

Competition in the Banking System: Evidence from Turkey Using the Panzar–Rosse Model

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This paper uses the Panzar–Rosse model to investigate the competitive conditions in the Turkish banking system over the period of 1992–2009. We break down the entire sample period into three distinctive periods: the pre-crisis period (1992–1998), characterized by financial deregulation, an increase in the number of banks, and a decrease in market concentration; the crisis period (1999–2003), characterized by a surge in non-performing loans, negative profits, and re-regulation; and the post-crisis period (2004–2009), characterized by bank consolidation and an increase in market concentration. The results indicate that the H-statistic increases significantly from 0.5623 for the period of 1992–1998 to 0.8700 for the period of 1999–2003, and increases to 0.8935 for the period of 2004–2009. The Wald test rejects the hypothesis of a monopolistic market structure ($H = 0$) at the 1% level and also rejects the hypothesis of a perfectly competitive market structure ($H = 1$) at the 1% level except for the period of 1999–2003. The empirical findings suggest that the Turkish banking market was monopolistically competitive during the pre-crisis period (1992–1998) and the post-crisis period (2004–2009), but the level of competition increased to perfect competition for the period of 1999–2003, the crisis period. The findings also indicate that the Turkish commercial banking market was in long-run equilibrium before the crisis caused disequilibrium, but made adjustments to the new equilibrium.

INTRODUCTION

The Turkish banking system underwent major consolidation between 1999 and 2003 in the aftermath of a devastating financial crisis. Before the crisis, the Turkish financial system was supervised by the Turkish Treasury, the Central Bank of Turkey, the Capital Markets Board, the Prime Ministry, and the Ministry of Finance at the same time, which led to insufficient coordination between the different regulatory bodies. With the Banking Law 4289, it was decided to establish the Banking Regulation and Supervision Agency (BRSA) in June 1999, which became operational in August 2000. With the centralization of the supervision and regulation duties under one umbrella, the Turkish banking system started to take its current shape. Since early 2004, relative macroeconomic stability appears to have been achieved, and having endured the worst, the banking sector appeared set for the next phase of consolidation and growth.

However, the competitive conditions of the banking sector in Turkey are by no means satisfactory and the need for a modern, flexible, and market-oriented financial system remains, but with the

liberalization and deregulation of the banking system, there have been clear indications of competition. While the market concentration decreased during the pre-crisis period due to financial deregulation, it has markedly increased since the crisis because of the reduction in the number of banks, bank consolidation, and the creation of mega banks. With this change, there has been growing concern about the market power in the Turkish banking industry.

In assessing the competitive conditions and contestability in banking, the Panzar–Rosse (P-R) *H*-statistic for banking has been used by various researchers. Particularly, for the United States, Shaffer (1982) uses the P-R methodology to examine the competitive conditions for banks in New York. Nathan and Neave (1989) use the same statistic to develop measures of competitiveness and contestability for the Canadian banking system. Shaffer (1993) supports and extends the findings of Nathan and Neave over a longer period of time using a different method. Molyneux, Lloyd-Williams, and Thornton (1994) utilize the P-R statistic to assess the competitive conditions in five major EC banking markets. Finally, Molyneux, Thornton, and Lloyd-Williams (1996) use the P-R methodology to examine the competitive conditions for Japanese commercial banks and Lee and Lee (2005) examine the competitive conditions for Korean banks.

