CONCENTRATION, COMPETITION, EFFICIENCY AND PROFITABILITY OF THE TURKISH BANKING SECTOR IN THE POST-CRISES PERIOD

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Abstract

After 2001 crisis, the macroeconomic environment led to important changes in Turkish banking sector which has experienced a process of concentration by involving in merger and acquisition activities and liquidation of some insolvent banks. Using the data from the detailed balance sheets of the banks that operated in the years from 2001 to 2005, we examine the degree of concentration and degree of competition in the market by applying Panzar and Rosse's approach. We also explore the existence of relationship between efficiency and profitability of the banks taking into account the internationalization of banking. Our results do not suggest the existence of relationship between concentration and competition. There is also no robust relationship between efficiency and profitability.

Key words: Concentration, Competition, Efficiency and Profitability of the Turkish Banking Sector in the Post-Crises Period.
JEL classification: C23, C67, E44, G21, O11.

1. Introduction

Banks play a substantial role in capital accumulation, firms' growth and economic prosperity. Hence, research on concentration, competition, efficiency and profitability of the banking sector has important policy implications. In investigating the relationship between the concentration and competition in banking sector there are two competing approaches: the Structure-Conduct-Performance (SCP) hypothesis and the Efficient-Structure hypothesis. The former states that the higher the concentration in a market is, the lower is the competition and the higher profits that the firms receive. The latter takes the efficiency factor into account and states that the firms with superior efficiency improve their market shares and become more profitable.

Berger and Hannan (1989) found consistent empirical results with the implications of SCP hypothesis. While Bikker and Groeneveld (2000) conclude that the increase in the degree of concentration in the European banking sector is negatively related to competition, Jansen and Haan (2003) found no evidence that concentration indicators are linked to profitability, and added that concentration and competition are not related. Smirlock (1985) also states that there is no discernable positive relationship between concentration and profitability. Yeyati and Micco (2007) further suggest that it is not at all clear whether competition and concentration should go in opposite directions. For the Turkey's banking sector, dominance, disparity and dynamic indexes are employed in addition to static measures in order to analyze market structure more comprehensively. According to the findings of this study, concentration showed an increasing tendency in 2000-2005. However, net interest margins which can be seen as the relevant prices in the sector (as an indicator for the measure of competition) declined.

While the literature generally focuses on scale and scope economies, more recent literature has attempted to evaluate X-efficiencies[1] in various European banking markets (Altunbas, 2001; Berg, 1993). Berger and Humphrey (1994) state that X-efficiency is more important than scale and scope

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[1] X-efficiency is the effectiveness with which a given set of inputs is used to produce outputs. If a firm is producing the maximum output it can, given the resources it employs, such as men and machinery, and the best technology available, it is said to be x-efficient.

economies taking into account the managerial ability to control costs. Isik and Hassan (2002) employ Data Envelopment Analysis (DEA) to investigate efficiency in the Turkish Banking sector and found out that foreign banks operating in Turkey seem to be significantly more efficient than their domestic peers.

Beside Berger (1995), in exploring the relationship between profitability and efficiency, Turati (2003) does not employ a proper regression analysis. He computes simple correlation coefficients between efficiency scores and different measures of bank profitability. According to this study, correlation coefficients between ROE and efficiency scores, and between ROA and efficiency scores are substantially close to zero for all the three models. These findings suggest that there is no linear relationship between profitability and efficiency. Turati (2003) also observed that for some European countries there is a negative correlation between efficiency and profitability. He interpreted this as a surprising result since the more inefficient banks were also the more profitable ones. Berger and Hannan (1998) stated that monopolists earned higher profits and given the absence of competitive pressures, were also characterized by a higher level of inefficiency.

After the November 2000 and February 2001 crises in Turkey, the new macroeconomic environment led to important changes in the banking sector[1]. The rise in the interest rates, depreciation of the Turkish Lira and the contraction of economic activities adversely affected the profitability of the banks. With regard to financial and operational resurrection attempts in the scope of the Banking Sector Reconstruction Program, the number of banks, branches, and employees were reduced. The equity structures of the private banks were strengthened and merger and acquisition activities were promoted with tax incentives. In 2001, eight banks[2] were acquired by Saving Deposit Insurance Fund (TMSF), seven banks[3] were merged, and the licenses of three banks[4] were revoked. In the private sector, several banks[5] engaged in mergers and acquisitions activities. After these mergers and acquisitions, concentration increased in the banking sector. In 2002, Pamukbank was acquired by TMSF. In 2003, Imar Bankasi entered into the liquidation process upon revocation of its license to perform banking activities and accept deposits. Fiba Bank was transferred to Finans Bank, ING Bank and Credit Suisse ceased their activities in the Turkish Banking sector. In 2004, Pamukbank was merged with Turkiye Halk Bankasi. In 2005, the tendency for merger and acquisition activities kept reducing the number of banks in the sector and increasing the concentration. Fortis Bank acquired Turkiye Dis Ticaret Bankasi[6].

