

COMPETITION IN TURKISH BANKING: IMPACTS OF RESTRUCTURING AND THE GLOBAL FINANCIAL CRISIS

CANAN YILDIRIM^{1,2*}

¹*Kadir Has University, Istanbul, Turkey; and* ²*CASE-Center for Social and Economic Research, Warsaw, Poland*

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This paper investigates the evolution of competition in the Turkish banking industry by taking into account the transformation in the sector in the aftermath of the country's financial crisis of 2000 to 2001 and the global financial crisis. The results demonstrate that the level of competition in the system did not increase despite the restructuring that was undertaken and the increased foreign bank participation. In addition, the level of competition in the sector deteriorated during the global crisis. There is also some evidence that the market power of banks with different ownership characteristics varied and did not converge over time.

Keywords: Banking competition; Restructuring of Turkish banking industry; Global financial crisis

JEL classification: G21, G28, L1

I. INTRODUCTION

SIMILAR to many emerging markets, banking dominates the financial sector in Turkey; hence a competitive and efficient banking sector is of paramount importance for economic growth and welfare.¹ The banking system in Turkey was significantly transformed in the aftermath of the financial crisis of 2000 to 2001; as the crisis effectively eroded the system's financial capital, a comprehensive bank-restructuring program was introduced in order to address regulatory and supervisory deficiencies and improve competition and efficiency. In

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* Corresponding author: Canan Yildirim, Kadir Has University, Kadir Has Caddesi, Cibali, Istanbul, 34083, Turkey. Tel: (90)-212-5336532/1633; Fax: (90)-212-5336515; Email: canan.yildirim@khas.edu.tr

¹ As of 2011 the Turkish banking sector accounts for 79% of the financial sector, excluding the exchanges (BRSA 2011).

the process, the banking environment underwent major changes. The number of banks decreased and concentration levels increased. At the same time, the foreign presence in the sector, which had previously been negligible, increased considerably due to cross-border mergers and acquisitions (M&As). The recovery from the crisis was followed by substantial growth. More recently, the sector exhibited remarkable resilience during the global financial crisis, unlike the banking sectors in many other emerging markets. While industry participants have spoken of “fierce” competition in the sector, the banks have continued to report high profit levels by international standards (see Alexander 2011). As global banks have revised their strategies and selected key markets to focus on because of pressure to deleverage, Turkey remains an attractive target country (see O’Byrne 2011, 2012).

In this context, this paper analyzes the evolution of competition in the Turkish banking industry in light of the processes of restructuring and transformation as well as the global financial crisis. While increasing efficiency and competition in the sector was one of the most important objectives of the extensive restructuring and the reform processes, whether these processes were effective or not has yet to be assessed empirically. Macroeconomic stabilization achieved in the postcrisis period, increased foreign penetration, and the legal and regulatory changes that created a level playing field for both state-owned and foreign-owned banks can be expected to improve the contestability and competitiveness in the system. However, it should be noted that the country’s banking sector is still small by international standards and banking penetration has remained low, implying future growth potential.² Hence, with a rapidly expanding market and demand for new services and products, it can also be expected that banks may not necessarily be motivated to pass on any efficiency gains to their customers.³

Increasing foreign bank participation and levels of concentration in the aftermath of the financial crisis and financial liberalization processes were observed in various emerging markets in the late 1990s, and the recent Turkish experience is not unique in this regard. However, the existing literature that analyzes the impact of financial reform and liberalization processes, consolidation, and foreign entry on banking competition in emerging markets has yet to reach conclusive results. Hence, this paper aims to contribute to this literature and expand on the knowledge concerning banking competition in emerging markets.

² Domestic credit provided by the banking sector as a percentage of GDP in 2010 in Turkey was only 69 while in the EU countries it was 160. As of 2009, the number of ATMs and bank branches per 100,000 adults in the country are 43.7 and 17.4, respectively, as opposed to the averages of 90.1 and 23.9 in high-income countries (World Bank 2012).

³ Concerning the rapid branch expansion of recent years, the following statement by the CEO of Halk Bank, a state-owned bank, is quite apt: “Underbanked, under-penetrated regions still exist and any new branch we open is generally profitable within three months” (O’Byrne 2012).

The Turkish banking sector, which has become increasingly integrated with international financial markets through recent cross-border M&As, is particularly suitable for assessing the impact of the recent financial crisis on the competitive behavior of banks in emerging markets. Focusing on the longest time period allowed by data availability, this study assessed not only the impact of the extensive restructuring and reform processes but also the changing global financial environment on competitive conduct in the industry. To the best of my knowledge, it is the first paper to analyze comprehensively the recent evolution of competition for the Turkish banking industry, which, unlike other emerging markets such as China and India, has been understudied.

To achieve this end, the study assessed competition in the Turkish banking sector for the period 2002 to 2011. Taking into account the fact that different approaches to the measurement of competition can lead to conflicting results, competition in the sector was assessed through the three most commonly used approaches in the recent empirical literature. The two nonstructural measures of competition, the Lerner index and the Panzar and Rosse H -statistic, were applied and a dynamic model was used to test competitiveness in the sector by analyzing profit persistence.

The remainder of the paper is organized as follows. Section II discusses the related literature on banking industry competition. Section III provides a review of the developments in the Turkish banking industry in the post 2000 to 2001 crisis period. Section IV discusses the methodologies employed, and section V presents the empirical results. Section VI offers a discussion of the study's conclusions.

II. REVIEW OF THE RELATED LITERATURE

The extant research on the assessment of bank competition has followed two approaches: structural and nonstructural. Under the former, the competitive conduct of banks is inferred through an analysis of the market structure, as the number and size distribution of firms in a market. The structural approach adopts the structure–conduct–performance (SCP) paradigm and the relative efficiency or efficient-structure (ES) paradigm. According to the SCP paradigm, market structure determines conduct, which in turn determines performance. As the concentration in a market increases, firms with a greater monopoly power charge higher prices and hence profitability increases. Market power may also result in higher costs rather than higher profits due to inefficiencies related to the fact that management is under less pressure to minimize costs, which is the so-called quiet life effect (Berger and Hannan 1998). According to the alternative ES paradigm, on the other hand, some firms earn superior profits because they are more efficient than other firms and greater efficiency results in higher market share and higher market concentration (Demsetz 1973). Although under both the SCP and the ES models the relationship between market concentration and profits is positive, with the ES

model market share and hence concentration are endogenously determined by efficiency. According to the nonstructural approach, it is recognized that competitive behavior can be present in concentrated markets if existing firms are vulnerable to hit-and-run entry, i.e., when markets are contestable (Baumol 1982). With this approach, competitive conduct is not inferred through an analysis of the market structure but rather it is assessed explicitly (Heffernan 1996).

There is an extensive empirical literature that focuses on assessing banking competition following the nonstructural approach.⁴ However, only a limited number of studies analyze the determinants of competition, and in particular, the impact of financial reform, consolidation, and foreign entry on banking competition in emerging markets. Claessens and Laeven (2004) undertook the first comprehensive cross-country analysis of the determinants of competition for developing and developed countries' banking systems. They show that there is a positive and statistically significant relationship between market concentration and competition suggesting that the two indicators cover different concepts and concentration measures should not be used as indicators of market competitiveness. The degree of foreign bank ownership, on the other hand, is positively related to the level of competition, suggesting that the nature of ownership matters. More contestable systems are found to be more competitive. Bikker, Spierdijk, and Finnie (2007) extended Claessens and Laeven (2004) and also found that market structure indicators have no impact on competition while contestability matters.

Mamatzakis, Staikouras, and Koutsomanoli-Fillipaki (2005) report a gradual improvement in competition in response to the reform processes undertaken for the Southeastern European banking sectors. Similarly, Yildirim and Philippatos (2007) found that competition improved in the Central and Eastern European (CEE) banking markets as a result of the reform and liberalization processes. Maudos and Solis (2011) analyzed the evolution of competition in the Mexican banking market during a period of deregulation, liberalization, and consolidation, and conclude that the measures undertaken were ineffective in creating a competitive banking sector. Gelos and Roldós (2004) report that for a number of emerging markets, consolidation did not result in weakened competition. The authors argue that increased participation of foreign banks might have prevented the negative effect of consolidation on competition. Martinez Peria and Mody (2004), on the other hand, analyzed the impact of foreign penetration together with concentration on banking spreads in Latin American countries. They show that while foreign bank participation influenced spreads by lowering costs of operation in the system, increased concentration had a positive economic effect on spreads. Accordingly, as noted by the authors, some of the benefits of foreign entry to the public at large may be lost when foreign entry is also associated with increased concentration. Yeyati and Micco (2007) also

⁴ Section IV provides references to several studies employing different nonstructural measures.

analyzed the impact of concentration and foreign penetration in the Latin American banking markets and show that foreign participation reduced competition. Poghosyan (2010), however, failed to find any significant impact of foreign participation on bank interest margins in CEE countries.

More recent literature takes into account differing entry modes (i.e., cross-border acquisition vs. greenfield) in analyses of the impact of foreign bank entry on competitive conduct in banking. Jeon, Olivero, and Wu (2011), for example, show that while foreign bank penetration improved competition in Asia and Latin America via spillover effects, the entry mode matters. More specifically, it was found that the pro-competitive impact is stronger in the case of de-novo penetration than penetration through M&As. Similarly, Lozano-Vivas and Weill (2012) found that relative market power of cross-border banks depends on the mode of entry in the case of EU countries, in that, whereas greenfield banks improve competition, M&As hinder competition. The authors argue that whereas incumbent banks can extract monopoly rents due to switching costs, such extraction is more difficult for new entrants. Poghosyan and Poghosyan (2010), on the contrary, found for the CEE countries that foreign bank participation is beneficial for competition, and banks acquired by foreigners have less market power relative to domestic and foreign greenfield banks.

