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HRM Polices and Performance: Insider Econometrics in a Multi-Unit Firm

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CROATIAN NATIONAL BANK

HRM POLICIES AND PERFORMANCE: INSIDER ECONOMETRICS IN A MULTI-UNIT FIRM[1]

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Abstract

We use an insider econometrics approach to analyze the impact of modernization of human resource management (HRM) policies on performance of a foreign-owned bank in Central-East Europe. Building on our knowledge of the policy adoption process and the fact that our data comprise the entire population of branches, we present a new strategy to identify our econometric model in the presence of endogeneity in the implementation of reforms – a major issue in insider econometrics. The reforms comprise the introduction of a new functional structure with differentiated incentives across functions. We conclude that the reforms have raised "sales" productivity (of loans and deposits) but had mixed benefits for the quality of sales in terms of product mix and profitability. While the bank has avoided a deterioration of loan-quality, our results underscore the risks of quantity-based incentives and the problems associated with differentiation in incentives among co-workers where quality is an important consideration.

Keywords: Insider Econometrics, Incentives, Foreign Ownership, Banking, Central and Eastern Europe,

JEL Classification: F23, G21, M52

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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, & Carlin, 1997, Grosfeld & Roland, 1997). In view of the importance of firm survival and competitiveness, several literatures aim 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 the introduction of modern human resource management (HRM) practices (Ichniowski & Shaw, 2003, Ichniowski & Shaw, forthcoming). Typically, insider econometric studies examine the effectiveness of the so-called "high-performance work practices." They often find that high-performance work practices enhance productivity, although they do not necessarily improve profitability (Cappelli & Neumark, 2001). In addition, it has been argued and found that various practices are complementary to each other (Ichniowski, Shaw, & Prennushi, 1997, Macduffie, 1995, Milgrom & Roberts, 1995) or to other organizational characteristics such as the use of Information Technology (Bartel, Ichniowski, & Shaw, 2007, Bresnahan, Brynjolfsson, & Hitt, Brynjolfsson & Hitt).

An important stream of the literature has found that performance incentives improve worker performance (Lazear, 2000) and that concerns about free riding in teams (Alchian & Demsetz, 1972) may be overstated as team-based incentives are surprisingly effective (Hamilton, Nickerson, & Owan, 2003, Hansen, 1997, Wageman, 1995). So far, this literature has studied workers with relatively homogeneous tasks, the outcome of which is measurable. We extend the literature by studying teams (bank branches) in which tasks are heterogeneous and have differentiated outputs that cannot be perfectly distinguished. This situation is common in manufacturing or organizations that combine sales and services, and it is difficult in both theory and practice to design optimal compensation schemes for these circumstances (e.g. Besanko, Regibeau, & 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 (Djankov & Murrell, 2002, Filatotchev, Wright, Uhlenbruck, Tihanyi, & Hoskisson, 2003, Meyer & Estrin, 2001). 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, & Wachtel, 2005a, Bonin, Hasan, & Wachtel, 2005b, Fries & Taci, 2005, Yildirim & Philippatos, 2007) as well as in other sectors (see Hanousek, Kocenda, & Svejnar, 2009 for a survey).

With some caveats (Lanine & Vander Vennet, 2007, Poghosyan & Borovicka, 2006) the literature has generally concluded that foreign ownership is associated with better performance of banks in the CEE region. Several papers study the factors underlying performance improvements more closely, considering corporate governance (Majnoni, Shankar, & Varhegyi, 2003), financial relationships between CEE banks and their foreign parents (De Haas & Naaborg, 2006) or improvements in management (Abarbanell & Bonin, 1997, Tóth, 2007).

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. There are several insider econometric studies looking at the efficacy of HRM policies in banking (Bartel, 2004, Bartel, Freeman, Ichniowski, & Kleiner, 2003, Jones, Kalmi, & Kauhanen, 2008) or more specifically at the role of incentives for lending (Agarwal & Wang, 2009). However, 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 strategic behavior by branch managers in a Polish bank (Frank & Obloj, 2009). The authors find that managers game the bank's incentive system by adjusting loan conditions to meet sales targets and that managers become better at gaming the system over time. However, Frank and Obloj do not discuss the internal organization of branches, which is the focus of our paper.[2]

An important issue in the insider econometrics literature is the potential endogeneity of HRM and other policy reforms. It usually arises as a result of heterogeneity in the marginal benefits of the adoption of these reforms (Athey & Stern, 1998, Ichniowski, et al., 1997) and the approach to tackling this issue has been context-specific. For example, Ichniowski et al. (1997) make a claim that the implementation of modern HRM practices in their sample is affected by heterogeneity in the cost but not the

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[2] Chan, Li and Pierce (2009) use an insider econometrics approach to study peer effects in a Chinese department store.

benefits of adoption across firms. Hence, unobserved heterogeneity does not bias the estimates of the benefits of adoption. Other studies either do not address the issue of endogeneity of reforms or do so by using fixed effects or first-difference estimation.[3] In this paper, we exploit a unique feature of our data, namely that it comprises the entire population of branches potentially eligible for the reforms and that the decision to implement the reforms is made over time at the level of the bank headquarters rather than in the individual branches. For each branch at a given point in time we hence use the extent of 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 a common exogenous shock instigates the adoption of HRM practices in a set of organizational units (without leading to adoption in all units at the same time). Following such a shock, adoption of the reforms by other units is informative about the likelihood the reforms will be adopted in a particular unit, but is uncorrelated with unobserved unit-specific factors that affect adoption. Hence, the adoption of practices in other units is a valid instrument for adoption in a particular unit.

Since we use the extent of reform carried out in similar branches to instrument the extent of reforms in any given branch, the identification strategy underlying our instrumental variables estimator is similar in spirit to propensity score matching. To test the robustness of our result we also implement a difference-in-difference estimator that uses the generalized propensity score to control for any bias due to differences between "treated" and "non-treated" branches (Hirano & Imbens, 2004, Imai & van Dyk, 2004).

[3] As we discuss in section 4, fixed effects (mean-difference) or first-difference estimation is generally insufficient to address this endogeneity of HRM practices.

The results are very similar and provide us with additional insight into the impact of the reforms on branch performance over time.

We find that giving a subset of branch employees ("bankers" and "advisors") high-powered incentives has had a positive impact on the volume of sales of loans and deposits, especially in larger branches. However, increasing the share of these employees eventually has decreasing or even negative marginal returns. The bank expected the employees with high-powered incentives to sell high-quality products in addition to selling more, but the evidence is mixed with regard to the impact of the reforms on quality in terms of product mix and profitability. Profitability did not improve when the bank introduced bankers, but only when it introduced advisors, who have individualized, but more moderate incentives than the bankers.

Using a simple model of employee behavior under the new incentive structure, we show that our results are consistent with the existence of free riding in large branches. In addition, we show that the lack of clear improvements in the quality of sales is consistent with the presence of collusion between branch employees to represent loans made by non-incentivized employees as loans made by the incentivized bankers. Such collusion raises the total bonus revenue for a branch. Collusion becomes more difficult with the arrival of advisors who, like bankers, have an incentive to represent other employees' sales as their own sales, but do not have the same ability as bankers to "bribe" other employees into colluding.

In pointing to the efficacy of high-powered incentives our results provide specific evidence of the positive impact of organizational reforms on the performance of foreign-owned banks in the CEE region. Sales volume has increased due to differentiation, especially in large branches. At the same time, our results point to the risks associated with differentiation in incentives and quantity-based incentives where quality is important (Agarwal & Wang, 2009, Baker, 2002). We also show that these risks are mitigated by introducing intermediate levels of incentives and that in our context a pure team system or a purely individual system may not be optimal.

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 discuss the results 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 (Berglof & Bolton, 2002, Buch, 1997) . 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 weighted by assets and essentially control universal banking.

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. 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.

We have access to quarterly branch-level balance sheets and profit and loss accounts covering the five-year period from 2003 to 2007. The data include a quarterly overview of staff for each branch, broken down by functions. The objective of the branches is to maximize "sales" of deposits, loans and insurance products to retail and SME clients. 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 intake of deposits – 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 first few years of post-privatization reforms were focused on rationalization and on improving internal controls and governance, and organizational innovation at the branch-level was hence limited.

