Three Essays in Governance and Banking

by

Atif Rehman Mian

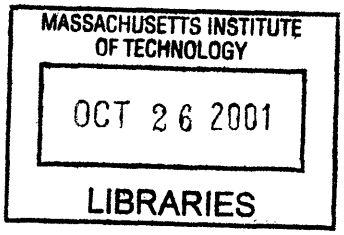
B.S., Massachusetts Institute of Technology (1996)

Submitted to the Department of Economics
in partial fulfillment of the requirements for the degree of

Doctor of Philosophy

at the

MASSACHUSETTS INSTITUTE OF TECHNOLOGY



August 2001
[September 2001]

Signature of Author .....
Department of Economics
30 June 2001

Certified by .....
Abhijit Banerjee
Professor, Applied Theory and Development
Thesis Supervisor

Certified by .....
Sendhil Mullainathan
Mark Hyman Jr. Career Development Assistant Professor of Economics
Thesis Supervisor

Accepted by .....
Richard Eckaus
Ford International Professor of Economics, Emeritus

Three Essays in Governance and Banking

by

Atif Rehman Mian

Submitted to the Department of Economics
on 30 June 2001, in partial fulfillment of the
requirements for the degree of
Doctor of Philosophy

Abstract

This dissertation consists of three separate essays. In the first essay, privatization is found to improve bank performance by both better monitoring of existing firms, and improved selection of new bank clients. Data on firms borrowing from government-owned banks, and firms borrowing from a privatized bank suggest that privatization led to an improvement of 1 to 2 percent in the earnings-per-asset of firms financed by the privatized bank. Privatization influenced firms with weak outside options the most. Moreover, bank-debt became more responsive to expected profitability of firms after privatization. Finally, privatization significantly improved the ability of the bank to attract and select more profitable firms, with the newly selected firms having on average, 4 percent higher earnings-per-asset compared to other firms in their cohort.

The second essay presents new empirical evidence on differences between domestic and foreign owned private banks in Africa. Domestic banks hold significantly more liquid assets, and are substantially less profitable than foreign banks. However, all of the difference in profitability can be explained by the 2.6% higher interest rate on deposits for domestic banks. Furthermore, domestic banks appear to take on riskier loans, but their return on loans is higher by 2.7%. Foreign banks on the other hand earn significantly more income through bank fees. Finally, domestic banks grow a lot faster than foreign banks with overall economic expansion in the country. A 1% growth in GDP expands domestic bank credit by 1.76% compared to 0.86% for foreign credit.

The third essay (joint with Daron Acemoglu and Michael Kremer) presents a theoretical analysis of the relative merits of markets, firms, and governments in environments where high powered incentives have both costs and benefits. Firms obscure information about workers' output, thus flattening incentives, and improving efficiency over markets. However in some cases, most notably under common shocks, firms are unable to commit to such a strategy. Under these circumstances, Governments may be able to commit to much flatter wage schedules, and improve the allocation of resources.

Thesis Supervisor: Abhijit Banerjee
Title: Professor, Applied Theory and Development

Thesis Supervisor: Sendhil Mullainathan
Title: Mark Hyman Jr. Career Development Assistant Professor of Economics

MIT has been a wonderful learning environment for me. I owe a great deal to several people here for the help and guidance that they provided. Foremost among them are my dissertation advisors Abhijit Banerjee, Sendhil Mullainathan, and Esther Duflo. Abhijit provided invaluable encouragement and criticism from the beginning of my graduate studies. My dissertation and thinking has benefitted greatly from his sharp insight into economic theory. Sendhil was a continuous source of support from the beginning. Esther provided extremely helpful advice during the course of this dissertation, particularly on empirical issues. I would especially like to thank all my advisors for the invaluable support and guidance that they provided during the job market process. I would also like to thank Daron Acemoglu, and Michael Kremer for their helpful advice and comments. The third chapter of my thesis is written jointly with Daron and Michael.

What made MIT a remarkable place for me was not only its exceptional faculty but also the brilliant students that I had an opportunity to interact with. Here I would particularly like to mention Asim Ijaz Khwaja, Paras Mehta and Dan Bergstresser for their constructive comments and discussions.

Many people outside MIT helped me in gathering information during the course of my research. I would like to thank officials at MCB, NBP, HBL, and UBL for providing access to data. I am also grateful to Wendy Abt, Nitin Mehra, and Angela Krenshaw at WPA for extremely useful discussions, advice, and help in collecting data for my research on African banking. I would also like to acknowledge the financial support from MIT Department of Economics and SSRC Applied Economics Program during my four years of graduate work at MIT.

I consider myself very fortunate for having the constant support from my friends and family during my academic career. Atif Zaheer who has been a true friend, endured me for four years of my graduate studies as roommate. Ayesha gave me tremendous moral and emotional support during this period. And last but not least I am especially indebted to my parents for all their love and support as well as prayers throughout my life. None of this would have been possible without them.

Chapter 1

Creditor Incentives and Privatization

Abstract

This paper examines, theoretically and empirically, how differences in the ownership of banks affect their overall performance, and specifically their ability to monitor and screen firms. The empirical analyses uses data from 1984-97 on firms in Pakistan borrowing predominantly from a major commercial bank, privatized in 1991, and firms borrowing from government-owned banks. The results suggest that privatization led to an improvement of 1 to 2 percent in the earnings-per-asset of firms financed by MCB. Possible sources for this result are analyzed, and it is found that firms with weak outside options were influenced the most. A test for credit allocation efficiency reveals that MCB's bank-debt became more responsive to expected profitability of firms after privatization. Finally, new firms selected by MCB suggest that privatization has significantly improved the ability of MCB to attract and select more profitable firms. The newly selected firms have, on average, 4 percent higher earnings-per-asset compared to other firms in their cohort. Thus, privatization is found to improve bank performance by both better monitoring of existing firms, and improved selection of new bank clients.

1 Introduction

Despite the importance of banks in formal financing, the prevalence of state-owned banks in many countries, and the importance of efficient financial markets for growth[1], there is little known about the effects of ownership on banks in general, and bank-lending in particular.[2] This is particularly relevant in light of the recent trend towards privatization of state owned institutions. This paper uses evidence from the privatization of a major commercial bank in Pakistan to assess the impact of privatization on the bank and on the firms that depend on it for external capital. In particular, it examines how privatization of the bank influences the performance of its existing client firms, and whether it affects the bank's client selection process.

The evidence from Pakistan is relevant to the debate concerning the role of ownership in banking. Many economists and policy makers, citing pervasive *market failures*, have encouraged state intervention in the banking sector (Lewis [1950], Myrdal [1968], and Atkinson and Stiglitz [1980]). An opposing view of banking intervention, termed the *government failure* view, focuses on politicization and corruption in government banks instead (Kornai [1979], Shleifer and Vishny [1994], La Porta et al [2000]). According to this view, government intervention, rather than correcting market failures, introduces a new set of failures that further hobble the banking sector and the firms that depend on it for external finance. A third, *agency* view of governments (Banerjee [1997], Hart et al [1997]) takes an intermediate position, and argues that relative agency costs such as informational asymmetries and incompleteness of contracts determine the preferred form of ownership.

These theories are useful in understanding the difficulties that previous empirical studies have had in assessing the effect of ownership on bank behavior. Any attempt to measure the *efficiency* effect of private ownership by comparing aggregate bank-level data, such as profitability, in a cross-sectional or time-series study may be confounded by unobservable characteristics associated with government banks. For example, the *market failure* view suggests that government banks are likely to be involved in activities where the social returns exceed the private returns, and the social benefits more than compensate for the cost borne by the bank.[3] In the presence of such

[1] See Greenwood and Jovanovic [1990], Gerschenkron [1962], Levine and Zevros [1998], and Rajan and Zingales [1998].

[2] Past empirical work evaluating the role of ownership in banking includes Clark and Cull [1997, 1998], Cull and Xu [2000], La Porta et al [2000], Megginson et al [1999], and Sapienza [1999].

[3] Examples of such activities include credit schemes for the poor and in rural areas at subsidized rates, branch networks in poor and hard to reach areas, lending to infant industries where learning externalities might be important, and lending for public good projects.

unobservable characteristics, any attempt to measure the effect of private ownership by comparing the differences between private and state banks will be biased upwards.

This paper presents a possible solution to this endogeneity problem. Instead of looking at overall bank performance, where the mix of activities performed by banks might change under government ownership, it looks at micro-level evidence, focusing on specific activities of the bank. In particular, it looks at the impact of ownership on bank-lending, and the firms borrowing from the privatized bank *prior* to privatization.

The paper begins by constructing a simple stylized model that helps explain the effect of ownership on bank-lending and the firms that the bank lends to. The model is built upon two features of banking: (i) the need to monitor firms, originating from the presence of moral hazard between the bank and the firms, and (ii) the need to regulate banks by the government, originating from the incompleteness in contracts between the regulator and the bank. The model has a number of implications. *First*, it shows that the effect of private ownership on the level of monitoring is ambiguous. *Second*, the relationship between monitoring and welfare is non-monotonic, as higher incentives could lead to monitoring beyond the socially optimal level. *Third*, as suggested earlier, overall bank measures such as profitability cannot help us identify the more efficient form of ownership. *Finally*, the model generates a number of testable predictions about observed firm and bank related outcomes, such as overhead cost, net interest revenue, and earnings-per-asset of borrowing firms, that can be used to assess the monitoring impact of privatization in the data.

The empirical part of the paper then assesses these theoretical predictions by focusing on the privatization of Muslim Commercial Bank (MCB) in Pakistan, which was privatized in 1991. It uses data from 1984 to 1997 on MCB and government banks, and detailed data on the firms borrowing from these banks to answer five related questions.

First, what was the impact of privatization on specific components of bank performance such as deposits, loans, overhead costs, and net interest revenue? The paper identifies these effects, using the nationalized banks as the control group.

Second, what was the impact of bank privatization on the performance of firms that predominantly borrowed from MCB prior to privatization (henceforth MCB_{old} firms), relative to those firms that continued to borrow from the non-privatized banks (henceforth NB_{old} firms)? The argument is that the newly privatized bank now has different incentives and so may choose to influence the performance of its borrowers, and hence its net return, through various instruments. For lack of a more general term, all such instruments are henceforth referred to as bank "monitoring" of the firm. The paper also discusses three specific reasons for a change in monitoring that

would impact the profitability of these firms: tunnelling or revenue hiding, project supervision, and credit allocation. It estimates the monitoring effect of ownership change on the earnings-per-asset of MCB_{old} firms by using NB_{old} firms as a control group. The empirical section discusses the validity of the identifying assumptions in detail.

The *third* question the empirical sections answers is, what factors determine the success of monitoring? Very little is known on this issue. Papers such as La Porta, Lopez-de-Silanes, Zamarripa [2000], and Hoshi, Kashyap, Scharfstein [1991] have looked at the related issue of the effect of close connections with banks on lending patterns and investment. This paper extends that literature by looking at a broad set of potential determinants of monitoring, such as industry experience, frequency of interactions, political connections, bargaining power, and probability of default. These results are able to shed light on the process through which monitoring is performed.

Fourth, the paper tests for improvement in the efficiency of bank lending after privatization. In the absence of accurate bond and stock prices that reflect market information about a firm's expected performance, banks perform the critical task of forecasting future profitability of different firms. They then provide loans to firms based on that information. Government banks are often criticized for failing to provide this important task of information gathering. They often use predetermined lending rules, such as current ratio benchmarks, to decide how much credit goes to a firm. The paper tests if privatization improved the efficiency of MCB by comparing how well the flow of bank debt predicts future earnings of firms after privatization.

Finally, the paper looks at the effect of privatization on another important function of banks: selection. In an environment with asymmetric information, banks perform the socially beneficial task of discriminating between good and bad firms. I estimate the effect of privatization on the selection ability of MCB. The paper is thus able to separate the theoretically distinct effects of monitoring and selection - sometimes also referred to as *ex-post* and *ex-ante* monitoring, respectively - which to the best of my knowledge is an innovation of the paper.[4]

The empirical results of this paper answer the above questions, and are summarized as follows. (1) Privatization led to rapid growth of MCB in terms of deposits and assets. The bank doubled in size in the first seven years after privatization, far outpacing any of its nationalized rivals. Growth in assets was accompanied by a corresponding improvement in the interest margin of MCB, which grew by 2 to 4 percent compared with the nationalized banks. Although there was no such growth in overall profitability, this can plausibly be attributed to the rapid expansion of MCB. (2) The analysis of firm-level data reveals an improvement of 1 to 2 percent in the earnings-

[4] Cull and Xu [2000] mention the difficulties the empirical literature has had in separating the two effects.

per-asset (EPA) of firms financing through MCB prior to privatization. The result is robust to a wide range of specifications. This is the pure monitoring effect, and is equivalent to a jump from 40^{th} to 50^{th} percentile in the distribution of EPA. (3) Almost all of this increase can be attributed to smaller firms, and firms with poor access to long term capital, i.e. firms that are likely to have weak political links and low outside options. This result favors a bargaining explanation in which weaker firms are easier to monitor and control. (4) The test for informational and allocative efficiency reveals that, after privatization, MCB's bank debt is more closely associated with future profitability of firms than is the debt of other banks. Thus privatization is associated with improved lending efficiency. (5) Finally, a comparison of firm selection by MCB before and after privatization shows that MCB substantially improved in its ability to attract and select better quality firms. As a result of privatization, MCB selects, on average, firms with 4% higher EPA ratios. The paper also presents complementary qualitative information about specific re-organizational steps taken by the new management after privatization, and discusses the possible role of these steps in light of the above results.

The rest of the paper is organized as follows. Section 2 presents the model. Section 3 describes the institutional set up and the data used in this paper. Section 4 provides bank-level evidence on the impact of privatization on MCB. Section 5 describes the firm-level empirical strategy and presents the main results. Section 6 concludes.

2 Model

Banks improve their net return by discerning good potential borrowers from bad ones, and subsequently by monitoring them effectively once credit has been extended, play a crucial role in economic life[5]. This section addresses the question of why ownership of banks influences their choice of monitoring. The model is able to generate testable predictions on monitoring and overall welfare. These predictions will later be used in the empirical section to assess the impact of bank privatization on firms' performance.

[5]The role of banks in monitoring and selection of firms has been extensively analyzed in the theoretical literature. For example, Broecker [1990], Holmstrom [1992], Holmstrom and Tirole [1997], Townsend [1979], and Krasa and Villamil [1992].

2.1 Setup

The model, which is built upon Banerjee [2000], is set up as follows. There are three agents in the economy, a firm (F) with a project to finance, a bank (B) that finances the project, and a government regulator (G) who enforces prudential regulations over the bank.

F has an investment opportunity that requires one unit of capital. It has no funds of its own, and must finance the entire project through an outside creditor, the bank in this case. For now, the only possible contract between B and F is a loan contract that specifies an interest rate r. B can raise funds through deposits at a gross cost of ρ. ρ is normalized to one for the rest of this paper. Once F has the required capital, it chooses a probability p that determines the riskiness and productivity of the project. The choice p is non-contractible, and $p\epsilon[p_0, p_1]$, . where $p_0 > 1/2$. For a given project choice p,the projects yields $R(p)$ with probability p, and 0 otherwise. There is a limited liability constraint for F i.e. it pays back r in the good state, but nothing in the bad state.

Define $E(p) = pR(p)$ as the expected output given p. All agents are risk neutral. In addition, the following assumptions hold, (i) $R(p_1) > r$, (ii) $R'(p) < 0$,(iii) $E'(p_0) < r$, (iv) $E'(p_0) > 0$, (v) $E'(p_1) < 0$, and (vi) $E''(p) < 0$. The first two assumptions guarantee that the firm will always be able to pay back the loan in the good state. The second assumption also highlights the trade-off between risk and return. The third assumption, it will turn out, implies that the firm wants to choose the riskiest project once it has the required funds. Finally, the last three assumptions guarantee a unique interior social optimum.

In addition, B has access to a monitoring technology that allows it to impose a cost, a, on F if it chooses a p different from the one agreed upon. The cost of monitoring for B is given by $C(a)$, where $C(.)$ is an increasing and convex function. This introduces an incentive compatibility constraint for F of the form:

$$pR(p) - pr \geq p_0R(p_0) - p_0r - a \tag{1}$$

Since the marginal benefit of increasing p for the firm is less than r, the firm wants to set p as low as possible. Hence, (1) must bind in equilibrium. This gives p strictly as a function of the monitoring level a. Moreover, as shown in the appendix, $p(a)$ is increasing and concave in a. This simple dependence of p on a will be useful in solving the model later on.

The IC constraint highlights the fundamental tension between a firm and its bank. Given a

debt contract, the firm wants to choose the riskiest project, or the lowest possible p. The bank, on the other hand, wants to minimize the probability of default, and wants the firm to choose the safest project, or the highest possible p.

Definition: The *regulatory environment* for B is a vector, $[D, x]$, where $D \leq \rho$ is the cost borne by B, in case F defaults, and x is the fraction of loans, that B can invest in the projects as equity. x in other words is a measure of insider or connected lending. A regulatory environment is called "tight", if D is close to ρ, and x close to zero, and "weak", if D is close to zero, and x close to 1. The bank's payoff function, in a given regulatory environment, is given by:

$$U_B = p((1-x)r + xR(p) - 1) - (1-p)D - C(a) = K_B - C(a) \tag{2}$$

where K_B is the expected cash-flow of the bank.

G is responsible for supervising $B's$ loan portfolio, ensuring timely and accurate provisioning of doubtful loans, and preventing insider, or connected lending. In other words, G tries to set the regulatory environment that B faces. G is left with any unpaid liabilities of B (for example, due to deposit insurance). Thus, $G's$ payoff is given by:

$$U_G = -(1-p)(1-D) \tag{3}$$

The social welfare function, W, is simply the sum of the three agents' utilities:

$$W = E(p) - 1 - C(a) \tag{4}$$

Equation (3) implies that G wants to set D as close to 1 as possible. It will turn out, that since higher x lowers the choice of p in equilibrium, G will want to set x as close to 0 as possible. I do not explicitly model how D and x are actually determined in equilibrium. They will in part depend upon the ability of the regulator to control the bank, and in part on the incentives of the bank to default, or engage in "connected lending" (sometimes referred to as "looting" in the literature, Akerlof and Romer [1993]). In the following section, I present the comparative statics of ownership and the regulatory environment, on the optimal choice of a and p. In addition, I will also discuss some possible determinants of the regulatory environment, and how they depend on the type of ownership.

2.2 Effect of Ownership

It will be helpful to consider the first best and the constrained first best as benchmarks.
First Best: When p is contractible, the first best level of p, p_F, is given by $E'(p_F) = 0$.
Constrained First Best: The constrained first best solves for p by maximizing the overall welfare in (4), subject to the IC constraint in (1). For our purposes, it is sufficient to note that $p_S < p_F$. I define the corresponding level of monitoring as a_S and a_F respectively.

I now turn to the question of ownership and how it might affect bank behavior. Privatization is introduced through a parameter γ, that captures the share of bank cash flow, K_B, received by the bank itself. I assume that γ is low under state ownership. This prevalence of low incentives in government organizations is a well known fact throughout the world.[6] The following proposition looks at the effect of changes in γ, while keeping the regulatory environment fixed. All proofs are relegated to the appendix.

> **Proposition 1:** Under complete government ownership, with no cash flow rights, ($\gamma = 0$), the bank fails to perform its monitoring role (i.e. $a = 0$), and expected output is reduced compared to the constrained first best. As the bank is gradually privatized, and it gains more cash flow rights, its monitoring level keeps on rising. However, there are three separate cases that determine the effect of increased monitoring on welfare and firm output. (i) For $p < p_S$, or $a < a_S$, both welfare and firm output increase as the bank increases its monitoring as a results of higher incentives. (ii) For $p_S < p < p_F$, or $a_S < a < a_F$, the firm's expected output keeps on increasing, but overall welfare decreases as there is over-monitoring by the bank. (iii) For $p > p_F$, or $a > a_F$, both expected output and welfare decrease.
>
> **Corollary:** If the extent of regulation is independent of who own the bank, the regulator will want to completely privatize the bank (i.e. set $\gamma = 1$), in order to minimize the probability of default.

Figure 1 illustrates the three cases in proposition 1. The over-monitoring result comes from the fact that the private bank fails to internalize the reduction in $R(p)$, as p increases. Proposition 1

[6] Theoretical work on the subject, such as Stiglitz [1989, 1994], Holmstrom and Milgrom [1991, 1994], Tirole[1986], Banerjee[1997], and Hart, Shleifer, Vishny [1997], gives various reasons for the existence of soft-incentives. These include agency costs, civil service rules, complexity of government objectives, and incomplete contracts. I take the presence of soft incentives in government banks as given, and look at its impact on the choice of monitoring by the bank.

highlights the potential benefits as well as costs of increasing incentives: incentives help minimize costs by reducing default, however, they can also lead to over conservative lending by the bank.

Proposition 1 clearly favors private ownership from the perspective of the regulator. However, regulation may not be independent of ownership. In that case, private ownership may not be optimal even from a regulator's perspective. The discussion below addresses the question of why regulation may depend on ownership. But first I discuss the effect of the regulatory environment, $[D, x]$, on the choice of a.

> **Proposition 2:** (a) A reduction in the cost of default, D, results in reduced monitoring, riskier project selection (lower p), and a higher rate of default. (b) An increase in the ability of the bank to invest in connected equity (i.e. increase in x), also lowers the level of monitoring, a, by the bank, and leads to riskier project selection.

Proposition 2 highlights the role of the regulatory environment in determining the equilibrium level of monitoring. The regulatory environment might in turn depend upon the type of ownership.

There are two possible reasons for private ownership to be better than government ownership from a regulatory standpoint. First, reputational concerns of private owners can reduce the necessity to regulate the bank. This is an argument often given in favor of allowing foreign banks, with greater reputational capital, to operate in developing countries. Second, politicization of government banks, might lead to lending based on political considerations, and make it harder for the government to regulate itself. Both these points are likely to lead to a *tighter regulatory environment under private ownership.*

On the other hand, since the regulator is interested in controlling the *quality* of a bank's loan portfolio, contracts between the regulator and the bank are inherently incomplete. As the literature on incomplete contracts suggests[7], under such conditions, it might be easier for the government to enforce its regulations when it also controls the residual rights in the bank. This would suggest that the regulatory environment might be *tighter under government ownership.*

> **Corollary:** If government ownership tightens regulation, it leads to a higher monitoring choice by the firm. Conversely, if government ownership weakens regulation, it leads to a lower level of monitoring by the firm.

[7]For example, Grossman and Hart [1986], Hart and Moore [1990], and Hart et al [1997].

2.3 The Empirical Problem

The theoretical effect of ownership on monitoring is thus ambiguous, and that is the position I take in this model. The effect of ownership on monitoring, then is largely an empirical issue. The model just described has some important predictions that can be used to infer the true direction of monitoring in the data.

Define $EPA_1 = E(p)$ as the expected earnings-per-asset of the firm borrowing from the bank, $Var(EPA_1) = p(1-p)(R(p))^2$ as the variance of EPA_1, $ROA = [\ [p(r-1)] - [(1-p)D + C(a)]\ ]$ as the overall profitability of the bank, $OH = C(a)$ as the overhead cost, or monitoring expense of the bank, and $NIR = p(r-1)$ as the net interest revenue of the bank as measured on its income statement.[8] The predictions of the model about these variables depend on, (i) the net effect of regulation and incentives on monitoring, and (ii) which one of the three cases from proposition 1 we are in. Note that overall bank profitability measures such as ROA are completely uninformative about the direction of monitoring. Since monitoring increases overhead expense, but increases net-interest-revenue as well, the net effect on ROA is ambiguous.

Table I summarizes the predictions of changes in a for the remaining variables. Table I will be useful in assessing the impact of privatization of MCB on monitoring. It suggests that to infer the effect of privatization on monitoring, one should be looking at specific components of bank level performance such as net interest revenue, as well as firm level measures such as EPA_1.

3 Institutional Setup and Data

3.1 Banks and Corporate Finance in Pakistan

Banks are the dominant source of capital in Pakistan. A 1992 IFC study found that internal funds represent only 12-58 percent of total financing needs for developing countries[9], compared with 52-100 percent for G7 countries (Glen and Pinto [1995]). Most of the external financing in developing countries is bank-financed. The same study finds that Pakistan has one of the highest

[8] NIR is calculated as follows. Rewrite the bank's overall return in equation (2) as: $[p(r-1)] - [(1-p)D + C(a)] + [px\tau(p)]$, where $R(p)$ is written as $[r + \tau(p)]$. The first term is NIR, the second term captures the cost due to loan loss provisioning imposed by the regulator and the non-interest monitoring expense, while the third term never shows up on the bank's income statement since these are "insider profits". Hence, overall profitability or ROA can be written as: $[p(r-1)] - [(1-p)D + C(a)]$. Accounting conventions relevant for Pakistan are used, where loan loss provisions go into the operating account and not NIR.

[9] The nine developing countries in the study were, Brazil, India, Indonesia, Jordan, Malaysia, Mexico, Pakistan, Turkey and Zimbabwe

debt-equity ratios with a value of around 2.0. If internal funds are the cheapest source of financing available, as in the pecking order theory, the reliance on external funds could mean that firms in developing countries are seriously cash-strapped. Alternatively, this reliance could simply be a consequence of subsidized credit in many developing countries. Regardless of the explanation, it is clear that bank loans play a substantial role in the capital structure of firms in developing countries, particularly Pakistan.

Commercial banks in Pakistan are primarily responsible for providing short and medium term loans[10]. This gives them a greater ability to monitor and control the firms they lend to, due to more opportunities to deny credit.

3.2 Brief History of Privatization in Pakistan

Banking in Pakistan was predominantly controlled by the state until 1990. The five major commercial banks[11] controlled 100% of the domestic banking market. However, after the elections in 1990, the government of Nawaz Sharif declared privatization as one of its key policy objectives. The primary reason for this announcement was pressure from the World Bank and IMF, as Pakistan needed their financial support in the face of fiscal and monetary problems. In the banking sector, it was decided to privatize MCB, and bids were requested from interested parties. Four bids were received, and the evaluation committee headed by the then Governor of State Bank of Pakistan, under its discretion, did not qualify the highest two bids. Instead the third highest bidder (National Group) was invited to match the highest bid of Rs. 56 per share. The contract was agreed upon, and signed on 8 April, 1991.

A natural question here is whether the bidding process was fair. Clearly there are reasons to doubt fairness given that the bank was awarded to the third highest bidder. If potential bidders are aware of corruption in the bidding process, it could hold them back, reducing competition and hence the price of the bank. Although evaluating the true price of MCB is not the concern of this paper, any shortcomings in the bidding process could adversely impact the quality of the successful bidder and hence future performance of the bank[12]. However, rejection of the highest

[10]Development finance institutions (DFIs) are responsible for providing long term debt, and have traditionally been the conduit for foreign lending. However, this source of funding largely dried up in the 90s.

[11]National Bank, United Bank, Habib Bank, Muslim Commercial Bank, and Allied Bank.