III. OVERVIEW OF THE TURKISH BANKING SECTOR

Since the initiation of the financial liberalization program in 1980, banks in Turkey have operated in an environment characterized by macroeconomic instability and a deficient regulatory and supervisory infrastructure. Banks were increasingly exposed to interest and foreign exchange risks and suffered from low asset quality and insufficient capital bases. Finally, in December 1999, an exchange rate-based stabilization program was introduced to address the worsening macroeconomic fundamentals and fragilities in the financial sector. However, it had to be abandoned amid a liquidity crisis in November 2000 and a major attack on the lira in February 2001, which resulted in substantial foreign exchange losses for banks. A new economic stabilization program was announced in April 2001 in order to restore economic stability and restructure the financial system.⁵

As part of the new economic program, a banking restructuring program was introduced in May 2001. Its components included: resolution of banks which were taken under the Savings Deposit Insurance Fund (SDIF), restructuring of state-owned banks, recapitalization of privately owned banks, improving regulation and supervision, and increasing efficiency and competition in the system. Between 1999 and 2003, 20 banks were taken under the control of the SDIF because of

⁵ During the year, the GDP contracted by 7.5% while the Turkish lira depreciated by 11% in real terms (CBRT 2002, 2003).

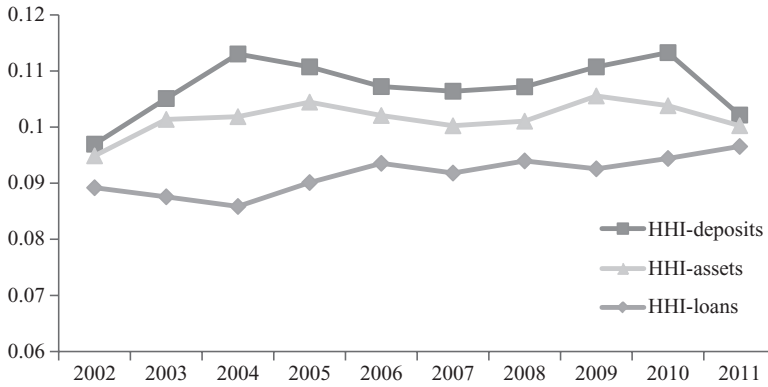
weak financial positions, and resolution of these banks involved liquidations, restructurings, and acquisitions by either Turkish or foreign banks. State-owned banks were recapitalized and capital support was provided to privately owned banks. As a result, the number of banks declined and concentration levels increased considerably over a short period of time. The number of commercial banks decreased to 36 in 2003 from a peak of 62 in 1999 while the 5-bank concentration ratio increased to 62.9% in 2003 from 48.6% in 1999 (see Table A1 in Appendix for selected market structure indicators).

One of the most important regulatory changes during the period was the introduction of a limited deposit insurance system in 2004, which replaced the full coverage insurance system. A new Banking Act in line with EU directives and international principles and standards was prepared by the Banking Regulation and Supervision Agency (BRSA) and enacted by the parliament in November 2005. Subsequent to operational restructuring, state-owned banks acquired the status of a joint stock company, which enabled them to operate on a commercial basis free from legal exceptions and responsibilities (IMF 2007). Initial public offerings were undertaken in two of the three remaining state-owned banks, which reduced the extent of government ownership in the system. At the same time, foreign presence in the sector, which had previously been negligible, increased significantly. Attracted by future growth prospects, foreign banks acquired controlling stakes in Turkish banks or made strategic partnership agreements. The majority of these acquisitions involved parent banks originating from European countries.⁶ The foreign entrants were interested in growth opportunities in the retail banking segment due to the improving macroeconomic and institutional environment and they aimed at expanding their market shares. As of December 2011, Turkish private ownership was 32.6% while the nonresidents' share reached 40.4% of the banking sector's total assets (BRSA 2011).

The sector quickly began to recover thanks to the strong growth performance of the economy and the availability of international funds, and banks were set to expand both their branch networks and array of products. The loans' share in total assets increased mainly due to economic growth and increased demand for consumer loans and mortgages while asset quality in the system improved. From 2002 to 2007, the commercial banking industry grew about 3.8 times in terms of assets, as measured in US dollars. However, economic growth slowed down in 2007 as a result of unfavorable international financial market developments and domestic political events. As was the case for many emerging markets, the impact of the

⁶ Foreign investors entering the Turkish market include HSBC and Novabank in 2001; Unicredit in 2002; BNP Paribas, Fortis Bank, and GE Capital in 2005; the National Bank of Greece and Dexia Participation Belgique in 2006; Eurobank EFG Holding, BTA Bank, Arab Bank, BankMed, Citibank, and ING Bank in 2007; the National Bank of Kuwait in 2008; and Banco Bilbao Vizcaya Argentaria in 2011.

Fig. 1. The Herfindahl–Hirschman Index (HHI)



Source: Author’s own calculations.

Note: The HHIs are calculated in terms of market shares in total assets (HHI-assets), deposits (HHI-deposits), and loans (HHI-loans).

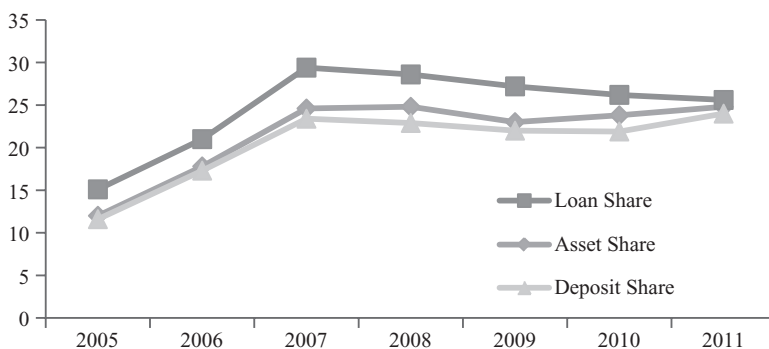
global crisis became significant for the Turkish banking system from late 2008 onwards as raising funds in international markets became difficult. Nonetheless, the sector proved to be resilient as it was not exposed to toxic assets, and domestic deposits traditionally constituted the main source of funds. In particular, net profits in the sector increased by 52% in 2009 mainly as a result of the maturity mismatch between long-term assets and short-term financing sources in the face of declining interest rates. The return on assets figures between 2008 and 2011 in Turkish banking were higher than the CEE countries’ average and those of most of the BRICS countries.⁷ Despite an increase in nonperforming loans in 2008 and 2009, higher profitability helped increase capital levels and the sector did not need any capital injections.

Figure 1 shows the evolution of concentration in the market as measured by the Herfindahl–Hirschman index (HHI).⁸ The HHI is calculated in terms of market shares in total assets, loans, and deposits. The average HHI in terms of total assets share is 0.1014, which indicates a comparable level of concentration to the EU averages of 0.1010 (old members) and 0.1190 (new members) for 2010 (Weill 2013). Following a jump during the early years of restructuring, which was the

⁷ Table A2 in the Appendix provides comparative statistics on key performance indicators for Turkey and some selected countries.

⁸ The HHI is the sum of the squares of bank sizes measured as market shares and ranges from $1/n$ to 1 if there are n banks in the market. It is preferable to a randomly selected k -bank concentration ratio because it takes into account share distribution by incorporating each bank individually (Bikker and Haaf 2002).

Fig. 2. Evolution of Foreign Bank Participation (%)



Source: Based on total equity and inclusive of the foreign stake in banks in which foreign ownership is less than 50%. The series are provided by the Banks Association of Turkey (BAT 2012) and available from December 2005 onwards only.

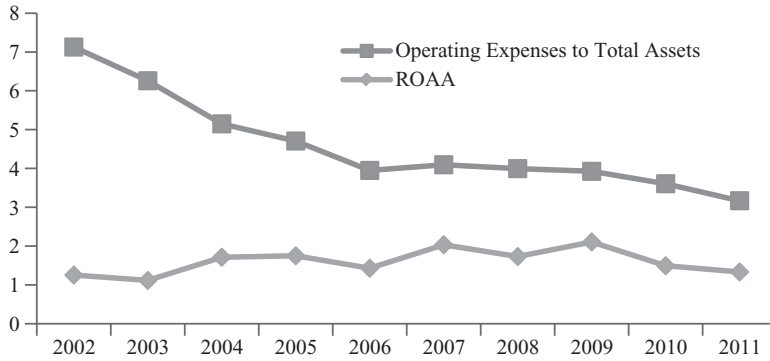
result of banks exiting the system, in terms of deposits and assets concentration in the system stabilized. In terms of loans, on the other hand, concentration displayed a slight upward trend over time.

Figure 2 illustrates the evolution of foreign bank participation in the Turkish banking industry between 2005 and 2011. There was a sharp increase in foreign penetration levels from 2005 to 2007. During the global crisis, foreign penetration in terms of loan share in the sector continuously decreased, while in terms of asset and deposit shares, it regained most of its losses by the end of 2011. It is especially noteworthy that foreign penetration in terms of deposits increased in the later periods while penetration in terms of loans is yet to recover, suggesting a strategy change on the part of foreign banks towards employing more local deposits in funding sources while constraining credit growth.⁹

Figure 3 presents the evolution of two performance indicators over the analysis period: return on average assets (ROAA) as a measure of profitability and ratio of operating expenses to total assets as a proxy for operational efficiency. We observe that operating expenses declined significantly and continuously up until 2006, and after some setbacks in 2007 and 2008 it continued its downward trend. The evidence here is compatible with a hypothesis that the measures taken as part of the restructuring program were effective in improving the efficiency of the system. Profitability, on the other hand, had an upward trend up until 2009 when it achieved a record high level of 2.11%. The impact of the global financial crisis is evident in

⁹ Deposit and loan ratios by ownership categories provided in Table A1 in the Appendix also confirm this observation.