Our data start at the beginning of the second phase of reforms in 2003, when management sought to transform the branch network into a true sales network. In 2003, most branches had a branch manager, employees with a focus on SME clients and employees serving retail clients (the left panel of Figure 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 their day-to-day activities.

The lack of stratification in the branch organization 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 and that branch employees had insufficient 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 2005 the bank introduced the “advisor” function. As with the introduction of 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 1). They focus on all clients but a limited set of products such as mortgage loans or sophisticated savings products. Table 1 summarizes the changes in the organizational structure of the branches. The number of bankers per employee rose quickly in 2003-2004 and then stabilized. The same pattern is observed with respect to the number of advisors per employee in 2005 and 2006. Panel B shows that the bankers and advisors were primarily assigned to large branches. Finally, Panel C shows that the presence of bankers and advisors is associated with higher growth in loans outstanding per employee and with higher profit per employee, but not necessarily with higher deposits per employee. [4]

Bonus System

The structure of the bonus system that applies to all regular employees depicted in Figure 2, is relatively straightforward. 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 for regular employees if the average performance of the branch is below 70 percent. The reward for meeting the 70 percent threshold is 10 percent of base salary. Above this level of performance, the bonus is a positive, continuous function of plan fulfillment up to an upper limit. Hence, employees for instance receive a bonus of 16 percent of base salary if branch performance is according to plan (100 percent) and 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. Their bonus curve is steeper and leads to a maximum bonus of 75 percent of their base salary.[5] Bonuses for members of the bankers' teams (assistants and team managers) are also based on the performance of their bankers.

[4] "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.

[5] In the final year, retail bankers had an 80/20 ratio

Branch managers are rewarded for performance on a mix of branch level and individual targets that can differ per branch.[6] Over time, emphasis on individual targets has replaced 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 (Frank & Obloj, 2009, Murphy, 2000, Weitzman, 1980). The sales performance of any individual branch has only limited impact on the central tendency in the regression line that establishes future sales targets. This means that low performance in the current period leads to an immediate drop in bonuses, but not to lower future lending targets.[7]

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 standards with regard to quality of services such as client friendliness and response to phone and email inquiries. If they failed to meet the standards, bonuses were cut by 50 percent (almost all branches met the standard).

Skills Improvement

In our empirical analysis we also evaluate the impact of the Leadership Academy for branch managers, an executive education program rolled out in 2006. The objective of

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[6] We do not have information on these objectives, or on any individual bonuses for that matter.

[7] 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.

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. 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. These programs were implemented in a short period of time and their effect is captured in the time fixed effects that we use.

3. Evaluating the Impact of the Reforms

The objective of our econometric analysis is to assess whether the reforms work. The bank's management appears to be fairly confident that they do. According to the people we interviewed, the bankers and advisors generally perform well and book a significant portion of sales at the branches. That being said, the bank reduced the number of advisor positions in the smaller branches in 2007 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, the banker-advisor system de-emphasizes profits and is more individualized, and in terms of the principal-agent model it introduces a stronger relationship between effort and the signal (sales) that is used to determine the bonus. Second, the incentive structure is aligned with the view that bankers and advisors should focus on making sales, while administrative staff and cashiers are multitaskers who make sales but also engage in support services (Besanko, et al., 2005, Holmstrom & Milgrom, 1991). Third, the stratification and improved delineation of function profiles enables the bank to improve matching of employees to jobs.

The new organizational structure and bonus system also carry with them a number of potential drawbacks. In particular, the system strongly emphasizes quantity over quality and thus relies on internal controls for quality assurance. The trade-off between quality and quantity is an issue in banking in general (Baker, 2002) and the fact that banker and advisors who are expected to make high quality (and high profit) sales work in the same unit with cashiers makes it more pointed. In particular, a loan made by a banker or an advisor generates more bonus revenue to the branch as a whole than the same loan made by a cashier. As a result, if side payments are possible, it is in the interest of branch employees to collude in order to pretend that most sales have been made by bankers or advisors, misrepresenting both the quality of sales and the distribution of effort expended in making them (Laffont & Rochet, 1996, Tirole, 1986).

Two pieces of evidence from the empirical literature on team-based incentives suggest that the standard principal-agent model overstates the benefits of high-powered individual incentives. First, Hansen (1997) and Hamilton et al. (2003) find that free riding in teams is much less of a problem than one might expect. Several other authors come to similar findings and attribute the efficacy of team-based incentives to peer-pressure among team members well (see Batt, 1999, Kandel & Lazear, 1992, Knez & Simester, 2001). Second, 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. The poor performance of hybrid systems appears to be related to poor coordination among team members.

However, the aforementioned papers study teams with homogenous tasks rather than teams in which some tasks (such as sales effort by bankers) are more important for the bottom line than other tasks. Besanko et al. (2005) argue that a "functional" organization becomes more desirable if one function (e.g., sales) makes a higher marginal contribution to performance than another (e.g., support services) and if certain activities focused on one product generate externalities to another (e.g., cashiers service both retail and SME customers and support performance in both product segments).

In sum, the empirical and theoretical literature provides insight into the mechanisms through which the introduction of bankers and a new bonus system may have affected sales performance, but does not provide us with a clear set of guiding hypotheses. In what follows, we first present our empirical analysis of the impact of organizational changes on branch performance. Subsequently, we introduce a simple model that rationalizes key results in the context of the relationship between a principal and multiple agents who may collude.

4. Empirical Strategy

The correlations in Table 1 are suggestive of a relationship between the reforms and performance, but they do not control for other observable or unobservable factors that may affect branch performance.

To assess the impact of the reforms more carefully, 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 to measuring the output of banks, which assumes that both loans and deposits are outputs (Berger, Hanweck, & Humphrey, 1987) .[8]

Our data on lending and deposit taking comes from quarterly branch balance sheets. At the end of each quarter, footing is equal to the stock of outstanding loans and deposits in the previous quarter minus 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:

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

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. In our baseline specification, the measure of branch-level reforms in Z_{ijt} is the number of bankers and advisors per employee plus a dummy variable that equals 1 when a branch manager has participated in the Leadership Academy and 0 otherwise. We use the number of employees to control for branch size and in some specifications we also include operational expenses. These expenses include personnel costs, marketing expenses and the cost of the branch office. Finally, we control for time and location with region x quarter x year fixed effects as well as two dummies indicating the size of the

[8] 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 & 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.

municipality in which a bank is located (population between 50,000 and 100,000, or population > 100,000; the capital, which is the largest city of the country, is treated as a separate region).

Estimation of equation (1) poses two problems: (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). [9] Preliminary estimates of our model (Table A1) reveal that OLS and FE estimates of α are quite similar – the biases are relatively small – and that the estimated value of α is close to 1. This implies 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.[10] To ascertain that α is indeed 1, we also estimate the model with the Arellano-Bond difference GMM estimator, which is not subject to the bias that is inherent in OLS and FE (Arellano & 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 A1 are again close to and not significantly different from 1.[11]

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

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

[11] 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 & 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 $\alpha = 1$.

Overall, these results do not allow us to reject the hypothesis that α is equal to 1. In what follows, we therefore impose this assumption and use ΔY_{ijt} as the dependent variable.

Endogeneity of Reforms and Identification

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 insider econometrics studies use fixed effects estimation to control for unobserved heterogeneity (e.g. Bartel, 2004, Huselid & Becker, 1996, Ichniowski, et al., 1997, Jones, et al., 2008, Jones, Kalmi, & Kauhanen, 2006). 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:

$$\Delta Y_{ijt} = \alpha + \beta x_{ijt} + \mu_{ij} + v_{ij} x_{ijt} + \omega_{ijt} \tag{2}$$

Equation (2) 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.[12]

[12] 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}

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. Hamilton et al. (2003) find that the effectiveness of teams can be attributed in part to the fact that more productive workers are more likely to join teams. These findings enrich our understanding of the origins of productivity improvements, but the selection effects also introduce endogeneity bias.

