Efficiency Change, Technical Progress and Productivity Growth in Banking: The Initial Post Liberalization Experience of Turkey

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Introduction

This study uses the methodology of *X-efficiency theory* to examine the impact of liberalization of the Turkish banking sector on the efficiency and productivity of banking firms.

The basic proposition of *X-efficiency theory* is that market structure aspects are critical in determining the optimal behavior of firms in production of services and goods. The degree of competitiveness in a firm's market, the extent to which it is formed as a part of public sector bureaucracy, the nature of regulatory regime under which a firm operates are among the primary factors that may explain the variations in X-efficiency (Leibenstein, 1978). Also, as the *quiet life theory* suggests, the lower the intensity of environmental pressures, the lower is the effort expended by managers to derive the maximal output from a given amount of inputs. Moreover, the extent to which a firm has the right organizational or ownership form that presents the necessary managerial skills and incentives to adapt to rapid changes in the operating environment and the extent to which a firm has international outlet for its idle resources or access for new technology are other possible sources of variations in X-efficiency.

The *economic theory of firm* maintains that as entry and exit barriers are reduced, new financial instruments and institutions are allowed, expansion to new markets and regions are permitted, competitive pressures will rise and inefficient banks will either quit or take measures to improve their productivity and efficiency. Thus, in the past two-decades, the policy-makers of many developed or developing countries have undertaken radical liberalization policies to improve the performance and competitive viability of banking sectors. They expected that heightened competition would result in improvements in resource allocation and productivity and efficiency of the financial system, which could bring about reductions in prices and expansions in the amount and quality of services for consumers.

As a reflection of the financial liberalization program that was implemented throughout the 1980s, the Turkish financial system has undergone important structural, institutional and legal changes. The abolition of directed credit policies, liberalization of deposit and loan interest rates, liberal exchange rate policies, relaxation of entry barriers, introduction of new financial markets, institutions and services and adoption of international best standard banking regulations among other measures were the main attributes of the 1980s, which have fostered competition in the financial services industry and accelerated the integration of the economy with the world. In the spirit of Leibenstein (1978), this paper is to study the sources of productivity and efficiency developments in banking by *ownership*, drawing particularly on the initial post liberalization experience of public, private and foreign banks operating in Turkey.

A close examination of different groups of banks is very important for policy and research concerns especially in the new environment. First and foremost, to detect the extents and sources of inefficiency (waste of resources) in each organizational form is the first step for policy makers towards writing right prescriptive measures to tackle the current and future problems of these institutions. Second, like virtually in all emerging markets, banks are the dominant financial institution in Turkey, as they control most of the financial flows and possess 75% of the total assets in the financial system. Given the fact that majority of non-bank financial institutions are also affiliates of banks, the dominance of banks in the financial system becomes even greater. Thus, their successes or failures strongly affect the health of the economy at large as demonstrated repeatedly in recent years.

Bank markets in emerging economies differ considerably from those in industrialized economies. For instance, in developing countries, institutions are limited in number and type, thus competition is weak; capital markets are narrow and shallow; market participants for financial products are few; asymmetric information problems are substantial, thus transaction costs are high; regulations are inadequate and often used for other purposes than the soundness of the financial system;[1] and the underlying economies are relatively poor and unsophisticated (Akcaoglu, 1998). In addition, banking sectors of these economies are highly concentrated. While three-bank concentration ratio is 0.19 for the U.S. and 0.22 for Japan, it is 0.44 for Turkey, 0.65 for Egypt, 0.69 for Peru, 0.74 for Pakistan and 0.87 for Uruguay (Demirguc-Kunt and Levine, 1999). It is possible that banks of concentrated markets become less motivated to operate efficiently and productively, as they do not face strong competition from new banks and non-bank financial institutions. The lack of

[1] For example, reserve and liquidity requirements have been used as monetary policy tools in Turkey until the mid-1980s. It is believed that the reserves that had been kept at the Central Bank had been used to finance the state's budget deficits during this era.

developed money and capital markets also presents comfort for banks of emerging countries, as "disintermediation" from depositors and borrowers does not threaten their business as in developed markets. Besides, state interventions and protections are more frequent and state and private banks operate side by side in emerging economies. Hence, studies from different regulatory environments and market structures may help us learn the impact of these differences on bank performance.

Institutional Background

As of 2000, there were 79 banks operating in Turkey, of which 15 were domestic public banks (including the banks in state custody), 28 domestic private banks, 18 foreign banks and the rest development and investment banks. The sector has enjoyed an impressive rate of growth in recent years, with assets increasing from $18,631 million (31% of GNP) in 1980 to $155,237 million (80% of GNP) in 2000. Public and private banks coexist in Turkey's mixed economic system, where the market share of public sector in banking, 43%, is almost matching that of private sector, 47%. In addition, there were a substantial number of foreign bank entries into the system in the 1980s (net 24 entries between 1980 and 1990, including the development and investment bank entries). However small the market share of foreign banks is (less than 10% of the sector assets by 2000), the impact of foreign banks on Turkish banking has been instrumental because of the new concepts and practices they have introduced.

The evolution of the Turkish banking sector into the current different ownership forms (public, private and foreign) dates back to the 19th century. Since engaging in interest carrying transactions was deemed 'profane' and 'ungodly' in the Ottoman society, foreigners or the minorities in Istanbul conducted all banking activities of these times. Because the financial condition of the Ottoman Empire had worsened after the Crimean War, the Empire had to call for external financial support. Large numbers of foreign banks responded with the hope of earning high interest rates. As a reaction to the increased role and power of foreigners in banking, the national banking movement that emerged during the years following the Second Constitution (1908) led to the foundation of 24 national banks in Istanbul and Anatolia between the years 1908 and 1923. However, these domestic banks were mostly local and too small to finance the newly developing economy. Thus, foreign banks continued to dominate banking markets due to insufficient domestic capital, consecutive wars between 1911-1922, and capitulations given to foreigners.

