An Empirical Analysis of Productivity Developments in "Traditional Banks": The Initial Post-Liberalization Experience[*]

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Abstract

By utilizing a non-parametric Malmquist index approach, we investigate the initial changes in the productivity and efficiency of the "traditional" Turkish banks in an era of financial liberalization (1980-1990). We hypothesize that the new liberal environment along with heightened competition from new banks coming from internal and external markets will discipline the traditional banks that are coming from the pre-liberalization period in resource management to economize their production inputs and/or in looking for new ways to expand their financial outputs, resulting in higher productivity and efficiency in these banks. Consistent with the expectations, we found that there is a significant upward trend in the productivity and efficiency of the traditional Turkish banks over the period under study. On the other hand, the results also indicate that the production technology of these banks has not advanced as expected. It appears that productivity growth in traditional Turkish banks mainly stems from the efforts of inefficient banks to catch up with the leading banks (efficiency increase) rather than the expansion of production frontier by the leading banks (technological progress).

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1. Introduction

Liberal policies are typically undertaken to increase competition among firms and in turn foster their performance. Efficient use of factors of production can result in better resource allocation, which is a positive outcome for the entire economy. Heightened productivity and efficiency in financial institutions can lead to price reductions and service expansions, which are certainly favorable outcomes for customers. Moreover, enhanced productive efficiency in the provision of financial services may bring additional savings on inputs and operating costs. If those operational savings can be translated into bottom line profits, then financial firms are more likely to survive and stay afloat, which is obviously a desirable result for the regulators and shareholders of financial firms.

In the early 1980s, Turkey introduced a '*stabilization and liberalization program*' to promote private market forces and open its economy to the world. The main theme was to enhance the international competitiveness of Turkish firms in all fronts, especially against a challenging business environment that will emerge with a possible European Union membership. Towards this end, domestic markets were opened up to new firms and *import substitution* policies were lifted in favor of *export-oriented* polices. Deregulation of the financial sector has undergone throughout the 1980s in parallel with this main spirit. Interest rate ceilings were abolished, financial taxes, reserve and liquidity requirements were reduced, restrictions on foreign exchange transactions were relaxed, money and capital markets were established. In this line, the reopening of Istanbul Stock Exchange (ISE) in 1986 was a keynote achievement, which enriched the array of funding sources for Turkish firms. As *universal* banks, Turkish banks have engaged in underwriting and trading in public or private securities, which provided additional income for Turkish banks.

The new competitive environment was expected to discipline domestic financial institutions in resource management and provision of better and more financial services and products at fairer prices. As a result of relaxation of entry barriers, several new banks have entered the market. The number of de novo banks began to match the number of existent banks by 1990. Substantial number of new entries and increased banking costs after interest rate deregulation threatened the survival and franchise value of traditional banks. In order to adapt to new conditions and compete effectively with the new comers from internal and external markets, existent Turkish banks looked for ways to improve their performance. They began

acquiring new technologies and developing new practices to control costs and boost profits. For this purpose, some of them established joint ventures with foreign banks that own better technology, marketing strategies and international experience. Moreover, in the new environment, soaring inflation resulted it strong mismatches between asset and liability structures of firms. Thus, maturity and liquidity risks of all banks, new or old, have exacerbated substantially during this period.

So far, empirical studies from different episodes around the world have not produced consistent results about the relationship between liberalization and bank performance. In some episodes, banks experienced better performance in a more liberal environment such as in Norway (Berg, Forsund, and Jansen; 1992), Thailand (Leightner and Lovell, 1998), Taiwan (Shyu, 1998), Korea (Gilbert and Wilson, 1998), India (Bhattacharya et al., 1997) and transition economies of Europe (Hasan and Marlton, 2001 and Yildirim and Philippatos, 2002). In some cases, deregulation brought about a reduction in measured performance rather than an improvement, such as in the US (Bauer, Berger, and Humphrey, 1993; Humphrey, 1993; Grabowski et al., 1994; Elyasiani and Mehdian, 1995; Humphrey and Pulley, 1997; Wheelock and Wilson, 1999)[1] and Spain (Grifell-Tatje and Lovell, 1997; Lozano, 1995; Kumbhakar, Lozana-Vivas, Lovell, and Hasan, 2001). Thus, the short run effects of deregulation may be discouraging as evidenced in some country episodes. Based on these findings, Berger and Humphrey (1997) in their survey study urge more studies to draw a conclusion about the impact of deregulation on competition, efficiency and productivity of the financial sector.

To our knowledge, no empirical work has studied the effects of strong environmental changes on the performance of Turkish traditional banks. We define *traditional banks* as the banks that were existent before liberalization and thus coming from a "quiet life" environment in which they were protected against competition from internal and external markets. One key goal of liberalization is to discipline traditional banks by new entries. Thus, the goal of this paper is to investigate how regulatory changes and new bank entries affected the technical progress, efficiency change and productivity growth in the existent traditional banks in Turkey. Neither the above international studies nor earlier Turkish studies has looked at the impact of liberalization on the efficiency and productivity of

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[1] However, two recent studies by DeYoung et al. (1998) and Mukherjee et al. (2001) provide some evidence on the positive impact of lifting restrictions on nation-wide branching and interest rate deregulation on the performance of US banks.

traditional banks *per se*. These studies have used mixed samples that contain both de novo and traditional banks. As compared to traditional banks, new banks may have different technologies and initial set-up costs and problems. Consistent with *learning by doing hypothesis*, Mester (1996) found that inefficient banks tend to be younger even though after de novo banks were excluded from the study due to their likely high start-up costs. Similarly, albeit weak, Berger and Mester (1997) reported a *positive* relationship between age and cost efficiency. A recent study by DeYoung and Hasan (1998) focused particularly on the efficiency of the U.S. chartered new banks. Their results suggested that on average it takes new banks about nine years to catch up with traditional banks. Because new banks are more likely to need more time to establish the necessary customer relationships and expand their operations to fully utilize scale economies, the existence of de novo banks in a sample may blur the true effect of the reforms on performance. The fact that half of the Turkish banks in the industry entered the system between the period 1980 and 1990 justifies this concern. Therefore, to control for such bias, we focus on only traditional banks that were in existence before and after the financial deregulation.

Most of the earlier studies were limited to a couple of years before and after liberalization. However, in order to control the impact of arbitrary selection of the reference and comparison years on the qualitative results, measurement over longer time periods is needed (Berger and Humphrey, 1997). Thus, using a panel data and a long chain of Malmquist index approach, we measure the productivity change in Turkish traditional banks between 1980 and 1990 period. On the other hand, some may suggest that even an eleven-year term is not long enough to investigate fully the effects of the liberalization on banking with regard to the productivity change. Although such a concern is understandable, we need to emphasize the fact that as the title implies the objective of this article is only to search the initial effects of the regulatory changes and new banks entries on the productivity growth of traditional Turkish banks. In this respect, there is apparently a room for further research to investigate such effects within a longer period by taking this limitation of the current study into account.

For further analysis, we decompose the productivity change index into its two mutually exclusive and exhaustive components, *efficiency change* (a measure of catching up with the best-practice banks), and *technical change* (a measure of innovation in the production technology). We also divide the efficiency change index into two independent parts, *'pure' efficiency change* (improvements in

management) and *scale efficiency change* (improvements towards an optimum size). We model banks as 3-output and 3-input multi product firms. Our specification of bank inputs and outputs reflects the recent trends in the nature of commercial banking in Turkey and elsewhere. We consider some other important bank outputs in our model such as interbank loans, directed loans and private and public security investments. Our results indicate that all types of traditional banks operating in Turkey (private or public; foreign or domestic) experienced considerable productivity gains. Also, despite its lower pace in the initial phase of liberalization, the productivity of traditional banks has substantially risen in parallel with the acceleration of the reforms. The dominant source driving productivity in traditional banks was efficiency increases resulting from improved managerial practices rather than improved scales.

The paper is organized as follows. In section 2, we summarize the reforms that affected the operations of traditional banks in Turkey. In section 3, we explain the model we use in constructing productivity and efficiency indices of traditional banks. In section 4, we discuss the empirical setting. In section 5, we examine the performance of the traditional banks after liberalization. Section 7 concludes.

2. Financial Liberalization and Traditional Banks

The Turkish financial system has been dominated by the banking sector that accommodates universal banks. There has been no significant competition from the non-bank financial institutions and the sector is highly concentrated. Government ownership has been very important in the banking sector. Moreover, industrial and commercial conglomerates have controlled majority of the private banks. The co-existence of state and private banks in the system has been the legacy of the historical developments in Turkey. The economic model pursued throughout the 1930s and 1940s was closer to the socialist experiences, and, 'state economic enterprises' were assigned as the engine of industrial growth. During these decades, the policies of industrialization through the initiative of the state resulted in the establishment of a group of state-owned banks to provide credit and promote investments in particular sectors of the economy. Over time, these banks diverged considerably from their particular targets and began to operate as universal commercial banks with an emphasis on retail business. After this period, when private enterprises prospered under protectionist import substitution policies, the state banks performed a critical role in channeling foreign aid and credit as well as domestic public credit to private industry. Furthermore, in the same period private

companies began to establish their own banks primarily for their own financial needs.

After the mid-1960s to January 1980, the industrialization strategy was based on import substitution (through protectionist policies) and the financial system was structured so as to satisfy the needs of this industrialization policy. In this environment, the financial system was highly repressed by extensive state intervention. In other words, the state was controlling the allocation of two critical resources in the economy, namely, foreign currency and credits with reference to 'political priorities'. Therefore, both exchange rates and interest rates were administratively defined at below the market rates.

As a result, deposit collection at administratively defined low interest rates had become the main area of competition in the banking sector. Consequently, large branch networks were developed, with an estimated average number of 250 new branch offices opened annually between 1970 and 1981 (Akguc, 1989). Apparently, the only way for the banks to increase profitability was through excessive growth such as opening new branches. In other words, the industry was protected and accustomed to non-price competition. However this policy had increased costs and produced a distinctive oligopolistic market structure. In this environment, the banks focused their attention inwards by structuring their organization around their own operational procedures, rather than around customers' financial needs and problems.