The purpose of this paper is to investigate how competition among Turkish banks changed during the period 1990–2009 (1992–2009?) due to the deregulation and liberalization of the Turkish financial market. Specifically, we assess the competitive condition of the country's banking system in Turkey by applying the Panzar–Rosse (P-R) model, which measures the competitive condition of the banking system by examining the elasticity of the revenue with respect to the input price. So far, the Turkish banking system has not received adequate attention, partially because of the lack of a solid data set.¹ As a result, the competitive conditions have not been thoroughly examined and this study uses reliable data that help shed light on this important issue. Therefore, we estimate reduced-form bank revenue equations for the period 1992–2009 and use the PR methodology to assess the competitive conditions in the Turkish banking sector. We break down the entire sample period into three distinctive periods: the pre-crisis period (1992–1998), characterized by financial deregulation, an increase in the number of banks, and a decrease in market concentration; the crisis period (1999–2003), characterized by a surge in non-performing loans, negative profits, and re-regulation; and the post-crisis period (2004–2009), characterized by bank consolidation and an increase in market concentration. As suggested by the literature, this paper estimates reduced-form bank revenue equations. The fixed-effects model is used to reflect bank-specific characteristics and to control the heterogeneity among banks. The conclusions drawn could prove useful for the analysis of the competitive conditions of the banking sectors in other medium-sized economies that are undergoing structural changes.

The paper is organized as follows. Section 2 outlines the institutional structure of the Turkish banking system and presents the evolution of the regulatory framework of bank operation in Turkey. Section 3 briefly discusses the methodology used to assess the competitive conditions in the banking system and reviews the previous empirical work on competition in banking markets. Section 4 presents the empirical model, while Section 5 discusses the empirical evidence of testing the model. Finally, Section 6 summarizes the results drawn for banking activity in Turkey.

REGULATORY FRAMEWORK AND STRUCTURE OF THE TURKISH BANKING SYSTEM

The last two decades of the twentieth century could be seen as a milestone in the financial liberalization in Turkey. However, the deregulation also led to a vulnerable banking system. Mainly due to weak regulation and discipline, the number of banks in the system increased from 43 in 1980 to 66 in 1990 and to 81 by the end of 1999. In addition, the macroeconomic instability throughout the 1990s and the global crises in 1991 (First Gulf War), 1997 (Asia Crisis), and 1998 (Russia Crisis) weakened the Turkish banking system further. Consequently, Turkey suffered from twin crises in November 2000 and February 2001, which later transformed into a systematic crisis in the banking sector.

The key factors that triggered the twin crises are seen as the weak economic growth, unsustainable domestic debt, high inflationary environment, and uncertainties in current account financing. For the

banking system, the key factors that rendered the sector vulnerable to shocks could be cited as poor liquidity conditions, increasing duty losses of the public banks, which increased from 3% of the GDP in 1996 to 12% of the GDP in 2000, increasing maturity mismatch, widening open foreign exchange positions carried in balance sheets, insufficient risk management, and a loss of focus on the financial intermediary services, which resulted in a sharp decline in the interest income from loans/total interest income ratio from 69% in 1990 to 38% in 2000. When the overall economic vulnerability of Turkey coupled with the financial sector's weakness, an important need for a supervisory and regulatory body arose.

As part of the Seventh Five-Year Development Plan, which cleared the Parliament in 1995, the Government's focus on supervisory and regulatory bodies increased. The financial sector was one of the key sectors that needed such a body, given that until 2000, the Turkish financial system was controlled and supervised by the Turkish Treasury, the Central Bank of Turkey, the Capital Markets Board, the Prime Ministry, and the Ministry of Finance at the same time, which led to insufficient coordination between the different institutions. With the Banking Law 4289, it was decided to establish the Banking Regulation and Supervision Agency (BRSA) in June 1999, which became operational in August 2000. With the centralization of the supervision and regulation duties under one umbrella, the Turkish banking system started to take its current shape.

As an important post-crisis step, the BRSA introduced the Banking Sector Restructuring Plan on May 15, 2001. The purpose of the plan was to ensure that banks refocus on their main purpose as financial intermediary services and that the Turkish banking system becomes resilient to both internal and external shocks with its improved competitiveness. In June 2001, the regulation regarding banks' mergers and acquisitions was revised to provide tax incentives and encourage the merger and acquisition activity in the sector. With the introduction of the Direct Foreign Investment Law 4875, which was accepted on June 17, 2003, the merger and acquisition activity in the sector accelerated. Between 2002 and 2007, 14 banks were acquired and there were 10 mergers in the sector. After incorporating the banks that had been taken out of the system during the crisis period of 2000–2001, the total number of Turkish banks in the system declined from 81 in 1999 to 49 in 2009. Financial liberalization has led to a significant increase in the foreign presence in the Turkish banking sector. The recent liberalization probably reduced the degree of competitiveness of the Turkish banking system.