Fig. 3. Evolution of Efficiency and Profitability (%)



Source: Author's own calculations.

the lower profit levels of the last two years. The question of whether the observed upward trend in profitability over time and the continuously high profit levels by international standards are the results of gains in operational efficiency or the less than optimal competitive conduct of the banks can only be answered by analyzing empirically the intensity of the competition in the system.

IV. METHODOLOGY

There does not seem to be consensus about how best to measure competition in the extant empirical literature on competition in banking. Carbo *et al.* (2009) show that determination of competition may differ depending on the measure chosen to assess it, as different indicators of competition tend to measure different things. Hence, it is important to consider a range of alternative measures to deduce competitive behavior. Accordingly, in this study, the level of competition in the Turkish banking industry was assessed by employing three alternative approaches. The two most commonly employed nonstructural measures of competition, the Lerner index and the Panzar and Rosse *H*-statistic, were derived and a dynamic model was used to test the competitiveness in the sector by analyzing profit persistence. In addition, market power across different ownership categories of banks was examined.

A. *The Lerner Index of Market Power*

The Lerner index represents the markup of price over marginal costs and is a measure of the degree of market power. The higher the markup, the greater the

realized market power. It has the advantage of capturing dynamics of the market power at bank level over time.¹⁰ It is calculated as:

$$Lerner_{it} = \frac{(P_{it} - MC_{it})}{P_{it}}, \quad (1)$$

where P_{it} is the price of total assets and defined as the total interest and noninterest income divided by total assets for bank i at time t , and MC_{it} is the marginal cost of total assets for bank i at time t . To generate MC_{it} , the following translog function is estimated:

$$\begin{aligned} \ln TC_{it} = & \beta_1 \ln Q_{it} + \frac{1}{2} \beta_2 (\ln Q_{it})^2 + \sum_{k=1}^2 \gamma_k W_{kit} \\ & + \frac{1}{2} \sum_{k=1}^3 \sum_{j=1}^3 \gamma_{kj} \ln W_{kit} \ln W_{jit} + \sum_{k=1}^3 \rho_k \ln Q_{it} \ln W_{kit} + \sigma_1 \ln Z_{it} + \frac{1}{2} \sigma_2 (\ln Z_{it})^2 \\ & + \sigma_3 \ln Z_{it} * \ln Q_{it} + \sum_{k=1}^3 \tau_k \ln Z_{it} \ln W_{kit} + \delta_1 Trend + \frac{1}{2} \delta_2 Trend^2 \\ & + \delta_3 Trend * \ln Q_{it} + \sum_{k=1}^3 \varphi_k \ln W_{kit} Trend + \delta_4 Trend * \ln Z_{it} + e_{it}, \end{aligned} \quad (2)$$

where TC_{it} is total costs defined as total interest and noninterest expenses and Q_{it} represents total output defined as total assets. Following the intermediation approach, which has been commonly employed in recent literature, three input prices are defined and included in W_{kit} : W_{1it} is the price of borrowed funds or funding costs (total interest expenses/total funds borrowed), W_{2it} is the price of labor (personnel expenses/number of employees), and W_{3it} is the price of administrative and other operating activities (operating expenses exclusive of personnel expenses/total assets). Z_{it} is total equity and included as a netput to account for the banks' risk preferences, and trend is the time variable specified to capture the effect of technical change over time following Fernandez de Guevera, Maudos, and Pérez (2005) and Maudos and Solis (2011). Total costs, price of borrowed funds, and the price of administrative activities are scaled by the price of personnel. According to this expression, marginal costs for total assets are given by the following equation:

$$MC_{it} = \frac{TC_{it}}{Q_{it}} (\beta_1 + \beta_2 \ln Q_{it} + \rho_1 \ln W_{1it} + \rho_2 \ln W_{3it} + \sigma_3 \ln Z_{it} + \delta_3 Trend). \quad (3)$$

¹⁰ Some recent applications of the Lerner index include Fernandez de Guevera, Maudos, and Pérez (2005), Carbo *et al.* (2009), and Weill (2013) for European markets, Fungáčová, Solanko, and Weill (2010) for the Russian banking sector, and Maudos and Solis (2011) for the Mexican banking sector.

B. *Panzar and Rosse H-statistic*

The Panzar and Rosse approach to the measurement of competitive behavior in markets is based on the derivation of a test statistic, *H*-statistic, which is the sum of the elasticities of the reduced form revenue with respect to factor prices (Panzar and Rosse 1987). According to this approach, $H \leq 0$ indicates monopoly or collusive oligopoly, $0 < H < 1$ indicates monopolistic competition, and $H = 1$ indicates perfect competition.¹¹ The *H*-statistic can also be interpreted as a continuous measure of the level of competition with higher values indicating stronger competition (Bikker and Haaf 2002; Casu and Girardone 2006).

Rather than deriving a conventional *H*-statistic, this study adopted the continuous-time curve version of the Panzar and Rosse *H*-statistic developed by Bikker and Haaf (2002) in order to account for market dynamics. Developments in the postcrisis period in the Turkish banking environment, in particular, increased foreign penetration and the reform of the regulatory framework might have led to a gradual change in the long-run equilibrium market structure and hence necessitate the control of market dynamics in the estimation of the *H*-statistic.¹² Accordingly, the following total revenue equation was applied to bank-level panel data:

$$\ln TR_{it} = \alpha + [\beta_1(\ln W_{1it}) + \beta_2(\ln W_{2it}) + \beta_3(\ln W_{3it})] \exp(\varepsilon * time) + \gamma X_{it} + e_{it}, \quad (4)$$

where TR_{it} is total revenue defined as interest income plus noninterest income. Total revenue is considered rather than interest income because the share of noninterest sources of income in total income has become substantial in modern banking in recent years. The three input prices of funds (W_{1it}), personnel (W_{2it}), and operating activities (W_{3it}) are defined as before. The *H*-statistic is calculated as the sum of the elasticities of total revenue with respect to three input prices multiplied by the continuous-time curve model factor, $\exp(\varepsilon * time)$. X_{it} is a vector of bank-level control variables including off-balance sheet (OBS) positions to total assets, total loans to total assets, owners' equity to total assets, and total deposits to total funds. In order to take into account scale economies, size dummies rather than a scale variable such as total assets were employed since Bikker, Spierdijk, and

¹¹ Various studies have employed the Panzar and Rosse *H*-statistic to assess developed and emerging countries' banking markets and have found monopolistic competition as the prevailing outcome. See, for instance, Bikker and Haaf (2002), Casu and Girardone (2006), and Weill (2013) for the European countries' banking markets and Gelos and Roldós (2004) for a sample of emerging markets in Latin America and Europe, Levy Yeyati and Micco (2007) for Latin American markets, Mamatzakis, Staikouras, and Koutsomanoli-Fillipaki (2005) for the Southeastern European banking sector, Günalp and Çelik (2006) for the Turkish banking sector, Yildirim and Philippatos (2007) for CEE banking markets, and Maudos and Solis (2011) for the Mexican banking sector.

¹² See Jeon, Olivero, and Wu (2011) for an application of the continuous-time curve approach to Latin American and Asian countries.

Finnie (2006) show that the use of such scale controls results in an upward bias in the H -statistic. Specifically, four size dummies were defined based on total asset percentiles, with the largest size percentile being the control group. As a robustness test an alternative H -statistic was also calculated considering only interest income rather than the total revenue as the dependent variable in the revenue equation (4).

C. Persistence of Profit

As opposed to the static methodology inherent in structural and nonstructural approaches, the persistence of profit approach is based on the investigation of the dynamics of bank-level profits. An important component of profitability is its persistence as it may reflect the existence of barriers to competition such as regulations and high entry and exit costs (Berger *et al.* 2000; Goddard, Molyneux, and Wilson 2004). Accordingly, profit persistence can be interpreted as an indicator of the intensity of competition. The underlying hypotheses are that when entry and exit are sufficiently free, abnormal profits are eliminated quickly by competition, and bank profit rates converge rapidly towards the same long-run equilibrium level.¹³ Following Goddard *et al.* (2011), the following first order autoregressive model was specified to assess the profit persistence:

$$\pi_{i,t} = \tilde{\pi}_i + \lambda\pi_{i,t-1} + e_{it}, \quad (5)$$

where $\pi_{i,t}$ and $\pi_{i,t-1}$ are normalized profit rates for bank i in period t and $t-1$ respectively, and $\tilde{\pi}_i$ is bank i 's long-run normalized profit rate. Return on average equity (ROAE) was used as the profit rate and transformed as the deviation from the cross-sectional mean profit rate in period t in order to control for the cyclical fluctuations that might affect all the banks in the same way. The coefficient of lagged profits (λ) represents the level of profit persistence and can be interpreted as a measure of the speed of adjustment to equilibrium profits and the level of competitiveness in the sector. The two-step system GMM estimator was employed to estimate equation (5) in order to address the endogeneity problem introduced with the inclusion of the lagged dependent variable, and second order lags and differences of the dependent variable were used as instruments (Arellano and Bover 1995; Blundell and Bond 1998).

To test if profit persistence changed over time, and in particular to assess the impact of the global crisis on profit persistence, equation (5) was applied in two subperiods: the first subperiod, transition, runs from 2002 to 2006 and covers the period during which legal and institutional measures aimed at improving

¹³ Recent studies examining profit persistence in banking include Berger *et al.* (2000) in the United States, Goddard, Molyneux, and Wilson (2004) in European countries, Agostino, Leonida, and Trivieri (2005) in Italy, Bektas (2007) in Turkey, Goddard *et al.* (2011) in developed and developing countries, and Garza-Garcia (2012) in Mexico.

regulation and supervision were introduced. Also in this period foreign bank participation was increasing and banks were actively seeking to increase their market shares. The second subperiod, crisis, runs from 2007 to 2011 and includes the global financial crisis. Definitions of the variables employed in the three models are given in Table A3 in the Appendix.