The structural adjustment program introduced in January 1980 has changed traditional protectionist economic policies and has promoted more integration with the world economy. The government adopted policies to deregulate the financial system further. The main components of the program were liberalization of the exchange rates, interest rates as well as institutional reforms in capital and monetary markets.[2] The aim was to make the operations of banks more efficient in line with the new economic policy stance, and prevent the possibility of a financial crisis resulting due to a lack of institutional regulations. As a reflection of liberal policies, foreign banks were allowed to operate in the domestic market from 1981 onwards with the expectation of capital inflows, increasing competition and efficiency, and gaining international and domestic banking know-how. Moreover, in this period the government introduced new institutions, legal arrangements and

[2] These changes imply the end of financial repression and experience of interest rate and exchange rate risks for the first time.

even instruments to the financial markets. The government also allowed domestic new entries into the market. Initially, unregulated brokerage houses entered into the financial market in the early 1980s. Four Islamic financial institutions followed this from 1985 onwards. Therefore, the traditional banks had to offer competitive interest rates on saving accounts to attract and/or maintain their customers against the new firms. This has increased the cost of funding and also credit interest rates. Because of the high capital requirements and the cost of establishing nation-wide branch networks, new entrants and the existing small banks tend not to compete for retail deposits. For example, foreign banks operated on a limited basis with few branches, and had a very small share of the banking sector.[3] Despite their insignificant market share, the entry of foreign banks together with the liberalization of the financial system has contributed to the banking sector substantially by increasing the diversification and quality of banking services. For instance, foreign banks were the first to introduce marketing departments and strategies in Turkey.

As mentioned, although there exist a few empirical studies investigating the episode of the Turkish financial liberalization, none of them has investigated the impact of regulatory reforms and new entries (domestic or foreign) on the productive performance of the *traditional* Turkish banks per se. For example, employing a nonparametric approach, Zaim (1995) found that economic efficiency of the Turkish institutions in 1990 was higher than that in 1981. However, he did not dwell on whether production frontier has expanded or contracted (technological progress or regress) or whether the average bank was able to produce more output with a given level of inputs (productivity growth or fall) in the post-liberalization era than in the pre-liberalization era.[4] Denizer (1997) examined the impact of the new entries following the deregulation on banking competition in Turkey. Using the structure-conduct-performance (SCP) paradigm, he tested market structure and efficient structure hypotheses and found evidence in favor of the former. In other

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[3] As a result, after the entry of foreign banks, the competitiveness of the sector did not increase significantly in terms of deposit collection type of retail activities. However, since the interest and exchange rates regimes were liberalized these new entrants operate effectively in wholesale activities such as foreign trade financing.

[4] Productivity and efficiency are two interrelated, but different terms. Efficiency of banks can increase when banks get closer to the efficient production frontier, which itself could either contract or expand. Even if banks stay at their original position between two years (their productivity does not change), their efficiency (the proximity to the efficient frontier) could still increase if the production frontier contracts due to regress.

words, according to him, the superior performance was driven by market power.[5] Our study will complement the limited literature on Turkish liberalization by focusing its impact on the *productivity* and *efficiency change* of traditional banks.

3. Methodology

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. Thus, 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.

In this study, we employ the DEA-type Malmquist productivity change index, which is dubbed after Sten Malmquist, a Swedish economist and statistician, in order to investigate the impact of the financial liberalization on the performance of the traditional Turkish commercial banks. Following Fare *et al.* (1994), we specify the output-orientated Malmquist total factor productivity change (TFPCH) index, M, as the geometric mean of two Malmquist productivity indexes, M_1 and M_2 .

$$M(y_{t+1},x_{t+1};y_t,x_t) = \left[\underbrace{\frac{d_t(x_{t+1},y_{t+1})}{d_t(x_t,y_t)}}_{(M_1)} \times \underbrace{\frac{d_{t+1}(x_{t+1},y_{t+1})}{d_{t+1}(x_t,y_t)}}_{(M_2)} \right]^{1/2} \quad (1)$$

Equation 1assumes that a bank was observed at the combination (x_t , y_t) in year t, whereas in year $t+1$, it was observed at the combination (x_{t+1} , y_{t+1}). The first term (M_1) represents the Malmquist productivity change index obtained relative to the benchmark technology in period t, whereas the second term (M_2) represents the

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[5] Denizer's study (1997) is based on standard accounting ratios rather than production frontiers. Isik and Hassan (2002) examine the performance of Turkish banks during the liberalization period but they do not make a distinction between traditional and non-traditional banks. They look at the overall performance of the entire banking industry including new and old banks.

Malmquist productivity change index calculated relative to the benchmark technology in period *t+1*. The representation of productivity change as geometric mean of these two output based Malmquist TFPCH indexes [$\boldsymbol{M} = (\boldsymbol{M_1} \times \boldsymbol{M_2})^{1/2}$] precludes arbitrariness in choosing the reference technology.[6]

Malmquist index (M) 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 (SCH) components. PEFFCH index measures the changes in the proximity of firms to the frontier, devoid of scale effects. SCH 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 × SCH. Thus, TFPCH = TECCH × PEFFCH × SCH. These Malmquist indexes can attain a value greater than, equal to, or less than unity depending on whether a bank experiences growth, stagnation or decline, respectively, between periods *t* and *t+1*. We estimate them utilizing Data Envelopment Analysis (DEA) method. This methodology has become standard by now in the literature. Please see Bauer et al. (1998), Wheelock and Wilson (1999) and Mukherjee et al. (2001) for further discussion.

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[6] $\boldsymbol{M}$ defines the productivity of the production point ($\boldsymbol{x_{t+1}}$, $\boldsymbol{y_{t+1}}$) with respect to the production point ($\boldsymbol{x_t}$, $\boldsymbol{y_t}$) according to both years' technologies.

3. Data and Descriptive Statistics of Traditional Banks

The data used in this study come from the Banks Association of Turkey (BAT). As aforesaid, we define *traditional banks* as the banks that were in existence before liberalization. We have a balanced panel data of total 280 observation points, which span the time horizon of 1981 through 1990. Table 1 provides the summary statistics of traditional banks in our sample such as their specialization areas, ownership structure, size and traditional performance measures for profitability, ROE (return on equity) and ROA (return on assets), in 1981 and 1990. Out of 56 commercial banks in the system in 1990, half are coming from the pre-liberalization era (traditional banks) and half are the new banks (non-traditional banks) that entered the market in the post liberalization era. Apparently, there are only 28 traditional banks, of which 8 are state banks, 16 private banks and 4 foreign banks. As shown in this table, all these banks are *universal* commercial banks, although some of the state-owned banks were initially established for supporting specific sectors, such as agriculture, mining and energy or textile. The footnotes of the table give brief information on that issue as well as detailed information is provided in the following paragraphs of this section.[7]

Before focusing on the ROE and ROA values, the employment figures in the table may supply interesting explanations. For instance, the number of employees of the public banks increased over 42% between 1981-1990 while this figure for the private banks increased only over 15% and, decreased 6% for the foreign banks. This reflects the fact that several privately owned banks were merged with some of the public banks in this period. For example, Istanbul Bankasi, Hisarbank and Ortadoğu Iktisat Bankasi were merged with T.C. Ziraat Bankasi in 1983 due to their unsustainable financial difficulties. Another financial institution, Istanbul Emniyet Sandigi, was also merged with Ziraat Bankasi in 1984. This is reflected by the employment figures of Ziraat Bankasi, which jumped from 5,465 to 11,240. The merger of Anadolu Bankasi with Turkiye Emlak Bankasi in 1988 provides a

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[7] Seven of the Turkish traditional banks under consideration in this study already existed before 1923. Foreign banks played an important role in the Turkish (Ottoman) banking sector from its inception. Osmanli Bankasi (Ottoman Bank) was established in 1856 mainly to intermediate between the foreign lenders and the Ottoman Empire that was heavily in need of debt financing. The majority shareholders of the bank were the British and French entrepreneurs although the capital had also a Turkish portion. The bank also served as a central bank to the Republic until 1930 as well as the Empire. It then became a middle-sized universal commercial bank in the following period. T.C. Ziraat Bankasi, the first national bank in the Turkish history, was established in 1863; gained a full state-owned status in 1916. Uluslararasi Endustri ve Ticaret Bankasi (1888, originally a partly foreign-owned bank – Selanik Bankasi), Milli Aydin Bankasi (1913, originally a regional bank) and Turk Ticaret Bankasi (1913, originally a regional bank) were also established by private capital. Two foreign banks, Banca Di Roma and Hollantse Bank opened their branches in Istanbul in 1913 and 1921 respectively.

similar example. The only exception among the public banks in the table in terms of the employment issue is Turkiye Ogretmenler Bankasi since it did not increase the number of staff employed during this period. This bank was originally a private bank; but due to serious financial difficulties, the government acquired it in 1987. This could be the reason why the bank did not change its employment level upward.

In this period, due to the upward trend in interest rates after liberalization, growth through opening new branches lost its attractiveness as a general policy in the banking sector. Albeit this was true, some regional small banks adopted a different approach to enlarge their operations to the country level by opening new branches. Employment figures, again, can give interesting information in this respect such as those of Iktisat Bankasi, Turk Dis Ticaret Bankasi, Milli Aydin Bankasi, Turkiye Tutunculer Bankasi or Demirbank. On the contrary, those such as Turkiye Is Bankasi, Akbank and Yapi ve Kredi Bankasi did not increase their staff numbers significantly in comparison with the others in the same group as they had already large and established branch networks. Unlike the other banks in the sector, foreign banks had a distinctive strategy, as they were generally involved in trade finance for multinationals operating in the country. This can also be seen in their employment figures. It should be noted that those four banks in this group differ from each other in some respects. For example, Banca Di Roma and Holantse Bank were operating only as branches of their head offices established in Italy and the Netherlands while Osmanli Bankasi and Arap Turk Bankasi were themselves originally established in Turkey. Therefore the last two resemble their native counterparts more than their peers in the same group. For instance, Osmanli Bankasi was also serving to other segments of the market such as branch banking next to trade financing services. This was true even though its number of personnel decreased by 11% between 1981-1990. Only Arap Turk Bankasi was an exception with regard to the employment issue among the foreign banks with a high increase around 60%. We may suggest that this was caused by the latter's aim to enlarge its operations similar to the native counterparts, as it entered into the market in 1977. However, Osmanli Bankasi had already a considerably large branch network. Therefore apart from Arap Turk Bankasi those foreign banks initiated a restructuring of their organizations to have efficiency gains because profits were under pressure of cost increases caused by increased competition. As can easily be expected, these were the most dynamic banks in the market because of their foreign origins and hence superior perception for the coming market conditions. In other

words they had the advantage of foreseeing the future better because of their management experiences acquired in other countries and adopting appropriate strategies.

