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Mumcu, Ayşe and Zenginobuz, Unal

2 January 2002

Forthcoming in: N. Colton and S. Neaime (Eds.), *Money and Finance in the Middle East : Missed Opportunities or Future Prospects? - Research in the Middle East Economics, Volume 6*, 137-167, Elsevier, 2005 (forthcoming).

AN ANALYSIS OF MERGERS AND ACQUISITIONS IN THE TURKISH BANKING SECTOR

Ayşe Mumcu and E. Ünal Zenginobuz

Department of Economics and Center for Economics and Econometrics Boğaziçi University
80815 Bebek, İstanbul TURKEY

Revised: January 3, 2002

ABSTRACT

We explore various aspects of mergers and acquisitions in the banking industry within a simple model that allows explicit comparison of sector performance before and after the mergers and acquisitions. The industry structure we look at involves a few dominant banks and a competitive fringe, which we take it as the structure most likely to resemble the Turkish banking industry in the aftermath of the ongoing restructuring process. Using a reasonable set of parameters to simulate the model, we do comparative statics exercises regarding the impact of mergers among domestic as well as with foreign banks on equilibrium outcomes.

JEL Classification Numbers

L13, G21, G34

Keywords

banking, mergers and acquisitions, imperfect competition, Turkey

1. Introduction

Turkish economy has been hit by two very severe crises recently, namely those of November 2000 and February 2001. These crises caught the Turkish banking sector in the middle of a sweeping restructuring process, which was one of the critical components of the comprehensive disinflation program Turkey adopted at the beginning of 2000. The disinflation program involved tight fiscal and monetary policies, large-scale structural reforms, and a pre-determined exchange rate policy to serve as a nominal anchor in reducing inflation from its chronically high levels. Regarding the banking sector, the disinflation program of 2000 foresaw revamping of the legal and regulatory framework for banking supervision in accordance with EU and world standards, correcting the weaknesses in the private banking system, and restructuring and the ultimately privatization of the state banks. Towards this end, the powers of the independent Banking Regulatory and Supervisory Agency (BRSA), which was established as part of a new banking law in June 1999, were further strengthened through a series of amendments approved in the Parliament in December 1999. As the single regulatory and supervisory agency to oversee the sector, BRSA has completely independent jurisdiction over the entry and exit of banks and over changes to the regulatory framework.

Prior to the disinflation program the Turkish banking industry had faced distorted incentives in the chronically high and erratic inflationary environment, which went together with increasing government deficits over the last decade. Excessive and persistent public sector borrowing requirements led to very high real returns in government issued securities that allowed some private banks to accumulate asset portfolios that were far from sound. Together with the slackening of entry requirements to the sector and the overall weakness of the regulatory framework, this environment contributed to the fragmentation of the banking sector into small banks. A significant number of small banks carrying weak asset portfolios became

insolvent over time and had to be transferred to the Savings Deposit Insurance Fund (SDIF).[1] The first banking crisis in December 2000, as well as the one that followed the financial crisis in February 2001, can be seen as a culmination of persistent distortions in the Turkish banking sector.

The new and tougher regulatory framework, together with the new macroeconomic environment that was to arise from the disinflation program of 2000, was expected to lead to significant changes in the Turkish banking sector. This included the increased likelihood of significant mergers and consolidation in the sector. Such a process was also expected to increase the presence of foreign banks in Turkey through acquisitions. Both of these developments have gained increased momentum after the already ailing Turkish banking sector was further hit by the November 2000 and the February 2001 crises.

Understanding the various impacts of mergers and acquisitions requires modeling of the banking industry structure and behavior of banks. The objective of this paper is to explore various aspects of mergers and acquisitions within a simple albeit rigorous model that allows explicit comparison of sector performance before and after mergers and acquisitions. The model studies strategic interaction among commercial banks in an imperfectly competitive banking industry, and allows us to consider the determinants of feasibility and desirability of mergers and acquisitions among domestic as well as foreign banks.

Given the aims of the ongoing fundamental reform process in the Turkish banking sector, we abstract from much of the features that are currently relevant and concentrate on a sector structure that is expected to arise after the proposed restructuring is successfully completed. This amounts to looking at a banking industry in a stabilized economy in which all public banks are privatized, banking regulations are in place and fully enforced.

[1] SDIF was established in 1983. The Turkish Central Bank had managed SDIF from its inception until August 30, 2000, when it was transferred to BRSA on August 30, 2000.

The main features of the stylized model we develop in this paper can be summarized as follows: Adopting an Industrial Organization approach, we consider an imperfectly competitive banking industry. Banks are assumed to act as independent entities that react strategically to their environment with deposits received, loan amounts serviced, and net foreign position viewed as strategic variables. The industry structure we look at involves a few dominant banks with a (competitive) fringe, which we take as the structure most likely to resemble the Turkish banking industry in the aftermath of the ongoing restructuring process. For a given as well as changing number of firms, we first study the features of equilibrium outcomes such as the size of banking industry, interest rates (deposit, loan, and interbank rates), etc. Using a reasonable set of parameters to simulate the model, we go on to do various comparative statics exercises regarding the impact of mergers among domestic as well as with foreign banks on equilibrium outcomes. Other comparative statics exercises that we carry out include the impact of deposit insurance, reserve requirement ratios, the country's international credit rating, and the global economic conditions.

The plan of the paper is as follows: Section 2 provides a quick glance at the Turkish banking industry structure and summarizes the developments that have rendered it vulnerable to crises of November 2000 and February 2001. In Section 3 we present the model we study. Section 4 presents the empirical application. Discussion and conclusions follow in Section 5.

2. A Quick Glance at The Turkish Banking Industry Structure[2]

At the end of September 2001, there were 68 banks operating in Turkey.[3] As of that date, the total assets in the Turkish banking sector amounted USD 110.7 billion. The deposits stood at USD 68.8 billion for the whole industry, while the total amount of loans extended by the

[2] The information and data presented in this section is compiled from various periodic reports by the Banks Association of Turkey and BRSA. The websites (in English) of the Banks Association of Turkey and BRSA can be reached at http://www.tbb.org.tr/english and http://www.bddk.org.tr/english/mainpage/index_eng.htm, respectively.
[3] The most recent official data on the Turkish banking industry is as of September 30, 2001.

industry equaled USD 28.6 billion. Further data on the Turkish banking sector as of September 2001 is presented below in Table 1.

TABLE 1 ABOUT HERE

Of the total of 68 banks, 52 are commercial (deposit money) banks while the rest are investment and development banks. Of the 52 commercial banks, 3 are state banks, 24 are privately owned domestic banks, 16 are privately owned foreign banks, and 9 banks are under the management of SDIF.

As of September 2001, the total assets of 24 private domestic banks constituted 53.6% of the total assets of the Turkish banking sector. The share of state banks in total assets stood at 27.2%, while foreign banks' share in total assets were 2.6%.

A cursory look at the evolution of Turkish banking sector from early 1980s until the November 2000 crisis reveals that it has significantly expanded during this period. The number of banks increased from 43 in 1980 to 66 in 1990 and to 79 by the end of 2000. As noted above, in the aftermath of the two recent financial crises this number now stands at 68. Total employment in the banking sector has also increased considerably during the 1980-2000 period: starting from 125,000 in 1980, it went up to 154,000 in 1990, and reached 170,000 in 2000. However, since the end of 2000 the number of employees has decreased by almost 15% to 147,453 in the first 9 months of 2001, indicating the extent of the shock received by the industry.[4]

Table 2 displays the changes in various financial indicators for the Turkish banking sector for the 1980-2000 period. Total assets of the Turkish banking sector increased from USD 20.8 billion (28.6% of GNP) in 1980 to USD 58.2 billion (38.2% of GNP) in 1990 and to USD

[4] Information on the developments in the Turkish banking sector over the 1980-2000 periods is compiled from various BRSA reports, in particular from BRSA (2001).

155 billion (76.9% of GNP) in 2000. The share of state banks in banking sector total assets has decreased from 45% in 1980 to 34% in 2000. Recall that further restructuring in the first 9 months of 2001 has reduced this figure down to 27.4%. The number of foreign banks increased from 4 to 18 in 2000. The foreign banks' share in total banking sector assets increased from 3.7% in 1992 to 5.4% in 2000, but this figure stood at 2.6% at the end of September 2001. Foreign presence in the Turkish banking sector is thus very low compared to similar emerging market economies.

TABLE 2 ABOUT HERE

Tables 1 and 2 also reveal that the share of loans in total assets of the banking sector declined from 47% in 1990 to 33% in 2000, and finally to 28.5% at the end of September 2001. The ratio of loans to deposits also decreased from 84% in 1990 to 51% in 2000, and to 42.8% as of September 2001. The credit to GNP ratio stood at a comparatively very low level of 25% at the end of 2000.