The late 1970s witnessed the rapid growth of private banks controlled by large holding companies. Due to lack of capital markets, industrial firms had no option but to open or acquire banks to meet their funding needs because state banks were primarily dedicated to funding public investments. In addition, during this period, inflation was soaring while interest rates were subject to a ceiling. Thus, rapidly rising prices resulted in negative real interest rates on deposits, which made borrowing very attractive for banks. This in turn led to a frantic expansion of bank branches all over the country. At the same time, there were only 3 new private bank entries and no foreign bank entry in the 70s, implying the existence of effective regulatory barriers discouraging new entries during the era. Thus, existent banks had to enlarge the scales of their operations constantly to meet the increasing demand for financial services from fast growing public and private sectors. However, excessive growth efforts of these already large banks caused extreme diseconomies of scale problems in the industry in the following decade, when deregulation of interest rates and resulting price competition, real interest rates, costly delivery systems due to lack of transaction volumes in rural areas have soon diminished the value of operating large branch networks.

In 1983, following the three years of military rule, a new government came into power with a team of internationally experienced bureaucrats and technocrats. Complementing the New Economic Policy introduced in January 1980, successive governments designed a series of reform packages coined as "December 1983 and January 1984 Decisions". The main theme of the reforms was to augment the efficiency and productivity of the financial system by fostering competition among economic units. Also, switching to an export oriented economy accelerated the opening process of a once closed economy to the world. By 1989, the process of capital account liberalization was completed, as capital flows were fully liberalized in the external accounts. Parallel to this trend, most directed credit programs and preferential rates were eliminated contributing to more efficient allocation of resources in Turkey (Denizer, 1997). Privatization of state economic enterprises was also within the priorities of the consecutive governments.

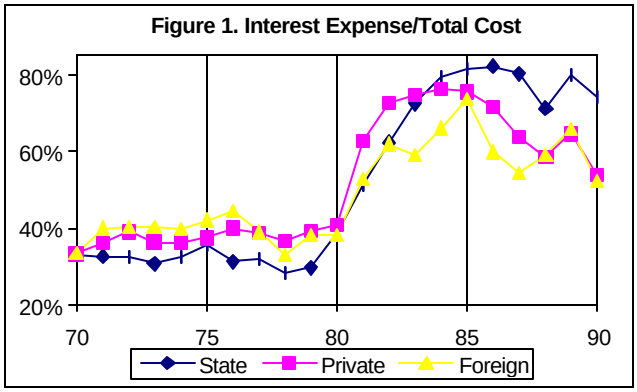
Parallel to these liberal policies, new types of financial institutions and instruments were allowed and a record number of foreign and domestic institutions entered the market. As presented above, while there were only 3 bank entries throughout the 70s, there were net 24 entries in the early 80s. Moreover, interest and foreign exchange rates were liberalized gradually. Starting from 1984, residents and non-residents were permitted to hold foreign exchange (FX) deposits, which boosted the volume of bank transactions and profits for banks. Over time, the level of the FX denominated deposits started to surpass the level of the Turkish Lira (TL) deposits in the sector. Beginning from 1984, special finance houses, doing business according to Islamic banking principles, were permitted to operate in Turkey. The first sale of government securities via periodic auctions started in 1985. In 1986, the Interbank Money Market was created and the Istanbul Stock Exchange (ISE) was reopened. In 1987, open market operations started while banks began to be audited by independent auditors. In 1989, Turkey joined the SWIFT network and established Foreign Exchange and Foreign Banknote Markets. In 1992, an electronic funds transfer system was installed for direct

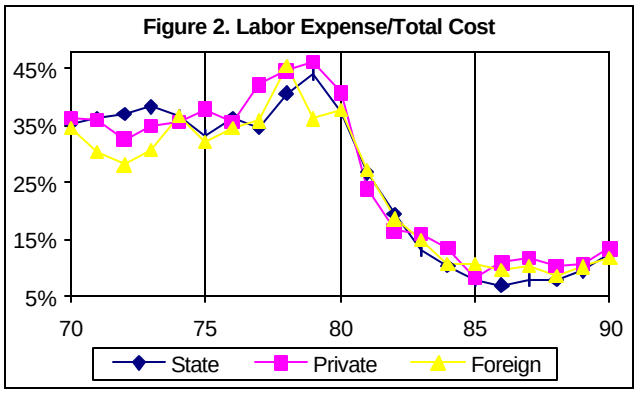
crediting in the banking system. The Turkish Interbank Clearing System was launched in 1992. In 1995, the Gold Exchange started to operate in Istanbul.

The abolishment of interest rate ceilings, reductions in the reserve and liquidity requirements, financial taxes, restrictions on foreign exchange operations as well as barriers on entry and exit have indeed provided a more liberal and contestable financial market environment. Within this new environment, the bank managers, who enjoyed a "quiet life" for a long time, understood the significance of running their banks efficiently, which was something they had constantly overlooked before. Consequently, they first concentrated on computerization and automation projects to increase the speed, quality and efficiency of banking services. Advances in technology infrastructure were remarkable in Turkish banking with a sharp increase in the number of ATMs, use of on-line banking services, use of Electronic Funds Transfer and SWIFT systems. Banking services have also expanded and bankcard and credit card use has increased rapidly. Although Turkish banks started to issue credit cards just in August 1988, the number of credit cards increased from 1 million in 1992 to 13.6 million in March 2001, a growth rate that is much higher than the European Union (EU) average.