Table 1
Descriptive Statistics of the Traditional Turkish Banks (1981-1990)

Name	Specialization	Bank Size		Bank Profitability			
		# of Emp.		ROA (%)		ROE (%)	
		1981	**1990**	**1981**	**1990**	**1981**	**1990**
PUBLIC BANKS							
Denizcilik Bankasi	Commercial[1]	905	1137	-10.80	-1.96	-33.70	-15.39
Etibank Bankacilik	Commercial[2]	2305	3018	2.58	-1.15	11.57	-3.75
Sumerbank	Commercial[3]	667	750	-1.41	0.07	-3.62	0.26
T. Ogretmenler B.	Commercial[4]	1975	1972	1.27	0.13	49.05	1.52
T.C. Ziraat Bankasi	Commercial[5]	30681	40381	3.55	3.04	120.30	36.33
Turkiye Emlak Bankasi	Commercial[6]	5465	11240	2.06	0.68	11.13	98.09
Turkiye Halk Bankasi	Commercial[7]	9804	14252	4.07	0.49	82.30	4.66
Turkiye Vakiflar Bankasi	Commercial	5120	8075	0.06	2.51	4.96	41.96
Average		*7115*	*10103*	*0.17*	*0.48*	*30.25*	*20.46*
PRIVATE BANKS							
Akbank	Commercial	9879	9979	0.85	6.82	40.52	52.84
Demirbank	Commercial	232	594	0.10	1.99	1.19	37.37
Egebank	Commercial	407	759	4.97	0.74	83.12	5.63
Eskisehir Bankasi	Commercial	345	959	0.86	3.02	16.80	31.17
Iktisat Bankasi	Commercial	131	733	0.19	1.82	2.86	17.38
Milli Aydin Bankasi	Commercial	245	684	1.90	3.24	17.59	49.89
Pamukbank	Commercial	2385	2999	1.41	0.72	61.12	9.29
Sekerbank	Commercial	2396	3310	0.02	3.64	0.47	37.02
Turk Dis Ticaret Bankasi	Commercial	351	972	8.05	3.68	325.69	41.04
Turk Ticaret Bankasi	Commercial	6771	8276	1.07	1.41	55.26	18.95
Turkiye Garanti Bankasi	Commercial	3548	5602	0.11	3.17	3.25	42.35
Turkiye Imar Bankasi	Commercial	376	529	0.45	1.83	4.19	29.06
Turkiye Is Bankasi	Commercial	20304	19095	1.11	1.07	73.96	13.34
Turkiye Tutunculer Bankasi	Commercial	428	1185	0.29	2.91	2.17	35.62
Uluslararasi End. ve Tic. B.	Commercial	317	635	1.54	5.34	74.31	54.03
Yapi ve Kredi Bankasi	Commercial	9002	9769	0.26	2.78	10.44	49.71
Average		*3570*	*4130*	*1.45*	*2.76*	*48.31*	*32.79*
FOREIGN BANKS							
Arap Turk Bankasi	Commercial[8]	165	265	6.99	-6.59	383.53	-41.46
Banca Di Roma	Commercial[8]	119	93	8.76	2.00	181.36	35.04
Holantse Bank	Commercial[8]	93	69	10.02	6.29	61.33	39.25
Osmanli Bankasi	Commercial	1583	1409	1.33	3.15	110.29	53.37
Average		*490*	*459*	*6.78*	*1.21*	*184.12*	*21.55*

[1] Denizcilik Bankasi was established originally for marine business financing.
[2] Etibank was established originally for finance and investment in the mining and energy sectors.
[3] Sumerbank was established originally for finance and investment in the textile and footwear sectors.
[4] T. Ogretmenler Bankasi was established originally for housing finance particularly for teachers.
[5] Although a commercial universal bank, T.C. Ziraat Bankasi has been assigned for financing of the agricultural sector.
[6] Although a commercial universal bank, T. Emlak Bankasi had been assigned for housing finance.
[7] Although a commercial universal bank, T. Halk Bankasi has been assigned for small business financing.
[8] These banks have a particular focus on trade financing.

Concerning the *public banks* in Table 1, average ROE declined from 30.25% in 1981 to 20.46% in 1990, while average ROA rose during the same period from 0.17% to 0.48%. A similar trend also applied to the *private banks* for ROE during

in this period, from 48.31% to 32.79%, while ROA rose from 1.45% to 2.76%. Regarding the *foreign banks*, on the other hand, ROE decreased sharply from 184.12% in 1981 to 21.55% in 1990, while ROA also decreased from a high of 6.78% to 1.21%. Those results were mainly due to the liberalization policies adopted after 1980 in the country. In this period the government allowed new entries into the market. As well as some new banks, special finance houses transacting business according to Islamic banking principles also became part of the financial system after 1985. This intensified competition in the sector and therefore caused a downward trend particularly in the average ROE of the banks. Those significant differences between the average ROE and ROA figures indicate the fact that these banks were relying on debt financing significantly. With regard to the public and private banks, furthermore, the average ROA increased while the average ROE decreased. This was partly caused by the fact that new entries led these banks to have lesser shares of the total deposits in the market. This meant smaller equity multipliers for individual banks. In addition, while the deposit interest rates increased (higher costs), the credits interest rates applied were also higher than before. Therefore, assuming that for an individual bank the amount of total assets was the same, its return was higher than the pre-liberalization period (higher ROA).

4. Empirical Setting and Design

Before estimating productivity change index and its components, we first ought to determine a model of bank production. There are two rival approaches in the literature in specifying the multiple inputs and outputs of the banks. One approach, known as *production approach*, defines bank output much more with engineering mentality; the *number* of deposit and loan accounts serviced by banks is considered as the output portfolio of banks. According to this approach, labor and physical capital are the resources making up the input portfolio of banks. Another but more common approach, termed as *intermediation approach*, treats banks as intermediaries, with outputs measured in dollar amounts rather than physical units and with labor, capital, and various deposits specified as inputs. We adopt the intermediation approach rather than production approach to define the inputs and outputs of banks because we, like majority of the associates in the literature, believe that the former reflects banking production process better. All variables except for the input factor labor are adjusted for inflation using the $US equivalents of these variables.

Table 2
Annual Means and Standard Deviations (in parentheses) of *Outputs* and *Inputs* for the Traditional Turkish Banks (in million $US)

Years / Variables	Panel A. BANK OUTPUTS			Panel B. BANK INPUTS		
	Short - Term Loans	Long - Term Loans	Other Earning Assets	Labor	Physical Capital	Funds
1981	181.63	52.09	138.38	4,003.17	13.04	515.87
	[267.39]	[127.94]	[501.41]	[6,824.06]	[22.38]	[884.94]
1982	192.58	50.76	128.87	4,222.79	20.73	534.12
	[289.08]	[145.76]	[398.17]	[7,115.76]	[31.89]	[883.09]
1983	147.89	60.82	115.48	4,380.62	16.53	484.87
	[230.27]	[150.69]	[363.93]	[7,603.56]	[23.63]	[845.09]
1984	136.72	38.50	123.47	4,487.52	16.88	485.80
	[219.91]	[99.76]	[345.03]	[7,909.24]	[23.49]	[849.78]
1985	193.33	44.39	185.66	4,566.90	20.85	634.25
	[302.29]	[100.76]	[468.04]	[8,021.65]	[28.73]	[1,094.19]
1986	261.64	47.45	231.55	4,732.52	24.74	801.80
	[424.64]	[123.46]	[641.90]	[8,250.22]	[32.20]	[1,305.91]
1987	314.82	56.49	298.33	4,910.34	31.47	970.23
	[494.75]	[130.63]	[716.03]	[8,578.67]	[40.33]	[1,558.20]
1988	241.96	44.31	275.57	5,072.62	48.48	863.38
	[325.11]	[95.03]	[687.93]	[8,505.88]	[70.42]	[1,294.55]
1989	325.21	57.72	375.09	5,137.59	73.61	1,088.26
	[338.47]	[125.59]	[878.33]	[8,560.21]	[122.42]	[1,627.02]
1990	483.37	60.53	437.68	5,137.90	78.31	1,330.80
	[486.17]	[123.16]	[1,105.88]	[8,371.03]	[100.91]	[1,876.41]
MEANS						
1981-86	185.63	49.00	153.90	4,398.92	18.80	576.12
	[288.93]	[124.73]	[453.08]	[7,620.75]	[27.05]	[977.17]
1987-90	341.34	54.76	346.67	5,064.61	57.97	1,063.17
	[411.13]	[118.60]	[453.08]	[8,503.95]	[83.52]	[1,589.05]
1981-90	247.92	51.31	231.01	4,665.20	34.46	770.94
	[337.81]	[122.28]	[610.67]	[7,974.03]	[49.64]	[1,221.92]

Accordingly, we selected the following three items as *inputs*, i.e., factors of production employed by the Turkish banks to produce their products and services: (1) labor, (2) physical capital, and (3) funds. We measure the quantity of *labor* by the number of full-time employees on the payroll, *capital* by the book value of premises and fixed assets, and *funds* by the sum of deposit (demand and time) and non-deposit funds as of the end of the respective year.[8] The following three items

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[8] Non-deposit funds are borrowed funds from interbank, central bank, domestic banks, abroad and others as well as funds raised by issuing securities.

are chosen as the *outputs* of the Turkish banks: (1) short-term loans, (2) long-term loans, and (3) other earning assets. *Short-term loans* and *long-term loans* comprise the loans with less than and more than a year maturity, respectively. *Other earning assets* consist of loans to special sectors (directed and specialized loans), inter-bank funds sold and investment securities (treasury bills, government bonds and other securities).[9]

Table 2 reports the annual averages and standard deviations of bank production variables (inputs and outputs) of the traditional Turkish banks for the study period (1981-90). In Turkey, real exchange rate policy is followed. Accordingly, the Turkish Lira is depreciated at the amount of purchasing power loss. Thus, all variables are expressed in $US to facilitate international comparison and alleviate the impact of inflation on bank variables. As the summary statistics reveals, there is a large variation in the levels of inputs and outputs across years. It is important to note that the level of short-term loans surpasses the level of long-term loans in every year. It appears that Turkish traditional banks extend predominantly liquid loans such as working capital credits. This indicates that Turkish non-financial firms face difficulty to finance their capital investment projects, as banks are reluctant to offer longer-term credits. Inflationary pressures curb asset transformation process of banks. In an environment where general price level is volatile, banks have hard time to collect long-term funds, which in turn inhibits their ability to create long-term assets.