There are a number of reasons why the Turkish banking sector has continually moved away from its traditional financial intermediation since the beginning of 1990s. The last decade was one of persistently high and volatile inflation as well as highly erratic growth rates for the Turkish economy. Liberalization of the current account in 1989 led to external capital inflows, but these were mostly very short-term in nature. External capital inflows have proven to be very sensitive to macroeconomic instabilities that distressed the Turkish economy and their fragility, in turn, further contributed to the volatility of economic variables. This was accompanied by currency substitution as confidence in Turkish Lira was continuously eroding in the presence of high inflation. The maturity of bank funding sources has shortened significantly and at the same time the share of foreign currency liabilities in total liabilities has increased considerably.

Another factor that contributed to the increase in foreign exchange open position of the banking sector was the attractiveness of borrowing abroad to purchase government securities that offered very high real interest rates. All throughout the 1990s persistent and increasing public sector borrowing requirements were financed through various government securities sold in the domestic financial markets.

As for the state banks, their financial health was severely compromised as they were increasingly being used to finance various government expenditures. This, together with inefficient management due to appointments based on political affiliation rather than merit, has resulted in the accumulation of excessive amounts of the so called ‘‘duty losses’’, which led the illiquid state banks to borrow from the markets at very high rates and short maturities. In turn, this has contributed to private banks’ practice of borrowing abroad to lend at very high domestic interest rates.

For all practical purposes, there were no effective internal risk assessment and management systems that were in use while liquidity, interest rate, and foreign exchange risks in the Turkish banking sector continually increased throughout the 1990s. In addition, the banking system was not subject to effective supervision and regulation by an independent public agency.

The increasingly more precarious Turkish banking sector was put through an early test in the wake of the 1994 financial crisis, which was only contained when interest rates were let to rise very sharply and the Turkish Lira depreciated by more than 50%. The banks with short positions in foreign exchange and mismatch of maturities incurred large losses. In addition, a significant run on deposits occurred which put several banks in severe liquidity problems. Further deposit withdrawals ensued when three small banks had to be put on the liquidation block. The run on the banks could only be contained when government introduced hundred percent guarantee for savings deposits and declared that it would provide liquidity to the banks in need. These developments revealed that the Turkish banking sector was quite segmented in

that it contained a small group of rather efficient and profitable banks and quite a few small banks at the margin that were prone to falling insolvent in the face of financial downturns.

The Turkish banking sector did recover from the 1994 crisis and managed to grow after 1995. However, a number of key issues, such as risk management and prudent regulation and supervision of the banking sector, were never seriously addressed. In fact, the hundred percent guarantee on savings deposits still continue today.

Before the structural reforms that the disinflation program that Turkey adopted at the beginning of 2000 could be fully implemented and take effect in the area of banking, other aspects of the program had started to seriously compromise the financial health of the banking sector once again. The disinflation program initially led to a sharp decline in the interest rates, but the government's financing needs continued. The pre-announced exchange rate path and the real appreciation of the Turkish Lira allowed banks once more to borrow abroad at low rates to invest in longer term fixed rate Treasury bills. Soaring maturity mismatches and foreign currency open positions were again the end result.

Delays in structural reforms in several key areas, together with the sharp increase in current account deficit, led to loss of confidence in the disinflation program by the Fall of 2000. An outflow of foreign funds ensued, leading to sharp increases in Treasury bill rates, which in turn led to serious financing difficulties for several banks that had concomitant maturity mismatch and foreign exchange open positions. In the resulting crisis in November 2000 several private banks had to be put under the management of SDIF. Despite efforts to calm the markets, the November 2000 crisis was never really contained, leading to increasing loss of credibility for the disinflation program, and finally the exchange rate peg, the vital component of the disinflation program, had to be abandoned in February 2001. In the aftermath of the crisis, once again a number of banks became insolvent and had to be taken under the umbrella of SDIF.

After the February 2001 crisis a new economic program, named 'Transition to a Strong Economy', was adopted. This program called for completion of the structural transformation of

the banking sector and it is still under effect. In addition to efforts to further improve banking regulation and supervision, state banks and banks under the umbrella of SDIF are currently undergoing drastic financial restructuring. As Table 1 indicates, the Turkish banking industry has already undergone a considerable amount of consolidation. There have already been acquisitions by foreign banks and several mergers among private domestic banks. Further mergers and acquisitions are expected to follow in the near future.[5]

Table 3 below presents data on a group of privately owned commercial banks in Turkey as of the end of September 2001. The first group, consisting of banks with assets in the USD 5-10 billion range, is what can be considered as the "dominant" group of banks with market power. The total assets of the 5 banks in this group make up about 64% of the assets of all privately owned commercial banks, domestic as well as foreign.[6] Most of the rest of the banks listed in Table 3 are considerably smaller in size than the first (dominant) group. This group can be considered as the "fringe" without market power. The total assets of the 20 banks listed in Table 3 make up about 95% of the assets of all privately owned commercial banks, and the same ratio for deposits and loans are even higher.[7]

TABLE 3 ABOUT HERE

3. A Stylized Model of the Banking Industry

In the Industrial Organization approach we adopt here, a bank is viewed as a firm that uses labor and physical capital as inputs to produce different financial services for depositors and

[5] An earlier version of this paper predicted a Turkish banking sector with about 20 private commercial banks (see Mumcu-Serdar et al., 2001). Table 1 reveals that the number of private commercial banks already fell to 24 by the end of September 2001.

[6] In fact, after September 2001, Garanti, the fourth largest private bank in Table 3, merged with Osmanlı, the sixth largest private bank according to Table 3, thereby becoming the largest private commercial bank in Turkey. With this merger, the share of the first five largest private commercial banks in total sector assets now reached 69.8%.

[7] In these calculations, foreign owned commercial banks have been included among the privately owned commercial banks. The banks under SDIF management have not been included in this category.

borrowers.[8] The banking activity is thus viewed as the production of deposit and loan services. In addition, we model the banking industry as an imperfectly competitive environment in which banks act as independent entities. As an approximation of the structure of the Turkish banking industry we will assume that there are few dominant banks together with a competitive fringe. The economy is assumed to be open so that the banking industry can borrow and lend freely in the world financial markets.

Specifically, we assume there to be a total of N domestic banks operating in an oligopolistic industry. There are assumed to be n banks in the dominant group while the competitive fringe consists of m banks, with $n + m = N$. Each bank is characterized by a cost function,

$$c_i = \left(D_i, L_i, F_i \right),$$

where D_i is the deposits collected and L_i is the loans extended by bank i, and F_i is bank i's net position in the world financial market. The balance sheet of a typical bank will therefore look as displayed below:

Assets	**Liabilities**
Loans (L)	Deposits (D)
Reserves (R)	Net Foreign Position (F)

Note that the reserves for a bank i is given by

$$R_i = D_i - L_i + F_i .$$

Cash reserves, C_i, and the net position on the interbank market, M_i, will make up bank i's reserves R_i.

[8] For various models of banking industry structure and bank behavior, see Freixas and Rochet, 1996.

The cash reserves C_i bear no interest, and therefore will be set at the minimum level required by the Central Bank. Letting α be the reserve requirement ratio on domestic deposits and β be the reserve requirement ratio on foreign credits set by the Central Bank, we will have

$$C_i = \alpha D_i + \beta F_i, \quad \text{for all } i .$$

The banks collect the deposits from households and borrow from international financial markets, and channel these funds to firms to finance their investment needs. The third actor in the real sector is the government. The government finances its deficit G either by issuing securities ΔB or by issuing high-powered money ΔM_0. Assuming that households do not hold cash, the high-powered money is only used to finance banks' compulsory cash reserves held in their accounts at the Central Bank. That is,

$$M_0 = \sum_{i=1}^{N} C_i = \alpha \sum_{i=1}^{N} D_i + \beta \sum_{i=1}^{N} F_i .$$

We will assume that banks are differentiated in terms of their perceived riskiness in the domestic financial market as well as in the foreign financial markets. Each bank i faces an upward sloping inverse supply function of savings $r_i^D(S)$, where $S = B + D$, with B being the outstanding government securities and $D = \sum_{i=1}^{N} D_i$. Banks' different perceived financial strengths are assumed to be summarized by parameters $\lambda_i \geq 1$ such that $r_i^D(S) = \lambda_i r^D(S)$, where $r^D(S)$ is the upward sloping inverse supply function of savings faced by the least risky bank (i.e. the bank i^* with $\lambda_{i^*} = 1$). Each bank i is assumed to face a downward sloping inverse demand function of loans $r^L(L)$, where $L = \sum_{i=1}^{N} L_i$. The cost of borrowing from the international financial market for bank i is $r_i^F = \mu_i r^F$, where $\mu_i \geq 1$ is bank i's perceived strength in the

international financial market and r^F is the risk free foreign interest rate. Finally, banks can borrow and lend in the interbank market at rate r.