Another response by Turkish banks to the heightened pressures of the new environment was to shut down or downsize unprofitable branches. Like in other liberalization episodes, such as in the US experience, after the interest rate ceilings were lifted, a competitive scramble outburst among banks to attract scarce deposits in the market. Figure 1 illustrates the trend in the fraction of interest expense in total costs between 1970 and 1990 for public, private and foreign bank groups. As can be seen, intense competition caused funding costs of banks to soar, reaching about 80% of the total bank costs at times in the mid of 1980s. This sudden jump in interest costs severely weakened financial conditions of some small private banks and banker houses between 1982 and 1983, a period dubbed as 'banker crisis era".

Turkish banks took rapid measures to tackle increased funding costs. First, they established 'friendship pacts' among each other to control running interest expenses. Despite this overt collusion, the share of interest expenses in total costs was still far greater in the post-liberalization era than what they were in the pre-liberalization era. Secondly, banks adopted restructuring policies to curb the increasing banking costs by trimming their variable input factor, labor. The 'branching mania' of the pre-liberalization era had resulted in over-employment in the sector. However, downsizing efforts due to competitive pressures led to a notable reduction in the number of employees per bank in the sector (from 3,303 in 1980 to 2,444 in 1990). Figure 2 presents the trends in the fraction of labor expense in total costs by ownership for the period 1970-90. As the figure shows, large layoffs, coupled with extensive branch closures, tremendously reduced the fraction of labor expense in total costs of Turkish banks, taking it from about 45% by the end of the 70s to less than 15% by the end of the 80s.





Apparently, funding costs of Turkish banks have more than doubled in the post-liberalization environment, which abruptly halted the free ride of a guaranteed spread between asset yields and liability costs. However, increased funding costs and following survival threats have disciplined banks in resource management, as suggested by substantial downsizing and automation efforts during the era. These cursory observations suggest that financial reforms fostered incentives to control costs and boost revenues for Turkish banks, both of which are essential steps towards more productive and efficient banking sector. However, how and to what extent the counteractive developments of the new era affected the productivity, technology and efficiency of Turkish banks are subject to an empirical testing.

Malmquist Productivity Growth Index

Researchers employ two different performance indices, the stochastic Tornqvist (1936) index or the non-stochastic Malmquist (1953) index, to measure productivity change in economic units. Stochastic approaches attribute deviations from the frontier to both purely random shocks and inefficiency, whereas non-stochastic approaches attribute all deviations from the frontier to inefficiency. This study adopts the Malmquist index in examining the effects of liberalization on different forms of Turkish banks. Malmquist index uses exclusively quantity information and

thus demands neither problematic price information nor a restrictive behavioral assumption in its calculation.

Because we do not know the production technology of a fully efficient firm in a banking industry, we should estimate it from the observations in practice. To this end, we first map firms in an input-output space to detect the *best-practice firm* or the *production frontier* (i.e., technology), which depict the maximum performance possible by firms. Then, we contrast existing firms to this frontier because it represents the set of efficient observations for which no other production unit employs as little or less of every input without changing the output quantities generated or produces as much or more of every output without altering the input quantities used. However, production technology may change over time, resulting in shifts in the best practice technical frontier, because of experience, increased knowledge, better production techniques, new innovations, financial liberalization or chaos and heightened competition. Malmquist index allows us to distinguish between shifts in the production frontier (technology change, TECCH) and movements of firms towards the frontier (efficiency change, EFFCH). Thus, Malmquist total factor productivity change index, TFPCH, is simply the product of efficiency change (EFFCH), how much closer a bank gets to the efficient frontier (catching up or falling behind), and technological change (TECCH), how much the benchmark production frontier shifts at each bank's observed input mix (innovation or shock).

We obtain the TECCH and EFFCH indexes under the assumption of constant returns to scale (CRS), i.e., assuming that banks operate at an optimum scale for cost minimization. However, in reality, banks could face scale inefficiencies due to decreasing returns to scale (DRS) or increasing returns to scale (IRS) in their operations resulting from market or regulatory constraints. When we relax the CRS assumption and adopt the more realistic variable returns to scale assumption (VRS), we become able to decompose EFFCH index into pure efficiency change (PEFFCH) and scale efficiency change (SECH) components. PEFFCH index measures the changes in the proximity of firms to the frontier, devoid of scale effects. SECH shows whether the movements inside the frontier are in the right direction to attain the CRS point, where changes in output result in proportional changes in costs. Briefly, TFPCH = TECCH × EFFCH and EFFCH = PEFFCH × SECH. Thus, TFPCH = TECCH × PEFFCH × SECH.[2] Any value greater (lower) than 1 indicates a growth (fall) while any value equal to 1 indicates stagnation in the relevant index.

EFFCH, PEFFCH and SECH obviously show the changes in technical efficiency (EFF), pure technical efficiency (PEFF) and scale efficiency (SE), which are calculated relative to both contemporaneous and previous year frontiers. Pure technical inefficiency (PEFF), which is technical inefficiency (EFF) devoid of scale effects, is entirely under the control of and results directly due to, management errors. Thus, it is also called *managerial inefficiency* in the literature. It occurs when more of each input is used than should be required to produce a given level of output. It is typically attributed to insufficient competitive pressures that allow management to "get away" with slackened productivity. A scale efficient (SE) firm will produce where there are constant returns to scale. In case there are increasing returns to scale, then efficiency gains could be obtained by expanding production levels. If decreasing returns to scale exist, efficiency gains could be achieved by reducing production levels. Because it involves the choice of an inefficient level, scale inefficiency is also considered a form of technical inefficiency. Hence, total technical efficiency includes both pure technical and scale inefficiency; that is, inefficient level of both inputs and outputs.