As Kwan (1997) points out, year-specific analyses are bound to fail to capture the changes in the regulatory environment and in the marketplace, which may have changed the underlying production frontiers (i.e.; technologies). Efficiency comparisons across time tell us only one part of the story. Productivity

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[9] Selection of the inputs and outputs may need further explanation and justification. Our definition of bank inputs and outputs takes into account the recent changes in Turkish banking. Zaim (1995) selected four inputs (labor, interest expenditures, depreciation expenditures, expenditures on materials), and four outputs (demand deposits, time deposits, short term loans, long term loans), whereas Altunbas et al. (1994) chose three inputs (labor, capital and total funds) and one output (total of short- and long-term loans, and net securities). First concern is that these two empirical studies did not account for directed lending (i.e.; loans to special sectors such as agriculture, housing or tourism) as they drew no distinction between directed lending and other lending. All state banks and some private banks make such subsidized loans and ignoring these activities could produce understated efficiency and productivity measures for such banks. Another point is concerning the investment security portfolios of banks. According to the Banks Association of Turkey (BAT) reports in 1996, 82% of the banks' securities portfolio consisted of public sector securities such as treasury bills and government bonds by the end of 1995. Ignoring the security investments in bank outputs could create biases for those banks, especially small banks, whose most operations revolve around the management of such investments. Another improvement is the inclusion of the very short-term loans (inter-bank loans).

improvements are not only as a result of the increases in efficiency but also as a result of progress in the technology. Even, as Wheelock and Wilson (1999) put it accurately, a favorable increase in productivity could cause an efficiency decline. A bank that stayed behind technological advances would become increasingly inefficient relative to banks adopting a new technology. Thus, a technological improvement initiated by a few banks, but not the average bank, could push the estimated frontier outward and explain the observed decrease in average bank efficiency.

In order to demonstrate the dynamics of productivity and efficiency growth in the traditional banks during liberalization and not to fall in selection bias, we report the results for the full ten years between 1981 and 1990.[10] Although reforms started in 1980, they have accelerated after the mid-1980s. Accordingly, Denizer (1997) chose 1986 as the beginning of the post-liberalization period while studying the effects of financial liberalization and new bank entry on market structure and competition in Turkey. Similarly, Yulek (1998) also used 1986 as the basis year to study the effect of the liberalization on the real economy. Thus, following the earlier literature, we treat 1986 as the reference year in our analysis to represent the pre- and post- liberalization eras.

Malmquist productivity change index and its components cannot be constructed without a reference technology. In a multi-period setting, the reference could be the technology of any year. We report the results relative to the fixed technology of the first year, 1981. The main reason for a fixed rather than changing technology reference is that when addressing productivity change, one is interested in improvements from a certain period; whether there was an improvement in performance relative to where one started. This also allows us to focus on the performance changes in traditional banks by excluding the new banks that entered the market after liberalization.[11] For the entire study period, the grand averages of the Malmquist total factor productivity change (TFPCH) index, and its two mutually exclusive and exhaustive components (1) efficiency change (EFFCH) and (2) technological change (TECCH) for all traditional banks and sub-groups of traditional banks are presented in Table 3. The two distinct components of the

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[10] The format of balance sheets and income statements has changed after 1980, dictating us the choice of 1981, rather than 1980, as the beginning year of the analysis to be in accordance and conformity with the data used for the post liberalization era.

[11] Over the study period, the banks in our sample stay the same and only time period changes. Thus, the changes in bank performance will be predominantly driven by time, i.e., by the changes in the operating and regulatory environment of the traditional banks.

technical efficiency change (EFFCH), namely (1) pure technical efficiency change (PEFFCH) and (2) scale efficiency change (SCH) are also reported in the table.

Table 3
Average Productivity Growth (TFPCH) and its Components in the Traditional Banks

	(1) Malmquist index (TFPCH) = (2)*(3)	(2) Technical change (TECCH) = (1)/(3)	(3) Efficiency change (EFFCH) = (4)*(5)	(4) Pure efficiency change (PEFFCH) = (3)/(5)	(5) Scale efficiency change (SCH) = (3)/(4)
Traditional Banks	0.854	0.862	1.004	1.011	0.991
Sub-groups					
Traditional *Public* Banks	0.906	0.853	1.071	1.098	0.974
Traditional *Private* Banks	0.845	0.838	1.020	1.000	1.019
Traditional *Foreign* Banks	0.963	0.933	1.060	0.984	1.068

The arithmetic means of Malmquist index and its components summarized in the table are based on a ***fixed reference technology*** (data points in every year are compared to the efficient points both on the relevant year and 1981frontiers). Banks are modeled as multi-product firms. Accordingly, it is assumed that banks 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. The results are based on data from 1981-90 period.

In Table 3, the reference frontier is fixed, i.e., the technology of the year 1981. The data points in each year from 1982 to 1990 are compared to the points in 1981 in the input-output space. As discussed, the Malmquist index [TFPCH] and its sub-components [EFFCH (PEFFCH, SCH) and TECCH] attain a value greater than, equal to, or less than unity if bank has experienced growth, stagnation, or loss in the respective measures between periods, *t* and *t+1*, from the perspective of period *t* technology. Thus, any score greater than 1 indicates improvement, any score lower than 1 indicates deterioration in the relevant measure with respect to the reference year 1981. On average between 1982 and 1990, the results in Table 6 suggest that the traditional banks recorded about 15% productivity loss, 14% technical regress, 0.04% efficiency increase, 1% pure efficiency increase and 1% scale efficiency decrease. These results indicate that the financial reforms and new bank entries did

not improve the productivity of traditional banks. On the contrary, such changes in the operating environment worsened their productivity. It seems that the major source of productivity loss is the contraction in the production frontier.

The traditional banks have quite different ownership structures. As Isik and Hassan (2002) and Altunbas et al. (2001) discussed, differences in ownership can cause significant efficiency and productivity variations as private banks are more constrained by market forces than public banks. Private banks are expected to maximize the share value by minimizing input costs and maximizing output revenues while public banks are expected to serve mainly social goals. During the same period, on average, traditional *public* banks registered 10% productivity loss, 15% technical regress, 7% efficiency increase, 10% pure efficiency increase and 3% scale efficiency decrease. Traditional *private* banks demonstrated 15% productivity decline, 16% technical regress, 2% efficiency increase, 0% pure efficiency increase and 2% scale efficiency increase. On the other hand, traditional *foreign* banks showed 4% productivity loss, 7% technical regress, 6% efficiency increase, 1.6% pure efficiency decrease and 7% scale efficiency increase. The subgroup results also confirm the deterioration in productivity for traditional banks, which is driven mostly by downward shift in the frontier.

Table 3 results are the grand averages of the performance scores. Although they reveal the central tendency of the measures, they hide the trends in those scores. There may be structural shifts in performance as the traditional banks took measures to cope with the changes in the environment. In order to detect the trends in the productivity growth and its constituents, we constructed Figure 1 (for all traditional banks), Figure 2 (for traditional public banks), Figure 3 (for traditional private banks), and Figure 4 (for traditional foreign banks). Bold linear lines in the figures are *trend lines*, which indicate the overall tendency in the respective measures. Again, any point above 1.0 means an improvement. When we look at Figure 1.1, we see that except for 1982, the traditional banks did not register any productivity growth (TFPCH) until 1989. Likewise, except for 1982, these banks also have seen regress in their technologies (TECCH). However, the negative productivity growth (loss) has become increasingly less negative over time, implying an upward trend in the productivity of traditional banks (the trend line of the TFPCH index has a positive slope).

The decomposition of TFPCH into its components in Figures 1.2 and 1.3 suggest that the productivity growth observed in the post-liberalization period for these

traditional banks were mainly due to increase in their efficiency (EFFCH), rather than progress in their technology (TECCH). However, there is an apparent development in technology after 1986, although still lower with respect to the basis year 1981.

Fig. 1. Trends in the Performance of the traditional banks in Turkey
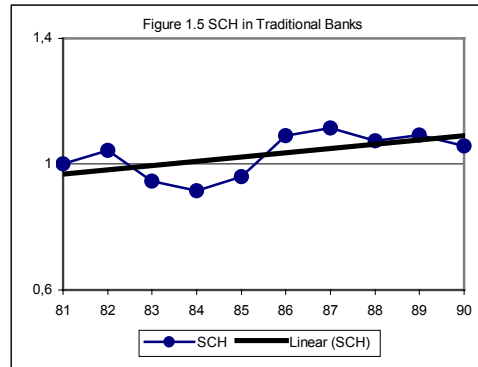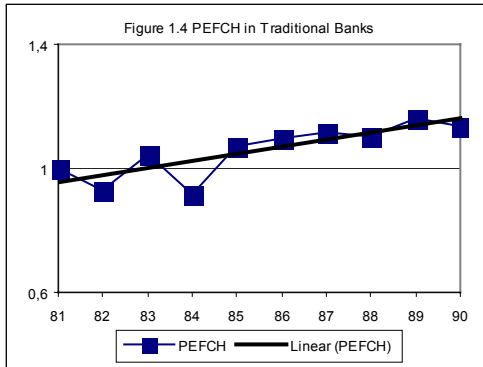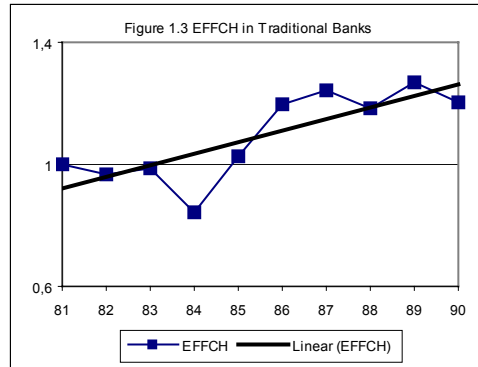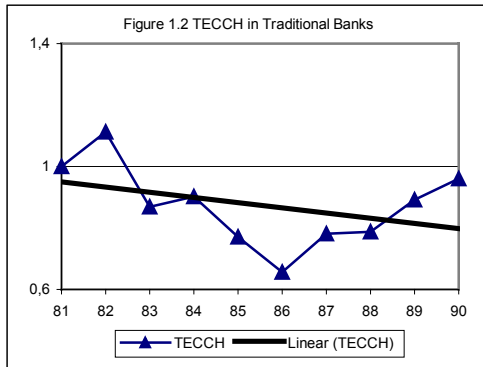
Fig. 2. Trends in the Performance of the Traditional PUBLIC Banks in Turkey

