true type of the project:[30]

$$\sigma = Pr(s = h \mid \theta = h) = Pr(s = l \mid \theta = l) \tag{3.3}$$

To ensure that signals are informative, we assume that σ is greater than ½ .[31] Given σ and q, we can now use Bayes' rule to derive the probability that a project is of type H conditional on the signal being h (we define $\overline{p}$ as the probability that $s = h$).

$$\overline{q}(\sigma) = Pr\left(\theta = H \mid s = h\right) = \frac{q\sigma}{q\sigma + \left(1-q\right)\left(1-\sigma\right)} = \frac{q\sigma}{\overline{p}} > q \tag{3.4}$$

The last inequality follows from the assumption that $\sigma > ½$. For a monopolist bank, lending is feasible if $\overline{q}R - \rho > 0$ and we assume that lending is always feasible for both

[29] Hence, we assume that any impact of distance between bank and clients on borrowing and lending decisions can be ignored. For models in which the distance between banks and borrowers matters see e.g. Almazan (2002), Hauswald and Marquez (2006), Lehner and Schnitzer (2008).
[30] Broecker (1990) allows probability that banks correctly identify a good project to be different from the probability that they correctly identify a bad project (see Banerjee, 2005 for a discussion).
[31] If σ were smaller than ½ we could simply relabel the signals to satisfy this assumption.

banks. For future reference, it is useful to define the break-even interest rate for a monopolist bank as:

$$r^{MIN} = \frac{\rho}{\overline{q}} \tag{3.5}$$

Given that uninformed lending is infeasible and that signals are informative, banks will never offer a loan if they receive a negative signal ($s = l$). Upon receiving a positive signal ($s = h$) a bank, say bank i, can choose to offer a loan at an interest rate r, so that $r_i^{MIN} \leq r \leq R$ (where $r_i^{MIN} = r^{MIN}(\sigma_i)$). Borrowers accept the offer if the other bank, j, receives a negative signal or receives a positive signal and offers a higher interest rate than bank i. It is well-known that this form of Bertrand competition for borrowers has no equilibrium in pure strategies (Broecker, 1990; Von Thadden, 2004; Freixas, Hurkens, Morrison and Vulkan, 2007).[32] [33] The rationale is as follows: Suppose banks always charge the same interest rate when they receive signal $s = h$. This gives both an incentive to just undercut their competitor. This increases the number of borrowers accepting the bank's offer in exchange for a negligible reduction in the expected profit per borrower. However, if one bank, say i, lowers its interest rate, bank j lends only to borrowers that were rejected by bank i. This pool of borrowers is of lower quality on average than the population as a whole. As a result, bank j has an incentive to either reciprocate in order to improve the pool of borrowers it is sampling from, or, given its current pool of borrowers, to raise its interest rate offer. In either case, the interest rate

[32] The information structure in Von Thadden (2004) is slightly different from the structure that is used here. Von Thadden assumes that the signal of the less-informed bank is a noisy signal of the signal of the more-informed bank. However, the main characteristics of the equilibrium in the lending game are the same: only if a bank is better informed than its competitor can it make a profit (see also Engelbrecht-Wiggans, Milgrom and Weber, 1983; Hauswald and Marquez, 2006)

[33] Freixas et al. (2007) show that an equilibrium in pure strategies can exist if there is a marginal cost of screening that increases in the number of loan applicants.

offer made by bank *i* is no longer optimal given bank *j*'s strategy. Indeed, the conflicting incentives to reduce interest rates (in order to improve the borrower pool) and to increase interest rates (to raise profits given the borrower pool) prevent the existence of a pure-strategy equilibrium.[34]

Although no equilibrium in pure strategies exists, there is a unique equilibrium in mixed strategies. Proposition 1 characterizes the equilibrium in two cases: one in which both banks receive equally strong signals and one in which one bank receives a stronger signal than the other bank.

Proposition 1

Suppose two banks, i and j, compete for borrowers and receive signals about each borrower with signal strength σ_i *and* σ_j *respectively and that both* r_i^{MIN} *and* r_j^{MIN} *are smaller than R, then:*

a. *If* $\sigma_i = \sigma_j = \sigma$*, banks randomize their interest rate bids over the interval* $[r^{MIN}, R)$*, according to a continuous distribution F(r). F(R) < 1 and banks occasionally refrain from bidding. Expected profits are zero for both banks.*

b. *If* $\sigma_i > \sigma_j$ *, the bidding interval is* $[r_j^{MIN}, R]$ *where* $r_j^{MIN} = \rho / \overline{q}_j$*. Bank i randomizes its bids according to the continuous distribution function* $F_i(r)$ *such that* $F_i(r) = (\sigma_j / \sigma_i) F_j(r)$*, and* $F_j(r)$ *is bank j's bidding distribution. Both* $F_i(R)$ *and* $F_j(R)$ *are smaller than 1. The bidding distribution of bank i has an atom at R,*

[34] for a formal proof of the non-existence of a pure strategy equilibrium see Broecker (1990) or Von Thadden (2004)

bank j occasionally refrains from bidding. Bank i has an expected profit of $\overline{p}_i\left(\overline{q}_i r_j^{MIN} - \rho\right)$*, bank j has zero expected profit.*

Proof: see the appendix to this chapter

The proof is relegated to the appendix as it largely follows a number of standard steps that have been presented in the literature before (Broecker, 1990; Banerjee, 2005).

Looking at the equilibrium behavior of the banks, a bank with more reliable information than its competitor can bid less aggressively, with an atom at *R*, because the better-informed bank does not suffer from adverse selection as much as the less well-informed bank. Even so, we can show that well-informed banks lend more than less well-informed banks provided that $q > ½$.

We are now ready to define screening capacity. Specifically, assume that signal strength σ takes on two values: it can either be weak, σ^W, or strong, σ^S , where $1 > \sigma^S > \sigma^W > ½$. A bank's screening capacity γ_i^t is then defined as the proportion of signals that are strong. A well-managed bank successfully trains its staff and will generally be able to collect reliable and comprehensive information about its borrowers. However, even a strong bank will occasionally hire a weak loan officer such that the bank receives some weak signals. Similarly, a weak bank can be lucky and hire a good branch manager who figures out how to make reliable credit assessments that generate strong signals.

For any given borrower, both banks know the strength of their own signal and of the signal that the other bank receives – but do not observe the actual signal of the other bank. One way to think about the assumption that banks know the strength of each other's signals is that a branch employee of one bank will generally know which branch

of the other bank a borrower visits. Through experience, the employee will also know if that branch is performing well or not.[35] For any borrower, each bank can therefore find itself in four situations: if the bank receives a strong signal, the other bank's signal can be either strong or weak and the same applies if the bank receives a weak signal.

It follows from proposition 1 that a bank, say bank *i*, can only make a positive expected profit when it receives a strong signal about a borrower while bank *j* receives a weak signal. This is the case for a proportion of borrowers that is equal to $\gamma_i^1(1-\gamma_j^t)$. Noting that the values of $\overline{p}$, $\overline{q}$ and r^{MIN} depend on the value of σ, but not on the identity (or the screening capacity) of a bank, we can write total revenue from lending as:

$$v_i^t = \gamma_i^t(1-\gamma_j^t)\left[\overline{p}(\sigma^S)\left(\overline{q}(\sigma^S)r^{MIN}(\sigma^W)-\rho\right)\right] \tag{3.6}$$

The term between square brackets in the revenue function v_i^t is a constant and the function as a whole establishes bank competition as a game with strategic substitutes (Bulow, Geanakoplos and Klemperer, 1985). An increase in the capacity of bank *j* reduces the marginal benefits of an increase in capacity by bank *i*. The result that investment in information by banks is a strategic substitute is familiar from other specifications of lending competition as well (e.g. Hauswald and Marquez, 2006), although it does not apply universally (Banerjee, 2005). In our model v_i^t is akin to revenue in the standard Cournot model except for the fact that the second derivative with respect to a bank's own capacity is zero.[36] In a Cournot model an increase in capacity leads to lower prices that are needed to induce the marginal consumer to buy the product.

[35] This assumption is without loss of generality. Allowing for uncertainty about the quality of the other bank's signal would not fundamentally alter the analysis: the more likely a competitor bank is to receive a strong signal, the lower the expected profit from lending.

[36] In the traditional Cournot model, revenue is equal to $R_i = q_i(a-bq_i-cq_j)$ such that $\partial^2 R_i / \partial^2 D_i = -2b$

In the present context, an increase in capacity means that more borrowers will pass screening and are permitted to buy the product (i.e. to borrow). However, given the capacity of the other bank, a bank that increases its own capacity does not need to lower its price.

3. STRATEGIC INVESTMENT WITH MYOPIC BANKS

We analyze the strategic investment game in two steps. First, using a more general, but still quadratic, revenue equation than (3.6), we analyze the case of myopic firms. Second, returning to equation (3.6) as the revenue function and imposing some restrictions on the cost of investment function, we analyze the two-period case in which investment decisions in the first period take into account the strategic response in the second period.

With myopic banks, the objective function is defined as follows:

$$\begin{aligned} &\underset{I_i^1}{Max} V_i = v(\gamma_i^1, \gamma_j^1) - \frac{1}{e_i} c(\tilde{\gamma}_i^0, I_i^1) \\ &s.t.\ \ \gamma_i^1 = I_i^1 + (1-\delta^0)\gamma_i^0 = I_i^1 + \tilde{\gamma}_i^0 \end{aligned} \tag{3.7}$$

The cost of investment is a function of pre-existing capacity $\tilde{\gamma}_i^0$, investment in period 1 and the value of the "cost-shifter" e_i. Under the assumption that foreign ownership provides banks with access to knowledge, investment is cheaper for foreign-owned banks, which is represented by higher values of e_i. Our comparative statics consider the impact of acquisition of bank *i*, which induces an increase in e_i, on investment behavior and value V_i, given the value of e_j. Ultimately, we are interested in whether an increase in e_i has a larger impact on investment and profits when the rate of depreciation in period 0 increases – i.e. whether foreign acquisition has higher benefits after structural economic change. Formally, this is the case when $\partial^2 V_i / \partial \delta^0 \partial e_i$ is greater than zero.

We make the following assumptions about the cost function:

$$
\begin{aligned}
& c_i(0;\tilde{\gamma}_i^{t-1}) = 0 \\
& \frac{\partial c_i^t}{\partial I_i^t} = c_{i,I_i^t} > 0,\ \frac{\partial^2 c_i^t}{\partial^2 I_i^t} = c_{II} > 0 \\
& \frac{\partial^2 c_i^t}{\partial^2 \tilde{\gamma}_i^{t-1}} = 0,\ \frac{\partial^2 c_i^t}{\partial I_i^t \partial \tilde{\gamma}_i^{t-1}} = c_{I\gamma},\ c_{II} > \left| c_{I\gamma} \right|
\end{aligned}
\tag{3.8}
$$

There is no fixed cost of investment, cost is convex and quadratic in investment and quadratic in pre-existing capacity $\tilde{\gamma}_i^{t-1}$. We assume that the magnitude of the second derivative of cost with respect to investment is greater than that of the cross-derivative with respect to investment and pre-existing capacity. However, the sign of the cross-derivative can be either positive or negative. If $c_{I\gamma}$ is positive, banks with lower existing capacity have lower marginal cost of investment in new capacity. Essentially, this implies that banks can improve performance by picking the low-hanging fruit first. Conversely, if $c_{I\gamma}$ is negative, it is cheaper for banks with high initial screening capacity to add even more capacity – there is learning-by-doing.[37] Put differently, a negative $c_{I\gamma}$ implies that banks with high screening capacity also have higher capacity to absorb new knowledge whether transferred from their new corporate parent or acquired otherwise.[38]

As implied in equation (3.8), we use the following notation for derivatives (let $g, h \in \{i, j\}$): (i) first derivatives $\partial x_i / \partial y_g$ are written as x_{i,y_g}, (ii) second derivatives $\partial^2 x_i / \partial y_g \partial z_h$ that are the same for both banks are written as x_{yz} and (iii) second

[37] By assumption, γ can be no higher than 1. Hence, because $c_{I\gamma}$ is constant, it needs to be the case that the other parameters in the model, notably c_{II} and δ^t, prevent γ from coming too close to 1.

[38] In the model, knowledge is measured along only one dimension, quantity. In reality, absorptive capacity and hence the ease of knowledge transfer will be affected by other aspects of knowledge as well, such as whether pre-existing knowledge in an acquired bank is related to the knowledge being transferred by the new parent (Cohen and Levinthal, 1990).

derivatives that depend on the identity of a bank are written as $x_{i,y_g z_h}$. Finally, the derivative of the revenue function (i) with respect to own investment is $v_{i,1}$, (ii) with respect to the other banks' capacity is $v_{i,2}$ and (iii) the second derivatives are v_{ab}, $a,b \in \{1,2\}$. In equation (3.6), v_{11} and v_{22} are both zero, while the cross-derivative $v_{12} = -\left[\overline{p}(\sigma^S)\left(\overline{q}(\sigma^S) r^{MIN}(\sigma^W) - \rho\right)\right]$. In this section, we do not impose the assumption that v_{11} and v_{22} are zero *ex ante* to ensure that our results have more general validity. However, we will assume that v_{12} is smaller than zero (investment is a strategic substitute) and that $v_{i,2}$ is smaller than zero (investment by the competitor lowers revenue).

The rate of depreciation in period 0 affects the value function only through $\tilde{\gamma}_i^0$ and $\tilde{\gamma}_j^0$. Hence, we can write the derivative of (3.7) with respect to δ^0 as:[39]

$$V^1_{i,\delta^0} = V^1_{i,\tilde{\gamma}_i^0}\tilde{\gamma}^0_{i,\delta^0} + V^1_{i,\tilde{\gamma}_j^0}\tilde{\gamma}^0_{j,\delta^0} = -V^1_{i,\tilde{\gamma}_i^0}\gamma_i^0 - V^1_{i,\tilde{\gamma}_j^0}\gamma_j^0 \qquad (3.9)$$

Equation (3.9) defines the impact of depreciation on a bank's value as a weighted average of its own capacity and the capacity of its competitor. For some parameter values, an increase in depreciation only induces an increase in investment by bank *i* if γ_j^0 is large enough as compared to γ_i^0. The same applies to the cross-derivatives of investment and value with respect to δ^0 and e_i. The intuition is that, if γ_j^0 is large, an increase in depreciation leads to a substantial weakening of bank *j*'s competitiveness, which is good for bank *i*.

[39] note that: $\tilde{\gamma}^0_{i,\delta^0} = \partial\left((1-\delta^0)\gamma_i^0\right)\Big/\partial\delta^0 = -\gamma_i^0$

The key comparative statistics of interest are summarized in proposition 2, the proof of which can be found in the appendix.

Proposition 2

Maintain the assumptions in equation (3.8) and assume that revenue v_i *increases in* γ_i *and decreases in* γ_j *and that* $v_{12} < 0$. *Also, assume that* $v_{11} - e_g c_{II} + \left| e_g v_{12} \right| < 0$ *for* $g \in \{i, j\}$. *Then:*

a. *If* $c_{I\gamma} > \left(e_i e_j \left((v_{12})^2 - (v_{11})^2 \right) + e_i v_{11} c_{II} \right) / \left(c_{II} - e_j v_{11} \right)$, *or alternatively if* $\gamma_j^0 / \gamma_i^0 > \left(e_i e_j (v_{12})^2 - \left(e_j v_{11} - c_{II} \right)\left(e_i v_{11} - c_{I\gamma} \right) \right) \Big/ e_i v_{12} \left(c_{I\gamma} - c_{II} \right)$ *an increase in depreciation induces higher investment by bank i .*

b. *An increase in* e_i *leads to higher investment by bank i and lower investment by bank j. Value for bank i increases as well.*

c. $I_{i,\delta^0 e_i}$ *is greater than zero if* $v_{11} c_{II} < e_j \left((v_{11})^2 - (v_{12})^2 \right)$, *or alternatively if* $\gamma_j^0 / \gamma_i^0 > \left(e_j \left((v_{12})^2 - (v_{11})^2 \right) + c_{II} v_{11} \right) \Big/ \left(-c_{II} v_{12} \right)$. *Furthermore, if* $0 \geq v_{22} \geq \left(e_j v_{11} - c_{11} \right) \Big/ e_i e_j$, *a positive value α exists such that* $V_{i,\delta^0 e_i}$ *is greater than zero if* $\gamma_j / \gamma_i > \alpha$.

Proof: see the appendix to this chapter

The assumption in proposition 2 that $v_{11} - e_g c_{II} + | e_g v_{12} | < 0$ is equivalent to the assumption that $V_{i,I_i^1 I_i^1} + | V_{i,I_i^1 I_j^1} | < 0$ which is a sufficient condition for the existence of a

unique equilibrium (e.g. Tirole, 1988, p.226). As to part a. of the proposition, an increase in depreciation generally encourages investment because a drop in the capacity of a competitor increases the marginal revenue of investment. If $c_{I\gamma}$ is positive, depreciation also reduces the marginal cost of investment, providing an additional incentive to raise investment. The constraint on $c_{I\gamma}$ is less strict if revenue is concave in a bank's own capacity ($v_{11} < 0$, as in the standard Cournot model). If that is the case, the reduction in a bank's own capacity associated with depreciation generates an additional increase in the marginal revenue of investment. If $c_{I\gamma}$ does not meet the condition in the proposition, investment will only rise with depreciation if γ_j^0 is sufficiently large as compared to γ_i^0. When $c_{I\gamma}$ is small or negative, the condition on γ_j^0 / γ_i^0 tends to be less binding if cost is very convex in investment (c_{II} is large).

Part b. of the proposition states that lower marginal cost of investment is good for a bank. This implies that according to this simple model, foreign acquisition of a bank is always attractive. Hence, to explain a surge in acquisitions following structural economic change, it should be the case that there is a fixed cost of acquisition and it should be more likely that this fixed cost can be overcome after structural economic change. This is what part c. of the proposition addresses: under certain conditions, an increase in depreciation leads to a larger increase in investment and value for a bank that is acquired by foreigners relative to the value of the same bank under domestic ownership. Looking at investment first, the derivative $I_{i,\delta^0 e_i}$ is positive if the cost-function is sufficiently convex and revenue sufficiently concave in a bank's own investment. While this condition does not

hold with the revenue function of equation (3.6), it will hold in many specifications of the basic Cournot model where v_{11} is negative (see footnote 36).

When the condition on c_{II} does not hold (for example because v_{11} is zero), $I_{i,\delta^0 e_i}$ can still be positive if γ_j^0 is large enough. When both v_{11} and $c_{I\gamma}$ are zero the conditions on γ_j^0 in parts a. and c. of the proposition are identical and become less binding if costs are very convex and e_j is small. When v_{11} and $c_{I\gamma}$ are not zero either of the conditions in a. or in c. may be stricter.

The sign of $V_{i,\delta^0 e_i}$ is harder to pin down exactly. The reason is that $V_{i,\delta^0 e_i}$ depends on the partial derivatives of investment by both banks with respect to e_i. The magnitude of these derivatives is a function of the level of investment, which we cannot determine unless we explicitly solve the model. However, provided that revenue is neither convex nor too concave in the other bank's capacity (as reflected in the parameter v_{22}), we can guarantee that there is a ratio of γ_j^0 / γ_i^0 for which $V_{i,\delta^0 e_i}$ is positive.[40]

The approximation of a structural shock with an increase in depreciation is convenient as a change in one parameter, δ^0, affects the capacity of both banks. However, the price of convenience is an implicit assumption that high-capacity banks suffer more from a structural shock. This assumption is reasonable if "high capacity" is equivalent to "highly adapted to the old external environment". However, in many cases we would expect that well-managed banks are also more capable of adapting to a new external

[40] note that v_{22} is zero in the standard Cournot model and in equation (3.6)

environment than banks with low capacity.[41] Hence, it might be more reasonable to think that a structural shock causes a reduction in pre-existing capacity that is equal in size for both banks rather than an equal percentage of capacity. In general, analyzing the impact of an equivalent absolute reduction in pre-existing capacity is more complicated than analyzing the impact of an increase in depreciation and the impact of a structural shock on bank *i* remains dependent on the pre-existing capacity of bank *j*. However, when banks have the same initial capacity, such that $\gamma_j^0 / \gamma_i^0 = 1$, an equivalent absolute reduction and an equivalent percentage reduction in pre-existing capacity are identical. This leads us to the following:

Corollary 1

When $\gamma_j^0 / \gamma_i^0 = 1$*:*

a. $I_{i,\delta^0 e_i} > 0$ *if* $-c_{II}\left(v_{12}+v_{11}\right) > e_j v_{12}\left(v_{12} - v_{11}(v_{11}/v_{12})\right)$, *which always holds if* $v_{11} < -v_{12}$

b. *let* $c_{I\gamma} = v_{11} = v_{22} = 0$, *then* $V_{\delta^0 e_i} > 0$ *if* $c_{II}\left(1 - e_i e_j v_{12}(v_{12}/c_{II})^2\right) > -(1+e_j)v_{12}$

Proof: Omitted

Statement a. implies that a shock to pre-existing capacity makes foreign acquisition more attractive provided that revenue is not too convex with regard to a bank's own capacity. If revenue is increasing sharply in own capacity, an exogenous drop in pre-existing capacity

[41] None of the conditions in proposition 2 necessarily imply that γ_j^0 has to be greater than γ_i^0 or that e_j is smaller than e_i. Although many of the conditions are stricter when e_j is large, the results are valid regardless of the ownership of bank *j*.

lowers the marginal revenue of investment (and thus the marginal cost of investment in equilibrium) such that the benefits of a reduction in marginal cost are lowered as well. The condition in part b. of corollary 1 will be met if c_{II} is sufficiently large as compared to v_{12}, i.e. if an increase in e_i produces a significant reduction in the marginal cost of investment. Alternatively, depending on the values of e_i and e_j, it may be possible that the condition be met if c_{II} is low relative to v_{12}, i.e. if a shock to the capacity of the other bank leads to a significant increase in the marginal benefits of investment.

4. INVESTMENT IN THE TWO PERIOD MODEL

When we introduce an additional period in the model, banks' investment decisions in the first period will take into account the response by the other bank in the second period. In a model with strategic substitutes, this will give rise to "top-dog" strategies in the first period provided that investment does not make firms "soft" in the second period (Fudenberg and Tirole, 1984; Tirole, 1988). With the opportunity cost of lending as the discount rate, the objective function in the two-period model is:

$$\begin{aligned} &\underset{I_i^1}{Max} V_i = v_i(\gamma_i^1, \gamma_j^1) - \frac{1}{e_i} c(\tilde{\gamma}_i^0, I_i^1) + \frac{1}{\rho}\left(v_i(\gamma_i^2, \gamma_j^2) - \frac{1}{e_i} c(\tilde{\gamma}_i^1, I_i^2) \right) \\ &s.t.\ \ \gamma_i^t = \tilde{\gamma}_i^{t-1} + I_i^t \end{aligned} \tag{3.10}$$

The first-order condition for bank *i*'s optimization problem is:

$$V_{i,I_i^1} = v_{i,1}^1 - \frac{1}{e_i} c_{i,I_i^1}^1 + \frac{(1-\delta^1)}{\rho}\left[v_{i,1}^2 - \frac{1}{e_i} c_{i,\tilde{\gamma}_i^1}^2 + v_{i,2}^2 I_{j,\tilde{\gamma}_i^1}^2 \right] = 0 \tag{3.11}$$

Based on the preceding analysis[42], the term between brackets is greater than zero so that the sum of the first two terms must be negative. This requires that banks over-invest in the first period (i.e. invest more than they would have invested in the myopic bank case).