V. EMPIRICAL ANALYSIS

A. *Data*

Financial data for the depository banks were obtained from the Banks Association of Turkey (BAT) for 2002 to 2011.¹⁴ Owing to the M&As that took place during the period of analysis, the final sample is an unbalanced panel with 300 bank-year observations. As of 2011 the sample accounts for almost 100% of the total depository banking system's assets because it includes 28 banks out of a total of 31 banks in operation.¹⁵ Financial data were deflated to 2002 constant prices by using CPI (1994 = 100) of the Turkish Statistics Institute (TSI). Financial statement variables were winsorized at the top and bottom 1% of the distribution. Table A4 and Table A5 in the Appendix provide the descriptive statistics on the variables employed and the cross-correlation matrix, respectively.

B. *The Lerner Index*

In order to calculate the bank-level Lerner indices, marginal costs were derived from the estimation of the translog function given in equation (2) for the period 2002 to 2011.¹⁶ Before presenting the Lerner indices, the parameter estimates of the translog cost function are considered briefly in order to provide some perspective on the existence of scale economies.¹⁷ Scale economies, in particular those resulting from investments in technology, are a major determinant of optimum

¹⁴ There were in total 44 (54) banks in operation as of December 2011 (2002): 31 (40) of them were depository banks and the remaining were development and investment banks. Since development and investment banks are different from depository banks in terms of not only financing sources but also products and services provided, they are not included in the study.

¹⁵ Banks taken under the control of the Savings and Deposit Insurance Fund (SDIF) as well as two small foreign-owned banks that left the system at the beginning of the analysis period were not included in the study. One small foreign-owned bank was also excluded as it did not report any loan data.

¹⁶ Estimation of a common cost function for the total sample implicitly assumes that banks with different ownership characteristics have the same technology. This assumption should not cause any concern here since the study's sample is homogeneously made up of for-profit depository banks where the same cost-minimizing technology should be employed. The author is grateful to an anonymous referee for making this point.

¹⁷ The parameter estimates are given in Table A6 in the Appendix.

TABLE 1
Yearly Lerner Indices

	No. of Obs.	Mean	Median	Max.	Min.	SD	Weighted Mean
2002	33	0.0954	0.1516	0.7336	-1.2608	0.3572	0.0830
2003	31	0.0659	0.0774	0.6674	-2.9209	0.5957	0.0488
2004	31	0.1866	0.1799	0.6652	-0.9006	0.2748	0.1941
2005	31	0.2017	0.2249	0.5376	-0.3973	0.1843	0.2313
2006	30	0.2116	0.2263	0.5620	-0.1326	0.1536	0.2596
2007	29	0.2137	0.2185	0.7637	-0.2733	0.1850	0.2290
2008	29	0.2223	0.2265	0.5863	-0.2629	0.1775	0.2665
2009	29	0.3379	0.3616	0.6402	0.0018	0.1574	0.3791
2010	29	0.3361	0.3105	0.9248	0.0043	0.1751	0.3812
2011	28	0.3522	0.3193	1.0055	-0.1784	0.2215	0.3821
Total	300	0.2188	0.2362	1.0055	-2.9209	0.2949	0.3808

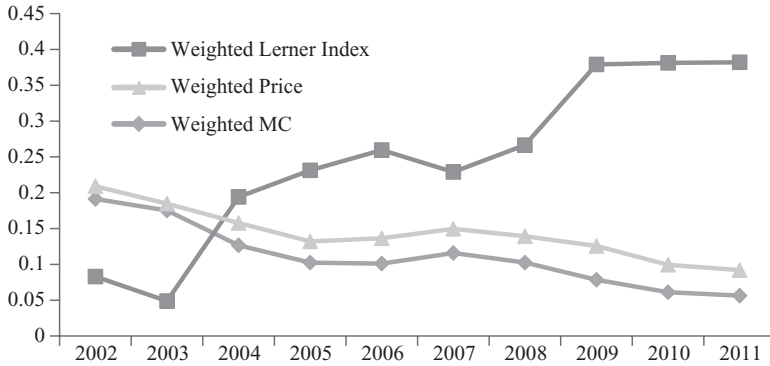
bank size and hence should provide insights for the existing market structure.¹⁸ Cost advantages to be gained through larger size could have been one of the driving forces behind the consolidations in the sector right after the crisis and the strong growth performance of the banks in more recent years. Scale economies at bank level were calculated using the estimated translog function parameters. The average scale economies for the whole period was found to be 1.02, which is not significantly different from 1 and indicates that on average constant costs exist. When yearly averages of scale economies were considered, however, the results show that the sector was displaying diseconomies of scale in the first two years, scale economies in the last two years, and constant costs in between.¹⁹ A reasonable interpretation of the picture that emerges would be that banks were oversized at the beginning of the restructuring and that they trimmed down their sizes continuously over the sample period.

The bank-level Lerner indices calculated according to equation (1) are presented in Table 1. The mean (median) Lerner index ranges from 6.59% to 35.22% (from 7.74% to 36.16%) over time. These figures, especially in the later periods studied, are considerably higher than what was found for some emerging markets. For instance, Anzoategui, Martínez Pería, and Melecky (2012) report mean Lerner indices for the period 2002 to 2008 for Russia (10.1%), Brazil (5.4%), China (20.9%), and India (14.5%). Fungáčová, Solanko, and Weill (2010) found mean Lerner indices ranging from 20.1% to 22.0% for Russian banks between 2001 and 2007. Weill (2013), on the other hand, provides Lerner indices for EU countries for

¹⁸ The author is thankful to an anonymous referee for this suggestion.

¹⁹ The results are not presented but are available upon request.

Fig. 4. Evolution of Sector-wide Marginal Cost, Price, and Lerner Indices



Note: Weighted MC, Weighted Lerner Index, and Weighted Price are asset weighted average of bank-level marginal costs, Lerner indices, and prices, respectively.

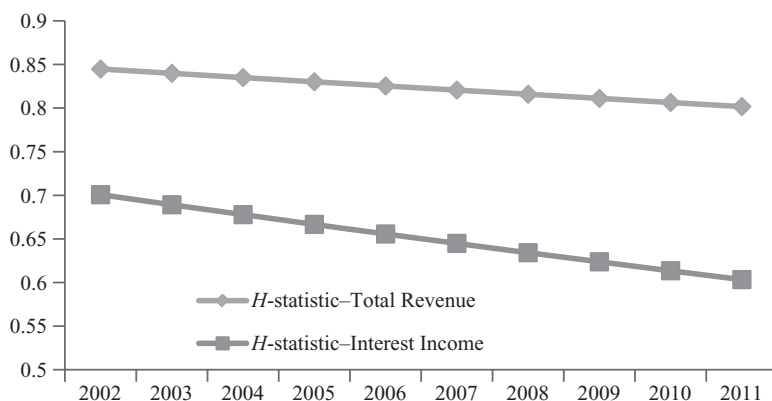
the period 2002 to 2010. Whereas the mean indices range from 8.24% to 19.54% for the old EU member countries, for the new EU members they are higher and range from 12.03% to 21.33%.

Sector-wide marginal costs, prices, and Lerner indices calculated as asset-weighted averages of bank-level measures are displayed in Figure 4 in order to shed some light on the evolution of the Lerner index over time. Both prices and marginal costs decline till 2005. After displaying an upward trend between 2005 and 2007, both series continue their declining trends. While declining marginal costs might indicate efficiency gains in the sector due to restructuring and reform processes, the development in the Lerner index depends on the relative level of changes in marginal costs and prices. The results show that except for 2003, market power on average increases up until 2006 due to marginal costs decreasing more than prices in the system. The onset of the global financial crisis, however, coincides with sharp increases in the average market power in 2008 and 2009 before stabilizing in the last two years.

C. Panzar and Rosse *H*-statistic

The model estimates of the continuous-time curve version of the Panzar and Rosse *H*-statistics as defined in equation (4) for total revenue and interest income are presented in Figure 5.²⁰ Both series exhibit an insignificant downward trend,

²⁰ The regression results are given in Table A7 in the Appendix.

Fig. 5. Continuous-time Curve H -Model Estimates

Note: H -statistic–Total Revenue and H -statistic–Interest Income stand for the H -statistic estimates according to the model given in equation (4) with total income and interest income as dependent variables, respectively.

indicating a lack of improvement in the competitiveness of the sector. This provides support for the findings pertaining to the evolution of market power as measured by the Lerner index.

D. Persistence of Profit

Table 2 presents the results of estimating the dynamic profit equation (5) for the whole period together with the two subperiods. The results of the two specification tests, the Arellano–Bond test for serial correlation of order two in the first-differenced residuals and the Hansen test for overidentifying restrictions, are both satisfactory and the number of instruments is less than the number of groups as advised.

The persistence of profit as measured by the coefficient of the lagged profit variable was found to be 0.467, which is slightly higher than the averages of 0.426 and 0.442 for developing and advanced countries, respectively, as found by Goddard *et al.* (2011). When the persistence of profit in the two subperiods is considered, the findings suggest that banks were able to retain a relatively smaller fraction of their abnormal profits from year to year in the transition subperiod. Overall, the findings imply that competition was relatively higher in the precrisis period and provide support for the findings relating to the evolution of the period-varying H -statistics and the Lerner indices.²¹

²¹ In unreported analysis return on average assets (ROAA) is also employed as an alternative proxy for a robustness check. The results remain qualitatively the same and are available upon request.