[12]The fact that the third highest bidder was willing to pay the highest bid does not imply that they are expecting to be as profitable as the highest bidder. This happens because bidders may not bid their true valuation of the bank. This would be especially true when bidders differ in managerial ability and hence private valuation. Moreover, even if the politically connected bidder has no ability at all, but intends to loot the bank in future, he will be willing to

two bids does not necessarily imply corruption. The government could be justified in denying ownership to the first two bidders due to moral hazard concerns. In the presence of moral hazard, where private owners have the opportunity to loot the bank, looters might bid more than honest bidders. A government could then be well justified in denying ownership to the highest bids if it doubts their credibility. The paper presents no evidence to favor one opinion over the other. There has clearly been no outright expropriation of the bank since privatization. However, to the extent that political connections led to lower managerial ability of the new owner, my estimate of the "true" privatization effect will be biased downwards. Alternatively, one could think of my estimate as the privatization effect under political constraints.

It is important to note here that another government bank, Allied Bank of Pakistan (ABP), was also privatized around the same time as MCB. There are two main reasons ABP is not included in this study. First, privatization of ABP was *not* accompanied by a management change. ABP was bought out by its own employees. It is difficult to take such privatization in the absence of a management change seriously. Recent evidence from privatization of Russian shops (Barberis et al [1995]) suggests that induction of new management is critical for successful privatization. It is quite likely that the government followed with a management buy out of ABP simply because it was politically easier to do. Second, ABP was a much smaller bank than MCB at the time of privatization. Since I had to gather data for the bank's clients by manually going through their credit files, only one privatized bank was chosen for logistical reasons.

Privatization of MCB was accompanied by overall attempts by the government to improve banking regulation and supervision. This involved the government gradually raising its capital adequacy ratio, adopting stricter loan classification and provisioning standards, imposing minimum diversification standards for bank loan portfolios such as lending limits to a single affiliate, maintaining high reserve requirements, and strengthening the supervision of defaults by creating a credit history database for individuals and groups (State Bank [1990-2000]). The paper controls for these and any other changes over time by including the nationalized banks[13] (henceforth NBs) as the control group.

3.3 Data

For the bank level analysis, quantitative data comes from the annual reports of MCB and the three NBs from 1985-98. Qualitative information on administrative, organizational, and policy

pay a high amount.

[13] National Bank, Habib Bank, and United Bank.

changes was collected using MCB and NB credit manuals, State Bank banking circulars, and MCB internal documents. Results from this data are discussed in detail in section 5.

The firm level data covers 1984-97. I went to each of the four banks (MCB, NBP, HBL, and UBL), and requested the list of firms (henceforth MCB_{old} for firms borrowing from MCB, and NB_{old} for firms borrowing from the nationalized banks) satisfying the following criteria: (i) they were listed on the stock exchange, and (ii) they had the corresponding bank as their major creditor in 1990, where major creditor is defined as the bank through which the firm borrowed at least 50% of its financing needs. The focus was limited to listed firms primarily due to the availability of annual financial data for these firms. However, to increase the sample size in MCB_{old} firms, I expanded the definition for MCB to include non-listed firms as well. The non-listed firms are not listed on the stock exchange, but are classified as "corporate firms" by MCB. This means that they have a minimum credit line of 50 million Rupees (roughly 1 million dollars). Data on the non-listed firms was not publicly available. However, MCB allowed me to access its credit files in order to obtain the necessary information about the non-listed firms. Financial information on the non-listed firms was obtained by manually going over the credit files in the two MCB head offices in Karachi and Lahore. Similar information was obtained for listed and non-listed firms that entered into relationship with MCB *after* privatization (henceforth MCB_{new} firms).

Table II summarizes various characteristics of MCB_{old}, NB_{old}, and MCB_{new} firms. There are 104 NB_{old} firms, 58 MCB_{old} firms (26 listed and 32 non-listed), and 68 MCB_{new} firms (35 listed, 33 non-listed). About 50% of firms in all the three sets are in the textile sector, with sugar and chemical being a distant second and third.

The bottom half of the table compares various firm characteristics of NB_{old} and MCB_{old} firms. I divide MCB_{old} firms further into listed and non-listed. The comparison reveals no significant differences between the groups in terms of asset size or EPA. Listed MCB_{old} firms are similar to NB_{old} firms in other aspects as well, such as fixed-to-total-asset ratio (capital intensity), revenue-to-total asset ratio (capital turnover), and debt-equity ratio. However, non-listed MCB_{old} firms have significantly lower fixed to total asset ratio (0.39 vs. 0.52 for listed MCB_{old}), higher revenue to total asset ratio (1.63 vs. 1.13), and higher debt-equity ratio (3.51 vs. 2.28). This should not be too surprising though as non-listed firms have poorer access to long-term capital. The analysis that follows, also checks if any of the results are driven by the inclusion of non-listed firms, and finds that not to be the case.

It should be noted here that the panel data set is not a complete panel. Table I in the appendix summarizes the availability of data across 1984-97. There are two main reasons for the

incompleteness of data. First, the selection of firms was done based on information in 1990. The primary source of data for listed firms used in this paper (VISTA) covers the period 1990-98. As such, other less complete sources of information had to be used for years prior to 1990 (these were essentially annual reports of listed companies published in the annual State Bank reports). Second, some firms, on average 3% or less of the firms in a given year, are missing data for some of the years after 1990.

4 Bank Level Analysis

The empirical section begins by comparing bank-level changes in size and profitability of MCB with the three nationalized banks.[14] As noted in the introduction, such analysis is not sufficient to identify the effect of ownership on banks. However, bank-level information will still be useful for two reasons. First, as shown in the theoretical model (Table I), bank-level evidence on variables such as overhead cost, and net-interest-revenue can help me limit the space of possible hypotheses about the effect of privatization on monitoring and welfare. Second, bank level analysis helps in checking differences between MCB and NBs before privatization, cross-checking consistency of firm-level results, and evaluating administrative and organizational changes undertaken by MCB. I begin by describing the qualitative evidence on changes undertaken by the new management of MCB.

4.1 Qualitative Evidence

MCB invested rapidly in modernizing and computerizing its branch network. New programs were instituted for training of its new and existing staff. MCB was also one of the first banks to introduce new services in the banking industry such as the introduction of ATMs.

The new management of MCB took significant steps to reorganize its credit management policies. New rules were drafted for the preparation and evaluation of credit proposals. Fresh guidelines were given for monitoring existing loans. Bank officials were required to meet specific deadlines for evaluating current and proposed credit contracts. When considering proposals for renewing or fresh loans, officers were required to report on the following (MCB [1990-99]): (i) the amount of loan relative to business size, (ii) borrower's expertise and experience in the project to be financed, (iii) liquidity and insurance of collateral, (iv) MCB's seniority vis-a-vis other loans to the client, (v)performance projections for the individual borrower and industry, including market

[14] National Bank of Pakistan (NBP), Habib Bank Limited (HBL), United Bank Limited (UBL).

size, market share, competition and growth potential, (vi) financial performance of the firm in question for the past 3 years, and (vii) past relationship with MCB, including any late payments and/or rescheduling of debt.

Since privatization, bank managers have been required to visit actual business sites (e.g. factory or plant) and meet with firm management at least once every six months. Site visits are meant to be unannounced and random. Upon completion of such visits, branch managers are then required to send back to the central office the firm's latest operating performance, industry situation, and future investment and business plans. In the event that the asset or security can be readily expropriated, the frequency of such visits can go as high as once per month.

MCB also initiated a system of credit risk rating (CRR), that assigned all MCB customers a specified risk rank based on their existing and expected financial performance. The ratings are ranked from 1 to 5 (with 1 being the best). It is the branch manager's responsibility to continually reassess this ranking, and downgrade or upgrade it as appropriate. The CRR system was quantified through a specific "point system". Factors that go into determining the CRR include equity base, profitability, ownership structure, length of relationship, collateral, past history, and an internal review. Firms are more likely to get a lower CRR if they have a bigger equity base, high and increasing profitability in the past, corporate ownership structure, good quality collateral, favorable internal reviews, and good credit history with MCB and other banks. After privatization, it has been the branch manager's responsibility to maintain adequate risk analysis for a firm. Previously this activity was delegated to a centralized authority that assessed a firm only once a year. This policy change clearly reflects a move towards closer and more frequent monitoring by MCB. Under the present system, whenever CRR exceeds a value of 4, the firm or client automatically comes under the control of a centralized unit, the Special Asset Management Group (SAMG), which initiates the process of loan recovery and any litigation procedures if necessary.

The change from a centralized to a decentralized system of monitoring under private ownership is interesting in light of the *agency view* of government ownership. The centralized and infrequent form of monitoring, although inefficient, does not necessarily imply poor planning and organization on part of the state-owned bank. Such an organizational structure could indeed be a rational response to the informational constraints facing a government. In particular, if a bureaucratic set up is unable to incentivize its workers properly, the moral hazard problem *within* the bank is exaggerated. Governments will find it harder to rely on their officers to monitor the bank's clients properly. Faced with such a conflict, governments will deliberately choose to

take control away from branch managers and concentrate as much control at the center as possible.

4.2 Quantitative Evidence

Figures 2-5 display the evolution of selective size and profitability variables for the four banks. The top graph in each figure plots the variable under study for each of the four banks, while the bottom graph plots the performance of MCB *relative* to the average NB.

Effect on size: Figure 2 looks at the evolution of total assets for the four banks over time. The results for loans and deposits are almost identical. Two observations stand out from this figure. First, MCB was about one-third the size of an average NB at the time of privatization. Second, while MCB and NBs grew at about the same rate before privatization, MCB growth picks up appreciably soon after privatization. The timing of growth in MCB clearly suggests a causal role for privatization. By the end of the period under study, MCB had almost doubled in size relative to NBs (with MCB now about two-third the size of an average NB). The sharpest drop in asset size occurs for HBL and UBL, whereas NBP actually grows in size after privatization. This evidence is artificial, however, as it is essentially the result of a government decision to keep all of its deposits with NBP instead of other NBs after privatization. This policy change actually justifies the comparison of MCB with the average NB, as taking averages neutralizes any substitution of assets among NBs.

Qualitative anecdotal evidence is consistent with the observed growth in MCB. Soon after privatization, MCB aggressively sought new deposits through an active marketing campaign, recruitment and training of new staff, and computerization of branches. In fact, the growth in assets is due to better market penetration of existing branches, and *not* due to an expansion in the existing branch network. The total number of branches actually fell from 1,270 in 1989 to 1,216 in 1998.

Growth of MCB relative to NBs should be seen within the wider context of banking reforms in Pakistan. Since privatization was accompanied by the government's decision to allow private domestic banks in the country, newly established private domestic banks started capturing market share away from the 5 major banks. By the end of 1990s, the market share of new domestic banks had grown from 0% in 1990 to 15%. Therefore, MCB and NBs not only faced increased competition from each other, but also from new nascent private banks.

Growth in deposits and assets as a result of privatization has important economic implications.

It is the very purpose of financial intermediaries to raise capital through deposits and lend it productively. Empirical analysis has found financial depth to be an important determinant of economic growth.[15] Any policy that expands the participation of financial sector should have a positive impact on growth and productivity as well.

Can one deduce from the evidence above that privatization led to a stronger and deeper financial market in Pakistan? There are two issues to be considered. First, part of the growth in assets for MCB could just be a substitution from NBs. Second, private and social returns of new deposits might be different. To take an extreme view, if MCB is able to pay better rates on deposits by investing the money in high yielding but socially harmful criminal activities, then the creation of new deposits can hardly be qualified as welfare improving. Alternatively, MCB could simply be engaging in a Ponzi scheme that has not yet collapsed.

It is hard to quantify the part of growth due to *new* credit creation since there is no counterfactual experiment. Ideally one would need a measure of how deposits and credit would have grown in Pakistan in the absence of privatization. Since this is an impossible exercise, one cannot directly answer the above question. However even if the growth in assets represents a switch of customers from NBs to MCB, it must be that MCB offered those customers a higher "net price" than NBs. The price here reflects both the interest rate and services offered by MCB. As long as one is willing to assume that the net price for NBs did not decrease, switching of customers signals higher deposit returns, and possible welfare gains in the long run.

An important caveat here is the second point mentioned above. MCB might have deliberately subsidized new deposits in expectation of expropriation, or high yielding criminal investments. However, the evidence in Figure 3 is not consistent with such a view. It plots the ratio of loans-to-deposits over time. This ratio is about the same for MCB and NBs before privatization, but drops by about 10% in the first two years after privatization, before gradually coming back to its original level relative to NBs. This evidence is consistent with a prudent bank that is initially reluctant to give out new loans because of asymmetric information. However, as the bank gains experience and knowledge about the market, it lends out more until its asset portfolio attains the appropriate level of diversification. The overall loans-to-deposits ratio drops for all banks in the 90s which was a troublesome period for the economy as a whole, with limited investment opportunities. If the bank were only interested in loaning money to its friends, or criminal activities, one may not have observed the U-shaped reaction of loan-deposit ratio. This piece of evidence strengthens the case for asset growth to be welfare improving.

[15] See Levine and Zevros [1998].

Effect on profitability and efficiency: Figure 4 displays overall return on assets for the four banks under study. There is no consistent difference between MCB and NBs in ROA before or after the privatization. The sharp drop in ROA for HBL and UBL in 1997 is due to the large non-interest expense that these banks bore as part of the government's "golden handshake" scheme. The scheme offered generous severance payments to government employees volunteering to retire. It was initiated in all government departments in an effort to reduce the size of government. A closer look at the different components of ROA, namely commissions and fees, non-interest expense (salaries, rent, etc.), and miscellaneous return[16], shows a similar picture. There is no apparent trend in the data. The only exception is the interest margin ratio, or net-interest-revenue-to-total-assets (Figure 5). The ratio is about the same on average for MCB and NBs until 1994, but then grows appreciably for MCB. The faster growth in interest margin for MCB is consistent with the bank level evidence on the loans-to-deposits ratio presented earlier, as well as the firm-level micro evidence to be presented in the next section. Since MCB was initially reluctant to loan out the new deposits it was generating, this would automatically bias MCB's interest margin downwards early on. Secondly, firm-level evidence on new borrowers selected by MCB after privatization shows that the new firms were among the best in the country, leading to better returns for MCB. The timing of new firms is also consistent with the evidence on interest margin as firms start entering into a relationship with MCB after 1993. The magnitude of growth in interest margin on assets is substantial as the interest margin more than doubles from an initial level of 0.02.

There is a plausible explanation for the lack of improvement in overall profitability of MCB in the face of rapid expansion. Firms that are rapidly expanding often forgo profits in the short run for higher expected profits in future. A bank growing rapidly after privatization would need to make new investments in improving its branch network, training its work force, and marketing. Moreover, as explained earlier, new deposits would take time for the bank to be lent out profitably. This naturally creates a lag between profitability and assets that would in turn lead to lower returns for a growing bank.

Although MCB was much smaller than the NBs at the time of privatization, there appear to be no systematic pre-privatization differences between MCB and NBs in terms of profitability or interest margin. This is consistent with the conjecture that MCB was chosen for privatization because of political reasons (i.e. easier to privatize because of its smaller size), and not due to its economic performance. Furthermore, ceteris paribus it is not clear why a government would

[16] miscellaneous return=tax, provisions, and "other" income such as sale of assets.

necessarily choose its best bank to be privatized. First, it is harder politically to sell the idea of privatizing your best public institution. Second, when a government is facing fiscal constraints, it would want to keep the most profitable institutions, and only dispose the most burdensome ones.

The paper next tests for the statistical significance of the variables above and other related variables. Estimates for the effect of privatization on these variables were obtained by running the following regression:

$$Y_{it} = \alpha + \gamma_i + \varphi_t + \beta(MCB_i * Post_t) + \varepsilon_{it} \quad (5)$$

where Y_{it} is a bank performance indicator for bank i in year t such as deposit size or profit, γ_i and φ_t are bank and year effects respectively, MCB_i is a dummy for MCB, $Post_t$ is a dummy for post-privatization years (1992 onwards), and β measures the impact of privatization on Y for MCB. The regression compares the performance of MCB before and after privatization, while controlling for contemporaneous macro shocks through the inclusion of $NB's$. The inclusion of NBs as the control group is crucial to control for other macro reforms, changes in banking regulations, and macroeconomic shocks such as exchange rate risk. The above specification was also run with MCB_i replacing γ_i in order to estimate pre-privatization differences between MCB and NBs. Tables IIIa and IIIb summarize the results of running (5) on size and profitability variables.

MCB had total assets worth 1.5 billion dollars at the time of privatization compared with 4.4 billion dollars for the average NB. However, MCB's assets grew significantly faster than the NB's, with MCB's assets increasing by about 500 million dollars on top of the growth in NBs. The differences in loans and deposits are similar (Table IIIa columns (1)-(6)). Pre-privatization differences and faster growth in MCB are both significant at the 1% level (columns (4)-(6)). Table IIIb looks at the profitability and efficiency of the four banks. Column (7) confirms that overall return on assets was not significantly different for MCB before privatization[17]. The impact of privatization on profitability, although positive, is not statistically significant. The earlier observation about net interest revenue is also confirmed in the quantitative analysis (column (8)). The difference between MCB and NBs in net-interest-revenue per asset was close to zero at the time of privatization, but grew appreciably after privatization, with MCB gaining an average of 1.06% over NBs. There is no significant improvement in other components of profitability as a result of privatization (columns (9)-(11)). There is also no consistent advantage for MCB in these profitability components before privatization. MCB had higher OPI/TA and MISC/TA, but

[17]Regressions 7,10 and 12 have 54 observations instead of 56, as we remove the two bank-year observations where the overhead expenditure was extraordinarily high due to the "golden hand shake" severence payment scheme.

higher overhead expenditure as well. It is worth mentioning the result for overhead cost in column (10). The model in section 2 predicted that both net-interest-revenue, and overhead cost should move in the same direction. The coefficient on overhead cost is positive but insignificant. It should be noted however, that whereas net-interest revenue corresponds very closely to the theoretical construct in the model, the overhead cost in the data here is not entirely the monitoring cost, as assumed in the model. The overhead cost in the data includes *all* non-interest expenses some of which, such as excess employees or branches, might be efficient to cut down.

5 Firm Level Analysis

1. Privatization (Monitoring) effect

I first estimate the effect of privatization of MCB on the firms it was already financing at the time of privatization. Section 2 built a model that investigated the *monitoring effect* of privatization in detail. I now estimate the effect of privatization on one of the key variables in the model, earnings-per-asset of firms borrowing from the privatized bank.

It is important to highlight here some of the possible reasons in real life for monitoring to impact firm performance:

(i) Tunneling or Revenue Hiding: Firms use different techniques such as transfer pricing and accounting tricks to hide profits (Bertrand et al [2000], Johnson et al [2000]). This has negative consequences for capital markets and the economy as potential shareholders shy away from investment for fear of expropriation (Shleifer and Wolfenzonn [2000]). Monitoring could reduce the extent of this problem as banks try to reduce the likelihood of firms hiding their true profits and subsequently declaring bankruptcy.

(ii) Project Supervision: Banks have to supervise the projects they finance in order to ensure that their loans are used properly and not expropriated for a different activity. Since a bank gives out loans based on its evaluation of specific projects, better implementation of the project should result in higher firm value. This will be particularly true for firms earning marginal profits, as is often the case in developing countries.

(iii) Credit Allocation: In a close firm-bank relationship, as measured by the reliance of a firm on the bank for financing, a firm depends critically on timely credit for its operations. The efficiency of a bank in recognizing good investment opportunities and providing timely credit when credit is needed will have a direct impact on the profitability of the firm.

The empirical analysis is done using the MCB_{old} and NB_{old} firms. These are the firms that had

MCB and NBs respectively as their major creditor *prior* to privatization. The basic regression for estimating the monitoring effect is:

$$Y_{it} = \alpha + \gamma_i + \varphi_t + \beta_1(MCB_i * Post_t) + \beta_2(X_i * \varphi_t) + \varepsilon_{it} \quad (6)$$

where Y_{it} is EPA for firm i in year t, γ_i and φ_t are firm and year fixed effects, β_1 identifies the *causal* effect of privatization on monitoring of firms, and $(X_i * \varphi_t)$ controls for any time varying changes due to initial differences in X_i such as firm size, capital intensity (fixed assets to total assets), capital turnover (revenue to total assets), and debt-equity ratio. X_i is a dummy variable that classifies firms according to some underlying characteristic of interest (size etc.). It takes a value 1 if the firm was in the top half of the distribution, for the variable under question, at the time of privatization.

It is worth spelling out the assumptions underlying (6), that allow me to interpret β_1 as the causal effect of privatization. (i) MCB and the three nationalized banks (NBs) were centrally supervised and run under a single organization, the Pakistan Banking Council, before privatization. Therefore, firms in MCB_{old} and NB_{old} sample are likely to be on similar trajectories at the time of privatization. This makes it possible to control for any time-varying macro shocks, such as aggregate industry demand, exchange rate fluctuations, and government policies, through the difference-in-differences approach. Controlling for macro shocks is particularly important in this paper since privatization was also accompanied by large-scale macro reforms such as trade and currency liberalizations. (ii) Most of the firms in the sample are almost exclusively borrowing from a single bank. The small number of large banks coupled with asymmetric information about firm quality makes it difficult for firms to switch banks quickly. This "lock-in" effect allows me to estimate the monitoring effect of a change in ownership on the *same* firm. (iii) All firms in the sample are private firms belonging to large, reasonably competitive industries. This makes it harder to justify the presence of social externalities in the firm-bank relationship. As such, any effect of privatization should be a pure ownership effect, unlikely to be confounded by unobservables such as the internalization of some externalized social benefit under government ownership. (iv) The length of the panel data can be used to study the dynamics of the privatization effect, and test the identifying assumptions underlying the estimation strategy.

Table IV reports the results of running equation (6). Column (1) is the most stripped down version of equation (6), without any firm effects, year effects or other controls. It shows a positive

impact of privatization on EPA of MCB_{old} firms with the EPA increasing by 1.1% on average. However, the standard errors are too big to make the coefficients statistically significant. The coefficient on MCB_{old}, which measures any pre-privatization differences between MCB_{old} and NB_{old} firms, is close to zero.

Although the results in column (1) are suggestive, one must control for at least three factors before these results can be taken seriously. (i) Observations for firms borrowing from the same bank during a given year are likely to be correlated due to common bank-year shocks. (ii) Since we do not have a complete panel of firms, simple OLS could be biased if the number of pre-privatization missing observations for a firm is correlated with EPA. (iii) A significant amount of variation in the data comes from yearly fluctuations in aggregate firm performance which must be controlled for.

Column (2) controls for these three factors by (i) reporting clustered standard errors with bank-year serving as the unit of clustering; (ii) probability-weighing each firm-observation according to the missing observations it represents;[18] and (iii) including year fixed effects. The year fixed effects significantly reduce the standard errors. This is not surprising for a developing country where the economic environment tends to be extremely volatile. The results in column (2) are striking. Privatization of MCB had a positive and significant effect on MCB_{old} firms. On average it led to an increase of 1.3% in EPA. Moreover, pre-privatization differences between MCB_{old} and NB_{old} firms remain insignificant and very close to zero. Column (3) restricts the sample to only a complete panel of firms, and the results hold.

A potential concern with the results in column (2) is that omitted firm differences across MCB_{old} and NB_{old} are driving the results. For example, if the 1990s happened to be a good time for a particular industry, and MCB_{old} had a higher share of firms from that industry than NB_{old} firms, the regression in column (2) will be biased upwards. Column (4) controls for a number of such possible confounding effects by including firm fixed effects, and the interaction of year dummies with dummies for specific firm characteristics. These firm characteristics include industry affiliation, size, capital-intensity as proxied by the ratio of fixed assets to total assets, capital turnover as proxied by revenue to total assets, and debt-equity ratio. All firm characteristic dummies equal 1 if the firm was in the upper half of the distribution at the time of privatization (1990). The results strongly reject the hypothesis that the earlier results were driven by pre-existing firm differences. In fact the magnitude of the privatization effect goes up to 2%, and is

[18] e.g. if a firm has 5 years of pre-privatization data instead of 7, then each pre-privatization firm-observation is given a weight of 7/5 instead of 1.

significant at the 1% level.

As mentioned in section 3, the MCB_{old} sample is different from the NB_{old} sample in the sense that it contains non-listed firms as well. Banks might find it easier to monitor listed firms since they already have other monitoring mechanisms such as regulations for the protection of minority shareholders. Alternatively, if listed firms are already being monitored by shareholders, banks may not make much of a difference. In this case the monitoring results could primarily be driven by the fact that the MCB_{old} sample has non-listed firms in it. Column (5) in Table IV tests for that by separately looking at the differential impact of privatization on non-listed firms. The results suggest that listed and non-listed firms are affected almost equally.

The monitoring effect of privatization is thus robust to a wide range of specifications. Column (6) does another robustness check by first running EPA on year fixed effects, aggregating the residuals within each bank-year cell, and then running these aggregated residuals on MCB_{old} and $(MCB_{old} * Post)$. The advantage of this aggregation is that one does not have to worry about the standard errors being biased due to correlation among firms in a bank-year cell. I also correct for the possibility of auto-correlation in the data, by including an AR(1) error term in the regression equation. The results are robust to this specification as well.

Column (7) does one final robustness check by introducing log of size or log(total assets) of the firm as the dependent variable. This checks for the possibility that MCB_{old} firms shrank disproportionately after privatization, increasing their earnings-per-asset. The result finds no evidence for such an effect.

The magnitude of the monitoring effect is sizeable given that the mean EPA at the time of privatization was 3.8%. Perhaps a better sense of the magnitude of privatization effect is given by the fact that it roughly represents a jump from the 40th to 50th percentile in the distribution of EPA.

So far the effect of privatization has been aggregated across all post-privatization years. Figure 6 plots the dynamics of privatization effect by estimating the effect of monitoring separately for each year. 1990 is the omitted year in the estimation. Although yearly estimates are quite noisy, one can still see a break in the effect of monitoring on EPA of firms after privatization. The figure conforms with the identification assumption that there were no systematic differences between MCB_{old} and NB_{old} firms prior to privatization. An F-test for the sum of pre-privatization coefficients to be equal to zero cannot be rejected at the 10% level, whereas a similar F-test for the post-privatization period is easily rejected. The timing of the monitoring effect in Figure 6, is also interesting. It suggests that most of the improvement took place in a single year, from 1992

to 1993. This quick and sharp increase in the earnings of firms could reflect two things: (i) the tunnelling effect is quite important, as the bank is forcing the firms to reveal their true accounts, and (ii) because of financing constraints, the firms were operating below their possible efficiency frontier.

Finally, a potential problem that needs to be addressed is the possible exit and switching of firms. As mentioned earlier, the small number of major commercial banks, asymmetric information about firm quality, and the fact that firms in this paper are heavily borrowing from a single bank, make switching less likely. This seems true in the data, as in the first five years after privatization, only 4 MCB_{old} firms and 7 NB_{old} firms switch out of their banks. The results are robust to the exclusion of these firms.