The introduction of an additional period, and the scope for pre-emptive investment, potentially invalidates some of the intuitive results from the myopic bank case. For example, it is no longer universally true that a reduction in the marginal cost of investment for bank *i* leads to an increase in investment by that bank and a reduction in investment by bank *j*. This is due to the fact that lower marginal cost makes second-period investment by bank *i* more responsive to first-period investments by bank *j*. If marginal cost gets low enough, pre-emptive investment by bank *j* can be sufficiently effective that bank *i* cuts back in the first period.[43]

For the formal analysis of the two-period model, we go back to the structure of the revenue function of equation (3.6) and we will also assume that the cost of investment is independent of existing capacity ($c_{I\gamma} = 0$). Proposition 3 presents the principal comparative statics.

Proposition 3

Assume that $v_{11} = v_{22} = 0$, *that* $c_{I\gamma} = 0$ *and that* $V_{i,I_i^1 I_i^1} + |V_{i,I_i^1 I_j^1}| < 0$, *also, without loss of generality, normalize* e_j *to 1. Then:*

[42] In the two-period model, banks are myopic in the second period such that all the findings with regard to the myopic bank case apply in period 2.

[43] Jun and Vives (2004) study an infinite horizon model in which a firm with zero adjustment costs becomes a Stackelberg follower. However, their model does not include depreciation and it is not obvious that the same result would obtain in an infinite horizon version of a model with depreciation such as ours. With depreciation, the high-cost firm would have to make a credible commitment that it will engage in costly maintenance in order to force a low-cost firm in the role of Stackelberg follower (Jun and Vives, 2004).

a. *there exists a positive value α such that, whenever* $\gamma_j / \gamma_i > \alpha$ *an increase in depreciation will lead to an increase in investment by bank i.*

b. *an increase in* e_i *will lead to an increase in investment by bank i if* $e_i < (v_{12} + c_{II})c_{II} / (v_{12})^2$

c. *Finally,* $I^1_{i,\delta^0 e_i}$ *is greater than zero if:*

$$\frac{\gamma_j^0}{\gamma_i^0} > \left(-\frac{c_{II}}{v_{12}(e_i)^2} \frac{\rho}{(1-\delta^1)^2} \frac{\left((c_{II})^2 - e_i(v_{12})^2\right)^3}{2(v_{12})^2(c_{II})^4} - \frac{v_{12}}{c_{II}} \right) \tag{3.12}$$

Proof: see the appendix to this chapter

Proposition 3 considers investment only because the combined impact of depreciation and e_i on the value of discounted profits cannot be determined without explicitly solving for investment. Part a. states that an increase in depreciation leads to higher investment provided that γ_j^0 is high enough. The rationale behind the condition on γ_j^0 is the same as in the one-period model.

As we already suggested above, very high levels of e_i make investment cheaper, but also make bank *i* more responsive to the strategies of bank *j*. If e_i becomes very large, this potentially opens the door to successful pre-emption by bank *j*. Therefore, we can only guarantee up to a certain point that an increase in e_i leads to more investment (part b.).

Part c. of the proposition presents, once again, a condition on the magnitude of γ_j^0 relative to γ_i^0. The first term in condition (3.12) is positive. The condition as a whole is

stricter than the condition in part c. of proposition 2, which reduces to $\gamma_j^0 / \gamma_i^0 > -v_{12}/c_{II}$ under the assumptions made in this section. The condition essentially requires that in the second period, the banks are sufficiently responsive to each other's investment in period 1 and that an increase in e_i makes both banks more responsive to investment by the other in period 1 (i.e. an increase in investment by one bank in period 1 has to lead to a significant cutback by the other bank in period 2 and, this cutback should be larger when e_i grows). The higher e_i, the more likely that this condition is met – e_i reduces not only the marginal cost of investment, but also the rate at which the marginal cost increases. The condition becomes harder to meet when the rate of depreciation in period 1 or the discount rate increase. The impact of changes in c_{II} and v_{12} is ambiguous.

Finally, building on corollary 1, it can be shown that $I^1_{i,\delta^0 e_i}$ is always greater than zero when $\gamma_i^0 = \gamma_j^0$.

Depreciation, foreign acquisition and value

The analysis of the relationship between the value of discounted profits, the rate of depreciation and the marginal costs of investment is more complicated and involves solving for the level of investment. To get a sense of the most important comparative statics, it is useful to simulate the model, which is what we do next. For the purpose of the simulations, we use the following cost function:

$$c_i^t(I_i^t, \tilde{\gamma}_i^t) = I_i^t \left(c_{I\gamma} \tilde{\gamma}_i^t + \frac{c_{II}}{2} I_i^t \right) \tag{3.13}$$

Table 3.1, panel A, summarizes the assumptions about the exogenous variables that provide the baseline for our simulations as well as the key outcomes given these

exogenous variables. The exogenous variables are chosen such that (i), the uniqueness condition in proposition 3 is met, (ii) investment by both banks is positive in both periods and (iii), the value of discounted profits is positive for both banks to make sure they would not prefer to exit. These requirements impose some limits on the exogenous variables, in particular the proportion of good projects in the population, which cannot be too small, and the difference between the quality of a strong signal and the quality of a weak signal, which cannot be too large. In addition, the cost shifters e_i and e_j cannot be too large compared to c_{II}, the second derivative of the cost function.

Panel B of Table 3.1 presents the simulated outcomes of the model for two values of $c_{I\gamma}$, 0 and 0.5. There is only a marginal difference in the value of discounted profits between the two cases. Perhaps surprisingly, profits are slightly higher when $c_{I\gamma}$ is 0.5, even though this makes investment more expensive in the first period. However, at higher levels of $c_{I\gamma}$ banks compete less vigorously. The net effect of higher marginal cost of investment and lower volumes of investment is positive.

In addition to raising the cost of investment, the value of $c_{I\gamma}$ also affects the development of profits and investment over time.[44] When $c_{I\gamma}$ is greater than zero, investment in period 1 makes a bank softer in period 2. This limits the effectiveness of top-dog investment strategies relative to "lean and hungry" strategies (Fudenberg and Tirole, 1984). As a result, banks have less of an incentive to over-invest, which gives them lower total cost and higher profit in the first period. The results in panel B of Table

[44] Note that by the very nature of a two-period model investment will tend to be less in period 2 when investment is a strategic substitute. Nevertheless the way in which key parameters affect the relative magnitude of profit and investment in the first and second periods are of interest.

3.1 as well as the results presented below are representative of the outcomes of model simulations for a wide range of parameter values.

Both propositions 2 and 3 identify the initial capacity of bank *j*, γ_j^0, relative to that of bank *i* as a key variable that determines whether or not bank *i* benefits from higher depreciation and whether higher depreciation raises the contribution of an increase in e_i to profits. Figure 3.4 shows how the relationship between value and the rate of depreciation is affected by e_i and the ratio of γ_j^0 to γ_i^0. The solid line is the baseline scenario in which $e_i = e_j = 15$. An increase in depreciation reduces value of both banks in this scenario. The dotted line represents the scenario in which bank *i* is acquired ($e_i = 20$), but nothing else changes. In this case we see that the value of bank *i* increases relative to the baseline and that the value increases more when depreciation rises. When depreciation is 25 percent, foreign acquisition leads to an increase in value by about 18 percent but the increase in value is 33 percent with depreciation at 75 percent. Of course, at 75 percent depreciation, baseline value is lower, but the amount with which value increases following foreign acquisition is still 35 percent higher with depreciation at 75 percent than with depreciation at 25 percent.

In the third scenario, we again assume that bank *i* is acquired by a foreign owner, but we now also assume that bank *j* has half the initial capacity of bank *i*. In this case (the line with short dashes), the increase in value following foreign acquisition decreases when the rate of depreciation increases. Overall, the results in Figure 3.4 imply that the conditions that we established in proposition 3 with regard to the relationship between

investment, depreciation and an increase in e_i associated with foreign acquisition are also reflected in the relationship between post-acquisition value and the other variables.[45]

The second issue we would like to review is how $c_{I\gamma}$ affects the relationship between depreciation, foreign acquisition, investment behavior and profits. In the one-period model we found that when $c_{I\gamma}$ is positive and large, higher depreciation is more likely to lead to higher investment. In Figure 3.5 we depict investment behavior in period 1 for both banks *i* and *j* under different assumptions about $c_{I\gamma}$ and the marginal costs of investment by bank *i*. As before, the solid line is the base case with no acquisition and $c_{I\gamma}$ equal to zero. When we raise $c_{I\gamma}$ to 0.5 (the line with short dashes) the level of investment drops, but the rate at which investment grows with the rate of depreciation increases. This is in line with the result of the one-period model.

The dotted line (for $c_{I\gamma} = 0$) and the line with long dashes ($c_{I\gamma} = 0.5$) show what happens when we increase e_i. A given increase in e_i causes a larger increase in investment in the scenario with $c_{I\gamma}$ at 0.5 and depreciation at 25 percent. This reflects the fact that cost-savings are greater in that scenario than in the scenario with $c_{I\gamma}$ at zero. However, relative to the no-acquisition scenario, the increase in investment associated with an increase in depreciation is less when $c_{I\gamma}$ is 0.5 than when $c_{I\gamma}$ is zero. This is because the incentive to raise investment when the marginal costs fall is countered by the concern that higher investment now leads to higher marginal costs in the future.

Even though the combined effect of depreciation and a reduction in the marginal cost of investment is less when $c_{I\gamma}$ is 0.5, than when $c_{I\gamma}$ is zero, the difference in value

[45] Indeed, a figure that pictures first-period investment under the four scenarios looks very similar to Figure 3.4, except that investment in scenario 4 is always lower than investment in the baseline scenario.

between the acquisition and no-acquisition scenarios increases faster with depreciation when $c_{I\gamma}$ is 0.5. This reflects both the fact that competition is fiercer when $c_{I\gamma}$ is zero and that absolute cost-savings due to an increase in e_i are larger when $c_{I\gamma}$ is 0.5. Finally, when $c_{I\gamma}$ is zero combined increases in depreciation and e_i cause the ratio of second period profits to first period profits to grow. This is due to more "over-investment" in the first period.

5. EMPIRICAL IMPLICATIONS AND EXTENSIONS

At the country level, the model developed in this paper provides a rationale for the well-known fact that foreign acquisitions of banks are more common following periods of structural economic change – provided there is a fixed cost of investment. At the bank-level our results imply that (i), the differences between foreign-owned and domestically owned banks grow with the depth of structural economic shocks and (ii) that, depending on the structure of the cost-function, the long-term benefits of foreign acquisition may be larger than the short-term benefits. The latter conclusion comes with the obvious caveat that there are limitations to our ability to make statements about the long term on the basis of a two period model. However, the impact of key parameters, such as δ^0, e_i and $c_{I\gamma}$, on the distribution of investment and profits over time is telling.

There are three issues we would like to discuss in this section. The first is the nature of the fixed costs of acquisition, the second is the scope for pre-emptive action by bank *j* to fend off acquisition of bank *i* and the third is the distinction between our model and the predictions about the timing and location of foreign acquisitions that can be

derived from other models. We don't have full answers yet on any of these issues, but we can provide further insight and point to directions for future research.

We have argued that foreign acquisition becomes more attractive when the value of a bank under foreign ownership increases relative to the value of the same bank under domestic ownership. The idea was that the difference in value has to be large enough to overcome the fixed cost of acquisition and we implicitly assumed that the fixed cost was a lump sum payment that did not affect the operations of the bank. Alternatively, one could think of the fixed cost of acquisition as a temporary disruption of operations related to uncertainty among employees, a switch to new systems, or a delay in investment while the new owners try to figure out how best to improve operations (Meyer and Lieb-Doczy, 2003; Bogaard and Svejnar, 2009). In our model, a disruption of operations associated with acquisition could be represented by an additional "discount" on the capacity of an acquired bank at the end of period 0. While this may block acquisition in certain circumstances, it reinforces the main result that acquisition becomes more attractive when depreciation increases; the discount on the pre-existing capacity of bank *i* increases the ratio of γ_j^0 to γ_i^0 and makes it more likely that the conditions established in propositions 2 and 3 will be met.

In unreported simulations, we also reviewed the impact of a delay in the benefits of foreign acquisition, by raising e_i in the second period, but not in the first. While this obviously reduces the benefits of foreign acquisition, it does not affect the sign of the comparative statics derived in the previous section. Indeed, acquired bank *i* may raise investment in period 1 in anticipation of lower marginal costs in period 2. In response, bank *j* reduces investment in both periods.

This brings us to the second topic of this section: the question as to whether it is better for bank *j* to accommodate foreign acquisition of bank *i* or to commit to making additional investments in order to pre-empt foreign acquisition. Without explicitly solving the model it is impossible to tell which is best. However, we can say something about the relationship between depreciation and the scope for pre-emptive investment by bank *j*.[46] Consider the baseline scenario in Figure 3.4 and compare it to the scenario with foreign acquisition of bank *i* but without any additional effects (i.e. the dotted line, with $e_i = 20,\ \gamma_{j0} = 0.5$). In the top panel of Figure 3.4 (for bank *i*) the solid baseline and the dotted line diverge as depreciation increases, but in the bottom panel (bank *j*), the lines converge ever so slightly. Hence, as acquisition becomes more beneficial for bank *i*, it becomes less harmful for bank *j*, reducing the incentive to engage in pre-emptive investment. Because the level of investment tends to increase with the level of depreciation in period 0, the marginal cost of any additional investment to discourage acquisition of bank *i* also becomes higher. Therefore, if it is ever attractive for bank *j* to pre-empt acquisition of bank *i*, this is less likely to be the case at high levels of depreciation.

The third issue we need to discuss is the distinction between the predictions from our model and the predictions from other approaches to foreign entry into banking. The major alternative for the access-to-knowledge motivation in our model is an access-to-capital motivation for acquisition (e.g. Sengupta, 2007; Gormley, 2008). It should be obvious, albeit unfortunate, that access to low-cost foreign capital is more attractive in times of economic turmoil, just like access to foreign knowledge. Hence, whenever

[46] To formally accommodate the possibility of investment by bank *j* to pre-empt acquisition of bank *i*, the timing of the model would need to be revised, which we ignore here.

structural economic change accompanies a financial crisis, we can use either motivation to explain a surge in foreign acquisitions of banks. Indeed, the two motivations are not mutually exclusive and might well complement each other. In order to fully compare the access-to-capital and access-to-knowledge perspectives, it would be useful to include them in a common framework. However, even without doing so, the access-to-knowledge motivation provides several testable predictions that are distinct from or enrich the access-to-capital perspective on foreign acquisition of banks.

To begin with, the access-to-knowledge story complements the access-to-capital story in explaining why there is no one-on-one relationship between economic turmoil and large scale foreign acquisitions of banks. For example, Mexico and South Korea experienced an increase in foreign ownership of banks following their most recent crises, but Thailand did not and Argentina experienced a reversal in foreign ownership after the 2001/2 crisis. In all these countries foreign banks had cost-of-capital advantages, but Korea, Mexico and the CEE economies went much further in implementing structural reforms that aligned the regulatory system with the systems familiar to banks from the advanced economies – the countries created an environment in which the knowledge of foreign banks was particularly useful.[47]

At the bank-level our model produces two interesting predictions that do not necessarily follow from access-to-capital motivations for foreign acquisition and that are

[47] Cost-of-capital motivations for (foreign) entry into banking usually rely on the assumption that (foreign) entrants are less well-informed than (domestic) incumbents (e.g. Dell'Ariccia and Marquez, 2004; Sengupta, 2007; Gormley, 2008). Building on these models one could argue that foreign acquisition has been more significant in Mexico, Korea and the CEE economies than in Russia, Thailand and Argentina because institutional reform in the first group of countries reduced information asymmetries between foreign-owned and domestically owned banks (Haselmann, Pistor and Vig, 2006). However, as we argued in the introduction, the assumption that domestic incumbent banks were well-informed about their current and potential borrowers is highly debatable for all countries mentioned (Buch, 1997; Bonin, Mizsei, Székely and Wachtel, 1998; Berglof and Bolton, 2002; Haber, 2005; Bogaard and Svejnar, 2009).

worth exploring further both empirically and in theoretical work. First, in the presence of adjustment costs and an asset (i.e. a state variable with costly adjustment), foreign acquirers can obtain a lasting advantage over domestically owned banks even if depreciation increases for just one period. Under certain conditions, this will be true even in a multi-period model and even when the cost-advantages of foreign ownership are short-lived (see Athey and Schmutzler, 2001 for a discussion). Without adjustment costs any advantages of foreign ownership will disappear as soon as the source of the advantage disappears. Hence, models based on cost-of-capital as a motivation for foreign acquisition appear to predict that the performance of foreign-owned and domestically owned banks should converge as the impact of a financial crisis subsides and access to capital improves for domestically owned banks.[48]

Second, we have shown that foreign acquisition becomes more attractive when the rate of depreciation increases only if competitors are strong enough, or rather, if an increase in depreciation sufficiently weakens the acquired bank's competitors. This is a counterintuitive result because there is a perception that foreigners have sought to acquire the best banks rather than the ones with strong competitors (Lanine and Vander Vennet, 2007; Bogaard, 2009). Further research is necessary to uncover which assumptions drive the result in propositions 2 and 3. This research should focus on the role of bank size and of heterogeneity in the costs of investment. For example, if high-capacity banks also tend to be large and if there are scale economies in knowledge transfer, foreign acquirers may be attracted to large banks that also happen to be relatively efficient. Alternatively, if high capacity is a proxy for the ability to absorb new and unfamiliar knowledge, the effective

[48] This does not apply to the model in Dell'Ariccia (2001) where banks could gain incumbency status as they build a sufficiently large client base while they have cost-of-capital advantages.

increase in e_i following foreign acquisition may be higher for high-capacity banks than for low-capacity ones, which could explain foreigners' preference for the high-capacity banks.

6. CONCLUSION

The purpose of this paper was to study the timing of foreign acquisition of banks in relation to economic turmoil in emerging market host countries. We have shown that a dynamic model in which banks compete on the basis of their knowledge capital and face adjustment costs can provide such a rationale. Moreover, the model produces interesting results with regard to the dynamics of post-acquisition performance. Especially when there is learning-by-doing the long term performance of foreign-acquired banks is better than the short term performance compared to locally owned banks. This is an important result for empirical research because it is often assumed that the impact of ownership changes on performance is constant over time.

The general characteristics of the model – Cournot type competition with adjustment costs, structural change affecting the starting point of the game, and the potential of foreign acquisition by firms with access to relevant resources – are useful beyond the banking sector. Future empirical and theoretical research should establish how banking differs from other sectors.

APPENDIX TO CHAPTER 3

Proof of Proposition 1

The proof of the proposition consists of a sequence of claims and proofs of those claims.

Claim 1: Banks randomize interest rate bids over a joint support [$\underline{r}$, R] and the bidding distributions have no gaps and no atoms on [$\underline{r}$, R); At most one bank can have an atom at R By definition, each bank's bidding distribution has a minimum $\underline{r}_g$, for $g = \{i, j\}$. Suppose that $\underline{r}_i < \underline{r}_j$. Then bank i can raise the expected payment per borrower without reducing the probability of winning. Hence $\underline{r}_i = \underline{r}_j = \underline{r}$. Similarly, suppose that the highest rate charged by either bank is lower than R, say x. Then, given the other bank's bidding distribution, a bank could raise its expected income by raising its highest bids from x to R. Therefore, the highest point in the bidding distributions has to be R.

Suppose that bank j has an atom in its bidding distribution at rate r_j. Then bank i can raise its profits by shifting weight from bids in $(r_j, r_j + \varepsilon)$ to $r_j - \mu$, for some ε and μ greater than zero. Similarly, if bank j has a gap in its distribution between x and r_j, bank i can raise its profits by shifting weight from the interval $(x, r_j - \varepsilon)$ to $r_j - \varepsilon$, which would create an atom.

No more than one bank can have an atom in its bidding distribution at R because if both banks had an atom, one of them could obtain higher profits by lowering bids from R to R – ε.

Claim 2: Assume that $\sigma_i \geq \sigma_j$ and that $R > r_j^{MIN} = \rho / \bar{q}_j$ then: $\underline{r} = r_j^{MIN}$, bank *i* makes a profit of $\bar{q}_i r_j^{MIN} - \rho$ and bank *j* makes zero profit If bank *j* receives a positive signal and bids an interest rate *r*, its expected profit from lending depends on the probability that a borrower has a good project and, if bank *i* has also received a positive signal, the probability that bank *i* does not enter a lower interest rate bid:

$$\begin{aligned}\pi_j(r \mid s_j = h) = \bar{q}_j\left[\sigma_i(1-F_i(r)) + (1-\sigma_i)\right](r-\rho) \\ + (1-\bar{q}_j)\left[\sigma_i + (1-\sigma_i)(1-F_i(r))\right](-\rho)\end{aligned} \tag{3.14}$$

If bank *i* enters a lower bid than bank *j*, bank *j* expects to make:

$$\pi_j(r \mid s_j = h) = \bar{q}_j(1-\sigma_i)(r-\rho) - (1-\bar{q}_j)\sigma_i\rho \tag{3.15}$$

As shown by Broecker (1990, proposition 2.2, pp 437-8), bank *j* will make zero profit unless it could profitably deviate to a higher interest rate, in particular *R*, given the behavior of bank *i*. Using equation (3.15), we can show that such a deviation is not possible because equation (3.15) is smaller than zero at R . Note first that the statement that $\bar{q}_j(1-\sigma_i)(R-\rho) - (1-\bar{q}_j)\sigma_i\rho < 0$ is equivalent to:

$$\sigma_j q(1-\sigma_i)(R-\rho) - (1-\sigma_j)(1-q)\sigma_i\rho < 0$$

Rewriting, we find:

$$\begin{aligned}&q\sigma_j(1-\sigma_i)R - \left(\sigma_j q(1-\sigma_i) + (1-\sigma_j)(1-q)\sigma_i\right)\rho \\ &= \sigma_j(1-\sigma_i)\left(qR-\rho\right) - \left(q\sigma_j(1-\sigma_i) - \sigma_j(1-\sigma_i) + (1-\sigma_j)(1-q)\sigma_i\right)\rho \\ &= \sigma_j(1-\sigma_i)\overbrace{\left(qR-\rho\right)}^{<0} - (1-q)\overbrace{\left(\sigma_i(1-\sigma_j) - \sigma_j(1-\sigma_i)\right)}^{\geq 0}\rho < 0\end{aligned} \tag{3.16}$$

Where the sign of the first term follows from assumption (3.2) and the sign of the second term from the assumption that $\sigma_i \geq \sigma_j$. This implies that bank *j* makes zero expected profit.