In general, the collection of data from a narrowly defined production process contributes to the elimination or reduction of the selection bias (Ichniowski & Shaw, 2003). Beyond that, the most appropriate approach to dealing with endogeneity bias is context specific. For example, 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 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.

We advance the literature in this area by implementing two approaches: (i) 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 and (ii) a generalized propensity score matching approach. Starting with the former, note that in many insider econometric studies the level at which the "treatment" is implemented is also the level at which

– $x_{ij,\, t-1}$. This is true even if units with the lowest v_{ij} are laggards with regard to the implementation of the reform.

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 on 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} (the branch-specific contribution of x to productivity) and we can use information about the implementation of reforms in these branches as instruments (see Hausman, 1997, Hausman & Taylor, 1981 and application in , Nevo, 2001, Shirley & 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 class (see Table A1 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 of each 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.

In our final estimating equation, we divide all variables by *FTE* (the number of employees in a branch) to facilitate the interpretation of the results in terms of sales per employee and we control for any returns to scale by including *FTE* as a control variable (in some specifications, we also include operational expenditures as a control). Finally, we allow for non-linearities in the impact of reforms by including squared terms and interactions as appropriate:[13]

$$\begin{aligned}\frac{\Delta Y_{ijt}}{FTE_{ijt}} &= \gamma + \beta_1 FTE_{ijt} + \beta_2 FTE_{ijt}^2 + \theta_1 \frac{(Bankers + Advisors)_{ijt}}{FTE_{ijt}} \\ &+ \theta_2 \left(\frac{(Bankers + Advisors)_{ijt}}{FTE_{ijt}} \right)^2 + \theta_3 (Bankers + Advisors)_{ijt} \\ &+ \theta_4 Leadership\ Academy_{ijt} + city_{ij} + region_j \times period_t + \varepsilon_{ijt}\end{aligned} \tag{3}$$

Our specification differs slightly from the two studies that are most similar to ours (Bartel, 2004, Bartel, et al., 2003), which 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 per employee.[14]

We estimate our models in Stata using standard IV regression or GMM, implemented with the *ivreg2* command (Baum, Schaffer, & Stillman, 2007). In each case, we report Hansen's J-test to show that the instruments can be omitted from the main

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[13] Note that $\frac{Bankers + Advisors}{FTE} \times FTE$ is simply $Bankers + Advisors$.

[14] Estimation of a loglinear specification of the model in Table 2 produces results that are consistent with what we present. However, partially due to multicollinearity, IV estimates of the loglinear model exhibit weak instrument problems.

equation.[15] We also inspect the first-stage regressions to ascertain that our estimates do not suffer from underidentification.

5. Results

In Table 2 we report the estimated coefficients from 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 exclude the squared and interaction terms in equation (3).[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. While the OLS specification suggests (at 10% significance test level) that the effect is positive, the GMM estimates reveal no significant impact of the reforms on performance. In the next three columns, we estimate the full quadratic specification of equation (3)and generate a number of interesting results. Noting that we control for branch-size (in terms of *FTE*), their interpretation is most straightforward if we use *Bankers + Advisors / FTE* (rather than *Bankers + Advisors*) as the measure of branch-level reform. To begin with, the coefficients on *Bankers + Advisors / FTE* and its square suggest a concave relationship between sales per employee and the number of bankers and advisors per employee. In addition, recalling that *Bankers + Advisors* is equal to (*Bankers + Advisors / FTE)* FTE*, the positive coefficient on *Bankers + Advisors* implies that the inflection point of this relationship is higher for large branches than for

[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.

[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.

small branches. This implies that a switch from branch-level to employee-level incentives is more beneficial in large branches, which is consistent with the belief that free riding under group incentives will be more problematic in larger groups (i.e. in large branches, individualized incentives "solve" a bigger problem).

Considering that the marginal contribution of bankers and advisors to sales productivity depends on branch size, we also calculated point estimates of this contribution for each of the branches. According to the GMM estimates in column 5, the marginal contribution is positive and significant (at the 5% level) in well over half of the branches. It is negative and significant in about 20% of the branches that have a relatively high number of bankers and advisors per employee. On average, the marginal contribution is about two standard deviations of the quarterly increase in footing per employee. So overall, the contribution of bankers and advisors to sales productivity is positive, but there are some branches that appear to have too many of them.

The results in columns 7 to 9, which add *Operational Expenses / FTE* as a control variable, are consistent with those in columns 4 to 6. 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 8 and particularly in column 9, where we treat all 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.[17] 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.

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 regions or branches dominates the results.[18] 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, except when we exclude 2003. 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), 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

[17] 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, the difference between the two statistics is distributed $\chi^2(k)$, where *k* is the number of suspected regressors (Hayashi, 2000 pp. 218-220).

[18] 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

sample is large enough to ignore this correlation. Hansen's J-test suggests we can. To provide further assurance on this point, we also estimated our model with the Jackknife Instrumental Variables Estimator (JIVE Angrist, Imbens, & 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* to eliminate correlation between v_{it} and the instrumented variables from the first stage. The results were almost identical to those in Table 2.

In order to assess whether performance improved in all market segments, Table 3 reports GMM 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 when the change in loans per employee is taken as the dependent variable (column 4) are all coefficients insignificant. [19] 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 3 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.

[19] An F-test shows that the coefficients are insignificant jointly as well as individually.

Generalized Propensity Score Matching

Going beyond simple robustness checks, note that our identification strategy – to predict the implementation of reforms in a branch on the basis of information about similar branches – is similar in spirit to propensity score matching (Rosenbaum & Rubin, 1983). Traditional propensity score matching is of course not feasible in our context because our treatment variable (bankers and advisors per employee) is continuous rather than binary. However, Hirano and Imbens (2004) and Imai and Van Dyk (2004) have developed a generalized propensity score that lends itself to the estimation of treatment effects for continuous treatments. We implement this approach in Table 4 and 5. In contrast to the IV estimator, matching estimators are based on a before/after comparison and we split the sample into two periods. The first covers the introduction of the banker positions and the second period covers the arrival of the advisors in the branches (Figure 3). For the first period, we estimate the propensity for branches to have a certain number of bankers per employee in quarters 7 to 10 on the basis of branch characteristics in quarters 1 to 4 of the sample (quarters 5 and 6 are excluded as we anticipate that bankers and advisors need some time to become fully effective; for further details see Appendix 1). We then estimate the impact of treatment on branch performance, controlling for the propensity scores. The estimates can be interpreted as estimates of causal effects under the identifying assumption that conditional on the propensity score at a given level of treatment, the expected impact of treatment on performance is independent of whether the treatment took place.

For example, the left-most coefficient in Table 4 is a difference-in-difference estimate of the impact of an increase in the number of bankers per employee from zero to

5%.[20] The first difference is that between no treatment and treatment at 5% and the second difference is that between performance in quarters 7 to 10 and performance in quarters 1 to 4.

Despite the fact that the estimates in Table 4 are based on a difference-in-difference specification, the results are very consistent with what we have seen so far. If anything, they are slightly stronger. Average productivity rises until the ratio of bankers to total branch employees is about 40% (at 0.079 the contribution of bankers and advisors is about 1.3 standard deviations of sales per employee in quarters 7 to 10). Table 5 reports the estimates for the second period. The advisor function was phased in during quarters 12 to 16. Hence in this case, we estimate the propensity for treatment and baseline performance in quarters 8 to 11, before the advisor function was introduced, and use performance in quarters 17 to 20 to measure the impact of the advisors. We see that on average, adding the advisor function had a significantly positive effect on productivity. Depending on the number of advisors per employee, the effects even appear to be larger than those in Table 4 (in this case, the range of "treatments" evaluated is capped at 35%, close to the highest proportion of advisors observed in the data). However, there is significant fluctuation across quarters – including or excluding a specific quarter significantly affects the average estimated impact of advisors on sales productivity. One of the causes of these fluctuations is probably the fact that sales targets are set for the year, but bonuses are paid by the quarter. If a branch, or its bankers and advisors oversell their targets in a given quarter, the extra sales count towards the next quarter. So after a

[20] In part because there is significant fluctuation in sales across quarters and in part because the functional structure of the branches does not change very much between the two reform phases (quarters in Figure 3, our data do not support fixed effects IV estimation.

quarter in which branches with 35% advisors had high sales, such as in quarter 17 or 19, the same branches might reduce effort in the following quarter.