According to the theoretical model, the evidence of higher earnings-per-asset for MCB_{old} firms, coupled with the evidence of higher net-interest-revenue for MCB, is consistent with the hypothesis of increased monitoring after privatization (see Table I). The effect on net welfare is still unclear according to the model, as both predictions 1a) and 2a) are consistent with the above evidence. In fact, the model really cannot discriminate between those two cases. However, due to the observed increase in EPA, I can reject the socially worst outcome associated with increased monitoring, outcome 2b in Table 1.

2. Heterogeneity of Privatization Effect

The magnitude of the privatization effect is not likely to be similar across all types of firms. Reasons for differences in the extent and effectiveness of monitoring can be categorized into four groups:

(i) Specialization: Banks are likely to be better monitors of firms they have better knowledge of. This knowledge could be a result of previous interactions with the same or similar firms. Alternatively, a bank might specialize in a particular industry or market. The superior knowledge, for example, might give the bank an edge in evaluating new investment opportunities and judging whether or not to hold firm management responsible for any delay in loan repayment.

(ii) Bargaining Strength: Monitoring is ultimately about control. Banks are able to monitor the firms only because they have the ability to punish firms through credit denials or litigation. As such, any factor that increases a bank's bargaining strength vis-a'-vis the firms will lead to more effective monitoring by the bank. Threats of foreclosure, litigation, and credit denial will be more credible and effective against firms with limited outside options. Richer firms with access to multiple financing options are likely to be less influenced by the bank's monitoring efforts. It might also be harder for banks to control firms with strong political ties. Similarly, the efficiency

of courts and enforcement mechanisms will determine how far the banks can go in their monitoring efforts.

(iii) Frequency of interactions: The most effective tool of banks to control firms remains credit denial. Whenever debt is refinanced more often, it provides more opportunities for creditors to review investment decisions, adjust interest rates to account for risk, or refuse to roll over debt and grant additional loans. Secondly, because short-term credit is often secured by short-term assets such as inventories or accounts receivable, foreclosure on these assets is relatively easy. Thus, a creditor can easily impose a credible threat of foreclosure if the debt is not repaid.

(iv) Concavity: The bank's return is concave in the cash flow of its firms. This implies that a bank will monitor more closely a firm at the lower end of profitability.

The following equation tests if any of these determinants were important for the monitoring effect:

$$\begin{aligned} Y_{it} &= \alpha + \gamma_i + \varphi_t + \beta_1(MCB_i * Post_t) + \beta_2(Z_i * MCB_i * Post_t) \\ &\quad + \beta_3(Z_i * Post_t) + \beta_4(Z_i * MCB_i) + \varepsilon_{it} \end{aligned} \tag{7}$$

where Z_i is a dummy variable capturing some firm characteristic related to one of the four determinants mentioned above.[19] Equation (7) is similar to equation (6), except that it also checks if the monitoring effect is higher for firms with a particular set of characteristics. β_2 is the coefficient that measures that differential effect. Possible firm characteristics that Z_i captures, include the following:

Industry Classification: Half the firms in the sample belong to the textile sector. If there is a specialization effect in monitoring, it should show up in the textile firms being affected more.

Size: Bigger firms are likely to be politically stronger. They are also likely to have greater outside options in choosing alternative sources of financing.

Fixed-Capital-to-Total-Asset ratio (Capital Intensity): This ratio reflects a firm's access to long term capital, and hence political strength. Long-term capital is almost always controlled by a government run domestic financial institution (DFI). These DFIs often serve as the conduit for multinational loans. Previous studies such as Amjad [1982] have established the importance of political connections in gaining access to these DFIs.

Leverage: Banks could have greater control over firms that are more highly leveraged (i.e. have

[19] Z_i equals 1 if a firm was in the top half of the distribution for the variable under consideration at the time of privatization.

higher debt-to-equity ratios).

Revenue-to-Total-Asset ratio (Capital Turnover): Firms with higher revenue to total asset ratio are likely to turnover capital faster and hence have more interactions with the bank.

Initial EPA: EPA of firms in 1990 measures how close they are to potential default.

Industry dummy tests for the specialization effect, Size, Capital Intensity, and Leverage test for the bargaining effect, Capital Turnover for the frequency effect, and Initial EPA for the concavity effect. The results of running (7) are shown in Table V.

Column (1) suggests that the specialization effect is not important in determining the extent of monitoring. Firms in the textile industry, which represent 50% of the sample are affected equally by privatization. Columns (2) and (3), which measure the effect on monitoring of size and capital intensity respectively, indicate that *all* of the effect of monitoring in Table IV can be attributed to small firms, and firms with low ratio of fixed-to-total capital. Column (4), which includes both the size and capital intensity variables shows that the two variables affect monitoring through independent channels. These results are interesting in light of the bargaining view of monitoring presented earlier. They suggest that firms that are weaker, perhaps due to lower outside options or weaker political links, are more likely to be influenced by a financial monitor. This highlights the complementarity between political reforms and economic reforms. In particular, providing incentives may not be sufficient in a politicized economic environment where the rules of the game might be dictated by political considerations instead of economic efficiency. Column (5) tests for another potential determinant of bargaining strength, namely the debt-equity ratio. Although the effect of higher debt on monitoring is positive, it is not statistically significant. Columns (6) and (7) test for other theories of monitoring based on frequency of interactions (capital turnover) and concavity of bank objective function. Although both effects go in the direction predicted by the theory, the results are not statistically significant.

3. Test for Efficiency

I now try to measure the *efficiency* of bank debt, and test if it improves for MCB after privatization. Suppose that we are able to measure this efficiency perfectly. Then if MCB does a better job of evaluating new loans and identifying productive projects, we should see an improvement in the efficiency of bank-debt for MCB_{old} firms. Clearly the biggest obstacle is measuring the efficiency of bank debt properly. This section proposes a test based on the predictive power of bank-debt for EPA. Specifically, I run the following regression:

$$EPA_{i,t+1} = \alpha + \gamma_i + \varphi_t + \beta_1 BD_{it} + \beta_2(BD_{it} * M_i) + \beta_3(BD_{it} * M_i * P_t) + \beta_4(BD_{it} * \varphi_t) + \beta_5(M_i * P_t) + \varepsilon_{it} \quad (8)$$

where BD is bank-debt divided by total assets, M_i is a dummy for MCB_{old} firms, and P_t is a dummy for post-privatization period. The coefficient β_3, in the above equation is capturing two effects. First, it reflects whether MCB's bank debt responded *more* to news of higher expected profitability for a given firm. This is the *informational* interpretation of the equation. Second, β_3 tests if the *causal* impact of MCB's bank debt on its firms was higher than the same impact for NBs on its firms. The first interpretation measures the *informational efficiency* of bank debt, whereas the second one measures the *allocative efficiency* of bank debt.

Table VI reports the results of running equation (8). Since data on bank-debt is available only from 1990 onwards, the number of observations is reduced in Table VI. The results indicate a positive and significant improvement in the predictive power of bank-debt for MCB_{old} firms (column (1)). The coefficient can be interpreted as an elasticity. As a result of privatization, bank-debt for MCB_{old} firms became *better* at predicting future EPA. In terms of elasticity, one can say that the elasticity of future EPA (EPA_{t+1}) with respect to normalized bank-debt this period (BD_t) increases by 0.069 for MCB_{old} firms as a result of privatization.

Column (2) in table VI is a stricter test of the informational content of bank-debt. It uses EPA in the current period instead of firm fixed effects. In other words, column (2) conditions for all the information already present in current period EPA, and tests if the informational content in bank-debt is better at predicting the new information contained in EPA_{t+1}. The coefficient on β_3 drops from 0.069 to 0.031. Although the coefficient remains positive, it is no longer statistically significant.

The results of Table VI can be interpreted as indicating that MCB at least used available information more efficiently than NBs. This is consistent with the theory that MCB became more sensitive to the expected profitability, and financial needs of a firm after privatization. As explained earlier, one explanation for the lack of sensitivity to available information in government banks is based on the agency view of governments that leads government banks to engage in unimaginative rule-based lending.

4. Selection Effect

The monitoring and screening aspects of banking are likely to be complementary. A bank with good ability to screen projects does not have to invest too much effort monitoring those

projects. It is this inter-relationship between monitoring and selection that has made it traditionally impossible to separate out the two effects empirically. However, since the selection criteria of government banks under a centralized governing body was similar, I was able to identify the pure monitoring effect by looking at firms in close relationship with the banks prior to privatization. Having separated the monitoring effect, the next question is, what is the effect of a change in ownership on the selection ability of MCB? In other words, are the private owners better at screening firms and selecting the most productive ones? The following simple thought experiment will be useful in understanding the requirements necessary for estimating the selection effect.

Suppose that MCB under government ownership is exposed to a distribution of potential borrowers with mean productivity τ_g. MCB evaluates each borrower and selects some with mean productivity μ_g. One measure of the selection ability of MCB under government ownership is then $(\mu_g - \tau_g)$. One can construct a similar measure when MCB is under private ownership: $(\mu_p - \tau_p)$. The effect of privatization on selection ability is then equal to, $S = (\mu_p - \tau_p) - (\mu_g - \tau_g)$.

There are two main problems in estimating S. (i) It is not known what the potential set of borrowers is. I do not have information on firms that applied to MCB for credit, but got rejected. However, even that information would not be sufficient. The reason is that the set of borrowers applying to MCB at a given time is *endogenous* to the selection ability of the bank. Many borrowers may not apply in the first place because they know they are not qualified enough to be selected by MCB. (ii) There is also the basic problem of measuring the true *potential* productivity of borrowers at the time of selection. One cannot really use future realized productivity as that would in turn, depend upon the decision of MCB to finance the firm or not.

Given the limitations of available data, the two problems above cannot be solved perfectly. However, with some additional assumptions, one can calculate an estimate of the selection effect of privatization. The strategy is suggested by the differences in age of MCB_{new} and MCB_{old} firms. The firms in the two samples are separated by a median age difference of 18 years. This suggests that new firms coming to seek financing, generally belong to similar age cohorts. Hence for a given firm, one set of potential competitors is the set of firms belonging to the same age-cohort.

I adopt this strategy, and compare the profitability of MCB_{new} firms with firms in the same age-cohort, where an age cohort is defined as the set of firms born in the same half-decade. The set of comparison firms is based on all the 334 non-financial listed firms, other than MCB_{new} and MCB_{old}.

I first look at MCB_{new} firms, and compare them with their age-cohort *before* the time of selection, by running the following regression:

$$EPA_{it} = \alpha + \varphi_t + \beta_1(B_i) + \beta_2(B_i * \varphi_t) + \beta_3(MNew_i) + \varepsilon_{it} \quad (9)$$

where φ_t is a vector of year dummies, B_i is a dummy that signifies the 5-year period of birth, and $MNew_i$ is a dummy for firms selected by MCB after privatization. For each MCB_{new} firm, only years prior to the year of selection, are included. β_3 thus measures the average difference in profitability prior to selection between MCB_{new} firms, and their respective age-cohorts. This estimate is the conceptual equivalent of $(\mu_p - \tau_p)$ in the discussion earlier.

I next repeat the same procedure with MCB_{old} firms, with one caveat. Since I do not have information on the exact year that these firms joined MCB, I cannot compare them with their respective age-cohorts prior to the year of selection. Therefore, I simply compute the difference between MCB_{old} firms and their age-cohorts prior to privatization. This is the conceptual equivalent of $(\mu_g - \tau_g)$ in the discussion earlier.

Columns (2) and (4) in Table VII report the estimates of selection ability of MCB under private and government ownership respectively. The results suggest considerable improvement in the selection ability of MCB after privatization. Column (4) shows that before privatization, firms selected by MCB were no different than their age-cohort peers. However, firms selected after privatization had an EPA of 3.69% higher than their age-cohorts. In other words, the *privatization effect* on selection can be estimated to be 3.69%.

The analysis suggests the importance of ex-ante monitoring, or screening for banks. If banks are able to attract high quality firms, they need to invest lot fewer resources later on for monitoring of these firms. Furthermore, the fact that some of the best corporate firms in Pakistan sought out MCB as their creditor suggests that MCB indeed adds value to the firm's operations.

6 Conclusion

The paper developed a model showing that the theoretical effect of ownership on bank performance, and firm supervision is ambiguous. The model also presented empirical predictions that could be used to infer the actual effect of ownership on monitoring in the data. The paper finds strong empirical evidence for the monitoring effect of privatization.

Bank-level evidence from the privatization of MCB shows that privatization led to rapid growth of MCB in terms of deposits and assets. The bank doubled in size in the first seven years after privatization, far outpacing any of its nationalized rivals. This growth in assets was also accompanied by a corresponding improvement in the interest margin of MCB, which grew by 2 to

4 percent. The growth in net interest revenue is of particular interest in light of the model, as it is consistent with an increase in monitoring by the bank. Although the data shows no real growth in overall profitability for the bank, this can plausibly be attributed to the rapid expansion of MCB.

The analysis of firm-level data shows an improvement of 1 to 2 percent in the earnings-per-asset (EPA) of firms financing through MCB prior to privatization. The result is robust to a wide range of specifications. This is again an interesting result in the light of the model, suggesting an improvement in MCB's ability to supervise its client firms. This monitoring effect of privatization is identified by the inclusion of firms borrowing from the non-privatized government banks prior to privatization. The magnitude of the effect is also substantial, implying a jump from the 40^{th} to the 50^{th} percentile in the distribution of EPA.

As mentioned in the introduction, "monitoring" is used as a general term and could incorporate a wide variety of instruments being used by MCB to influence the performance of its firms. A possible line of future research would be to try to identify the precise mechanisms through which banks influence firms. For example, do banks exercise control through threats of credit denials, or do they tie in the firms by forcing them to use certain suppliers preferred by the bank?

The paper in fact tries to get at the issue of possible determinants of the monitoring effect. It finds that almost all of the effect of monitoring can be attributed to smaller firms, and to firms with weak access to long term capital. These are characteristics likely to be associated with weak political links, and low outside options. This suggests an explanation of the results based on a bargaining story where politically weaker firms are easier to control and hence monitor. The result is of particular relevance to public policy, as it highlights the importance of political environment in determining the outcome of economic reforms.

The test for informational and allocative efficiency reveals that MCB's bank lending after privatization is more closely associated with future profitability of firms than the lending of other non-privatized banks. This is further confirmation of the hypothesis that MCB was actively trying to pursue profitable ventures through its lending.

The paper also sheds light on another important public policy issue. Banks create economic value as they screen out poor credits. The paper shows that privatization significantly improved MCB's screening ability. The bank was able to select firms after privatization, which had 4% higher earnings-per-asset than other firms in their age-cohort. This separate identification of the monitoring and selection effects of privatization is a particular contribution of this paper.

This paper is related to a small but growing literature that investigates the benefits of firm-

creditor relationships. For example, Hoshi, Kashyap, and Scharfstein [1990] in their study of Japan, find that close-ties with banks help firms overcome frictions in the credit market, and makes them less susceptible to financial distress. Similarly, work for the United States by Lummer and McConnel [1989], James and Wier [1990], and Petersen and Rajan [1994] finds that the existence or renewal of banking relationships, and loan commitments is a positive signal for firm value. The work in this paper is similar to these earlier ones in that it looks at the effect of a particular attribute in the firm-creditor relationship, namely the ownership of the creditor, on firm performance. However, this study differs from previous ones in one important aspect, the strength of the identification that comes from looking at an event like privatization.

The identification strategy used in this paper of estimating the effect of a change in an organization, on agents interacting with the organization can also be applied more broadly. For example, it would be interesting to see how privatization of other large government run institutions such as public utility companies, impacts the smaller upstream and downstream customers of the institution. This paper has taken a first step towards this promising area of future research.

Theory Appendix

Claim on page 6: $p(a)$ is increasing and concave in a.

Proof: Differentiate (1) with respect to a to get:

$p'(a) = \frac{-1}{E'(p)-r} > 0$ for all a, from assumptions (iii) and (vi).

Differentiate the above expression again to obtain:

$p''(a) = \frac{-[p'(a)]^2 E''(p)}{E'(p)-r} < 0$, from assumptions (iii) and (vi).

Proof of Proposition 1: For a given γ, the creditor's payoff function is given by:

$\gamma[p(a)[xR(p) + (1-x)r - 1] - (1-p(a))D] - C(a)$

Differentiating it with respect to a, gives the first order condition:

$\gamma p'(a)[xE'(p) + (1-x)r + D - 1] = C'(a)$

Thus, when $\gamma = 0$, $a = 0$ will be chosen.

Define, $\psi = [xE'(p) + (1-x)r + D - 1]$.

Then from the first order condition above, if $\psi < 0$, we get the corner solution, $a = 0$.

As γ rises, $\frac{\partial a}{\partial \gamma}$, is given by:

$\frac{\partial a}{\partial \gamma} = \frac{-p'(a)\psi}{p''(a)\psi+(p'(a))^2 xE''(p)-C''(a)}$. In an interior solution, $\psi > 0$, which implies $\frac{\partial a}{\partial \gamma} > 0$.

The rest of the proof follows straight from Figure 1.

Proof of Proposition 2:

Without loss of generality, assume $\gamma = 1$.

Then differentiation the creditor's first order condition above gives us:

$\frac{\partial a}{\partial D} = \frac{-p'(a)}{p''(a)\psi+(p'(a))^2 xE''(p)-C''(a)} > 0.$

$\frac{\partial a}{\partial x} = \frac{rp'(a)}{p''(a)\psi+(p'(a))^2 xE''(p)-C''(a)} < 0$

Table I: Possible effects of Privatization, and their Predicted Outcomes

Possible Hypotheses		*Predicted Outcomes*
1) a ↑ , W ↑ (Case 1)	Case 1	1a) EPA_1 ↑, OH ↑, NIR ↑ $Var(EPA_1)$ ↓
2) a ↑ , W ↓ (Cases 2 and 3)	Case 2	2a) EPA_1 ↑, OH ↑, NIR ↑ $Var(EPA_1)$ ↓
	Case 3	2b) OH ↑, NIR ↑ EPA_1 ↓, $Var(EPA_1)$ ↓
3) a ↓ , W ↑ (Cases 2 and 3)	Case 2	3a) $Var(EPA_1)$ ↑ EPA_1 ↓, OH ↓, NIR ↓
	Case 3	3b) $Var(EPA_1)$ ↑, EPA1 ↑ OH ↓, NIR ↓
4) a ↓ , W ↓ (Case 1)	Case 1	4a) $Var(EPA_1)$ ↑ EPA_1 ↓, OH ↓, NIR ↓

a and W refer to the level of monitoring, and social welfare respectively.

EPA_1, OH, and NIR refer to expected earnings-per-asset, over head costs, and net-interest-revenue respectively.

Table II: Summary Statistics - Firm Level Data

	NB_{old} Firms		MCB_{old} Firms		MCB_{new} Firms		All listed firms	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Industry Classification								
Auto	6	5.8	2	3.5	2	2.9	20	4.6
Cement	3	2.9	0	0.0	1	1.5	13	3.0
Chemical	9	8.7	7	12.1	5	7.4	33	7.6
Electrical Machinery	1	1.0	3	5.2	4	5.9	21	4.8
Jute	3	2.9	1	1.7			7	1.6
Miscellaneous	11	10.6	4	6.9	11	16.2	46	10.6
Oil	2	1.9	4	6.9	2	2.9	19	4.4
Paper	3	2.9	2	3.5	2	2.9	12	2.8
Sugar	13	12.5	5	8.6	5	7.4	30	6.9
Textile	53	51.0	30	51.7	36	52.9	202	46.7
Firm Classification								
Listed	104	100	26	44.8	35	51.5		
Unlisted	0	0	32	55.2	33	48.5		
Total	**104**	**100**	**58**	**100**	**68**		**403**	**100**

Firm Characteristics	NB_{old} Firms	MCB_{old} listed	MCB_{old} non-listed	
Total Assets	383.87	346.16	422.61	
Capital Intensity	0.57	0.52	0.39	**
Capital Turnover	1.20	1.13	1.63	**
Debt/Equity	2.75	2.28	3.51	**

NBold: firms with NB at the time of privatization, MCBold: firms with MCB at the time of privatization, MCBnew: firms joining MCB after privatization.
Capital Intensity: Fixed-to-total-asset ratio. Capital Turnover: Revenue-to-total-asset ratio.
Data on firm characteristics is from 1990. ** difference between MCBold non-listed and MCBold listed is significant at the 5% level.

Table III a: Bank Level Effect of Privatization on Size

Dependent Variable	(1) Total Assets	(2) Loans	(3) Deposits	(4) Log Asset	(5) Log Loan	(6) Log Deposit
MCB*Post	494,966*	337,376**	518,487**	0.52***	0.50***	0.54***
	(317,162)	(148,479.)	(257,927)	(0.081)	(0.09)	(0.073)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Bank	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.88	0.92	0.91	0.92	0.93	0.94
# obs :	56	56	56	56	56	56
Pre-privatization difference for MCB	-2,886,239***	-1,398,357***	-2,692,053***	-1.05***	-1.06***	-1.088***
	(255,745)	(149,778)	(231,268)	(0.054)	(0.066)	(0.055)
Pre-privatization mean for MCB	1,511,880***	717,109***	1,330,367***	14.2***	13.5***	14.1***
	(70,351)	(42,249)	(51,839)	(0.0452)	(0.0593)	(0.0375)

*, **, *** 10, 5 and 1 % significance levels respectively.Robust s.e. reported. Data covers 1985-1998. All figures are in ,000 US $.

Table III b: Bank Level Effect of Privatization on Profitability

	(7)	(8)	(9)	(10)	(11)	(12)
Dependent Variable	**ROA**	**NIR/TA**	**OPI/TA**	**OH/TA**	**MISC/TA**	**OH/INC**
MCB*Post	0.0035	0.0106**	-0.0014	0.0018	0.0023	-0.0519
	(0.0039)	(0.0053)	(0.0012)	(0.0023)	(0.0064)	(0.0582)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Bank	Yes	Yes	Yes	Yes	Yes	Yes
R-sq	0.42	0.45	0.76	0.78	0.31	0.61
# obs :	54	56	56	54	56	54
Pre-privatization difference for MCB	0.0011	0.0004	0.0016***	0.0040***	0.0031***	0.0258
	(0.0008)	(0.0009)	(0.0002)	(0.0008)	(0.0006)	(0.0259)
Pre-privatization mean for MCB	0.0065***	0.024***	0.011***	0.031***	0.0022**	0.8019***
	(0.0006)	(0.002)	(0.0012)	(0.0012)	(0.0011)	(0.0545)

*, **, *** 10, 5 and 1 % significance levels respectively. Robust s.e. reported. Data covers 1985-1998. All figures are in ,000 US $.
ROA: Return on Asset. NIR/TA:Net Interest Revenue over Total Assets.
OPI/TA: Other Operating Income (Commission and Fees)/ Total Assets.
OH/TA: Overhead (non-interest expenses)/Total Assets.
MISC/TA: Remaining net return on Total Assets. OH/INC: Overhead over Income.

Table IV: Privatization (Monitoring) Effect

Dependent Variable	(1) EPA	(2)[1] EPA	(3)[1,2] EPA	(4)[1] EPA	(5)[1] EPA	(6)[3] EPA	(7)[1] og(Assets)
MCB_{old}*Post	0.0111	0.0131***	0.0160***	0.0199***	0.0107	0.0102*	0.0076
	(0.0112)	(0.0043)	(0.0037)	(0.0050)	(0.0076)	(0.0058)	(0.0264)
MCB_{old}	-0.0006	-0.0028				Yes	
	(0.0080)	(0.0025)					
Post	-0.0420***						
	(0.0062)						
$MCB_{unlisted}$*Post					0.0027		
					(0.01)		
Year Effect		Yes	Yes	Yes	Yes	Yes	Yes
Firm Effect			Yes	Yes	Yes		Yes
Other Controls[4]				Yes			
Probability Weighted		Yes		Yes	Yes		Yes
R-sq	0.032	0.06	0.586	0.536	0.43	0.222	0.9
# obs :	1643	1643	1101	1643	1643	52	1643

1991 is the excluded year.

[1] Columns report clustered standard errors, with a bank-year cell being the unit of clustering.

[2] Column (3) is run only on a complete panel of firms.

[3] In column (6), data is aggregated within each bank-year cell. The regression also includes an AR(1) error term to correct for potential autocorrelation.

[4] Other controls are a group of dummy variables, and their interactions with year fixed effects. The dummy variables classify firms according to some underlying characteristic of interest (such as size). The dummy variable takes the value 1 if the firm was in the top half of the distribution, for the variable under question, at the time of privatization. Firm characteristics included in the regression are: Total Assets, Fixed-to-Total-Assets ratio, Revenue-to-total-assets ratio, and debt-to-equity ratio.

Table V: Heterogeneity of Privatization Effect

Dependent Variable	(1) **EPA**	(2) **EPA**	(3) **EPA**	(4) **EPA**	(5) **EPA**	(6) **EPA**	(7) **EPA**	(8) **EPA**
MCB_{old}*Post	0.0117	0.0368***	0.0307***	0.0541***	0.0085	0.0049	0.0115	0.031
	(0.0116)	(0.0091)	(0.0095)	(0.0104)	(0.0101)	(0.0110)	(0.0093)	(0.0294)
Textile*MP	0.0023							-0.016
	(0.0223)							(0.0259)
Size*MP		-0.0391**		-0.0348**				-0.0205*
		(0.0156)		(0.0156)				(0.0109)
Capital-Intensity*MP			-0.0454**	-0.0475**				-0.0165
			(0.0203)	(0.0208)				(0.0222)
Debt-Equity*MP					0.0126			0.0312
					(0.016)			(0.0181)
Capital-Turnover*MP						0.0137		0.0109
						(0.0180)		(0.017)
Initial-EPA*MP							-0.0131	-0.0124
							(0.016)	(0.0189)
R-sq	0.449	0.443	0.433	.446	0.432	0.431	0.531	0.541
# obs :	1643	1643	1643	1643	1632	1643	1643	1632

MP=MCBold*Post

*, **, *** 10, 5 and 1 % significance levels respectively.

All regressions include Firm fixed effects, Year fixed effects, and interactions of Z_i with MCB_{old} and Post.

Bank-year clustered s.e. reported. All regressions are probability weighted to account for unbalanced data set.

1991 is the omitted year.

Table VI: Predictability of earnings by bank-debt.

Dependent Variable	(1) $\mathbf{EPA_{t+1}}$	(2) $\mathbf{EPA_{t+1}}$
BD/TA	-0.0406	-0.0244
	(0.0260)	(0.0438)
(BD/TA)*MCB_{old}	-0.0064	0.0179
	(0.0413)	(0.0273)
(BD/TA)*(MCB_{old}*Post)	0.0688***	0.0305
	(0.0237)	(0.0285)
Firm Effect	Yes	
EPA_t		Yes
R-sq	0.636	0.472
# obs :	1070	1070

Data from 1990-98. BD/TA bank-debt/total asset.

*, **, *** 10, 5 and 1 % significance levels respectively.

Both regressions include (BD/TA)*Year, (MCBold*Post), and Year effects.