[2] We obtain the ***TFPCH*** index using the Data Envelopment Analysis. For further discussion, please see Wheelock and Wilson (1999).

Literature Review

Banking industry is one of the most heavily regulated sectors all over the world. The evidence to date suggests that regulation is a dominant source of bank inefficiency. The strong protection and absence of competitive forces, which is induced by industry regulation, allow inefficient banks to continue to operate in spite of the fact that management does not effectively utilize the resources available to them. As deregulatory and liberal policies adopted around the globe, the heightened competition will force banks to operate more efficiently and productively. Those unable to do so by adjusting to the new competitive environment should have difficulty surviving (Evanoff and Israilevich, 1990). Given that a principal goal of liberalization or deregulation has been to boost efficiency and competition in banking industry, one could expect that its impact on bank performance should be *de facto* positive. However, the empirical results have been mixed.

As opposed to the positive experiences of Norway (Berg et al., 1992), Taiwan (Shyu, 1998), Thailand (Leightmer and Lovell, 1998), Korea (Gilbert and Wilson, 1998), and India (Bhattacharyya et al., 1997), the consequences of liberalization were negative in Spain (Grifell-Tatje and Lovell, 1996; Khumbhakar et al., forthcoming) and USA (Humphrey and Pulley, 1997; Wheelock and Wilson, 1999). According to Burger and Humphrey (1997), interest rate deregulation in the U.S. stimulated a competitive scramble to pay higher interest rates on consumer deposits without a corresponding reduction in either banking services or an immediate and fully offsetting increase in deposit fees. Hence, productivity gains that otherwise would have been captured by banks was instead passed onto consumers. In Spain, efficiency benefits were traded with a desire to rapidly expand market share. Therefore, depending on market conditions prior to liberalization, the results of liberalization may differ across countries.

Although financial liberalization could boost banking performance, the extent of its impact may vary across

different ownership and organizational forms (Leibenstein, 1978; Saunders, Strock and Travlos, 1990; Button and Weyman-Jones, 1992). In fact, different forms of banks could demonstrate different reactions to environmental changes. Hence, the impact of financial liberalization could vary across banking groups. For instance, public and private banks have divergent missions and goals (e.g.; social welfare versus profit maximization). Foreign and domestic banks have different degrees of familiarity with the old and new political and economic environment. Also, the nature of operations for these banks may lead to differences in performance. Most large private or public banks are respectively more involved in loan production than foreign banks and small private banks whose portfolios are tilted towards investment securities, which are less expensive to produce and service than loans that require operating large network of branches. Foreign banks utilize purchased funds more heavily than domestic banks in funding assets. Also, attitudes towards risk, degree of support from the state, incentive schemes to mitigate the conflicts of interest between bank managers and owners, and possession of professional skills and systems to cope with the consequences of the new environment change significantly across different groups of banks. Therefore, whether financial liberalization have affected all forms of bank, which carry different characteristics, is an important issue to be investigated.

Data and Empirical Setting

Data used in this study originate from the several issues of the Banks Association of Turkey (BAT), which houses all forms of banks in Turkey as members under its umbrella. Our sample includes the universe of domestic and foreign banks that operated in Turkish market between 1981 and 1990. Altogether, we have a total of 439 bank observations, of which 97 come from domestic public banks, 210 come from domestic private banks and 132 come from foreign private banks.

This paper employs two alternative models for measuring productivity in banking: (1) *traditional banking approach*, Model 1, where banks accept deposits and transform them into an array of interest earning services, and (2) *non-traditional banking approach*, Model 2, where banks accept deposits and turn them into a mix of fee generating and interest earning services. According to Model 1, banks use three *input factors*: (1) labor [Labor], the number of full-time employees on the payroll, (2) capital, [Capital], the book value of premises and fixed assets, and (3) banking funds, [Funds], the sum of the Turkish Lira (TL) and foreign exchange (FX) demand and time deposits and non-deposit funds, to produce a vector of three *bank outputs*: (1) short-term loans [ST Loans], (2) long-term loans [LT Loans]: the loans with less than and more than a year maturity, respectively, (3) other earning assets [OEA]: loans to special sectors, inter-bank funds sold and investment securities (treasury and other securities). According to Model 2, banks utilize the above three *input factors* (1) labor, (2) capital, and (3) funds, to generate an array of four *bank outputs*: (1) short-term loans, (2) long term loans, and (3) other earning assets as well as (4) risk adjusted off-balance sheet activities [OFF-B/S]: guarantees and warranties (letters of guarantee, bank acceptance, letters of credit, guaranteed pre-financing, endorsements and others), commitments, foreign exchange and interest rate transactions as well as other off-balance sheet activities.