In this paper, we analyze the changes in concentration and competition in the Turkish banking sector in the light of the facts discussed above, and focus on efficiencies of all commercial banks and the existence of the relationship between efficiency and profitability. The plan of the paper is as follows. Section 2 describes the data and the measures of concentration, competition, efficiency, and profitability. Section 3 presents the related results and Section 4 concludes.

2. The Data

This study uses data from the detailed balance sheets of the banks that operated in the years from 2001 to 2005 in Turkey (see Table A.1 and Table A.2 for details). We obtained the data from the Banks Association of Turkey database. Throughout this period the number of banks in Turkey has been decreasing due to the merger and acquisition activities and/or liquidation of some insolvent banks. Table 1 shows the numbers of banks according to their types for each year. There are totally

[1] On recent development in Turkey also see Al and Aysan (2006) and Aysan and Yildiz (2007).
[2] Ulusal Bank, Sitebank, Iktisat Bankasi, Kentbank, Tarisbank, Bayindirbank, EGS Bank, and Toprakbank
[3] Egebank, Yurtbank, Yasarbank, Bank Kapital, Ulusal Bank under Sumerbank; Interbank and Esbank under Etibank
[4] Etibank, Iktisat Bankasi, and Kentbank
[5] Korfez Bank was transferred to Osmanli Bankasi, then Osmanli Bankasi was transferred to Garanti Bankasi, Bank Ekspres merged with Tekfen Yatirim ve Finansman and formed Tekfen Bank, HSBC acquired Demirbank, Sumerbank was transferred to Oyakbank and Sinai Yatirim Bankasi was transferred to Turkiye Sinai Kalkinma Bankasi
[6] For detailed information on recent development in Turkey's financial restructuring also see Aysan and Ceyhan (2007a), Aysan and Ceyhan (2007b) and Aysan and Ceyhan (2006).

six state-owned banks in each year, three of which are commercial and the others are non-depository. As the number of state-owned banks did not change throughout the period, the decline in the number of banks in the sector is attributed to the decline in the number of privately-owned banks, particularly the commercial ones. The number of foreign banks, however, only decreased from 18 to 16. In each year commercial banks outnumber the non-depository banks.

Table 1

Number of Banks*

	2001	2002	2003	2004	2005
Sector Total	**61**	**54**	**50**	**48**	**47**
Commercial	**46**	**40**	**36**	**35**	**34**
State-owned	3	3	3	3	3
Privately-owned	22	20	18	18	17
Foreign	15	15	13	13	13
Under SDIF**	6	2	2	1	1
Non-depository	**15**	**14**	**14**	**13**	**13**
State-owned	3	3	3	3	3
Privately-owned	9	8	8	8	7
Foreign	3	3	3	2	3

* End of the year
** Saving Deposit Insurance Fund (TMSF)

2.1. Measures of Concentration

The degree of concentration is measured in various ways. The literature generally uses the k-bank concentration ratio. We used C3 and C5 ratios which show the concentration ratios of the biggest 3 and 5 banks respectively according to the share of their assets in the total assets of the banking sector. These ratios are easy to calculate. However, information about the remaining banks is not used in these ratios. Hence we also calculated Herfindahl-Hirschman Index (HHI) which is calculated by adding up the squares of the market shares of all banks.

2.2. Measure of Competition

To measure competition we used the well known Panzar and Rosse's approach, which has been used in many studies. The method of Panzar and Rosse constructs H-statistic as a measure of competition. The H-statistic is defined as the sum of the factor price elasticities of interest revenue with respect to capital, labor, and physical capital.