The Quality of Sales

While bankers and advisors are primarily incentivized to raise the volume of sales, they are also expected to raise the quality of sales in terms of profitability and product mix. For example, the bank sought to raise sales of mortgages and contractual savings products in the expectation that this would tie clients to the bank long term. When advisors first started in 2005, they were assigned to mortgage sales. In Table 6 (GMM) and Table 7 (generalized propensity score), we investigate whether bankers and advisors indeed contributed to sales quality.

In the first two columns of Table 6, we find no evidence that the presence of bankers and advisors in a branch is associated with higher sales of mortgages. [21] Yet, in Table 7, which reports difference-in-difference estimates of the impact of advisors on mortgage lending, we find a strong positive effect in quarters 17-20 (we do not have data on mortgage and mutual fund sales for quarters 7 to 10). On the other hand, the presence of advisors is also associated with a drop in mutual fund sales in Table 7. The IV estimates for mutual fund sales in Table 6 mimic the results for total sales in Table 2. However, higher sales of mutual funds do not translate into an increase in the share of mutual funds in overall savings and deposits (column 4). Finally, columns 5 and 6 of Table 6 show on average no impact of bankers and advisors on profits. However, the results in Table 7 reveal a negative impact of the bankers and a positive impact of the

[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.

advisors. In both cases, the estimated impact is about a standard deviation of profit per employee in the quarters covered by the estimates.

6. **Discussion**

The overall findings with regard to the impact of bankers and advisors on performance are first that they have contributed positively 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. It was rolled out relatively quickly towards the end of the sample, making identification of any effect difficult.

Second, sales per worker fall with branch size while the impact of bankers and advisors on sales per worker increases with size. This is consistent with the presence of free riding under a system that relies solely on team incentives. At the same time, we find a concave relationship between *Bankers + Advisors / FTE* and sales per employee. Eventually, adding bankers and advisors has a decreasing or even negative impact on sales per employee.

Third, there is at best mixed evidence that bankers and advisors had an impact on the composition of the product portfolio or the profitability of the branches. On the one hand, this is good news: despite the fact that the bonus system primarily rewards volume, loan standards have not been compromised.[22] Also, higher sales volume and market shares were key objectives of the bank's management in the anticipation that profits will

[22] In unreported estimates based on the Generalized Propensity Score, we find that an increase in the share of bankers and advisors causes lower loan-loss provisions (i.e. is associated with lower expected losses).

follow over the medium to longer term.[23] On the other hand, an important reason 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 with the lessons of the multi-tasking principal-agent model in mind. At the same time, the organizational model also has inherent tensions, relating to differentiation of incentives across functions and the focus on quantity as opposed to quality that need to be managed carefully. An important risk is that of collusion between branch employees who have an incentive to represent loans made by cashiers as loans made by bankers or advisors in order to increase the total bonus payments for the branch.

In order to evaluate to what extent our results reflect the theoretical risks and benefits associated with the organizational structure and bonus system in the branches, it is instructive to consider a simple model of the system.

A Simple Model of Incentives

Suppose branches have two types of workers, cashiers (*c*) and bankers (*b*) who sell two types of loans: standard cashier's loans and more valuable banker's loans. Bankers in branch *k*, indexed by *i*, have the following compensation function:

$$w_{bik} = w_{b0} + a_b \min\left[b_b \left(l_{bik} / \overline{l}_{bik} \right), b_b \right] + (1 - a_b) \min\left[b_b \left((L_{ck} + L_{bk}) / (\overline{L_{ck} + L_{bk}}) \right), b_b \right] \quad (4)$$

[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 & Opiela, 2002)

Where w_{bik} is the total wage and w_{b0} the fixed part of it. a_b is the weight given to individual performance. l_{bik} is the volume of banker loans made by an individual banker and $L_{ck} + L_{bk}$ is the total volume of banker's and cashier's loans made by the branch. The maximum compensation for bankers is $w_{b0} + b_b$, which they receive if (i) the individual banker meets his or her individual bonus ceiling $\overline{l_{bik}}$ (see Figure) and (ii) the branch as a whole meets the branch bonus ceiling $(\overline{L_{bk} + L_{ck}})$. If either the banker or the branch as a whole does not reach its ceiling, the bonus depends on performance relative to the ceiling, the bonus coefficient b_b and the weight a_b on individual performance.[24]

The compensation function for the cashiers, indexed by j, is:

$$w_{cjk} = w_{c0} + \min b_c \left[\left((L_{ck} + L_{bk}) \Big/ (\overline{L_{ck} + L_{bk}}) \right), b_c \right] \quad (5)$$

Cashiers' bonuses depend only on total lending by a branch and are never higher than b_c. We assume that banker's loans are more valuable to the bank and that therefore $b_c < b_b$.

Individual sales of loans by bankers are increasing in a banker's own effort (e_{bik}), and in the "service" effort by cashiers (S_{ck}). Individual sales may also depend on lending by other bankers in the branch($L_{b,-ik}$). Given the number of potential banker clients on the local market of a branch, lending by one of its bankers may make it more difficult for its other bankers to find clients.

$$l_{bi} = l_{bi}(e_{bi}; S_c, L_{b,-i}) \quad (6)$$[25]

Similarly, lending by a cashier is a function of his or her own effort and lending by colleagues:

$$l_{cj} = l_{cj}(e_{cj}; L_{c,-j}) \quad (7)$$

[24] For ease of exposition, we assume that branches and bankers meet the threshold for receiving a bonus (70 % of target performance in Figure). Data on performance-to-target for the final two years of our sample period shows that branches generally met this threshold.
[25] As long as it is not confusing, we omit the branch subscript k going forward.

In analyzing the behavior of bankers and cashiers, we make the standard assumptions that all branch-employees engage in Cournot-Nash behavior and that utility is separable in total compensation and the cost of lending effort. For bankers, the cost of effort is convex and for cashiers, the cost of effort is convex in both lending and service effort:

$$\begin{aligned} U_{bi}(w_{bi}, e_{bi}) &= w_b(e_{bi}; L_{b,-i}, L_c, S_c) - c_b(e_{bi}) \\ U_{cj}(w_{cj}, e_{cj}, s_{cj}) &= w_b(e_{bi}; L_b, L_{c,-j}, S_c) - c_b(e_{cj}, s_{cj}) \end{aligned} \tag{8}$$

The optimal choice of effort for both bankers and cashiers depends on whether or not the bonus ceilings bind. If neither the individual, nor the branch-level ceilings bind, the first-order condition for bankers implies that:[26]

$$c_{b,e_{bi}} \big/ l_{b,e_{bi}} = \left[b_b \left(a_b \big/ \overline{l}_{bi} + (1-a_b) \big/ (\overline{L_c + L_b}) \right) \right] \tag{9}$$

The left-hand side of equation (9), represents marginal the cost of effort per dollar of lending. With convex cost and loan-sales that are linear or concave in effort, this is increasing in effort – we assume this is the case. For cashiers we find:

$$\begin{aligned} c_{c,e_{cj}} \big/ l_{c,e_{cj}} &= \left[b_c \big/ (\overline{L_c + L_b}) \right] \\ c_{c,s_{cj}} \Big/ \sum_i l_{bi,s_{cj}} &= \left[b_c \big/ (\overline{L_c + L_b}) \right] \end{aligned} \tag{10}$$

As before, the marginal cost of effort per dollar of lending increases in lending or service effort when cost is convex and sales are linear or concave in effort.

The right-hand sides of conditions (9) and (10) represent the marginal incentive to lend when neither the individual nor the branch level bonus ceilings bind. When either of the ceilings bind, branch employees receive no additional bonus for banker's loans, cashier's loans or both. In that case, the marginal incentives to lend will be lower.