TABLE 2
Dynamic Profit Equation Estimates for the Crisis Period

	Whole Period (2002–11)	Transition Period (2002–06)	Crisis Period (2007–11)
<i>Lagged ROAE</i>	0.467*** (2.94)	0.224* (1.84)	0.632*** (6.20)
<i>Constant</i>	0.554*** (3.87)	0.854*** (4.97)	0.387*** (3.63)
No. of obs.	264	120	115
No. of banks	32	31	29
No. of instruments	17	7	7
AR(2) <i>p</i> -value	0.504	0.453	0.451
Hansen <i>p</i> -value	0.654	0.429	0.749

Note: Dynamic panel data estimation, two-step system GMM. Z statistics in parentheses. AR(2) *p*-value is the Arellano-Bond test *p*-value for serial correlation of order two in the first-differenced residuals, where H_0 : no autocorrelation. Hansen *p*-value is the Hansen test *p*-value for over-identifying restrictions, where H_0 : over-identifying restrictions are valid.

***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

E. Market Power by Ownership

The foregoing analysis indicated a lack of improvement in overall competitiveness in the sector over time. However, it is possible that the evolution of competitive conduct might differ in banks with different ownership characteristics. State-owned banks might have higher market power due to various factors such as cost of capital advantages and captive depositors. Foreign-owned banks, on the other hand, as subsidiaries of large and internationally active banks, might benefit from the advantages of their parent banks in generating private information and hence have higher market power (Buch, Koch, and Koetter 2013). Moreover, the Turkish banking sector is characterized by substantial heterogeneity in terms of size. State-owned banks, in particular, are substantially larger and have a wide branch network across the country: the three state-owned banks accounted for about 30.5% of the total assets of the depository banking sector at the end of 2011 (see Table A1 Panel A in the Appendix for selected market structure indicators). Hence, they might be able to extract monopoly rents due to their large size and extensive branch networks.²² Additionally, the relative market power of banks might depend on macroeconomic and financial market conditions. For instance, during a financial turmoil, such as the recent global crisis, customers fleeing to safety might enhance the market power of state-owned banks due to the perceived safety of these banks. The impact of the crisis on the market power of foreign-owned banks, however, might be affected by home country and/or parent bank conditions.

²² Hence in the following discussions it should be noted that the market power of state-owned banks relative to other categories of banks would be due to the combined impacts of both their ownership status and large size. The author thanks an anonymous referee for raising this issue.

While a comprehensive analysis of sources of market power at bank level is beyond the scope of this study, analysis of the evolution of market power of banks across different ownership categories might provide further insights into the sector's competitiveness given the recent increase in foreign presence in the sector and the operational and legal changes in state-owned banks which might have influenced their market power over time. For this purpose, yearly averages of Lerner indices were compared for the following groups of banks: state-owned, majority foreign-owned, and privately owned. Table 3 presents the yearly summary statistics on Lerner indices by ownership while Figure 6 graphically presents the behavior of the median indices for these groups over time. Figure 7 shows the asset-weighted average Lerner indices according to ownership categories as well.

It is first observed that the market power of both state- and privately owned banks displays an upward trend over time. The market power of foreign-owned banks, conversely, does not exhibit any trend. Whereas foreign-owned banks seem to have higher market power at the beginning of the observed period, state-owned banks dominate both foreign- and privately owned groups in the later periods. According to Wilcoxon–Mann–Whitney test results, state-owned banks significantly dominate privately owned banks only for the period 2008 to 2010 while foreign-owned banks have significantly higher market power than privately owned banks only for 2002 and 2003.²³ One possible explanation for the significantly higher Lerner indices of state-owned banks for the period 2008 to 2010 might be the perceived safety of these banks during financial turmoil.

VI. CONCLUSIONS

This paper presents a comprehensive analysis of the recent evolution of competition in the Turkish banking industry in light of the processes of restructuring and transformation as well as the global financial crisis. The main finding of the study is that the extensive restructuring and reform processes undertaken in the country and increased foreign penetration have failed to create a competitive banking system. All the indicators generated by employing three alternative approaches to the measurement of competition in banking consistently support this finding. In addition, there is also some evidence that state-owned banks, which are considerably larger, have enjoyed higher market power in the later periods.

This paper expands on knowledge concerning the evolution of banking competition in emerging markets due to financial reform, consolidation, and foreign entry. The main finding that competitive conduct of the sector did not improve despite restructuring and foreign entry is in line with the previous literature, which emphasizes the interactions between higher concentration and foreign bank

²³ Test results are not reported due to space limitations but are available on request.

TABLE 3
Yearly Lerner Indices by Ownership Categories

	State-Owned				Foreign-Owned				Privately Owned			
	Obs.	Mean	Median	SD	Obs.	Mean	Median	SD	Obs.	Mean	Median	SD
2002	3	0.1373	0.0785	0.1307	12	0.1413	0.2132	0.5412	18	0.0577	0.0621	0.2128
2003	3	0.1219	0.0334	0.1929	11	0.0478	0.3537	1.0095	17	0.0678	0.0642	0.1519
2004	3	0.2834	0.2955	0.1445	11	0.2158	0.3310	0.4258	17	0.1506	0.1651	0.1482
2005	3	0.2205	0.2440	0.1060	12	0.2016	0.2237	0.2563	16	0.1982	0.2235	0.1347
2006	3	0.2492	0.2342	0.0326	14	0.1835	0.1789	0.1978	13	0.2331	0.2404	0.1126
2007	3	0.2444	0.2408	0.0192	16	0.1958	0.1966	0.2383	10	0.2330	0.2062	0.1022
2008	3	0.3267	0.3451	0.0638	16	0.2050	0.1870	0.2280	10	0.2186	0.2109	0.0793
2009	3	0.4384	0.4391	0.0281	16	0.3353	0.3575	0.1965	10	0.3118	0.3088	0.0918
2010	3	0.4402	0.4188	0.0376	16	0.3205	0.2626	0.2242	10	0.3299	0.3439	0.0851
2011	3	0.4475	0.4532	0.0627	15	0.3427	0.2997	0.2846	10	0.3379	0.3551	0.1298
Total	30	0.2910	0.2913	0.1425	139	0.2276	0.2452	0.3955	131	0.1929	0.2175	0.1656

Note: Foreign banks are defined as banks where the foreign share is at least 50%.

Fig. 6. Median Lerner Indices by Ownership Categories

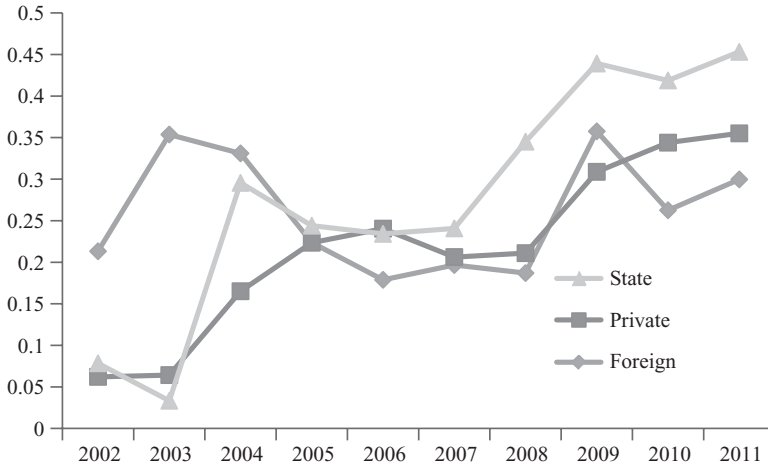
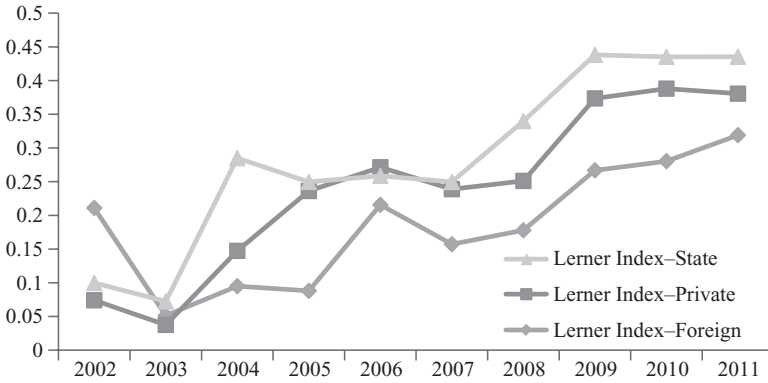


Fig. 7. Asset-weighted Lerner Indices according to Ownership Types



Note: Lerner Index–Foreign is the asset-weighted average of Lerner indices of foreign owned banks. Lerner Index–Private is the asset-weighted average of Lerner indices of privately owned Turkish banks. Lerner Index–State is the asset weighted average of Lerner indices of state-owned banks.

penetration affecting competitiveness (Martinez Peria and Mody 2004; Yeyati and Micco 2007). The fact that foreign bank entries in the Turkish case took the form of M&As, instead of greenfield investment, might have limited the expected positive impact of foreign penetration on the sector’s competitiveness as argued in the recent literature (Jeon, Olivero, and Wu 2011; Lozano-Vivas and Weill

2012).²⁴ The strong growth performance of the country in recent years and its rapidly growing middle class, who have created a demand for banking services such as consumer and mortgage loans, could be contributing to the overall lack of improvement in the competitive conduct of the sector. This also provides indirect support for previous findings that economic growth positively affects market power in banking (Fernandez de Guevera, Maudos, and Pérez 2005; Fungáčová, Solanko, and Weill 2010).

The findings suggest that the market power of banks with different ownership characteristics might vary and hence future research should concentrate on the impact of ownership on the sources of market power.²⁵ Finally, the paper indicates that the recent global crisis might have coincided with a less competitive market structure in the banking sectors of other emerging countries. The implication for policy makers is that the impact of reform and restructuring processes together with accompanying foreign entry and growth on banking competition should be analyzed empirically in order to develop policies promoting efficient and strong financial systems.