The fact that bank *j* makes no profit has two key implications. First, even when the bank receives a positive signal, not entering a bid can be part of the equilibrium strategy of bank *j*. Second, bank *j* is sure to win the loan contract with interest rate bid $\underline{r}$ (there are no atoms at $\underline{r}$). Therefore, its pool of borrowers depends only on the outcome of bank *j*'s own screening and because bank *j* makes zero expected profit at any point in its bidding distribution it has to be the case that $\underline{r} = r_j^{MIN}$. Consequently, because bank *i* also has the same expected profit at any point in its bidding distribution, its profit is: $\bar{q}_i r_j^{MIN} - \rho$ **.**

Claim 3: When $\sigma_i = \sigma_j = \sigma$, **banks' bidding distributions are** $F(r) = \left(\bar{q}r - \rho\right) \Big/ \left(\bar{q}\sigma(r-\rho) - (1-\bar{q})(1-\sigma)\rho\right)$ **and banks occasionally refrain from bidding** Claim 2 implies that both banks' profit is zero in this case. Hence we can set equation (3.14) equal to zero in order to derive the bidding distributions. This gives:

$$\frac{-\bar{q}_j(1-\sigma_i)(r-\rho) + \rho(1-\bar{q}_j)\sigma_i}{\bar{q}_j\sigma_i(r-\rho) - \rho(1-\bar{q}_j)(1-\sigma_i)} = (1-F_i(r))$$

And subsequently:

$$F_i(r) = F_j(r) = F(r) = \frac{\bar{q}r - \rho}{\bar{q}\sigma(r-\rho) - (1-\bar{q})(1-\sigma)\rho} \qquad (3.17)$$

At $r = \underline{r} = \rho / \bar{q}$, equation (3.17) is obviously zero. To show that banks occasionally refrain from bidding we have to show that *F(R)* is smaller than 1:

$$F(R)=\frac{\bar{q}R-\rho}{\bar{q}\sigma(R-\rho)-(1-\bar{q})(1-\sigma)\rho}<1$$

$$\Rightarrow (1-\sigma)\bar{q}R<(1-\bar{q})\sigma\rho+\bar{q}(1-\sigma)\rho$$

$$\Rightarrow (1-\sigma)qR<(1-\sigma)(1-q)\rho+q(1-\sigma)\rho$$

$$\Rightarrow (1-\sigma)\left(qR-\rho\right)<-q(1-\sigma)\rho+q(1-\sigma)\rho=0$$

The statement is true because the left hand side on the last line is negative. The banks refrain from bidding just often enough that their competitor makes zero profit if it enters a bid of *R*.

Claim 4: When $\sigma_i > \sigma_j$ bank *i*'s bidding distribution is

$F_i(r)=\left(\bar{q}_j r-\rho\right)\Big/\left(\bar{q}_j\sigma_i(r-\rho)-(1-\bar{q}_j)(1-\sigma_i)\rho\right)$ **and bank *j*'s is**

$F_j(r)=\bar{q}_i\left(r-r_j^{MIN}\right)\Big/\left(\bar{q}_i\sigma_j(r-\rho)-(1-\bar{q}_i)(1-\sigma_j)\rho\right)=\left(\sigma_i/\sigma_j\right)F_i(r)$**, bank *j***

occasionally refrains from bidding while bank *i* has an atom at *R* Because bank *j* has zero profit, we can again use (3.14) to derive bank *i*'s bidding distribution:

$$F_i(r)=\frac{\bar{q}_j r-\rho}{\bar{q}_j\sigma_i(r-\rho)-(1-\bar{q}_j)(1-\sigma_i)\rho} \tag{3.18}$$

For bank *j*'s bidding distribution, we use bank *i*'s profit function[49] equal to $qr_j^{MIN}-\rho$, which gives:

$$\begin{aligned}(1-F_j(r))&=\frac{\bar{q}_i r_j^{MIN}-\bar{q}_i r+\left[\bar{q}_i\sigma_j(r-\rho)-(1-\bar{q}_i)(1-\sigma_j)\rho\right]}{\left[\bar{q}_i\sigma_j(r-\rho)-(1-\bar{q}_i)(1-\sigma_j)\rho\right]}\\ F_j(r)&=\frac{\bar{q}_i\left(r-r_j^{MIN}\right)}{\left[\bar{q}_i\sigma_j(r-\rho)-(1-\bar{q}_i)(1-\sigma_j)\rho\right]}\end{aligned} \tag{3.19}$$

[49] Bank *i*'s profit function is the equivalent of equation (3.14), after switching subscripts *i* and *j*

This is obviously equal to zero at r_j^{MIN}. Using the same logic as before, it can also be shown that $F_j(R)$ is smaller than 1. Some further algebra reveals that:

$$F_i(r) = \frac{\sigma_j}{\sigma_i} F_j(r) \tag{3.20}$$

Hence, $F_i(R)$ is also smaller than 1. Because only one bank can have an atom at *R*, we conclude that bank *i* has an atom while bank *j* occasionally refrains from bidding. The atom at *R* in bank *i*'s bidding distribution is just large enough to ensure that bank *j* makes exactly zero profit even when it bids *R* (without the atom, a bid of *R* would generate a loss, see equation (3.15)).

Proof of Proposition 2

Analogous to (3.9), we can write the relation between depreciation and investment as:

$$I^1_{i,\delta^0} = -I^1_{i,\tilde{\gamma}_i^0}\gamma_i^0 - I^1_{i,\tilde{\gamma}_j^0}\gamma_j^0 \tag{3.21}$$

The sign and magnitude of the partial derivatives of investment with respect to initial capacity can be found using the implicit function theorem. This requires that we obtain the first order condition for investment:

$$V_{i,I_i^1} = f_i = v_{i,1} - \frac{1}{e_i} c_{i,I_i^1} = 0 \tag{3.22}$$

Taking derivatives with respect to investment by and initial capacity of banks *i* and *j* and applying the implicit function theorem we get:

$$I^1_{i,\tilde{\gamma}_i^0} = -\frac{\left(e_j v_{11} - c_{II}\right)\left(e_i v_{11} - c_{I\gamma}\right) - e_i e_j (v_{12})^2}{\left(e_j v_{11} - c_{II}\right)\left(e_i v_{11} - c_{II}\right) - e_i e_j (v_{12})^2} \tag{3.23}$$

This expression will be negative if:

$$c_{I\gamma} > \frac{e_i e_j \left((v_{12})^2 - (v_{11})^2 \right) + e_i v_{11} c_{II}}{\left(c_{II} - e_j v_{11} \right)} \tag{3.24}$$

For the second term in (3.21), we find:

$$I^1_{i,\tilde{\gamma}^0_j} = -\frac{e_i v_{12} \left(c_{I\gamma} - c_{II} \right)}{\left(e_i v_{11} - c_{II} \right)\left(e_j v_{11} - c_{II} \right) - e_i e_j (v_{12})^2} < 0 \tag{3.25}$$

Therefore, if (3.24) holds, an increase in depreciation always leads to an increase in investment. If (3.24) does not hold, an increase in depreciation leads to an increase in investment if:

$$\gamma^0_j > \frac{\left(e_i e_j (v_{12})^2 - \left(e_j v_{11} - c_{II} \right)\left(e_i v_{11} - c_{I\gamma} \right) \right)}{e_i v_{12} \left(c_{I\gamma} - c_{II} \right)} \gamma^0_i \tag{3.26}$$

This completes the proof of part a. of the proposition.

For the impact of an increase in e_i on investment we find:

$$I^1_{i,e_i} = -\frac{1}{e_i} \frac{\left(e_j v_{11} - c_{II} \right) c_{i,I^1_i}}{\left(e_j v_{11} - c_{II} \right)\left(e_i v_{11} - c_{II} \right) - e_i e_j (v_{12})^2} > 0 \tag{3.27}$$

For bank j, an increase in e_i results in a drop in investment because:

$$I^1_{j,e_i} = \frac{1}{e_i} \frac{v_{12} c_{i,I^1_i}}{\left(e_j v_{11} - c_{II} \right)\left(e_i v_{11} - c_{II} \right) - e_i e_j (v_{12})^2} < 0 \tag{3.28}$$

Applying the envelope theorem, the impact of an increase in e_i on value is:

$$V_{i,e_i} = V_{i,I^1_j} I^1_{j,e_i} > 0 \tag{3.29}$$

This completes the proof of part b. of the proposition.

Turning now to part c. of the proposition, the combined impact of an increase in depreciation and e_i is:

$$I^1_{i,\delta^0 e_i} = -I^1_{i,\tilde{\gamma}_i^0 e_i}\gamma_i^0 - I^1_{i,\tilde{\gamma}_j^0 e_i}\gamma_j^0 \tag{3.30}$$

In the first term:

$$I^1_{i,\tilde{\gamma}_i^0 e_i} = -\frac{\left(\left(e_j v_{11} - c_{II}\right)v_{11} - e_j (v_{12})^2\right)\left(e_j v_{11} - c_{II}\right)\left(c_{I\gamma} - c_{II}\right)}{\left(\left(e_j v_{11} - c_{II}\right)\left(e_i v_{11} - c_{II}\right) - e_i e_j (v_{12})^2\right)^2} \tag{3.31}$$

This is positive if:

$$v_{11} c_{II} > e_j \left((v_{11})^2 - (v_{12})^2\right) \tag{3.32}$$

Which holds if for instance v_{11} is equal to zero. However:

$$I^1_{i,\tilde{\gamma}_j^1 e_i} = \frac{c_{II} v_{12}\left(c_{I\gamma} - c_{II}\right)\left(e_j v_{11} - c_{II}\right)}{\left(\left(e_i v_{11} - c_{II}\right)\left(e_j v_{11} - c_{II}\right) - e_i e_j (v_{12})^2\right)^2} < 0 \tag{3.33}$$

If (3.32) does not hold, $I_{i,\delta^0 e_i}$ is always positive, if (3.32) holds, we can combine (3.30), (3.31) and (3.33) to show that $I_{i,\delta^0 e_i}$ is guaranteed to be positive if:

$$\frac{\gamma_j^0}{\gamma_i^0} > \frac{\left(e_j \left((v_{12})^2 - (v_{11})^2\right) + c_{II} v_{11}\right)}{-c_{II} v_{12}} \tag{3.34}$$

Moving on to the impact of depreciation and e_i on value. We need to derive:

$$V^1_{i,\delta^0 e_i} = -V^1_{i,\tilde{\gamma}_i^0 e_i}\gamma_i^0 - V^1_{i,\tilde{\gamma}_j^0 e_i}\gamma_j^0 \tag{3.35}$$

As an intermediate step, we start from equation (3.9), the derivative of value with respect to depreciation. For the first term of this equation we find:

$$V_{i,\tilde{\gamma}_i^0} = v_{i,1} - \frac{1}{e_i} c_{i,\tilde{\gamma}_i^0} + \overbrace{V_{i,I_i^1}}^{=0} I^1_{i,\tilde{\gamma}_i^0} + V_{i,I_j^1} I^1_{j,\tilde{\gamma}_i^0} = v_{i,1} - \frac{1}{e_i} c_{i,\tilde{\gamma}_i^0} + v_{i,2} I^1_{j,\gamma_i^0} \tag{3.36}$$

Due to the assumptions that the $c(0,.)=0$ and that $\left|c_{I\gamma}\right| < c_{II}$, the sum of the first two terms in (3.36) is positive (the "marginal cost" of initial capacity is lower than the marginal cost of investment). The sign of the last term is negative because $I^1_{j,\tilde{\gamma}_i^0} = e_j / e_i \, I^1_{i,\tilde{\gamma}_j^0}$, which we found to be negative in (3.28). As a result, the sign of (3.36) as a whole is positive.

Differentiating (3.36) with respect to e_i produces:

$$V_{i,\tilde{\gamma}_i^0 e_i} = I^1_{i,e_i}\left(v_{11} + v_{12} I^1_{j,\tilde{\gamma}_i^0} - \frac{1}{e_i} c_{I\gamma}\right) + I^1_{j,e_i}\left(v_{12} + v_{22} I^1_{j,\tilde{\gamma}_i^0}\right) + \frac{1}{(e_i)^2} c_{i,\tilde{\gamma}_i^0} + v^1_{i,2} I^1_{j,\gamma_i^0 e_i} \quad (3.37)$$

The sign of this equation is ultimately ambiguous. The sign of the first term is the same as the sign of the term between brackets. The term is more likely to be positive if v_{11} is positive and $c_{I\gamma}$ is negative and large ($I^1_{j,\tilde{\gamma}_i^0}$ also becomes more negative when $c_{I\gamma}$ drops). The second term in (3.37) is positive if v_{22} is positive, or more generally if $v_{12} + v_{22} I^1_{j,\tilde{\gamma}_i^0} < 0$. The sign of the third term depends on the sign of $c_{I\gamma}$. For the final term in the equation note that:

$$I^1_{j,\tilde{\gamma}_i^0 e_i} = \frac{e_j v_{12}\left(c_{I\gamma} - c_{II}\right)\left(v_{11}\left(e_j v_{11} - c_{II}\right) - e_j (v_{12})^2\right)}{\left(\left(e_i v_{11} - c_{II}\right)\left(e_j v_{11} - c_{II}\right) - e_i e_j (v_{12})^2\right)^2} \quad (3.38)$$

Equation (3.38) is negative (and the last term in equation (3.37) positive) if (3.32) holds and if $v_{i,2}$ is negative as well, which we have assumed to be the case.

Turning to the second part of equation (3.9), we find:

$$V_{i,\tilde{\gamma}_j^0} = v_{i,2}\left(1 + I^1_{j,\tilde{\gamma}_j^0}\right) \quad (3.39)$$

This is negative provided that $I^1_{j,\tilde{\gamma}^0_j}$ is greater than –1, which is the case due to the assumption that $\left|c_{I_\gamma}\right| < c_{II}$. The derivative of (3.39) with respect to e_i is:

$$V_{i,\tilde{\gamma}^0_j e_i} = \left(v_{12} I^1_{i,e_i} + v_{22} I^1_{j,e_i}\right)\left(1 + I^1_{j,\tilde{\gamma}^0_j}\right) + v_{i,2}\left(1 + I^1_{j,\tilde{\gamma}^0_j e_i}\right) \tag{3.40}$$

The first term in this equation is negative provided that:

$$v_{22} > \frac{e_j v_{11} - c_{11}}{e_i e_j} \tag{3.41}$$

The second term is negative because:

$$I^1_{j,\tilde{\gamma}^0_j e_i} = -\frac{e_j (v_{12})^2 \left(e_i v_{11} - c_{II}\right)\left(c_{II} - c_{I_\gamma}\right)}{\left(\left(e_j v_{11} - c_{II}\right)\left(e_i v_{11} - c_{II}\right) - e_i e_j (v_{12})^2\right)^2} > 0 \tag{3.42}$$

Finally, note that γ^1_j, and thus $(1-\delta^0)\gamma^0_j$ enters (3.37) in the last term if v_{22} is not zero.[50] In particular, if v_{22} is greater than zero, an increase in γ^0_j has an ambiguous effect on the sign and value of equation (3.35) as it may make the first term $-V^1_{i,\tilde{\gamma}^0_i e_i}\gamma^0_i$ more negative, while making the second term $-V^1_{i,\tilde{\gamma}^0_j e_i}\gamma^0_j$ more positive. However, when $0 > v_{22} > \left(e_j v_{11} - c_{11}\right)\big/ e_i e_j$ an increase in γ^0_j, given γ^0_i ambiguously leads to an increase in (3.35). Hence, there exists a value α such that $V^1_{i,\delta^0 e_i} > 0$ whenever $\gamma^0_j \big/ \gamma^0_i > \alpha$. This completes the proof of proposition 2.

[50] $v_{i,2}$ has the form $v^t_{i,2} = a + v_{12}\gamma^t_i + v_{22}\gamma^t_j$

Proof of Proposition 3

For the purposes of the proof, note that the partial derivatives for period 1 investment that we derived for the proof of proposition 2 now apply to period 2.

We are ultimately interested in:

$$\frac{\partial I_i^1}{\partial \delta^0 \partial e_i} = -I^1_{i,\tilde{\gamma}_i^0 e_i}\gamma_i^0 - I^1_{i,\tilde{\gamma}_j^0 e_i}\gamma_j^0 \tag{3.43}$$

Under the assumptions made, the first order condition for investment in period 1 is:

$$V_{i,I_i^1} = f_i = v^1_{i,1} - \frac{1}{e_i}c^1_{i,I_i^1} + \frac{(1-\delta^1)}{\rho}\left[v^2_{i,1} + v^2_{i,2} I^2_{j,\tilde{\gamma}_i^1}\right] = 0 \tag{3.44}$$

Defining, as in equation (3.44) the first order condition for bank *i* as f_i, the partial derivative of bank *i*'s investment with respect to its own initial capacity is:

$$I^1_{i,\tilde{\gamma}_i^0} = -\frac{f_{j,I_j^1}\left(f_{i,I_i^1} + \frac{1}{e_i}c_{II}\right) - f_{i,I_j^1} f_{j,I_i^1}}{f_{j,I_j^1} f_{i,I_i^1} - f_{i,I_j^1} f_{j,I_i^1}} = -1 - \frac{1}{e_i}\frac{f_{j,I_j^1}c_{II}}{f_{j,I_j^1} f_{i,I_i^1} - f_{i,I_j^1} f_{j,I_i^1}} \tag{3.45}$$

Where we make use of the fact that $f^1_{i,\tilde{\gamma}_i^1} = f^1_{i,I_i^1} + \frac{1}{e_i}c_{II}$ and that $f^1_{i,\tilde{\gamma}_j^1} = f^1_{i,I_j^1}$.By assumption, f_{j,I_j^1} is negative and $\left|f^1_{i,I_i^1}\right| > \left|f^1_{i,I_j^1}\right|$ such that the denominator of the last term in (3.45) is positive. In fact, it can be shown that (3.45) as a whole is positive because the last term has an absolute value that is greater than 1. The interpretation of (3.45) is as follows: if we were to force bank *i* to invest an extra unit and then allow it to readjust, it would reduce investment by the exact same unit that we forced it to add (the –1 in the equation). If instead we add a unit to initial capacity, the impact on investment is

moderated by the fact that initial capacity reduces investment by the competitor (it is a commitment to have a certain level of capacity in place). Furthermore, we can derive:

$$I^1_{i,\tilde{\gamma}^0_j} = \frac{f_{j,I^1_j} f_{i,I^1_j} - f_{i,I^1_j}\left(f_{j,I^1_j} + c_{II}\right)}{f_{j,I^1_j} f_{i,I^1_i} - f_{i,I^1_j} f_{j,I^1_i}} = \frac{f_{i,I^1_j} c_{II}}{f_{j,I^1_j} f_{i,I^1_i} - f_{i,I^1_j} f_{j,I^1_i}} \tag{3.46}$$

The second derivatives in (3.45) and (3.46) can be written explicitly as:

$$f^1_{i,I^1_i} = -\frac{1}{e_i} c_{II} + v_{12} \frac{(1-\delta^1)^2}{\rho} I^2_{j,\tilde{\gamma}^1_i}\left[1 + I^2_{i,\tilde{\gamma}^1_i}\right] = \frac{1}{e_i} f^1_{j,I^1_j} < 0 \tag{3.47}$$

Also:

$$f^1_{i,I^1_j} = v_{12} + v_{12} \frac{(1-\delta^1)^2}{\rho}\left[I^2_{j,\tilde{\gamma}^1_j} + I^2_{j,\tilde{\gamma}^1_i} I^2_{i,\tilde{\gamma}^1_j}\right] = f^1_{j,I^1_i} < 0 \tag{3.48}$$

These derivatives are independent of the capacities of either bank in period 0. Hence, there exists a value α such that $I^1_{i,\delta^0} > 0$ whenever $\gamma^0_j / \gamma^0_i > \alpha$. This proves part a. of the proposition.

Moving to part b., note that:

$$I^1_{i,e_i} = -\frac{f_{j,I^1_j} f_{i,e_i} - f_{i,I^1_j} f^1_{j,e_i}}{f_{j,I^1_j} f_{i,I^1_i} - f_{i,I^1_j} f_{j,I^1_i}} \tag{3.49}$$

Both f_{j,I^1_j} and f_{i,I^1_j} are negative (see above). The derivative of f_i with respect to e_i is:

$$f^1_{i,e_i} = \frac{1}{(e_i)^2} c^1_{i,I^1_i} + \frac{(1-\delta^1)}{\rho}\left[v_{12} I^2_{i,e_i}\left(1 + I^2_{j,\tilde{\gamma}^1_i}\right) + v^2_{i,2} I^2_{j,\tilde{\gamma}^1_i e_i}\right] \tag{3.50}$$

The first term in this equation is positive and so is the last term between brackets, but the first term between brackets is negative whenever $\left|I^2_{j,\tilde{\gamma}^1_i}\right|<1$. The derivative of f_j with respect to e_i is positive:

$$f^1_{j,e_i}=\frac{(1-\delta^1)}{\rho}\left[\nu_{12}I^2_{j,e_i}+\nu_{12}I^2_{i,e_i}I^2_{i,\tilde{\gamma}^1_j}+\nu^2_{j,2}I^2_{i,\tilde{\gamma}^1_j e_i}\right]>0 \tag{3.51}$$

Hence, a sufficient condition for (3.49) to be positive is that $\left|I^2_{j,\tilde{\gamma}^1_i}\right|<1$, which requires that:

$$e_i<\frac{c_{II}(\nu_{12}+c_{II})}{(\nu_{12})^2} \tag{3.52}$$

For part c. of the proposition, we define $A=f_{j,I^1_j}f_{i,I^1_i}-f_{i,I^1_j}f_{j,I^1_i}$. Taking the derivatives of (3.45) and (3.46) with respect to e_i and plugging these back into (3.43), we find:

$$I^1_{i,\delta^0 e_i}=-\frac{c_{II}}{(A)^2}\left(\left(\gamma^0_i f_{i,I^1_i e_i}+\gamma^0_j f_{i,I^1_j e_i}\right)A-\left(\gamma^0_i f_{i,I^1_i}+\gamma^0_j f_{i,I^1_j}\right)A_{e_i}\right) \tag{3.53}$$

Furthermore, taking derivatives of (3.47) and (3.48) with respect to e_i gives:

$$f^1_{i,I^1_i e_i}=\frac{1}{(e_i)^2}c_{II}+\nu_{12}\frac{(1-\delta^1)^2}{\rho}\left(I^2_{j,\tilde{\gamma}^1_i e_i}\left[1+I^2_{i,\tilde{\gamma}^1_i}\right]+I^2_{j,\tilde{\gamma}^1_i}I^2_{i,\tilde{\gamma}^1_i e_i}\right)>0 \tag{3.54}$$

And:

$$f^1_{i,I^1_j e_i}=\nu_{12}\frac{(1-\delta^1)^2}{\rho}\left[I^2_{j,\tilde{\gamma}^1_j e_i}+I^2_{j,\tilde{\gamma}^1_i e_i}I^2_{i,\tilde{\gamma}^1_j}+I^2_{j,\tilde{\gamma}^1_i}I^2_{i,\tilde{\gamma}^1_j e_i}\right]<0 \tag{3.55}$$

This implies that the first term between parentheses in (3.53) is negative provided that γ^0_j is large enough. Specifically, it can be shown that the term is negative if:

$$\gamma^0_i\left(-\frac{c_{II}}{\nu_{12}(e_i)^2}\frac{\rho}{(1-\delta^1)^2}\frac{\left((c_{II})^2-e_i(\nu_{12})^2\right)^3}{2(\nu_{12})^2(c_{II})^4}-\frac{\nu_{12}}{c_{II}}\right)<\gamma^0_j \tag{3.56}$$

Finally:

$$A_{e_i} = (f_{i,I_i^1})^2 + 2e_i f_{i,I_i^1} f_{i,I_i^1 e_i} - 2 f_{i,I_j^1} f_{i,I_j^1 e_i} < 0 \qquad (3.57)$$

The sign of A_{e_i} is negative because the absolute value of $e_i f_{i,I_i^1 e_i}$ is greater than the absolute value of f_{i,I_i^1}. This makes the sum of the first two terms in (3.57) negative while the last term is negative as well. As a result, (3.56) is a sufficient condition for (3.53) to be positive. This completes the proof of part c. of the proposition.