Figure 2.1 TFPCH in Traditional PUBLIC Banks

Figure 2.2 TECCH in Traditional PUBLIC Banks

Figure 2.3 EFFCH in Traditional PUBLIC Banks

Figure 2.4 PEFCH in Traditional PUBLIC Banks

Figure 2.5 SCH in Traditional PUBLIC Banks
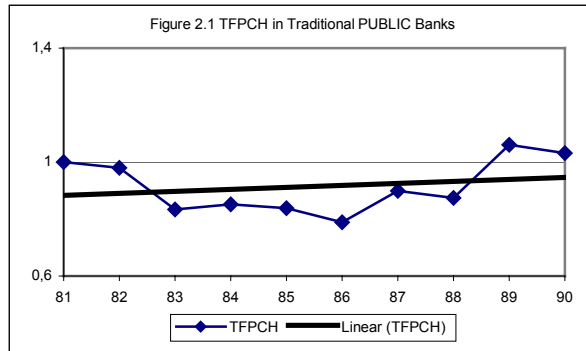
Fig. 3. Trends in the Performance of the Traditional PRIVATE Banks in Turkey

Figure 3.1 TFPCH in Traditional PRIVATE Banks


Figure 3.2 TECCH in Traditional PRIVATE Banks

Figure 3.3 EFFCH in Traditional PRIVATE Banks

Figure 3.4 PEFCH in Traditional PRIVATE Banks

Figure 3.5 SCH in Traditional PRIVATE Banks
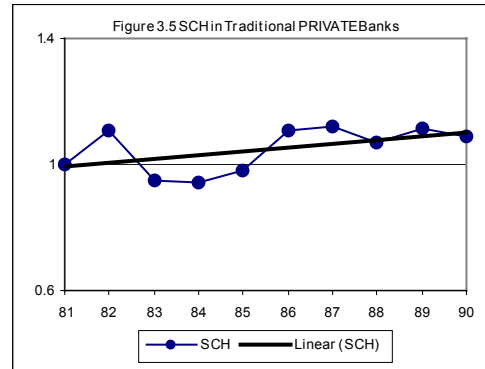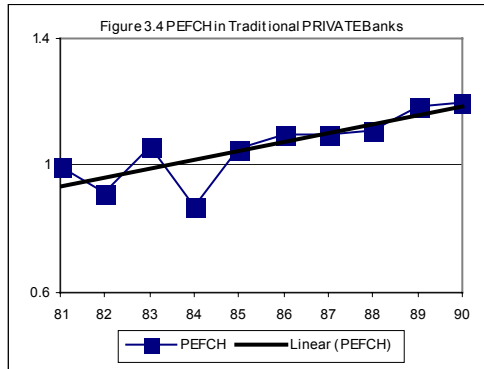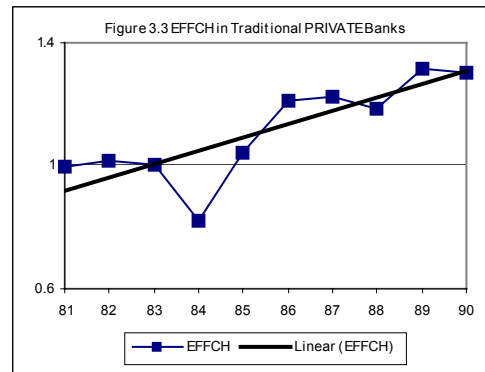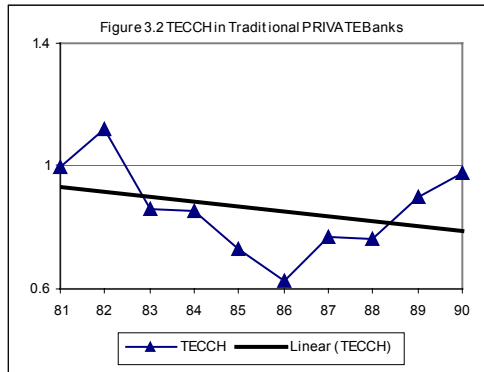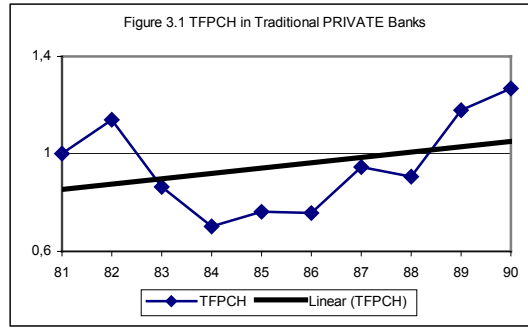
There is a note-worthy improvement in the efficiency of traditional banks. They have experienced efficiency increase every year and at an increasing rate after 1984. The productivity loss in the early phase of liberalization implies that these banks have faced some adaptation problems. PEFFCH (Figure 1.4) and SCH (Figure 1.5), the components of the EFFCH index (Figure 1.3), indicate that the

general tendency in management practices and scale changes is positive. As the slope of the PEFFCH index is steeper than that of SCH index, one implication is that efficiency increase in traditional banks is mostly driven by better management techniques that achieved more output per input rather than scale improvements.
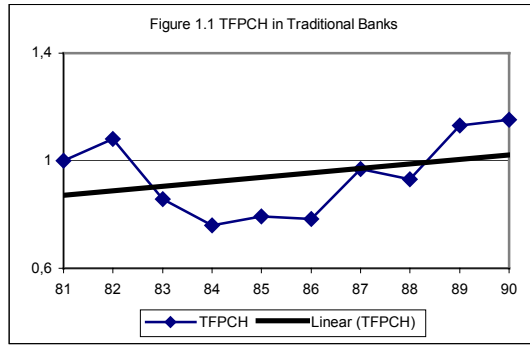
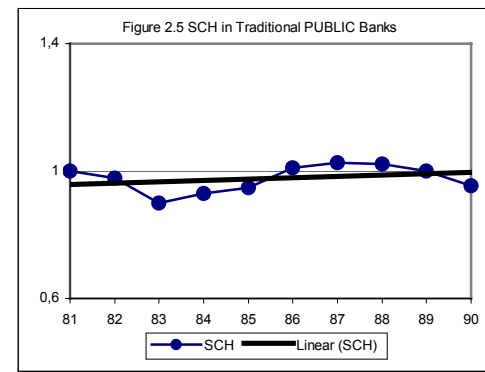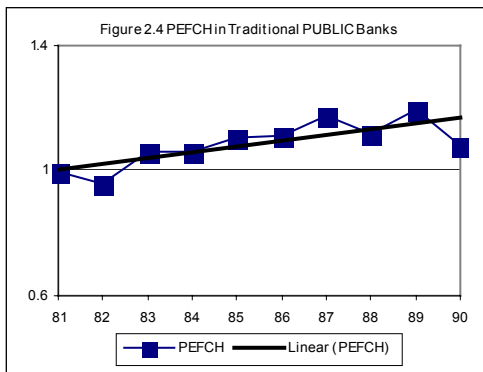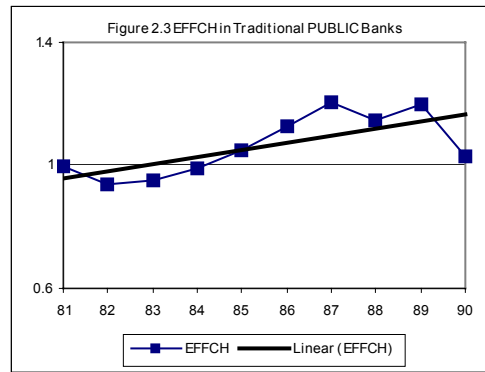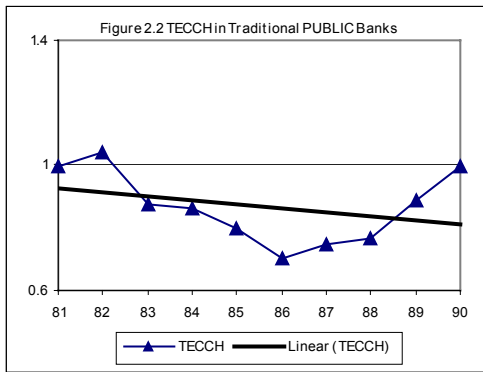**Fig. 4. Trends in the Performance of the Traditional FOREIGN Banks in Turkey**

Figure 4.1 TFPCH in Traditional FOREIGN Banks

Figure 4.2 TECCH in Traditional FOREIGN Banks

Figure 4.3 EFFCH in Traditional FOREIGN Banks

Figure 4.4 PEFCH in Traditional FOREIGN Banks

Figure 4.5 SCH in Traditional FOREIGN Banks
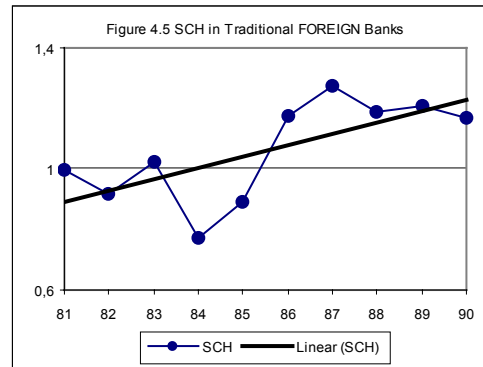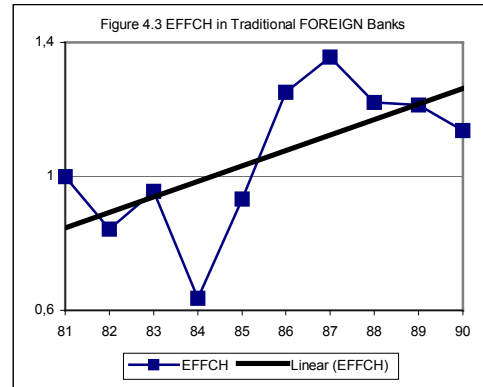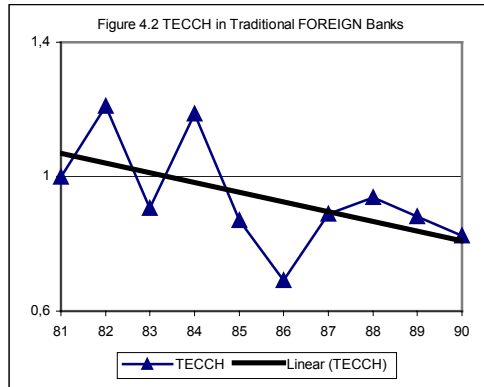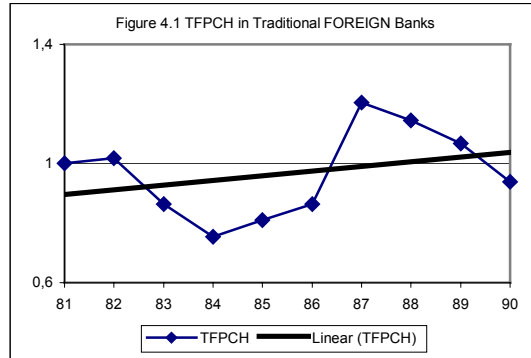
As for the performance of the sub-group banks, they demonstrate similar results. As can be seen from Figures 2 through 4, although in varying degrees, all ownership forms, public, private and foreign, experienced increasing productivity mainly owing to efficiency increases. Efficiency increases in each type of banks seem to be driven by the improvement in pure technical efficiency rather than in scale, implying that management of banking operations has improved after the liberalization for these banks.