3.1. The Behavior of the Dominant Group and the Competitive Fringe

The choice variables of the banks are deposits D_i, loans L_i, and net foreign position F_i. Taking into account the operational costs, the profit of bank i will be given by

$$\pi_i\left(D_i, L_i, F_i\right) = r^L\left(L\right)L_i + rM_i - \lambda_i r^D\left(S\right)D_i - \mu_i r^F F_i - c_i\left(D_i, L_i, F_i\right), \tag{1}$$

where M_i, the net position of the bank i in the interbank market, is

$$M_i = \left(1-\alpha\right)D_i + \left(1-\beta\right)F_i - L_i. \tag{2}$$

Substituting (2) in (1) yields

$$\pi_i\left(D_i, L_i, F_i\right) = \left[r^L\left(L\right) - r\right]L_i + \left[r\left(1-\alpha\right) - \lambda_i r^D\left(S\right)\right]D_i + \left[r\left(1-\beta\right) - \mu_i r^F\right]F_i - c_i\left(D_i, L_i, F_i\right). \tag{3}$$

Thus, the banks' profits are the sum of the intermediation margins on loans, deposits, and the net foreign position net of operational costs.

The banks in the competitive fringe are price takers in all three markets. That is, in addition to the risk free foreign rate r^F, they take the loan rate r^L and the deposit rate r^D determined by the dominant group as given as well. The first order conditions for the banks in the competitive fringe are

$$\frac{\partial \pi_i^f}{\partial D_i} = r\left(1-\alpha\right) - \lambda_i r^D - \frac{\partial c_i}{\partial D_i} = 0, \tag{4}$$

$$\frac{\partial \pi_i^f}{\partial L_i} = r^L - r - \frac{\partial c_i}{\partial L_i} = 0, \tag{5}$$

and

$$\frac{\partial \pi_i^f}{\partial F_i} = r\left(1-\beta\right) - \mu_i r^F - \frac{\partial c_i}{\partial F_i} = 0. \tag{6}$$

Let $L_i^f\left(r^L, r_i^D, r_i^F, r\right)$, $D_i^f\left(r^L, r_i^D, r_i^F, r\right)$, and $F_i^f\left(r^L, r_i^D, r_i^F, r\right)$ be the loan supply, deposit demand, and net foreign position of the banks in the competitive fringe, respectively, found by solving (4), (5), and (6) simultaneously. Define

$$L^f\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{m} L_i^f\left(r^L, r_i^D, r_i^F, r\right), \tag{7}$$

$$D^f\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{m} D_i^f\left(r^L, r_i^D, r_i^F, r\right), \tag{8}$$

and

$$F^f\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{m} F_i^f\left(r^L, r_i^D, r_i^F, r\right) \tag{9}$$

as the total loan supply, the total deposit demand, and the total net foreign position of the fringe, respectively. The residual demand for loans function that the dominant group will face will be $L^r\left(r^L\right) = L\left(r^L\right) - L^f$, where $L\left(r^L\right)$ is the total demand for loans (inverse of $r^L\left(L\right)$). Similarly, the residual supply of deposits function will be $S^r\left(r^D, \lambda, \mu\right) = S\left(r^D, \lambda, \mu\right) - D^f - B$, where $S^r\left(r^D, \lambda, \mu\right)$ is the total supply of savings, with $\lambda = \left(\lambda_1, \cdots, \lambda_N\right)$ and $\mu = \left(\mu_1, \cdots, \mu_N\right)$. The banks in the dominant group are assumed to engage in quantity (Cournot) competition in determining their supply of loans and demand for deposits. Given the behavior of the competitive fringe, the first order conditions summarizing the dominant group banks' maximizing behavior are

$$\frac{\partial \pi_i^d}{\partial D_i} = r\left(1-\alpha\right) - \lambda_i\left(D_i \frac{\partial S^{r^{-1}}\left(r^D, \lambda, \mu\right)}{\partial D_i} + S^{r^{-1}}\left(r^D, \lambda, \mu\right)\right) - \frac{\partial c_i}{\partial D_i} = 0, \tag{10}$$

$$\frac{\partial \pi_i^d}{\partial L_i} = L_i \frac{\partial L^{r^{-1}}\left(r^L\right)}{\partial L_i} + L^{r^{-1}}\left(r^L\right) - r - \frac{\partial c_i}{\partial L_i} = 0, \tag{11}$$

and

$$\frac{\partial \pi_i^d}{\partial F_i} = r\left(1-\beta\right) - \mu_i r^F - \frac{\partial c_i}{\partial F_i} = 0. \tag{12}$$

Let $L_i^d\left(r^L, r_i^D, r_i^F, r\right)$, $D_i^d\left(r^L, r_i^D, r_i^F, r\right)$, $F_i^d\left(r^L, r_i^D, r_i^F, r\right)$ be the loan supply, deposit demand, and net foreign position of the banks in the dominant group, respectively, found by solving (10), (11), and (12) simultaneously. Define

$$L^d\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{n} L_i^d\left(r^L, r_i^D, r_i^F, r\right), \tag{13}$$

$$D^d\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{n} D_i^d\left(r^L, r_i^D, r_i^F, r\right), \tag{14}$$

and

$$F^d\left(r^L, r_i^D, r_i^F, r\right) \equiv \sum_{i=1}^{n} F_i^d\left(r^L, r_i^D, r_i^F, r\right) \tag{15}$$

as the total loan supply, the total deposit demand, and the total net foreign position of the dominant group, respectively.

3.2. Equilibrium

Summing condition (2) over all banks will give the market clearing condition in the interbank market as

$$(1-\alpha)\left[D^d(\cdot)+D^f(\cdot)\right]+(1-\beta)\left[F^d(\cdot)+F^f(\cdot)\right]=L^d(\cdot)+L^f(\cdot). \tag{16}$$

The market clearing conditions in the loan market and the deposit market will be given by

$$L\left(r^L\right) = L^d(\cdot) + L^f(\cdot), \tag{17}$$

and

$$S\left(r^D, \lambda, \mu\right) = B + D^d(\cdot) + D^f(\cdot), \tag{18}$$

respectively. Note that all of the banks are assumed to be price takers in the foreign credit markets. Solving (16), (17), and (18) simultaneously will give the non-cooperative equilibrium in the banking industry for given N, λ_i, μ_i, α, β, and r^F. Some of the comparative statics exercises that can be carried out thus involve changes in N, n, and m (impact of mergers);

changes in α and β (impact of reserve requirement ratios); changes in λ_i (impact of deposit insurance); μ_i (impact of country's international credit rating, or acquisitions by foreign banks); and r^F (impact of global economic conditions).

4. Empirical Application: Mergers and Acquisitions

We use special functional forms in simulating the model. As the inverse demand function for loans and the inverse supply function of deposits we use

$$r^L(L) = A_L - B_L L \tag{19}$$

and

$$r^D(S) = A_D + B_D S\,, \tag{20}$$

respectively. As for the cost functions, we assume that the banks in the dominant group have a cost advantage over those in the fringe.[9] We assume that the costs of banks in the dominant group are linear in deposits and loans, but quadratic in funds borrowed from abroad. The functional specification adopted for the cost function of the banks in the dominant group is

$$c^d(D_i, L_i, F_i) = K^d + \sigma_D D_i + \sigma_L L_i + \frac{\sigma_f}{2} F_i^2 \tag{21}$$

The banks in the fringe are assumed to have decreasing returns to scale in production. Their cost function is assumed to have the following form:

$$c^f(D_i, L_i, F_i) = K^f + \frac{\rho_D}{2} D_i^2 + \frac{\rho_L}{2} L_i^2 + \frac{\rho_F}{2} F_i^2 \tag{22}$$

The effect of the changes in the parameters of the model will be assessed mainly according to their impact on welfare. We use the standard welfare measure of total surplus (the sum of depositors' and creditees' surpluses and total profits of the banks) in quantifying welfare.

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[9] Evidence on economies of scale in banking the industry is mixed. Various studies show that only very small banks have a potential to achieve scale economies and that the average cost curve becomes quickly more or less flat for the larger firms (see Dermine, 1999, and references cited therein).

Mergers can take place either sequentially, which we will call *sequential mergers*, whereby one bank is acquired at a time, or through *block mergers* , whereby a number of banks are acquired together. The extent of consolidation will be much more under block acquisitions than under sequential acquisitions. In the sequential case, the market power and profits of the remaining banks are increased at each stage, making further acquisitions more costly for the acquiring bank.

To the extent possible we use data from the Turkish banking industry. When data is not available on a particular parameter, we concentrate on reasonable range of values and consider the robustness of results to changes in the parameter values. The base case for parameters used in most of empirical applications is summarized in Table 4 below. We used data from 1999, the most recent data before the November 2000 and February 2001 crises.

TABLE 4 ABOUT HERE

We took the group of privately owned commercial banks listed in Table 3 above as representing the completely privatized banking industry structure in our model. As already indicated, the assets of these 20 banks make up about 95% of the assets of all privately owned commercial banks in Turkey, and this ratio is even higher for deposits and loans. In the dominant group there are 5 banks, each with assets in the U.S.D 5-10 billion range. The total assets of these banks make up about 64.2% of the assets of all privately owned commercial banks. The rest of the banks listed in Table 3 are considerably smaller in size than the dominant group. This group of 15 banks is taken as the fringe without market power. Thus, as the base line values of n and m we take $n_0 = 5$ and $m_0 = 15$, respectively.