Table 3.1: Baseline Model: Exogenous Variables and Outcomes

Panel A: Exogenous Variables

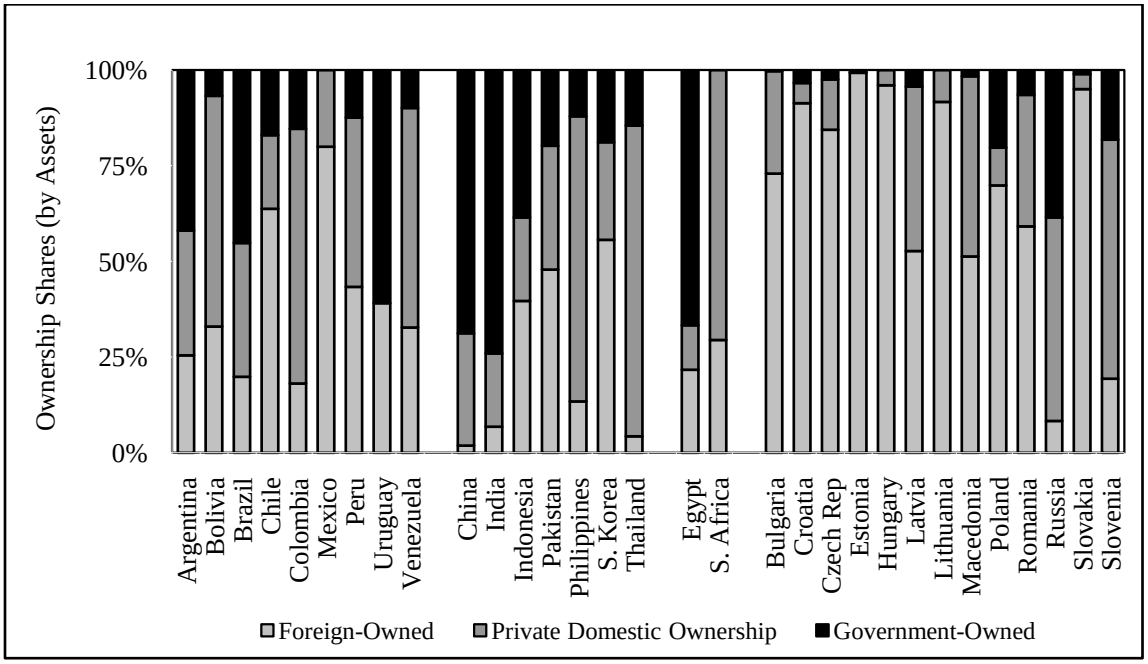
q	proportion of good projects	0.75
ρ	opportunity cost of lending	1.25
R	return on good projects	1.50
σ^W	weak signal; Pr(signal type = project type)	0.75
σ^S	strong signal; Pr(signal type = project type)	0.80
δ	1 - depreciation (periods 0 and 1)	0.75
γ^0	initial capacity (banks i and j)	0.50
e	efficiency of investment	15.0
c_{II}	second derivative of the cost function wrt investment	1.50

Panel B: Outcomes

		$c_{I\gamma} = 0$	$c_{I\gamma} = 0.5$
V	total value (discounted profits)	0.0075	0.0076
I^1	investment (period 1)	0.1672	0.0711
I^2	investment (period 2)	0.1023	0.0224
γ^1	capacity (period 1)	0.5422	0.4461
γ^2	capacity (period 2)	0.5089	0.3570
π^1	profit (period 1)	0.0038	0.0040
π^2	profit (period 2)	0.0047	0.0045

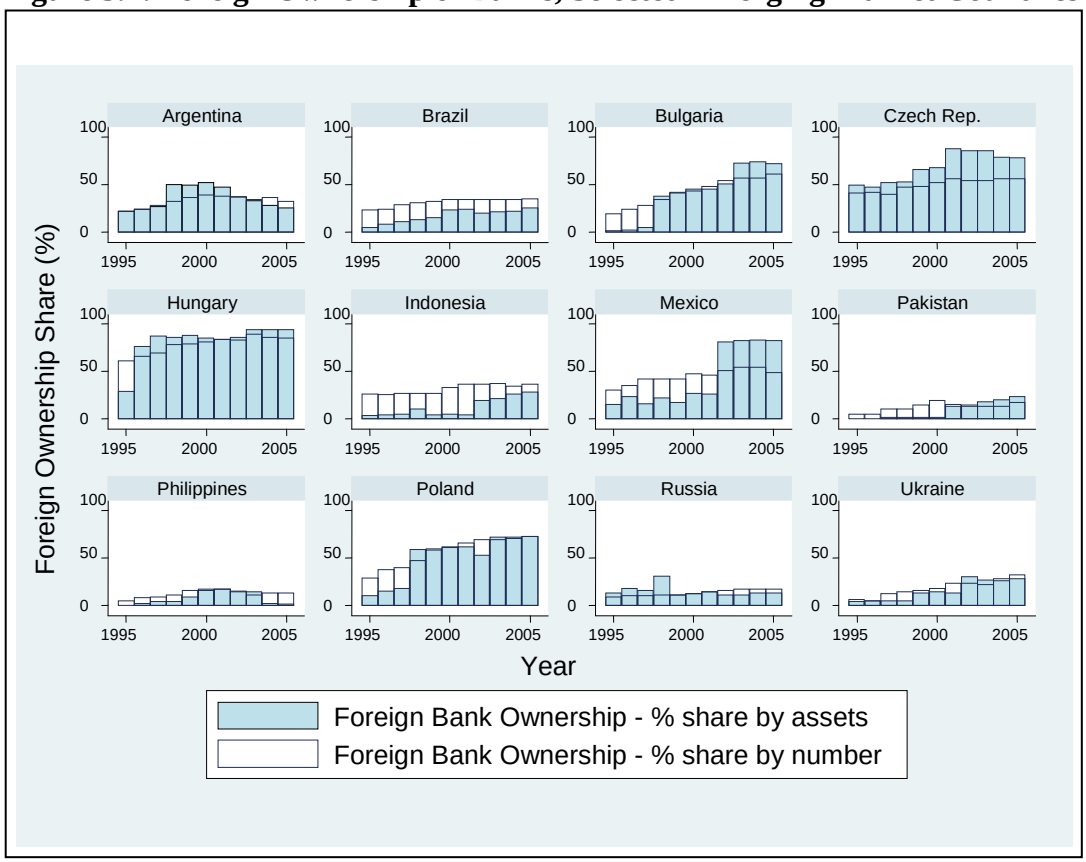
Notes All variables apply to both banks. $c_{I\gamma}$ is the cross-derivative of the cost of investment with regard to Investment, I and pre-existing capacity γ.

Figure 3.1: Bank Ownership in Emerging Markets



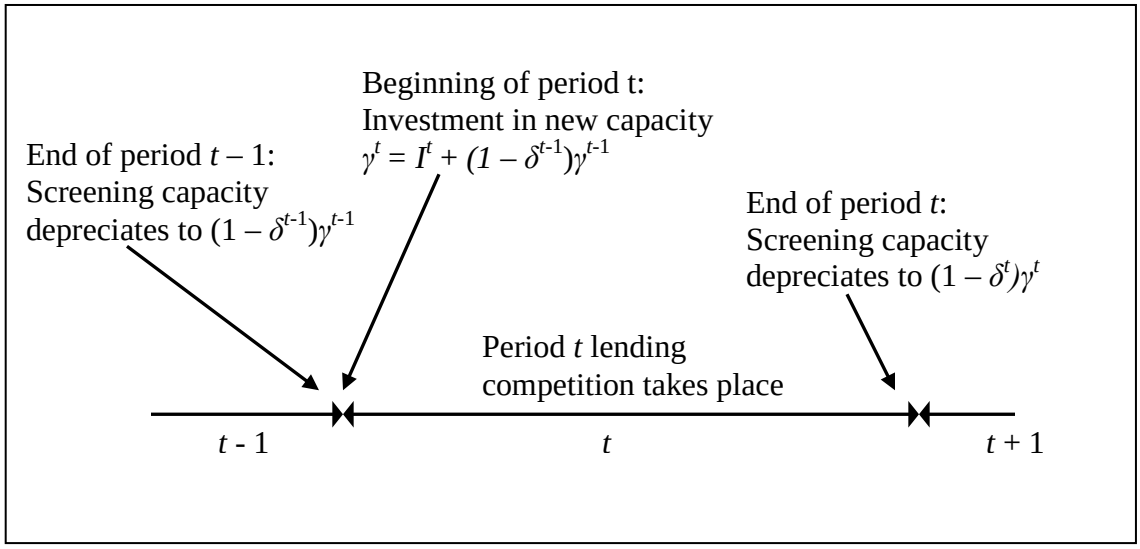
Source World Bank Survey of Bank Regulation and Supervision. http://go.worldbank.org/SCH5XTN5U0

Figure 3.2: Foreign Ownership of Banks, Selected Emerging Market Countries



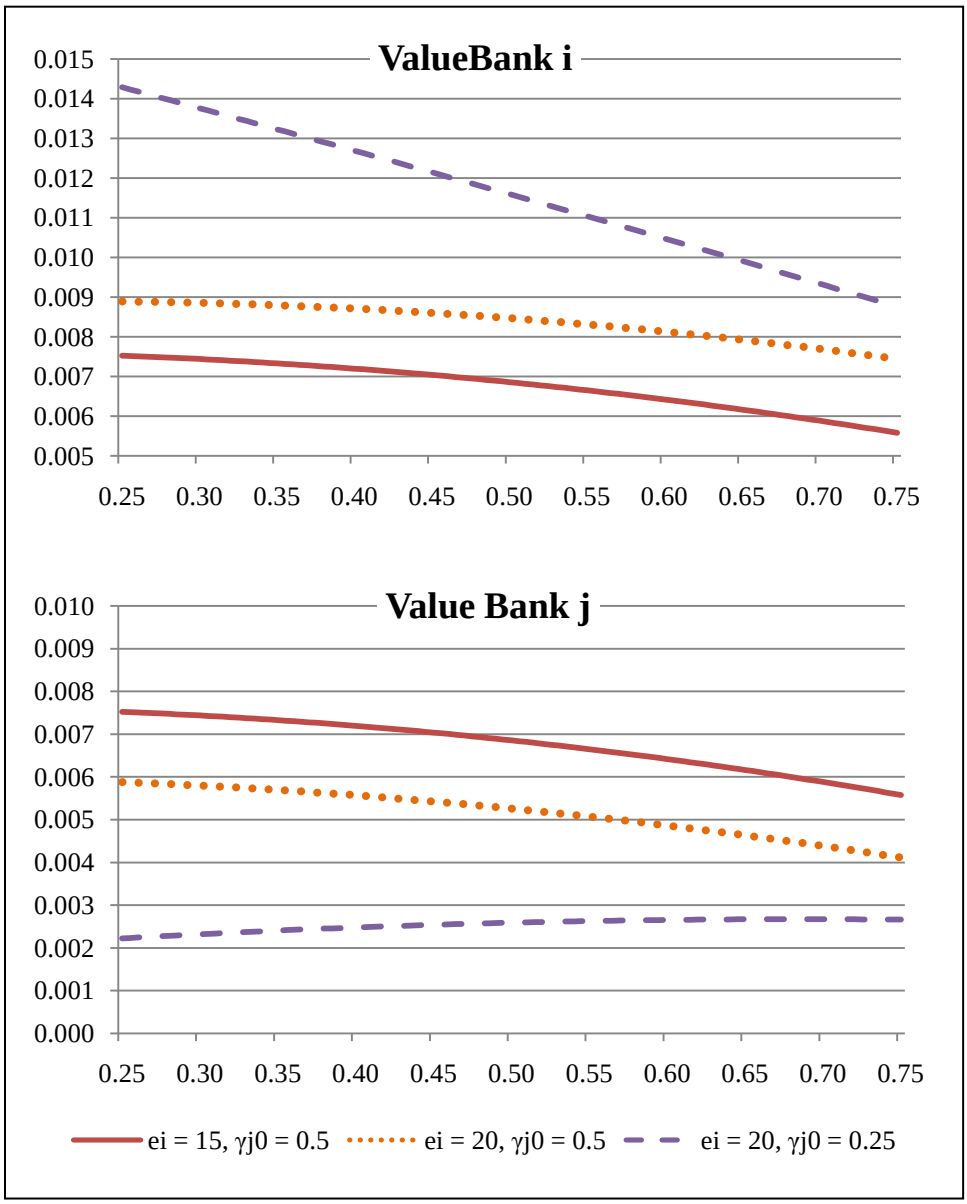
Source Claessens, Van Horen, Gurcanlar, Mercado (2008) Foreign Bank Presence in Developing Countries 1995-2006: Data and Trends, World Bank

Figure 3.3: Timing of the Model



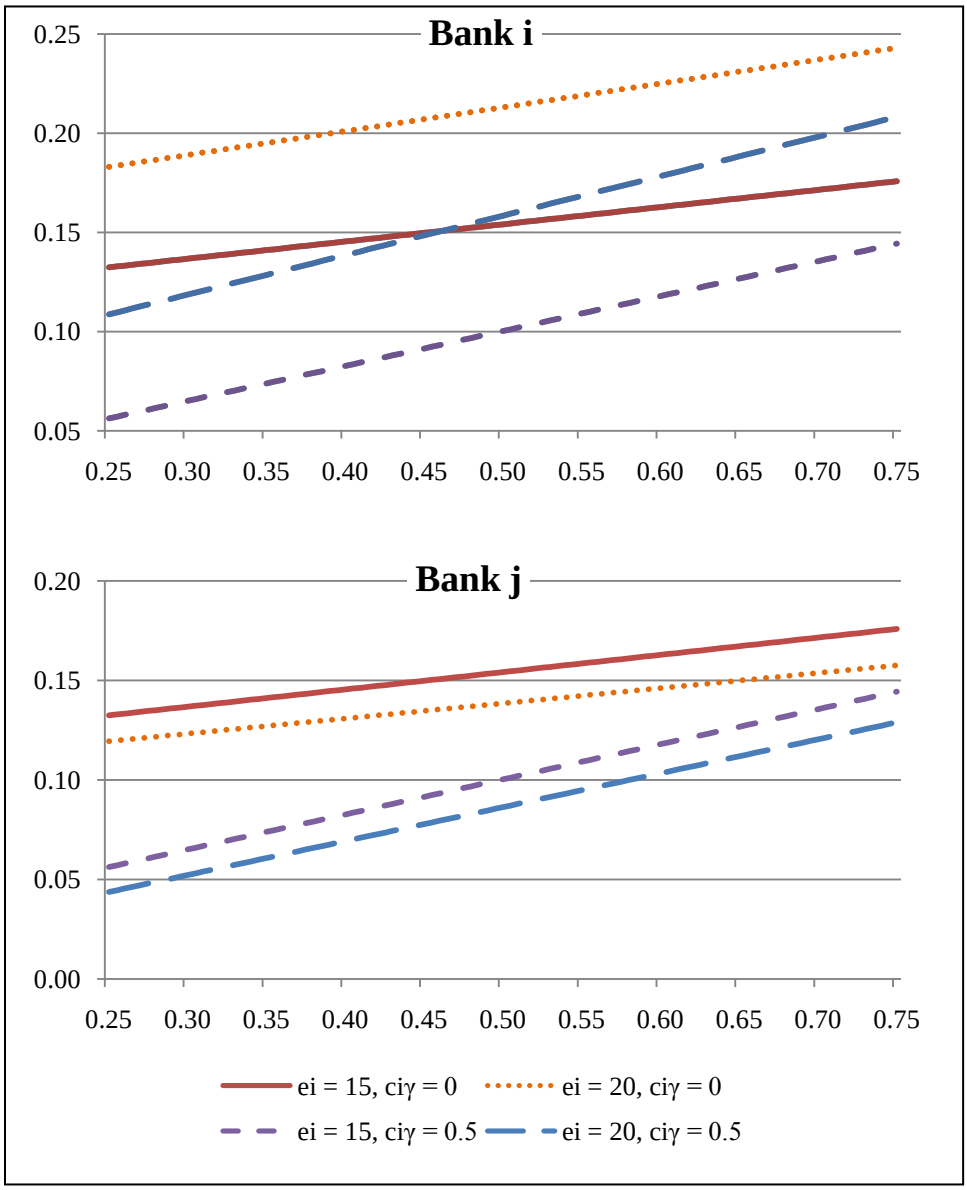
Notes γ^t : screening capacity, δ^t : rate of depreciation, I^t*:* Investment in screening capacity

Figure 3.4: Value, Depreciation and the Marginal Cost of Investment



Notes all exogenous variables are the same as in Table 3.1, except if indicated otherwise.

Figure 3.5: Investment in Period 1, Depreciation and the Marginal Cost of Investment



Notes all exogenous variables are the same as in Table 3.1, except if indicated otherwise.

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CHAPTER 4
STRUCTURAL ECONOMIC CHANGE AND FOREIGN ACQUISITIONS

1. INTRODUCTION

Foreign acquisition of firms can be profitable if the value of a firm is higher to a new foreign owner than to an existing or prospective domestic owner. It has been a mainstay of the international business literature since at least Hymer (1960/1976) that it is more costly for foreigners to operate a business than it is for domestic owners because foreigners are unfamiliar with the local environment. Hence, unless there are foreign ownership advantages that compensate for the costs of the "liability of foreignness", acquisitions are not attractive. These advantages are generally found in superior organizational capabilities or other specialized assets that foreign acquirers transfer to their new subsidiaries (Zaheer, 1995).

In this paper, I study how structural economic change such as the transition in Eastern Europe or Mexico's membership of NAFTA affects the relative benefits of foreign and domestic ownership. The central argument is that a structural economic shock makes many of the capabilities of domestic firms obsolete. Assuming that foreign owners can provide firms with access to knowledge that enables firms to adapt to changing economic circumstances, acquisition by foreigners will be more attractive after the shock than before.

I use the context of the commercial banking industry to develop and test specific hypotheses that follow from my main argument. In recent years, countries such as

Mexico, South Korea, Turkey and many transition economies in Central and Eastern Europe (the CEE region) have experienced an increase in foreign ownership of banks, often in the aftermath of economic turmoil. The results in this paper are based on data on more than 225 banks from eleven countries in the CEE region over the years 1997 to 2004. The key finding is that foreign acquisition initially raises cost and reduces profit. However, two to three years after acquisition, foreign-owned banks have higher profits and lower costs than comparable banks that remain under domestic ownership. The initial dip in performance is consistent with the presence of a fixed cost of acquisition in the form of a temporary disruption of operations. I confirm this finding in a number of robustness tests that include a version of the Heckman-Hotz (1989) preprogram test to ascertain that foreigners do not acquire banks that had a faster rate of profit growth (or cost-reduction) even before acquisition. In addition, I use a clustering procedure to group banks that are engaged in similar activities. Non-acquired banks in the same cluster provide a more accurate counterfactual for the performance of banks that received the foreign ownership "treatment". Interestingly, I find that the result that foreign acquisition improves bank performance holds most strongly in a cluster of universal banks with large branch networks and a significant involvement in lending. This appears to contradict the widely held view that foreign ownership is associated with a reluctance or inability to engage with the typical clients of universal banks: Small and Medium-Sized Enterprises (SMEs) and consumers (Tschoegl, 1987; Mian, 2006; Detragiache, Tressel and Gupta, 2008; Gormley, 2008). However, the evidence is consistent with evidence that many of the foreign acquirers of CEE banks have successfully sought to maintain or develop their subsidiaries' performance in the SME and retail markets where they compete with

domestic banks (Haselmann, 2006; De Haas, Ferreira and Taci, 2007; Bogaard and Svejnar, 2009).

In further analysis, I show that the contribution of foreign acquisition to bank performance is higher in countries that underwent deeper structural change. This result is based on a novel indicator of structural change that measures the reallocation of resources across sectors. Such a reallocation leads to obsolescence of banks' knowledge because a banking relationship with, say, a firm in the agribusiness demands different skills and financial products than a relationship with, say, a travel agency. I do not find support for the claim that improvements in creditor rights benefit foreign-owned banks more than domestically owned ones (Haselmann, Pistor and Vig, 2006). Assuming that foreign-owned banks have difficulty processing soft information on borrowers, it has been argued that better creditor rights should benefit foreign-owned banks because creditor-rights reduce the importance of soft information (Sengupta, 2007).

My work contributes to the literature in several ways. First, the focus on the timing of acquisition and the dynamics of performance of foreign-owned banks, complements the geographical dimension that has been explored before. Several papers have found that banks from advanced economies outperform local competitors in emerging markets, but not in other advanced economies and that the performance of foreign-owned banks declines with the (cultural) distance between home and host-country (Claessens, Demirguc-Kunt and Huizinga, 2001; Miller and Parkhe, 2002; Lensink and Hermes, 2004; Mian, 2006). The dynamics are distinct from those in Zaheer and Mosakowski (1997), in Uhlenbruck (2004) or in Barkema and Nadolska (2007), which focus on learning by foreign acquirers and a relaxation of the liability of

foreignness. Instead, the dynamics in my work derive from a precipitous weakening of domestic firms due to fact that structural economic change creates an unfamiliar environment for them (see also Perez-Batres and Eden, 2008). In this sense, my work is related to recent work by Desai, Foley and Forbes (2007) and Cuervo-Cazurra and Dau (2008a, b) who study the impact of financial crises and structural economic reform on the relative benefits of foreign and domestic ownership.