[26] Partial derivatives such as $\partial c_{bi} / \partial e_{bi}$ are written as $c_{b,e_{bi}}$

In large branches, the bonus ceiling $(\overline{L_{bk} + L_{ck}})$ is higher than in small branches, resulting in smaller marginal incentives to lend, especially for cashiers. In our data, we find both that employees are less productive in large branches and that bankers contribute more to productivity in these branches. The latter finding reflects the fact that high values of $(\overline{L_{bk} + L_{ck}})$ increase the difference between the marginal incentives for bankers and the marginal incentives for cashiers such that the difference in productivity between bankers and cashiers is indeed expected to be higher in large branches.

The finding that employees are less productive in large branches is consistent with predictions that team incentives lead to free riding when teams get larger. In our context, there are apparently limits to what team incentives can achieve. Hence, the results in e.g. Hansen (1997) and Hamilton et. al. (2003) might be specific to teams with homogeneous tasks. Alternatively, they may not apply in transition economies where individualized incentives could be important to help develop a more commercial attitude among workers.

Upon further inspection of the first order conditions (9) and (10) there is another point to be made: given the cost of effort, the effectiveness of the incentives in promoting sales depends on β_c and β_b as well as on the number of dollars lent per unit of effort (which is represented by $l_{b,e_{bi}}$, $l_{bi,S_{cj}}$ and $l_{c,e_{cj}}$; the higher these partial derivatives, the more employees lend for each unit of effort). The bank allocates staff to the branches on the basis of expected local lending opportunities. Consequently, $l_{b,e_{bi}}$, $l_{bi,S_{cj}}$ and $l_{c,e_{cj}}$ should be larger at large branches. Our results imply that they are not quite large enough to compensate for the fact that the incentive to expend effort is smaller in large branches than in small ones. It appears that large branches are larger than justified by local lending opportunities. In the same vein, the fact that there are decreasing and eventually negative marginal returns to higher shares of bankers and advisors in total employees implies that branches with a high share do not have sufficient potential clients for these employees or that they do not have enough cashiers to provide the necessary service tasks, which reduces the productivity of bankers and advisors.

Aside from our findings related to branch size and share of bankers and advisors, we found mixed evidence with regard to the impact of the organizational reforms on the quality of lending. One way to interpret this result would be that it was possible to gain business among high value clients, but hard to make a profit due to competition from other banks. However, insofar as we know competition was fiercer in 2006/7 than in 2003/4. In Table 7 we found that profits increased with the arrival of advisors, but not with the arrival of bankers who started in the less competitive environment.

A more intriguing interpretation is that the lack of improvements in the quality of sales is the result of collusion among bankers and other employees to misrepresent part of cashier's loans L_c as banker's loans L_b. As we show in what follows, this interpretation is consistent with the fact that the arrival of advisors had a positive impact on profits. Before we do so, it is important to point out that collusion is not without precedent for the bank. During our interviews we were told that the bank used to work with independent agents who sold loans on commission. At times, the agents would bribe local branch employees to allow them to book a sale to their own account that was about to be made by an employee.

It is not difficult to imagine why it would be difficult for the bank's management to distinguish perfectly between banker's loans and cashier's loans. For example, there is probably a grey area between clients that are typical banker's clients and other clients. Indeed, the bankers tend to work with a number of "prospective banker's clients" – prospective because the bank is unsure whether they fully fit the profile.

Given the amount of lending by a branch, cashiers are indifferent as to how loans are classified while bankers have a strong interest in classifying as many loans as possible as their own as long as they do not reach $\overline{l}_b$. It is likely that cashiers incur a small cost for cooperating with the misrepresentation of loans such that bankers have to pay a small bribe to convince them to cooperate.

We measure the cost of bribery as a fraction *f* of cashier's loans represented as banker's loans. One could think of *f* as the probability that a client leaves while being transferred from a cashier to a banker or as the risk of detection. This friction is especially costly to cashiers because the expected volume of loans sold falls and with it their bonus.

If bribery is a transaction between one cashier and one banker, it is feasible if:

$$a_b b_b \left((1-f)/\overline{l}_{bi}\right) > \left((1-a_b)b_b + b_c\right)\left(f/(\overline{L_c + L_b})\right) \tag{11}$$

The left-hand side of equation (11) is the increase in the individual bonus on banker's loans associated with a one dollar transfer from cashier's to banker's loans. The right-hand side is the loss in bonuses that are associated with branch-level performance. According to equation (11), bribery is more likely to be feasible if a_b and b_b are high and f and b_c are low. If bribery is feasible and f is constant, the extent of misrepresentation of loans is capped only by the bankers' bonus ceilings. Alternatively, f could be an increasing function of the volume of loans transferred. In that case, a gradual increase in *f* would limit bribery. It can be shown that, as long as neither the bankers' ceilings $\overline{l_{bi}}$ nor the branch ceilings $\overline{L_c + L_b}$ are met, the misrepresentation of loans does not affect the marginal incentive to lend for either bankers or cashiers and leaves total effort unaffected. This is consistent with our finding that branches with more bankers make more loans, but do not have higher profits. Finally, note that the arrival of advisors limits the scope for bribery by the bankers. On the one hand, bankers face competition for the "purchase" of cashier's loans when bribes are low. On the other hand, they may have to pay higher bribes to convince advisors to sell their loans (in terms of our model, the arrival of advisors is akin to an increase in b_c). Either way, having advisors limits branches' ability to misrepresent loans, because more employees have an interest in claiming loans as their own. This is a potential explanation for the increase in profits following the introduction of the advisors function.

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 show how one may benefit from collecting data that comprise the entire population of units eligible for a set of reforms to HRM policies, which provides one 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 because the timing of reforms in these other branches is informative. 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, our results underscore the complications of introducing a new functional structure and bonus system in a bank or indeed any other organization. The reforms were partially inspired by the practices at the foreign owner's home institution. To the extent that the system is difficult to manage because of the tension between quantity incentives and quality control and between employees with high and low-powered incentives, our results indicate that the bank and its branch managers may not have been ready for the challenge. 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 & 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.[27]

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

[27] 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.

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 & Naaborg, 2005b) as well as the extent to which banks in the CEE engage with SME and retail clients (De Haas, Ferreira, & Taci, 2007, De Haas & Naaborg).

Table 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

Year	Branches	Employees	retail bankers	SME bankers	advisors	Leadership Academy	Loan Growth / Employee	Dep. Growth / Employee	Profit / Employee
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 1 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 / 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: Sales (ΔFooting/FTE) and Branch Characteristics

	(1) OLS	(2) GMM	(3) GMM	(4) OLS	(5) GMM	(6) GMM	(7) OLS	(8) GMM	(9) GMM
Bankers + Advisors / FTE	0.035	0.021	0.020	0.095	0.452	0.472	0.096	0.364	0.512
	[0.020]*	[0.024]	[0.029]	[0.045]**	[0.137]***	[0.117]***	[0.046]**	[0.148]**	[0.118]***
Bankers + Advisors / FTE squared				-0.194	-1.724	-1.702	-0.185	-1.225	-1.822
				[0.122]	[0.638]***	[0.450]***	[0.125]	[0.682]*	[0.471]***
Bankers + Advisors				0.004	0.018	0.017	0.004	0.010	0.017
				[0.003]	[0.011]	[0.006]***	[0.003]	[0.012]	[0.006]***
Leadership Academy	0.004	0.004	0.003	0.006	0.009	0.012	0.008	0.011	0.014
	[0.006]	[0.006]	[0.006]	[0.006]	[0.008]	[0.008]	[0.006]	[0.008]	[0.008]*
FTE	-0.000	-0.000	0.000	-0.003	-0.005	-0.005	-0.002	-0.003	-0.006
	[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							0.433	0.469	-0.475
							[0.176]**	[0.140]***	[0.523]
Operating Expenses / FTE squared							-0.217	-0.246	0.509
							[0.095]**	[0.078]***	[0.443]
Constant	0.069	0.072	0.071	0.078	0.084	0.076	-0.031	-0.043	0.169
	[0.017]***	[0.016]***	[0.016]***	[0.017]***	[0.020]***	[0.018]***	[0.046]	[0.042]	[0.120]
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		1.172	2.170		0.430	0.290		5.350	6.493
p-value		0.279	0.141		0.512	0.590		0.0689	0.0899