²⁴ BRSA granted the first new banking license in the post-crisis period to Bank Audi of Lebanon in October 2012 and recently to Rabobank of the Netherlands in August 2013. In this respect, the new licenses can be considered an important step in the right direction.

²⁵ There are very few studies analyzing the firm-level factors affecting the market power of banks (see, for instance, Fernandez de Guevera, Mandos, and Pérez (2005), Fungáčová, Solanko, and Weill (2010), and Anzoategui, Martínez Pería, and Melecky (2012).

REFERENCES

- Agostino, Mariarosaria; Leone Leonida; and Francesco Trivieri. 2005. "Profits Persistence and Ownership: Evidence from the Italian Banking Sector." *Applied Economics* 37, no. 14: 1615–21.
- Alexander, Philip. 2011. "Turkish Banks Draw Battle Lines in Fight for Customer Market Share." *Banker*, May 4. <http://www.thebanker.com/World/Western-Europe/Turkey/Turkish-banks-draw-battle-lines-in-fight-for-customer-market-share/> (accessed November 16, 2011).
- Anzoategui, Diego; María Soledad Martínez Pería; and Martin Melecky. 2012. "Bank Competition in Russia: An Examination at Different Levels of Aggregation." *Emerging Markets Review* 13, no. 1: 42–57.
- Arellano, Manuel, and Olympia Bover. 1995. "Another Look at the Instrumental Variable Estimation of Error-Components Models." *Journal of Econometrics* 68, no. 1: 29–51.
- Banking Regulation and Supervision Agency (BRSA). 2011. "Finansal Piyasalar Raporu." [Financial market report], no. 24, December. Ankara: BRSA. http://www.bddk.org.tr/websitesi/turkce/Raporlar/Finansal_Piyasalar_Raporlari/107982012_fpr_aralik_11_nisan.pdf (accessed April 7, 2014).

- Banks Association of Turkey (BAT). 2012. "Banka Grupları Bazında Sermaye Yapısı." [Capital structure by groups], March. Istanbul: BAT. <http://www.tbb.org.tr/tr/banka-ve-sektor-bilgileri/istatistiki-raporlar/59> (accessed March 6, 2012).
- Baumol, William J. 1982. "Contestable Markets: An Uprising in the Theory of Industry Structure." *American Economic Review* 72, no. 1: 1–15.
- Bektas, Eralp. 2007. "The Persistence of Profits in the Turkish Banking System." *Applied Economics Letters* 14, no. 3: 187–90.
- Berger, Allen N., and Timothy H. Hannan. 1998. "The Efficiency Cost of Market Power in the Banking Industry: A Test of the 'Quiet Life' and Related Hypotheses." *Review of Economics and Statistics* 80, no. 3: 454–65.
- Berger, Allen N.; Seth D. Bonime; Daniel M. Covitz; and Diana Hancock. 2000. "Why Are Bank Profits So Persistent? The Roles of Product Market Competition, Informational Opacity, and Regional/Macroeconomic Shocks." *Journal of Banking and Finance* 24, no. 7: 1203–35.
- Bikker, Jacob A., and Katharina Haaf. 2002. "Measures of Competition and Concentration in the Banking Industry: A Review of the Literature." *Economic and Financial Modelling* 9, no. 2: 53–98.
- Bikker, Jacob; Laura Spierdijk; and Paul Finnie. 2006. "Misspecification of the Panzar–Rosse Model: Assessing Competition in the Banking Industry." DNB Working Paper no. 114. Amsterdam: De Nederlandsche Bank.
- . 2007. "The Impact of Market Structure, Contestability and Institutional Environment on Banking Competition." Tjalling C. Koopmans Research Institute Discussion Paper no. 07-29. Utrecht: Utrecht School of Economics, Utrecht University.
- Blundell, Richard, and Stephen Bond. 1998. "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87, no. 1: 115–43.
- Buch, Claudia M.; Cathérine T. Koch; and Michael Koetter. 2013. "Do Banks Benefit from Internationalization? Revisiting the Market Power–Risk Nexus." *Review of Finance* 17, no. 4: 1401–35.
- Carbo, Santiago; David Humphrey; Joaquín Maudos; and Philip Molyneux. 2009. "Cross-country Comparisons of Competition and Pricing Power in European Banking." *Journal of International Money and Finance* 28, no. 1: 115–34.
- Casu, Barbara, and Claudia Girardone. 2006. "Bank Competition, Concentration and Efficiency in the Single European Market." *Manchester School* 74, no. 4: 441–68.
- Central Bank of the Republic of Turkey (CBRT). 2002. "2001 Annual Report." Ankara: CBRT. <http://www.tcmb.gov.tr/research/yillik/annualyeni.html> (accessed April 7, 2014).
- . 2003. "2002 Annual Report." Ankara: CBRT. <http://www.tcmb.gov.tr/research/yillik/annualyeni.html> (accessed April 7, 2014).
- Claessens, Stijn, and Luc Laeven. 2004. "What Drives Bank Competition? Some International Evidence." *Journal of Money, Credit and Banking* 36, no. 3: 563–83.
- Demsetz, Harold. 1973. "Industry Structure, Market Rivalry, and Public Policy." *Journal of Law and Economics* 16, no. 1: 1–9.
- Fernandez de Guevera, Juan; Joaquín Maudos; and Francisco Pérez. 2005. "Market Power in European Banking Sectors." *Journal of Financial Services Research* 27, no. 2: 109–37.
- Fungáčová, Zuzana; Laura Solanko; and Laurent Weill. 2010. "Market Power in the Russian Banking Industry." BOFIT Discussion Papers no. 3/2010. Helsinki: Institute for Economies in Transition, Bank of Finland.

- Garza-Garcia, Jesus Gustavo. 2012. "Does Market Power Influence Bank Profits in Mexico? A Study on Market Power and Efficiency." *Applied Financial Economics* 22, no. 1: 21–32.
- Gelos, R.G., and Jorge Roldós. 2004. "Consolidation and Market Structure in Emerging Market Banking Systems." *Emerging Markets Review* 5, no. 1: 39–59.
- Goddard, John; Hong Liu; Philip Molyneux; and John O.S. Wilson. 2011. "The Persistence of Bank Profit." *Journal of Banking and Finance* 35, no. 11: 2881–90.
- Goddard, John; Phil Molyneux; and John O.S. Wilson. 2004. "Dynamics of Growth and Profitability in Banking." *Journal of Money, Credit and Banking* 36, no. 6: 1069–90.
- Güenalp, Burak, and Tuncay Çelik. 2006. "Competition in the Turkish Banking Industry." *Applied Economics* 38, no. 11: 1335–42.
- Heffernan, Shelagh A. 1996. *Modern Banking in Theory and Practice*. Chichester: John Wiley and Sons.
- International Monetary Fund (IMF). 2007. "Turkey: Financial System Stability Assessment." IMF Country Report no. 07/361. Washington, DC: IMF.
- . 2013. *Financial Soundness Indicators, FSI Tables*. Washington, DC: IMF. <http://fsi.imf.org/fsitable.aspx> (accessed August 2, 2013).
- Jeon, Bang Nam; María Pía Olivero; and Ji Wu. 2011. "Do Foreign Banks Increase Competition? Evidence from Emerging Asian and Latin American Banking Markets." *Journal of Banking and Finance* 35, no. 4: 856–75.
- Lozano-Vivas, Ana, and Laurent Weill. 2012. "How Does Cross-border Activity Affect EU Banking Markets?" *European Financial Management* 18, no. 2: 303–20.
- Mamatzakis, Emmanuel; Christos Staikouras; and Anastasia Koutsomanoli-Fillipaki. 2005. "Competition and Concentration in the Banking Sector of the South Eastern European Region." *Emerging Markets Review* 6, no. 2: 192–209.
- Martinez Peria, Maria Soledad, and Ashoka Mody. 2004. "How Foreign Participation and Market Concentration Impact Bank Spreads: Evidence from Latin America." *Journal of Money, Credit and Banking* 36, no. 3, part 2: 511–37.
- Maudos, Joaquín, and Liliana Solis. 2011. "Deregulation, Liberalization and Consolidation of the Mexican Banking System: Effects on Competition." *Journal of International Money and Finance* 30, no. 2: 337–53.
- O'Byrne, David. 2011. "Investors Look Beyond Tough Conditions." *Financial Times*, December 13. <http://www.ft.com/cms/s/0/fe4ebeeec-2248-11e1-923d-00144feabdc0.html> (accessed April 19, 2012).
- . 2012. "Turkey Offers Domestic Banks Room to Grow." *Banker*, May 1. <http://www.thebanker.com/Banking/Retail-Banking/Turkey-offers-domestic-banks-room-to-grow?> (accessed September 5, 2012).
- Panzar, John C., and James N. Rosse. 1987. "Testing for 'Monopoly' Equilibrium." *Journal of Industrial Economics* 35, no. 4: 443–56.
- Poghosyan, Tigran, and Arsen Poghosyan. 2010. "Foreign Bank Entry, Bank Efficiency and Market Power in Central and Eastern European Countries." *Economics of Transition* 18, no. 3: 571–98.
- Poghosyan, Tigran. 2010. "Re-examining the Impact of Foreign Bank Participation on Interest Margins in Emerging Markets." *Emerging Markets Review* 11, no. 4: 390–403.
- Weill, Laurent. 2013. "Bank Competition in the EU: How Has It Evolved?" *Journal of International Financial Markets, Institutions & Money* 26: 100–12.

- World Bank. 2012. *World Development Indicators, 2012*. Washington, DC: World Bank. <http://data.worldbank.org/data-catalog/world-development-indicators> (accessed September 10, 2012).
- Yeyati, Eduardo Levy, and Alejandro Micco. 2007. "Concentration and Foreign Penetration in Latin American Banking Sectors: Impact on Competition and Risk." *Journal of Banking and Finance* 31, no. 6: 1633–47.
- Yildirim, H. Semih, and George C. Philippatos. 2007. "Competition and Contestability in Central and Eastern European Banking Markets." *Managerial Finance* 33, no. 3: 195–209.