The measures to strengthen the financial system in Turkey also include the regulation regarding the measurement and evaluation of the capital adequacies of banks, which was introduced by the BRSA on January 31, 2002. With this regulation, the risk measurement tools have been improved and banks were asked to measure their risks on a consolidated basis to reduce their vulnerability to internal as well as external shocks. With the establishment of the Turkish Accounting Standards Board on March 7, 2002, the effectiveness of the financial reporting and transparency of the sector started to improve.

LITERATURE REVIEW

Even though many studies have investigated the effect of bank consolidation on competition, there is little consensus on an appropriate theoretical framework. Furthermore, the empirical findings are mixed and inconclusive.² This section briefly reviews the theoretical models and empirical findings on bank competition. There are two broad theories that examine the effect of bank consolidation on competition. The first one arises from the structure–conduct–performance (SCP) paradigm.³ This paradigm suggests that the increasing market concentration leads to less competitive conduct, such as higher prices and lower output, and results in higher profits at the expense of lower consumer welfare. However, the empirical results are mixed.

To remedy the shortcomings of the SCP paradigm, two methods have been developed and tested directly, without regard to the industry structure. Shaffer (2004) contrasts the two methods in detail and discusses their advantages and disadvantages. The model of Bresnahan (1982, 1989) and Lau (1982) (B–L model) estimates the mark-up of price over marginal cost as a measure of market power and this is based on two structural equations, an inverse demand equation and a supply equation derived from the

first-order condition of profit maximization. The other method is the Panzar and Rosse (1982, 1987) model (P-R model) and it measures the extent to which a change in a vector of input prices is reflected in the gross revenue. This model is based on the theory that if the market is perfectly competitive, then the change will be fully reflected in the revenue.

Previous studies have used the Panzar–Rosse (1977) statistic, hereafter referred to as the “*H*-statistic,” to assess the competitive conditions in banking markets. The *H*-statistic is calculated from reduced-form revenue equations and measures the sum of elasticities of the total revenue with respect to the input prices. Panzar and Rosse (1987) show that the *H*-statistic reveals the competitiveness of the market or industry. However, Molyneux et al. (1994), Nathan and Neave (1989), Neave and Nathan (1991), Perrakis (1991), and Shaffer (1982, 1985) suggest different interpretations of the *H*-statistic. For example, if a firm is a profit-maximizing monopolist or a conjectural variations short-run oligopoly, an increase in input prices increases the marginal cost and may reduce the equilibrium output and total revenue. In contrast, the *H*-statistic is unity for a natural monopoly in a perfectly contestable market and also for a sales-maximizing firm subject to break-even constraints (Shaffer, 1982). The *H*-statistic is also unity when there is perfect competition. In such a case, an increase in the input prices increases both the marginal and the average costs affecting the optimal output of any individual firm.