Overall, the results indicate that all types of traditional banks benefited from liberal policies as evidenced by the increases in their productivity and efficiency. The group that flourished in this environment the most is private banks, domestic or foreign. The foreign banks are the only banks that indicate technical progress (innovation) in their technologies in a couple of cases in the advent of the deregulation. This supports the common impression in the sector about foreign banks, that they were the pioneers of many technological advances and new applications in the country. However, the above analysis is based on the averages. Thus, the results could be distorted by extreme observations, either too low or too high, in the sample. On the other hand, reporting what percentage of the banks showed productivity growth/loss, efficiency increase/decrease might help us overcome such bias. For this purpose, we will have a look at the development in the percentage of the traditional Turkish banks that experienced productivity gain or loss during the lib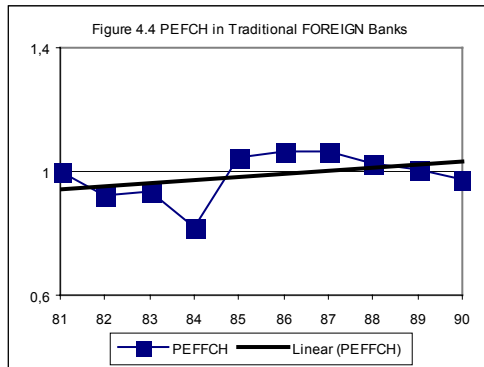eralization period, relative to the fixed reference technology. Table 4 gives the results for the full sample (all traditional banks), Table 5 for the traditional public banks, Table 6 for the traditional private banks, Table 7 for the traditional foreign banks.

Looking at Table 4, we see that while in the early phase of the liberalization (1982-86), only 24% of all traditional banks experienced productivity growth, the majority, 76%, experienced productivity loss. On the other hand, between 1987-90, the percentage of the banks with productivity growth increased substantially reaching 44%, while the percentage of the banks with productivity loss decreased notably to 55%. The results also show that the percentage of banks recorded technical progress (regress), efficiency increase (decrease), pure efficiency increase (decrease), and scale efficiency increase (decrease) has considerably risen (fallen) between 1987-90 with respect to those between 1982-86, suggesting that on average, deregulation and new bank entry improved the performance of the traditional Turkish commercial banks. The subgroup results reported in Table 5, 9,

10, show that the percentage of public, private and foreign traditional banks that experienced improvement (worsening) in productivity, technology, and efficiency has tremendously increased (decreased) over time, as a result of financial reforms. The bank group with the highest percentage of banks that have experienced productivity growth between 1987-90 is traditional foreign banks (63%), followed by traditional private banks (39%), and then by traditional public banks (44%).

Table 4
Development in the Percentage of the <u>Traditional TURKISH Banks</u> with Productivity Gain or Loss / Efficiency Increase or Decrease

Period	#	Productivity Change (TFPCH)			Technology Change (TECCH)			Efficiency Change (EFFCH)			Pure Efficiency Change (PEFFCH)			Scale Efficiency Change (SCH)		
		Growth	Loss	No Δ	Progress	Regress	No Δ	Inc.	Dec.	No Δ	Inc.	Dec.	No Δ	Inc.	Dec.	No Δ
82-81	28	32%	68%	0%	61%	39%	0%	39%	43%	18%	18%	50%	32%	57%	25%	18%
83-81	28	25%	75%	0%	21%	79%	0%	25%	64%	11%	29%	36%	36%	25%	64%	11%
84-81	28	21%	75%	4%	29%	68%	4%	25%	64%	11%	25%	50%	25%	21%	68%	11%
85-81	28	21%	79%	0%	14%	86%	0%	39%	50%	11%	43%	21%	36%	32%	57%	11%
86-81	28	18%	82%	0%	7%	93%	0%	61%	25%	14%	39%	32%	29%	68%	18%	14%
87-81	28	32%	68%	0%	11%	89%	0%	64%	21%	14%	43%	29%	29%	68%	14%	18%
88-81	28	29%	68%	4%	11%	89%	0%	61%	25%	14%	36%	36%	29%	68%	18%	14%
89-81	28	57%	43%	0%	36%	64%	0%	71%	14%	14%	50%	18%	32%	68%	18%	14%
90-81	28	57%	43%	0%	54%	46%	0%	61%	29%	11%	46%	32%	21%	61%	29%	11%
Mean																
82-86		24%	76%	1%	26%	73%	1%	38%	49%	13%	31%	38%	31%	41%	46%	13%
87-90		**44%**	**55%**	**1%**	**28%**	**72%**	**0%**	**64%**	**22%**	**13%**	**44%**	**29%**	**28%**	**66%**	**20%**	**14%**
82-90		33%	67%	1%	27%	73%	0%	50%	37%	13%	37%	34%	30%	52%	35%	13%

Table 5
Development in the Percentage of the <u>Traditional PUBLIC Banks</u> with Productivity Gain or Loss / Efficiency Increase or Decrease

Period	#	Productivity Change (TFPCH)			Technology Change (TECCH)			Efficiency Change (EFFCH)			Pure Efficiency Change (PEFFCH)			Scale Efficiency Change (SCH)		
		Growth	Loss	No Δ	Progress	Regress	No Δ	Inc.	Dec.	No Δ	Inc.	Dec.	No Δ	Inc.	Dec.	No Δ
82-81	8	25%	75%	0%	50%	50%	0%	38%	25%	38%	38%	25%	38%	50%	13%	38%
83-81	8	25%	75%	0%	38%	63%	0%	25%	50%	25%	38%	13%	50%	25%	50%	25%
84-81	8	25%	63%	13%	25%	63%	13%	25%	50%	25%	38%	25%	38%	25%	50%	25%
85-81	8	25%	75%	0%	38%	63%	0%	25%	50%	25%	38%	25%	38%	25%	50%	25%
86-81	8	25%	75%	0%	13%	88%	0%	50%	25%	25%	50%	25%	25%	50%	25%	25%
87-81	8	25%	75%	0%	13%	88%	0%	63%	0%	38%	50%	0%	50%	63%	0%	38%
88-81	8	38%	63%	0%	13%	88%	0%	50%	13%	38%	38%	25%	38%	63%	0%	38%
89-81	8	50%	50%	0%	50%	50%	0%	50%	25%	25%	38%	13%	50%	38%	38%	25%
90-81	8	63%	38%	0%	63%	38%	0%	25%	50%	25%	38%	38%	25%	25%	50%	25%
Mean																
82-86		25%	73%	3%	33%	65%	3%	33%	40%	28%	40%	23%	38%	35%	38%	28%
87-90		**44%**	**56%**	**0%**	**34%**	**66%**	**0%**	**47%**	**22%**	**31%**	**41%**	**19%**	**41%**	**47%**	**22%**	**31%**
82-90		33%	65%	1%	33%	65%	1%	39%	32%	29%	40%	21%	39%	40%	31%	29%

Underlying Malmquist measures are calculated relative to fixed reference frontier, 1981. Banks are categorized according to the following: Productivity Growth: Malmquist Index (TFPCH)>1, Productivity Loss: TFPCH<1, Productivity Stagnation: TFPCH=1; Technical Progress: TECCH>1, Technical Regress: TECCH<1, Technical Stagnation: TECCH=1; Efficiency, Pure and Scale Efficiency Increase: EFFCH, PEFFCH, and SCH>1; Efficiency, Pure and Scale Efficiency Decrease: EFFCH, PEFFCH, and SCH<1, No Change in Efficiency, Pure and Scale Efficiency: EFFCH, PEFFCH, and SCH=0.

Table 6
Development in the Percentage of the <u>Traditional PRIVATE banks</u> with Productivity Gain or Loss / Efficiency Increase or Decrease

		Productivity Change (TFPCH)			Technology Change (TECCH)			Efficiency Change (EFFCH)			Pure Efficiency Change (PEFFCH)			Scale Efficiency Change (SCH)		
Period	#	Growth	Loss	No Δ	Progress	Regress	No Δ	Inc.	Dec.	No Δ	Inc.	Dec.	No Δ	Inc.	Dec.	No Δ
82-81	16	31%	69%	0%	56%	44%	0%	50%	44%	6%	13%	69%	19%	69%	25%	6%
83-81	16	25%	75%	0%	13%	88%	0%	25%	75%	0%	31%	50%	19%	25%	75%	0%
84-81	16	19%	81%	0%	25%	75%	0%	31%	69%	0%	25%	63%	13%	25%	75%	0%
85-81	16	19%	81%	0%	0%	100%	0%	50%	50%	0%	50%	25%	25%	44%	56%	0%
86-81	16	13%	88%	0%	0%	100%	0%	63%	31%	6%	38%	44%	19%	75%	19%	6%
87-81	16	19%	81%	0%	6%	94%	0%	63%	38%	0%	44%	50%	6%	69%	25%	6%
88-81	16	19%	81%	0%	6%	94%	0%	63%	38%	0%	38%	50%	13%	69%	31%	0%
89-81	16	56%	44%	0%	31%	69%	0%	81%	13%	6%	63%	19%	19%	81%	13%	6%
90-81	16	63%	38%	0%	50%	50%	0%	81%	19%	0%	56%	31%	13%	75%	25%	0%
Mean																
82-86		21%	79%	0%	19%	81%	0%	44%	54%	3%	31%	50%	19%	48%	50%	3%
87-90		**39%**	**61%**	**0%**	**23%**	**77%**	**0%**	**72%**	**27%**	**2%**	**50%**	**38%**	**13%**	**73%**	**23%**	**3%**
82-90		29%	71%	0%	21%	79%	0%	56%	42%	2%	40%	44%	16%	59%	38%	3%