APPENDIX

TABLE A1

Selected Market Structure and Performance Indicators

	2011	2010	2009	2008	2007	2006	2005	2004	2003	2002	1999
Panel A. Market structure indicators (depository banks):											
Total no. of banks	31	32	32	32	33	33	34	35	36	40	62
Asset share [†]	96.42	96.78	96.62	96.75	96.64	96.84	96.76	96.30	95.89	95.56	95.23
3-bank concentration ratio	41.91	43.71	44.49	42.60	42.29	43.53	47.16	44.19	44.76	42.25	35.06
5-bank concentration ratio	63.50	64.97	65.24	64.47	64.04	64.65	65.09	61.80	62.85	61.14	48.60
State-owned banks:											
No. of banks	3	3	3	3	3	3	3	3	3	3	4
Asset share [‡]	30.47	32.02	32.40	30.41	30.17	30.53	32.41	36.22	34.71	33.38	36.67
Privately owned banks:											
No. of banks	11	11	11	11	11	14	17	18	18	20	31
Asset share [‡]	55.32	53.33	53.56	54.12	54.13	56.57	61.71	59.61	59.41	58.78	51.95
Foreign-owned banks:											
No. of banks	16	17	17	17	18	15	13	13	13	15	19
Asset share [‡]	14.14	14.56	13.93	15.35	15.55	12.64	5.39	3.51	2.90	3.26	5.48
Panel B. Performance indicators:											
Depository banks:											
Total loans to total assets	56.89	52.63	47.25	51.53	49.61	44.34	37.84	32.52	26.47	24.75	28.33
Deposits to total assets	62.45	66.03	65.75	66.40	65.83	66.63	66.02	66.88	67.15	70.06	70.27
Loans to deposits	91.10	79.70	71.86	77.61	75.36	66.55	57.32	48.62	39.41	35.33	40.32
Owners equity to total assets	10.99	12.35	12.16	10.55	11.90	10.74	12.36	13.83	13.09	11.17	2.20
Bad loans to total assets	1.55	1.99	2.64	1.91	1.78	1.70	1.91	2.09	3.53	5.04	1.27
Return on total assets	1.62	2.20	2.40	1.74	2.48	2.18	1.31	2.08	2.16	0.93	3.01
State-owned banks:											
Total loans to total assets	54.24	49.18	41.51	41.97	38.63	32.83	25.34	20.15	15.31	13.80	24.32
Deposits to total assets	70.46	76.59	74.86	77.65	78.22	77.90	76.81	77.10	72.62	72.06	76.26
Loans to deposits	76.98	64.22	55.45	54.05	49.39	42.14	32.99	26.13	21.09	19.15	31.89
Owners equity to total assets	9.13	9.88	9.40	8.34	10.29	10.36	10.65	9.42	11.52	9.95	2.97
Bad loans to total assets	1.38	1.64	1.86	1.59	1.57	1.68	2.02	2.24	5.17	6.70	1.57
Return on total assets	1.58	2.31	2.56	1.88	2.76	2.60	2.30	2.51	2.15	1.56	1.13
Privately owned banks:											
Total loans to total assets	57.91	52.74	47.55	54.11	52.14	48.08	43.58	39.57	33.01	30.80	33.53
Deposits to total assets	59.03	62.04	61.64	62.75	60.48	61.62	61.45	61.74	64.73	69.70	62.74
Loans to deposits	98.09	85.02	77.14	86.23	86.21	78.02	70.92	64.10	51.00	44.19	53.44
Owners equity to total assets	11.70	13.39	13.04	11.07	12.23	10.39	12.40	15.57	14.73	12.72	8.58
Bad loans to total assets	1.38	1.75	2.56	1.89	1.88	1.73	1.82	1.99	2.25	2.79	0.47
Return on total assets	1.69	2.35	2.41	1.75	2.44	1.75	0.59	1.61	2.05	2.03	4.36
Foreign-owned banks:											
Total loans to total assets	58.94	60.06	59.79	61.77	62.58	56.29	50.56	46.29	39.93	33.94	16.47
Deposits to total assets	58.90	57.79	60.82	57.48	61.03	63.08	59.10	59.94	51.06	52.19	34.81
Loans to deposits	100.08	103.93	98.31	107.47	102.54	89.24	85.55	77.23	78.20	65.03	47.30
Owners equity to total assets	11.89	13.60	14.71	12.58	13.21	11.99	15.93	20.13	23.99	20.95	6.51
Bad loans to total assets	2.60	3.65	4.69	2.52	1.78	1.54	1.97	1.47	1.77	1.68	0.12
Return on total assets	1.46	1.44	1.92	1.32	2.01	2.46	2.48	2.39	2.68	1.24	6.06

Source: Author's calculations based on Banks Association of Turkey.

Note: Banks controlled by the Fund are not included in the subcategories and hence the total of depository banks is not the same as the total of the subcategories.

[†] In total banking sector assets.

[‡] In depository banking sector assets.

TABLE A2
Comparative Statistics on Key Performance Indicators

	2006	2007	2008	2009	2010	2011
Capital to assets:						
Turkey	11.9	12.8	12.1	12.5	12.3	11.7
Advanced economies	6.6	6.6	6.2	6.8	7.2	6.9
Central and Eastern Europe	10.6	10.4	10.4	10.7	10.7	10.9
Russia	12.1	13.3	10.8	13.1	12.9	11.8
China	5.1	5.7	6.0	5.6	6.1	6.4
India	6.6	6.4	7.3	7.0	7.1	7.1
South Africa	7.9	8.0	5.6	6.7	7.1	7.3
Brazil	10.8	11.3	10.7	11.3	11.0	10.5
Nonperforming loans to total loans:						
Turkey	3.9	3.3	3.4	5.0	3.5	2.6
Advanced economies	1.8	1.6	2.2	3.8	4.4	4.8
Central and Eastern Europe	3.8	3.3	4.8	10.0	12.2	12.6
Russia	2.4	2.5	3.8	9.5	8.2	6.6
China	7.1	6.2	2.4	1.6	1.1	1.0
India	3.3	2.7	2.4	2.3	2.4	2.4
South Africa	1.1	1.4	3.9	5.9	5.8	4.7
Brazil	3.5	3.0	3.1	4.2	3.1	3.5
Return on assets:						
Turkey	2.3	3.3	2.5	3.3	3.1	2.2
Advanced economies	1.1	1.1	0.4	0.3	0.5	0.4
Central and Eastern Europe	1.6	1.7	1.2	0.0	0.3	0.8
Russia	3.3	3.0	1.8	0.7	1.9	2.5
China	0.9	0.9	1.0	0.9	1.1	1.3
India	0.9	0.9	1.0	1.0	1.1	1.1
South Africa	1.4	1.4	1.5	1.1	1.2	1.5
Brazil	3.1	3.5	1.6	2.4	3.2	1.5
Return on equity:						
Turkey	19.1	26.6	20.0	26.4	23.9	19.0
Advanced economies	18.3	17.5	6.1	5.4	7.6	5.0
Central and Eastern Europe	16.8	17.7	12.1	-1.7	2.3	7.0
Russia	26.3	22.7	13.3	4.9	12.5	17.3
China	14.9	16.7	17.1	16.2	17.5	na
India	12.7	13.2	12.5	14.5	13.4	13.7
South Africa	18.3	18.1	26.9	18.0	18.3	21.0
Brazil	29	32.0	14.3	22.0	28.9	14.0

Source: Author's compilation, based on Financial Soundness Indicators (IMF 2013).

TABLE A3
Variable Definitions

Variable	Definition
<i>Cost of funds</i>	Total interest expenses to total funds borrowed (loans borrowed + deposits + money market payables)
<i>Cost of personnel</i>	Ratio of personnel expenses to number of personnel
<i>Cost of administrative activities</i>	Ratio of operating and other operating expenses (exclusive of personnel expenses) to total assets
<i>Capital ratio</i>	Owners' equity to total assets
<i>Deposit funding</i>	Total deposits to total assets
<i>Loans ratio</i>	Total loans to total assets
<i>OBS positions</i>	Off-balance sheet positions to total assets
<i>Price</i>	Total interest and noninterest income divided by total assets
<i>ROAA</i>	Profit; Net income to average assets ratio
<i>ROAE</i>	Profit; Net income to average owners' equity ratio
<i>Total costs (TC)</i>	Total interest and noninterest expenses; millions of TL, at constant 2002 prices
<i>Total equity</i>	Total owners' equity (millions of TL at constant 2002 prices)
<i>Total output</i>	Total assets (millions of TL at constant 2002 prices)
<i>Total revenue</i>	Total of interest and noninterest income (millions of TL at constant 2002 prices)
<i>Interest income</i>	Total interest income (millions of TL at constant 2002 prices)
<i>Trend</i>	Time trend