Table VII: Selection Effect of Privatization

	Selection Effect under Private Ownership		Selection Effect under Government Ownership	
Dependent Variable	(1) **EPA**	(2) **EPA**	(3) **EPA**	(4) **EPA**
MCB_{new}	0.0464***	0.0369***	0.0173**	0.0044
	(0.0084)	(0.0099)	(0.0074)	(0.0072)
Year	Yes	Yes	Yes	Yes
Birth		Yes		Yes
Birth*Year		Yes		Yes
R-sq	0.018	0.068	0.016	0.085
# obs :	2031	2031	1642	1642

Birth are dummies for 5-year period of birth.

*, **, *** 10, 5 and 1 % significance levels respectively.

Figure 1: The effect of monitoring on earnings-per-asset, and welfare

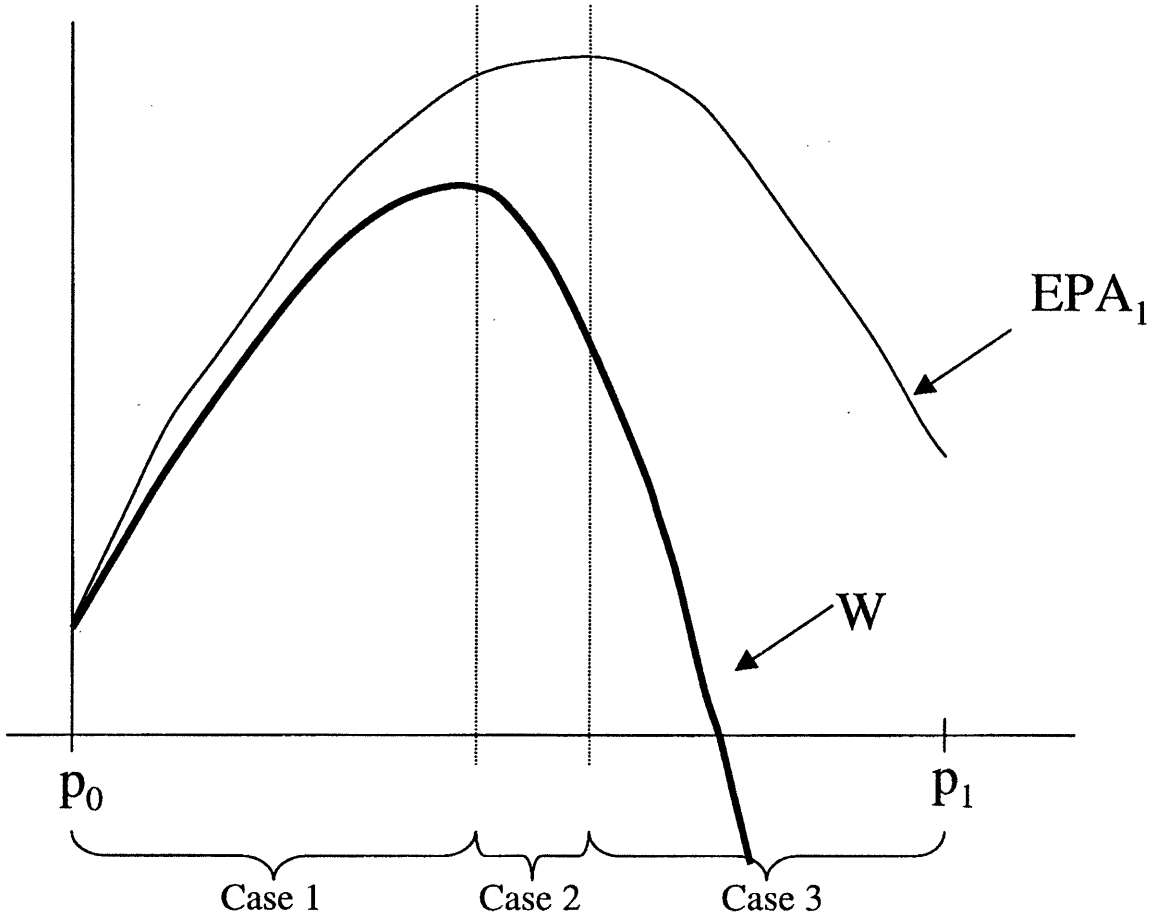
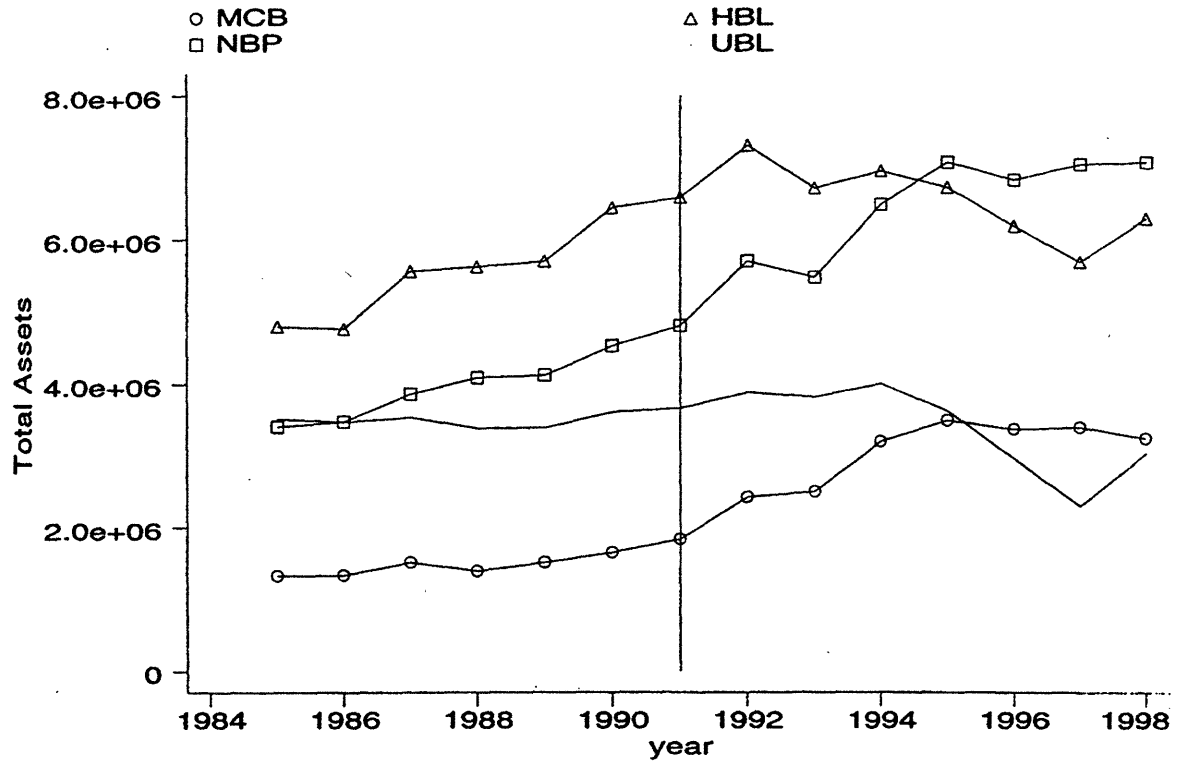


Figure 2: Total Assets of Banks



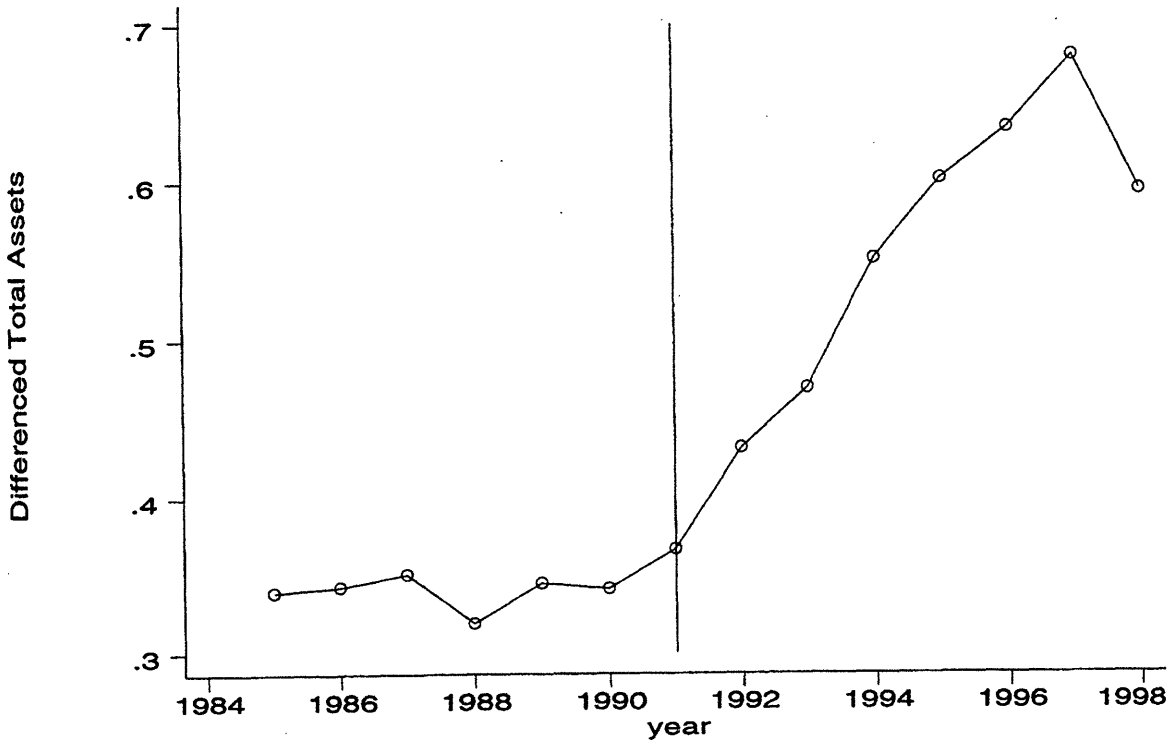
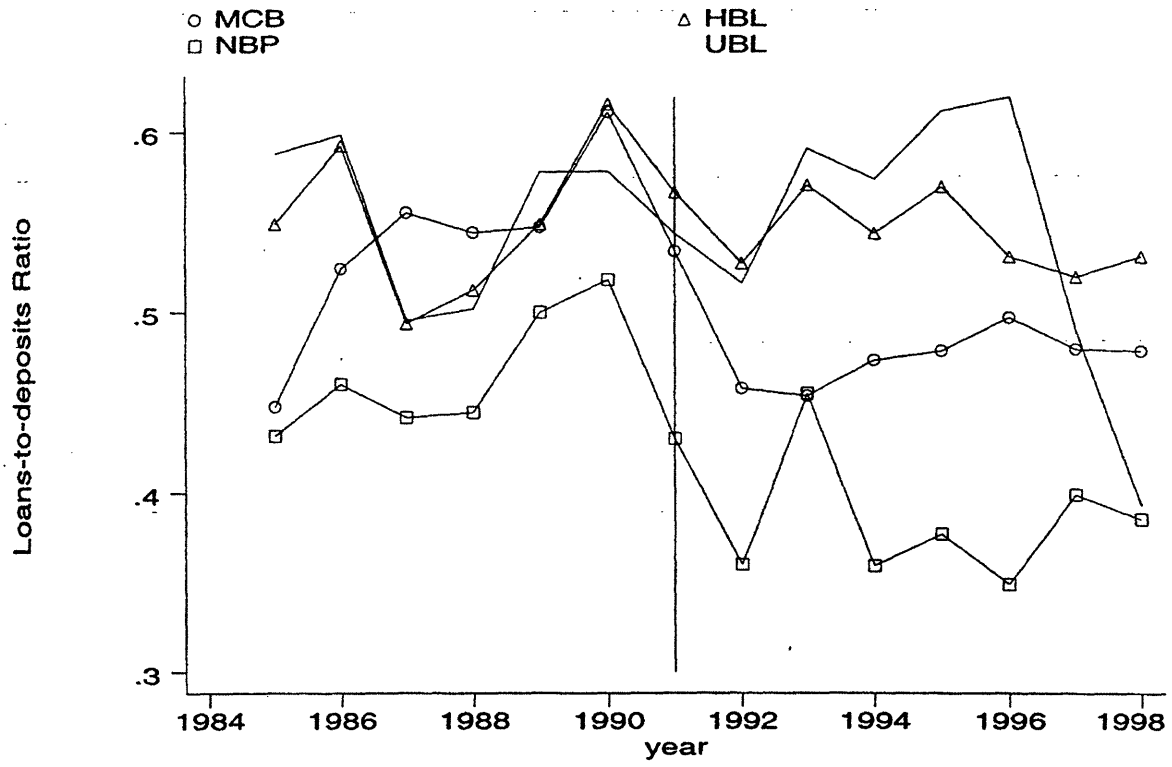


Figure 3: Loan to Deposit Ratios of Banks



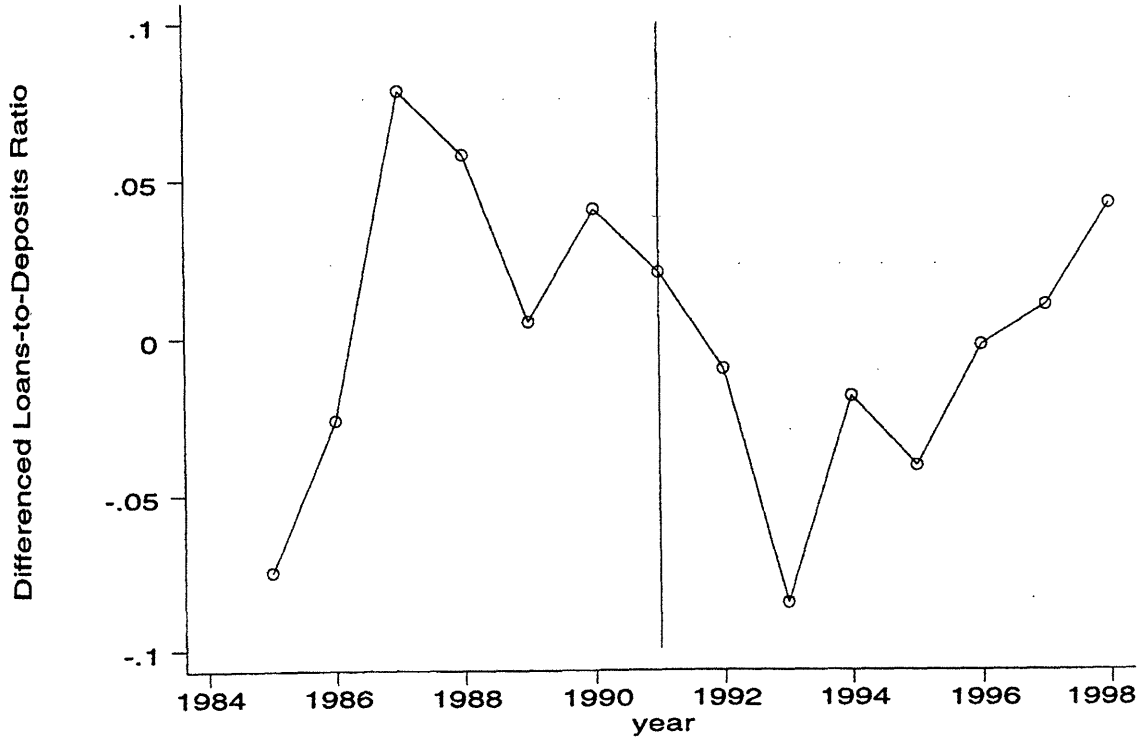
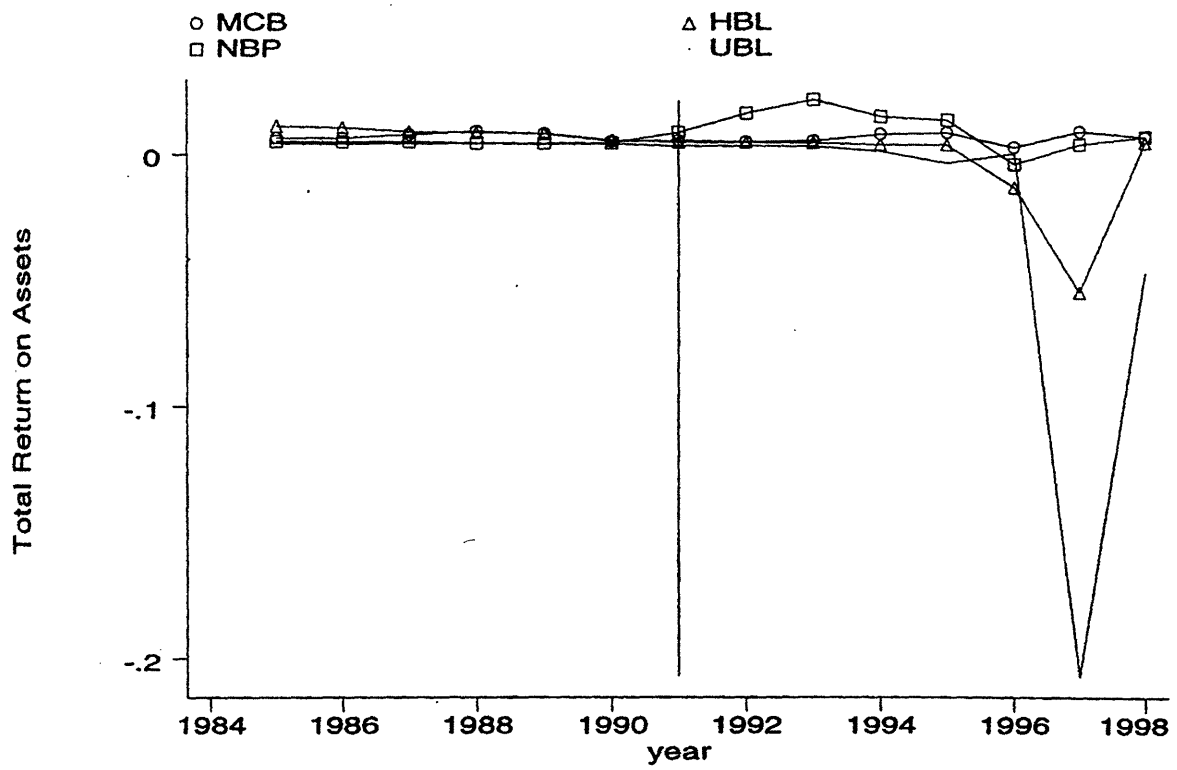


Figure 4: Total Return on Assets of Banks



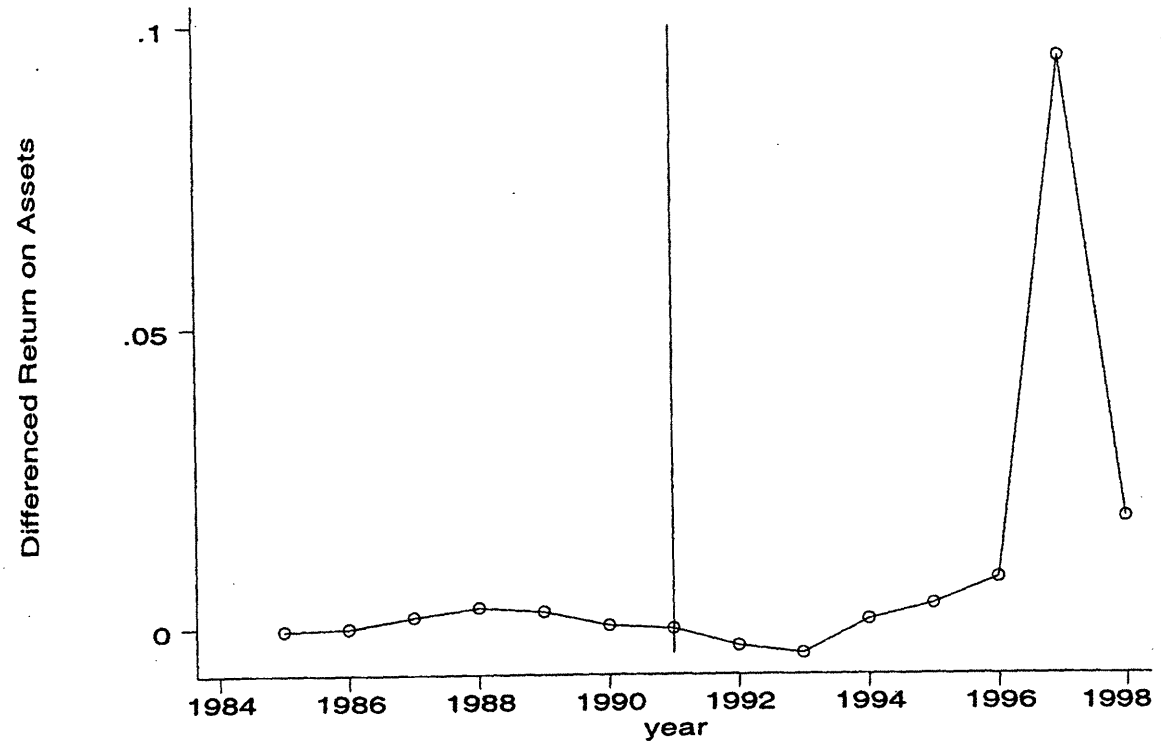
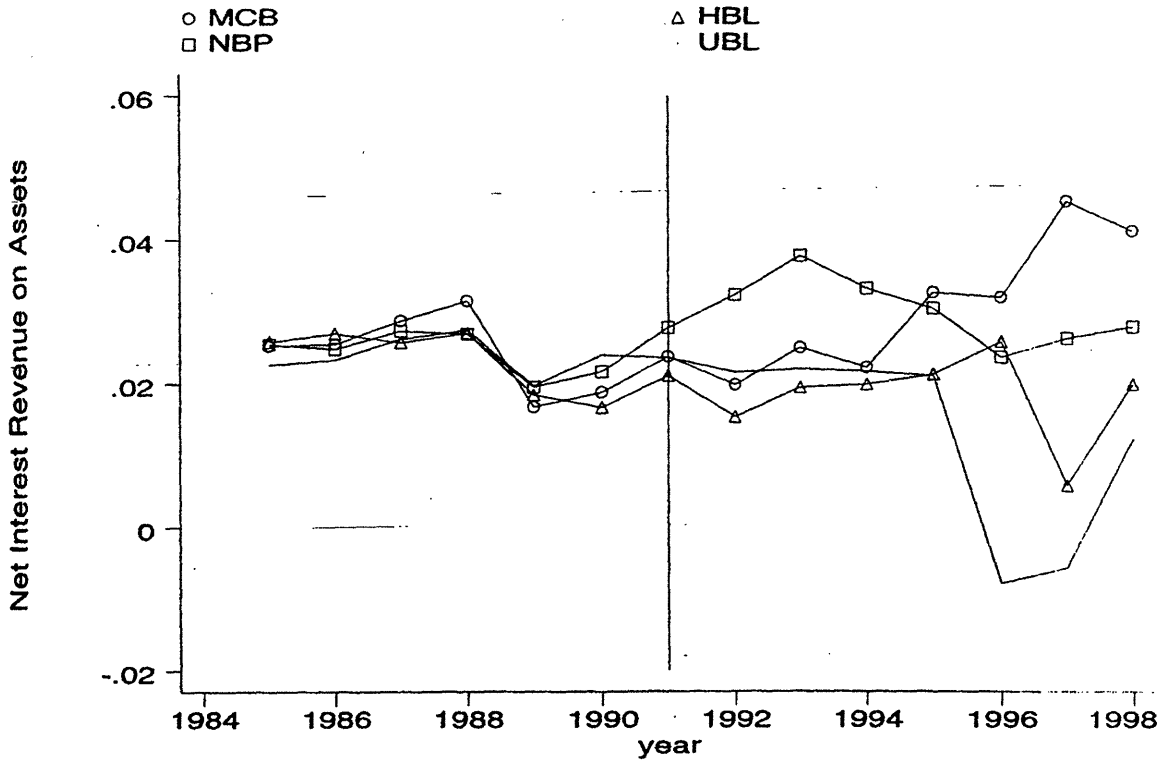