Table 7
Trends in the Percentage of the <u>Traditional FOREIGN Banks</u> with Productivity Gain or Loss / Efficiency Increase or Decrease

Period	#	Productivity Change (TFPCH)			Technology Change (TECCH)			Efficiency Change (EFFCH)			Pure Efficiency Change (PEFFCH)			Scale Efficiency Change (SCH)		
		Growth	Loss	No Δ	Progress	Regress	No Δ	Inc.	Dec.	No Δ	Inc.	Dec.	No Δ	Inc.	Dec.	No Δ
82-81	4	50%	50%	0%	100%	0%	0%	0%	75%	25%	0%	25%	75%	25%	50%	25%
83-81	4	25%	75%	0%	25%	75%	0%	25%	50%	25%	0%	25%	75%	25%	50%	25%
84-81	4	25%	75%	0%	50%	50%	0%	0%	75%	25%	0%	50%	50%	0%	75%	25%
85-81	4	25%	75%	0%	25%	75%	0%	25%	50%	25%	25%	0%	75%	0%	75%	25%
86-81	4	25%	75%	0%	25%	75%	0%	75%	0%	25%	25%	0%	75%	75%	0%	25%
87-81	4	100%	0%	0%	25%	75%	0%	75%	0%	25%	25%	0%	75%	75%	0%	25%
88-81	4	50%	25%	25%	25%	75%	0%	75%	0%	25%	25%	0%	75%	75%	0%	25%
89-81	4	75%	25%	0%	25%	75%	0%	75%	0%	25%	25%	25%	50%	75%	0%	25%
90-81	4	25%	75%	0%	50%	50%	0%	50%	25%	25%	25%	25%	50%	75%	0%	25%
Mean																
82-86		30%	70%	0%	45%	55%	0%	25%	50%	25%	10%	20%	70%	25%	50%	25%
87-90		**63%**	**31%**	**6%**	**31%**	**69%**	**0%**	**69%**	**6%**	**25%**	**25%**	**13%**	**63%**	**75%**	**0%**	**25%**
82-90		44%	53%	3%	39%	61%	0%	44%	31%	25%	17%	17%	67%	47%	28%	25%

Underlying Malmquist measures are calculated relative to fixed reference frontier, 1981. Banks are categorized according to the following: Productivity Growth: Malmquist Index (TFPCH)>1, Productivity Loss: TFPCH<1, Productivity Stagnation: TFPCH=1; Technical Progress: TECCH>1, Technical Regress: TECCH<1, Technical Stagnation: TECCH=1; Efficiency, Pure and Scale Efficiency Increase: EFFCH, PEFFCH, and SCH>1; Efficiency, Pure and Scale Efficiency Decrease: EFFCH, PEFFCH, and SCH<1, No Change in Efficiency, Pure and Scale Efficiency: EFFCH, PEFFCH, and SCH=0.

Table 8
Major Source of Productivity Growth or Loss / Efficiency Increase or Decrease in the Traditional Commercial Banks in Turkey (by ownership structure)

Period	#	Productivity GROWTH mainly due to:		Productivity LOSS mainly due to:		NO Prod. Δ	Efficiency INCREASE mainly due to:		Efficiency DECREASE mainly due to:		NO Eff. Δ
		Eff. Incr.	Tech. Progress	Eff. Decr.	Tech. Regress		PTE Incr.	SE Incr.	PTE Decr.	SE Dec.	
A. <u>*ALL*</u> TRADITIONAL BANKS											
82-81	28	18%	14%	36%	32%	0%	18%	21%	36%	7%	18%
83-81	28	18%	7%	46%	29%	0%	21%	4%	29%	36%	11%
84-81	28	14%	7%	50%	25%	4%	21%	4%	39%	25%	11%
85-81	28	18%	4%	29%	50%	0%	29%	11%	21%	29%	11%
86-81	28	14%	4%	7%	75%	0%	36%	25%	21%	4%	14%
87-81	28	25%	7%	4%	64%	0%	43%	21%	21%	0%	14%
88-81	28	29%	0%	7%	61%	4%	32%	29%	25%	0%	14%
89-81	28	43%	14%	7%	36%	0%	36%	36%	7%	7%	14%
90-81	28	36%	21%	7%	36%	0%	39%	21%	21%	7%	11%
Mean											
82-86		16%	7%	34%	42%	1%	25%	13%	29%	20%	13%
87-90		**33%**	**11%**	**6%**	**49%**	**1%**	**38%**	**27%**	**19%**	**4%**	**13%**
82-90		24%	9%	21%	45%	1%	31%	19%	25%	13%	13%
B. TRADITIONAL <u>*PUBLIC*</u> BANKS											
82-81	8	13%	13%	25%	50%	0%	38%	0%	25%	0%	38%
83-81	8	13%	13%	25%	50%	0%	25%	0%	0%	50%	25%
84-81	8	25%	0%	25%	38%	13%	25%	0%	13%	38%	25%
85-81	8	25%	0%	25%	50%	0%	25%	0%	25%	25%	25%
86-81	8	25%	0%	0%	75%	0%	50%	0%	13%	13%	25%
87-81	8	13%	13%	0%	75%	0%	50%	13%	0%	0%	38%
88-81	8	38%	0%	0%	63%	0%	25%	25%	13%	0%	38%
89-81	8	25%	25%	13%	38%	0%	38%	13%	0%	25%	25%
90-81	8	25%	38%	0%	38%	0%	25%	0%	25%	25%	25%
Mean											
82-86		20%	5%	20%	53%	3%	33%	0%	15%	25%	28%
87-90		**25%**	**19%**	**3%**	**53%**	**0%**	**34%**	**13%**	**9%**	**13%**	**31%**
82-90		22%	11%	13%	53%	1%	33%	6%	13%	19%	29%

In order to demonstrate the sources of productivity growth (technological progress or efficiency increase), and efficiency increase (pure efficiency increase or scale efficiency increase), we constructed the Table 8, which is mainly breakdown of Table 4 through Table 7. Panel A of the table gives the results for all traditional banks in the system, Panel B for traditional public banks, Panel C for traditional private banks, and Panel D for traditional foreign banks. When we look at Model 1 (Panel A) and Model 2 (Panel B) results, we see that for the entire period, 1982-90, and two sub-periods, 1982-86, and 1987-90, the dominant source of the productivity growth is efficiency increase, not technical progress for traditional banks. Over the entire period, and sub-periods, the major source of productivity loss was technical regress rather than efficiency decrease. Moreover, most of the

banks that experienced efficiency increase owe it to the improvements on the management practices (pure efficiency increases) not to the improvements in scale (scale efficiency increases). Efficiency decreases in traditional banks result mainly from managerial mistakes in resource utilization rather than incorrect scale choices.

Table 8
(continued)

Period	#	Productivity GROWTH mainly due to:		Productivity LOSS mainly due to:		NO Prod. Δ	Efficiency INCREASE mainly due to:		Efficiency DECREASE mainly due to:		NO Eff. Δ
		Eff. Incr.	Tech. Progress	Eff. Decr.	Tech. Regress		PTE Incr.	SE Incr.	PTE Decr.	SE Dec.	
C. TRADITIONAL _PRIVATE_ BANKS											
82-81	16	25%	6%	38%	31%	0%	13%	38%	44%	0%	6%
83-81	16	25%	0%	56%	19%	0%	25%	0%	44%	31%	0%
84-81	16	13%	6%	56%	25%	0%	25%	6%	50%	19%	0%
85-81	16	19%	0%	31%	50%	0%	31%	19%	25%	25%	0%
86-81	16	13%	0%	13%	75%	0%	31%	31%	31%	0%	6%
87-81	16	19%	0%	6%	75%	0%	44%	19%	38%	0%	0%
88-81	16	19%	0%	13%	69%	0%	38%	25%	38%	0%	0%
89-81	16	44%	13%	6%	38%	0%	38%	44%	13%	0%	6%
90-81	16	44%	19%	6%	31%	0%	50%	31%	19%	0%	0%
Mean											
82-86		19%	3%	39%	40%	0%	25%	19%	39%	15%	3%
87-90		**31%**	**8%**	**8%**	**53%**	**0%**	**42%**	**30%**	**27%**	**0%**	**2%**
82-90		24%	5%	25%	46%	0%	33%	24%	33%	8%	2%
D. TRADITIONAL _FOREIGN_ BANKS											
Model 1											
82-81	4	0%	50%	50%	0%	0%	0%	0%	25%	50%	25%
83-81	4	0%	25%	50%	25%	0%	0%	25%	25%	25%	25%
84-81	4	0%	25%	75%	0%	0%	0%	0%	50%	25%	25%
85-81	4	0%	25%	25%	50%	0%	25%	0%	0%	50%	25%
86-81	4	0%	25%	0%	75%	0%	25%	50%	0%	0%	25%
87-81	4	75%	25%	0%	0%	0%	25%	50%	0%	0%	25%
88-81	4	50%	0%	0%	25%	25%	25%	50%	0%	0%	25%
89-81	4	75%	0%	0%	25%	0%	25%	50%	0%	0%	25%
90-81	4	25%	0%	25%	50%	0%	25%	25%	25%	0%	25%
Mean											
82-86		0%	30%	40%	30%	0%	10%	15%	20%	30%	25%
87-90		**56%**	**6%**	**6%**	**25%**	**6%**	**25%**	**44%**	**6%**	**0%**	**25%**
82-90		25%	19%	25%	28%	3%	17%	28%	14%	17%	25%

This table reports the major sources of developments in the productivity and efficiency of the Turkish banks by ownership. Underlying Malmquist measures are calculated relative to fixed reference frontier, 1981. Definition of the sources is as follows: Productivity GROWTH because of Technological Progress: TFPCH>1, and TECCH> (1 and EFFCH); Productivity GROWTH because of Efficiency Increase: TFPCH>1, and EFFCH> (1 and TECCH); Productivity LOSS because of Technological Regress: TFPCH<1 and TECCH<(1 and EFFCH); Productivity LOSS because of Efficiency Decrease: TFPCH<1, and EFFCH<(1 and TECCH); Efficiency INCREASE because of PTE Increase: EFFCH>1, and PEFFCH>(1 and SCH), Efficiency INCREASE because of SE Increase: EFFCH>1, and SCH>(1 and PEFFCH); Efficiency DECREASE because of PTE Decrease: EFFCH<1 and PEFFCH<(1 and SCH), Efficiency DECREASE because of SE Decrease: EFFCH<1, and SCH<(1 and PEFFCH).