The emphasis on access to knowledge as a motivation for foreign acquisition also complements the focus in the theoretical literature on cost-of-capital advantages as an explanation for foreign entry (e.g. Sengupta, 2007; Detragiache et al., 2008). In these models, foreigners are assumed to be informationally challenged and can break into the market only if their cost of capital is lower than that of domestically owned banks. However, this explanation is at best incomplete. There is a widely held belief that banks in the CEE region, in Mexico before the 1994/5 Tequila crisis and in South East Asia before the 1997 crisis had a severe lack of know-how about credit assessment and would benefit from an infusion of foreign knowledge (Buch, 1997; Bokros, 2001; Jotev, 2001; Gruben and Mccomb, 2003; Haber, 2005; Tschoegl, 2005; Lehner and Schnitzer, 2008). Empirically, foreign entry on the basis of cost-of-capital advantages only would appear to produce the largest impact on bank performance in the short term, immediately following a financial crisis. Over time, the performance of domestically owned banks should gradually recover as the cost of capital for foreign and domestic owners converges. The pattern uncovered in this paper shows the opposite.

Furthermore, in accounting for changes over time in the relative performance of foreign-owned and domestically owned banks this paper resolves an empirical paradox.

On the one hand, a number of papers using efficient frontier analysis find that foreign ownership of banks in the CEE region is associated with higher efficiency (Grigorian and Manole, 2002; Bonin, Hasan and Wachtel, 2005a, b; Fries and Taci, 2005; Yildirim and Philippatos, 2007). On the other hand, Lanine and Vander Vennet (2007) find that foreigners simply acquire the most efficient banks and that, controlling for the endogeneity of ownership, foreign acquisition has an insignificant or negative effect on performance. Poghosyan and Borovička (2007) come to a similar conclusion. All these papers assume that the effect of foreign ownership on performance is constant over time, which, as my analysis shows, is an assumption that results in biased estimates.

In section 2 of this paper, I discuss the theoretical motivation for this paper and the hypotheses to be tested. Section 3 presents the empirical context and data and section 4 the empirical approach. The results are presented in section 5 and discussed in section 6. Section 7 concludes.

2. MOTIVATION AND HYPOTHESES

The level of foreign ownership of banks differs dramatically across emerging markets (Figure 1). Measured by foreign control of banking assets, foreign ownership tends to be low in Asia, somewhat higher in Latin America and fifty percent or higher in Central and Eastern Europe as well as in Mexico. Differences in the level of foreign ownership are associated with differences in the strategic orientation of foreign-owned banks. At the risk of too much generalization, foreign-owned banks in Asia tend to focus on up-market clients and in particular on corporate banking. In Latin America and the CEE region however, foreigners have acquired universal banks with large branch networks that are

actively engaging with retail and SME clients (Guillén and Tschoegl, 2000; De Haas and Naaborg, 2006; Haselmann, 2006). The empirical literature has found that acquirers are attracted to countries that are reasonably well-governed by somewhat "underbanked" such that they provide growth opportunities (Buch and Delong, 2004; Focarelli and Pozzolo, 2005; Focarelli and Pozzolo, 2008).

What the cross-section of foreign-ownership levels in Figure 1 does not show is that the high levels of foreign ownership in Mexico and the CEE countries are the result of a relatively brief spike in foreign acquisitions. In Mexico, this spike followed the 1994/5 Tequila crisis, the start of NAFTA in January 1994 and privatization and deregulation of Mexican banks in the early nineties (Gruben and Mccomb, 2003; Haber, 2005; Perez-Batres and Eden, 2008). In the CEE region governments decided to allow or even encourage foreign acquisition of banks during the process of economic transition (Bokros, 2001; Jotev, 2001; Cottarelli, Dell'ariccia and Vladkova-Hollar, 2005).

Structural economic change encompasses a wide range of factors that affect the interaction between economic agents. In this paper, I think of structural economic change as a process that alters the fundamentals of the relationships between banks and their clients. This may be due to economic and institutional changes (Desai, Foley and Forbes, 2007; Cuervo-Cazurra and Dau, 2008a, b), but can also be related to the loss of political patronage for both banks and their clients (Brown and Dinç, 2005; Siegel, 2007). Structural economic change frequently triggers a financial crisis, which is then the proximate cause for countries to allow foreign acquisition of banks (Tschoegl, 2005). However, financial crises are conceptually distinct from structural change. In so far as a crisis does not change the fundamental character of post-crisis banking relationships can

be the same as before a crisis. This is true even if individual clients go bankrupt due to the financial strain associated with a crisis.[51]

It is useful to consider the bank that is studied in Bogaard and Svejnar (2009).[52] The bank is located in a transition economy and was acquired by a Western European bank upon privatization towards the end of the nineties. Compared to its peers, the bank weathered the economic and financial turmoil of the nineties relatively well. Management and employees were technically competent administrators and stuck to a conservative strategy. However, the new owners soon found that the bank's conservatism came with a risk-averse attitude and the absence of skills to identify, let alone reach out to, valuable clients. This is akin to the challenges faced by non-financial firms in the CEE region that had technically competent staff without the skills to market their products or find new export markets (Meyer and Bjerg Moller, 1998; Filatotchev, Dyomina, Wright and Buck, 2001; Blazejewski and Dorow, 2003). It is also similar to the experiences of banks in Mexico or even Scandinavia that got in trouble after significant changes in the structure of the market for financial products (Drees and Pazarbasiog1o, 1995; Gruben and Mccomb, 2003).

Finally, the experience of the bank casts doubt on a key assumption in the literature on foreign entry into banking, which is that domestically owned banks are always better at evaluating soft information about borrowers than foreign-owned banks (Sengupta, 2007; Detragiache et al., 2008; Gormley, 2008). This assumption does not appear to be a good point of departure for theoretical models that explain foreign

[51] Dell'Ariccia (2001) develops a model of banking competition in which turnover of individual clients weakens the competitive strength of an incumbent bank as compared to a potential entrant.
[52] For reasons of confidentiality the name and exact location of the bank cannot be revealed

acquisitions of banks in emerging markets (see Buch, 1997; Bonin, Mizsei, Székely and Wachtel, 1998).

The new owners of the bank in Bogaard and Svejnar (2009) became painfully aware of the bank's gap in know-how when they discovered that high-value clients were leaving in droves. In the competitive environment of the twenty-first century the ability to actively engage with clients had become an essential part of the skill set of bank employees. In so far as the incumbent managers recognized the problem, they did not know how to deal with it. Foreign acquisition provided the bank with access to the knowledge of expatriate managers who introduced a business strategy that involved better client segmentation and an organizational model that was aligned with the strategy. In so far as domestically owned firms did not have access to similar knowledge (or only at a higher cost Kogut and Zander, 1993), this can explain differences in the performance of foreign-owned and domestically owned firms.

Hypotheses

Building on the foregoing discussion, foreign acquisition of banks following structural economic change could be explained as follows: (i) a structural shock makes many of the skills of domestically owned banks obsolete and these banks do not have access to the knowledge that is required to adapt effectively to the new economic conditions (ii) the value of a bank under foreign ownership is higher than under domestic ownership because foreign owners can provide the bank with access to key knowledge.[53] On the

[53] Strictly speaking, a complete rationale requires that acquisition is more attractive than greenfield entry for the foreign owner. In practice, greenfield entry is mostly restricted to corporate banking and other specialized services like private banking and trade finance. In so far as foreigners enter into universal

basis of this rationale, we can develop hypotheses with regard to both the timing of foreign acquisitions of banks and (ii) with regard to post-acquisition performance (Bogaard, 2009 develops a theoretical model building on formalizing this rationale for foreign acquisition of banks).

Hypotheses with regard to the exact timing of foreign acquisitions are not well identified. Structural economic change is a process that is usually spread out over a number of years. It is difficult to tell precisely in which year there has been enough and sufficiently rapid structural economic change to precipitate a surge in foreign acquisitions. The timing of foreign acquisitions is also affected by government because foreign ownership tends to be regulated and because foreigners often acquire banks that are being privatized (Caprio, Laeven and Levine, 2003; Haber, 2005; Tschoegl, 2005). While governments appear to be sensitive to the relative benefits of foreign ownership, some governments are quicker to recognize the potential benefits of foreign ownership in banking than others (Siegelbaum and Fleming, 2001; Cottarelli et al., 2005). Moreover, it is difficult to control for unobserved heterogeneity in country-level data.

Hypotheses with regard to post-acquisition performance do not suffer from these identification problems and my empirical analysis focuses on bank performance conditional on acquisition. Considering that the countries in the CEE region all experienced significant structural economic change, we would expect that generally, foreign ownership improves bank performance. Hence:

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banking and engage with retail and SME clients, acquisition is the dominant mode of entry (see also Guillén and Tschoegl, 2000).

Hypothesis 1: Foreign acquisition improves the performance of banks relative to the performance of banks that remain under domestic ownership.

Existing research about the contribution of foreign ownership to bank performance in the CEE is inconclusive. On the one hand, there is a significant number of papers that finds that foreign-owned banks outperform domestically owned banks, in terms of either cost or profit efficiency or both (e.g. Grigorian and Manole, 2002; Bonin et al., 2005a; Fries and Taci, 2005; Yildirim and Philippatos, 2007). However, these papers do not control for the fact that owners might simply acquire banks that perform well to begin with. With the exception of Bonin et al. (2005b) the papers that do so find that foreign ownership has an insignificant or negative effect on bank performance (Poghosyan and Borovicka, 2006; Lanine and Vander Vennet, 2007).

As long as foreign banks have knowledge that is valuable to emerging market banks, one might expect foreign acquisitions to take place regardless of the external economic circumstances. However, if there are fixed costs to acquisition, foreign acquisitions are only attractive if the benefits of access to knowledge are sufficiently large. One can think if fixed costs as a lump sum transfer from the new owner to the old domestic owner who has to be convinced to give up the private benefits of ownership. Alternatively, the fixed cost may be associated with initial disruption of operations that is related to the change of ownership. In that case, foreign acquisition initially causes a dip in performance before things get better. In the short term, post-acquisition performance might also be depressed by the fact that acquirers initially invest heavily in new screening

capacity, while after a few years they can restrict themselves to maintenance. This leads to the following hypothesis:

> **Hypothesis 2:** The benefits of foreign acquisition materialize over time, but may initially lead to a drop in performance.

So far, there is limited evidence on the dynamics of foreign ownership and bank performance. Most papers (implicitly) impose the assumption that the effect of ownership on performance is constant over time (e.g. Claessens et al., 2001; Bonin et al., 2005a; Fries and Taci, 2005; Poghosyan and Borovicka, 2006; Lanine and Vander Vennet, 2007). There is some evidence that the positive impact of foreign ownership on bank performance strengthened over time in Hungary (Majnoni, Shankar and Varhegyi, 2003). Bonin et al. (2005b) find that early privatized banks are more efficient than banks that are privatized later and conclude that this may be due to the fact that the impact of foreign ownership on performance does not take hold immediately. However, their result may also be due to the fact that more efficient banks are privatized first (Gupta, Ham and Svejnar, 2008). For a wider sample of countries, Boubakri, Cosset and Guedhami (2005) find that the economic efficiency of banks improves over time following privatization. However, they do not estimate separate performance trends for foreign-owned and domestically owned banks. Outside of the banking sector, studies by Brown et al. (2006) and Hanousek, Kocenda and Svejnar (2007) show that the relationship between forms of ownership and performance changes over time in transition countries.

Even in the CEE region, not all countries experienced structural change to the same extent. The economies of the former Yugoslav Republics as well as Hungary were somewhat more liberalized at the onset of transition in 1989, as compared to (at the time) Czechoslovakia and in particular Romania and Bulgaria. Also, countries like Poland, Hungary and to some extent the Czech Republic implemented market-oriented reforms more quickly than other countries. Consequently, banks in countries that had taken a head start with economic liberalization as well as those in countries that implemented reforms only slowly experienced less structural change than others. The central thesis of this paper suggests that the benefits of foreign ownership will be higher in countries that experienced the most structural economic change:

> **Hypothesis 3:** Improvements in performance following foreign acquisition are larger in countries that have experienced deeper structural change.

3. EMPIRICAL CONTEXT AND DATA

I test my hypotheses on a sample of 284 banks in eleven Eastern European countries (Bulgaria, Croatia, The Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia) over the years 1997 to 2004.

Over the past fifteen to twenty years, the transition economies moved from a mono-bank system with no clear separation between the Central Bank and "commercial" banks to a more modern banking system that is reasonably well regulated by emerging market standards.[54] Soon after the fall of the Berlin Wall in 1989, all CEE countries

[54] The books by Bonin et al. (1998) and Bokros, Fleming and Votava (eds.) (2001) provide an analysis of developments in banking and finance in a range of CEE countries.

rapidly separated the Central Bank from commercial banking. In addition, they allowed the establishment of new banks, which led to a rapid but unsustainable increase in the number of banks, particularly in some smaller countries like Estonia, Latvia and Croatia. Countries also permitted the entry of foreign banks, which initially set up small offices with the objective to support home country clients that had started operations in the CEE region after 1989. Subsequently, they expanded their activities to financing healthy local companies as well as to providing private banking services to wealthy individuals (De Haas and Naaborg, 2005). However, these foreign greenfield banks rarely ventured into the market for retail or SME lending.

In addition to dealing with a growing number of private banks, financial regulators and governments had to decide on the best approach to restructuring the institutions that had emerged from the old banking system. A legacy of directed lending led to an overhang of bad loans and governments used a variety of approaches to recapitalize banks. However, weak supervision and accounting standards, bad incentives for risk management and a lack of banking skills resulted in a recurrence of the problems and several governments were forced to recapitalize banks more than once (Buch, 1997; Bokros, 2001).

Sooner or later, governments came to realize that consolidation of the banking industry and private, possibly foreign, ownership of major banks was required to put the industry on a sustainable footing. Although countries moved at different speeds, measured by the percentage of banking assets under foreign control, all eleven countries except Slovenia, had a foreign ownership share of close to 50 percent or higher by 2003. The new owners of Eastern European banks are mostly Western European banks. In the

Baltic Republics, Scandinavian banks dominate the market while Austrian and German banks play a large role in Poland and the rest of Central Europe. Italian and Greek banks tend to focus on Romania, Bulgaria and other Southern European countries.[55] Several of the foreign acquirers, especially the Austrian and German ones, initially entered as greenfield banks with a focus on corporate banking and services for home-based clients. Banks from other countries, such as KBC from Belgium, Millennium BCP from Portugal and Allied Irish Bank entered only when they could acquire banks in privatizations. Other banks with a multi-country presence include Société Générale from France and GE Capital and Citibank from the US. Finally, the Hungarian bank OTP, which has substantial foreign ownership but domestic managers, has started to expand into other transition economies.

Data and variables

I use *Bureau van Dijk's Bankscope* as the primary data source and my dataset contains information from banks' annual statements for the years 1997 to 2004. I eliminate observations without information on loans, deposits, equity, overheads or total assets, or with inconsistent information such as negative cost. I also excluded a number of smaller banks in Latvia from the dataset because I could not trace their ownership. All the mainstream Latvian banks are part of the dataset. The excluded banks generally provide specialized services such as trade finance and private banking. This leaves me with a maximum of 1,631 observations on 284 banks. In practice, most regressions contain

[55] The fact that home and host countries are matched so narrowly in the CEE region makes it impossible to test hypotheses with regard to the relation between the performance of foreign-owned banks and geographical or cultural distance with the home-country of the owner.

fewer observations because I do not use the first year that a bank is part of the dataset and there are some observations with other missing variables such as fee income.

As performance indicators, I use Return on Assets (ROA), which I take directly from *Bankscope*, and the Expense-to-Income ratio. ROA is a widely used measure of bank performance. The Expense-to-Income ratio is an indicator of operational performance. Income is total operating income in *Bankscope* and is equal to net interest income plus net fee and commission income plus a few smaller items.[56] Expenses, total operating expenditure in *Bankscope*, include personnel expenses and other overheads as well as loan-loss provisions and write-downs. To reduce the influence of outliers in the performance measures I winsorize both ROA and the expense-to-income ratio at the upper and lower 2.5th percentile. Some of the extreme values in performance appear to be due to idiosyncrasies in income or costs, or to exceptionally low levels of assets rather than to normal variation in business performance.

Several other papers that investigate the relationship between ownership and performance of CEE banks use efficient frontier estimation to derive cost efficiency or profit efficiency as indicators of performance (e.g. Grigorian and Manole, 2002; Bonin et al., 2005a, b; Fries and Taci, 2005; Yildirim and Philippatos, 2007).[57] However, efficiency estimates often account for productive and scale efficiency, but not for allocative efficiency, i.e. deviations from optimal output are not counted as inefficiencies

[56] *Bankscope* reports either Fee Income or Commission Income.

[57] The papers cited here are all multi-country studies, there are also a number of single-country studies of bank-efficiency that, although they differ on some details, come to the same broad conclusion that foreign-owned banks are more cost-efficient than domestically owned banks and possibly more profit efficient (e.g. Kraft and Tirtiroglu, 1998; Nikiel and Opiela, 2002; Hasan and Marton, 2003; Kraft, Hofler and Payne, 2006).

(Berger and Mester, 1997).[58] My theoretical framework suggests that the ability to sell loans and deposits and to choose the optimal level of output is part and parcel of good performance.

One of the disadvantages of the *Bankscope* database is that it does not have historic ownership data, which have to be hand-collected. I define ownership categories on the basis of majority ownership. That is, a bank is classified as foreign-owned (state-owned) if foreigners (the state) control more than fifty percent of its shares. Among foreign-owned banks I distinguish foreign greenfield banks and banks acquired by foreigners. A bank is classified as foreign greenfield if it is both controlled by foreigners and was originally established by foreign owners. Banks that are not state-owned or foreign-owned are classified as domestic private.[59] I collected information on bank ownership from the banks' own websites and annual reports, the websites of Central Banks and news reports that I accessed through Factiva.

The fifty percent threshold for the assignment of ownership may appear high. In developed countries, shareholders often have control with ownership shares well below fifty percent. However, in many cases banks in the CEE region are controlled by a few block holders, frequently a foreign owner and the state. While being a block holder gives foreign owners significant influence on operations, the state may still frustrate decision making on key strategic policies (Abarbanell and Bonin, 1997). Several other studies of the relationship between ownership and bank performance also use fifty percent as a

[58] Theoretically it is possible to estimate a version of profit efficiency that encompasses allocative efficiency. However, this method is only valid if there is perfect competition, which is not a tenable assumption in the CEE context (Berger and Mester, 1997).

[59] There are relatively few cases where no owner or no ownership category has a majority. In those cases, I generally categorize the bank on the basis of the single largest owner.

threshold (e.g Bonin et al., 2005a; Fries and Taci, 2005; Poghosyan and Borovicka, 2006; Yildirim and Philippatos, 2007).

If *Bankscope* reports both consolidated and unconsolidated data for a bank, I use consolidated except if a bank had a subsidiary in the dataset or if there was a longer series of unconsolidated data. I use data reported in accordance with International Accounting Standards where available. As is customary, I excluded some specialty banks, in particular car-finance companies, from the data even though they are labeled "Commercial Bank" in *Bankscope* (Bonin et al., 2005a; Micco, Panizza and Yanez, 2007).

Table 4.1 gives an overview of data on ownership, by year and by country. Ownership categories are evenly distributed across countries and there are at least several foreign acquisitions in each country. Table 4.2 provides summary data about performance by origin of ownership – either domestic (panel A) or foreign (panel B). The average size of foreign-owned banks as compared to domestically owned banks gradually increases over time (panel C). In most years, foreign-owned banks are also more profitable and more cost-efficient. Table 4.3 reports the results of median (quantile) regressions of the performance indicators on ownership, controlling for country x year fixed effects.[60] Foreign-owned banks are both more cost efficient and more profitable than state-owned banks according to these results, although banks that are foreign by acquisition cannot always be distinguished from privately owned domestic banks. Foreign greenfield banks, which have about the same median size as privately owned domestic banks have significantly better performance.

[60] OLS estimation gives similar results both qualitatively and quantitatively.

Measuring structural change

In order to test hypothesis 3, we need a measure of structural change in the economy. Structural change is a broad concept that can encompass changes in the rules and regulations governing the economy, a shift in the sector structure of the economy as well as a change in the demography of firms. A measure of structural change has to capture those aspects that are most closely aligned with the theoretical approach in this paper.

My hypotheses are based on the assumption that a structural shock makes existing skills obsolete while creating a need for new skills. Ideally, we would approximate this process with a measure that represents changes in the nature of client population, or another measure that reflects the change in the character of banking relationships. An association between such a measure and bank performance reflects banks' ability to develop business opportunities in new markets and to compensate for the loss of old ones. Unfortunately, there are no reliable measures of firm demographics that reflect the change between the pre-1989 and the post-1989 situation. This is partially due to the break-up of Yugoslavia and Czechoslovakia but also to the switch to new ISIC codes and alignment of the reporting standard of CEE countries with those of other countries. Instead, using ILO data, I construct a measure of structural change on the basis of the reallocation of labor. For each country, I first calculated the share of each 2-digit industry in total employment in each country. Subsequently, I calculated year-to-year changes in these shares over the 1995 to 1998 period. I then added the absolute values of these changes for each year and country. Finally, I averaged the result over the years 1995 to 1998. The assumption underlying these measures is that a reallocation of resources and activity across industries requires a reorientation of bank strategies.

4. EMPIRICAL APPROACH

Testing hypotheses 1 to 3 requires a reliable estimate of the impact of foreign ownership on bank performance. Hypothesis 3 suggests that foreign ownership initially has a negative effect on bank performance, followed by an improvement over time. Hence, I distinguish level effects of ownership as well as trends. Level effects represent the initial effect of changes in ownership on performance while the trend effects represent the annual change in performance associated with ownership. With y_{ijt} as the measure of performance, I specify the following treatment effects model in which ownership measures the "treatment" that banks received:

$$\begin{aligned} y_{ijt} = {} & \alpha + \gamma_1 DP_{ijt} + \gamma_2 FA_{ijt} + \gamma_3 FG_{ijt} \\ & + \delta_1 (owndur_{ijt} \times DP_{ijt}) + \delta_2 (owndur_{ijt} \times FA_{ijt}) + \delta_3 (owndur_{ijt} \times FG_{ijt}) \\ & + \theta y_{ij0} + \varphi (trend_t \times y_{ij0}) + \sum_{t=1}^{T} \lambda_t + \sum_{j=1}^{T} \omega_j \cdot trend_t + \sum_{t=1}^{T} \tau_t \cdot trend_t + \mu_i + \varepsilon_{ijt} \end{aligned} \tag{4.1}$$

In equation (4.1) subscripts *i* are for a particular bank, *j* for country and t for time. The ownership dummies *DP*, *FA* and *FG* stand for Domestic Private, Foreign Acquired and Foreign Greenfield respectively. State Owned is the omitted category. The variable $owndur_{ijt}$ is equal to year *t* minus the latest change in ownership. This reflects the assumption that the difference in performance between a bank acquired by foreigners and the typical state-owned bank depends on the number of years that have passed since the foreign owners acquired the bank (rather than on the calendar year). $trend_t$ is always year *t* minus 1998. By including initial performance, y_{ij0} in the regression as well as an interaction of initial performance with a trend, the model allows for a systematic relationship between initial and subsequent performance (the observation from year 0, the first year that a bank enters the data, is never included in the regressions). The vector z_{jt}

contains country level controls (real GDP growth, GDP per capita, producer price inflation, the lending interest rate and the EBRD transition indicator for Bank Reform)[61] and c_j, t_t are country and year fixed effects and c_j *x* $trend_{jt}$ is a country specific trend (country dummies times year minus 1998).