Figure 5: Net Interest Revenue to Asset Ratios of Banks



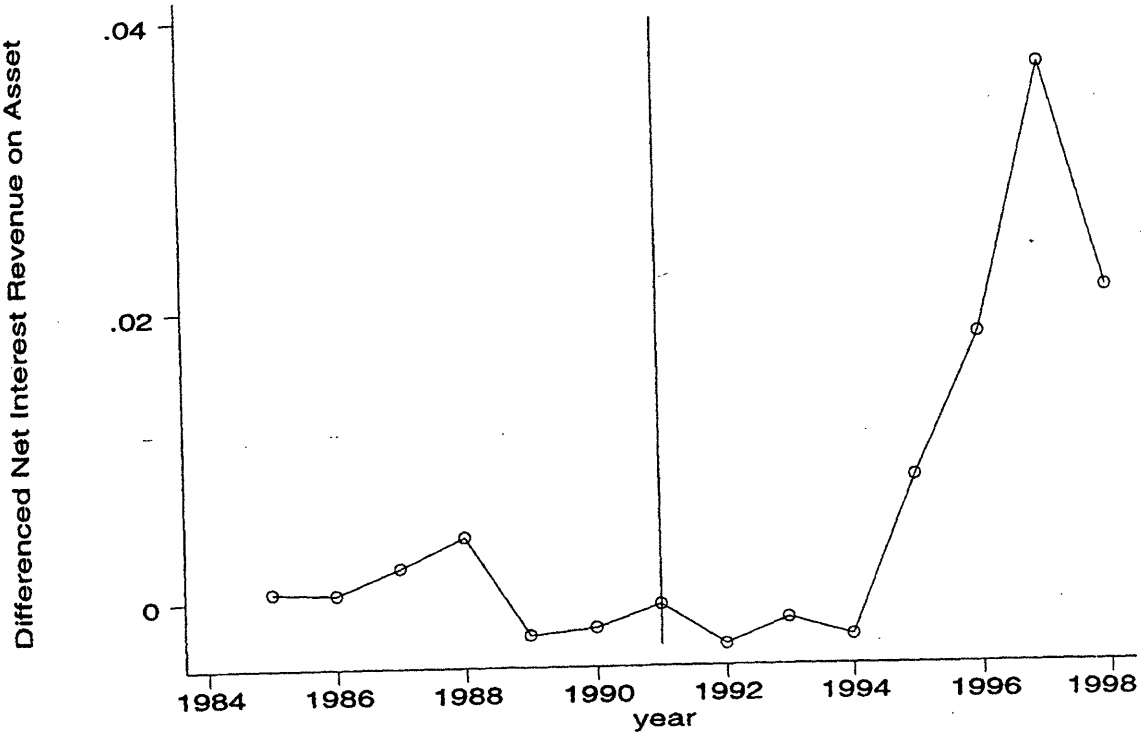
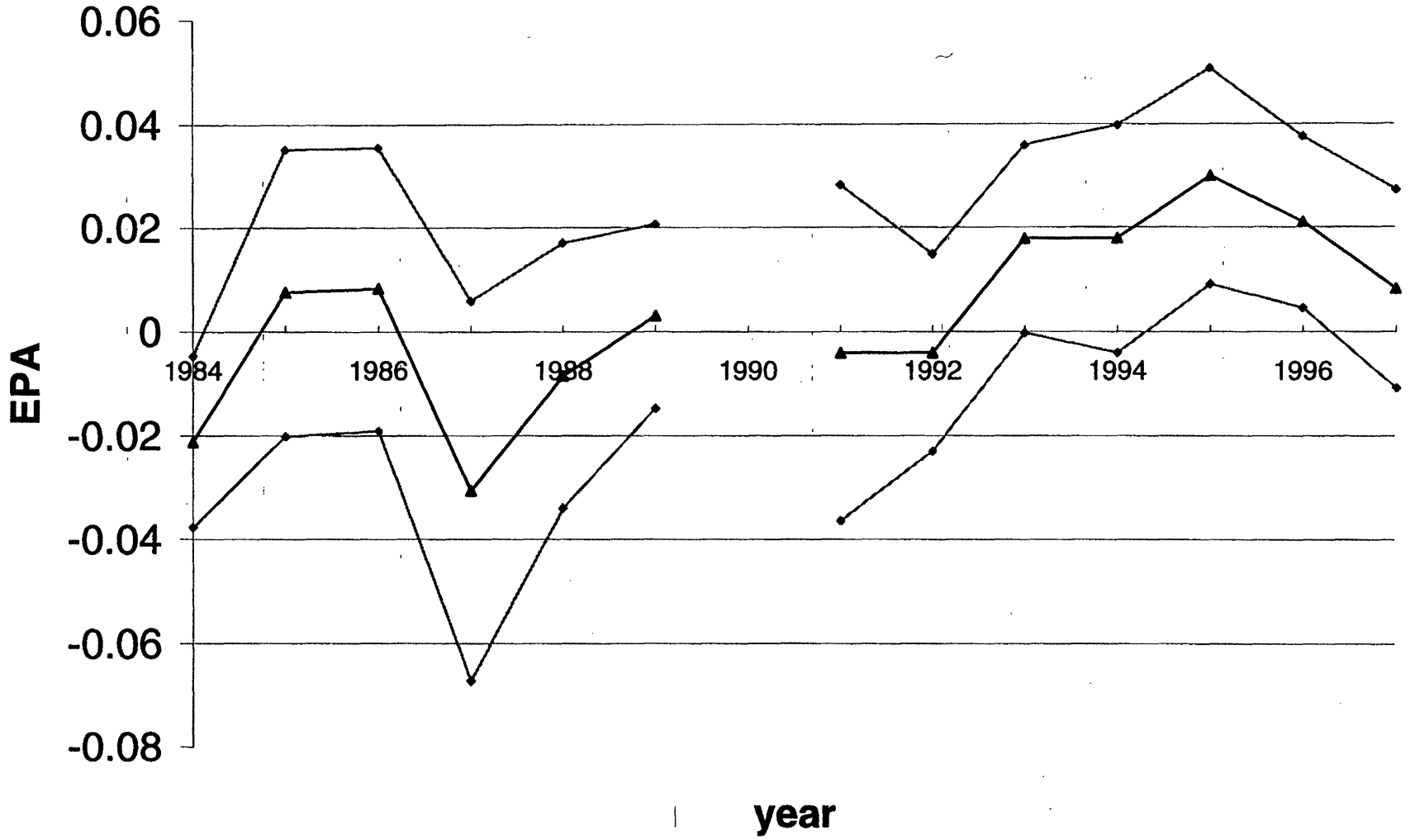


Figure 6: Monitoring effect of Privatization



Chapter 2

Domestic and Foreign Banks in Africa: Some New Evidence

Abstract

This paper documents differences between foreign and private domestic banks in Africa using a data set of 183 banks from 35 African countries. Domestic banks are well represented over the entire range of bank sizes in Africa. They hold significantly more liquid assets, and are substantially less profitable than foreign banks. However, all of the difference in profitability can be explained by the 2.6% higher interest rate on deposits for domestic banks. Furthermore, domestic banks appear to take on riskier loans, but their return on loans is higher by 2.7%. Foreign banks on the other hand earn significantly more income through bank fees. Finally, domestic banks grow a lot faster than foreign banks with overall economic expansion in the country. A 1% growth in GDP expands domestic bank credit by 1.76% compared to 0.86% for foreign credit. Our results, suggest that whereas foreign banks provide more prudent banking and better services than domestic banks, domestic banks play a critical role in lending to the local firms that might otherwise be neglected.

1 Introduction

There is a growing literature on the importance of banks and financial markets in economic growth[1]. Promotion of foreign banks is sometimes suggested as a possible solution to increasing financial efficiency in developing countries. Various claims are made about the relative merits of foreign and domestic banks in this context. However, surprisingly little empirical evidence exists about the differences between foreign and domestic banks in the real world. This paper attempts to fill the gap by carefully documenting differences between these banks in 35 countries in Africa.

We collected a data set of 183 foreign and private domestic banks in Africa. The data set contains all major foreign and domestic[2] commercial banks in Africa, and covers a period of 7 years from 1992 through 1998. We classified the ownership type of each bank by going over the shareholder information whenever available, and contacting the banks directly in other cases. A number of interesting facts emerge from the data.

(i) The smallest commercial banks in Africa tend to be domestic. This is not surprising since domestic banks are likely to face lower fixed costs than foreign banks in setting up a bank. What is more interesting is that domestic banks are also some of the largest banks in Africa. This suggests that they are able to compete with the foreign banks in capturing market share, an observation that has important implications about the role of domestic banks, as we discuss towards the end. (ii) Domestic banks hold significantly more liquid assets, with a liquidity ratio of 47.6%, versus 38.3% for foreign banks. (iii) Domestic banks are less profitable than foreign banks with an ROA of 2.3%, versus 4.0% for foreign banks. (iv) The entire difference in profitability can be explained by the 2.6% higher interest rate on deposits paid by domestic banks. (v) The return on loans for domestic banks is higher by 2.7%. (vi) Foreign banks earn more than domestic banks through banking commissions and fees. (vii) Domestic banks expand more relative to foreign banks as a result of overall domestic growth. A 1% growth in GDP leads to a growth of 1.76% in domestic bank credit, but only 1.03% in the foreign bank credit. We discuss the robustness of each of these results separately in the empirical section below.

The theoretical debate on differences between foreign and domestic banks has identified three main attributes that separate foreign and domestic banks. First, due to better supervision, and reputational concerns, foreign banks are more prudent in their banking practices than domestic banks. Second, foreign and domestic banks operate in different loan markets due to informational

[1] Levine and Zevros [1998], Rajan and Zingales [1998].

[2] from now on, domestic banks always refers to "private domestic banks".

advantages in the relevant markets. Third, technical expertise and economies of scale give foreign banks a productivity advantage over domestic banks in the provision of banking services.

Our results indicate that all three theories are relevant for explaining the differences between foreign and domestic banks in Africa. The reasons are discussed in detail in section 4. Here, it is interesting to note the policy implication of this result. Foreign banks alone cannot be expected to overcome the gap in financial efficiency that developing countries suffer from. Simply promoting the entry of foreign banks in domestic markets is not likely to be enough. Such policies have to be coupled with a parallel effort to remove the imperfections, such as weak supervision, that plague the domestic banking sector. An emphasis on foreign banks alone can even be detrimental for the domestic corporate sector, if it takes credit away from them to the multinational corporate sector where foreign banks have a comparative advantage.

The rest of the paper is organized as follows. Section 2 describes the data. Section 3 presents the empirical evidence on differences between foreign and domestic banks. Section 4 discuss the empirical results in light of the various theories of foreign and domestic banks, while section 5 concludes with a discussion of the main findings.

2 Data

The data comes from the IBCA BankScope data set that contains annual financial information for more than 11,000 banks across the world. The data spans the period 1992-1998. We selected all African commercial banks, with the exclusion of South Africa, present in the data set in 1997. South Africa was excluded because most of its major domestic banks, such as ABSA, Standard Bank, and Nedcor, were established and run by European countries during apartheid. As such the distinction between domestic and foreign banks is not clear for South Africa. There were 228[3] banks that met our criteria. The choice of the year was dictated by the expanding coverage of BankScope over the years. The selected banks represent over 90 percent of commercial banking assets in Africa in 1997. BankScope data set thus excludes the smallest banks in Africa. Moreover, as we will see later the smallest banks are most likely to be domestic banks. This selection effect however is unlikely to have a serious (if any) effect on our results, as we discuss in the empirical section.

We included all observations between 1992 and 1998 for the selected banks, to form a panel data set. The panel is not balanced though as some banks are missing for some years. Table 1

[3] We excluded all non-commercial banks, such as investment and development banks.

in the appendix lists the number of banks in each year. There are a total of **1,138** bank-year observations.

The banks in the data set were divided into three categories: (i) government, (ii) private domestic, and (iii) foreign. A bank was assigned a category, if a controlling percentage (>50% usually) of the shares was held by shareholders of the given category. Information on shareholding pattern, including share holders names, was collected from the BankScope data set itself. We then asked *WPA*, a consulting firm that consults for commercial banks in Africa, to classify each shareholder into the three categories. Whenever doubts remained as to the actual categorization of shareholders, and/or control of the bank, we contacted the central banks of the country in question directly to obtain the relevant information. It must be pointed out that our initial sample of banks was **237** , but **9** of the banks could not be classified[4]. All African banks with branches in other African countries were also classified as domestic[5]. With this classification, we have **45** government, **119** private domestic, and **64** foreign banks in Africa. (see *Table* **1**).

The data set contains annual financial information, including balance sheet and income statement information. Table II presents summary statistics for the variables used in this paper. The data was first converted to constant 1997 US dollars, and then averaged out for each bank over time. Not all banks report information at the same level of disaggregation. This is why the number of observations for some variables, such as the ratio of non-interest income to total income, is less than 228[6].

African banks are quite small in size relative to world standards, with average total assets of 652 million dollars. An interesting observation about commercial banks in Africa is their high profitability rate. The average African bank has an ROA of 2.6%, which is substantially higher than ROA's of 0.6%, 0.9%, and 1.2% for South Asian, Latin American, and European banks respectively. Comparing the breakdown of profitability for African banks with banks from other regions, we find that almost all of this difference in ROA can be explained by higher non-interest income to assets ratio for African banks. Non-interest income includes income from bank commissions and fees, and trading income such as capital gains. This most likely reflects the low level of competition in African banking, leading to high service fees.

In the analysis that follows, we drop the 45 government banks since our aim in this paper is

[4]our results however are robust to the inclusion of these unclassified banks on the assumption that they are private domestic banks.

[5]There were 28 such banks. Our results are robust to including these banks as a separate category.

[6]as such there could be a selection effect for these variables.

to document and analyze the differences between foreign and domestic banks[7]. We are thus left with 183 domestic and foreign banks, and 901 bank-year observations.

3 Empirical Results

This section establishes some facts about the differences between domestic and foreign banks in Africa. As mentioned in the introduction, a lot of discussion about domestic and foreign banks has gone on without much scientific data to guide the discussion. By analyzing a comprehensive data set of foreign and domestic banks in Africa, we attempt to document facts that can be useful in properly evaluating the relative merits of foreign and domestic banks.

3.1 Why should Foreign and Domestic Banks Differ?

Given that foreign here refers to the owner being a western multi-national bank, there could be several reasons. For example, foreign banks could have access to higher ability managers. Foreign banks could carry "name recognition" that gives them a comparative advantage in loan and deposit markets. They could also have certain informational advantages or disadvantages in the lending market. For instance, foreign banks might have better information and enforcement mechanisms for multinational firms, than for local corporate firms. Finally, another important difference between foreign and domestic banks is that foreign banks are likely to be subject to stricter prudential standards than domestic banks. The difference in prudential standards could stem from two sources. First, foreign banks are required to report to their home country regulatory authority as well under Basle rules. Since the level of supervision in developed countries is stricter than in developing countries, foreign banks are naturally subjected to a stricter system of supervision. Second, any bank default by foreign banks in one country, will have a negative reputational effect for its branches worldwide. Consequently foreign banks have stringent internal supervisory mechanism to ensure that its subsidiaries in different countries are not taking excessive risk.

[7] Government banks often have a social objective as well, that makes their comparison with private banks very difficult (see Mian [2000] for more on this issue). Second, government banks are not subject to the same constraints as private banks. For example, cost of deposits is unlikely to go up even under weak supervision, since governments always bail out their own banks.

3.2 Size

We begin by comparing the asset size of domestic and foreign banks. Table III, column (1) presents the results. The first row presents raw difference between log total assets of foreign and domestic banks. The second row computes this difference using country fixed effects in the regression. The results with country fixed effects are more interesting, as our measure of interest is the average difference between foreign and domestic banks within the same country. The difference between foreign and domestic banks is 0.83 on a log scale, with the difference significant at the 1% level. Mean size for domestic banks is 11.2 on a log scale. Foreign banks thus tend to be larger than domestic banks on average in Africa. However, looking at the entire distribution of asset size reveals some more interesting facts. Fig 1 plots the complete asset distribution for domestic and foreign banks. The distribution reveals that private domestic banks are not just the smaller private banks in Africa. They comprise some of the largest private banks as well.

The fact that the smallest banks in Africa tend to be domestic, is mostly likely a consequence of a selection effect at the entry decision of banks. It is reasonable to assume that potential foreign banks face higher fixed costs than potential domestic banks in setting up an operation in Africa. The higher fixed cost could be driven by factors such as managing workers from a distance, or unfamiliarity with the business environment. Given such fixed costs, only those foreign banks will enter the African banking market, that can sustain a minimum scale of operations. Figure 1 clearly suggests that this is indeed the case. Since the BankScope data set excludes the smallest banks, which are mostly likely to be domestic banks, the true average asset size of domestic banks is likely to be smaller than column (1). However, to the extent that small banks tend to be different from larger banks independent of their ownership, we would like to compare domestic and foreign banks within the same size range. It is for this reason that we feel that the selection criteria of size used by BankScope is unlikely to be a major concern.

In the results that follow, we not only report raw, and country fixed effects differences between domestic and foreign banks, but also report the differences after controlling for asset size. We control for asset size by including dummies for the quartile of asset distribution that a bank belongs to. Moreover, we also use non-parametric kernel regressions to plot country de-meaned bank variables against asset size for domestic and foreign banks. This has the advantage of giving us a visual map of differences between foreign and domestic banks for the entire range of bank sizes. The non-parametric plots use the Nadaraya-Watson nonparametric regression, with a bandwidth of 1, and an Epanechnikov weight function. Given the small number of observations,

the non-parametric regressions are not useful for significance tests, and as such we do not report standard error bands in our plots.

3.3 Asset and Capital Structure

Table III, columns (2) through (5) compare the asset and capital structure of foreign and domestic banks. The assets of each bank are broken into four categories: cash, investment securities, loans, and other/fixed assets. We classify cash and investment securities as "liquid assets", and loans as "non-liquid assets". Cash and investment securities are classified as liquid since they can be readily exchanged for their face value in the market. Investment securities almost always consist of the highly liquid government bonds in Africa. Columns (2), (3), and (4) show that domestic banks have significantly higher fraction of liquid assets in their portfolio. They hold 47.6% of their assets in liquid assets, compared to 38.3% for foreign banks, with the difference being significant at the 1% level (column (4)). Moreover, as column (2) suggests most of the difference in liquidity comes from a larger cash holding by domestic banks. Fixed assets only form a small percentage of the overall asset portfolio (around 10% from Table II), and the fraction does not differ significantly between foreign and domestic banks (not shown). Given the similar fixed asset ratios, the higher liquidity ratio implies that domestic banks correspondingly hold smaller fraction of their assets in loans (regression not shown).

The higher liquidity result holds even after controlling for the asset size of banks by including four dummies corresponding to the quartile of asset distribution. Figure 2 gives further evidence of the robustness of this result by plotting the country-demeaned expected liquidity ratios for foreign and domestic banks against the log of total asset size of banks. The figure shows that domestic banks have higher expected liquidity ratios than foreign banks at every point over the range of asset sizes.

Column (5) looks at the capital structure of foreign and domestic banks, by comparing their capitalization rates. Capitalization rate refers to the fraction of owner's equity in the total liabilities of the bank. With the inclusion of country fixed effects, we find that the capitalization rate for domestic banks is larger by 4.7%, with the difference being significant at the 5% level. However the difference is not robust to the inclusion of asset controls, as it is driven by the high capitalization rates of smaller domestic banks. The inclusion of asset dummies makes the capitalization difference insignificant. This can also be seen by the non-parametric plot in Figure 3, which shows that the smallest domestic banks were driving most of the difference.

3.4 Income Structure

Table IV compares the income structure between domestic and foreign banks. We are interested in answering two related questions here. First, do foreign and domestic banks differ in overall profitability? Second, do they differ in terms of their sources of income and expenses? The following accounting identity was used for answering these questions:

$$\text{Net Return}^8 \equiv II + NII - IE - NIE - LLP \tag{1}$$

where II is interest income, NII is non-interest income, IE is interest expense, LLP is loan loss provisions, and NIE is non-interest expense. All variables in (1) are normalized by total assets for comparison across banks. II is income from earning assets such as loans, NII is income from commissions, fees, and capital gains, IE is the interest expense on different types of deposits, NIE includes operational expenses such as salaries and rent, and LLP covers expenses due to provisioning of bad or doubtful loans.

Column (1) in table IV compares the net return on assets (ROA) for domestic and foreign banks. Foreign banks are significantly more profitable than domestic banks, with an ROA[9] of 3.98%, as opposed to 2.25% for domestic banks after controlling for country fixed effects. The result is robust to the inclusion of asset dummies, and Fig 4 confirms this with the non-parametric plot. Profitability for foreign banks dominates domestic banks at all asset levels.

Columns (2) through (6) then look at the different components of profitability in identity (1), to identify the sources of differences in ROA. The analysis reveals that *all* of the difference in overall profitability can be explained by the higher interest expense ratio[10] for domestic banks (column (4)). The interest expense ratio is lower by 2.1% for foreign banks, which is more than enough to account for the 1.7% difference in ROA of foreign and domestic banks. The result on interest expense is robust to the inclusion of asset dummies, and the non-parametric plot in figure 5 reveals that domestic banks have higher interest expense ratios than foreign banks over the entire range of asset size. Moreover, since we know the overall deposit base of banks, we can divide interest expense by the total deposit size to impute the interest rate offered on deposits by banks. Column (7) compares this interest rate for foreign and domestic banks. The interest rate on deposits for domestic banks is 2.6% higher than that for foreign banks, and the difference is significant at the 1% level. The deposit rate differential between foreign and domestic banks

[9] $\text{ROA} = \frac{\text{Net Return}}{\text{TA}}$

[10] $\text{interest expense ratio} = \frac{\text{interest expense}}{\text{TA}}$

could reflect a higher level of services offered to depositors by the foreign banks, or it could reflect a higher probability of default by the domestic bank.

Another interesting result of Table IV is that foreign banks have a higher non-interest income ratio than domestic banks on average (column(3)). As mentioned earlier, non-interest income reflects the commission and fee income from banking services provided to customers. Therefore this result is particularly interesting in light of the above evidence of lower deposit rates for foreign banks. It implies that not only do foreign banks offer low deposit rates to their customers, but they also charge them high service fees. The result on non-interest income goes away, once we control for asset size. The non-parametric plot in figure 6 shows that it is the bigger foreign banks that have a higher non-interest income ratio.

There are no significant differences in any of the remaining components of overall profitability. However, an important fact to note is that foreign banks have lower interest income ratio than domestic banks (although the difference is not significant). Recall from Table III that foreign banks have a *higher* proportion of non-liquid earning assets (loans) in their portfolio than domestic banks. Thus foreign banks must be earning significantly lower return on their earning assets to end up with a lower interest income ratio in spite of a larger proportion of earning assets. This is confirmed by column (8) that compares differences between the ratio of interest income to earning assets for foreign and domestic banks. The return on earning assets is 20.8% for domestic banks, and 18.1% for foreign banks, with the difference being significant at the 1% level. Domestic banks on average earn 2.7% more than foreign banks on their loans. Moreover, the result is robust to the inclusion of asset dummies (see figure 7 for the non-parametric plot as well).

All regressions in Table IV control for heteroskedasticity, as bank level averages have been computed using different number of bank-year observations.

3.5 Risk

Conceptually the level of risk in a bank's portfolio is one of the most important determinant of a bank's health. Governments establish sophisticated regulatory institutions to continuously audit and monitor the level of risk taken by banks. Banks are subject to numerous prudential regulations that are aimed at limiting the extent of risky behavior that can lead to bank failures in future. Unfortunately, given the importance of risk, it is an equally difficult metric to measure. Since risk refers to expected volatility in *future* returns, measuring the level of risk at a given point in time can be an arduous task. This is particularly the case under weak disclosure laws

that are common in the banking sector.

Even historical analysis of risk requires that one has access to a long panel of data, so that enough different realizations of possible states of nature have been observed. The data requirements for properly measuring risk in a bank's portfolio are thus quite large. Given the limitations of our data, we construct two, admittedly limited, measures of risk for analysis: (i) Ratio of loan loss reserves to gross loans, and (ii) Coefficient of variation of overall income.

(i) Ratio of loan loss reserves to gross loans

The reserve ratio captures the fraction of loans that have been defaulted in the bank's portfolio. If all loan defaults are properly accounted for, the reserve ratio can be a very good measure of the overall level of risk that the bank has taken in the past. Unfortunately the loan loss reserve numbers often do not reflect the true level of a bank's bad loans. A major determinant of the accuracy of reserve ratio is the regulatory environment that a bank operates in. By comparing reserve ratios between foreign and domestic banks with country fixed effects we can keep the regulatory environment fixed. Country fixed effects also control for macro level factors such as uncertainty and aggregate shocks, that might influence the riskiness of a bank. Columns (1) in Table V shows the difference between the reserve ratio of foreign and domestic banks using country fixed effects. The result suggests that foreign banks have a lower reserve ratio of 7.64%, compared with 10.54% for domestic banks. The difference is significant at the 10% level. The result is suggestive of foreign banks taking a lower level of risk than domestic banks in their loan portfolio.

There remains a potential source of bias even after including country fixed effects. It is reasonable to expect that banks that take higher risks, are also more likely to hide or underreport their true loan losses, particularly under an imperfect regulatory regime. This suggests that our measured difference between foreign and domestic banks could be biased downwards, lending some further support to the hypothesis that domestic banks take on higher risk.

However, the result on reserve ratio is not robust to the inclusion of bank asset dummies. This can also be seen from figure 8 that plots the non-parametric expected reserve ratios for foreign and domestic banks.

(ii) Coefficient of Variation of Income

The level of risk taken by a bank will ultimately be reflected in its income stream. Banks that take on riskier projects, are also more likely to have higher variances in their incomes. Therefore one potential test of riskiness is to measure the variability in income. Using the panel data, we compute the coefficient of variation of total income ($COVI$) for each bank, and then compare

this coefficient across domestic and foreign banks. Table V columns (2) presents the results. The result suggests no significant differences, after the inclusion of country fixed effects, between foreign and domestic banks in the variability of their income streams.

The results from the risk analysis hint at the domestic banks taking on more risk than foreign banks, but to conclude this with a fair amount of certainty, requires detailed loan level data. We discuss some of these issues in greater detail towards the end.

3.6 Credit Expansion and Economic Growth

The analysis so far has been based on the cross-sectional analysis of the collapsed bank level panel data. The analysis was helpful in documenting fixed differences across domestic and foreign banks. We now explore the panel nature of our original data set, by comparing the relative performance of foreign and domestic banks in periods of economic expansion and contraction. Such evidence can be extremely useful in discriminating between different theories of foreign bank behavior. The resulting information can then have important policy implications. We discuss the possible interpretations of our results in greater detail in section 4.

The empirical strategy for capturing the effect of economic expansion (or contraction) on domestic and foreign banks is as follows. Let Y_{ict} be the bank variable of interest (such as bank size) for bank i in country c and year t. We are interested in estimating how differences in Y between domestic and foreign banks *within* a given country vary with overall economic growth in the country. The following regression equation estimates this:

$$Y_{ict} = \alpha + \beta_1(F_i)(LGDP_{ct}) + \underline{\beta_2}(\gamma_c * \gamma_t) + \underline{\beta_3}\gamma_i + \varepsilon_{ict} \qquad (2)$$

where i, c, and t index bank i, in country c, and year t respectively. $LGDP_{ct}$ represents the log of GDP for country c in year t. $(\gamma_c * \gamma_t)$ represents all possible interactions between country and year dummies. It controls for all possible country-year fixed effects such as the state of the macro economy in a given year for a given country, and forces the comparison between foreign and domestic banks to be made within the same country every year. γ_i controls for bank level fixed effects. The coefficient of interest is β_1, that captures the differential impact of change in GDP of a country on foreign banks. The GDP data was obtained using the IMF IFS data series. This series has the advantage that it reports quarterly GDP estimates. This allows us to construct an annual GDP series that matches completely with the timing of financial reporting for the banks

in our sample[11].

We run equation (2) using total assets, gross loans, and total deposits (all in logs) as dependent variables separately. Table VI columns (1) through (3) present the results. The results show a very robust and consistent fact: **economic expansion is more favorable for the growth of domestic banks than foreign banks.** This is true along all dimensions of bank size presented in Table VI. Since all variables are in logs, the coefficients can be interpreted as elasticities. Columns (1) shows that a 1% increase in the GDP of a country leads to a 1.13% increase in the asset size of domestic banks, but only a 0.73% increase for foreign banks. Similarly, gross loans and total deposits for domestic banks expand by 1.76% and 1.14%, whereas for foreign banks they expand by 0.86% and 0.67% only (columns (2) and (3)). All differences in the growth of domestic and foreign banks are significant at the 1% level. The results in Table VI are also robust to the inclusion of size controls, done by adding the interaction of quartile dummies for size with log of GDP.

We also tried to see if economic growth lead to changes in the different income and asset ratios analyzed in tables III and IV, by regressing these ratios on the *growth rate* of GDP, and the dummies in equation (2). Unfortunately, the data becomes too noisy after taking differences, leading to large standard errors and hence no significant results.

3.7 Summary of Empirical Results

For the discussion that follows, it will be useful to summarize the main empirical findings:

1. The smallest banks in Africa tend to be private domestic, but on the whole private domestic banks are well represented over the entire range of bank sizes in Africa.

2. Domestic banks hold significantly more liquid assets, with a liquidity ratio of 47.6% vs. 38.3% for foreign banks.

3. Domestic banks are less profitable than foreign banks, with an ROA of 2.25% vs. 3.98% for foreign banks.

4. All of the difference in profitability can be explained by the 2.6% higher interest rate that domestic banks pay on average to depositors.

5. The return on loans for domestic banks is higher by 2.7%.

[11]The IMF GDP data is sometimes missing for certain quarters. We dropped all country-years with missing quarterly GDP data.

6. Foreign banks have higher non-interest income to assets ratio than domestic banks on average, with the difference generated by larger foreign banks.

7. Domestic banks expand more, i.e. extend more credit, relative to foreign banks with economic expansion in the country. A 1% growth in GDP leads to a growth of 1.76% in domestic bank credit, but only 0.86% in the foreign bank credit.