$$ln\ INTR = a + (b * ln\ INTE + c * ln\ PPE + d * ln\ PCE) + f * ln\ BSF + e, \quad (1)$$

where *INTR* is the ratio of interest revenue to the total assets, *INTE* is the ratio of annual interest expenses to the total funds, *PPE* is the ratio of annual personnel expenses to the number of employees, *PCE* is the ratio of physical capital expenditure to the total fixed assets, *BSF* are bank specific exogenous factors reflecting differences in risk and size components: i) the ratio of equity to the total assets, ii) the ratio of net loans to the total assets, iii) log of total real assets, and e is the random error component. *INTE*, *PPE*, *PCE* are the unit prices of the inputs of the banks: loanable funds, labor and capital. The H-statistic is calculated as $b+c+d$, for each year. These unit prices of the inputs are the ones that were used in the methodology of Isik and Hassan (2002). We also used the proxies for the unit prices of inputs that are used in Claessens and Laeven (2003) where *INTE* is approximated as the ratio of interest expenses to total deposits, *PPE* as the ratio of personnel

expenses to total assets, and *PCE* as the ratio of other operations and administrative expenses to total assets.

The PR model suggests that $H \leq 0$ under monopoly, $0 < H < 1$ under monopolistic competition, and $H = 1$ under perfect competition. The magnitude of H can be interpreted as an inverse measure of the degree of monopolistic power, hence a measure of the degree of competition.

2.3. Measure of Efficiency

To measure the efficiencies of the banks we are interested in X-efficiency, which shows whether banks use their inputs efficiently or not (Paul Schure and Rien Wagenvoort, 1999). After constructing a cost frontier using the following regression function, we obtained efficiency indices of the banks yearly.

$$TC = \Sigma\,(INPUTS) + \Sigma\,(OUTPUTS) + e, \quad (2)$$

where *TC* is the total cost calculated by adding up interest expenses, commission expenses and total operating expenses, and *e* is the random error component. Three independent variables exist in the regression as inputs: price of loanable funds, price of labor, and price of building. Finally we have five outputs: customer deposits, total loans, equity investment, off-balance sheet items, and commission revenue as other services. Price of loanable funds is the ratio of the interest expenses to the total funds borrowed, price of labor is the ratio of the personnel expenses to the number of employees, and the price of building is the ratio of physical capital expenditure (depreciation) to the book value of fixed assets. Efficiency indices are calculated as the difference between the cost frontier constructed and the realized total cost.

2.4. Measure of Profitability

We use two indicators for profit: return on assets (ROA) and return on equity (ROE). Table 2 shows the distribution of domestic and foreign banks among the most profitable 5 and 15 banks respectively. The data includes the commercial banks that operated throughout the whole period explored[1].

Table 2

Return on Equity and Returns on Assets

	Top 5 Banks					Top 15 Banks				
	2001	**2002**	**2003**	**2004**	**2005**	**2001**	**2002**	**2003**	**2004**	**2005**
ROA										
Domestic	2	5	2	3	2	8	11	9	10	10
Foreign	3	0	3	2	3	7	4	6	5	5
ROE										
Domestic	3	5	3	4	4	9	10	11	11	10
Foreign	2	0	2	1	1	6	5	4	4	5

When return on assets is taken as the measure of profitability, it is seen that a significant proportion of the top five banks is foreign banks except the year 2002. If return on equities is employed the proportion decreases. Looking at the top 15 banks in the sector according to profitability, the number of foreign banks constitute significant portion although they are not many in the entire banking sector.

[1] It is important to note that, omitting the banks which were not in the sector for the whole period, there are only eight foreign banks in the Turkish banking sector.

3. Results

3.1. Concentration and Competition

Table 3 and Figure 1 show the concentration indices according to C3, C5, and Herfindahl-Hirschman Index (HHI). While C3 and C5 ratios increased continuously except the year 2004, HHI kept increasing in the whole period. It is commonly accepted that Herfindahl indices below 0.1000 indicate non-concentrated, between 0.1000 and 0.1800 moderately concentrated and indices above 0.1800 imply concentrated. Hence, these measures suggest that in spite of recent merger and acquisition activities, Turkey's banking sector is still characterized as non-concentrated.