Off-balance sheet activities involve trading financial instruments and generating income from fees and loan sales, activities that affect bank profits but do not appear on bank balance sheets. These non-traditional activities represent a potential source of more dependable income and an effective innovation to balance the volatility in interest income. The income from these items as a percentage of assets has nearly doubled since 1979 for US banks. Moreover, these items are often effective substitutes for loans that demand similar information gathering, origination, monitoring and control costs. The use of Basle Accord risk weights implies that these items have roughly the same perceived (according to the Accord) credit risk and thus approximately the same production costs as loans (Berger and Mester, 1997). Thus, it is important to account for such activities in productivity studies because they are often four or five times greater than the on-balance sheet items when measured by nominal values. In recent years, Turkish banks have also moved their business aggressively off balance sheet to generate extra earnings and control increasing costs. The ratio of off-balance sheet activities to on-balance sheet items in the sector reached levels as high as 1.95 in the 1980s. Model 2 aims to proxy the new bank activities that are mostly fee-based with off-balance sheet activities. This treatment is by itself innovation in research as no-frontier productivity study has formerly considered such items (Berger and Mester, 1997). These non-traditional items are also concentrated in private and foreign banks. As a result, a measurement bias might be present if no account were taken of these items, as these banks would have disproportionately higher costs relative to their measured output.

Productivity Growth in Turkish Banks

Table 1 reports geometric means of productivity change index along with its components averaged over the 1982-90 period. The purpose is to provide a quick glance on the central tendency of productivity change among public, private and foreign banks in the post liberalization era. The results according to two alternative models, the 'traditional' Model 1 and 'non-traditional' Model 2, suggest that all types of banks somewhat benefited from the more liberal environment in Turkey.

More formally, according to Model 1 (and Model 2), the average results for various ownership forms in Turkey between 1982-90 are as follows. Average *productivity growth* is 1.2% (2.9%) for public banks, 3.9% (9.5%) for

private banks, and 14.2% (17%) for foreign banks. Average *technical progress* is –6.2% (-7.2%) for public banks, -7.1% (-1.7%) for private banks and –0.4% (9.3%) for foreign banks. Average *efficiency change* is 7.9%(10.9%) for public banks, 11.8% (11.4%) for private banks, and 14.6% (7.1%) for foreign banks.

Table 1. Productivity growth in Turkish banks by ownership

	Model 1	Model 2
TFPCH		
Public	1.012	1.029
Private	1.039	1.095
Foreign	1.142	1.170
TECCH		
Public	0.938	0.928
Private	0.929	0.983
Foreign	0.996	1.093
EFFCH		
Public	1.079	1.109
Private	1.118	1.114
Foreign	1.146	1.071
PEFFCH		
Public	1.022	0.983
Private	1.089	1.084
Foreign	1.060	1.040
SECH		
Public	1.055	1.128
Private	1.027	1.027
Foreign	1.082	1.030

1. The annual geometric means of the Malmquist index (TFPCH) and its components are summarized in the table. Banks are modeled as multi-product firms in Model 1 and 2. Model 1 assumes that banks are engaged mostly in traditional banking, accepting deposits and making loans. Whereas, Model 2 assumes that banks embrace increasingly non-traditional activities in the new environment, thus they transform bank inputs not only to traditional commercial loans but also to extensive amount of non-traditional off-balance sheet items such as swaps and forwards. Accordingly, in Model 1, bank produce 3 outputs from 3 inputs, where outputs are 1) short-term loans, 2) long-term loans (3), other earning assets, and inputs are 1) number of employees, 2) physical capital, and 3) sum of deposit and non-deposit funds. In Model 2, employing inputs 1, 2 and 3, bank produce 4 outputs, off-balance sheet activities in addition to the 3 outputs in Model 1.

The above results indicate that although all types of banks were positively affected by liberalization, private and foreign banks' productivity gains outweigh those of public banks. However, the components of the productivity change index present interesting results. Although all forms of banks recorded substantial efficiency increases, they all experienced notable technical regresses, during the new era, except for foreign banks. This suggests that the major source of productivity gains in Turkish banking was efficiency change (increased proximity of banks to the frontier) rather than technical progress (outward shifts in the benchmark frontier).

The decomposition of efficiency change into its constituents reveals the following. According to Model 1 (and Model 2), average *pure efficiency change* is 2.2% (-1.7%) for public banks, 8.9% (8.4%) for private banks, and 6.0% (4.0%) for foreign banks. Average *scale efficiency change* is 5.5% (2.19%) for public banks, 2.7% (2.7%) for private banks, and 8.2% (3.0%) for foreign banks. These results suggest that the main source of efficiency increases in domestic and foreign private banks is better management practices rather than improved scales. However, scale improvements seem to be the major source of efficiency increase in public banks.

Although the aggregate results from Table 1 reveal the central tendency of the productivity growth and its components, they conceal the volatility (trends) in those scores. Figures 3 to 5 illustrate historical developments on the TFPCH, TECCH and EFFCH scores between 1982-90, respectively, for public, private and foreign banks. The line passing from 1.0 on the *y*-axis in these figures is the "demarcation line". The points above this line indicate improvement whereas the points below it indicate deterioration in the relevant index between two periods. Figure 3 shows that the productivity growth of foreign banks far outweighs that of private banks, whose productivity growth in turn outperforms that of public banks, for the most parts of the period. Another interesting observation is that there is an apparent positive shift after 1986 and a clear convergence towards the end of the period in the productivity growth indices of those banks. Although Figure 4 provides a highly volatile picture, the dominance of efficiency changes in driving productivity growth in Turkish banking is very obvious from this figure, as efficiency change indices of all forms of banks are constantly above the demarcation line after 1985. On the other hand, Figure 5 that depicts technology changes in Turkish banks suggests that the progress in technology is unimpressive throughout the period except for a few blinks from foreign banks.