4 Discussion of Empirical Findings

In this section we first present three separate theories about differences between foreign and domestic banks, and then discuss which of them are supported by the evidence above. The analysis sheds new light on the role of foreign banks in developing countries, and has interesting policy implications that we discuss towards the end.

4.1 Theories of Foreign and Domestic Banks

4.1.1 Prudence Theory

This theory states that the key difference between domestic and foreign banks is in the level of prudence exercised by the two banks. Prudence refers to the extent to which a bank fully internalizes the risk of the loans it gives out. The practice of prudential behavior in lending can be divided into two stages: (i) the ex-ante internalization of the riskiness of the loan before it is given out, and (ii) the ex-post provisioning of bad loans into loan loss reserves in case of loan default. These two stages are intimately connected. Any bank that correctly performs ex-post provisioning, will be forced ex-ante to internalize the entire risk of the loan. If for any reason, banks adopt lax provisioning standards, it inevitably leads to excessive risk taking at the first stage as well.

It is widely believed that foreign banks have more prudent banking operations than domestic banks in developing countries. This could be driven by a number of factors. First, domestic and foreign banks are both subject to banking supervision by the domestic regulatory authority, but foreign banks are also subject to the regulatory authority in their home country. The purpose of the regulatory authority is to continuously monitor the performance of banks, and ensure that banks follow the above mentioned prudential behavior. Since regulatory authorities in developed countries have more successful mechanisms for enforcing prudential regulations, foreign banks

are likely to have higher prudential criteria than domestic banks. Second, even if domestic and foreign banks face the same level of supervision by the regulatory authorities, foreign banks might endogenously decide to adopt more prudent policies. Such preference of foreign banks for low levels of risk can result from them facing a higher cost of risky behavior. For example, foreign banks often have a large network of branches outside the developing country under question as well. If the bank takes too much risk through imprudent banking in the developing country, leading to bank failure or default, it can have large negative consequences through reputation on its operations worldwide. Hence, anticipating such higher cost of risky behavior, foreign banks may end up devising internal monitoring mechanisms to curb their level of risk. Finally, a third reason for a more prudent behavior by foreign banks can be understood in the context of the agency problem of bank owners trying to monitor the level of risk taken by their managers. Suppose both foreign and domestic banks have the same preference for adopting prudent behavior. However, they must incentivise their bank managers for moral hazard reasons. For example, the bank manager might collude with a firm to "loot" the bank. Foreign banks might be able to provide better incentives to managers through promises of promotion to better "global" positions that domestic banks cannot offer due to their limited scope in operations.

For any of the reasons mentioned above, foreign banks are expected to be more prudent in their banking practices. Recent empirical evidence from Mexico by La Porta et al [2001] also supports this view. The authors show that all domestic banks engage in significant insider lending, while foreign banks engage in none of that.

The prudential advantages of foreign banks have led many policy makers to argue for the promotion of foreign banking in developing countries. They argue that when informational and contractual limitations prevent domestic regulators from enforcing prudential regulations on domestic banks, foreign banks through their prudential advantage can be a quick fix. Whereas, we do not doubt the potential prudential advantages of foreign banks, our empirical evidence suggests that a blind faith in the promotion of foreign banks can be dangerous for the domestic corporate sector. We discuss these issues in section 4.2 and 4.3.

4.1.2 Market Segmentation Theory

The market segmentation theory focuses on the relative informational strengths of foreign and domestic banks in the loan market. It has long been recognized that information plays a critical

role in determining the success of financial intermediaries[12]. Lending to firms involves a series of close and complex interactions between the bank and the firm. Banks first have to screen and select good quality firms for financing, and later monitor their performance in order to ensure that the loans are being utilized properly. A bank needs to recognize the productive projects of the firm, and extend financing in a timely fashion. Any delay, or failure to recognize a good investment possibility by the bank can be extremely costly for the firm. This is particularly true for commercial bank credit that involves short and medium term lending with short windows of opportunity for the firm.

Banks therefore need to have an extensive knowledge of the markets and industries they operate in. The market segmentation theory holds that foreign and domestic banks hold informational advantages in completely different markets. Since foreign banks enter as "outsiders", they often lack the connections and detailed information required to lend to the domestic corporate sector. Instead foreign banks mostly focus on the multi-national corporate sector where they have a wide experience in dealing with these firms worldwide. Domestic banks do not possess such experience with multi-national firms, and instead concentrate on the domestic firm market. Hence there is a complete segmentation of the loan market, with foreign and domestic banks operating in separate segments.

4.1.3 Efficiency Theory

Efficiency theory argues that foreign banks may have an efficiency advantage over domestic banks due to their technical expertise, and economies of scale. Foreign banks may have better access to new technology such as ATM's and risk management systems, that help them achieve greater efficiency than domestic banks. Foreign banks also have access to a bigger pool of internal capital, that can help them smooth idiosyncratic shocks, and avoid liquidity problems.

4.2 Welfare Implications of the Three Theories

The three theories can have different welfare implications for the domestic economy. The efficiency theory clearly predicts a positive role for foreign banks as they promote efficiency, and technology transfer in the banking sector. The prudence theory has similar implications, as foreign banks are able to get around the market imperfections resulting from weak supervision of the banking industry. For example, weak supervision by promoting risky behavior for domestic banks will

[12]For example, Broecker [1990], Holmstrom [1992], Holmstrom and Tirole [1997], Townsend [1979], and Krasa and Villamil [1992].

create distortions in the economy through higher interest rate on deposits. Lowering of interest rates through a deposit guarantee will only worsen the situation, as tax payers will have to bail out the risky adventures of domestic banks. Foreign banks can help circumvent these problems through their prudent behavior, thus lowering interest rates without any subsidization.

However, contrary to efficiency and prudence theories, the market segmentation theory does not have a particularly positive role for foreign banks in the domestic economy. To the extent that a policy maker is interested in developing the domestic corporate sector, foreign banks have little role to play due to the informational asymmetries in the loan market.

Notice that the three theories are not mutually exclusive, and can be simultaneously true. In fact the interaction of these theories can lead to interesting results. For example, the interaction of prudence and market segmentation stories can be particularly bad for the domestic corporate sector. Higher prudence allows the foreign banks to borrow at low rates, whereas market segmentation means that this low cost of funds is only transferred to the multi-national firms, while constricting credit supply from the domestic sector[13]. This may not only restrict the flow of credit to domestic firms, but can also give an advantage to multi-national firms whenever they are in competition with the domestic firms.

4.3 Squaring Theory with Evidence

Having described the three main theories of differences between domestic and foreign banks, we now determine how much of the empirical evidence can be explained by each of them.

The **prudence theory** generates a number of predictions that we can test in the data. An earlier version of the paper developed a model that generated predictions about banks that differed only in their level of prudence. To understand the results of the model, consider a regulatory authority that provides some but not complete deposit insurance to depositors. Since the regulator does not provide complete deposit insurance, some of the risk taken by the less prudent bank will be priced by depositors, leading to a higher deposit rate than that for the more prudent bank. Second, since the less prudent bank bears a lower fraction of the liabilities in case of default by the firm[14], it enjoys a comparative advantage over the more prudent bank in lending to riskier firms.

[13] In other words, an advantage for foreign banks in the deposit market would translate into lower cost of funds for multi-national firms compared to the domestic firms with the same productivity and risk rating.

[14] In the model, this resulted from the fact that a less prudent bank put a lower fraction of defaulted loans into loan loss reserves.

The provision of partial deposit insurance by the regulator implies that it would like to closely monitor the level of risk taken by banks, in an effort to reduce the probability of bank failure. However, because of informational and contractual limitations, regulators in developing countries often fail to perform this monitoring task properly. In the absence of effective monitoring mechanisms, the regulator then imposes certain extra requirements on the less prudent bank. These requirements are aimed at credibly committing the bank to higher prudence even in the absence of active monitoring by the regulator. Two such requirements include higher liquidity ratio, and higher capitalization rate.

Higher liquidity ratio increases the liquidation value of the bank in case of default, thus lowering the expected payment that the regulator has to pay. Higher capitalization rate, on the other hand, exposes more of the bank's own capital to risk, forcing it to be more prudent.

Differences in the level of prudence can thus simultaneously explain a number of the observed facts about domestic banks: higher deposit rates, higher risk, higher liquidity ratio, and higher capitalization rate. To the extent there is a trade off between risk and return, domestic banks will also have higher return on their loans relative to foreign banks. However, the prudence theory has no direct prediction about the relative importance of the domestic economic growth for domestic banks. The theory only suggests that domestic banks will be biased in favor of riskier projects. One could in principle use this fact to argue that most of the growth in the domestic economy is generated by riskier firms, which explains the high correlation between domestic GDP growth, and domestic bank expansion. However, firms generating most of the growth are also likely to be more productive overall, which makes them more likely to borrow from the foreign banks under the prudence theory[15]. Therefore, prudence theory alone cannot easily explain why lending by domestic banks is so highly correlated with domestic economy expansion, relative to foreign banks. Moreover, the theory is mute on the relative importance of non-interest income for domestic banks. To explain these facts, we must turn to alternative explanations.

Market segmentation theory can better explain why domestic banks are disproportionately favored by domestic economic expansion. This theory predicted that domestic banks will concentrate in the domestic corporate market, whereas foreign banks will concentrate in the multinational firm market. As long as domestic firms have a greater contribution towards GDP growth than multinational firms in Africa, market segmentation will lead to the observed correlation between GDP growth, and domestic bank expansion.

Finally, evidence such as the higher level of income from banking commissions and fees for

[15] the model in the previous version of the paper formally proves this point.

foreign banks suggests an **efficiency** role for foreign banks. Foreign banks can afford to charge high fees, due to the better quality of services that they provide. Lower interest rates on deposits could also partly reflect the provision of better services by foreign banks. However, a pure efficiency theory cannot explain why domestic banks grow more with domestic GDP than foreign banks. It also cannot explain why domestic banks will have higher average loan returns, but riskier loan portfolios than foreign banks.

To summarize, our analyses indicate that all of the theories about possible differences between foreign and domestic banks, are important in explaining the empirical evidence. As mentioned in section 4.2, this can have important implications for policy in developing countries. In particular, in spite of the prudential and efficiency advantages that foreign banks provide, efforts to promote the domestic banking sector cannot be ignored. Domestic banks due to their informational advantage in the local firm market, can provide the vital function of lending to small and medium size domestic firms in the economy. In the face of such evidence, concurrent effort must be made to improve the efficiency of the domestic banking sector through transfer of technology, and better mechanisms to monitor the risk of these banks.

5 Conclusion

This paper began by documenting differences between foreign and domestic banks in Africa. The empirical results were summarized in section 3.7. A theoretical investigation of these results suggests that foreign banks provide the benefits of prudent banking and better banking services in Africa. However, this does not limit the role that domestic banks play in the domestic economy. Domestic banks expand credit faster than foreign banks with economic expansion. We have suggested that if growth is mostly driven by domestic firms rather than multinational firms, the credit expansion result might reflect the informational advantage of foreign banks in lending to small but growing local firms. From a policy perspective, this cautions against the promotion of foreign banking at the expense of domestic banks. Equal efforts should be made to improve the efficiency of domestic banking industry through promoting technology transfer, and instituting better mechanisms of enforcing prudential behavior.

More data needs to be collected to further test the hypotheses that we have introduced in this paper. Our analysis was limited by the fact that we only had aggregate bank level financial information. In order to comprehensively answer questions about risk, market orientation, and quality of services, much more detailed data needs to be collected. For example, information

on how the loan portfolio is divided among different industries, locations, and individuals, can help get a better sense of the types of risk that a bank is exposed to. A commendable effort in this area has been the recent work of La Porta et al [2001] who trace the identity of loans for banks in Mexico. Detailed loan level data will also help us identify more clearly, questions of market orientation of different banks, and how the demand for various types of loans changes with aggregate demand in the economy. Closer examination of the services provided to depositors, can help us determine the share of interest rate differential that can be explained by differences in services. The question is an important one in the debate regarding the effectiveness of depositors in monitoring bank behavior. Our hope is that this paper will lead to greater empirical efforts in answering these questions.

Bibliography

Akerlof, G. and Romer, P. 1993. "Looting: The economic underworld of Bankruptcy for profit". Brookings Papers on Economic Activity, #2.

Bartholdy, Jan; Boyle, Glenn; Stover, Roger. "Deposit Insurance, Bank Regulation and Interest Rates: Some International Evidence", ssrn.com working paper, 2001.

Barth, James; Caprio, Gerard; Levine, Ross. "The Regulation and Supervision of Banks Around the World: A New Database". University of Minnesota Financial Studies Working Paper No. 0006. 2001.

Broecker, T. 1990. "Credit worthiness tests and interbank competition". Econometrica 58:429-52

Diamond, Douglas; Rajan Raghuram. "Liquidity shortages and Banking Crises", University of Chicago Working Paper. 2001

Holmstrom, Bengt 1992. "Financing investment in Eastern Europe: A theoretical perspective". Yale University. Mimeographed.

Holmstrom, Bengt; and Jean Tirole 1997. "Financial Intermediation, loanable funds, and the real sector". Quarterly Journal of Economics: 665-691.

Krasa C. M., and A. P. Villamil. 1992. "Monitoring the monitor: An incentive structure for a financial intermediary". Journal of Economic Theory 57:197-221.

Levine R, Zervos S. 1998. "Stock Markets, Banks, and Economic Growth". American Economic Review. 88 537-558

Mian, Atif. 2000. "Creditor Incentives and Privatization". Mimeo, MIT.

Rajan, Raghuram; Zingales, Luigi. "Financial Dependence and Growth", American Economic

Review. June 1998, vol 88, pg. 559-586.

Townsend R. 1979. "Optimal contracts and competitive markets with costly state verification". Journal of economic Theory 21: 417-25

Figure 1: Distribution of Banks by Size

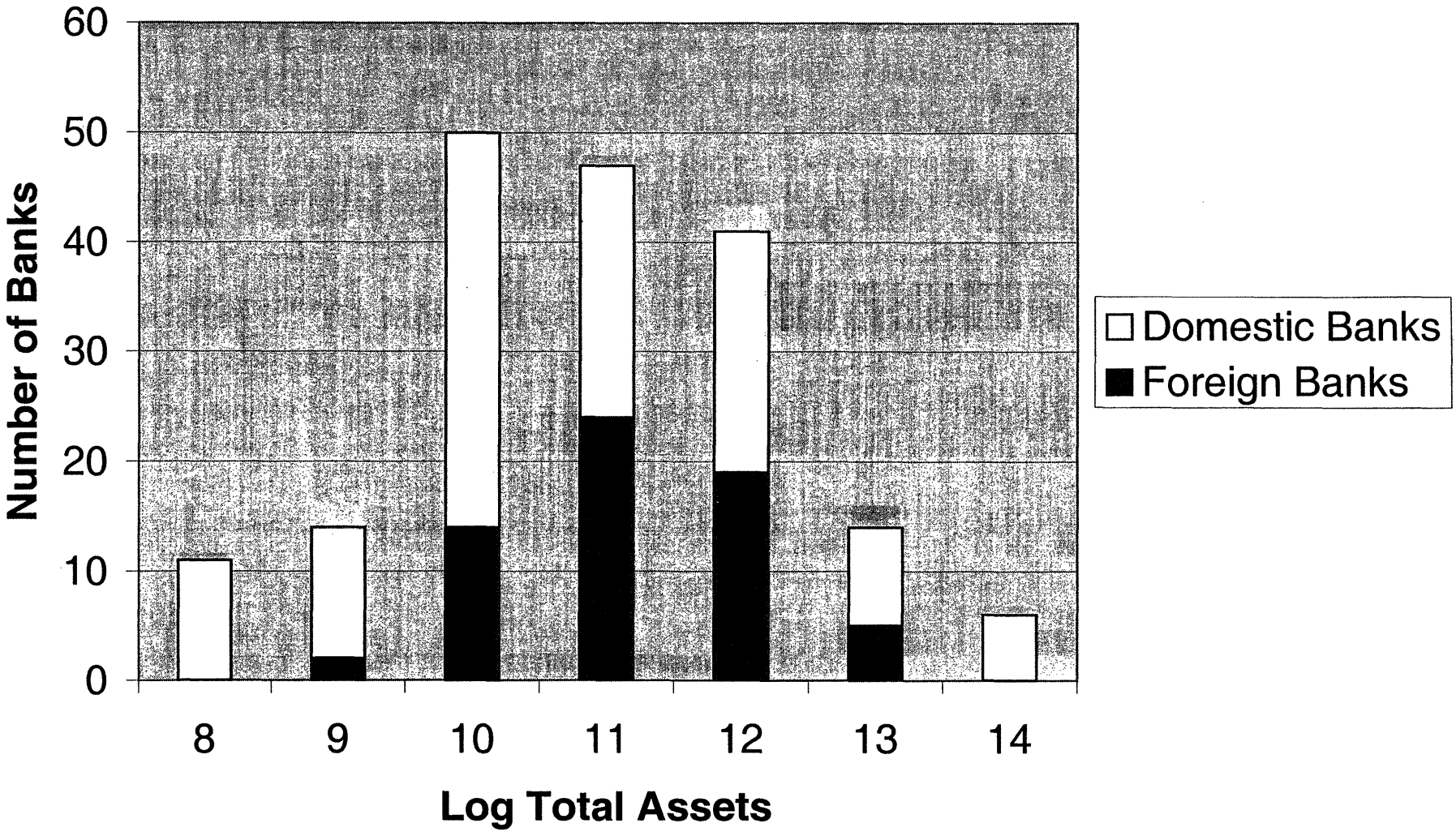


Table I: Distribution of Ownership Types

Ownership Type	Frequency	Percentage
Government	45	19.74
Private Domestic	64	28.07
Foreign	119	52.19
Total	*228*	*100*

Table II: Summary Statistics of African Banks

Variable as a percentage of Total Assets*	Mean	Min	Max	# of obs
Total Assets	441,791	2,813	10,300,000	228
Cash	0.297	0.057	0.708	228
Investment Securities	0.155	0.000	0.550	228
Net Loan	0.441	0.000	0.868	228
Other Assets	0.109	0.000	0.550	228
Deposits	0.794	0.363	2.623	228
Other Liabilities	0.115	0.000	0.756	228
Total Capital	0.091	-1.851	0.506	228
Interest Income	0.109	0.001	0.321	214
Interest Expense	0.058	0.003	0.195	211
Non-Interest Expense	0.057	0.006	0.246	226
Loan Loss Provision	0.012	-0.203	0.060	212
Net Return	0.026	-0.113	0.236	227

* except Total Assets

Table III: Asset and Capital Structure

	Dependent Variable	(1) Log Assets	(2) Cash	(3) Investment Securities	(4) Liquidity Ratio	(5) Capitalization Rate
Without country fixed effects	***Foreign***	0.5122***	-0.0703***	-0.0175	-0.0878***	-0.0137
		(0.1764)	(0.0220)	(0.0166)	(0.0268)	(0.0087)
	Constant	11.211***	0.3198***	0.1564***	0.4762***	0.1136***
		(0.1368)	(0.0126)	(0.0107)	(0.0154)	(0.0074)
With country fixed effects	***Foreign***	0.8344***	-0.0687***	-0.0246*	-0.0933***	-0.0392*
		(0.2064)	(0.0193)	(0.0147)	(0.0181)	(0.0212)
Country f.e. + Asset Dummies	***Foreign***		-0.0554*	-0.0289*	-0.0844***	-0.0323
			(0.0211)	(0.0154)	(0.0205)	(0.0412)
	# obs :	183	183	183	183	183

*, **, *** 10, 5 and 1 % significance levels respectively.

Table IV: Income Structure

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Dependent Variable	**Net Return**	**Interest Income**	**Non-Interest Income**	**Interest Expense**	**Non-Interest Expense**	**Loan Loss Provision**	**Interest Expense / Deposits**	**Interest Income / Earning Assets**
Without country fixed effects	***Foreign***	0.0136***	-0.0009	0.005	-0.0144**	-0.0003	-0.0004	-0.0198***	-0.0183
		(0.0040)	(0.0076)	(0.0052)	(0.0062)	(0.0047)	(0.0026)	(0.0075)	(0.0145)
	Constant	0.0225***	0.1144***	0.0460***	0.0666***	0.0578***	0.0117***	0.0850***	0.2083***
		(0.0027)	(0.0057)	(0.0030)	(0.0048)	(0.0031)	(0.0022)	(0.0056)	(0.0098)
With country fixed effects	***Foreign***	0.0173***	-0.0087	0.0091**	-0.0208***	0.0031	-0.001	-0.0259***	-0.0270**
		(0.0044)	(0.0075)	(0.0044)	(0.0063)	(0.0041)	(0.0020)	(0.0074)	(0.0136)
Country f.e. + Asset Dummies	***Foreign***	0.0177***	-0.0034	0.007*	-0.0177***	0.0062	-0.0033	-0.0210***	-0.021
		(0.0056)	(0.0078)	(0.0044)	(0.0057)	(0.0051)	(0.0032)	(0.0067)	(0.0131)
	# obs :	182	173	181	171	182	174	171	173

*, **, *** 10, 5 and 1 % significance levels respectively.

All variables in (1) through (6) are given as a proportion of total assets.

Table V: Risk

		(1)	(2)
	Dependent Variable	**Reserves to Gross loans [1]**	**COVI [2]**
Without country fixed effects	***Foreign***	-0.0405***	-0.0536*
		(0.0148)	(0.0323)
	Constant	0.1054***	0.3411***
		(0.0111)	(0.0200)
With country fixed effects	***Foreign***	-0.0291*	-0.0404
		(0.0164)	(0.0374)
Country f.e. + Asset Dummies	***Foreign***	-0.0309	0.0055
		(0.0206)	(0.0376)
	# obs :	160	173

*, **, *** 10, 5 and 1 % significance levels respectively.
All equations include a constant as well.

Table VI: Economic Growth and Credit Expansion

	(1)	(2)	(3)
Dependent Variable	**Log Assets**	**Log Gross Loans**	**Log Deposits**
Foreign*LogGDP	-0.4046**	-0.9036***	-0.4663**
	(0.1726)	(0.2180)	(0.1918)
R-sq	0.987	0.977	0.982
# of obs.	719	718	719
Log GDP [1]	1.1323***	1.7574***	1.1378***
	(0.0819)	(0.1289)	(0.0910)

*, **, *** 10, 5 and 1 % significance levels respectively.
All regression include Country*Year effects, Foreign Dummy, Bank fixed effects, and a constant.
[1] Log GDP is the coefficient from the regression with country fixed effects instead of country*year fixed effects.

Appendix Table 1: No. of Banks per year

Year	No. of Banks	Percentage
1992	92	8.08
1993	114	10.02
1994	141	12.39
1995	164	14.41
1996	207	18.19
1997	227	19.95
1998	193	16.96
Total	*1138*	*100*

