8. Türkiye Ekonometri ve İstatistik Kongresi
24-25 Mayıs 2007 – İnönü Üniversitesi
Malatya

Competitive Conditions in the Turkish Non-Life Insurance Industry

Adnan Kasman[1]* Evrim Turgutlu[2]

Abstract: This paper investigates the evolution of market structure in the Turkish insurance industry over the period 1996-2004, using the Panzar and Rosse (1987) methodology. The sample period has been divided into three sub-periods (1996-1998, 1999-2001, and 2002-2004). The results suggest that in the first and second sub-periods, the insurance firms operating in the Turkish insurance industry earned revenues under the monopoly or conjectural variations short-run oligopoly. In the third period, however, the results indicate that insurance market was neither monopolistic nor perfectly competitive. Firm revenues were earned as if operating under monopolistic competition. Overall, the results show that market concentration is not significantly related with competitive conduct.

JEL classification: G22; L13
***Keywords*:** Competition; Market Structure; Turkish Non-life Insurance Industry.

[1] Associate Prof. Dr., Department of Economics, Faculty of Business, Dokuz Eylül University, 35160, Buca, Izmir, Turkey, Tel: +90 (0) 232 412 8209, Fax:+90 (0)232 453 5062, e-mail: adnan.kasman@deu.edu.tr

[2] Dr., Department of Economics, Faculty of Business, Dokuz Eylül University, 35160, Buca, Izmir, Turkey, Tel: +90 (0) 232 412 8211, Fax:+90 (0)232 453 5062, e-mail: evrm.gursoy@deu.edu.tr

1.Introduction

Turkish economy and the financial system have experienced major changes over the past decades. In particular, policies towards financial liberalization and restructuring with the goal of establishing a competitive environment and enhancing efficiency have been implemented. Deregulation process started predominantly in the banking system. However, transformation phase in the insurance industry followed with 5 to 10 years lag.

Until mid-1980s Turkish insurance industry was heavily regulated. New entries were restrained and the prices were set under regulatory conditions. By the end of 1980s the liberalization process started and insurance industry moved gradually from strict regulation towards liberalism. This process has considerable implications for the structure of the industry and conduct of the firms. Hence, Turkish insurance industry offers an attractive field for researchers to examine the evolution of its competitive structure. On the contrary, the literature lacks studies addressing this issue. Merely, a recent study by Celik and Kaplan (2007) focuses on the competitive structure of the Turkish insurance industry over the period 2002-2004. To the authors' best knowledge there exists no study examining whether or not the market structure of the insurance industry has changed due to the developments in last two decades. In this context, we aim to assess the competitive structure and contestability of the Turkish non-life insurance industry over the period 1996-2004, through three-year sub-periods. We estimate the reduced-form revenue equations for the sample of non-life insurance firms and follow the Panzar and Rosse (1987) approach to test for competition. The accurate measures of the variables (input prices and total revenues) have extreme importance in this methodology. Hence, we aim to contribute the relevant literature by defining an insurance-industry specific revenue function.

The rest of the study is organized as follows: Section 2 gives a brief overview on the Turkish insurance industry. Section 3 presents the methodology. Data set, variables and empirical results are reported in Section 4. The last section is devoted to conclusions.

2. An Overview on Turkish Insurance Industry

The history of the insurance operations in Turkey dates back to the mid-19th century. However, a national insurance system is relatively young since foreigners dominated the financial activities during the Ottoman Empire period. Until the establishment of the Republic of Turkey in 1923, foreign domination, insufficient capital accumulation and lack of legal and regulatory adjustments were the main features of the Turkish insurance industry, which caused unfair competition and created conflict of interest between the firms and the customers. The existing regulations could not provide sound solutions to settle these conflicts. Hence, some attempts to originate a regulatory framework for the insurance industry were made following the establishment of the Republic of Turkey. The primary goal of these attempts was to build up a national insurance industry. However, development of the insurance industry lagged behind the other sectors of the economy. Per capita premium increased only about $5 from 1923 to mid-1980s.