Previous works have used the Panzar–Rosse statistic for banking. In particular, Shaffer (1982) uses the methodology to study a sample of banks in New York. He concludes that banks behave neither as monopolists nor as perfectly competitive firms in long-run equilibrium. Nathan and Neave (1989) study the competitive conditions for banks, trust, and mortgage companies of the Canadian financial system. They support the view that bank revenues are earned as if the system is characterized by monopolistically competitive conditions. Shaffer (1985) uses the Panzar–Rosse statistic to test the hypothesis of monopolistic conduct among the largest banks of a sample of banks in Illinois. Nathan and Neave (1989) reject the hypothesis of monopoly power of Canadian banks. Country-specific empirical studies include Vesala (1995) for Finland, Molyneux et al. (1996) for Japan, Coccoresse (1998) for Italy, Hondroyiannis, Lolos, and Papapetrou (1999) for Greece, and Hempell (2002) for Germany. Bikker and Groeneveld (2000) and Molyneux et al. (1994) find monopolistic competition in several European countries. On the other hand, De Bandt and Davis (2000) find monopolistic competition for large banks and monopoly for small banks in Germany and France. Bikker and Haaf (2002) find that the banking industries in OECD countries are generally characterized by monopolistic competition, with the exception of Australia and Greece. Gelos and Roldos (2002) compare eight European and Latin American countries and find that the bank consolidation process is in its early stage.

MODEL, DATA, AND VARIABLES

We use the Panzar–Rosse (P-R) model to examine the competitiveness of the Turkish banking industry because this model is robust to the extent that the market- and bank-level data are available. Let a bank’s revenue function be $R = R(x, y_1)$, where x = a vector of products and y_1 = a vector of exogenous variables shifting the revenue function. Furthermore, let a bank’s cost function be $C = C(x, w, y_2)$, where w is a vector of input prices and y_2 = a vector of exogenous variables shifting the cost function. The y_1 and y_2 vectors may include common variables. The profit-maximizing bank satisfies the following condition: the marginal revenue equals the marginal cost, which is $R'(x, y_1) = C'(x, w, y_2)$. Panzar and Rosse (1987) calculate the sum of the elasticities of the revenue with respect to the input prices from the reduced-form revenue equation and define it as the *H*-statistic. The *H*-statistic is

$$H = \sum \left(\frac{\partial R}{\partial w_i} \right) \left(\frac{w_i}{R} \right) \quad (1)$$

where w_i is the *i*th input price. Panzar and Rosse (1987) show that the *H*-statistic is equal to unity ($H = 1$) in a perfectly competitive market, and less than or equal to zero ($H \leq 0$) under monopoly. Although they

show that $0 < H < 1$ could be consistent with oligopolistic behavior, it is common to regard $0 < H < 1$ as the condition of Chamberlinian monopolistic competition. This interpretation is valid under the assumption that the observations are in the long-run equilibrium (Nathan & Neave, 1989).

The reduced-form revenue equation of a bank is the following:

$$\ln(R_{it}) = \alpha + \beta_1 \ln(w_{1,it}) + \beta_2 \ln(w_{2,it}) + \beta_3 \ln(w_{3,it}) + \gamma_k \sum z_k + \varepsilon_{it} \quad (2)$$

where R_{it} is bank i 's revenue at time t , w_1 is the input price of labor, w_2 is the input price of capital, w_3 is the input price of funds, and z_k is a vector of control variables affecting the bank's revenue function. Then, the H -statistic is the sum of β_1 , β_2 , and β_3 . In order to eliminate the manual calculation of $\beta_1 + \beta_2 + \beta_3$ and its standard error, Eq. (2) can be rearranged as follows:

$$\begin{aligned} \ln(R_{it}) = & \alpha + \beta_1[\ln(w_{1,it}) - \ln(w_{3,it})] + \beta_2[\ln(w_{2,it}) - \ln(w_{3,it})] \\ & + (\beta_1 + \beta_2 + \beta_3)\ln(w_{3,it}) + \gamma_k \sum z_k + \varepsilon_{it} \end{aligned} \quad (3)$$

The coefficient of $\ln(w_{3,it})$ can be regarded as the estimated H -statistic and its standard error can be used to test the significance of this estimate.

Since the P-R model is valid if the market is in equilibrium, Claessens and Laeven (2004), Molyneux et al. (1996), Shaffer (1982), and many others use Eq. (4) in order to test whether the market is in equilibrium:

$$\ln(ROA_{it}) = \alpha + \beta_1 \ln(w_{1,it}) + \beta_2 \ln(w_{2,it}) + \beta_3 \ln(w_{3,it}) + \gamma_k \sum z_k + \varepsilon_{it} \quad (4)$$

In equilibrium, the rates of return on assets should not be statistically correlated with the factor prices ($H = 0$). On the other hand, if the market is in disequilibrium, an increase in factor prices would result in a temporary decline in the rates of return ($H < 0$).