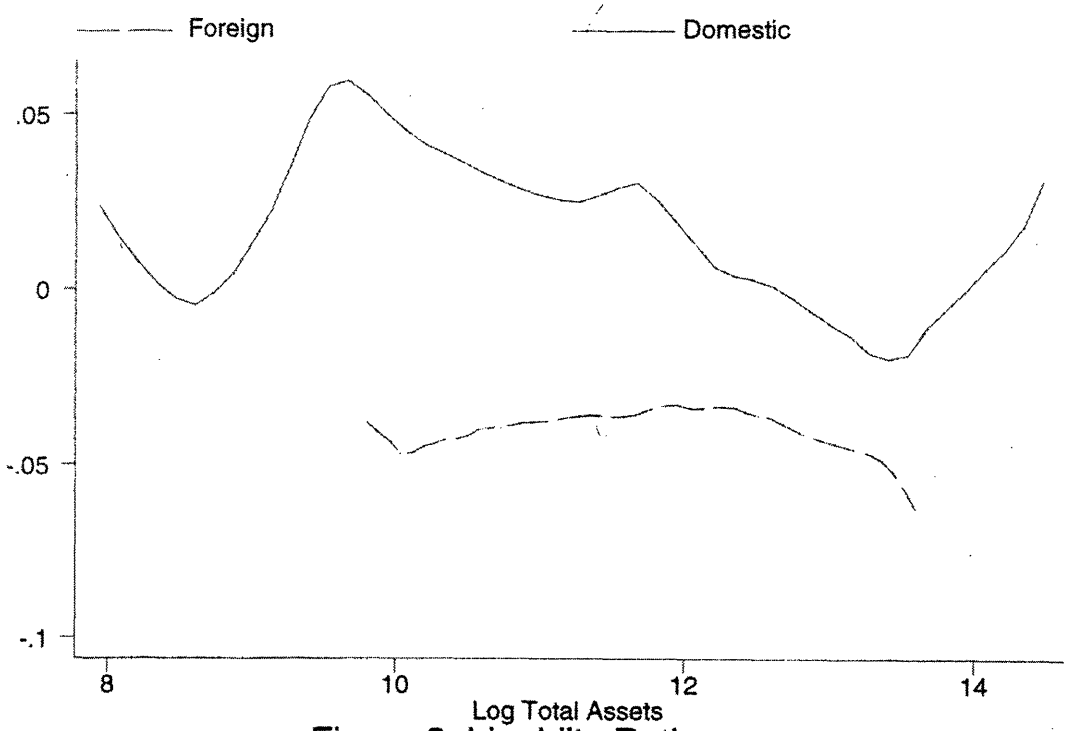


Figure 2: Liquidity Ratio

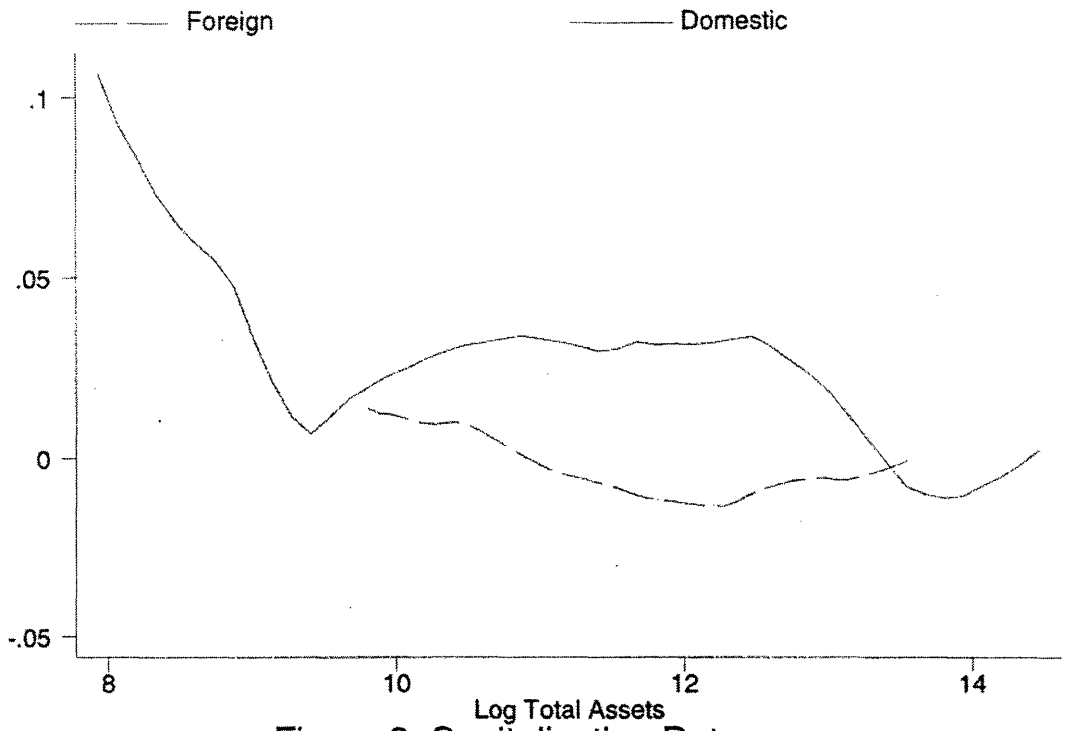


Figure 3: Capitalization Rate

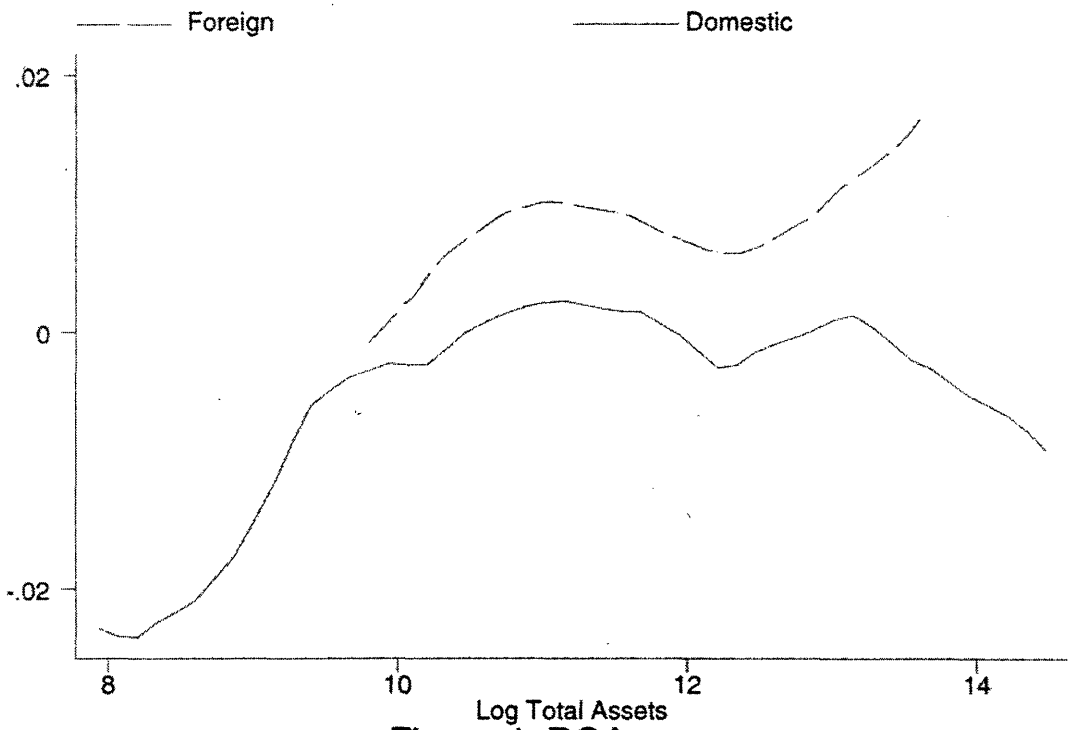


Figure 4: ROA

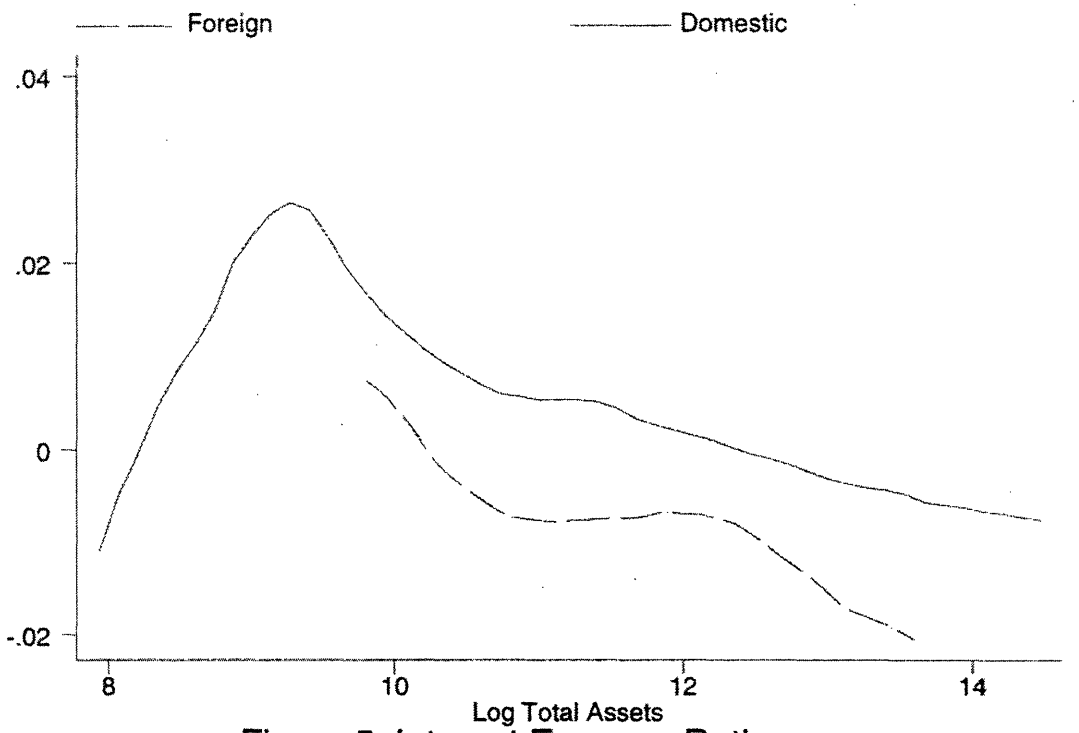


Figure 5: Interest Expense Ratio

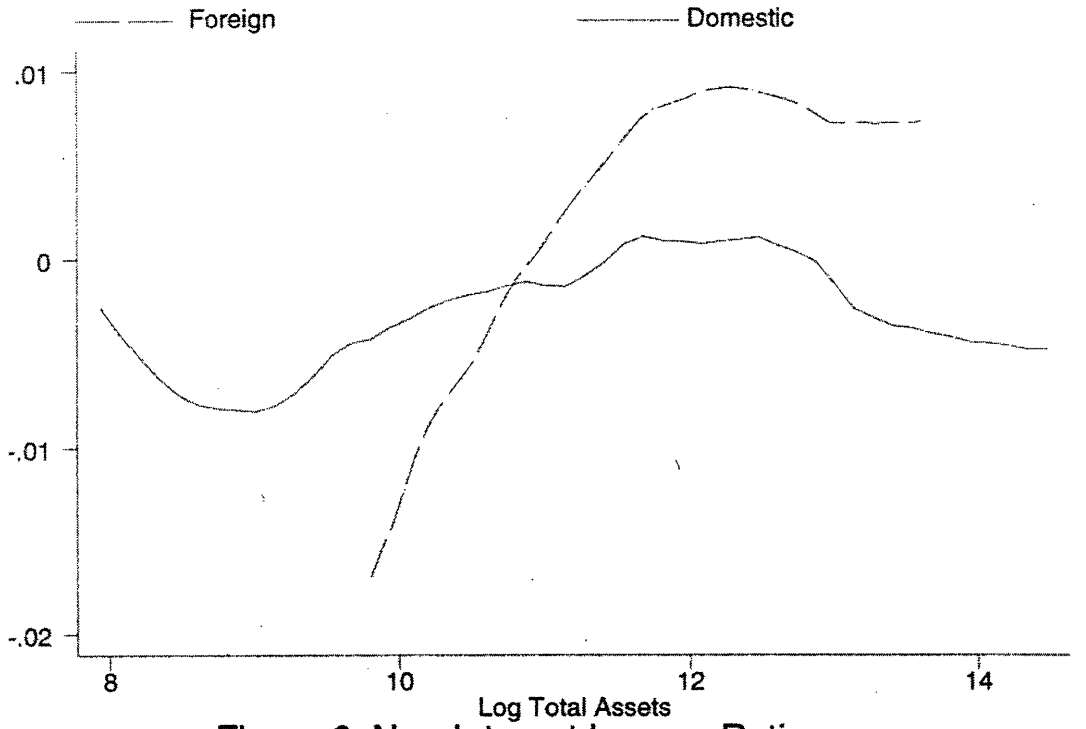


Figure 6: Non-Interest Income Ratio

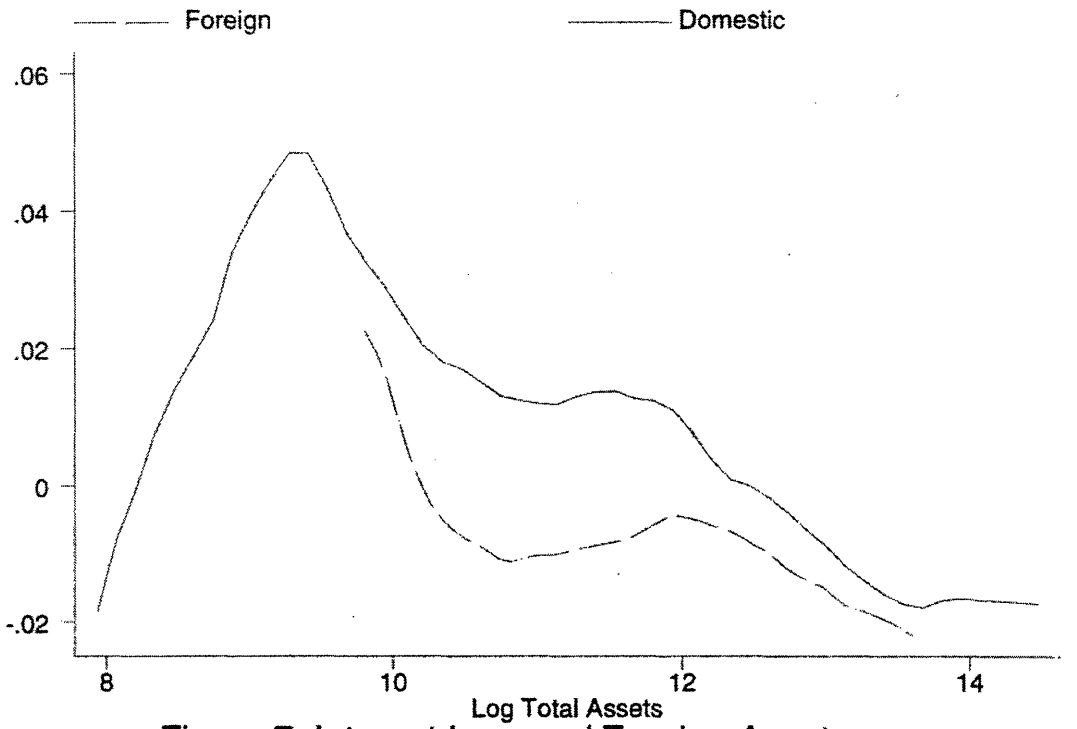


Figure 7: Interest Income / Earning Assets

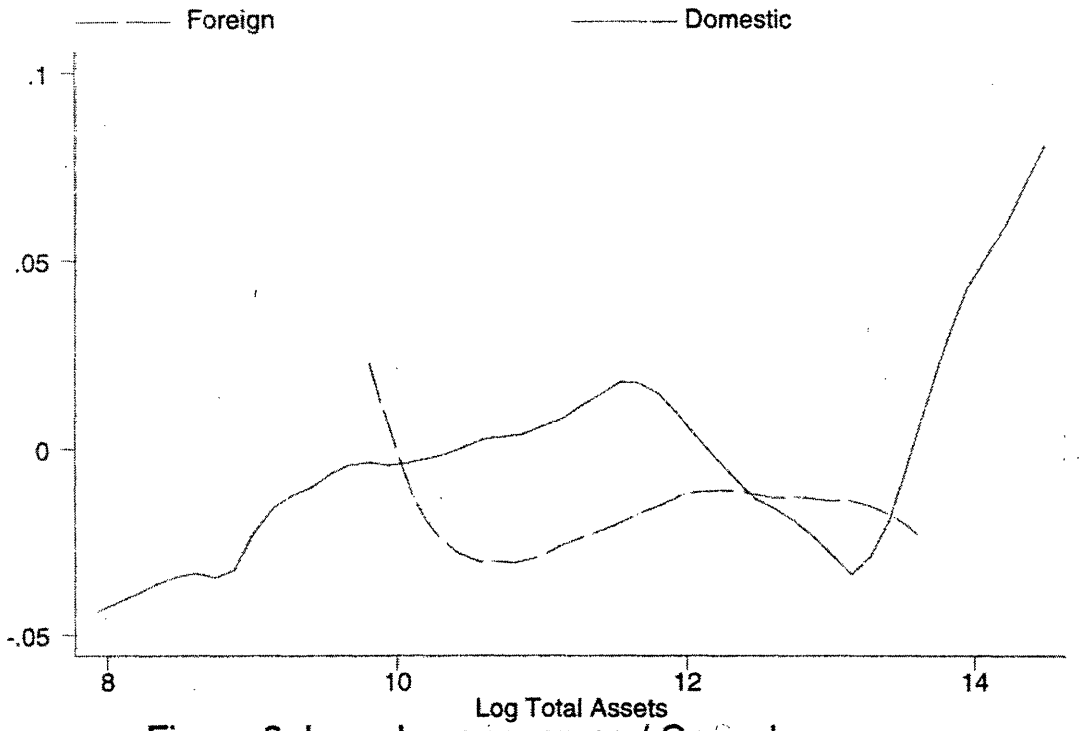


Figure 8: Loan Loss reserves / Gross Loans

Markets, Firms and Governments

Abstract

This paper examines the relative merits of markets, firms, and governments in environments where high powered incentives have both costs and benefits. Career concerns of workers, which are most pronounced in competitive markets, create strong incentives to distort the "composition" of effort. Firms may be able to obscure information about workers output, thus flattening incentives, and improving efficiency. However, in some cases, firms themselves may be unable to commit to not providing greater compensation to employees with higher observed output. Governments, on the other hand, may be able to commit to much flatter wage schedules, and improve the allocation of resources in these circumstances. This is particularly true in the presence of common shocks, as governments internalize the negative externality of higher observed output from one employee on the evaluation of the rest of employees. Our model may help explain the widespread role of governments in the provision of pensions, education, health care and law enforcement.

1 Introduction

While a range of transactions take place in markets, many important activities are organized within firms, and are partly shielded from market incentives. Still there are other activities that are either directly or indirectly controlled by governments, with even more limited role for market incentives through prices. The theory of the firm, starting with the seminal contribution of Coase [1937], has sought to identify why firms exist, what shapes their boundaries, and which activities are likely to be organized within firms.

The most popular theory in this field identifies firms with ownership of assets (Williamson [1985]; Hart and Moore, [1990], and does not directly address what determines the boundaries between firms and governments. The theory of public finance, on the other hand, prescribes government intervention when there are market failures. But since in most cases the government can deal with market failures with Pigovian taxes and subsidies, this theory also does not provide an answer to the question of why government are directly involved in the production of many services.

Most of what governments do is neither to subsidize under-provided activities nor to provide public goods, such as lighthouses and linear accelerators, but to operate schools, hospitals, pension systems, and law enforcement. This is despite the evidence that in many activities private ownership may increase productive efficiency (e.g. Barberis, et al [1996] and LaPorta et al [1999]). So why are so many activities run by governments rather than by markets and firms?

We argue that markets, and the associated price system, create high-powered incentives. As succinctly captured by the multi-tasking literature (e.g. Holmstrom and Milgrom [1991] & [1994], these high-powered incentives might be detrimental by encouraging individuals to distort their effort towards tasks more easily measured and rewarded by the market. In our dynamic economy, this problem arises due to career concerns: in tasks where quality is difficult to measure, agents will try to improve their future rewards at the expense of the unobserved quality of the service they are providing. One possible example is that of teachers. In a market economy, knowing that their ability will be judged by the success of their pupils, teachers tend to concentrate on skills that will lead to higher test scores at the expense of other types of knowledge. The allocation of resources can be improved by flattening teachers' incentives. But in a dynamic economy where all transactions take place in the market, this is not possible: the market cannot commit to not rewarding teachers who are revealed to have higher ability.

One solution is to form teams of teachers, i.e. firms. In firms, teachers engage in "joint

production". A teacher who improves the test performance of her pupils will not only improve the market's perception of her ability, but also that of her co-teachers. To the extent that this externality cannot be internalized via side contracts, each teacher will have weaker incentives to invest in test scores at the expense of more fundamental knowledge, and will "free-ride" on her co-teachers by not distorting the composition of her effort. In other words, in a firm, each agent ceases to be the full residual claimant of the returns she generates, and to the extent that she had excessively high-powered incentives, firms may engender a better allocation of resources than the market. Naturally, however, as the power of incentives decline so do investments. Firms are therefore costly as they distort a range of investments, and perhaps the amount of total effort. These costs of low-powered incentives need to be compared to their benefits in determining the optimal size of a firm.

When are governments necessary, then? The reason is that firms may have a commitment problem in enforcing the equilibrium with teams. At the end of the day, firms themselves are profit-maximizing, and do respond to market incentives. While a teacher may have little to gain by improving the test scores of the school's students, the owner or the principal of the school does. He cannot therefore commit to not rewarding teachers for improving the test scores of their students, effectively letting market prices once again shape teachers' incentives. A non-profit-maximizing organization may therefore be better at ensuring low-powered incentives. This is particularly true when government control eliminates yardstick competition between schools and when the contribution of governments to success in test scores is small, so that even a self-interested politician in charge of schools would have little to gain by rewarding better performing teachers.[1]

Our analysis therefore emphasizes a number of factors as key determinants of the optimal, and perhaps equilibrium, organization of economic activities. Occupations where high-powered incentives are desirable, such as entrepreneurship, should be selling their services in markets. Other activities where career concerns and quality considerations are important and high powered incentives could be detrimental such as law, accounting, consulting, should perhaps be organized within firms.[2] At the other extreme, occupations where quality is very important but equally hard to observe, low-powered incentives are more desirable, and adverse selection may be difficult to

[1]For example, most test scores are standardized within cohorts and are not comparable across cohorts, so it would be impossible for the government to improve "average" performance.

[2]We consider cooperatives as firms, also, since we define firms with the act of "joint production", not ownership patterns. See Kremer [1998] for a discussion of cooperatives.

prevent, such as teaching, pensions and law enforcement, may be more appropriate for government regulation.

Another interesting example to mention in this context is that of pensions. As noted above, pensions are an important area where governments directly run the production of a service. On the face of it, this is surprising.. Although we might believe that the government should ensure savings for old age and a welfare network, why the investment of pension funds should be carried out under the auspices of the government is not clear. However, in his analysis of the Chilean case, where social security reform transferred these functions to private firms, Diamond notes that a significant percentage of resources are spent for advertising and attracting new customers by competing fund managers. Such activities are informative about the rate of return to investments, but are also quite wasteful, and may encourage short-termism at the expense of investments that are sound in the long-run, in some sense similar to teachers preparing students only for the tests at the expense of fundamental knowledge. Preventing the high-powered incentives conveyed by the market in this case may therefore be beneficial, and suggests a useful role for governments in flattening incentives, and a reason why privatizing social security may be socially costly.

Our paper is clearly related to a very large literature. Some of the points we emphasize are very similar to those of the multi–tasking literature, for example Holmstrom and Milgrom [1991] and [1994], and use ideas from the career concerns literature (e.g. Holmstrom [1999], Dewatripont, Jewitt and Tirole [1999]. The literature on the costs of advertising also emphasizes some of the same points. As in these papers, we argue that high-powered incentives come with costs, but by modeling markets as well as firms, we formalize one possible way in which firms and governments could solve these problems. The role of firms as institutions for efficient suppression of information has been discussed by other authors, including Gibbons [1998], Gibbons and Murphy [1992], as well. However, this work assumes that firms have no commitment problem, and therefore provide no role for the government.

The most popular approach to theory of the firm is that of incomplete contracts as developed by Williamson [1985], Grossman and Hart [1986], Hart and Moore [1990]. In this approach, ownership of assets is crucial in making firms different than markets, and in determining the boundaries of the firm. Our approach is complementary as we emphasize incentives and how the differ in firms, markets, and governments, but we do not define firms with reference to asset ownership. In contrast, firms are defined by joint production, which ensures that markets learn relatively little about the performance of each member. Another important difference between the incomplete contracts literature and our paper is on the impact of firms on incentives. In

this literature, firms may be preferred to markets because they improve incentives and encourage investments. In contrast, the problem in our setting is "too high-powered" incentives, and firms are useful as they flatten these incentives. Although both roles of firms are likely to be present in practice, empirical work could find out which may be more important.

A number of other papers have sought to understand why governments run and control certain activities. Hart, Shleifer and Vishny [1997] use the incomplete contracts approach to explain why governments run prisons, and attempt to define what the proper scope of governments should be. Kremer and Sarychev [1997] suggest that governments may run schools in order to control what ideology is taught to students. This paper presents another reason for government involvement, one based on the ability of the government to provide low-powered incentives, particularly in the presence of yardstick competition.

The rest of the paper is organized as follows. Section 2 describes the environment and characterizes optimal incentives in the context of a simple mechanism design problem. Section 3 then compares the incentive structure under markets, firms, and governments, and discusses the optimality of each. Section 4 concludes with a discussion of the main findings.

2 Model

2.1 Setup

Consider an infinite horizon economy where each period parents send their children to teachers for education. There are n teachers and n parents[3] in the economy. Each parent has one child, who needs to be matched with one teacher every period. A teacher can only teach to one student at a time. Each teacher, i, is endowed with a teaching ability a_t^i at the beginning of period t. The exact level of a_t^i is unknown, but both teacher i and parents share the same belief about the distribution of a_t^i. The common belief about teacher $i's$ ability is given by:

$$a_t^i \vee N(m_t^i, v_t) \tag{1}$$

Ability evolves over time according to a fixed stochastic process given by:

$$a_{t+1}^i = a_t^i + \varepsilon_t^i \tag{2}$$

[3] For our model to be completely consistent with Bertrand competition, we should actually assume $n+1$ parents.

where ε_t^i is i.i.d. with $\varepsilon \vee N(0, \sigma_\varepsilon^2)$. The shock ε could reflect personal shocks such as changes in health, or it could reflect the ability of the teacher to adapt to changing education technology.

We consider a multi-tasking work environment, where a teacher can make two types of effort, "good" and "bad", denoted by g_t^i and b_t^i respectively. The titles good and bad reflect the social value of these efforts. The total output of a teacher is calculated through the education or human capital, h_t^i, that she provides to her student. h_t^i depends on the ability, as well as the good effort of the teacher according to the equation:

$$h_i^i = a_t^i + f(g_t^i) \tag{3}$$

where $f(g)$ is increasing and concave in g, with $f(0) = 0$.

Parents only care about the level of human capital provided to their children. The utility of a parent at time t is given by:

$$U_t^P = \sum_{k=0}^{\infty} \delta^k (h_{t+k} - w_{t+k})$$

where $\delta < 1$ is the discount rate, and w is the wage paid to the teacher.

There is perfect competition among parents for education, such that each parent pays a teacher a wage w_t^i equal to the expected level of education provided to her child, i.e. $w_t^i = E[h_t^i]$. The utility of a teacher i, who gets a wage w_t^i, is given by the time separable utility function:

$$U_t^i = \sum_{k=0}^{\infty} \delta^k [E(w_{t+k}^i) - g_{t+k}^i - b_{t+k}^i] \tag{4}$$

Our main assumption of the model is that the true level of h_t^i provided by a teacher is not observable to parents. The parents cannot observe h directly, and instead rely on an imperfect signal of h, given by the test score, s.

$$s_t^i = a_t^i + f(g_t^i) + cf(b_t^i) + \theta_t^i + \eta_t \tag{5}$$

where $c \geq 0$ measures the importance of bad effort relative to good effort in influencing the

test score, θ_t^i is an i.i.d. teacher level shock distributed as $N(0, \sigma_\theta^2)$, and η_t is a common shock that **every** teacher receives in period t. For example, if all students are given the same test, η_t can be thought of as the overall difficulty of the test. η_t is distributed as i.i.d. $N(0, \sigma_\eta^2)$. The variance σ_θ^2 measures the quality of signal s_t^i. The lower this variance, the more precise the signal is in measuring the quantity of interest, namely human capital. Notice that the signal of human capital is imperfect in two ways. First, shocks θ and η make the test scores a noisy signal for the student's level of education. Second, the signal can be inflated by the teacher with the bad type of effort. As we will see, both these imperfections have important consequences for the optimal organizational structure for education.

The reason for calling the two types of efforts good and bad should become apparent now. Parents, as well as the society, only care about the good type of effort put in by the teacher, since that determines the level of human capital h that the children receive. However, parents cannot observe h directly. The signal s that they observe is only an imperfect measure of h, and moreover can be manipulated with the bad type of effort. In real life, the good type of effort can be thought of as real or honest teaching, where the teacher tries to ensure that the children understand conceptually what has been taught to them. Bad type of effort on the other hand can be thought of as what is commonly referred to as "teaching to the test". It involves rote learning, where the teacher just forces the students to cram certain essential facts or methods, without explaining the concepts behind them or the connection between the various facts and phenomena. Such cramming is useless in terms of the human capital of the students, but it is useful in inflating the test scores of the students.

The timing of our model is as follows. In the beginning of every period t, parents form priors, m_t^i, on the abilities of teachers based on the historical test scores of the teachers. They then offer each teacher a wage w_t^i. The teacher then decides on the levels of good and bad effort to put in, and h and s are realized at the end of period t. Ability a_t^i is then updated according to the stochastic process (2). The process then repeats itself in period $t+1$.

Our analysis in this paper will be limited to the equilibrium path, along which all agents have rational expectations. Furthermore, we will only be looking at the long run dynamics of the model. This translates into considering a stationary environment, where the variance of each teacher's ability is constant, i.e. $v_t = v_{t+1} = v$. We solve for v in the next section.

Our model uses teaching as an example only to illustrate the main points of the model. In a more general representation of our model, we can label teachers as "producers", who are selling a "service" to "consumers", where "service" and "consumers" correspond to education and parents

in our example respectively.

2.2 Updating Beliefs

We first determine how beliefs about teacher $i's$ ability will be updated at the end of period t based on new information revealed during period t. Parents' belief about teacher i at the beginning of period t can be summarized as, $a_t^i \vee N(m_t^i, v_t)$. Let $S_t = [s_t^1 \ldots\ldots s_t^n]^T$ denote the vector of n test scores that the agents observe during period t.