Protectionism had been the main characteristic of the Turkish insurance industry until mid 1980s. The market entry was restricted and product prices were set by the state. The major step towards liberalization was the achievement of free entry and exit right for firms in 1987. Moreover, by 1990, insurance firms have started to set price of the voluntary non-life insurance policies under market conditions, freely. Another major step, which enhanced competition, came about in 1994 by the legal adjustment enforcing insurance firms to specialize in either life or non-life branches. These changes resulted in a dramatic increase in the number of firms and total premiums. However, the relatively small portfolio with respect to the number of firms created destructive competition. The larger firms

intensified the competition by cutting prices and allowing longer payment periods for their customers. Hence, in 1994 and 1999 new regulatory acts were effectuated to restructure the competitive conditions in the market.

The Marmara earthquake in 1999 and the financial crisis in 2001 had important impacts on the Turkish insurance industry. The earthquake laid a burden of $10 billion on the Turkish economy. Hence, a new insurance line, "compulsory earthquake insurance" was created. This precautionary insurance formed a new channel for competition among the incumbent firms. The effect of the financial crisis in 2001 was observed mainly in the banking industry. The insurance firms, however, were affected relatively to a smaller extent. The operating licenses of some firms were cancelled. Total number of firms, premiums and total assets declined in this period. A recent development in the Turkish insurance industry is the implementation of the "Private Pension Savings and Investment System" in October, 2003. Some of the existing life insurance companies started to operate both in life and pension lines. The system created a new channel to attract potential investors and aims to increase the national propensity to save.

Turkish insurance firms are obliged to operate either in life or non-life branches. In this study, we focus on the dynamics of the non-life insurance industry. Table 1 summarizes the main structural characteristics of the Turkish non-life insurance industry over the period 1996-2004 and reports total number of firms, total assets, total premiums, the four-firm concentration ratio (C4) and the Herfindahl-Hirschman Index (HHI) as derived from total assets[3]. Both the C4 and HHI are the indicators of underlying market structure. The number of firms fluctuates over the sample period. After a slight increase in the beginning of the period, it declines and reaches 32 in 2004. The concentration indicators C4 and HHI follow a cyclical pattern similar to the number of firms along the nine years. The concentration ratios are high and seem to increase in recent years in the Turkish non-life insurance industry. By examining these concentration ratios, one can infer that the revenues in this industry were generated from an oligopolistic-type market structure during the sample period.

Table 1. Turkish non-life insurance industry (1996-2004)

Year	Number of Firms	Total Assets (Million $)	Total Premiums (Million $)	C4	HHI
1996	38	1236.38	972.54	0.449	0.071
1997	42	1308.95	1102.91	0.422	0.065
1998	41	1499.86	1330.50	0.414	0.067
1999	40	1945.50	1315.52	0.488	0.081
2000	39	2271.39	1910.70	0.448	0.076
2001	36	1484.03	1279.98	0.461	0.078
2002	36	1611.32	1621.04	0.428	0.075
2003	39	2632.55	2540.12	0.445	0.077
2004	32	3634.54	3799.79	0.458	0.080

Source: Annual reports of the Insurance Supervisory Board of Republic of Turkey, Prime Ministry Undersecretariat of Treasury.

3. Methodology

Although the discussion in the previous section provides some insights on the competitive structure in the Turkish non-life insurance industry, it reveals little information about the competitive behavior of the insurance firms in the industry.

The previous studies investigating the competitive conditions of the financial institutions used structural and non-structural approaches. Structural approach infers the

[3] The HHI is the sum of the squared market shares of the individual insurance firm.

nature of competition in an industry from its structural characteristics, which are concentration, market share, number of firms (see Bain, 1951). The two main structural approaches are the structure-conduct-performance (SCP) hypothesis and the efficient-structure (ES) hypothesis. The SCP hypothesis asserts that firms in a concentrated market can extract monopolistic rent as a result of imperfect competition. Hence, the industry's performance depends on the conduct of sellers and buyers, which depends on the structure of the industry. The ES hypothesis, however, states that the explanation for the positive relationship between market concentration and profitability is efficiency. Efficient firms increase in size and market share due to their ability to generate higher profits. According to the ES hypothesis, the concentration-performance relation is not due to collusion but is rather a result of firm efficiency (see Demsetz, 1973 and Smirlock, 1985). As Bikker and Haaf (2002) state, the competitiveness of a banking industry cannot be clearly explained using structural approaches because the structural approaches ignore the relationship between market contestability and revenue behavior at the firm level.