Notes *Footing* is the sum of Loans and Deposits. Δ*Footing /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* and its square (and for *FTE* and *Operational Expenditures* and their interaction in columns 3, 6 and 9) 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 region x quarter x year fixed effects, a dummy that is 1 if the bank originally belonged to the bank that was merged into the main bank (see text) and city/town dummies for branches located in towns with 50,000 to 100,000 people or cities with more than 100,000 people. Robust standard errors, clustered by branch, in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 3: 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	0.211	0.218	0.328	0.183
	[0.082]**	[0.090]**	[0.131]**	[0.075]**
Bankers + Advisors / FTE squared	-0.802	-0.846	-1.200	-0.686
	[0.362]**	[0.412]**	[0.604]**	[0.339]**
Bankers + Advisors	0.008	0.009	0.010	0.007
	[0.006]	[0.007]	[0.011]	[0.006]
Leadership Academy	0.002	0.008	0.004	0.000
	[0.005]	[0.004]*	[0.007]	[0.004]
Observations	3236	3236	3236	3236
Number of Branches	187	187	187	187
Hansen J test	5.339	0.00687	3.190	4.249
p-value	0.0693	0.997	0.203	0.119

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 and its square (and for FTE and Operational Expenditures and their interaction in columns 3, 6 and 9) 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*, region x quarter x year fixed effects, a dummy that is 1 if the bank originally belonged to the bank that was merged into the main bank (see text) and city/town dummies for branches located in towns with 50,000 to 100,000 people or cities with more than 100,000 people. . Robust standard errors, clustered by branch, in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 4: Impact of Bankers on Sales Per Employee - Generalized Propensity Score Estimates

Bankers / FTE	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Average, Quarters 7 to 10	0.005	0.011	0.021	0.034	0.048	0.061	0.072	0.077	0.076	0.067
	[0.002]***	[0.003]***	[0.004]***	[0.004]***	[0.004]***	[0.004]***	[0.003]***	[0.002]***	[0.001]***	[0.002]***
Quarter 7	0.014	0.026	0.040	0.058	0.076	0.093	0.103	0.103	0.090	0.060
	[0.002]***	[0.004]***	[0.005]***	[0.006]***	[0.006]***	[0.004]***	[0.003]***	[0.002]***	[0.003]***	[0.006]***
Quarter 8	0.002	0.006	0.011	0.015	0.018	0.021	0.023	0.025	0.027	0.029
	[0.001]**	[0.002]***	[0.002]***	[0.003]***	[0.003]***	[0.004]***	[0.004]***	[0.004]***	[0.005]***	[0.005]***
Quarter 9	-0.007	0.002	0.019	0.036	0.052	0.066	0.078	0.088	0.097	0.107
	[0.001]***	[0.001]***	[0.001]***	[0.003]***	[0.003]***	[0.004]***	[0.004]***	[0.004]***	[0.003]***	[0.003]***
Quarter 10	0.009	0.009	0.014	0.026	0.044	0.065	0.083	0.094	0.092	0.072
	[0.003]***	[0.007]	[0.010]	[0.011]**	[0.012]***	[0.011]***	[0.008]***	[0.006]***	[0.003]***	[0.003]***

Notes The numbers in this table are estimates of the impact of having a certain share of bankers per branch employee (with percentage shares ordered by column) on sales per employee in a branch. The estimates are based on difference-in-difference analysis conditional on the propensity score for the share of bankers per employee (the treatment). See Appendix 1 for details. Standard errors are bootstrapped with 1,000 repetitions. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 5: Impact of Advisors on Sales Per Employee - Generalized Propensity Score Estimates

Bankers / FTE	5%	10%	15%	20%	25%
Average Quarter 17 to 20	0.006	0.042	0.098	0.168	0.245
	[0.001]***	[0.001]***	[0.001]***	[0.003]***	[0.005]***
Quarter 17	-0.001	0.013	0.038	0.068	0.103
	[0.001]	[0.000]***	[0.000]***	[0.001]***	[0.002]***
Quarter 18	0.013	0.071	0.159	0.266	0.384
	[0.001]***	[0.001]***	[0.002]***	[0.005]***	[0.008]***
Quarter 19	0.009	0.033	0.066	0.105	0.147
	[0.000]***	[0.000]***	[0.001]***	[0.002]***	[0.003]***
Quarter 20	-0.000	-0.014	-0.036	-0.064	-0.095
	[0.001]	[0.000]***	[0.000]***	[0.001]***	[0.002]***

Notes The numbers in this table are estimates of the impact of having a certain share of bankers per branch employee (with percentage shares ordered by column) on sales per employee in a branch. The estimates are based on difference-in-difference analysis conditional on the propensity score for the share of bankers per employee (the treatment). See Appendix 1 for details. Standard errors are bootstrapped with 1,000 repetitions. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 6: 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	0.013	-0.196	0.498	-0.056	-91.736	-0.005
	[0.021]	[0.209]	[0.116]***	[0.082]	[209.141]	[0.030]
Bankers + Advisors / FTE squared	-0.027	0.605	-1.856	0.236	-125.171	-0.009
	[0.070]	[0.819]	[0.432]***	[0.302]	[964.713]	[0.104]
Bankers + Advisors	0.000	-0.006	0.021	-0.003	13.148	0.000
	[0.001]	[0.011]	[0.005]***	[0.003]	[15.512]	[0.002]
Leadership Academy	0.001	-0.007	0.003	0.003	-20.903	-0.001
	[0.001]*	[0.006]	[0.004]	[0.003]	[18.494]	[0.001]
Constant	0.015	0.029	0.016	0.008	41.769	0.004
	[0.002]***	[0.011]**	[0.007]**	[0.007]	[36.457]	[0.005]
Observations	2574	2578	2574	2578	3236	3238
Number of Branches	187	187	187	187	187	187
Hansen J test	0.0118	1.390	0.132	2.603	0.920	1.991
p-value	0.914	0.238	0.717	0.107	0.631	0.370

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*, region x quarter x year fixed effects, a dummy that is 1 if the bank originally belonged to the bank that was merged into the main bank (see text) and city/town dummies for branches located in towns with 50,000 to 100,000 people or cities with more than 100,000 people. Robust standard errors, clustered by branch, in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Impact of Bankers and Advisors on Performance - Generalized Propensity Score Estimates

Bankers / FTE	5%	10%	15%	20%	25%	30%	35%	40%	45%	50%
Panel A: Bankers in Quarters 7 to 10										
Profit per Employee	0.000	-0.000	-0.001	-0.002	-0.002	-0.002	-0.001	-0.001	-0.001	0.000
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]
Observations	168	168	168	168	168	168	168	168	168	168
Panel B: Advisors in Quarters 17 to 20										
Profit per Employee	0.001	0.002	0.003	0.004	0.004					
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***					
ΔMortgages per Employee	0.000	0.002	0.004	0.007	0.010					
	[0.000]***	[0.000]***	[0.000]***	[0.000]***	[0.000]***					
ΔMortgages / Loans	0.019	0.050	0.084	0.117	0.147					
	[0.000]***	[0.001]***	[0.002]***	[0.004]***	[0.005]***					
ΔFunds per Employee	-0.012	-0.027	-0.043	-0.058	-0.069					
	[0.000]***	[0.000]***	[0.001]***	[0.001]***	[0.002]***					
ΔFunds / Loans	-0.005	-0.029	-0.065	-0.108	-0.153					
	[0.001]***	[0.000]***	[0.002]***	[0.003]***	[0.005]***					
Observations	178	178	178	178	178					