Traditionally, the revenue (R_{it}) has typically been measured by the interest income or its ratio to the total assets, presuming that the main function of banks is financial intermediation. However, with the weakening of financial intermediation in recent years and the diversification of bank assets, the total revenue or its ratio to the total assets is used in some studies. We use both the interest income (IR) and the total revenue (TR). The ROA is the ratio of net income to total assets. The labor cost ($w_{1,it}$) is measured by the ratio of personnel expenses to the number of employees. The capital cost ($w_{2,it}$) is measured by the ratio of depreciation allowance and other maintenance costs to the total fixed assets. The funding cost ($w_{3,it}$) is measured by the ratio of the interest expenses to the sum of the total deposits and borrowings. All the revenues as well as all the input prices are adjusted for the inflation.

We also include several control variables in the model. The total assets (ASSET) are included to control for the size effect while the number of branches (BRANCH) is included to account for the effect of bank networks. The ratio of non-performing loans to total loans (NPL) is included to control for the risk effect. The BIS risk-adjusted capital ratio (CAR) is alternatively used as a control variable for the credit market and operational risk. The ratio of non-interest income to total revenue (NIITR) is included to reflect the effect of changing the income mix. All the variables are expressed in logarithmic form.

The data used in the analysis cover all banks for the years 1992–2009 and are collected from the Central Bank of Turkey [should be “from BRSA and the Banks Association of Turkey”]. We use unbalanced panel data including all the Turkish domestic as well as foreign commercial banks in operation in any year during the period of 1992–2009. In this paper, it is assumed that any change in price initiated by a bank in one location will affect the behavior of banks throughout the country. This seems unlikely in the US banking market, where there are many regional banking markets. However, the Turkish banking market can be regarded as a single market.

REGRESSION RESULTS

We break down the entire sample period into three distinctive periods: the pre-crisis period (1992–1998), characterized by financial deregulation, an increase in the number of banks, and a decrease in market concentration; the crisis period (1999–2003), characterized by a surge in non-performing loans, negative profits, and re-regulation; and the post-crisis period (2004–2009), characterized by bank consolidation and an increase in market concentration.⁴ We estimate Eq. (2) and Eq. (3) for each sub-period, not for the whole sample period. The fixed-effects model is used to reflect bank-specific characteristics and to control the heterogeneity among banks.⁵ The results of the tests of competitive conditions are presented in Table 2 for the dependent variable with interest income and Table 3 for the dependent variable with total revenue. To take into consideration the overestimation concern raised by Bikker, Spierdijk, and Finnie (2006), we estimate the model with and without the scale variable, the logarithm of total assets.⁶

Table 2 presents the results with interest income as the dependent variable. It shows that the H -statistic increases significantly from 0.5623 for the period of 1992–1998 to 0.8700 for the period of 1999–2003, and increases to 0.8935 for the period of 2004–2009 with the inclusion of the logarithm of total assets in the model. The Wald test rejects the hypothesis of a monopolistic market structure ($H = 0$) at the 1% level. The Wald test also rejects the hypothesis of a perfectly competitive market structure ($H = 1$) at the 1% level except for the period of 1999–2003.

The table also shows the results with interest income as the dependent variable by excluding the scale variable, total assets. However, the results are similar to the results with the inclusion of the scale variable, and imply that there is no overestimation of the level of competition caused by the scale variable. The H -statistic increases significantly from 0.7575 for the period of 1992–1998 to 0.8325 for the period of 1999–2003, and increases to 0.9417 for the period of 2004–2009. The Wald tests reject the hypothesis of a monopolistic market structure and a perfectly competitive market structure at any significance level except for the period of 1999–2003.