Since we are interested in solving for the model dynamics along the rational expectations equilibrium path, we can assume that along this path, parents correctly infer effort levels g_t^i and b_t^i chosen by the teachers. This means that parents can back out the part of S_t which only reflects the ability levels of the teachers, plus the noise. Let $Z_t = [z_t^1 \ldots\ldots z_t^n]^T$ denote this backed out signal, where $z_t^i = s_t^i - f(g_t^i) - cf(b_t^i) = a_t^i + \theta_t^i + \eta_t$. Let $a_{t+1}^i \vee N(m_{t+1}^i, v_{t+1})$ be the updated prior on teacher $i's$ ability conditional on observing Z_t.

First, using the Normal updating formula for variance v_{t+1}, we set $v_{t+1} = v_t = v$ according to the stationarity assumption mentioned in the previous section. See Appendix for the explicit solution of v.

Next, using the Normal updating formula for the mean, m_{t+1}^i, we get:

$$m_{t+1}^i = m_t^i + \beta(z_t^i - m_t^i) - \overline{\beta}(\overline{z}_t^{-i} - \overline{m}_t^{-i}) \tag{6}$$

where $\overline{z}_t^{-i} = \frac{1}{(n-1)} \sum_{j \neq i} z_t^j$, and $\overline{m}_t^{-i} = \frac{1}{(n-1)} \sum_{j \neq i} m_t^j$ The exact proof of (6) is given in the appendix. The coefficients β and $\overline{\beta}$ depend on the total number of teachers n, and the variances of the shocks σ_θ^2, σ_ε^2 and σ_η^2. The updating rule can be summarized in the following lemma.

Lemma 1: Parents update their beliefs about teacher $i's$ ability level, according to equation (6), where $1 > \beta > \overline{\beta} > 0$. β is increasing in σ_ε^2 and n, and decreasing in σ_θ^2 and σ_η^2.

The intuition behind lemma 1 is that any increase in the variance of θ or η increases the noise in the signal, thus reducing its value. However, an increase in n is helpful, as it allows to back out a greater portion of the common shock affecting the test scores, thus reducing the noise in the test score. An increase in σ_ε^2 makes the signal more valuable due to a greater change in ability since last period.

The coefficient $\overline{\beta}$ captures relative evaluation due to the common shock η. $\overline{\beta}$ "corrects" for the part of teacher $i's$ test score that is likely to be due to the common shock hitting everyone[4].

2.3 Constrained Best

We define social welfare at time t, U_t^W, as the sum of the teachers' and parents' utilities. Since the ability of teacher i enters additively in a teacher's utility function, all teachers choose the same effort level in a given period. Social welfare can then be written as:

$$U_t^W = \sum_{k=0}^{\infty} \delta^k (\overline{A} + f(g_{t+k}) - g_{t+k} - b_{t+k}) \tag{7}$$

where $\overline{A}$ is the average ability of the n teachers. Since each individual teacher's ability is a random walk, the average ability level of the population does not vary over time.

First Best: Maximizing (7), gives us the first best. In the first best, there is no bad effort, and the level of good effort, g^{FB}, is given by, $f'(g^{FB}) = 1$.

Constrained Best: The first best is useful as a benchmark. However, since we have assumed that teacher effort is not contractible, and the level of human capital is not directly observable, a more useful benchmark is to solve for the optimal mechanism design given these informational constraints.

Let $\Omega_t^i = [m_0^i \; s_0^i \; s_1^i \; s_2^i \; ..... \; s_{t-1}^i]$ be the vector of test scores for teacher i at the beginning of period t. Ω_t^i summarizes *all* contractible information about teacher i upto t. Let $w_t^i(\Omega_t^i)$ be the wage paid to teacher i in period t. Then the constrained maximization problem can be written as:

$$\begin{aligned} & Max \; U_t^W \text{ , subject to} \\ (g_{t+k} \; , \; b_{t+k}) \; &= \; \arg\max \; [\sum_{k=0}^{\infty} \delta^k (w_{t+k} - g_{t+k} - b_{t+k})] \end{aligned} \tag{8}$$

Proposition 1: The constrained best solution is given by $g_{t+k} = g^{SB}$, and $b_{t+k} = b^{SB}$ for all k, with $g^{SB} < g^{FB}$. The optimal wage schedule is given by an affine transformation of the

[4] $\overline{\beta}$ is increasing in n. A higher n facilitates in the determination of η, and as $n \to \infty$, $\overline{\beta} \to \beta$ and η is completely known.

function $w_t^i = \alpha^{SB} m_t^i$. α^{SB} is monotonically decreasing in c, with $\alpha^{SB} < 1$, for $c > \underline{c}$.

Proof: The above is a point-wise maximization problem. We can rewrite, for each k, the constraint for the maximization problem in (8) as:

$$f'(g_{t+k}) \sum_{l=0}^{\infty} (\delta^l \frac{\partial w_{t+k+l}}{\partial s_{t+k}}) = 1, \text{ and } cf'(b_{t+k}) \sum_{l=0}^{\infty} (\delta^l \frac{\partial w_{t+k+l}}{\partial s_{t+k}}) = 1 \tag{9}$$

The above conditions can be combined to give, $f'(g_{t+k}) = cf'(b_{t+k})$ which implies that:

$$b_{t+k} = f'^{-1}[\frac{f'(g_{t+k})}{c}] \tag{10}$$

The inverse of $f'(x)$ exists due to the concavity of $f(x)$. (10) greatly simplifies our maximization problem (8), which can be transformed into the unconstrained problem:

$$\underset{g_{t+k}}{Max} \sum_{k=0}^{\infty} \delta^k (\overline{A} + f(g_{t+k}) - g_{t+k} - f'^{-1}[\frac{f'(g_{t+k})}{c}]) \tag{11}$$

The above is a well defined maximization problem, with a unique global maxima. Moreover, because of the additive nature of (11), at the optimum, $g_t^{SB} = g_{t'}^{SB} = g^{SB}$ for all $t \neq t'$. Taking derivative of (11) with respect to g_t, we can explicitly solve for g^{SB}, and see that $g^{SB} < g^{FB}$. (see appendix for details).

Given g^{SB}, it is easy to solve for the optimal wage structure. In fact there is a continuum of optimal wage structures, as long as they satisfy the condition (from (9)), $f'(g^{SB}) \sum_{l=1}^{\infty} (\delta^l \frac{\partial w_{t+k+l}}{\partial s_{t+k}}) = 1$. This condition can be satisfied by the wage schedule $w_t^i = \alpha m_t^i$. To see this, note that from (6), we can write $m_{t+l} = (1-\beta)^l m_t + \beta(1-\beta)^{l-1} s_t + \beta(1-\beta)^{l-2} s_{t+1} + ... + \beta s_{t+l-1} + (\text{constant})$. We can then write $\frac{\partial w_{t+k+l}}{\partial s_{t+k}} = \alpha\beta(1-\beta)^{l-1}$, which implies that at the constrained best, $\alpha^{SB} = \frac{1-\delta(1-\beta)}{f'(g^{SB})\beta\delta}$. Since g^{SB} is decreasing in c, there exists a $\underline{c}$ such that for $c > \underline{c}$, $\alpha^{SB} < 1$. ¥

Proposition 1 highlights the trade-off that the social planner faces given the informational constraints. The planner needs to provide incentives to the teacher in order to induce any effort from her. However, higher incentives lead to both good and bad type of efforts. This increases the shadow cost of increasing the good type of effort, leading to a lower level of good effort in the constrained best relative to first best. c captures the cost of higher incentives in the form of bad effort. Hence an increase in c reduces the optimal level of incentives for the teacher.

With $w_t = \alpha m_t$, teachers are driven entirely by career concerns. There are no effort contingent contracts. Teachers are paid a wage every period depending on their perceived ability at the time. This formulation of incentives is very similar to the seminal career concerns paper by Holmstrom

[1999]. The extra effort put in by the teacher in period t increases her test score in period t. There are no immediate rewards for this increase as the teacher has already been paid her wage. However, an increase in the test score at t increases the perceived ability of the teacher in period $t+1$ due to the updating rule (6). Moreover, because of the recursive nature of (6), the increase in perceived ability in $t+1$ has a (progressively damped) ripple effect on all future expected abilities. Hence the present discounted value of the marginal benefit of higher test scores in period t can be summarized as: $\alpha\delta\beta[1+\delta(1-\beta)+\delta^2(1-\beta)^2+....] = \frac{\alpha\delta\beta}{1-\delta(1-\beta)}$. Notice that the marginal benefit is increasing in β, which is the coefficient on an individual teacher's test score in the ability updating rule. We thus define the coefficient on an individual teacher's test score in the ability updating equation as the "career-concerns coefficient". With α fixed to 1 in a competitive setup, the career-concerns coefficient determines the level of incentives for the teacher.

3 Optimal Organizational Structure

The constrained best solution highlighted the trade-off in providing higher incentives to teachers. Whereas higher incentives are good for increasing the good type of effort, they also lead to a an increase in the bad type of effort. This necessitates the need for "taming" of the incentives. In this section, we consider three different organizational structures, markets, firms, and governments, and compare the incentives they induce on the teachers.

3.1 Markets

Consider first the textbook model of perfectly competitive markets. Every teacher works independently, and sells her teaching services in the parents market each period. There is perfect competition among parents for education, and as a result each teacher gets paid her full expected output, which is given by the human capital equation (3). Wage w_t^i is given by $w_t^i = m_t^i + E[f(g_t^i)]$. The solution to the market equilibrium will thus be identical to the constrained best equilibrium, except that now α is fixed to be 1. This leads to the following result.

Lemma 2: The market equilibrium is characterized by good effort level g^M, where $g^M < g^{SB}$ if $c < \underline{c}$, and $g^M > g^{SB}$ if $c > \underline{c}$.

The proof follows from proposition 1. The result that $g^M < g^{SB}$ if $c < \underline{c}$ is the Holmstrom

[1999] result that career concerns are never sufficient in inducing the optimal level of effort[5].

In the remaining of this paper, we focus on the case where $c > \underline{c}$, so that career concerns in a market equilibrium lead to too strong an incentive relative to the constrained best.

3.2 Firms

The previous section showed that the presence of competitive forces could make it impossible to reduce incentives, even when it is socially optimum to do so. We now consider how firms through better organization of teachers can overcome the problems due to pure market forces. In doing so, we provide a theory of the firm based upon the informational advantages that it provides over pure markets.

The firms in our model consist of "groups" of teachers that work together to provide education to their customers. In this sense one can also think of firms as cooperatives. Our point of departure from the market set up is that firms have the ability to shut down individual signals (test scores) of the teachers. In particular, instead of providing individual test scores of every teacher in its group, a firm only reports the average test score for the entire group. As we will soon show, this ability to suppress individual level information, reduces the equilibrium incentives for individual teachers, thus improving welfare.

Firms thus create value through their ability to organize and disseminate information more efficiently than pure markets. Firms could adopt different mechanisms to achieve the informational form it wants. For example, in the case of teachers, if teachers are organized in such a way that they rotate to teach to different students, then that will make it impossible to judge the individual contribution of a teacher from the test score of a student.

Formally, consider a firm made up of K teachers. All firms are identical, leading to a total of $J = n/K$ firms in the economy[6]. We index each firm by j, and teachers within a firm by k. The market observes J signals every period, where each signal is the average test score of all the teachers in the firm. Let s_t^j denote the signal from firm j at time t, then,

$$s_t^j = \overline{a}_t^j + f(g_t) + cf(b_t) + \overline{\theta}_t^j + \eta_t \tag{12}$$

where $\overline{a}_t^j = \frac{1}{K}\sum_{k=1}^{K} a_t^{jk}$, and $\overline{\theta}_t^j = \frac{1}{K}\sum_{k=1}^{K} \theta_t^{jk}$. As before, since parents can figure out the levels of

[5] assuming a discount rate of less than 1.

[6] we assume J is a whole number.

good and bad effort undertaken by teachers, they can back out the signal $\overline{z}_t^j = \overline{a}_t^j + \overline{\theta}_t^j + \eta_t$ from s_t^j. Let $\overline{m}_t^j = \frac{1}{K}\sum_{k=1}^{K} m_t^{jk}$, be the expected ability of the firm j at time t. Then parents update their belief about teacher $k's$ ability according to the updating formula,

$$m_{t+1}^{jk} = m_t^{jk} + \beta_F(\overline{z}_t^j - \overline{m}_t^j) - \overline{\beta_F}(\overline{z}_t^{-j} - \overline{m}_t^{-j}) \tag{13}$$

where superscript $-j$ refers to the average over the remaining $(J-1)$ firms.

We assume that teachers can make a "take it or leave it offer" to the firm, and are thus paid a wage equal to the human capital they provide, i.e. $w_t^{jk} = m_t^{jk} + f(g_t)$. Parents in turn pay the firm an amount $\overline{m}_t^j + f(g_t)$ for every teacher. The firm thus makes zero profit on the whole.

Given the updating rule, and wage rate for a teacher, we can now determine the level of good effort, g^F that a teacher will make in equilibrium.

Proposition 2: In a firm of size K, the good effort level chosen by a teacher is given by $g^F(K)$, with g^F monotonically decreasing in K, and $g^F(1) = g^M$. Hence, there exists an optimal level of K^*, such that $g^F(K^*) = g^{SB}$.

The formal proof is given in the appendix, here we outline the intuition behind the result. As in the market equilibrium, a teacher is still paid her expected output. However, the marginal effect of test score at time t on future expected ability is lower with firms. In other words, firms lower the "career concerns coefficient". This coefficient from the updating equation (13), is equal to $\frac{\beta_f}{K}$. There are two reasons why firms are able to lower the "career concerns coefficient" for the teachers. First, the aggregation of signals makes the test score signals less informative about an individual teacher's ability level (i.e. $\beta_F < \beta$). Second, and more importantly, organization into groups means that a teacher only gets $\frac{1}{K}$ times the marginal benefit of increasing his test score.

The reduction of career concerns effect under firms can thus completely resolve the "over-incentivization" problem. With firms of appropriate size, the constrained best outcome in section 2.3 is achieved. When firms compete to maximize their value, all firms will endogenously expand to the optimal size K^*.

The Commitment Problem:

The equilibrium with firms hinges critically on the assumption that *both* the parents, and the firm owner only receive the aggregate signal. Suppose there were informational asymmetry, and the owner of the firm could observe individual teacher test scores as well. This could be the case

for example, if the firm owner had access to internal firm information that contains individual test scores for all teachers in the firm. With informational asymmetry of this sort, there is a commitment problem in implementing the firm-equilibrium above.

When the firm owner can observe individual teacher scores, his updating rule for a teacher will be given by the updating rule in the market economy (equation (6)). Moreover, since the firm owner gets the *full* marginal product of an increase in its employee's ability, he has an incentive to write a side contract with every teacher, promising them to pay a wage based on their individual test scores. As soon as that happens, teachers have the same incentives as in section 3.1 to increase their test scores, leading to the same outcome as in the market equilibrium.

The commitment problem can thus break the efficient firm-equilibrium or proposition 2.

3.3 Governments

Whenever firms are unable to commit to the suppression of information, they fail to improve upon the market outcome. In this section, we introduce governments, and discuss how they can resolve the commitment problem of the previous section.

One reason why governments might be able to improve upon the market outcome is their ability to provide flat incentives. Provision of low incentives by governments has been well documented, and various theoretical justifications for this empirical evidence have been presented (Banerjee[1997], and Tirole[1992]). The inability of governments to provide high-powered incentives is usually seen as a drawback of government ownership. However, in our model, since higher incentives by leading to a distortion of effort can be efficiency reducing, flat incentives through government ownership could lead to better outcomes than either markets or firms.

Any ability of the governments to provide low-powered incentives for reasons outside our model can be helpful in limiting the extent of wasteful activities. However, our model also provides additional reasons for why governments might succeed in providing low incentives, when markets and firms fail. As such we do not necessarily have to appeal to some exogenous ability of the government in providing low-powered incentives.

Consider the same set up with firms as in section 3.2. Everything is identical, except that the firms are now owned by the government, instead of being privately owned. As before, parents pay each firm the expected human capital that it provides, and firms in turn pay each teacher a wage equal to her expected output. The updating rule for ability is again given by (13), and a teacher's career concerns coefficient is given by $\frac{\beta_E}{K}$. Thus, as in section 3.2, with $K = K^*$, constrained best

is achieved.

The critical difference with government ownership of firms is that the firm now has less of a commitment problem. The firm always gets the entire marginal value of a teacher's ability. In the equilibrium of section 3.2, the career-concerns coefficient for the firm was β_F, whereas for the individual teacher it was $\frac{\beta_F}{K}$. It was the difference between these two career concerns incentives that gave the firm owner an incentive to write side-contracts with the teacher. However, with government ownership, the career concerns coefficient for the firm becomes $(\beta_F - \overline{\beta}_F)$. The reason is that because of relative evaluation, an increase in the test score of firm j, has a *negative* impact on firm $j' \neq j$. Individual firm owners never take this negative externality of a firm's test scores into account. The government does however, and consequently has fewer incentives to increase test scores by writing side contracts with the teachers.

We measure the extent of the commitment problem by the difference between the career concerns incentives of the firm owner, and the teacher. Thus the commitment problem under private ownership of firms is given by $(\beta_F - \frac{\beta_F}{K})$, whereas under government ownership it is given by $(\beta_F - \overline{\beta}_F - \frac{\beta_F}{K})$. Let,

$$\Psi = \frac{(\beta_F - \frac{\beta_F}{K}) - (\beta_F - \overline{\beta}_F - \frac{\beta_F}{K})}{\beta_F - \frac{\beta_F}{K}} = \frac{K\overline{\beta}_F}{(K-1)\beta_F}$$

Ψ measures the percentage reduction in the commitment problem due to government ownership. The discussion above can then be summarized in the following proposition:

Proposition 3: Government ownership of firms reduces the commitment problem (i.e. $\Psi > 0$). Moreover, the credibility advantage of government ownership is monotonically increasing in the variance of the common shock, σ_η^2 (i.e. $\frac{\partial \Psi}{\sigma_\eta^2} > 0$).

4 Conclusion

This paper was interested in understanding the boundaries between markets, firms and governments in environments which were characterize by noisy signals of output, multi-tasking agents, and common shocks. Our analysis suggests that competitive markets work well when agents can observe unbiased signals of output. This corresponds to a low c in our model (proposition 1). When output signals can be manipulated by worker, markets can lead to inefficient behavior as workers increase their effort along signal-enhancing, but unproductive dimensions. Firms can help in such situations by organizing workers in a manner that blunts the signals that individual workers provide. However, firms can only achieve this as long as they have some commitment mechanisms

to credibly commit to blunt signals. In the absence of such mechanisms, side contracts between the firm and its workers once again lead to high incentives for the workers, leading to the same outcome as under markets. This is where governments can potentially lead to better outcomes by their ability to provide flat incentives to workers. In fact, in the presence of common shocks, there is a natural reason to believe that governments will be more effective than private firms in providing flat incentives. The presence of common shocks leads to yardstick competition among firms. Under such competition, an increase in one firm's output signal has a negative impact on the evaluation of the remaining firms. Private ownership of firms fails to take this externality into account. However, government ownership of firms internalizes the negative externality, thus reducing the incentives for side-contracting.

We have only focused on different organizational structures in solving the incentive problems arisen due to multi-tasking agents and biased signals. One could think of more traditional instruments such as taxation in solving for the incentive problems. In particular, one could have solved the mechanism design problem of section 2.3, in terms of the optimal marginal tax rate α^* on wages. However, imposing a differential tax rate on a particular activity such as education, may be legally or politically feasible. Moreover, any sort of price regulation such as wage ceilings is also unlikely to work in practice for a couple of reasons. First wage ceilings are hard to enforce due to the possibility of non-pecuniary incentive schemes such as promotion and job assignment. Second for teachers below the wage ceiling, composition of effort will still be distorted. It is on these grounds that we only focused on the organizational structure in solving the incentive problem.

5 Appendix

Proof of (6):

Using the normal updating formula, $m_{t+1}^i = m_t^i + \Sigma_{12}\Sigma_{22}^{-1}(Z_t - M_t)$, where $M_t = [m_t^1 \ ..... \ m_t^n]^T$,

$\Sigma_{12} = [0\ 0\ ..v....\ 0]$, (where v is the ith component of the vector) and

$$\Sigma_{22} = \begin{bmatrix} (v+\sigma_\theta^2+\sigma_\eta^2) & \sigma_\eta^2 & \sigma_\eta^2 \\ \sigma_\eta^2 & ..... & \sigma_\eta^2 \\ \sigma_\eta^2 & \sigma_\eta^2 & (v+\sigma_\theta^2+\sigma_\eta^2) \end{bmatrix}$$

Σ_{22} is an (nxn) matrix with $(v+\sigma_\theta^2+\sigma_\eta^2)$ as the diagonal term, and σ_η^2 as all the non-diagonal terms. Σ_{22}^{-1} can be written as:

$$\Sigma_{22}^{-1} = (1/b)\begin{bmatrix} a & 1 & 1 \\ 1 & ...a... & 1 \\ 1 & 1 & a \end{bmatrix}, \text{ where}$$

$b = (n-1)\sigma_\eta^2 - \frac{(v+\sigma_\theta^2+\sigma_\eta^2)^2}{\sigma_n^2} - (n-2)(v+\sigma_\theta^2+\sigma_\eta^2)$, and

$a = -[\frac{(v+\sigma_\theta^2+\sigma_\eta^2)}{\sigma_n^2} + (n-2)]$.

Plugging in the value of Σ_{12} and Σ_{22}^{-1}, we get:

$m_{t+1}^i = m_t^i + \beta(z_t^i - m_t^i) - \overline{\beta}(\overline{z_t}^{-i} - \overline{m_t}^{-i})$, where:

$\beta = \frac{va}{b}$, and

$\overline{\beta} = -\frac{v(n-1)}{b}$.

It can be checked from above, that $1 > \beta > \overline{\beta} > 0$.¥

Solution for $v_{t+1} = v_t = v$:

Using the normal updating formula, $v_{t+1} = v_t - \Sigma_{12}\Sigma_{22}^{-1}\Sigma_{21} + 1$, where Σ_{12} and Σ_{22} are defined above, and $\Sigma_{21} = [\Sigma_{12}]^T$

$=> v_{t+1} = v_t - \frac{a}{b}v_t^2 + 1$

Assuming $v_{t+1} = v_t = v$ for stationarity, we get,

$v^2 = \frac{b}{a}$, which can be expanded into:

$v^3 + v^2[(n-1)\sigma_\eta^2 + (\sigma_\theta^2 - 1)] - v[n\sigma_\eta^2 + 2\sigma_\theta^2] - [(\sigma_\theta^2)^2 + n\sigma_\eta^2\sigma_\theta^2] = 0$

We can see that as $n \to \infty$, or $\sigma_\eta^2 \to 0$, the above expression turns in to, $v^2 - v - \sigma_\theta^2 = 0$.

One of the roots of the above cubic equation is always real and positive, and this the root we assume holds throughout our paper. v is thus well-defined for all n, σ_θ^2, and σ_η^2.

Prop 1: FOC of (11):

$f'(g^{SB}) = 1 + \frac{(1/c)f''(g^{SB})}{f''(f'^{-1}(\frac{f'(g^{SB})}{c}))}$

Because of the concavity of $f(x)$, the last expression on the RHS is positive, implying $g^{SB} < g^{FB}$.

Proof of $\beta_F < \beta$:

In the model with firms, parents observe J signals, represented by: $\overline{Z}_t = [\overline{z}_t^1\ \overline{z}_t^2\ .....\ \overline{z}_t^J]^T$. Then using the normal updating formula, ability for teacher k in firm j is updated using:
$m_{t+1}^{jk} = m_t^{jk} + \bar{\Sigma}_{12}\bar{\Sigma}_{22}^{-1}(\overline{Z}_t - \overline{M}_t)$, where $\overline{M}_t = [\overline{m}_t^1 ..... \overline{m}_t^J]^T$, and $\bar{\Sigma}_{12} = (1/K)\Sigma_{12}$, and $\bar{\Sigma}_{22} = (1/K)\Sigma_{22}$, with σ_η^2 replaced by $K\sigma_\eta^2$. Thus it follows from lemma 1, that $\beta_F < \beta$. ¥

Prop 4:

$\Psi = \frac{-v(K-1)}{b}\frac{b}{va}\frac{K}{(K-1)} = -\frac{K}{a}$
$= \frac{K\sigma_\eta^2}{v+\sigma_\theta^2+(K-1)\sigma_\eta^2}$, which is increasing in σ_η^2.

Bibliography

Banerjee A. 1997. "A Theory of Misgovernance". Quarterly Journal of Economics 112, 1289-1332.

Barberis, Nicholas; Maxim Boycko; Andrei Shleifer; and Natalia Tsukanova. 1996. "How does Privatization Work? Evidence from the Russian Shops". Journal of Political Economy. 104:4, 764-90.

Coase, R. H. "The Nature of the Firm". Economica, 4:386-405 (1937).

Dewatripont, Mathias ; Jewitt, Ian ; Tirole, Jean "The Economics of Career Concerns, Part I: Comparing Information Structures " Review of Economic Studies v66, n1 (January 1999): 183-98.

Gibbons, Bob "Incentives in Organizations". National Bureau of Economic Research Working Paper: 6695 August 1998

Gibbons, Bob and Murphy, Kevin. "Optimal Incentive Contracts in the Presence of Career Concerns: Theory and Evidence" Journal of Political Economy v100, n3 (June 1992): 468-505

Grossman, S. and Hart, O. "The Costs and Benefits of Ownership: A Theory of Vertical and Lateral Integration". Journal of Political Economy, (1986) 94:691-719.

Hart, O. and Moore, J. "Property Rights and the Nature of the Firm". Journal of Political Economy, (1990) 98:1119-58.

Hart, O. , Shleifer, A. and Vishny, R. "The Proper Scope of Government: Theory and an Application to Prisons". Quarterly Journal of Economics v112, n4 (November 1997): 1127-61.

Holmstrom, Bengt "Managerial Incentive Problems: A Dynamic Perspective" Review of Economic Studies v66, n1 (January 1999): 169-82

Holmstrom, Bengt "Aggregation and Linearity in the Provision of Intertemporal Incentives" Econometrica v55, n2 (March 1987): 303-28

Holmstrom, B., and Milgrom P. "Multitask Principal-Agent Analyses: Incentive Contracts, Asset Ownership, and Job Design." Journal of Law, Economics and Organization, (1991) 7 (Special Issue): 24-52.

Holmstrom, B., and Milgrom P. "The firm as an Incentive Structure". American Economic Review. (1994) 84(4) : 972-91.

LaPorta, R. and Lopez-de-Silanes F. "The Benefits of Privatization: Evidence from Mexico". Quarterly Journal of Economics. v114, n4 (November 1999): 1193-1242

Kremer. M. "Why are Worker Cooperatives so Rare?". NBER. Working Paper. (1998).

Tirole, Jean. 1986. "Hierarchies and Bureaucracies: On the Role of Collusion in Organizations". Journal of Law Economics and Organization, 2, 181-214.

Williamson, O. "The Economic Institutions of Capitalism". New York: Free Press. (1985)