This observation is contrary to expectations given the fact that Turkish banks made heavy investments in computerization and automation projects. Apparently, this capital investment did not pay off in the short term. Several factors could have played role in this unexpected outcome. Following liberalization, banks started a race to establish their own communication networks, information systems and ATMs. However, these investments were driven mostly by prestige and reputation concerns rather than the feasibility or profitability of these projects. Many banks lacked the required transaction capacity or customer base to justify these investments. This eventually resulted in idle capacity in these banks. Because they were experiencing increasing returns to scale, some banks with lack of transaction volume began to share their devices such as ATMs with others. In addition, these data processing and communication devices need strong information management systems and information economics. As discussed below further, if these new practices are subject to "learning by doing", Turkish banks might need more time to learn how to utilize these costly high-tech investments to full extent.

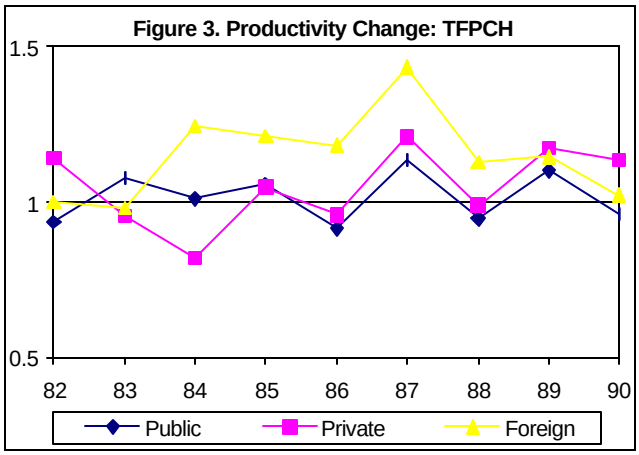
Correlates of Productivity Growth

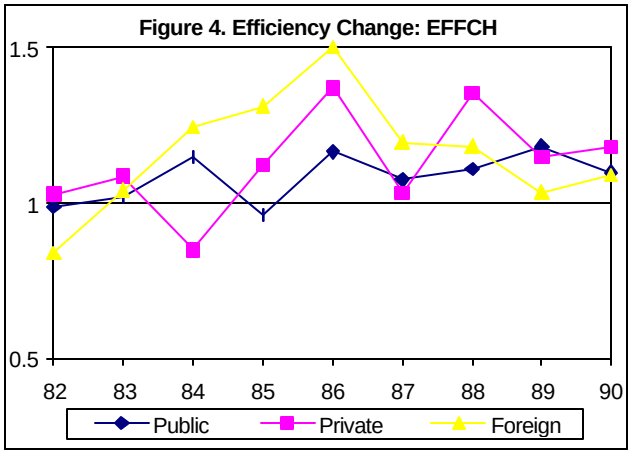
The focal aspect of this study is to examine the performance variance among various forms of Turkish banks across time. Researchers generally use the event of interest rate liberalization to determine the pre- and post-liberalization periods. After several decades of state interventions, the determination of interest rates in Turkey was eventually left to the market forces in July 1980, which opened a new era in Turkish banking called "July Banking". However, stability concerns, which emerged especially after the "banker crisis" of 1983, resulted in re-regulation of interest rates between 1983-86.

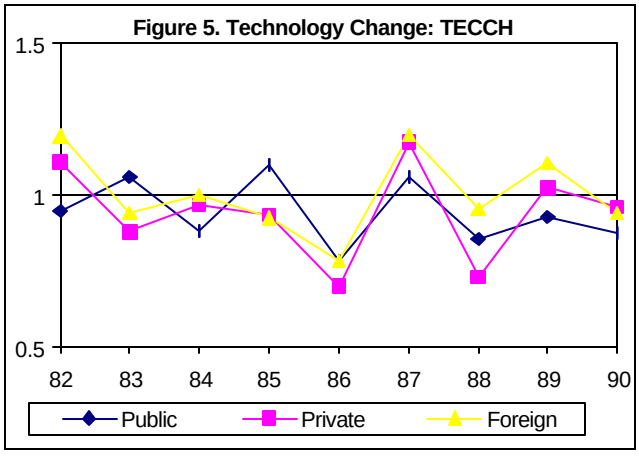
Given the fact that freeing interest rates was not complete until the end of 1986, this study considers the year 1986 as the fully-fledged starting year of liberalization. According to Denizer (1997) and Yulek (1998), it is more plausible to take 1986 as the start of the financial liberalization, as it is 1986 that most of the financial markets and instruments became available. Accordingly, we divide the 1981-1990 period into two distinct periods. Period 1 refers to 1981-86 (*pre*-liberalization), and Period 2 refers to 1987-90, (*post*-liberalization). In this context, an important question is whether the differences in the mean productivity change measures of these banks between the two periods are statistically significant. We run preliminary ANOVA tests for each group to detect this issue. The results indicate that the improvements in the productivity of foreign and domestic private banks are statistically significant at 1% significance level. The scale efficiency increases between the two periods are also significant for public and private domestic banks at least at the 10% significance level. Technology improvements are statistically significant only for foreign banks. Efficiency changes between the two periods are significant for private and foreign banks.

In addition to large variations across time, there are also large variations across different types of banks in terms of performance. We employ the generalized least square model, GLS, to examine the significance of the performance variation between these three different forms of banks. This issue is important because the Turkish government plans to privatize its state enterprises. If it could be justified on efficiency and productivity grounds that state entities are not using the scarce resources of the country efficiently, it will be easier both economically and politically to sell them off to the general public. It is thus *expected* that ownership type or organizational form that produces stronger incentives to control inputs and/or boost outputs will have more efficient and productive operations.