Table 3

Concentration Indices

	2001	2002	2003	2004	2005
C3	0.370727	0.403774	0.429238	0.425586	0.456325
C5	0.475055	0.48892	0.493417	0.489567	0.534048
HHI	0.083636	0.088299	0.09417	0.094883	0.098053

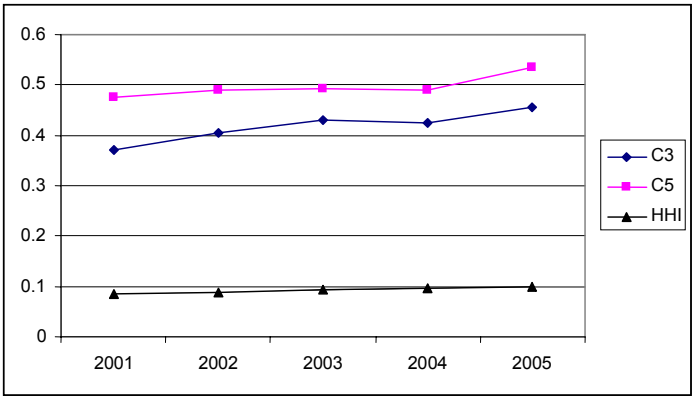

Fig. 1. Progress in Concentration Indices

Table 4 shows the H-statistics calculated according to Panzar and Rosse's methodology. We used two separate models differing in the approximation to the unit prices of inputs of the banks. In Model 1 the ratio of annual interest expenses to the total funds, the ratio of annual personnel expenses to the number of employees, and the ratio of physical capital expenditure to the total fixed assets are used as the unit prices of the loanable funds, labor, and capital respectively, whereas in Model 2 the ratio of interest expenses to total deposits, the ratio of personnel expenses to total assets, and the ratio of other operations and administrative expenses to total assets are used. Both models reveal that the H-statistic is between 0 and 1 which indicates that there is a monopolistic competition throughout the whole period investigated even if the values of the H-statistics decreased from 2001 to 2005. Figure 2 shows the changes in the H-statistics.

Table4

H-Statistics

	2001	2002	2003	2004	2005
Model 1	0.5650542	0.2438027	0.1830553	0.181469	0.1923365
Model 2	0.5975753	0.4919328	0.5785956	0.1884205	0.3922842

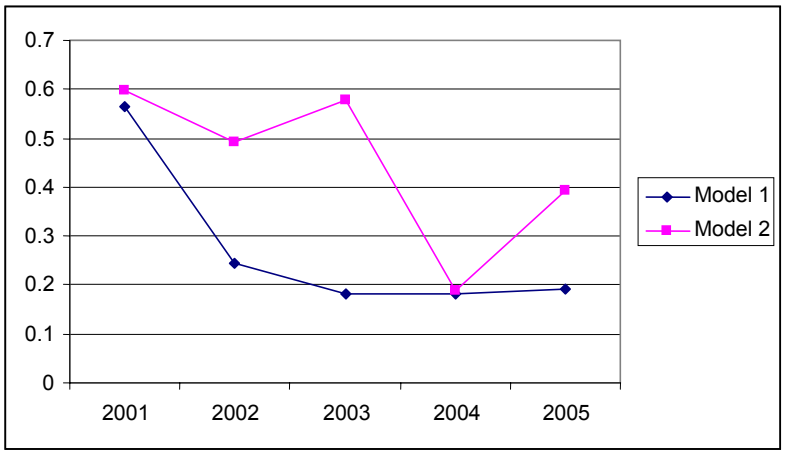

Fig. 2. Progress in H-Statistics

3.2. Efficiency

For the sake of comparability we only included the banks which had data for all 5 years in the regression. There were 30 such commercial banks. However for Adabank it was not possible to calculate the price of loanable funds because it did not have loans borrowed in its balance sheet, and Banka di Roma and Habib Bank Limited were omitted due to the irrelevancy they created. Turkiye Dis Ticaret Bankasi was sold to Fortis Bank. Hence we combined these two banks' data. Finally, we ended up having 135 observations in our panel regression. Table 5 shows the efficiency indices of 27 banks in Turkey. After calculating efficiency using the Cost Frontier Approach we set the most efficient bank to be 1 and the least efficient to be 0.

The large banks generally turned out to be more efficient than the smaller ones. The least efficient banks were the foreign banks with the exception of HSBC and Citibank. Fortis Bank also seems more efficient than the other foreign banks. However, until 2005 it was Turkiye Dis Ticaret Bankasi which was a privately-owned domestic bank. Akbank turned out to be the most efficient bank in 2002 and 2003 and Turkiye Is Bankasi in 2004 and 2005. In 2001 Tekfenbank was the most efficient bank.