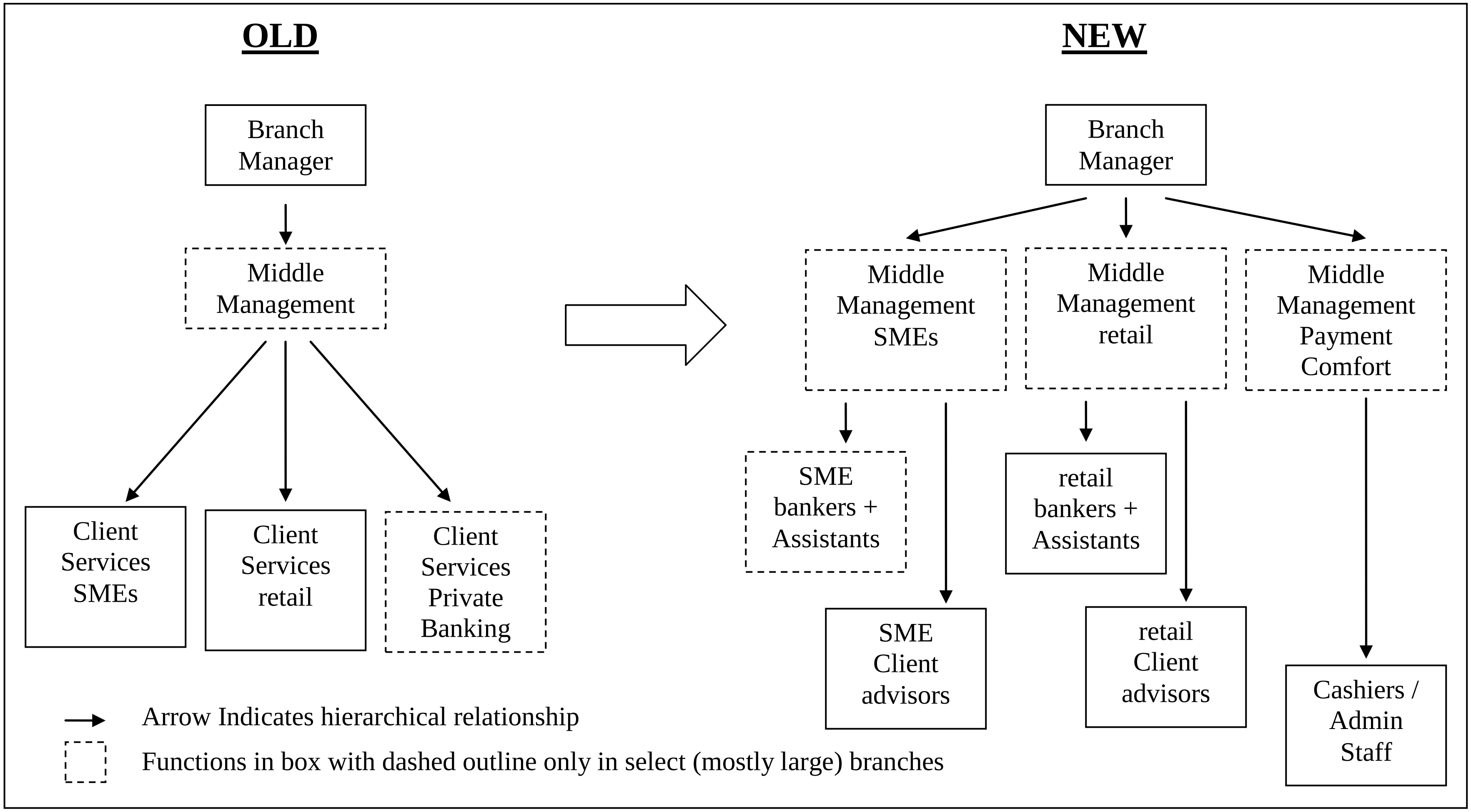
Notes The numbers in this table are estimates of the impact of having a certain share of bankers per branch employee (with percentage shares ordered by column) on profit per employee and loan loss provisions as a percentage of loans in a branch. The estimates reflect the average impact over quarters 7 to 10 and quarters 17 to 20 respectively and are based on difference-in-difference analysis conditional on the propensity score for the share of bankers per employee (the treatment). See Appendix 1 for details. Standard errors are bootstrapped with 1,000 repetitions. * significant at 10%; ** significant at 5%; *** significant at 1%

Table A1: 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

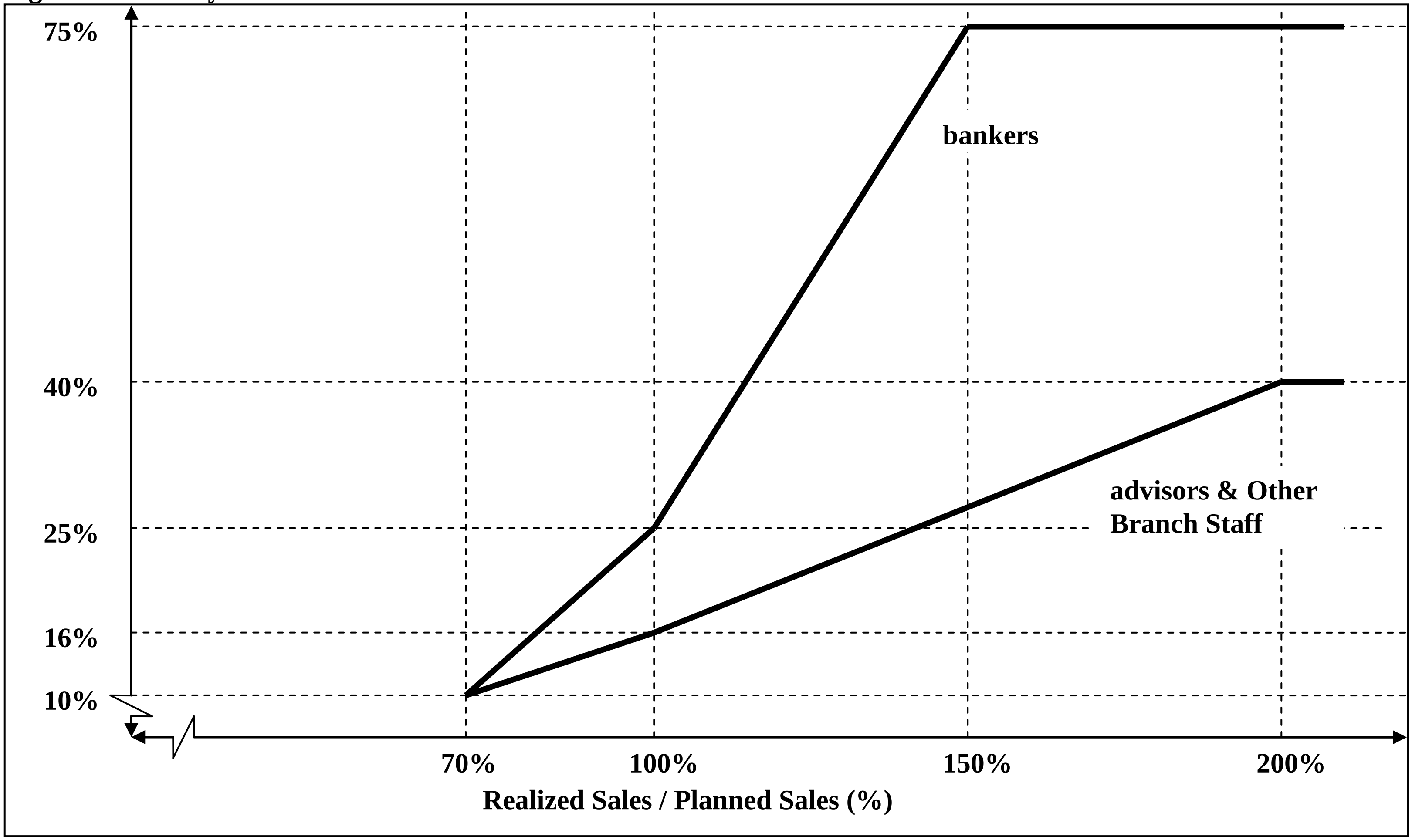
Notes *Footing*, the dependent variable, is the sum of Loans and Deposits. *FTE* is the number of employees in a branch. *Operating Expenses* include personnel expenses and other expenses for e.g. marketing, rent, et cetera. OLS is ordinary least squares estimation and FE stands for fixed effects. AB 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%