Equation (4.1) includes a bank fixed effect μ_i and tests on the residuals of OLS estimates of equation (4.1) show serial correlation. A robust version of the Hausman test suggests that this effect is not only present but correlated with the independent variables.[62] We can eliminate μ_i, from the equation through either traditional fixed effects (mean-difference) estimation or by first differencing equation (4.1). First differencing is more convenient because it simplifies the ownership-trend interactions and allows us to drop some variables (Δ is the difference operator):

$$\begin{aligned} \Delta y_{ijt} = \alpha + \gamma_1 \Delta DP_{ijt} + \gamma_2 \Delta FA_{ijt} + \gamma_3 \Delta FG_{ijt} + \delta_1 DP_{ijt} + \delta_2 FA_{ijt} + \delta_3 FG_{ijt} \\ + \varphi y_{ij0} + \Delta z_{jt}^{T} \cdot \lambda + c_j^{T} \cdot \sigma + t^{T} \cdot \tau' + \varepsilon_{ijt} \end{aligned} \tag{4.2}$$

In this specification, the coefficients in γ and δ are essentially difference-in-difference estimates of the level and the trend effects. Because the standard errors in difference-in-difference models are liable to be affected by serial correlation, I cluster standard errors and allow for arbitrary correlation between errors by bank (Bertrand, Duflo and Mullainathan, 2004).

[61] Sources for the control variables are the *Economist Intelligence Unit* and the EBRD (see Table 4.14).
[62] Implementation of the standard Hausman test requires that standard errors are homoskedastic. If this is not the case, Wooldridge suggests estimating a pooled OLS regression that includes the average values (by individual) of each of the time-varying independent variables as arguments. If random effects estimation is consistent, the coefficients on the average values should be insignificant, which can be tested with a Wald-test (Wooldridge, 2002 p.291).

5. RESULTS

I begin by estimating equations (4.1) and (4.2), the baseline specification of the model, in Table 4.4. The OLS estimates are shown to emphasize the importance of controlling for bank specific heterogeneity. With state ownership as the omitted form of ownership, these estimates suggest that both domestic private banks and foreign greenfield banks perform better than state-owned banks while foreign acquired banks are insignificantly better (note that a negative coefficient on the expenditure-to-income ratio indicates better performance). With ROA as the dependent variable, the level effects on foreign greenfield and domestic private are only significant if both the trend effects and initial performance are included in the regression (column 3). With Expenditure / Income as the dependent variable the level effect of foreign ownership by acquisition becomes insignificant once we include the trend effects. Only foreign greenfield ownership has a significant trend effect in the ROA regression. Its negative sign suggests that other banks catch up with greenfield banks.

The first difference estimates (equation (4.2)) eliminate bank specific effects from the equation and reveal a strikingly different pattern. The level effect of foreign acquisition is negative (the coefficient on foreign ownership in column 6 is almost significant at the 10% level), while the trend effects point towards improved performance over time (the level effect of greenfield ownership drops out in first differences). This is in line with hypothesis 3. The point estimates of the level and trend effects for both ROA (column 6) and the expenditure-to-income ratio (column 12) are economically meaningful. In both cases, the level effect of foreign ownership is about one half of a standard deviation of the dependent variable. Average ROA is 0.94. Foreign acquisition

initially reduces ROA by about 85 percent of the average, but raises ROA by about 120 percent of the average after five years.[63] The percentages are lower for the expenditure-to-income ratio. However, with the average of this ratio at 0.83, the level effect of foreign ownership is about 21 percent of the average and the trend effect about 7.5 percent (i.e. a drop in the expenditure-to-income ratio of more than 15 percent after five years of foreign ownership).

The trend and level effects of private ownership are insignificant in columns 6 and 12 of Table 4.4 meaning that privatization to domestic owners produces no significant improvement in performance over state ownership. I tested whether the coefficients on private domestic ownership are different from those for foreign-acquired banks. Both the level and trend effects are significantly different at the five percent level or better – over time, foreign owned banks improve their performance relative to the performance of private domestic as well as state-owned competitors.

The negative coefficients on the performance in year 0 and trend interactions imply that there is some mean reversion in performance (note that performance in year 0 without the trend interaction drops out in the first difference specification). Among the country level control variables, only the indicator of bank reform has a strongly significant impact on bank performance. When bank reform progresses, banks become more cost efficient and more profitable. This is so despite the fact that a higher score on bank reform is associated with an increase in the contestability of the market for banking services. The insignificance of the other controls implies that, after taking account of year and country effects, changes in e.g. GDP per capita, have no impact on bank performance. The results in Table 4.4 are in line with hypotheses 1, 2 and 3.

[63] 85 percent ≈ 0.81/0.94 and 120 percent ≈ (5*0.39 – 0.81)/0.94

Robustness

I did several checks to ensure that these results are robust. To begin with, I re-estimated the equations in Table 4.4 with country x year fixed effects rather than the economy controls. Country x year fixed effects absorb all observed and unobserved country level variation that affects bank performance. The results did not change in this specification. Furthermore, we should be concerned that the banks that were acquired by foreigners were improving their performance at a faster rate even before acquisition – first differencing takes care of bank specific level effects, but not of bank specific trends (e.g. Brown, Earle and Telegdy, 2006). To investigate whether foreigners acquire banks with a higher rate of improvement in performance than non-acquired banks, I re-estimated equation (4.2) with separate trends for banks that are acquired at some point during the sample period and banks that are never acquired. This specification implements a version of the pre-program test in Heckman and Hotz (1989) to check whether there are unobserved differences between treated banks and the control group. The results in Table 4.5 show that only privately owned domestic banks that are never acquired are significantly different from other domestic banks.[64] Compared to the banks that end up in foreign hands, these banks improve their cost-efficiency faster, not slower. This suggests that there is a subset of domestic private banks that are capable of adapting to changing circumstances such that the benefits of foreign ownership are limited. Controlling for differences between banks that are and are not acquired does not affect our central results. I re-estimated the equations in Table 4.6 with dummies that are equal to 1 only in the last year before acquisition rather than in all pre-acquisition years. These dummies should control for any activities by the previous owners to prepare banks for acquisition

[64] Note that the level effect of "Domestic Private – Remaining Domestic" drops out in first differences.

(such as debt relief, or initial restructuring).[65] The coefficients on these dummies were never significant and their presence did not materially affect the other coefficients.

In Table 4.6 I also check if initial ownership of banks affects performance trends and if so, whether this affects our main results. The equation estimated in this table is similar to the one that Hanousek et al. (2007) apply to a sample of non-financial firms in the Czech Republic.

$$\begin{aligned}\Delta y_{ijt} = \alpha + \gamma_1 \Delta DP_{ijt} + \gamma_2 \Delta FA_{ijt} + \gamma_3 \Delta FG_{ijt} + \delta_1 DP_{ijt} + \delta_2 FA_{ijt} + \delta_3 FG_{ijt} \\ + \kappa_1 DP_{ij0} + \kappa_2 FA_{ij0} + \kappa_3 FG_{ij0} + \varphi y_{ij0} + \quad z_{jt}^T \cdot \lambda + c_j^T \cdot \sigma + t^T \cdot \tau' + \varepsilon_{ijt}\end{aligned} \tag{4.3}$$

In equation (4.3), DP_{ij0} equals 1 if a bank was in domestic private ownership at the beginning of the sample period. FA_{ij0} and FG_{ij0} are defined likewise. The trend effect for initial foreign ownership in this table indicates that banks that had been acquired by foreigners by 1998 improve their performance more slowly than banks that are acquired during the sample period. Estimation of this model again confirms the main result that, following post-acquisition restructuring, foreign ownership improves bank performance. At the same time the trend effect on foreign ownership is somewhat higher here than in Table 4.4. In combination with the coefficient on FA_{ij0} this suggests that the impact of foreign acquisition on the trend in performance tapers off over time. However, the sample

[65] Heckman, Lalonde and Smith (1999) point out that neither the Heckman and Hotz pre-program test nor controlling for performance in the year immediately prior to acquisition fully controls for the "fallacy of alignment". In many cases however, the test will reject the estimators that are most biased due to differences between "treated" and "untreated" groups (Heckman, Lalonde and Smith, 1999 p. 2032). Brown et al. (2006) estimate a model with separate pre- and post-acquisition dummies for each year before and after firms in their sample were acquired by foreign owners (from $t - 4$ to $t \geq 5$) and use the pre-acquisition dummies to check for systematic differences between acquired and non-acquired firms. My data do not have sufficient pre-acquisition observations to estimate such a model.

covers too short a period to estimate a specification that includes a square of the trend to allow for non-linearities.[66]

An assumption underlying Difference-in-Difference estimation is that in the absence of foreign acquisition both treated and untreated banks would have experienced the same change in performance. In Table 4.5 and Table 4.6 I investigated whether there were unobserved differences between banks violate this assumption. Another way to check the robustness of our results is to restrict comparisons to banks that are observationally similar before changes in ownership and can therefore be expected to have the same response to treatment or the absence of treatment. This is the idea behind matching estimators (Heckman, Ichimura and Todd, 1997). Implementation of a full-fledged matching estimator is hampered by the fact that there are ultimately a limited number of banks per country such that it is difficult to find matches that are close enough. A less ambitious approach is to run the regressions on a restricted sample of banks that have similar characteristics even though they are not exactly matched.

This is what I do in Table 4.7. To begin with, my theoretical framework is focused on foreign acquisition and *a priori* there are two groups of banks that are different from most of the foreign-acquired banks: foreign greenfield banks and *de novo* domestic private banks (domestic private banks that were established by private entrepreneurs and were never state-owned). Foreign greenfield banks tend to focus on a narrower set of banking services. Similarly, many *de novo* banks provide specialized

[66] Qualitatively, the results in Table 4.4 hold when I exclude the banks that were acquired after 2001, i.e. those with a short post-acquisition history.

services and they are rarely acquired by foreigners.[67] Apparently, their assets are not of interest to foreign owners. Columns 1, 2, 5 and 6 of Table 4.7 therefore exclude greenfield banks or both greenfield and *de novo* banks. Neither of these exclusions affect the main result.

Rather than making *a priori* judgments about the type of banks that are engaged in similar business, one can let the data speak and use a clustering method to identify banks that are alike. Clustering methods are a non-parametric approach designed to spot similarities between observations (Kaufman and Rousseeuw, 1990; Heckman et al., 1999 p. 2032). Amel and Rhoades (1988) use clustering to identify strategic groups in banking and Brown and Glennon (2000) use it in the context of an evaluation of bank efficiency. Their concern, like mine, is to ensure that all banks included in a regression can be expected to have the same coefficients in the estimated equation. Because many foreign acquisitions involve universal banks with large branch networks I clustered banks on the basis of five financial ratios that I expect to distinguish these banks from others. I anticipate that universal banks have relatively high fixed assets and overheads (which include personnel expenses) because they are managing a branch network. These branches also give banks access to cheap deposits. Hence I use the ratios of fixed assets, overheads and deposits to total assets as clustering variables. In addition I use the loan-to-asset and fee-income-to-asset ratios. I don't have specific priors with regard to the latter variables. However, focus on lending is obviously important for banks. I include fee income as an indicator for the quality of bank services. Bonin et al (2005b) argue that fee-based services require an upgrade in human capital and technology.

[67] In general, *de novo* domestic private banks are not identified separately because the level effect of this type of ownership is poorly identified in first difference estimation; there are only about ten foreign acquisitions of these banks.

The Appendix to this chapter discusses a number of more technical issues with regard to the clustering method used in this paper. These issues include the normalization of data, the choice of a specific clustering procedure and the determination of the number of clusters in the data. The procedure I use is k-medians clustering, or "partitioning around medoids" (Kaufman and Rousseeuw, 1990). k-medians maximizes the absolute distance between observations in different clusters, while minimizing the distance between observations within clusters. The method is akin to the more familiar k-means clustering except for the fact that k-means is based on the Euclidean distance between observations. In using absolute distance between observations, k-medians is more robust to extreme observations. In and of itself, the k-medians algorithm does not determine the number of clusters in the data and I use a method developed by Tibshirani and Walther (2005) to establish how many clusters there are. Their method is based on a statistic called "prediction strength", which can be calculated for any number of clusters k. Given k, prediction strength measures whether k-medians clustering consistently puts pairs of observations in the same cluster (Tibshirani and Walther, 2005). The number of clusters in the data is then the largest number k for which prediction strength is reasonably high. Figure 4.2 shows that there are four clusters in the data according to this method.

Table 4.8 provides an overview of ownership indicators in the clusters (Table 4.13 has more detailed information on the distribution of banks over countries and clusters). Table 4.8 confirms that greenfield banks tend to be different from other foreign-owned banks. The observations on the former are concentrated in clusters 2 and 3, while the observations on the latter are mostly in clusters 1 and 4. Moreover, most of the acquisitions and privatizations take place in clusters 1 and 4. In Table 4.9, we see that the

banks in clusters 2 and 3 tend to be smaller (note that asset size is not a clustering variable), take in less deposits from customers, have less fee income and lower overheads. The big difference between the banks in clusters 1 and 3 on the one hand and clusters 2 and 4 on the other hand is their involvement in lending.

Closer inspection of the data reveals that many of the individual banks that are assigned to clusters 1 and 4 are universal banks with significant branch networks. Several subsidiaries of *Raifeissen*, greenfield banks that sought to operate as a universal bank, belong to cluster 4 rather than to either cluster 2 or 3. This implies that the clusters are more informative about bank strategies than the greenfield / *de novo* classification in the first two robustness tests in Table 4.7.

Returning to Table 4.7, we see that the results with regard to the contribution of foreign ownership to bank performance from Table 4.4 appear to hold in cluster 4, especially for ROA. However, they do not hold in cluster 1. There are several possible explanations for this result including the distribution of observations within clusters across countries and the low number of observations in cluster 1. One of the more intriguing differences between the two clusters however, is that the banks in cluster 4 tend to lend more than banks in cluster 1. It is not clear from these results whether the lending activity is the result of successful management by foreign owners or if banks that lend more derive more benefits from foreign ownership. However, if foreign-owned banks suffered from an information disadvantage as suggested in the literature on foreign entry into banking, we would expect higher levels of lending by universal banks to be associated with worse, not better performance.

Country level differences in structural change

Because the transition economies all experienced a significant structural shock, it is not surprising that foreign-owned banks outperform domestically owned banks in general. To provide further evidence in support of the rationale for foreign acquisition presented in this paper, I investigate whether foreign ownership of banks in countries that experience more structural change has a larger impact on performance (hypothesis 3). Table 4.10 presents the estimates of a model augmented with interaction of change in ownership and ownership with my measure of structural change. With these interactions in the ROA equation, the normal level and trend effects (without the structural change interaction) become insignificant. However, the trend interacted with ownership and structural change is positive and highly significant in line with hypothesis 3. In addition, the interacted trend effect for foreign-acquired banks is significantly larger than the trend effect for domestic private banks. With Expenditure-to-Income as a dependent variable, the level effect that we found in Table 4.4 is somewhat larger and more significant. However, the trend effect becomes insignificant while the trend x structural change interaction is significantly negative as we would expect.

In order to provide further evidence, Table 4.11 reports the results from estimates of the model on split samples of banks from countries with high levels of structural change (above the median) and banks from countries with low structural change. I created split samples on the basis of the measure of reallocation of labor from Table 4.10 as well as on the basis of structural change measured as reallocation of exports (calculated on the basis of the Feenstra / NBER data) and changes in the industry shares of firms, output and investment (calculated using the UNIDO Industrial Statistics

Database).[68] The ILO data are richer than these latter data sets because the ILO includes both manufacturing and service sectors whereas the trade and industrial data are limited to manufacturing. Nevertheless, Table 4.11 shows that, even with these more limited indicators of structural change, foreign-owned banks tend to improve their performance faster, relative to domestically owned banks, in countries with high levels of structural change.

In order to put the results in Table 4.11 in the context of the broader literature on the foreign entry into banking and economic and institutional conditions in the host country it is useful to re-run the regressions with indicators that reflect e.g. improvements in creditor rights or the investment climate more generally. I do this in Table 4.12. As indicator of a better investment climate in general, I use the Heritage Foundation's index of economic freedom. Furthermore, I use the indicator of creditor rights developed by Haselmann et al. (2006). According to the model in Sengupta (2007), better creditor rights and especially a better regime for collateral should benefit foreign-owned banks. Haselmann et al (2006) find that an improvement in the collateral regime is associated with higher loan growth for foreign-owned banks.[69] As before, countries in Table 4.12 are categorized on the basis of change in the indicators in the years before 1998, with "high Δ" indicating that the indicator changed more than the median level of change (see Table 4.14 for a summary of variables).[70]

[68] As before, "structural change" is calculated as change in the sector shares of each variable.
[69] The creditor rights indicator in Haselmann et al (2006) is composed of an indicator for the bankruptcy regime and an indicator for the regime for use and enforcement of collateral. I do not use the bankruptcy indicator because it does not change sufficiently to achieve a useful split between high change and low change countries.
[70] Using the current value of each of the indicators, or the change over the course of the sample period instead of the indicator calculated on the basis of structural change before the start of the sample period, does not affect the result.

Larger improvements in the Heritage Foundation indicator is associated with higher trend effects for foreign-owned banks while more change in the two measures from Haselmann et al. (2006) is associated with lower trend effects for foreign-owned banks. Because many of the models of foreign entry into banking focus on the amount of lending rather than on costs or profits, I also ran the model with banks' market share in terms of loans outstanding as a dependent variable. The results were essentially the same.

6. DISCUSSION

The results support the hypothesis that foreign acquisition leads to better performance of banks and that a higher degree of structural change is associated with larger benefits of foreign acquisition. These findings are consistent with a role of foreign acquirers as suppliers of banking skills that contribute to higher screening capacity. At the same time, I find little if any evidence in favor of a model that pictures foreign-owned banks as informationally challenged. Also, the estimated trend effects are not in line with a model in which credit constraints on the side of domestically owned banks are the primary explanation for a post-crisis surge in foreign acquisitions.

There are several ways in which the results in this paper could be further strengthened. For example, it would be useful to include banks from other regions in order to have more variation in structural change. As the econometric model includes a number of separate trends, it would also be useful to expand the length of the sample period. I am working to add additional ownership information and extend the sample to about ten years. This would also enable the implementation of more flexible tests to detect bias due to endogeneity in ownership (as in Brown et al., 2006). Such tests are

especially important because the *Bankscope* data do not include many variables that can be used as instruments for ownership. I tried several approaches to instrumental variables estimation, but the instruments were either too weak or did not pass exogeneity tests. Poghosyan and Boroviçka (2006) use a number of financial ratios as instruments for ownership. While these appear to pass the relevant tests, several of the instruments, such as the cost-to-income ratio and net interest revenues, are themselves measures of performance. *A priori* this makes it difficult to believe that they are correlated with ownership but not with performance variables that are dependent variables.

Two of the results provide an opening for further research. First, it is interesting that foreign-owned universal banks that are relatively active lenders (cluster 4) are more successful than otherwise similar banks that do not lend as much (cluster 1). Following the argument promoted in this paper, one could hypothesize that the active lenders are successful innovators, able to develop new markets and client relationships. Future research should establish whether this hypothesis is correct and if so, what makes some foreign owners more successful than others. Second, the results in Table 4.5 suggest that domestically owned private banks that are doing relatively well are less likely to be acquired by foreigners. There are two possible explanations for this. To begin with, these banks may be niche players that do not have assets that are of interest to foreigners. Alternatively, some domestic banks may be so successful that the added value of access to knowledge from foreign owners is relatively limited.

In light of the literature on foreign entry into banking, one question that may be lingering is: does the divergence in performance between foreign-owned and domestically owned banks reflect cherry picking by the foreign-owned ones that crowds

out the domestic ones? Several papers argue that foreign entry reduces profitability for domestic banks and raises their risk profile because foreign-owned banks cherry pick the best clients and crowd out the domestic ones (Dell'ariccia and Marquez, 2004; Detragiache et al., 2008; Gormley, 2008). Detragiache et al. (2008) find evidence in support of their model and Claessens et al. (2001) also find that foreign entry reduces profit margins for domestically owned banks. However, Mian (2006), who finds that foreign-owned banks avoid opaque clients, finds no evidence that domestic banks suffer lower returns as a result.

With regard to the CEE region, there is some evidence that cherry picking played a role in the market for corporate credit (Bonin et al., 1998; Sengupta, 2007). Yet overall, it appears that foreign ownership has contributed to the development of the credit market and provided more people with access to banking services in the CEE region (Fries and Taci, 2002; De Haas et al., 2007). In unreported and preliminary regressions, I did not find robust evidence that the presence of foreign banks affects the performance of domestically owned banks either way.

7. CONCLUSION

This paper develops a rationale for foreign acquisition of banks following structural economic change. We argued that structural change makes many of the skills of existing banks obsolete. Assuming that foreign-owned banks can provide access to resources in the form of knowledge, this leads to an increase in the value of a bank under foreign ownership as compared to its value under domestic ownership. As a result, foreign acquisitions become more likely and foreign-owned banks should outperform

domestically owned ones. While the application in this paper is focused on the banking sector, the underlying principles – that a structural shock induces obsolescence of knowledge diminishing domestic ownership advantages as compared to foreign ownership advantages – are applicable to other industries. This opens the door for the analysis of the relationship between foreign acquisitions and economic conditions in the host country within a dynamic framework.

APPENDIX TO CHAPTER 4

Clustering procedure

Cluster analysis is a non-parametric method that is used to identify groups of similar observations in data sets (Kaufman and Rousseeuw, 1990).

In the context of the banking industry Amel and Rhoades (1988) use cluster analysis to categorize banks into "strategic groups" – groups of banks with a similar business strategy. Similarities in the business strategy are operationalized as similarities in the composition of the balance sheet. Brown and Glennon (2000) use clustering in a study of bank-efficiency and also form clusters on the basis of balance sheet items. Their objective – similar to mine – is to make sure that banks in each cluster are expected to have the same cost-function.

Implementation of a clustering procedure involves three choices: (i) the variables used to measure similarity between observations, (ii) the clustering method and (iii) the number of clusters to be identified.