Using the 1999 figures, the reserve requirement of 6% is taken as the value for α, while the liquidity requirement ratio for liabilities in foreign currency of 3% is taken as the value for β

In arriving at values for K^d and K^f we use the overhead costs to assets ratio of 6% reported by Demirgüç-Kunt and Levine (1999).

Given the blanket deposit insurance in Turkey that every bank enjoys without discrimination, in the base case the perceived financial strength (from the viewpoint of depositors) of all banks are taken as equal, i.e. we take $\lambda^d = \lambda^f = 1$.

An average LIBOR rate for 1999 (expressed in terms of TL) is taken as the value for the risk free cost of borrowing in international markets. The values for μ^d and μ^f are arrived at by considering the difference in borrowing costs of representative banks from the dominant and the fringe groups.[10]

4.1. Mergers among Fringe Banks

4.1.1. Will a fringe bank acquire another fringe bank?

The first question we consider is whether a fringe bank will have an incentive to acquire another fringe bank. We first look at the case where the merged entity is still a fringe bank; the other case we look at is where the merged entity becomes a dominant bank.

Table 5 exhibits, for the base case as well as with higher fixed costs for the fringe, the change in the profits of the fringe banks as the size of the fringe varies. When a fringe bank acquires another fringe bank and the merged entity still remains a fringe bank, the post-merger profits of the fringe banks are higher, as observed in Table 5. However, a merger will actually take place if and only if both the acquiring and the acquired firms have incentives to merge. The maximum amount that a fringe bank will bid to acquire another fringe bank is the difference between its pre- and post-merger profits. A targeted fringe bank will accept an offer to merge if the bid it receives exceeds its pre-merger profits. Therefore, a merger will go through if and only

[10] We thank Cevdet Akçay for providing us this information on the perceived riskiness of the privately owned Turkish commercial banks in international financial markets.

if the maximum amount that the acquiring firm will be willing to bid exceeds the minimum amount the firm to be acquired is willing to accept.

TABLE 5 ABOUT HERE

We observe from Table 5 that in the base case there is no profitable acquisition of a fringe bank by another fringe bank, regardless of whether the acquisitions are carried out sequentially or in block. The increase in the profits of banks when the number of fringe banks is reduced by one from 15 to 14 is less than the pre-merger profit of a single bank.

As the fixed costs of the fringe banks increase, block acquisitions do become profitable, however. In the high fixed cost case presented in Table 5, 10 banks could profitably merge as a block. When there are 15 fringe banks, the profit of each fringe bank is TL 3.75 trillion. With 10 fringe banks merged, there will be 6 banks altogether in the fringe. The minimum total post-merger profit that will be sufficient to compensate each merging bank is TL 37.5 trillion. The profit of the merged bank will be TL 38.58 trillion in this case, which exceeds TL 37.5 trillion. We observe that sequential mergers are not profitable even in this case of high fixed costs.[11]

As mentioned above, a merger among fringe banks may lead to their acquiring enough resources to become one of the dominant banks. The comparative statics exercise that is involved here requires checking whether there exist incentives for the fringe banks to become dominant banks. Table 6 below shows that the profits of a fringe bank will increase when it is converted to a dominant firm, as to be expected. If the increase in profits exceeds the cost of acquiring the requisite technology to operate as a dominant bank, a single fringe bank will indeed choose to become a dominant bank.[12] For example, the profit of a fringe bank in an industry with $m = 15$ and $n = 5$ is TL 33.7 trillion, while the profit of a dominant bank in an

[11] As fixed costs do not affect the marginal decisions of banks, $\Delta\pi^f$ is the same for all levels of fixed costs. However, fixed costs affect the level of profits and thus the feasibility of mergers.

[12] The assumption here is that there are no other extra-economic barriers that would prevent a fringe bank from acquiring the requisite technology to become a dominant bank.

industry with $m = 14$ and $n = 6$ is TL 82.6 trillion. Therefore, if the cost of acquiring the requisite technology to operate as a dominant bank is less than TL 48.9 trillion, a fringe bank will choose to become a dominant bank.

TABLE 6 ABOUT HERE

Also observe from Table 6 that two fringe banks could profitably merge to become the sixth dominant bank in an industry structure with $m = 13$ and $n = 6$. The profit of a dominant bank in the industry structure with $m = 13$ and $n = 6$ is TL 96.1 trillion. This exceeds TL 67.4 trillion, which is the total pre-merger profits of the two fringe firms, by 28.7 trillion TL. Note that the profit advantage of becoming a dominant bank decreases in this case, making mergers among fringe firms less likely. We observe from Table 6 that it would not be profitable for three fringe banks to merge and then convert into a dominant bank.

4.1.2. Should Fringe Banks Merge?

We now turn to evaluating the desirability of mergers to see whether they conflict with the incentives of banks to merge. As can be seen from Figure 1, for the base case of parameters we consider, merging firms in the fringe may in fact lead to a decrease in total surplus as long as the size of the dominant group remains the same (the solid line in Figure 1). Recall from above that there were no incentives on the part of fringe firms to merge in this case either.

FIGURE 1 ABOUT HERE

On the other hand, if the fixed costs of the fringe banks were higher, it would be welfare improving to reduce the number of banks in the fringe through consolidations among themselves. In Figure 1 the dashed curve displays such a case, where the total surplus maximizing number of firms in the fringe (when $n = 5$) is 12, indicating desirability of mergers

with respect to the base case where *m* is 15. Though we would expect total surplus to increase with more competition, increasing *m* might not lead to higher welfare because of the fixed costs of operation. If fixed costs are sufficiently small, then increasing the number of banks in the fringe will always be welfare increasing. This is due to decreasing returns to scale in production for the fringe. Recall from above that, though sequential mergers were not profitable, block mergers did turn out to be profitable in this case. Note, however, that the reduction in the size of the fringe (to a total of 6 banks) leads to a smaller fringe than the optimal size identified in Figure 1.

Figure 2 displays the impact of changing the size of both the dominant and the fringe groups on total surplus. We observe that merging a number of fringe banks and turning them into a dominant bank will not necessarily increase welfare. For example, combining two fringe banks (thus reducing *m* to 13) and turning them into one dominant bank (thus making $n = 6$) will reduce welfare. This is despite the fact that competition among the dominant group has increased with the addition of one firm, and the improved variable cost when the fringe firms are merged and become a dominant bank. The high fixed cost of operating a dominant firm may exceed gains from increased competition and improved production efficiency.

FIGURE 2 ABOUT HERE

But if cost structure is different, e.g. when fixed costs are lower, the welfare result displayed in Figure 2 may be reversed. Figure 3 displays a case where it will desirable to merge the banks in the fringe and turn them into a dominant bank.

FIGURE 3 ABOUT HERE

Note also from Figure 3 that whether it is desirable to merge the fringe banks or not will depend on how many dominant firms there are. If there are four banks in the dominant group it

will not increase welfare to reduce the number of fringe banks. If, however, n is larger, then mergers in the fringe become desirable.

4.2. Mergers among Dominant Banks

4.2.1. Will a dominant bank acquire another dominant bank?

Table 7 presents the change in the profits of the-dominant banks as the size of the dominant group varies in the base case. Whether sequential or block mergers among dominant banks will be profitable depends very much on their fixed costs of operation. In the base case where fixed costs are relatively low, the increase in profits when competition is lessened with a sequential merger will not exceed the pre-merger profits of a targeted dominant bank. Block mergers will, however, be feasible: four dominant banks can profitably merge at once, leading to a two-bank dominant group. On the other hand, when fixed costs are high, profits in the pre-merger stage are low, making mergers more likely. In the case presented in Table 7 (with K^d = 0.25), both sequential and block mergers are feasible.

TABLE 7 ABOUT HERE

4.2.2. Should dominant banks merge?

Whether dominant banks should merge or not depends on the fixed costs in the dominant group as well as on the size of the fringe. We can use Figure 2 to consider the impact of changing the size of the dominant group on total surplus. Though there is no incentive for the banks themselves to merge in this case, it turns out that shrinking the size of the dominant group to $n = 4$ would increase total surplus when m = 15. Further reducing the size of the dominant group to n = 3 would reduce the total surplus, however. Reducing the dominant group by one bank saves on the fixed costs at the expense of reduced competition; the competition effect takes

over when there is further reduction in the number of banks and the negative impact on total surplus exceeds the savings from fixed costs. If fixed costs in the dominant group were higher, further reducing the size of the dominant group would have been warranted.

One other factor that allows welfare improving reduction in the size of the dominant group is the presence of a sizeable fringe with 15 banks. If the competitive fringe were smaller, say, with $m = 6$, increasing the size of the dominant group would have increased monotonically the total surplus.