Figure 1 Old and New Branch Organizational Models



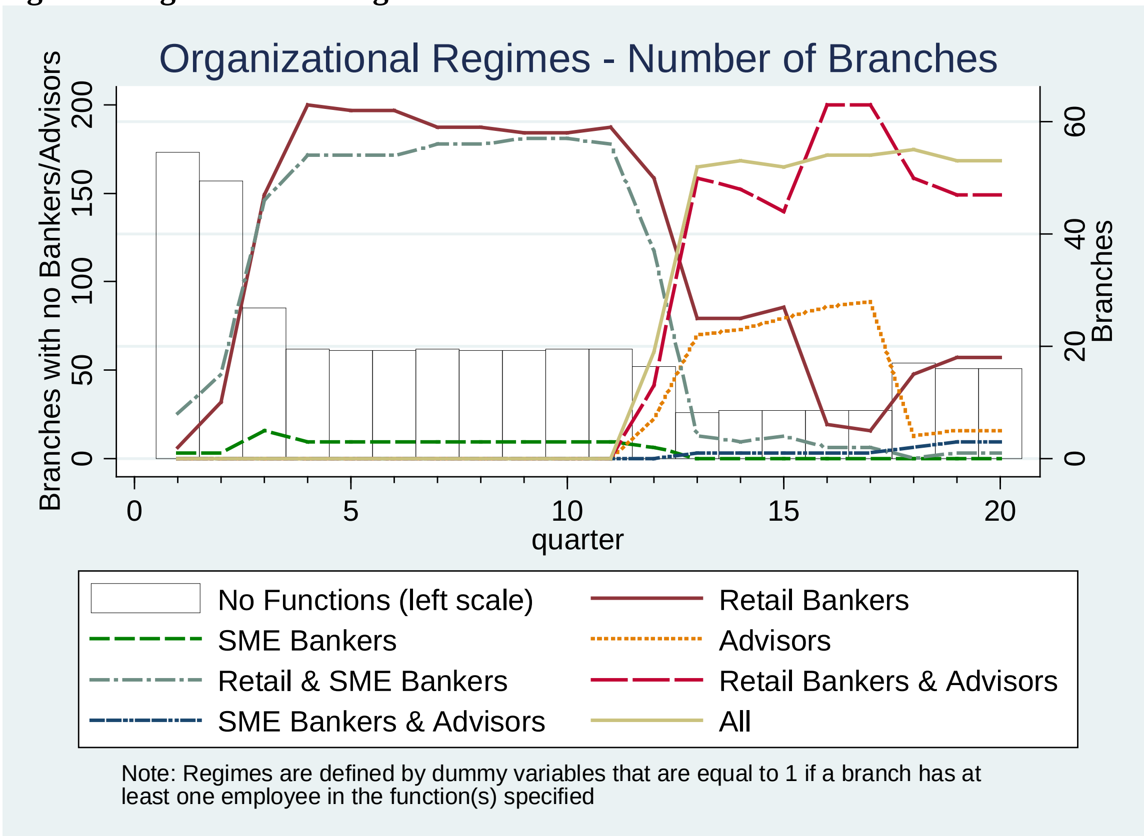
Note: In the new branch organizational model, the smallest branches have only a branch manager and staff at the Cashier level.

Figure 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 3 Organizational Regimes over Time



Appendix 1

Estimating treatment effects using the generalized of propensity score

The generalized propensity score and its application to estimate the effect of continuous treatments are developed in Hirano and Imbens (2004) and Imai and van Dyk (2004). Our implementation of the method has similarities to the implementation in Du and Girma (2009) who estimate the effect of varying levels of foreign ownership on the performance of Chinese firms. This appendix draws on these three papers mentioned above.

If we define the treatment as a variable $t \in T$, the generalized propensity score is the density of t conditional on a vector of branch characteristics X. By definition, treatment is independent of X after we condition on the propensity score. The identifying assumption justifying the use of the generalized propensity score in treatment effects estimation is that the effect of treatment on the outcome (sales productivity in our case) does not depend on the actual treatment received conditional on X. If this is true, conditioning on the generalized propensity score is sufficient to remove any bias that are associated with differences in branch characteristics X (Hirano & Imbens, 2004).

In our data, treatment is defined as the number of bankers per employee (in the first reform period) and as the number of advisors per employee (in the second reform period). The fraction of bankers per employee varies between zero and about 0.55 and for advisors the maximum is 0.55.

In order to estimate the generalized propensity score, we first estimate a fractional logit model (Papke & Wooldridge, 1996) with the treatment as the dependent variable. For the first reform period, the independent variables X in are branch size (log *FTE*), footing per employee and the change in footing per employee in the pre-treatment period (the average for quarters 1 and 2) as well as region fixed effects. For the second reform period, we add the number of bankers to *X* and use averages over the quarters 7 to 10. Using the coefficients from these estimates, we can calculate for each observation, the generalized propensity score at any given level of treatment. The score is equal to the density of the distribution of *T* at *t* conditional on *X*.

To ensure that conditioning on the propensity score leads to bias reduction, we implement the balancing tests proposed in Hirano and Imbens (2004). According to these tests, one separated the sample into broad treatment groups (e.g. 0 bankers per employee, between 0 and 0.25 bankers per employee and more than 0.25 bankers per employee). For each of these groups the propensity score for treatment are calculated at the median treatment level *t* in the group and the observations are then divided into quintiles based on the propensity scores. Subsequently, the propensity score for the observations outside of the treatment group are calculated and the observations are allocated to the quintiles according to the scores. The balancing test then comes down to checking whether, on average, the variables in *X* are significantly different between the treated and non-treated observations in the same quintile. The tests indicated that conditioning on the propensity score significantly improves balance and should reduce bias in the treatment effects estimates.

The next step is to estimate the effect of treatment on the outcome, conditional on the propensity score. In our main model, we use the change in footing as the outcome variable and to eliminate any branch-specific effects we subtract the change in footing in the pretreatment period. Hence, we estimate:

$$\Delta \mathrm{Y}_{ij1} - \Delta Y_{ij0} = \alpha + \beta_1 \cdot t_{ij1} + \beta_2 \cdot t_{ij1}^2 + \beta_3 \cdot \hat{g}_{ij1} + \beta_4 \cdot \hat{g}_{ij1}^2 + \beta_5 \cdot t_{ij1} \cdot \hat{g}_{ij1} \tag{12}$$

In equation (12), $\hat{g}_{ijt}$ is the estimate of the generalized propensity score at X_{ij0} and t_{ij1}, where period 0 is the base period and period 1 is the post-treatment period. Finally, using the estimated coefficients from equation (12), the outcome at any treatment level can be calculated as follows:

$$E\left[\left(\Delta Y_1 - \Delta Y_0\right)(t)\right] = \frac{1}{N}\sum_i \left[\hat{\alpha} + \hat{\beta}_1 \cdot t + \hat{\beta}_2 \cdot t^2 + \hat{\beta}_3 \cdot \hat{g}(t, X_{ij0}) + \hat{\beta}_4 \cdot \hat{g}(t, X_{ij0})^2 + \hat{\beta}_5 \cdot t \cdot \hat{g}(t, X_{ij0})\right] \tag{13}$$

The treatment effect given $t > 0$ as compared to $t = 0$ is then:

$$\Delta Y_1(t) = E\left[\left(\Delta Y_1 - \Delta Y_0\right)(t)\right] - E\left[\left(\Delta Y_1 - \Delta Y_0\right)(0)\right] \tag{14}$$

Standard errors for the estimate of the treatment effect in (14) should take into account that the estimates of the treatment effects rely on estimates of the propensity scores and the coefficients in equation (12). Therefore, we report bootstrapped standard errors.

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