Table 3 presents the results with total assets as the dependent variable and a similar pattern is found in the model. It shows that the H -statistic increases significantly from 0.5855 for the period of 1992–1998 to 0.9867 for the period of 1999–2003, but decreases to 0.9014 for the period of 2004–2009 with the inclusion of the logarithm of total assets in the model. The Wald test rejects the hypothesis of a monopolistic market structure ($H = 0$) for all the sub-periods but the hypothesis of a perfectly competitive market structure ($H = 1$) is rejected for the pre- and post-crisis periods. The exclusion of the scale variable does not change the results in a significant way. The table shows that the H -statistic increases significantly from 0.7721 for the period of 1992–1998 to 0.8413 for the period of 1999–2003, and increases to 0.9042 for the period of 2004–2009. The Wald tests reject the hypothesis of a monopolistic market structure for all the sub-periods and the hypothesis of a perfectly competitive market structure is not rejected for the period of 1999–2003. The H -statistics estimated by using two different dependent variables are robust, as shown by Tables 2 and 3. The empirical results suggest that the Turkish commercial banking market was monopolistically competitive during the pre-crisis period (1992–1998) and the post-crisis period (2004–2009). It also suggests that the level of competition increased to perfect competition for the period of 1999–2003. The unit labor cost (w_1), the unit capital cost (w_2), and the unit funding cost (w_3) are positive and significant for most of the sub-periods, which imply that an increase in the unit costs of labor or funds results in greater incomes and revenue. All the other control variables have the expected signs.

Table 5 represents the estimation results for the equilibrium tests of Eq. (4). In the estimation, we use the natural logarithm of $(1 + \text{ROA})$ as the dependent variable. The table shows that for both the 1992–1998 period and the 2004–2009 period, the hypothesis of long-run equilibrium is not rejected; however, for the 1999–2003 period, the hypothesis of $H = 0$ is rejected, which suggests that the Turkish commercial banking market was in long-run equilibrium before the crisis, fell into disequilibrium during the crisis period, but made adjustments to the new equilibrium. Our findings are consistent with many other pieces

of empirical research, such as that of Molyneux et al. (1996) for Japanese commercial banks and Lee and Lee (2005) for Korean banks.

CONCLUSION

This paper uses the Panzar–Rosse model to investigate the competitive conditions in the Turkish banking system over the period of 1992–2009. We break down the entire sample period into three distinctive periods: the pre-crisis period (1992–1998), characterized by financial deregulation, an increase in the number of banks, and a decrease in market concentration; the crisis period (1999–2003), characterized by a surge in non-performing loans, negative profits, and re-regulation; and the post-crisis period (2004–2009), characterized by bank consolidation and an increase in market concentration. As suggested by the literature, this paper estimates reduced-form bank revenue equations. The fixed-effects model is used to reflect bank-specific characteristics and to control the heterogeneity among banks.

The results indicate that the H -statistic increases significantly from 0.5623 for the period of 1992–1998 to 0.8700 for the period of 1999–2003, and increases to 0.8935 for the period of 2004–2009 with the inclusion of the logarithm of total assets in the model. The results with total assets as the dependent variable are similar. The Wald test rejects the hypothesis of a monopolistic market structure ($H = 0$) at the 1% level and it also rejects the hypothesis of a perfectly competitive market structure ($H = 1$) at the 1% level except for the period of 1999–2003. Excluding the scale variable, the results are similar to the results with the inclusion of the scale variable, and imply that there is no overestimation of the level of competition caused by the scale variable.