The p*roperty rights theory*, *agency cost theory*, *transaction costs theory*, and *contract theory*, among others, suggest that publicly owned firms should perform less efficiently and less profitably than private firms. According to Beim and Calomiris (2001), private ownership of the means of production is the single credible form for higher productive efficiency. The cardinal goal of a successful private firm is to maximize shareholder value, which is closely connected to the efficient use of resources; whereas the goals of public firms are various, conflicting and rarely related to the efficient use of resources such as to maximize employment, promote regional development and reward loyalists. Also, state enterprises are not under strong market discipline, as they are not put out of business if they fail to earn a positive return on their funds. Moreover, the public staff usually exerts less effort because they do not have ownership incentives (Boycko, Shleifer, and Vishny, 1996).







In every institution the quality of management is very important for better performance. However, management

quality in public banks generally is not as good as in private and foreign banks. In Turkey, the appointment of CEOs and board members of public banks are made on political grounds and these positions are not always given to the most qualified bankers. Promotion often has more to do with seniority than ability in those banks. There is also a total lack of continuity at the top level in these banks, as new appointees are assigned in every government change and these appointees bring their own trusted team of senior executives. The ruling politicians often influence the credit evaluation and extension decisions of the appointees, resulting in inefficient loan approvals and consequently poor quality assets in public banks. Further, public bankers are in effect civil servants, thus like other public workers, they are underpaid as compared to their counterparts in the private sector. This affects the quality and motivation of human capital in state banks adversely (Akcaoglu, 1998 and Isik and Hassan, 2002a,b). Thus, the incentives to innovate, adapt to new conditions and utilize bank resources efficiently and understanding of banking in public sector may not be as strong as in profit minded and motivated private sector.

On the other hand, foreign firms relying on their origin may have comparative cost advantages over their domestic peers stemming from their better management, technologies and access to international markets (Bhattacharya et al., 1997; Isik and Hassan, 2002b). There could also be a significant association between bank size and performance. The so-called *shakeout theory* posits that smaller banks may not be able to obtain enough capital and management ability to successfully operate in a complex environment that requires frequent technology updates, thus suggesting a positive relation between size and performance. Alternatively, the *divisibility theory* holds that there will be no such operational advantage accruing to large banks, if the technology is divisible, that is, small-scale banks can produce financial services at costs per unit output comparable to those of large banks, suggesting no (or a possible negative) association between size and performance. Advances in technology that reduce the size and cost of the automated equipment and small banks' efforts to cooperatively purchase expensive technology imply more divisibility in technology in banking (Kolari and Zardkoohi, 1987).

Table 2 presents the generalized least squares (GLS) results to determine possible correlates of the productivity growth measures with (Model 2) and without non-traditional activities (Model 1). The dependent variables in the regressions are thus the productivity measures whereas independent factors are the *ownership* [private (excluded from the regressions as the base case), state and foreign banks], *structure* and *size* variables. All independent variables, except for the intercept and size (the log of the number of bank workers), are dummy variables.[3] After controlling for size, we see that foreign banks experienced more significant productivity, technology and efficiency improvements than domestic public and private banks, implying that foreign banks began to overcome their lack of exposure in a new market and improved their performance

Table 2. Correlates of the productivity growth

	TFPCH	TECCH	EFFCH	PEFFCH	SECH
Model 1					
Intercept	0.806[a]	0.987	0.641[a]	0.641[a]	0.964[a]
Public Banks	-0.206[c]	-0.101	-0.173[a]	-0.127[a]	0.066[b]
Foreign Banks	0.351[a]	0.207[b]	0.098[a]	0.641[a]	-0.020
Structure	0.316[a]	0.032	0.095[a]	0.088[a]	0.007
Size	-0.144[c]	-0.103	-0.013[c]	0.009	-0.022[a]
N	396	396	396	396	396
R^2	0.128[a]	0.015	0.114[a]	0.111[a]	0.131[a]
Model 2					
Intercept	0.836[a]	1.266	0.789[a]	0.719[a]	1.058[a]
Public Banks	-0.230[b]	-0.141[c]	0.099[b]	0.056[c]	0.057[b]
Foreign Banks	0.428[a]	0.329[a]	0.124[a]	0.098[a]	0.032
Structure	0.212[b]	0.097	0.091[a]	0.039	0.051[b]
Size	-0.220[b]	-0.032[c]	-0.033[a]	0.013	-0.049[a]
N	201	201	201	201	201
R^2	0.318[a]	0.103[b]	0.214[a]	0.157[a]	0.310[a]

[a], [b], [c] indicate 1%, 5% and 10% significance levels respectively for the coefficients of the independent variables predicted using the GLS regressions. ***Dependent variables*** are ***TFPCH*** (total factor productivity change), ***TECCH*** (technological change), ***EFFCH*** (technical efficiency change), ***PEFFCH*** (pure technical efficiency change), and ***SECH*** (scale efficiency change). ***Independent variables***: ***State Banks*** are the banks that are owned predominantly by the domestic taxpayers and voters; ***Private Banks*** are the banks whose more than 50% of shares is owned by the Turkish residents (base group); ***Foreign Banks*** are the banks founded in Turkey whose more than 50% of shares is owned by the residents of foreign countries. State, private and foreign bank variables are dummies, i.e., ***State Banks*** take 1 for domestic public banks and 0 otherwise; ***Private Banks*** attain 1 for private domestic banks and 0 otherwise (excluded from regressions as a base group); ***Foreign Banks*** take 1 for foreign owned banks and 0 otherwise. ***Structure*** is a dummy variable that takes 1 if the observation belongs to 1987-1990 period and zero if it belongs to 1981-1986 period. ***Size*** variable is the log of the number of bank employees.

over their domestic counterparts. The earlier results showed that like other forms of banks, public banks recorded higher productivity and efficiency in the post-liberal era. However, the GLS results suggest that the public bank's productivity and efficiency improvements were significantly less than those of the private domestic and foreign banks, indicating that the performance gap between public and private banks tended to narrow in the new environment.