4.3. Mergers Involving Both Dominant and Fringe Banks

4.3.1. Will a dominant bank acquire a fringe bank?

Consider now the case where fringe banks are bought out by a dominant bank in a sequential manner (so m decreases while n remains constant). Table 8 shows that, in the base case, there turns out to be no incentive for such acquisitions of fringe banks by a dominant bank. For block mergers to be profitable, one dominant bank will have to acquire 13 fringe banks at once, which indicates that this kind of mergers will be difficult to realize. When the fixed costs of the fringe banks are higher, then both sequential as well as block acquisitions of fringe banks by a dominant bank are feasible. For example, when $K^f = 0.05$, it will be desirable for a dominant bank to acquire fringe banks sequentially until the size of the fringe falls to 12. It would also be profitable to acquire the whole fringe as a block (seeTable 8).

TABLE 8 ABOUT HERE

4.3.2. Should a dominant bank acquire a fringe bank?

Welfare analysis in this case is similar to evaluating the desirability of mergers among fringe banks while keeping the size of the dominant group intact. Figure 1 demonstrates, for the base

case, that the acquisition of fringe banks by dominant banks may lead to a decrease in total surplus (the solid line in Figure 1). On the other hand, if the fixed costs in the fringe banks are higher the acquisition of fringe banks by dominant banks will be welfare improving (the dashed curve in Figure 1).

4.4. Changes in Policy Variables

4.4.1. Reserve Requirement Ratio

Figure 4 displays the impact of changing the reserve requirement ratio from 6% to 4%. This policy change does not have any impact on the desirability of mergers in the fringe. Decreasing α has the following impact on the equilibrium outcomes in this example: r decreases, r^L increases, r^D decreases, the profits of both the dominant and the fringe banks decrease, and total welfare increases. A decrease in a amounts to cost reduction which favors the depositors and creditees.

FIGURE 4 ABOUT HERE

4.4.2. Deposit Insurance

Figure 5 displays the impact of changes in the perceived financial strength of the banks. In the base case we consider, the dominant and the fringe banks are assumed to have the same financial strength from the view point of the depositors. This is justified in the presence of blanket deposit insurance extended to depositors of all banks without discrimination, which has been the case in Turkey since 1994. Any change in the deposit insurance system that will lead to differences in the perceived financial strength of banks will be expected to change equilibrium outcomes. In the example exhibited in Figure 5, an increase in the perceived riskiness of the

fringe banks does not have an impact on the desirability of mergers among the fringe firms. Increasing λ^f has the following impact on the equilibrium outcomes in this example: r increases, r^D decreases, r^L increases, the profits of the dominant banks increase while those of the fringe banks decrease, and total surplus decreases. Though the change in total surplus is rather small in the case exhibited in Figure 5, the increase in the market share of dominant banks in deposits may be considerable, leading to driving the fringe banks out of the sector.

FIGURE 5 ABOUT HERE

4.5. Acquisition by Foreign Banks

Consider a scenario in which foreign banks establish considerable presence in the Turkish banking industry through acquisitions. If the dominant group is now dominated by foreign banks, one implication of this will be the ease of access to international financial markets. We can capture this change by considering a reduction in μ^d. Figure 6 displays the impact of such a change on total welfare. In the example exhibited in Figure 6, a decrease in the perceived riskiness in the international markets of the dominant banks does not have any impact on the desirability of mergers among the fringe. Decreasing μ^d has the following impact on the equilibrium outcomes in this example: r decreases, r^D decreases, r^L decreases, the market share of dominant banks in deposits decreases, the profits of the dominant banks increase and those of the fringe banks decrease, and total welfare increases.

FIGURE 6 ABOUT HERE

4.6. Changes in Global Economic Conditions

In our model the impact of the economic conditions external to the country is summarized by r_F. In Figure 7 below we look at the impact of changes in this parameter. If the conditions in the world economy worsen so that r^F increases, the equilibrium outcomes move in the following directions in the example exhibited in Figure 7: r, r^D, and r^L all increase; the profits of both the dominant and fringe banks decrease; and total welfare also decreases. Note that mergers among fringe banks now become desirable.

FIGURE 7 ABOUT HERE

5. Concluding Remarks

We know from the Industrial Organization literature that a merger in an imperfectly competitive industry involves two main effects. One is a decrease in competition due to the reduced number of players in the market. The only countervailing effect that can balance this negative impact is the possible efficiency gains that may be realized at the end of the merger. This will more likely be the case in industries where production exhibits increasing returns to scale. In such a case the merger will allow taking advantage of economies of scale and result in more efficient overall production in the industry. Whether the increase in welfare due to efficiency gains or the adverse effect of reduced competition will outweigh the other will in general depend on the specifics of the industry.

In a simple but rigorous model, we studied a series of scenarios and assessed the likely impact of mergers and acquisitions in the Turkish banking industry. Our exploration clearly shows the importance of quantifying empirically the cost structures and other related parameters for accurate assessment of the pros and cons of mergers in the banking industry. Depending on parameter values, especially the fixed costs of operating a bank, we identified cases where

mergers among fringe banks as well as the dominant banks turn out to be desirable from the welfare point of view.

Note that the welfare measure we used to evaluate changes in banking industry structure as well changes in policy variables was the standard total surplus measure that gave equal weight to consumers' (depositors' and creditees') surpluses and total industry profits. One can certainly envision more general social welfare functions that give higher weight to depositers' and creditees' welfare, and our analyses can easily be repeated for more general social welfare functions.[13]

Whether there will indeed be incentives to merge or not is a question related to, but different than, the desirability of mergers. In cases where there is incentive to merge with adverse welfare impacts, the competition authority may want to step in to block the proposed merger. We identified such cases where dominant banks will have incentive to make bids to acquire fringe banks that will be acceptable to the targeted banks. We also showed that whether the mergers proceed sequentially, i.e. one firm is acquired first and then another, or a number of firms are acquired in block makes a difference for the desirability of mergers. As far as incentives to merge are concerned, the extent of consolidation will be greater under block acquisitions than under sequential acquisitions. In the sequential case, the market power and profits of the remaining banks are increased at each stage, making further acquisitions more costly for the acquiring bank.

When mergers involving only the fringe firms are considered, we found that as the fixed costs of the fringe banks increase block acquisitions did become profitable. High fixed costs in this case also made decreasing the number of fringe firms preferable from the welfare point of view. The extent of consolidation that would come about could, however, be more than the optimal size identified. In the case of a number of fringe banks merging and becoming a

[13] If there is concern regarding the stability of the banking system, giving less weight to profits may lead, in general, to more frequent exit and entry in the sector than desirable. In turn, this may compromise systemic stability of the sector. In addition to being the standard assumption in the Industrial Organization literature, total surplus reflects a neutral stance regarding this point.

dominant bank, total surplus will in certain cases decrease. This is despite the fact that competition among the dominant group has increased with the additional banks joining the group, and the improvement in variable cost when the fringe banks become larger. The high fixed cost of operating a large bank may exceed gains from increased competition and improved production efficiency.

Whether sequential or block mergers among dominant banks will be profitable depends very much on their fixed costs of operation. As the fixed costs of operating a large bank rise, block mergers as well as sequential mergers may become feasible. Whether dominant banks should merge or not depends on the fixed costs in the dominant group as well as on the size of the fringe.

When the fixed costs of the fringe banks are high, then both sequential as well as block acquisitions of fringe banks by a dominant bank become feasible. Welfare analysis in this case demonstrates that the acquisition of fringe banks by dominant banks may increase or decrease total surplus depending on the fixed costs of the fringe banks.

Changes in the reserve requirement ratio, the extent of deposit insurance, and improved perception of riskiness in international financial markets do affect the equilibrium outcomes obtained. On the other hand, incentives to merge do not seem to be significantly affected by changes in these variables. A dramatic effect of removing the blanket deposit insurance may be the forcing of the fringe banks out of the sector, which will reduce total surplus. We also demonstrated how worsening conditions in the world economy may render consolidation of the fringe desirable from the welfare point of view.

A number of lessons can be drawn from our analysis regarding mergers in the banking sector. As for whether mergers will occur or not, the nature of the merged entity is of critical importance. If two fringe banks merge to become a dominant bank, this indicates not only an improvement in the cost structure but also enhanced market power. Thus even in cases where there is no incentive for fringe firms to merge to remain a fringe firm, they will merge if through

merging they can exercise market power. The welfare consequences of such mergers have to be carefully analyzed, paying due attention to the relative size of the fringe and the dominant group and the cost structure in the banking industry before and after mergers. Consolidations among both the fringe and the dominant banks may turn out to be excessive, and thus their extent has to be carefully assessed by competition authorities. Though block mergers, where a group of banks are acquired by another bank, are not necessarily welfare reducing, this type of mergers may end up stifling competition too much. Sequential mergers, where only one bank can be acquired at a time, are more difficult; thus, allowing only this type of mergers will be a safety check against excessive mergers.