Panels B, C, and D of the table suggest that main cause of productivity growth in public, private and foreign banks was efficiency increase. However, the role of technical progress in driving productivity is more emphasized in foreign banks, as the productivity growth is driven proportionately by both technical progress and efficiency increase. All types of banks that experienced productivity loss incurred the loss mainly due to technical regress. Efficiency increases in private and public banks are the product of improvements in pure technical efficiency, not in scale efficiency, while the opposite is true for the foreign banks. Efficiency decreases, on the other hand, are mainly as a result of managerial mistakes, not adverse wrong moves in scale for private and foreign banks, the opposite is true for public banks. These results indicate that scale adjustments are in wrong direction for public banks as these giant banks may be experiencing diseconomies of scale.

7. Concluding Remarks

By utilizing a DEA-type Malmquist Index approach, we investigated the initial effects of new bank entries and financial reforms introduced during the 1980s on the productivity, efficiency, and technology growth of the traditional Turkish commercial banks. Our results suggest that productivity and efficiency of the traditional banks has initially deteriorated. However, over time, especially in the second half of the 1980s, the traditional banks have recorded significant productivity improvements. It appears that it took traditional banks a number of years to adjust to the challenging conditions of the new operating environment. Overall, the productivity growth was mainly driven by the efficiency increases, i.e., substantial efforts of the inefficient banks to catch up with the best practice banks, rather than technical progress, i.e., the expansion of production frontier outward by the leading banks. Efficiency increases, on the other hand, were mainly as a result of the improvements in management practices rather than the improvements in scale. Our results by ownership indicate that once the uneven treatment between private banks and state banks is reduced gradually after liberalization, the performance difference between those banks has started to vanish because private banks, domestic or foreign, recorded much higher productivity and efficiency increases. These results imply that financial reforms put into effect after 1980 were somewhat successful in promoting competition among the traditional Turkish banks that have been enjoying a quiet life for a long time, and in initiating a noticeable upward trend in their productivity and efficiency performance.

The strong efficiency increases observed among these banks indicate that Turkish banks are very good at "imitating" (replicating the production technologies of leading banks) and but not at innovating (yielding more outputs from a given

amount of inputs by inventing new techniques). The less than expected technical progress in traditional banks suggest that there may be still some market and regulatory distortions that prevent these banks from innovating and moving the production frontier outward. As advocated in the finance literature, deficiencies, which exist in a financial system, may distort the production and/or diffusion of financial innovation. Although product development and innovation is originally a marketing activity, Turkish banks have not had a marketing organization until 1983. In may be that the real economy and its non-financial participants were not sophisticated enough to create substantial demand for sophisticated financial products and services, which would justify their research and development (production) costs. Furthermore, the less than perfect legal infrastructure may be another impediment for the production of complicated financial contracts by Turkish banks. For instance, the delay in the inception of derivative instruments and markets in Turkey is closely related to the lack of sophistication in the marketplace and to the inexistence of strong legal system that will enforce these contracts. It appears that the internal performance of financial institutions (their efficiency, productivity, profitability, competitiveness and innovativeness, etc.) is closely related to the performance of their external environment (legal, social and regulatory apparatus).

References

Akguc, O. 1989. Turkiye'de Bankacilik (Banking in Turkey), Gercek Yayinevi, Istanbul.

Akcaoglu, E. 1998. Financial Innovation in Turkish Banking, Capital Markets Board publication No.127, Ankara.

Akyuz, Y. 1990. Financial System and Policies in Turkey in the 1980s, in Aricanli, T. and Rodrik, D., (eds.), The Political Economy of Turkey - Debt, Adjustment and Sustainability, Macmillan, London.

Altunbas, Y., Molyneux, P. and Murphy, N. 1994. Privatization, Efficiency and Public Ownership in Turkey - An Analysis of the Banking Industry 1991-1993, Institute of European Finance, unpublished working paper.

Altunbas, Y., Evans, L. and Molyneux, P. 2001. Bank Ownership and Efficiency, *Journal of Money, Credit and Banking*, Vol. 33 (November), pp. 926-954.

Banks Association of Turkey, 1993. Banks in Turkey, Ankara.

Bauer, P.W., Berger, A.N., Ferrier, G.D. and Humphrey, D.B. 1998. Consistency Conditions for Regulatory Analysis of Financial Institutions: A Comparison of Frontier Efficiency Methods. *Journal of Economics and Business* 50, 85-114.

Berg, S.A., Forsund, F.R. and Jansen, E.S. 1992. Malmquist Indices of Productivity Growth During the Deregulation of Norwegian banking, 198-89. *Scandinavian Journal of Economics* 94, S211-S228.

Berger A.N. and Humphrey, D.B. 1997. Efficiency of Financial Institutions: International Survey and Directions for Future Research. *European Journal of Operational Research* 98, 175-212.

Berger, A.N. and Mester, L.J. 1997. Inside the Black Box: What Explains Differences in the Efficiencies of Financial Institutions? *Journal of Banking and Finance* 21, 895-947.

Bhattacharya, A., Lovell, C.A.K. and Sahay, P. 1997. The Impact of Liberalization on the Productive Efficiency of Indian Commercial Banks. *European Journal of Operational Research* 98, 332-345.

Caves, D.W., Christensen, L.R. and Diewert, W.E. 1982. The Economic Theory of Index Numbers and the Measurement of Input, Output, and Productivity. *Econometrica* 50:6, 1393-1414.

Demirguc-Kunt, A. and Detragiache, E. 1998. Financial Liberalization and Financial Fragility. World Bank Development Research Group, Working Paper no: 1917.

Denizer, C. November 1997. The Effects of Financial Liberalization and New Bank Entry on Market Structure and Competition in Turkey. World Bank Development Research Group, Working Paper no: 1839.

DeYoung, R. and Hasan, I. 1998. The Performance of de Nova Commercial Banks: A profit efficiency approach. *Journal of Banking and Finance* 22, 565-87.

DeYoung, R., Hasan, I. and Kirchhoff, B. 1998. The Impact of Out-of-State Entry on the Cost Efficiencies of Local Commercial Banks. *Journal of Economics and Business* 50, 191-203.

Elyasiani, E. and Mehdian, S.M. 1995. The Comparative Efficiency Performance of Small and Large U.S. Commercial Banks in the Pre- and Post-Deregulation Eras. *Applied Economics* 27, 1069-79.

Fare, R., Grosskopf, S., Norris M. and Zhang, Z. 1994. Productivity Growth, Technical Progress, and Efficiency Change in Industrialized Countries. *The American Economic Review*, vol.84, no.1, 66-83.

Farrell, M.J. 1957. The Measurement of Production Efficiency. *Journal of the Royal Statistical Society* 120, Series A, General, 253-281.

Gilbert, R.A. and Wilson, P.W. 1998. Effects of Deregulation on the Productivity of Korean Banks. *Journal of Economics and Business* 50, 133-155.

Grabowski, R., Rangan, N. and Rezvanian, R. 1994. The Effect of Deregulation on the Efficiency of U.S. Banking Firms. *Journal of Economics and Business* 46, 39-64.

Grifell-Tatje, E. and Lovell, C.A.K. 1996. Deregulation and Productivity Decline: The Case of Spanish Savings Banks. *European Economic Review* 40, 1281-1303.

Hasan, I. and Marton, K. 2001. Development and Efficiency of the Banking Sector in a Transitional Economy: Hungarian Experience, Working Paper, New Jersey Institute of Technology, Newark, NJ, US.

Humphrey, D.B. 1993. Cost and Technical Change: Effects from Bank Deregulation. *Journal of Productivity Analysis* 4, 5-34.

Humphrey, D.B. and Pulley, L.B. 1997. Banks' Responses to Deregulation: Profits, Technology, and Efficiency. *Journal of Money, Credit, and Banking* 29, 73-93.

Isik, I. and Hassan, M.K. 2002. Technical, Scale and Allocative Efficiencies of Turkish Banking Industry. *Journal of Banking and Finance* 26, 719-766.

Kumbhakar, S.C., Lozana-Vivas, A., Lovell, C.A.K. and Hasan, I. 2001. The Effects of Deregulation on the Performance of Financial Institutions: The case of Spanish savings banks. *Journal of Money, Credit and Banking* 33, 101-121.

Kwan, S.H. 1997. Efficiency of U.S. Banking Firms - An Overview, Federal Reserve Bank of San Francisco. *Economic Letter*. Number 97-06.

Leightner, J.E. and Lovell, C.A.K. 1998. The Impact of Financial Liberalization on the Performance of Thai Banks. *Journal of Economics and Business* 50, 115-131.

Lozano, A. 1995. Efficiency and Technical Change for Spanish Banks. *Applied Financial Economics* 8, 289-300.

Malmquist, S. 1953. Index Numbers and Indifference Surfaces. *Trabajos de Estadistica* 4, 209-42.

Mester, L.J. 1996. A Study of Bank Efficiency Taking into Account Risk-Preferences. *Journal of Banking and Finance* 20, 1025-1045.

Mitchell, K. and Onvural, N.M. 1996. Economies of Scale and Scope at Large Commercial Banks: Evidence from the Fourier Flexible Functional Form, *Journal of Money, Credit, and Banking* 28, 178-199.

Mukherjee, K., Ray, S.C. and Miller, S.M. 2001. Productivity Growth in Large US Commercial Banks: The Initial Post-Deregulation Experience. *Journal of Banking and Finance* 25, 913-39.

Shyu, J. 1998. Deregulation and Bank Operating Efficiency: An Empirical Study of Taiwan's Banks. *Journal of Emerging Markets*, 3, 1, 27-46.

Wheelock, D.C. and Wilson, P.W. 1999. Technical Progress, Inefficiency, and Productivity Change in U.S. Banking, 1984-1993. *Journal of Money, Credit, and Banking* 31-2, 212-234.

Yulek, M.A. 1998. Financial Liberalization and the Real Economy: The Turkish Experience. CMBT publications, Number: 110. Ankara.

Yildirim H.S. and Philippatos, G.C. 2002. Efficiency of Banks: Recent Evidence from the Transition Economies of Europe −1993-2000. Working Paper, University of Saskatchevan, Saskatoon, Canada.

Zaim, O. 1995. The Effect of Financial Liberalization on the Efficiency of Turkish Commercial Banks. *Applied Financial Economics* 5, 257-64.