Table 5

Efficiency Scores of Turkey's Banks

	2001	**2002**	**2003**	**2004**	**2005**
ABN AMRO Bank N.V.	0.7301	0.8762	0.8370	0.7341	0.6236
Akbank T.A.Ş.	0.9679	1.0000	1.0000	0.9940	0.9828
Alternatif Bank A.Ş.	0.8972	0.9464	0.8927	0.8282	0.5720
Anadolubank A.Ş.	0.9226	0.9656	0.9379	0.9095	0.8380
Arap Türk Bankası A.Ş.	0.7320	0.7052	0.6234	0.6191	0.3495
Bank Mellat	0.0000	0.2474	0.0000	0.0000	0.1094
Citibank N.A.	0.8810	0.9333	0.9048	0.8999	0.8481
Denizbank A.Ş.	0.9526	0.9888	0.9789	0.9732	0.9504
Finans Bank A.Ş.	0.9307	0.9894	0.9704	0.9591	0.9349
Fortis Bank A.Ş.	0.9253	0.9770	0.9743	0.9628	0.9267
HSBC Bank A.Ş.	0.9520	0.9635	0.9544	0.9414	0.9058

Table 5 (continued)

	2001	2002	2003	2004	2005
Koçbank A.Ş.	0.9296	0.9744	0.9718	0.9701	0.9780
MNG Bank A.Ş.	0.6713	0.6764	0.5996	0.6446	0.4852
Oyak Bank A.Ş.	0.9427	0.9667	0.9536	0.9473	0.9014
Sociéte Générale (SA)	0.1132	0.0000	0.1581	0.5903	0.2172
Şekerbank T.A.Ş.	0.9338	0.9761	0.9730	0.9613	0.9505
Tekfenbank A.Ş.	1.0000	0.9697	0.9742	0.9515	0.9303
Tekstil Bankası A.Ş.	0.9235	0.9644	0.9481	0.9165	0.8337
Turkish Bank A.Ş.	0.6204	0.7722	0.7350	0.8969	0.6996
Türk Ekonomi Bankası A.Ş.	0.9150	0.9650	0.9485	0.9343	0.8449
Türkiye Cumhuriyeti Ziraat Bankası	0.9327	0.9832	0.9725	0.9892	0.9894
Türkiye Garanti Bankası A.Ş.	0.9430	0.9876	0.9863	0.9770	0.9633
Türkiye Halk Bankası A.Ş.	0.9219	0.9778	0.9831	0.9867	0.9871
Türkiye İş Bankası A.Ş.	0.9624	0.9947	0.9968	1.0000	1.0000
Türkiye Vakıflar Bankası T.A.O.	0.9402	0.9868	0.9864	0.9842	0.9984
Westdeutsche Landesbank Girozentrale	0.7153	0.7927	0.5073	0.2588	0.0000
Yapı ve Kredi Bankası A.Ş.	0.9601	0.9881	0.9863	0.9798	0.9538

3.3. Efficiency and Profitability

We used return on assets (ROA) and return on equity (ROE) as measures of profitability. We ran random effect regression with panel data of 135 observations to analyze the relationship between efficiency and profitability. We added a dummy variable to see the differences between domestic banks and foreign banks.

$$Profitability = a + b*Efficiency + c*ForeignDummy + e \quad (3)$$

The results of the panel regression are shown in Table 6.

Table 6

Efficiency and Profitability

	ROA	ROE
Constant	-1.766 (1.697)	-34.601 (57.414)
Efficiency	1.979 (1.827)	24.529 (61.822)
Foreign Dummy	2.297* (1.042)	28.409 (35.261)

Standard errors are in parentheses.* Significant at 5% level.

There is no significant evidence from the data that efficiency affects profitability. Taking the return on assets into account, foreign banks are found to be significantly more profitable than domestic banks. Going back to Table 2, one notes that although there are only eight foreign banks in the period explored, most of them are more profitable than their domestic counterparts in both return on assets and return on equity. While the least efficient banks turned out to be foreign with the exception of a few, being foreign increases banks' profitability. This result shows us that foreign

banks are less efficient but more profitable compared to the domestic banks. Hence, there is no clear evidence that there is a positive relationship between efficiency and profitability.

4. Conclusion

In this paper, we used a detailed balance sheet database for banks that operated between the years 2001 and 2005 to explore the concentration and competition in the post-crises Turkish banking sector and the relationship between efficiency and profitability. The results show that C3 and C5 ratios increased except for the year 2004 and Herfindahl-Hirschman Index kept increasing in the whole period, which can be interpreted as an increase in the concentration overall. On the other hand, in the two models that we used to estimate the competition in the banking sector, our findings do not show a clear relationship between concentration and competition. In the first model we used, the competition index which is shown by the H-Statistic calculated by Panzar-Rosse method, kept decreasing until 2004 but increased in 2005. In the second model the H-Statistic did not show a stable path and fluctuated throughout the years. However, the H-Statistics were always between zero and one, which can be interpreted as an evidence for the existence of monopolistic competition in the Turkish banking sector.