Finally it is to be noted that mergers among dominant as well as fringe banks will be impeded by a prisoners' dilemma type interaction among each other. Consolidation in the sector will benefit all banks through reduced competition. But those that are not actually involved in mergers will not bear merging costs. For example, Table 1 reveals that if 10 fringe banks merge to reduce the size of the fringe from 15 to 6, those that do not take part in the merger will enjoy a profit increase of TL 34.83 trillion. Compared to its pre-merger profit, each of the 10 merging fringe bank will be able to derive much less benefit from the merger, since the total profits of the merged entity will not be more than the profit of fringe firms that remained out of the merger. Thus, each bank favors mergers in the sector but does not want itself to be a part of mergers. Unless mergers lead to dramatic improvement in the cost structure and lead to significant increase in market share, which in the case of fringe banks can only happen if the merged entity becomes one of the dominant banks, the prisoners' dilemma identified will render consolidation in the sector highly unlikely.

Acknowledgements

We gratefully acknowledge the contribution of Mehmet Aras Orhan for an earlier version of this paper. We also thank two anonymous referees for helpful comments. Göze Aslankara provided assistance with data for the current version, which we would like to acknowledge. The paper draws from a project, titled "The Restructuring of the Turkish Banking Industry and Its Impacts on Competition", funded by Boğaziçi University Research Fund, Project No. 00C103.

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Table 1: Turkish Banking Sector (September 30, 2001)

	Number of Banks	Total Assets (USD mn)	Share in Sector (%)	Total Loans (USD mn)	Share in sector (%)	Total deposits (USD mn)	Share in sector (%)
TOTAL	68	110,763	100.0	28,642	100.0	68,796	100.0
Commercial Banks	52	105,402	95.2	26,338	92.0	68,796	100.0
-State Owned	3	30,101	27.2	5,322	18.6	21,430	31.2
-Privately Owned	24	59,403	53.6	19,240	67.2	38,946	56.6
-5 largest banks		40,005	36.1	15,127	52.8	26,568	38.6
-Other		19,398	17.5	4,112	14.4	12,379	18.0
-Foreign Owned	16	2,933	2.6	681	2.4	978	1.4
-SDIF Managed	9	12,965	11.7	1,096	3.8	7,441	10.8
Development & Investment Banks	16	5,330	4.8	2,304	8.0	0	0.0
-State Owned	3	4,347	3.9	1,868	6.5		
-Privately Owned	10	881	0.79	400	1.4		
-Foreign Owned	3	102	0.09	36	0.1		

Sources: The Banks Association of Turkey, BRSA

Table 2: Turkish Banking Sector: Financial Indicators

In USD million (unless otherwise stated)	**1980**	**1990**	**1994**	**1999**	**2000**
Total Assets	20,785	58,171	52,552	133,533	155,237
Total Credits	11,168	27,342	20,559	40,206	50,931
Securities Portfolio	1,339	5,997	5,955	22,955	17,848
Total Deposits	10,188	32,564	33,191	89,361	101,884
Savings Deposits	4,288	19,343	24,190	58,807	64,352
-TL	4,288	11,914	8,612	24,701	26,628
-FX	..	7,429	15,578	34,106	37,724
Non-deposit funding	1,289	11,760	9,019	22,934	29,435
-Foreign banks	..	3,460	2,675	12,073	16,284
Networth+Profits	1,147	5,903	4,409	7,840	11,367
Total Assets/GNP (%)	28.6	38.2	40.3	71.7	76.9
Total Credits/GNP (%)	15.4	17.9	15.8	21.6	25.2
Securities Portfolio/GNP (%)	1.8	3.9	4.6	12.3	8.8
Savings Deposits /GNP (%)	5.9	12.7	18.5	31.6	31.9
State Bank Assets/Total Sector Assets (%)	44.1	44.6	39.6	34.9	34.2
Off-balance Sheet Operations/ Total Assets (%)	..	..	49.5	103.5	100.8

Source: BRSA (2001)

Table 3: Private Commercial Banks Ranked by Asset Size (September 2001)*

	Total Assets (USD mn)	Share in Sector (%)	Total Loans (USD mn)	Share in sector (%)	Total deposits (USD mn)	Share in sector (%)
USD 5-10 billion						
İş Bankası	9,491	8.6	3,247	11.3	7,084	10.3
Akbank	9,451	8.5	2,838	9.9	5,866	8.5
Yapı Kredi	8,638	7.8	3,425	12.0	5,839	8.5
Garanti	6,780	6.1	2,161	7.5	3,830	5.6
Pamukbank	5,644	5.1	3,456	12.1	3,949	5.7
Group Total	**40,005**	**36.1 (64.2)**	**15,127**	**52.8 (75.9)**	**26,568**	**38.6 (66.5)**
USD 1-5 billion						
Osmanlı	3,536	3.2	507	1.8	1,485	2.2
Koçbank	3,127	2.8	988	3.5	2,086	3.0
Finansbank	2,326	2.1	610	2.1	1,151	1.7
Sümerbank	1,476	1.3	14	0.0	1,322	1.9
Dışbank	1,271	1.1	239	0.8	633	0.9
İmar Bankası	1,129	1.0	399	1.4	958	1.4
Toprakbank	1,123	1.0	203	0.7	1,015	1.5
TEB	1,056	1.0	267	0.9	712	1.0
Group Total	**15,043**	**13.6 (24.1)**	**3,227**	**11.3 (16.2)**	**9,362**	**13.6 (23.4)**
USD 0-1 billion						
Şekerbank	933	0.8	221	0.8	713	1.0
Denizbank	933	0.8	185	0.6	617	0.9
Alternatifbank	776	0.7	183	0.6	496	0.7
Tekstil Bank	595	0.5	69	0.2	397	0.6
Oyak Bank	355	0.3	104	0.4	259	0.4
Anadolubank	336	0.3	63	0.2	256	0.4
Tekfenbank	163	0.1	28	0.1	144	0.2
Group Total	**4,092**	**3.7 (6.6)**	**854**	**3.0 (4.3)**	**2,881**	**4.2 (7.2)**

Sources: The Banks Association of Turkey, BRSA

* As of September 30, 2001, there were 24 privately owned domestic banks and 16 foreign banks. Of these, the largest 20 in terms of total asset size are reported in this table.

** The figures in parentheses indicate the shares within all privately owned commercial banks, including the foreign owned.

Table 4: Base Model Parameter Values*

$n_0 = 5$	$A_D = 0.01$	$K^d = 0.2$	$K^f = 0.03$	$\lambda^d = 1$	$r^F = 0.03$
$m_0 = 15$	$B_D = 0.01$	$\sigma_D = 0.01$	$\rho_D = 0.04$	$\lambda^f = 1$	$B = 9.7$
$\alpha = 0.11$	$A_L = 0.9$	$\sigma_L = 0.02$	$\rho_L = 0.05$	$\mu^d = 1.05$	
$\beta = 0.11$	$B_L = 0.01$	$\sigma_F = 0.06$	$\rho_F = 0.15$	$\mu^f = 1.1$	

* The TL values are in quadrillion for the relevant parameters (A_D, A_L, K^d, K^f, B).

Table 5: Mergers among Fringe Banks*

$n = 5$			
m	π^f ($K^f = 0.03$)	π^f ($K^f = 0.06$)	$\Delta\pi^f$
1	135.57	105.57	
2	112.70	82.70	22.85
3	96.85	66.85	15.85
4	85.11	55.11	11.74
5	*75.97*	45.97	9.14
6	68.58	38.58	7.39
7	62.43	32.43	6.15
8	57.19	27.19	5.24
9	52.63	22.63	4.56
10	48.62	18.62	4.01
11	45.05	15.05	3.57
12	41.82	11.82	3.23
13	38.90	8.90	2.92
14	36.22	6.22	2.68
15	33.75	3.75	2.47

*Profit figures (π^f) are in TL trillion.

Table 6: Fringe Banks Merging into a Dominant Bank*

	$n = 5$		$n = 6$	
m	π^d	π^f	π^d	π^f
1	719.78	135.57	518.22	109.01
2	607,96	112.70	434.94	91.41
3	522.82	96.85	371.22	79.06
4	455.34	85.11	320.49	69.80
5	400,23	75.97	278.89	62.52
6	354.16	68.58	243.98	56.57
7	314.94	62.43	214.15	51.58
8	281.03	57.19	188.27	47.29
9	251.36	52.63	165.53	43.54
10	225.11	48.62	145.35	40.22
11	201.67	45.05	127.29	37.23
12	180.60	41.82	110.99	34.53
13	161.52	38.90	96.18	32.07
14	144.14	36.22	82.67	29.80
15	128.22	33.75	70.26	27.70

* Profit figures (π^d , π^f) are in TL trillion.

Table 7: Mergers Among Dominant Banks*

$m = 15$			
n	π^d ($K^d = 0.2$)	π^d ($K^d = 0.25$)	$\Delta\pi^d$
1	1593.22	1543.22	
2	696.66	646.66	896.5
3	374.25	324.25	322.41
4	218.12	168.12	156.13
5	70.26	78.22	89.89

* Profit figures (π^d) are in TL trillion.