The empirical findings suggest that the Turkish banking market was monopolistically competitive during the pre-crisis period (1992–1998) and the post-crisis period (2004–2009), but the level of competition increased to perfect competition for the period of 1999–2003, the crisis period. The findings also indicate that the Turkish banking market was in long-run equilibrium before the crisis, fell into disequilibrium during the crisis period, but made adjustments to the new equilibrium. Although the Turkish banking system has become more concentrated due to the restructuring since the crisis, our study shows that the bank competition has not been affected negatively by the bank consolidation. The Turkish banking system may have remained competitive despite its consolidation due to the entry of foreign banks and increased foreign ownership of domestic banks.

Even though the time period considered is relatively short for the banking system to adjust to the new regulatory changes of 2001–2003, we think that our findings are helpful in understanding the competitiveness of the banking sector in Turkey. However, the findings in this paper need to be scrutinized by further studies with a longer sample period in the future due to the limitations of the data on the entry of foreign banks and the unavailability of data for a few banks.

ENDNOTES

1. Alfred Steinherr, Ali Tukul, and Murat Ucer (2004).
2. See Berger and Humphrey (1992) and Gilbert (1894).
3. See Mason (1939) for the so-called “collusion” hypothesis.
4. The Chow breakpoint test is used to see whether we can treat the whole period as a homogenous period or not, that is, whether there is no significant difference in the estimated equations between sub-periods. With three sub-periods, our test rejects the null hypothesis of no structural change.
5. The fixed-effects model is usually regarded as more appropriate than the random-effects model when population data instead of sample data are used. The estimation results of the random-effects model are similar.
6. They show that the inclusion of a scale variable such as total assets in the Panzar–Rosse model may cause overestimation of the level of competition and may distort the tests on monopoly and perfect competition.

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TABLE 1
PANZAR-ROSSE H -STATISTIC

Equilibrium test

$H = 0$	Equilibrium
$H < 0$	Disequilibrium

Competitive conditions

$H \leq 0$	Monopoly or conjectural variations short-run oligopoly
$H = 1$	Perfect competition or natural monopoly in a perfectly contestable market or sales-maximizing firm subject to a break-even constraint
$0 < H < 1$	Monopolistic competition

TABLE 2
THE RESULTS OF EQ. (2) ESTIMATION AND THE PANZAR-ROSSE H-STATISTIC: INTEREST INCOMES

	1992-1998		1999-2003		2004-2009	
	With Scale Variable	Without Scale Variable	With Scale Variable	Without Scale Variable	With Scale Variable	Without Scale Variable
Ln w₁	0.1234 (0.12)	0.0841 (0.08)	0.3163** (2.23)	0.1869* (1.79)	0.1985* (1.83)	0.2189** (1.97)
Ln w₂	-0.1254 (-0.19)	0.4864*** (3.12)	-0.2468 (-0.87)	0.2402** (2.18)	0.3953*** (2.97)	0.4320*** (3.02)
Ln w₃	0.5643*** (4.39)	0.1870* (1.80)	0.8005*** (8.76)	0.4054*** (2.95)	0.2997** (2.12)	0.2908** (2.00)
Ln Asset	0.3420*** (10.35)		0.6085*** (18.72)		0.7590*** (19.20)	
NINT	-0.6582*** (-3.89)	-1.009*** (-6.54)	-0.3197* (-1.94)	-0.4698*** (-2.56)	-0.5109*** (-3.12)	-0.3763** (-2.31)
NPL	-0.0098 (-0.12)	-0.1905*** (-2.65)	0.0126 (0.99)	-0.0245 (-0.86)	0.0001 (0.57)	-0.1208* (-1.87)
CAR	0.0038 (0.68)	-0.0023 (-1.24)	0.1016*** (3.61)	0.2108*** (5.98)	0.0939*** (3.12)	0.1036*** (3.94)
Adj-R²	0.8910	0.8879	0.9139	0.8908	0.9091	0.9118
F	257.92	125.63	295.37	210.21	329.81	413.50
H-statistic	0.562*** (12.05)	0.758*** (16.99)	0.870*** (8.47)	0.833*** (7.60)	0.894*** (3.56)	0.942*** (3.90)
H = 0	134.89*** (0.00)	87.62*** (0.00)	87.24*** (0.00)	23.00*** (0.00)	34.98*** (0.00)	43.99*** (0.00)
H = 1	123.09*** (0.00)	23.67*** (0.00)	1.35 (0.24)	0.87 (0.32)	56.97*** (0.00)	25.98*** (0.00)