TABLE A4
Summary Statistics

Variable	Count	Mean	Median	Max.	Min.	SD
Total sample:						
<i>Cost of funds</i>	300	0.093	0.079	1.731	0.007	0.114
<i>Cost of personnel</i>	300	41.306	30.165	198.654	14.568	30.474
<i>Cost of admin. activities</i>	300	2.681	1.311	52.979	0.219	5.112
<i>OBS positions</i>	300	293.073	188.160	2,760.236	1.838	315.738
<i>Loans ratio</i>	300	41.566	43.363	84.716	0.311	19.759
<i>Capital ratio</i>	300	15.678	12.598	80.740	3.265	10.252
<i>Deposit funding</i>	300	56.168	61.686	87.885	0.364	20.201
<i>Price</i>	300	0.149	0.137	0.803	0.033	0.073
<i>ROAA</i>	298	0.016	0.017	0.117	-0.274	0.025
<i>ROAE</i>	298	0.126	0.132	1.091	-0.590	0.153
<i>Total revenue[‡]</i>	300	1,423.270	320.479	7,653.685	2.839	2,064.898
<i>Interest income[‡]</i>	300	1,174.913	248.355	7,136.460	2.143	1,735.306
<i>Total output[‡]</i>	300	10,507.020	2,172.543	65,614.550	25.955	16,119.460
<i>Total costs[‡]</i>	300	1,030.978	254.722	5,808.086	1.537	1,462.431
<i>Total equity[‡]</i>	300	1,237.718	270.326	7,711.129	6.553	1,887.915
State-owned banks:						
<i>Cost of funds</i>	30	0.112	0.101	0.354	0.048	0.063
<i>Cost of personnel</i>	30	26.489	25.284	35.558	19.471	4.008
<i>Cost of admin. activities</i>	30	0.782	0.790	1.407	0.348	0.296
<i>OBS positions</i>	30	212.357	130.853	718.897	24.496	200.441
<i>Loans ratio</i>	30	36.297	33.572	64.259	6.930	17.532
<i>Capital ratio</i>	30	10.090	10.316	13.265	5.960	1.870
<i>Deposit funding</i>	30	73.828	73.439	84.319	64.495	4.942

Table A4 (Continued)

Variable	Count	Mean	Median	Max.	Min.	SD
<i>Price</i>	30	0.157	0.145	0.425	0.090	0.066
<i>ROAA</i>	30	0.023	0.024	0.032	0.004	0.006
<i>ROAE</i>	30	0.241	0.231	0.500	0.036	0.095
<i>Total revenue</i> [†]	30	4,824.469	3,790.557	7,653.685	2,748.862	1,867.247
<i>Interest income</i> [†]	30	4,279.590	3,389.555	7,136.460	1,958.419	1,829.584
<i>Total output</i> [†]	30	33,646.190	31,475.400	65,614.550	12,733.310	15,171.780
<i>Total costs</i> [†]	30	3,501.235	2,787.273	5,808.086	2,013.746	1,370.641
<i>Total equity</i> [†]	30	3,316.134	3,292.982	6,347.112	758.939	1,304.270
Foreign-owned banks:						
<i>Cost of funds</i>	139	0.092	0.068	1.731	0.007	0.161
<i>Cost of personnel</i>	139	57.314	37.132	198.654	22.072	38.852
<i>Cost of admin. activities</i>	139	4.005	1.729	52.979	0.219	7.015
<i>OBS positions</i>	139	360.377	230.064	2,760.236	1.838	404.367
<i>Loans ratio</i>	139	38.527	37.054	84.716	0.311	22.976
<i>Capital ratio</i>	139	19.628	15.643	80.740	3.927	12.993
<i>Deposit funding</i>	139	45.516	51.579	87.885	0.364	24.098
<i>Price</i>	139	0.147	0.127	0.803	0.033	0.092
<i>ROAA</i>	137	0.014	0.015	0.117	-0.274	0.035
<i>ROAE</i>	137	0.076	0.091	0.437	-0.590	0.166
<i>Total revenue</i> [†]	139	354.980	73.983	2,267.174	2.839	542.836
<i>Interest income</i> [†]	139	295.526	52.724	1,982.798	2.143	470.007
<i>Total output</i> [†]	139	2,596.756	536.325	19,727.210	25.955	4,099.840
<i>Total costs</i> [†]	139	264.435	61.902	1,661.442	1.537	393.686
<i>Total equity</i> [†]	139	350.359	99.905	2,456.432	6.553	508.739
Privately owned banks:						
<i>Cost of funds</i>	131	0.090	0.083	0.271	0.027	0.040
<i>Cost of personnel</i>	131	27.714	27.697	49.469	14.568	4.372
<i>Cost of admin. activities</i>	131	1.711	1.317	16.989	0.274	2.047
<i>OBS positions</i>	131	240.143	166.020	1,061.079	19.624	193.857
<i>Loans ratio</i>	131	45.997	46.735	76.213	3.644	15.263
<i>Capital ratio</i>	131	12.768	12.054	55.519	3.265	5.416
<i>Deposit funding</i>	131	63.426	63.380	85.276	33.623	8.384
<i>Price</i>	131	0.149	0.140	0.303	0.054	0.048
<i>ROAA</i>	131	0.016	0.016	0.057	-0.046	0.012
<i>ROAE</i>	131	0.153	0.149	1.091	-0.090	0.128
<i>Total revenue</i> [†]	131	1,777.899	692.214	7,088.939	15.814	2,167.856
<i>Interest income</i> [†]	131	1,397.008	538.215	5,664.236	15.815	1,686.353
<i>Total output</i> [†]	131	13,601.310	4,026.227	65,614.550	57.431	18,119.670
<i>Total costs</i> [†]	131	1,278.624	546.994	5,237.255	12.467	1,495.711
<i>Total equity</i> [†]	131	1,703.293	447.261	7,711.129	31.885	2,342.277

[†] In millions of TL at constant 2002 prices.

TABLE A5
Cross-correlation Matrix

	Cost of Funds	Cost of Personnel	Cost of Admin. Activities	OBS Positions	Loans Ratio	Capital Ratio	Deposit Rounding	Price	ROAA	ROAE	Total Revenue	Interest Income	Total Output	Total Costs	Total Equity
Cost of funds	1.000														
Cost of personnel	0.335	1.000													
Cost of admin. Activities	0.030	0.458	1.000												
OBS positions	-0.070	0.168	0.221	1.000											
Loans ratio	-0.204	-0.504	-0.232	0.225	1.000										
Capital ratio	0.281	0.408	0.115	0.055	-0.297	1.000									
Deposit funding	-0.010	-0.343	-0.091	0.160	0.254	-0.516	1.000								
Price	0.817	0.323	-0.030	-0.060	-0.279	0.286	0.062	1.000							
ROAA	-0.075	0.015	-0.028	0.050	0.024	0.049	0.009	0.099	1.000						
ROAE	0.019	-0.172	-0.096	-0.067	0.058	-0.166	0.262	0.165	0.713	1.000					
Total revenue	0.023	-0.284	-0.188	-0.120	0.046	-0.257	0.344	0.006	0.164	0.322	1.000				
Interest income	0.030	-0.285	-0.187	-0.122	0.036	-0.263	0.349	0.009	0.157	0.318	0.994	1.000			
Total output	-0.045	-0.270	-0.172	-0.072	0.118	-0.251	0.306	-0.112	0.144	0.281	0.951	0.938	1.000		
Total costs	0.041	-0.289	-0.193	-0.123	0.041	-0.272	0.357	0.024	0.146	0.308	0.990	0.988	0.925	1.000	
Total equity	-0.048	-0.257	-0.166	-0.070	0.121	-0.198	0.274	-0.102	0.150	0.249	0.923	0.896	0.968	0.886	1.000

TABLE A6
Parameter Estimates of the Translog Cost Function

Variable	Coefficient	Variable	Coefficient
<i>lnW1</i>	1.04 (1.47)	<i>lnQ*LnZ</i>	0.56*** (3.52)
<i>lnW3</i>	0.52* (1.71)	<i>lnZ*W1</i>	-0.12 (-1.57)
<i>lnQ</i>	2.79*** (5.29)	<i>lnZ*W3</i>	-0.12 (-1.41)
<i>lnZ</i>	-1.95*** (-3.41)	<i>trend</i>	-0.02 (-0.19)
<i>0.5*lnW1* lnW1</i>	0.00 (0.02)	<i>0.5*trend*trend</i>	-0.00 (-0.91)
<i>0.5*lnW3* lnW3</i>	-0.18*** (-3.4)	<i>lnQ*trend</i>	-0.03 (-1.13)
<i>lnW1*lnW3</i>	0.15*** (4.18)	<i>lnZ*trend</i>	0.04 (1.18)
<i>0.5* lnQ* lnQ</i>	-0.53*** (-4.41)	<i>lnW1*trend</i>	-0.02** (-2.00)
<i>0.5* lnZ* lnZ</i>	-0.605*** (-2.88)	<i>lnW3*trend</i>	0.05*** (3.66)
<i>lnQ*lnW1</i>	0.12* (1.95)	<i>Constant</i>	-0.13 (-0.03)
<i>lnQ*lnW3</i>	0.09 (1.19)		

Note: Stochastic frontier with normal/half normal model and clustered errors at bank level. Number of observations: 300; Log pseudolikelihood: 53.9762 (0.000). Z statistics in parentheses.

***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.

TABLE A7

Estimation Results of the Continuous-time Curve Version of the Panzar and Rosse *H*-Model

	Dependent Variable	
	Total Revenue	Interest Income
<i>Cost of funds</i>	0.56*** (3.39)	0.61*** (4.02)
<i>Cost of personnel</i>	0.20 (0.98)	0.04 (0.20)
<i>Costs of administrative activities</i>	0.08 (1.16)	0.06 (0.81)
<i>Time</i>	-0.01 (-0.25)	-0.02 (-1.17)
<i>OBS positions</i>	0.02 (0.42)	0.03 (0.35)
<i>Loans ratio</i>	0.14 (1.31)	0.09 (0.84)
<i>Capital ratio</i>	-0.32** (-2.31)	-0.44*** (-3.07)
<i>Deposit funding</i>	0.29* (1.95)	0.26* (1.72)
<i>Constant</i>	14.91*** (12.11)	15.84*** (13.24)
Adj- <i>R</i> ²	0.93	0.93
No. of obs.	300	300

Note: Nonlinear regressions with clustered errors at bank level. Size dummies are included but not reported. *t*-statistics in parentheses.

***, **, and * represent statistical significance at the 1%, 5%, and 10% levels, respectively.