Table 8: Dominant Firms Acquiring Fringe Firms*

m	$n = 5$			
	π^d	$\pi^f (K^f = 0.03)$	$\pi^f (K^f = 0.05)$	$\Delta\pi^d$
1	719.78	135.57	115.57	
2	607.96	112.70	92.70	111.81
3	522.82	96.85	76.85	85.14
4	455.34	85.11	65.11	67.48
5	400.23	75.97	55.97	55.11
6	354.16	68.58	48.58	46.06
7	314.94	62.43	42.43	39.22
8	281.03	57.19	37.19	33.90
9	251.36	52.63	32.63	26.67
10	225.11	48.62	28.62	26.25
11	201.67	45.05	25.05	23.43
12	180.60	41.82	21.82	21.07
13	161.52	38.90	18.90	19.08
14	144.14	36.22	16.22	17.38
15	128.22	33.75	13.75	15.91

*Profit figures (π^d , π^f) are in TL trillion.

Figure 1: Impact of Changing *m* keeping *n* constant

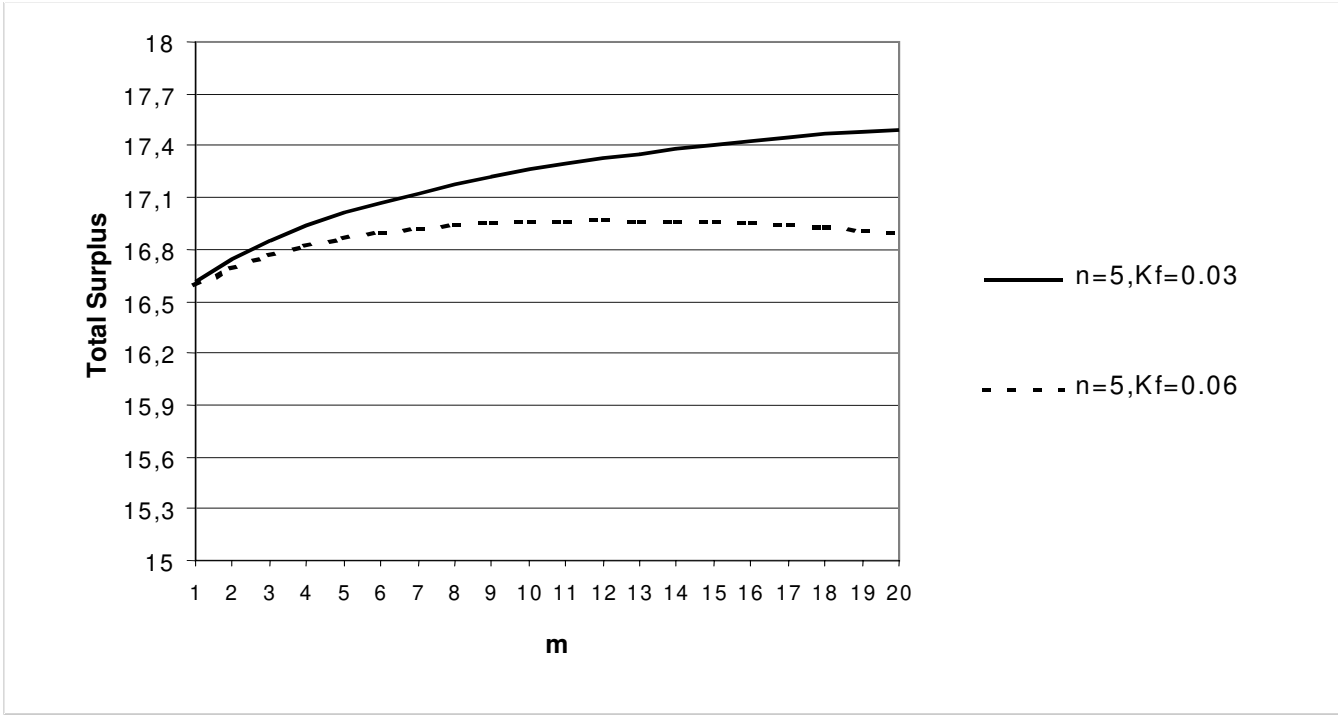

Figure 2: Impact of Changing both *m* and *n*

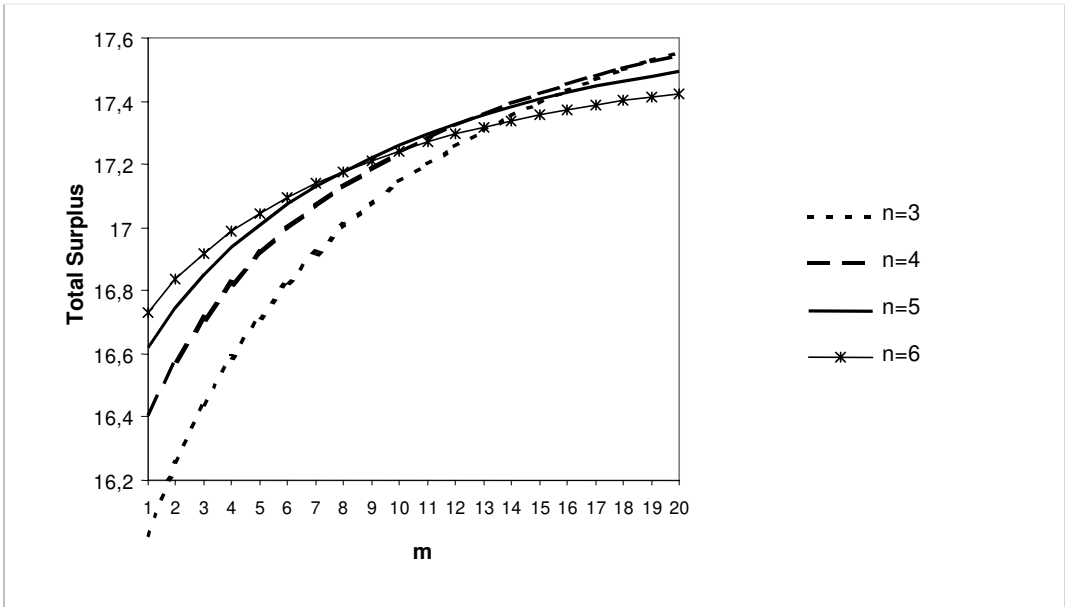

Figure 3: Impact of Changing Both *n* and *m* When K^d is Low

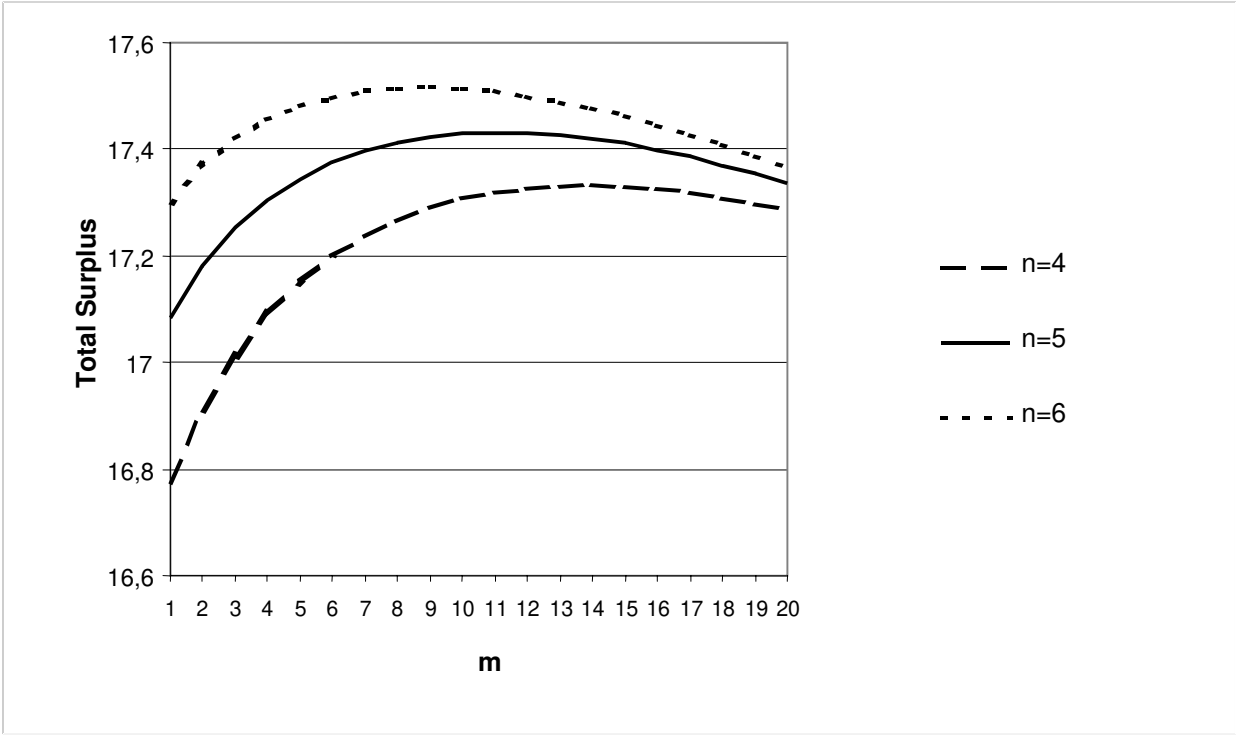

Figure 4: Impact of Changing *a*

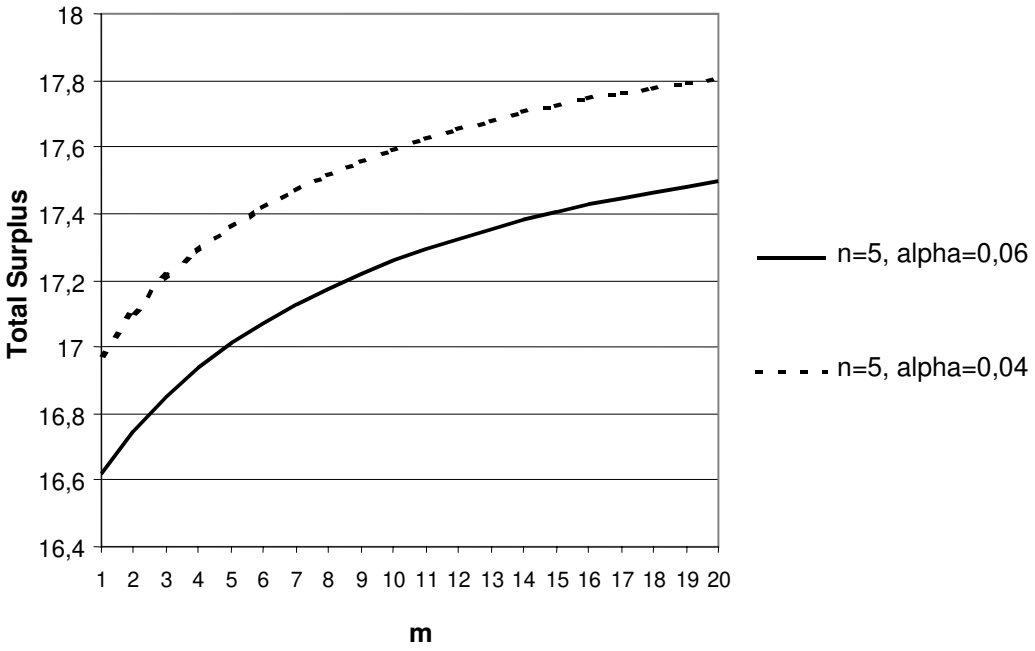

Figure 5: Impact of Changing λ^f

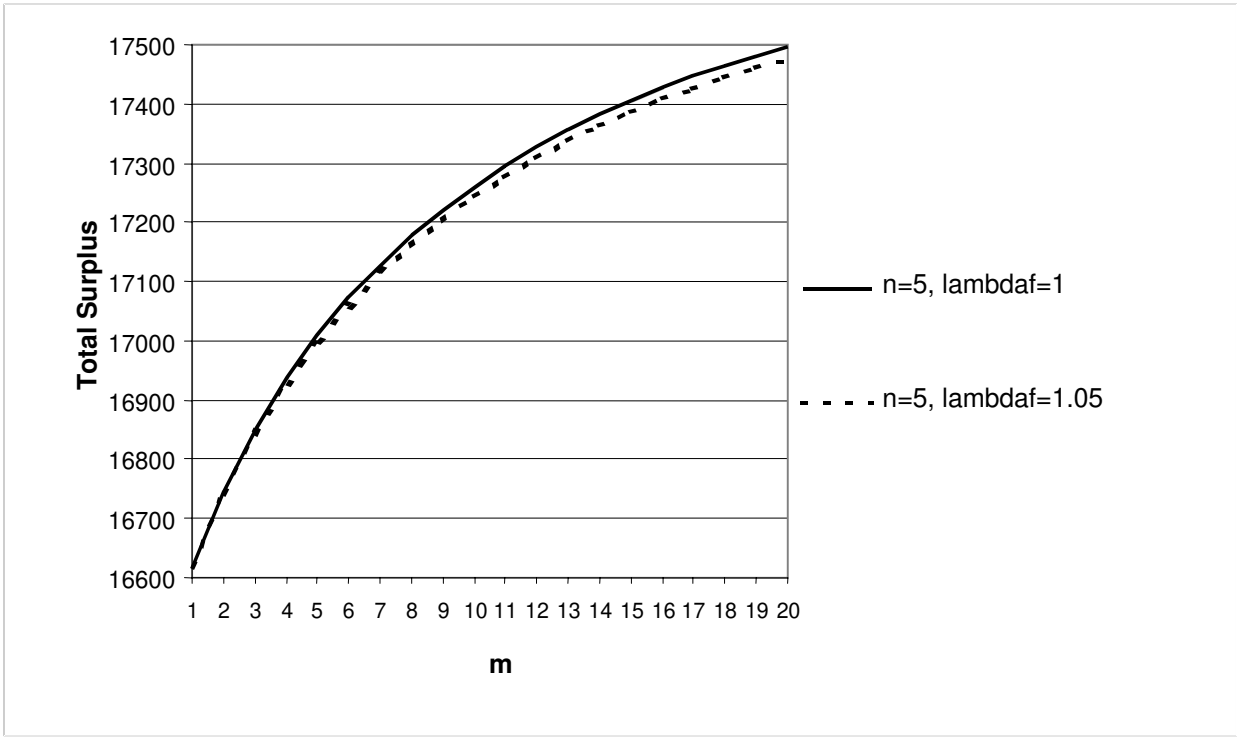

Figure 6: Impact of Changing μ^d

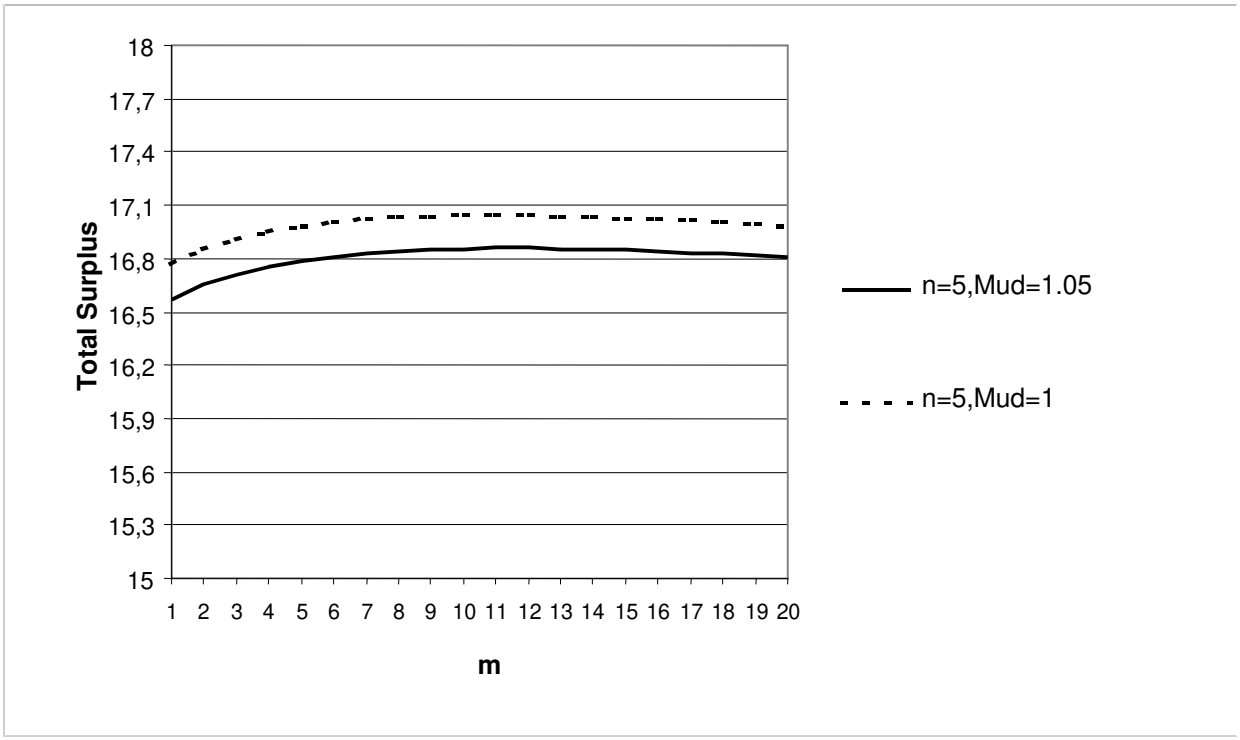

Figure 7: Impact of Changing r^F