With regard to the first issue, I used five financial ratios that characterize banks in a way that is related to the theoretical approach in this paper. In particular, I have argued that universal banks with large branch networks are different from other banks. With large branch networks, I expect these banks to have easy access to deposits as well as relatively high fixed assets and overheads (including personnel expenses). Because retail customers make relatively small deposits and borrow small amounts, retail business will be associated with a relatively high number of staff per unit of sales. In addition to these variables I use banks' lending and ability to generate fee income as clustering variables. I

don't have strong priors as to whether universal banks lend more or less or have more fee income, but lending is obviously an important variable and fee income has been mentioned by others as an important distinguishing characteristic of banks (Bonin et al., 2005b). In order to make variables comparable across banks and countries, I normalize all variables by assets. Hence, I use the ratio of loans, deposits, fixed assets, overheads and fee income to assets as clustering variables. After normalizing all variables by assets, I calculate z-scores of the ratios for each of the bank, i.e. I subtract the mean of each ratio and divide by the standard deviation. The normalization serves to ensure that all variables have the same scale such that none of them dominates the distance between variables in the clustering algorithm.

As to the clustering method, I chose so-called k-medians clustering (also called "partitioning around medoids" (Kaufman and Rousseeuw, 1990)). This method is similar to the more common k-means clustering method. The objective is to maximize the difference between clusters (or rather the medoids of each cluster) while minimizing the differences between observations within a cluster. The difference between k-medians and k-means clustering is that k-medians is based on the absolute distance between observations whereas k-means clustering is based on the Euclidean distance. As a result, k-medians clustering is less sensitive to the influence of extreme observations.

Both k-medians and k-means clustering are non-hierarchical methods, which means that the algorithms "correct mistakes". With a hierarchical clustering method one initially assigns observations to clusters on the basis of one variable, say the deposits-to-assets ratio, and then moves on to the next clustering variable. However, two observations that are assigned to different clusters on the basis of the deposits-to-assets

ratio can never end up in the same cluster even if they are "closer" on average than two variables that had slightly more similar deposit-to-asset ratios. The k-medians algorithm initially picks k medoids randomly, assigns observations to clusters based on their distance to the medoids, calculates the medoids of each of the resulting clusters and then reassigns observations on the basis of the new medoids until some criterion function has been satisfied.

In and of itself, the k-medians algorithm produces as many clusters as specified, but does not determine how many clusters there are in the data. To establish the number of clusters in the data, I rely on the concept of "prediction strength" developed by Tibshirani and Walther (2005). Prediction strength is calculated in four steps. First, we randomly select half of the observations and perform k-medians clustering on this half. Second, we use the medoids from the first half to form clusters in the remaining half of the observations (i.e. we do k-medians clustering with pre-determined medoids rather than letting the data determine the medoids). Third, we perform k-medians clustering on the same observations without pre-determined medoids. Fourth, we calculate prediction strength on the basis of the proportion of pairs of observations in the second half of the data that are in the same cluster both with and without pre-determined medoids. If the number of clusters k is greater than the true number of clusters, the "extra" medoids formed by the data are likely to be different from one half of the observations to the other. This lowers prediction strength. Therefore, the right number of clusters is the maximum number of clusters for which prediction strength is reasonably high (Tibshirani and Walther, 2005). Figure 4.2 shows that this number is 4 in our data set.

In addition to the information in Tables 4.8 and 4.9, Table 4.13 gives more detailed information on the distribution of observations over the clusters. The table shows that, banks from all countries are represented in clusters 1 and 4 and have a reasonably good distribution over forms of ownership with the exception of the three Baltic countries and Slovenia. As we would expect from Table 4.8, the distribution of observations is substantially less well distributed for clusters 2 and 3. For example, we have a relatively high number of observations from the Czech Republic in cluster 3, while cluster 2 has a high number of observations from Croatia and Hungary.

Table 4.1: Bank Ownership (by year and by country)

	Observations	Ownership				Changes in ownership	
Year		domestic private	state	foreign by acquisition	foreign greenfield	privatized	acquired by foreigners
1997	211	100	49	14	48	3	4
1998	211	88	48	21	54	4	9
1999	217	76	44	36	61	8	16
2000	220	72	38	49	61	7	15
2001	210	64	31	57	58	5	10
2002	212	61	22	67	62	8	11
2003	209	63	18	67	61	4	4
2004	155	43	9	57	46	2	3
	Observations	**Ownership**				**Changes in ownership**	
Country		domestic private	state	foreign by acquisition	foreign greenfield	privatized	acquired by foreigners
Bulgaria	163	45	35	42	41	6	8
Croatia	237	118	44	45	30	6	11
Czech Rep.	142	22	26	33	61	5	7
Estonia	43	17	5	18	3	2	3
Hungary	181	41	7	48	85	2	5
Latvia	113	77	8	20	8	0	2
Lithuania	66	47	8	11	0	2	3
Poland	275	84	20	77	94	3	14
Romania	169	39	24	31	75	6	8
Slovakia	108	12	30	28	38	6	8
Slovenia	148	65	52	15	16	3	3

Table 4.2: Bank Size and Performance (by year and ownership)

Year	Observations	Assets	ROA	Cost / Assets	Expenditure / Income
		Median, USD mln	Median, %	Median, %	Median, %
A: Domestically Owned (state or private)					
1997	145	253	1.22	10.26	75.62
1998	135	311	0.82	12.31	83.71
1999	120	232	0.93	10.90	83.91
2000	108	201	0.92	10.39	86.37
2001	94	224	0.86	9.04	82.25
2002	83	217	1.15	8.16	77.53
2003	81	297	1.09	7.06	77.21
2004	52	585	1.20	6.13	78.12
B: Foreign-owned (acquisition or greenfield)					
1997	62	265	1.05	10.65	0.63
1998	75	325	1.04	11.59	0.74
1999	97	383	0.92	10.19	0.76
2000	109	473	1.18	9.60	0.76
2001	114	493	1.11	8.68	0.74
2002	128	584	1.10	7.59	0.73
2003	126	787	1.06	6.33	0.71
2004	102	1396	1.24	5.43	0.70
C: Ratio Foreign-owned / Domestically Owned					
1997		1.05	0.86	1.04	0.84
1998		1.04	1.27	0.94	0.88
1999		1.65	0.99	0.93	0.91
2000		2.35	1.29	0.92	0.88
2001		2.20	1.29	0.96	0.90
2002		2.69	0.96	0.93	0.94
2003		2.65	0.97	0.90	0.92
2004		2.39	1.04	0.88	0.89

Notes The USD value of assets is calculated using the exchange rate recorded in *Bankscope*. ROA is Return on Assets. Cost is calculated as interest plus operating expenditure, which includes personnel and administrative expenditures as well as loan-loss provisions and write-offs. Expenditure is operating expenditure and Income is total operating income which is net interest income plus net fee / commission income and net trading income. Source: Own calculations based on *Bankscope* data.

Table 4.3: Bank Ownership and Performance (median regression)

Dependent Variable:	log Assets	ROA	Cost / Assets	Expenditure / Income
Ownership				
Domestic Private (DP)	-1.264	0.200	-0.002	-0.057
	[0.161]***	[0.134]	[0.002]	[0.021]***
Foreign-owned by Acquisition (FA)	0.276	0.310	-0.008	-0.081
	[0.214]	[0.141]**	[0.003]***	[0.025]***
Foreign Greenfield (FG)	-1.315	0.440	-0.022	-0.162
	[0.182]***	[0.149]***	[0.003]***	[0.024]***
Observations	1631	1631	1631	1630
Test: DP = FA	0.00	0.30	0.00	0.24
Test: DP = FG	0.68	0.03	0.00	0.00
Test: FA = FG	0.00	0.25	0.00	0.00

Notes The excluded ownership category is state-owned. All regressions include country x year fixed effects. Bootstrapped standard errors in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.4: Ownership and Performance over Time

Dependent Variable	ROA	ROA	ROA	ROA	ROA	ROA	Exp / Inc	Exp / Inc	Exp / Inc	Exp / Inc	Exp / Inc	Exp / Inc
Estimator	OLS	OLS	OLS	FD	FD	FD	OLS	OLS	OLS	FD	FD	FD
Ownership												
Domestic Private	0.384	0.314	0.509	0.364	0.366	0.395	-0.108	-0.125	-0.124	-0.003	-0.003	0.000
	[0.267]	[0.339]	[0.295]*	[0.567]	[0.556]	[0.537]	[0.048]**	[0.059]**	[0.055]**	[0.098]	[0.096]	[0.092]
Foreign by Acquisition	0.034	0.027	0.183	-0.663	-0.902	-0.813	-0.086	-0.083	-0.070	0.152	0.185	0.176
	[0.275]	[0.282]	[0.265]	[0.534]	[0.527]*	[0.531]	[0.052]*	[0.057]	[0.053]	[0.096]	[0.094]*	[0.090]*
Foreign Greenfield	0.242	0.547	1.340				-0.161	-0.179	-0.241			
	[0.318]	[0.398]	[0.367]***				[0.056]***	[0.071]**	[0.068]***			
Ownership x Time												
Domestic Private		0.025	0.003		0.132	0.116		0.007	0.009		-0.020	-0.026
		[0.073]	[0.074]		[0.116]	[0.081]		[0.012]	[0.013]		[0.022]	[0.019]
Foreign by Acquisition		-0.003	-0.020		0.460	0.389		0.001	0.001		-0.068	-0.062
		[0.070]	[0.067]		[0.151]***	[0.141]***		[0.011]	[0.008]		[0.026]***	[0.024]**
Foreign Greenfield		-0.104	-0.223		0.393	0.180		0.007	0.020		-0.072	-0.054
		[0.090]	[0.080]***		[0.146]***	[0.104]*		[0.015]	[0.014]		[0.028]***	[0.023]**
Initial Performance (Dependent Variable)												
Performance in year 0			0.262						0.239			
			[0.078]***						[0.092]**			
Performance in year 0 x Time			-0.026			-0.156			-0.021			-0.174
			[0.020]			[0.014]***			[0.018]			[0.021]***

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Table 4.4: Ownership and Performance over Time (continued)

Economy Controls												
GDP per Capita	-0.063	-0.066	-0.079	0.019	0.005	0.003	-0.032	-0.033	-0.034	-0.024	-0.022	-0.020
(in thousands of USD)	[0.127]	[0.127]	[0.126]	[0.117]	[0.118]	[0.118]	[0.025]	[0.025]	[0.025]	[0.022]	[0.022]	[0.022]
Producer Prices	-0.029	-0.030	-0.033	0.000	0.000	0.000	0.005	0.005	0.004	0.000	0.000	0.000
(% Change)	[0.021]	[0.021]	[0.020]	[0.002]	[0.002]	[0.002]	[0.003]	[0.003]	[0.003]	[0.000]	[0.000]	[0.000]
Lending Interest Rate	0.001	0.002	-0.010	-0.008	-0.012	-0.009	-0.001	-0.001	0.001	0.004	0.005	0.005
	[0.018]	[0.018]	[0.014]	[0.016]	[0.016]	[0.015]	[0.003]	[0.003]	[0.002]	[0.003]	[0.003]	[0.003]
GDP (% Real Growth)	0.018	0.019	0.003	0.012	0.008	0.013	-0.007	-0.007	-0.005	-0.003	-0.002	-0.003
	[0.034]	[0.034]	[0.036]	[0.029]	[0.030]	[0.030]	[0.006]	[0.006]	[0.006]	[0.005]	[0.005]	[0.005]
Bank Reform	1.144	1.152	1.194	1.879	1.893	1.865	-0.209	-0.208	-0.187	-0.338	-0.341	-0.338
	[0.534]**	[0.539]**	[0.569]**	[0.590]***	[0.588]***	[0.588]***	[0.094]**	[0.095]**	[0.092]**	[0.102]***	[0.102]***	[0.102]***
Constant	-1.839	-1.913	-2.480	-0.132	-0.373	-0.066	1.563	1.573	1.319	0.054	0.093	0.222
	[1.562]	[1.556]	[1.562]	[0.194]	[0.214]*	[0.250]	[0.261]***	[0.261]***	[0.277]***	[0.037]	[0.040]**	[0.046]***
Observations	1273	1273	1208	1188	1188	1188	1273	1273	1208	1188	1188	1188
Number of banks	232	232	232	231	231	231	232	232	232	231	231	231
R-squared	0.06	0.07	0.14	0.05	0.05	0.08	0.13	0.13	0.20	0.06	0.06	0.09

Notes *ROA* is Return on Assets. *Exp / Inc* is Operating Expenditure / Operating Income. OLS is for ordinary least squares regression and FD stands for first differences. Ownership is defined as a dummy that equals 1 if a specific type of owner has control of a bank. The omitted ownership category is state-ownership. The *Ownership x Time* trends are defined as the ownership dummy the number of years since the latest change in ownership. *Initial performance* is defined as the value of the dependent variable in the first year a bank appears in the data (the first year is excluded from the regressions). Bank-level accounting data is from *Bankscope* and economy-level data comes from the Economist Intelligence Unit and the EBRD. *Bank Reform* is an EBRD indicator of progress with regard to liberalization of the banking sector as well as the modernization of the regulation for this sector and the extent to which banking services are available (theoretically it ranges from 1, for no progress, to 4.333, for convergence to advanced economy standards; in the data, the range is 2.333 to 4). All regressions include country and year fixed effects and the OLS regressions also include a country specific trend. Robust standard errors, clustered by bank, in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.5: Ownership and Performance: Acquired vs. non-acquired banks

	(1)	(2)	(3)	(4)
Dependent Variable:	ROA	ROA	Exp / Inc	Exp / Inc
Banks Included:	All	Domestic	All	Domestic
Ownership				
Domestic Private - To be Foreign-owned	0.403	1.589	0.000	0.001
	[0.569]	[1.242]	[0.096]	[0.225]
Foreign by Acquisition	-0.818		0.177	
	[0.541]		[0.091]*	
Ownership x Time				
Domestic Private - To be Foreign-owned	-0.094	-0.067	0.005	-0.004
	[0.235]	[0.265]	[0.034]	[0.040]
Domestic Private - Remaining Domestic	0.072	0.071	-0.025	-0.027
	[0.057]	[0.067]	[0.013]*	[0.015]*
State-owned - To be Foreign-owned	-0.179	-0.088	0.012	0.005
	[0.196]	[0.187]	[0.045]	[0.047]
Foreign by Acquisition	0.328		-0.058	
	[0.105]***		[0.016]***	
Foreign Greenfield	0.114		-0.050	
	[0.077]		[0.016]***	
Observations	1188	583	1188	583
Number of banks	231	231	231	231
R-squared	0.08	0.10	0.10	0.12

Notes *ROA* is Return on Assets. *Exp / Inc* is Operating Expenditure / Operating Income. All equations are estimated in first differences. Ownership is defined as a dummy that equals 1 if a specific type of owner has control of a bank. The omitted ownership category is state-ownership. The *Ownership x Time* trends are defined as the ownership dummy the number of years since the latest change in ownership. All regressions include the economy controls reported in Table 4 as well as country and year fixed effects. Robust standard errors, clustered by bank, in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.6: Ownership and Performance: Initial Ownership

	ROA FD	Exp / Inc FD
Ownership		
Domestic Private	0.266	0.033
	[0.655]	[0.105]
Foreign by Acquisition	-0.957	0.206
	[0.585]	[0.095]**
Ownership x Time		
Domestic Private	0.274	-0.066
	[0.227]	[0.036]*
Foreign by Acquisition	0.554	-0.097
	[0.193]***	[0.031]***
Foreign Greenfield	0.176	-0.053
	[0.104]*	[0.023]**
Initial Ownership x Time		
Initial Ownership: Domestic Private	-0.164	0.041
	[0.204]	[0.029]
Initial Ownership: Foreign by Acquisition	-0.342	0.067
	[0.188]*	[0.028]**
Observations	1188	1188
Number of banks	231	231
R-squared	0.08	0.10

Notes *ROA* is Return on Assets. *Exp / Inc* is Operating Expenditure / Operating Income. All equations are estimated in first differences. Ownership is defined as a dummy that equals 1 if a specific type of owner has control of a bank. The omitted ownership category is state-ownership. The (*Initial*) *Ownership x Time* trends are defined as the ownership dummy the number of years since the latest change in ownership. All regressions include the controls reported in table 4 as well as country and year fixed effects. Robust standard errors, clustered by bank, in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.7: Ownership and Performance over Time: Subsamples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable:	ROA	ROA	ROA	ROA	Exp / Inc	Exp / Inc	Exp / Inc	Exp / Inc
Subsample:	No Greenfield	No Greenfield & De Novo	Universal Cluster 1	Universal Cluster 4	No Greenfield	No Greenfield & De Novo	Universal Cluster 1	Universal Cluster 4
Ownership								
Domestic Private	0.312	0.352	-0.829	0.770	0.015	0.006	0.216	-0.125
	[0.547]	[0.568]	[0.818]	[0.679]	[0.095]	[0.096]	[0.096]**	[0.139]
Foreign by Acquisition	-1.160	-0.896	-1.655	-0.226	0.229	0.183	0.425	-0.012
	[0.553]**	[0.580]	[1.081]	[0.748]	[0.096]**	[0.096]*	[0.128]***	[0.147]
Ownership x Time								
Domestic Private	0.095	0.023	0.213	0.287	-0.021	-0.008	0.007	-0.040
	[0.084]	[0.096]	[0.248]	[0.169]*	[0.018]	[0.018]	[0.046]	[0.042]
Foreign by Acquisition	0.376	0.309	-0.254	0.847	-0.061	-0.048	0.013	-0.081
	[0.143]***	[0.137]**	[0.431]	[0.281]***	[0.025]**	[0.024]**	[0.059]	[0.055]
Foreign Greenfield			-0.269	0.288			0.026	-0.073
			[0.390]	[0.258]			[0.068]	[0.059]
Observations	878	709	278	478	878	709	278	478
Number of banks	167	141	92	141	167	141	92	141
R-squared	0.10	0.11	0.21	0.09	0.12	0.11	0.25	0.08

Notes *ROA* is Return on Assets. *Exp / Inc* is Operating Expenditure / Operating Income. All equations are estimated in first differences. Ownership is defined as a dummy that equals 1 if a specific type of owner has control of a bank. The omitted ownership category is state-ownership. The *Ownership x Time* trends are defined as the ownership dummy the number of years since the latest change in ownership. The "No Greenfield" subsample excludes all foreign greenfield banks. The "Universal" clusters consist of banks grouped together using a clustering procedure on the basis of the ratios of deposits, loans, fixed assets and personnel expenses to total assets (See text, Appendix 1 and Table A1). All regressions include the controls reported in Table 4 as well as country and year fixed effects. Robust standard errors, clustered by bank, in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.8: Clusters by Ownership

Cluster	Observations	Domestic Private	State	Privati-zations	Foreign-owned	Foreign acquisitions	Foreign Greenfield
1	388	154	85	18	86	27	63
	100%	*40%*	*22%*	*5%*	*22%*	*7%*	*16%*
2	328	79	31	2	74	7	144
	100%	*24%*	*9%*	*1%*	*23%*	*2%*	*44%*
3	255	58	25	1	31	5	141
	100%	*23%*	*10%*	*0%*	*12%*	*2%*	*55%*
4	622	270	108	20	167	32	77
	100%	*43%*	*17%*	*3%*	*27%*	*5%*	*12%*

Notes Clusters are formed using k-medians clustering on the basis of deposits, loans, fixed assets, overheads and fee / commission income to total assets (see text for a discussion of the clustering procedure)

Table 4.9: Bank Characteristics and Performance by Cluster

Panel A: Average and Medium Values by Cluster

Cluster	Observations	Assets (USD mln)	Deposits / Assets	Loans / Assets	Fixed Assets / Assets	Overheads / Assets	Fee Income / Assets	ROA	Cost / Assets	Expenditure / Income
		Median	Median, %	Median, %	Median, %	Median, %	Median, %	Median, %	Median, %	Median, %
1	388	421	76.26	31.47	3.86	4.26	1.61	1.11	8.50	77.27
2	328	348	49.24	67.81	2.34	3.25	1.27	1.33	8.25	70.73
3	255	265	30.04	37.46	2.19	3.21	0.75	0.73	8.84	76.47
4	622	469	68.87	53.86	4.11	4.20	1.73	1.11	9.30	77.83
		Mean	Mean, %	Mean, %	Mean, %	Mean, %	Mean, %	Mean, %	Mean, %	Mean, %
1	388	2078	73.89	29.27	6.19	6.03	2.39	0.89	12.03	91.67
2	328	1092	45.11	69.04	3.01	3.91	1.56	1.10	9.34	82.87
3	255	592	28.56	36.66	4.10	4.84	0.98	0.61	10.10	84.07
4	622	1605	68.11	54.14	5.24	4.99	2.07	0.92	10.88	83.74

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Table 4.9: Bank Characteristics and Performance by Cluster (continued)

Panel B: Median Regression of Characteristics on Cluster Dummies

	Assets (USD bln)	Deposits / Assets	Loans / Assets	Fixed Assets / Assets	Overheads / Assets	Fee Income / Assets	ROA	Cost / Assets	Expenditure / Income
Dummy: Cluster 2	-0.067	-0.269	0.364	-0.016	-0.01	-0.003	0.23	-0.003	-0.064
	[0.072]	[0.011]***	[0.009]***	[0.003]***	[0.002]***	[0.001]***	[0.104]**	[0.004]	[0.024]***
Dummy: Cluster 3	-0.156	-0.461	0.060	-0.017	-0.010	-0.009	-0.370	0.003	-0.008
	[0.059]***	[0.014]***	[0.012]***	[0.003]***	[0.003]***	[0.001]***	[0.120]***	[0.004]	[0.020]
Dummy: Cluster 4	0.049	-0.072	0.224	0.002	-0.001	0.001	0.010	0.008	0.006
	[0.063]	[0.007]***	[0.006]***	[0.003]	[0.002]	[0.001]	[0.079]	[0.004]**	[0.018]
Constant	0.421	0.761	0.315	0.039	0.043	0.016	1.100	0.085	0.773
	[0.051]***	[0.007]***	[0.005]***	[0.003]***	[0.002]***	[0.001]***	[0.065]***	[0.003]***	[0.015]***
Equality Tests (P-values)									
Test: Cluster 2 = Cluster 3	0.050	0.000	0.000	0.460	0.840	0.000	0.000	0.090	0.020
Test: Cluster 2 = Cluster 4	0.090	0.000	0.000	0.000	0.000	0.000	0.020	0.000	0.000
Test: Cluster 3 = Cluster 4	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.120	0.450
Observations	1593	1593	1593	1593	1593	1593	1593	1593	1592

Notes Coefficients represent the results of a median regression of cluster dummies on the dependent variable. Clusters are formed using k-medians clustering on the basis of deposits, loans, fixed assets, personnel expenses and fee / commission income to total assets (see text for a discussion of the clustering procedure). Standard errors in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.10: Ownership, Structural Change and Performance over Time