The dummy *structure* variable is formed to examine whether there is a significant structural jump in Turkish bank performance between Period 2 and Period 1 as the reforms accelerated. The results indicate that after 1986, the performance of the Turkish banks have improved significantly whether their productivity is measured

[3] Alternatively, we also tried the log of total assets for size variable, which generated almost identical results (available upon request).

considering non-traditional banking services (Model 2) or not considering those services (Model 1). Our results also suggest that there is a negative association between size and productivity change, implying that smaller size banks could be more productive. In other words, productivity measures do not yield any comparative advantage accruing to large banks, perhaps supporting the divisibility theory. The small banks in Turkey are mostly engaged in investing in government securities, which are less expensive to operate, and in wholesale banking, which does not call for expensive branch networking. Also, with their small size and more professional management, they are more adaptive to the changes in the financial environment, enhancing their performance. The R^2 's of the models, with relatively parsimonious explanatory factors, are statistically significant.

Overall Results in Perspective

Overall results show that according to the Malmquist productivity compositions, Turkish banks on average became more productive over the period. Publicly owned banks saw the slowest productivity growth and foreign banks saw the fastest. Most of the productivity growth at public banks came from changing scale, while private (domestic or foreign) banks saw more productivity growth from increasing technical efficiency. Strikingly, most of this productivity growth is estimated to have come from banks coming closer to the existing technological frontier. However, the progress of technological frontier, representing the most efficient deployment of resources possible, was not as impressive. This indicates that the productivity growth observed in Turkish banking during the period mainly results from "*imitation*" – efforts of the inefficient banks to catch up with the best-practice banks - rather than "*innovation*" – outward shifts of the production frontier by the leading banks. That is, the efficiency gap between the worst- and best-practice banks tended to narrow in the liberal environment, which apparently fostered the average productivity of the industry.

In terms of efficiency, foreign banks strongly outperform domestic private and foreign banks in Turkey (Zaim; 1995 and Isik and Hassan, 2002a,b). Our results show that foreign banks demonstrated the fastest productivity growth during the liberalization. Thus, foreign banks represent the *best-practice* banks in the industry, whose actions are closely followed by domestic banks. In fact, foreign banks have been the pioneers of many new products and practices in the system, as they introduced credit cards, leasing, factoring and forfeiting, and a market-oriented management philosophy to the domestic market. Domestic banks responded to these changes by imitating the same products and services such as extending consumer credits and starting to use high technology such as establishing ATM networks, associating to the SWIFT system and using on-line computer systems. Pehlivan and Kirkpatrick (1992) suggest that planning, marketing and recruitment policies of domestic banks have been strongly affected by foreign banks. For instance, foreign banks introduced the practice of marketing strategies by establishing marketing departments for the first time in the sector. Domestic banks were soon stimulated to follow the same path. Prior to that, a passive approach towards product development had evolved and domestic banks did not need to differentiate their services or develop new products. As Turkish residents received managerial training in foreign banks and later transfer to domestic banks, modern techniques, skills and concepts are diffused to the entire sector. Because these transfers were mostly to private banks, they appear to have benefited more from this diffusion than public banks (Kumcu and Karafakioglu 1985; Akcaoglu, 1998).

The superiority of efficiency change in driving productivity in Turkish banks contradicts the results from U.S. banks [Mukherjee et al. (2001)], Spanish banks [Grifell-Tatje and Lovell (1997)] and Korean banks [Gilbert and Wilson (1998)], where the productivity growth was found to be driven mostly by technical progress rather than efficiency increase. One possible explanation is that Turkish banks are less experienced compared to their peers in those countries in adapting to the conditions of new environment and in assimilating the new technology. If technology input faces *learning curves*, Turkish banks may need more time to take advantage of their technology investments. According to Akcaoglu (1998), although financial liberalization has the potential to foster innovation in banking, deficiencies that continue to exist in the system may distort/hinder the production and/or diffusion of financial innovation. One such deficiency in Turkey is the lack of sophistication of market participants. This issue primarily explains the lack of demand for derivative securities in Turkey. For example, industrial firms are not very informed about these instruments due to the traditional economic policies and the level of sophistication of the aggregate economy. Moreover, banks do not have knowledgeable and well-trained staff in many new financial products. In addition, the lack of strong legal infrastructure to enforce financial contracts also inhibits the proliferation of new financial instruments. Thus, existing macro and micro problems such as lack of necessary legal, social and economic infrastructure, qualified workforce and sophisticated clientele may be inhibiting the full utilization of bank inputs and curbs financial innovation (shift of the production frontier upward) in this emerging market.

Most of the above constraints are exogenous for Turkish banks. However, they may have control of their own destiny. One of the major sources of productivity, pure technical efficiency, is directly under the control of banks themselves. Increased competition and external shocks in recent years caused one third of the banking industry to fail, weeding out the weakest and least efficient banks. Thus, the importance of running banks efficiently and productively has become now more critical than ever. Significant number of branch closings and costs saving campaigns aimed at reducing

payrolls indicate that efforts to improve bank productivity and efficiency further are already underway. As deregulation and liberalization continues, the increased competitive pressures will be forcing existent banks to operate more efficiently.

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