To explore the efficiency of commercial banks we used the panel data for 27 banks which operated throughout the whole period. The cost frontier approach was employed to calculate the efficiency of the banks. Regression results show that larger banks generally turned out to be more efficient than the smaller ones and the least efficient banks were the foreign banks with the exception of a few. Akbank turned out to be the most efficient bank in 2002 and 2003 and Turkiye Is Bankasi in 2004 and 2005. In 2001 Tekfenbank was the most efficient bank which seems somewhat surprising due to its low share in the banking sector.

We used both return on assets and return on equities as a measure of profitability. The relationship between the efficiency and profitability was not confirmed by the panel regression estimated. Only one coefficient which is the dummy for foreign banks turned out to be significant in explaining return on assets as the measure of profitability. This result shows that foreign banks reach higher profitability levels in the Turkish banking sector without having high efficiency scores. Hence, this study pinpoints the lack of strong evidence between efficiency and profitability in Turkish banking context.

For the future research, one may focus on various techniques to calculate the efficiency of baking sector. For example, non-parametric estimations of efficiencies can be calculated and their relationships with the concentration can be another research to dwell into. One may also analyze whether parametric and non-parametric efficiency measures give different results or not. More importantly, all these efficiency measures do not consider the risk undertaken by the individual banks. Hence, they miss a very important aspect of banking. Hence, one may also analyze the relationship between efficiency and life spans of the banks. A bank might appear to be quite efficient by undertaking too many risky activities in the short-run. However, this bank is expected to stay alive shorter period of time. Hence, the relationship between the survival of the bank on the one hand and risk and efficiency on the other hand is worth to investigate. Moreover, future research may also focus on different measures of banking concentration and analyze their relationship with the diverse measures of returns and equity.

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Appendix

Table A.1

Descriptive Statistics

Variable	Observation	Mean	Std. Deviation	Min	Max
Total Cost	256	3789251	9396104	0	8.60E+07
Price of Labor	255	268.5017	737.753	0	11574.05
Price of Capital	249	0.5221564	0.1975208	0.0940103	0.9856704
Price of Loanable Funds	226	34.11107	294.6047	0	4152.944
Total Deposits	255	1.44E+07	3.03E+07	0	1.70E+08
Total Loans	255	6806057	1.24E+07	0	7.25E+07
Equity Investment	255	2795855	5748220	-1.56E+07	3.18E+07
Interest Expenses	255	2767509	7938763	0	7.60E+07
Off Balance Sheet Items	255	7.46E+07	6.69E+08	0	1.06E+10
Other Services & Commission Revenue	255	351714.8	733725.6	0	3954115
Total Operation Expenses	255	928795.4	1719933	0	1.13E+07
Commission Expenses	256	106755.3	289823.9	0	2792072

Source: Authors' calculation.

Table A.2

The Correlation Matrix

	Total Cost	Price of Labor	Price of Capital	Price of Loanable Funds	Total Deposits	Total Loans	Equity Investment	Interest Expenses	Off Balance Sheet Items	Other Services & Commission Revenue	Total Operation Expenses	Commission Expenses
Total Cost	1.00											
Price of Labor	-0.07	1.00										
Price of Capital	-0.10	-0.01	1.00									
Price of Loanable Funds	0.05	0.07	0.05	1.00								
Total Deposits	0.81	-0.09	-0.08	0.09	1.00							
Total Loans	0.59	-0.08	-0.06	0.01	0.85	1.00						
Equity Investment	0.63	-0.04	-0.05	0.05	0.84	0.85	1.00					
Interest Expenses	0.99	-0.07	-0.09	0.06	0.75	0.49	0.56	1.00				
Off Balance Sheet Items	0.40	-0.07	-0.06	-0.02	0.64	0.79	0.64	0.32	1.00			
Other Services & Commission Revenue	0.60	-0.09	-0.11	0.00	0.82	0.92	0.77	0.49	0.78	1.00		
Total Operation Expenses	0.83	-0.08	-0.07	0.03	0.88	0.82	0.76	0.74	0.61	0.85	1.00	
Commission Expenses	0.41	-0.07	-0.12	-0.03	0.61	0.78	0.60	0.31	0.55	0.80	0.63	1.00

Source: Authors' calculation.