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable:		ROA			Expenditure / Income	
Ownership						
Domestic Private	-0.346	0.622	-0.326	0.161	-0.031	0.158
	[0.882]	[0.540]	[0.888]	[0.150]	[0.093]	[0.150]
Foreign by Acquisition	-0.724	-0.545	-0.444	0.298	0.134	0.265
	[0.819]	[0.533]	[0.856]	[0.117]**	[0.091]	[0.119]**
Ownership x Time						
Domestic Private	0.127	-0.292	-0.284	-0.028	0.052	0.051
	[0.083]	[0.176]*	[0.174]	[0.019]	[0.044]	[0.044]
Foreign by Acquisition	0.352	-0.307	-0.361	-0.055	0.072	0.058
	[0.144]**	[0.265]	[0.255]	[0.025]**	[0.054]	[0.049]
Foreign Greenfield	0.171	-0.228	-0.230	-0.052	0.056	0.055
	[0.106]	[0.207]	[0.205]	[0.023]**	[0.048]	[0.047]
Ownership x Structural Change						
Domestic Private	0.024		0.023	-0.005		-0.005
	[0.022]		[0.022]	[0.004]		[0.004]
Foreign by Acquisition	0.005		-0.003	-0.004		-0.003
	[0.020]		[0.021]	[0.003]		[0.003]
Ownership x Time x Structural Change						
Domestic Private		0.011	0.011		-0.002	-0.002
		[0.005]**	[0.005]**		[0.001]*	[0.001]*
Foreign by Acquisition		0.018	0.020		-0.003	-0.003
		[0.008]**	[0.007]***		[0.002]**	[0.001]**
Foreign Greenfield		0.011	0.011		-0.003	-0.003
		[0.005]*	[0.005]**		[0.001]**	[0.001]**
Observations	1132	1132	1132	1132	1132	1132
Number of banks	221	221	221	221	221	221
R-squared	0.09	0.09	0.09	0.10	0.10	0.10

Notes *ROA* is Return on Assets. *Exp / Inc* is Operating Expenditure / Operating Income. All equations are estimated in first differences. Ownership is defined as a dummy that equals 1 if a specific type of owner has control of a bank. The omitted ownership category is state-ownership. The *Ownership x Time* trends are defined as the ownership dummy the number of years since the latest change in ownership. Structural Change is measured as the average annual percentage-point changes in industry shares of workers between 1995 and 1998 (depending on the years available in the data, which come from the ILO).All regressions include the controls reported in table 2 as well as country and year fixed effects. Robust standard errors, clustered by bank, in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.11: Ownership and ROA: Low vs. High Structural Change

	Δexport shares (industry)		Δexport shares (country)		Δfirm shares (industry)		Δemployment shares (industry)		Δoutput shares (industry)		Δinvestment shares (industry)	
	low Δ	high Δ	low Δ	high Δ	low Δ	high Δ	low Δ	high Δ	low Δ	high Δ	low Δ	high Δ
Ownership												
Domestic Private	0.148	0.433	0.351	0.500	1.309	-0.613	0.089	0.598	-0.670	0.799	0.908	0.482
	[0.593]	[1.107]	[0.541]	[0.845]	[0.874]	[1.067]	[0.652]	[0.867]	[1.363]	[0.879]	[1.338]	[0.847]
Foreign by Acquisition	-0.617	-1.032	-0.068	-1.448	-0.072	-2.015	-0.724	-0.737	-1.014	-0.696	-0.142	-1.555
	[0.706]	[0.816]	[0.531]	[0.772]*	[0.756]	[1.257]	[0.704]	[0.759]	[1.628]	[0.763]	[1.097]	[1.059]
Ownership x Time												
Domestic Private	0.124	0.226	0.106	0.205	0.138	-0.001	0.081	0.208	0.209	0.079	0.083	0.003
	[0.101]	[0.147]	[0.099]	[0.144]	[0.150]	[0.206]	[0.118]	[0.116]*	[0.204]	[0.144]	[0.155]	[0.179]
Foreign by Acquisition	0.316	0.491	0.215	0.544	0.425	0.248	0.304	0.548	0.182	0.506	0.392	0.593
	[0.145]**	[0.264]*	[0.134]	[0.262]**	[0.235]*	[0.297]	[0.183]*	[0.213]**	[0.257]	[0.228]**	[0.280]	[0.301]*
Foreign Greenfield	0.190	0.153	0.156	0.161	0.168	0.021	0.194	0.235	0.035	0.180	0.145	0.128
	[0.109]*	[0.217]	[0.112]	[0.188]	[0.162]	[0.236]	[0.147]	[0.144]	[0.243]	[0.160]	[0.176]	[0.188]
Observations	756	432	678	510	474	291	565	623	350	530	378	257
Number of banks	152	79	138	93	94	53	111	120	65	104	79	46
R-squared	0.06	0.16	0.07	0.13	0.10	0.20	0.07	0.15	0.20	0.09	0.10	0.11

Notes *ROA* is Return on Assets. *Exp / Inc* is Operating Expenditure / Operating Income. All equations are estimated in first differences. Ownership is defined as a dummy that equals 1 if a specific type of owner has control of a bank. The omitted ownership category is state-ownership. The *Ownership x Time* trends are defined as the ownership dummy the number of years since the latest change in ownership. Countries with high structural change (high Δ) are those countries where a given measure of structural change is above the median, countries with low structural change are all others. The measures of Structural Change reflect the change in industry shares of exports, the total number of firms in a country, employment, output or value added (see Table A2). All variables are calculated as average change in the percentage share of 3-digit industries in a country's economy over the two to three years before 1998 (employment shares are based on 2-digit industries). All regressions include the controls reported in table 4 as well as country and year fixed effects. Robust standard errors, clustered by bank, in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.12: Ownership and ROA: Low vs. High Structural Change

Measure of Structural Change:	Δ Economic Freedom (Heritage)		Δ Creditor Rights (HPV)		Δ Collateral Regime (HPV)	
	low Δ	high Δ	low Δ	high Δ	low Δ	high Δ
Ownership						
Domestic Private	0.774	0.112	0.550	0.241	0.293	0.473
	[0.896]	[0.741]	[0.838]	[0.633]	[0.708]	[0.830]
Foreign by Acquisition	-0.462	-0.761	-0.879	-0.879	-0.514	-0.749
	[0.946]	[0.596]	[1.439]	[0.550]	[0.682]	[0.759]
Ownership x Time						
Domestic Private	0.020	0.225	0.195	0.060	0.174	0.058
	[0.150]	[0.099]**	[0.135]	[0.091]	[0.100]*	[0.125]
Foreign by Acquisition	0.271	0.539	0.582	0.338	0.503	0.329
	[0.181]	[0.230]**	[0.331]*	[0.157]**	[0.233]**	[0.160]**
Foreign Greenfield	0.179	0.091	0.292	0.131	0.156	0.223
	[0.143]	[0.156]	[0.208]	[0.120]	[0.148]	[0.145]
Observations	571	617	257	931	569	619
Number of banks	112	119	49	182	114	117
R-squared	0.09	0.10	0.05	0.10	0.05	0.19

Notes *ROA* is Return on Assets. *Exp / Inc* is Operating Expenditure / Operating Income. All equations are estimated in first differences. Ownership is defined as a dummy that equals 1 if a specific type of owner has control of a bank. The omitted ownership category is state-ownership. The *Ownership x Time* trends are defined as the ownership dummy the number of years since the latest change in ownership. Countries with high structural change (high Δ) are those countries where a given measure of structural change is above the median, countries with low structural change are all others. The measures of Structural Change reflect the change in the year immediately preceding 1998 in: the Economic Freedom Score and the Property Rights Score from the Heritage Foundation Index of Economic Freedom, the Creditor Rights Index and the Index for the Collateral Regime from Haselmann, Pistor and Vig (2006) All regressions include the controls reported in table 4 as well as country and year fixed effects. Robust standard errors, clustered by bank, in brackets. * significant at 10%, ** significant at 5%, *** significant at 1%

Table 4.13: Clusters by Country and by Ownership

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Slovenia
Cluster 1												
Observations		62	21	47	5	25	64	15	31	67	35	16
Of which:	Domestic Private	9	12	12	5	12	56	15	13	15	4	1
	State	20	5	8	0	6	5	0	6	16	6	13
	Privatizations	4	2	4	0	0	0	0	2	2	4	0
	Foreign-owned	20	4	24	0	5	3	0	7	10	13	0
	Foreign acquisitions	6	2	5	0	1	1	0	3	5	4	0
	Foreign Greenfield	13	0	3	0	2	0	0	5	26	12	2
Cluster 2												
Observations		23	78	17	14	58	21	5	50	15	18	29
Of which:	Domestic Private	4	31	1	0	11	8	0	8	0	3	13
	State	1	15	2	4	0	0	0	0	1	7	1
	Privatizations	0	0	0	2	0	0	0	0	0	0	0
	Foreign-owned	5	11	1	10	12	8	5	15	1	0	6
	Foreign acquisitions	0	1	0	2	0	1	0	3	0	0	0
	Foreign Greenfield	13	21	13	0	35	5	0	27	13	8	9

Continued next page

Table 4.13: Clusters by Country and by Ownership (continued)

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Latvia	Lithuania	Poland	Romania	Slovakia	Slovenia
Cluster 3												
Observations		20	16	51	7	25	10	3	80	22	15	6
Of which:	Domestic Private	6	2	8	4	1	6	3	22	3	2	1
	State	5	5	5	0	0	0	0	5	1	4	0
	Privatizations	0	0	0	0	0	0	0	0	0	1	0
	Foreign-owned	3	5	3	0	5	1	0	7	4	2	1
	Foreign acquisitions	1	1	1	0	0	0	0	1	0	1	0
	Foreign Greenfield	6	4	35	3	19	3	0	46	14	7	4
Cluster 4												
Observations		56	121	27	17	37	18	43	114	65	27	97
Of which:	Domestic Private	26	72	1	8	12	7	29	41	21	3	50
	State	9	19	11	1	1	3	8	9	6	3	38
	Privatizations	2	4	1	0	2	0	2	1	4	1	3
	Foreign-owned	14	25	5	8	16	8	6	48	16	13	8
	Foreign acquisitions	1	7	1	1	3	0	3	7	3	3	3
	Foreign Greenfield	7	5	10	0	8	0	0	16	22	8	1

Notes Clusters are formed using k-medians clustering on the basis of deposits, loans, fixed assets, personnel expenses and fee / commission income to total assets (see text for a discussion of the clustering procedure)

Table 4.14: Summary of Key variables

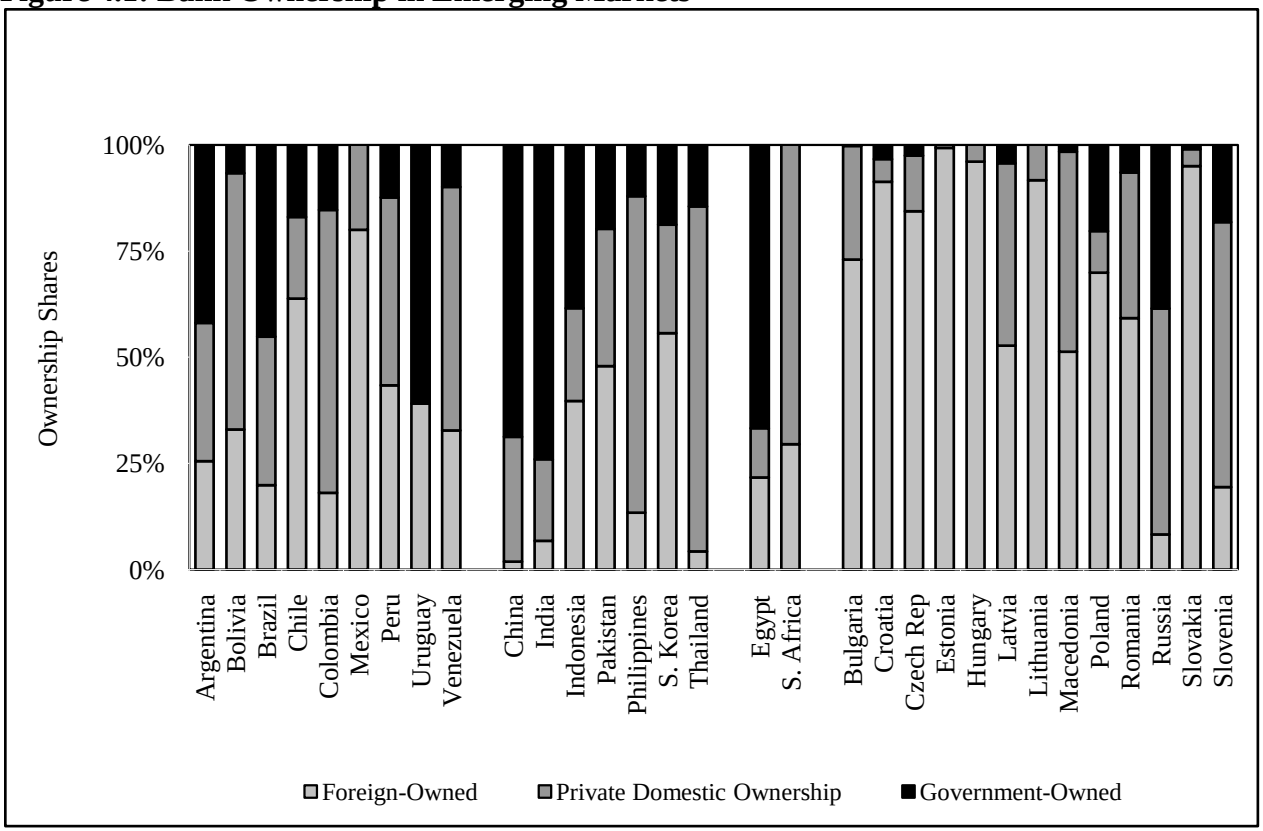
A: baseline model	Observations	Mean	Standard Deviation
Return on Assets (%)	1631	0.907	2.435
Expenditure-to-income ratio (%)	1630	0.854	0.528
GDP per Capita (USD)	1631	4965	2548
GDP Growth (Real, %)	1631	4.08	2.75
Producer Prices (Annual % Change)	1631	15.60	83.18
Lending Interest Rate	1458	13.47	13.38
Transition Indicator (Bank Reform)	1631	3.26	0.42

B: Structural Change Indicators

country	Employment Shares	Export Shares (Industry)	Export Shares (Country)	Firms (Industry)	Output (Industry)	Investment (Industry)	Economic Freedom	Creditor Rights	Collateral Regime
Bulgaria	9.6%	39.1%	26.3%	7.5%	13.0%	52.1%	-3	2	2
Croatia	19.8%	24.9%	12.4%				4	2	0
Czech Republic	25.7%	20.1%	9.5%	9.7%	11.6%	23.3%	0	0	0
Estonia	89.6%	36.9%	15.4%	7.5%	11.7%		7	2	2
Hungary	33.4%	26.8%	13.3%		10.7%		0	2	2
Latvia	35.9%	41.1%	22.2%	9.3%	11.5%		8	1	0
Lithuania		33.4%	21.6%	16.9%	15.0%	60.7%	10	2	2
Poland	39.9%	20.9%	13.4%	7.6%	21.4%	30.4%	1	0	0
Romania	49.4%	29.5%	17.9%	7.2%	12.4%	14.0%	8	2	0
Slovakia	43.9%	25.4%	14.8%	11.3%	11.4%	34.3%	0	0	0
Slovenia	58.5%	17.2%	10.5%				10	0	0

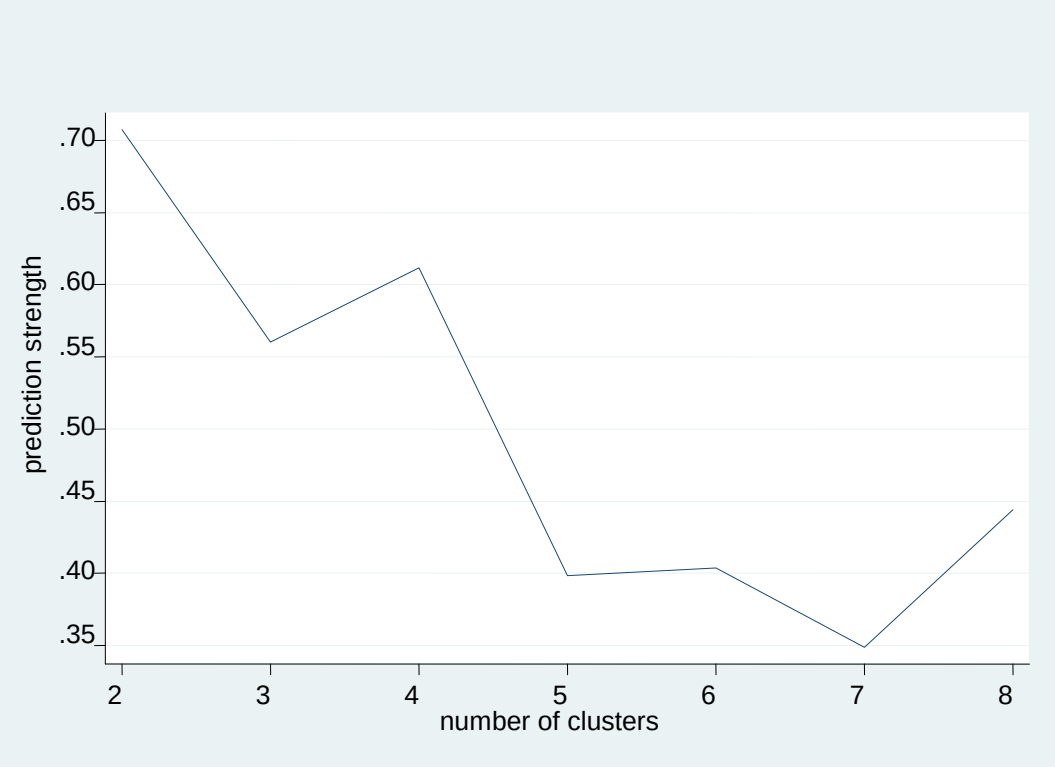
Notes Return on Assets and the Expenditure-to-Income ratio are from *Bankscope*. The Economy level controls (GDP per capita, GDP growth Propducer Prices, Lending Interest and the Transition Indicator for Bank reform are all from the Economist Intelligence Unit (except for the transition indicator which is from the EBRD). The indicators of structural change are measured at the country level. The industry (and country) shares of employment, exports, firms, investments and outputs are calculated as the absolute value of changes in the industry shares of each of the variables over the years 1995 to 1998. Employment shares are calculated from ILO data, the export shares from the Feenstra / NBER data and the firm, output and investment shares from the UNIDO Industrial Statistics Database. Changes in the Heritage Foundation's index of economic freedom reflect changes over the 1996 to 1998 period (higher score is more freedom). The indicators for creditor rights and the collateral regime are from Haselmann, Pistor and Vig (2006). The numbers in the table reflect increases in the scores over the period 1994 to 1997.

Figure 4.1: Bank Ownership in Emerging Markets



Source: World Bank Survey of Bank Regulation and Supervision. http://go.worldbank.org/SCH5XTN5U0

Figure 4.2: Clusters and Prediction Strength (k-medians clustering)



Notes See text and Appendix 1

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CHAPTER 5
CONCLUSION

The papers in my dissertation describe structural economic change in emerging markets as a process that makes a portion of the know-how of banks obsolete. This creates an opening for the acquisition of banks by foreign owners from advanced economies that can provide emerging market banks with access to knowledge that is relevant to rebuilding their operations. The papers provide empirical evidence describing this process form inside a bank as well as at the market level and develop a dynamic theoretical framework to study the access-to-knowledge motivation for foreign acquisition of banks in relation to structural economic change in the host country.

While this dissertation was being written, in 2008 and 2009, the global economy and in particular the banking sector in the advanced economies suffered a major crisis. Emerging markets, including those in the CEE region were not spared the fallout. However, the pain was concentrated in countries that were known to be vulnerable such as Hungary and Ukraine.

By way of conclusion, I would like to briefly address three questions that arise at the intersection of my research and the current global economic crisis.

First, what do recent events tell us about the argument underlying my work that structural change reduces the value of existing knowledge and creates the need for new know-how? Focusing just on the mortgage crisis in the US, there are obviously multiple explanations. However, the failure of banks to correctly evaluate risk in a changing

market environment is certainly part of the story. In the popular press, deregulation of the banking sector in the form of the 1999 Gramm-Leach-Bliley act, which eliminated many barriers between investment banking, insurance and commercial banking, has been mentioned as a cause for the crisis However, the first banks to get in trouble were classic investment banks that were not directly affected by this piece of deregulation (e.g. Leonhardt, 2008). More detailed and more direct evidence for the way in which institutional changes made existing knowledge obsolete and how banks failed to respond properly comes from two recent papers on mortgage defaults and pricing and the rise in securitization of mortgages. In one, the authors show that models of mortgage defaults based on credit histories in a period with low levels of securitization severely underestimate default risk in a period with high securitization (Rajan, Seru and Vig, 2008). The second paper shows that banks failed to properly price the risks of subprime loans, at least until house prices started to fall (Demyanyk and Van Hemert, forthcoming). These findings are directly related to the approach to structural change and depreciation of knowledge underlying my research.

Second, if banks from advanced economies failed so dramatically, what justifies the assumption that they can provide useful knowledge to banks in emerging markets? To begin with, note that the type of knowledge that the owner of the bank in chapter 2 is providing to its CEE subsidiary is related to banking operations that have been standard in Western Europe and in the US, but with which local managers were unfamiliar. Moreover, in the US as well as in Europe, banks have incurred losses on their investment portfolios, while retail banking operations have been remarkably resilient (Economist, 2009). This supports the assumption that the foreign owners of banks in emerging

markets have know-how that is relevant for strengthening the operations of their subsidiaries.

That being said, the news is not all good. Particularly worrying is the fact that banks, including foreign-owned banks such as subsidiaries of the Austrian Raifeissen bank, engaged in Swiss Franc and Euro-denominated mortgage lending. Considering the lessons from the 1997 Asia crisis banks should have known better, especially in countries that were known to be fragile, such as Hungary. At the very least this suggests that it would be useful to review how we can further refine hypotheses about which banks are likely to be capable of successfully transferring knowledge and managing foreign subsidiaries. A first step in this direction would be to analyze which banks in emerging markets have done well throughout the crisis and what role was played by their owners.

This brings us to the third question with regard to the relationship between the papers in this dissertation and the 2008/9 financial crisis: how should the crisis inform future research on foreign entry into banking? In addition to an analysis of which banks have done well and why, two lines of research would seem to be interesting. To begin with, it is not unlikely that Western European and American banks will seek to sell some of their subsidiaries in emerging markets in an effort to raise capital. Research into the post-sale performance of these banks would give us further insight into the nature of the relationship between foreign owner and subsidiary and the role of knowledge transfer. In particular, if subsidiaries derive benefits from being part of a larger multinational group, we should see that their performance suffers if they are sold to domestic owners. On the other hand, if foreign owners merely transfer a body of knowledge that can then be applied and adapted by local managers, there may be limited benefits to sustained foreign

ownership (Tschoegl, 2005). Along similar lines it would be useful to see how foreign-owned banks perform in countries that experience sustained turmoil (Hungary, Ukraine, Argentina) as compared to in countries in which, after a period of serious structural change, the dust settles and a more stable regulatory and economic regime emerges (Poland, Brazil or South Korea – as of the time of writing). This would also give insight into the relative importance of the governance role of foreign owners (more important in times of turmoil) as compared to their role as knowledge providers.

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