TABLE 3
THE RESULTS OF EQ. (2) ESTIMATION AND THE PANZAR-ROSSE H-STATISTIC: TOTAL REVENUE

	1992-1998		1999-2003		2004-2009	
	With Scale Variable	Without Scale Variable	With Scale Variable	Without Scale Variable	With Scale Variable	Without Scale Variable
Ln w₁	0.1268 (0.15)	0.0968 (0.10)	0.3853** (2.38)	0.1921* (1.89)	0.2003* (1.95)	0.2304** (1.97)
Ln w₂	-0.1289 (-0.24)	0.5078*** (3.34)	-0.2109 (-0.78)	0.2698** (2.38)	0.3990*** (2.99)	0.5198*** (3.53)
Ln w₃	0.5876*** (4.78)	0.1675 (1.63)	0.8123*** (8.98)	0.3794*** (2.72)	0.3021*** (2.65)	0.1540 (1.56)
Ln Asset	0.3761*** (11.98)		0.5935*** (13.49)		0.6930*** (14.81)	
NINT	-0.5349*** (-3.39)	-0.919*** (-5.76)	-0.3596** (-1.99)	-0.5152*** (-2.87)	-0.6723*** (-3.98)	-0.2314* (-1.92)
NPL	-0.0078 (-0.09)	-0.1219** (-2.32)	0.002 (0.54)	-0.0002 (-0.12)	0.0011 (0.98)	-0.0784 (-1.52)
CAR	0.0099 (1.45)	-0.0088 (-1.56)	0.1309*** (3.78)	0.1992*** (4.20)	0.1153*** (3.54)	0.1276*** (4.56)
Adj-R²	0.8845	0.8509	0.8976	0.8612	0.9255	0.9238
F	897.12	89.54	129.35	325.09	199.07	563.21
H-statistic	0.5855*** (11.89)	0.7721*** (15.33)	0.9867*** (6.87)	0.8413*** (5.11)	0.9014*** (6.65)	0.9042*** (5.90)
H = 0	139.23*** (0.00)	89.09*** (0.00)	84.98*** (0.00)	28.48*** (0.00)	37.50*** (0.00)	44.12*** (0.00)
H = 1	119.88*** (0.00)	28.83*** (0.00)	1.08 (0.18)	0.84 (0.32)	59.07*** (0.00)	27.12*** (0.00)

TABLE 4
THE RESULTS OF EQ. (4) ESTIMATION AND THE PANZAR–ROSSE *H*-STATISTIC

	1992–1998	1999–2002	2004–2009
Ln w₁	0.0032 (1.08)	0.0021 (0.87)	0.0035* (1.75)
Ln w₂	-0.0063 (-1.56)	-0.0010 (-0.56)	-0.0008 (-0.04)
Ln w₃	0.0029 (0.67)	0.0015 (0.53)	-0.0028 (-0.12)
Ln Asset	0.0032 (1.08)	0.0198 (1.64)	0.0078 (1.45)
NINT	0.0128* (1.67)	-0.0127 (-1.05)	0.0028 (1.36)
NPL	-0.0141** (-2.12)	-0.0095** (-1.96)	-0.0120** (-2.08)
CAR	-0.0021 (-0.18)	-0.1016** (-2.39)	0.0021 (0.34)
Adj-R²	0.5624	0.7451	0.5993
F	7.23	4.69	5.25
<i>H</i>-statistic	-0.0002 (-0.12)	0.0026** (2.16)	-0.0001 (-0.09)
H = 0	0.0239	8.87**	0.1292
(<i>p</i>-value)	(0.89)	(0.02)	(0.15)