In reaction to the theoretical and empirical deficiencies of the structural models, non-structural models of competitive behavior have been developed. Baumol (1982) states that oligopolies and monopolies sometimes behave very much like perfectly competitive firms. Therefore, firms behave differently depending on the market structure in which they operate. The main non-structural models are Iwata model (Iwata, 1974), the Bresnahan model (Bresnahan, 1982) and the Panzar and Rosse (P-R) model (Rosse and Panzar, 1977; Panzar and Rosse, 1987). These non-structural models measure competition and emphasize the analysis of the competitive conduct of firms without using explicit information on the structure of the market. In this study, we use P-R approach to assess the degree of competition in the Turkish non-life insurance industry.

The Panzar and Rosse (P-R) model

A test developed by Rosse and Panzar (1977) and Panzar and Rosse (1987) examines the relationship between input prices and equilibrium gross revenue derived from the theory of the firm under alternative assumptions abut competitive conditions. This test is based on properties of a reduced-form revenue equation at the firm level. Panzar and Rosse define a measure of competition, the *H*-statistic, which is the sum of the elasticities of the reduced-form revenue function with respect to input prices. This statistic represents the percentage variation of the equilibrium revenue derived from a unit percent increase in the price of all inputs used by the insurance firm.

The P-R test is derived from a general market model, which determines equilibrium output level and number of firms, by maximizing profits at both the firm level and industry level. This implies that firm *i* maximizes its profit where marginal revenue (MR) equals marginal cost (MC):

$$MR_i(q_i, n, z_i) - MC_i(q_i, w_i, s_i) = 0 \qquad (1)$$

where q_i is the output of the firm *i*, *n* is the number of firms, w_i is a vector of input prices of firm *i*, z_i and s_i are the vector of exogenous variables shifting firm's revenue and cost functions, respectively. At the industry level, however, when firms are in equilibrium, the zero profit constraint holds:

$$MR_i^*(q_i^*, n^*, z_i) - MC_i^*(q_i^*, w_i, s_i) = 0 \qquad (2)$$

where variables marked with an asterisk (*) denote equilibrium values. As mentioned above, Panzar and Rosse (1987) argue that the market power of a firm can be measured by the extent to which a change in input prices (dw_{ki}) are reflected in the equilibrium revenues (dR_i^*) earned by firm *i*. By indicating *H* as the sum of elasticity of total revenues with respect to input prices[4]:

$$H = \sum_{k=1}^{K} \left(\frac{\partial R_i^*}{\partial w_{ki}} \frac{w_{ki}}{R_i^*} \right) \qquad (3)$$

Panzar and Rosse (1987) show that *H*-statistic is equal to 1, when firms operate under perfect competition[5]. Therefore, an increase in input prices increases both marginal costs and average costs without changing the equilibrium output level of the average firm in the industry. Exit of some firms increases the demand faced by each of the remaining firms, leading to an increase in prices and revenues equivalent to the rise in costs. A negative value of *H* indicates that the structure of a market is a monopoly, a perfectly colluding oligopoly, or a conjectural variations short-run oligopoly[6]. If *H* is negative, an increase in factor prices increases marginal costs and reduces equilibrium output. Since a profit-maximizing monopoly never pushes its sales into the range where the demand curve is inelastic, an increase in factor prices leads to a reduction in total firm revenue. *H*-statistic is positive and less than 1 in the case of monopolistic competition with freedom of entry. This is based on the premise that under monopolistic competition, individual firms face an inelastic demand curve and hence revenues increase less than proportionately to changes in input prices.

A crucial feature of the *H*-statistic is that it must be considered as observations, which are in long-run equilibrium. Hence, equilibrium test should be carried out to verify that input prices are not correlated with industry returns. To test if observations are in long-run equilibrium, one can assume that competitive markets equalize the return rates across firms, so that in equilibrium these rates should not be correlated with input prices. Empirically, the equilibrium test can be carried out by using an indicator of firm return, namely return on assets (ROA) as dependent variable with the same independent variables used in the original model in the estimation of H. In this context, $H = 0$ and $H < 0$ imply that the data represent industry equilibrium and disequilibrium, respectively (see Shaffer, 1982). As mentioned in Panzar and Rosse (1987), this hypothesis is important for the cases of perfect competition ($H = 1$) and monopolistic competition ($H > 0$), while it does not constitute an important prerequisite in the case of monopoly since $H \leq 0$ is a long-run condition for monopoly. Hence, if the data is not in the long-run equilibrium, $H \leq 0$ no longer establishes monopolistic market conditions, but it remains true that $H > 0$ disproves monopoly or short-run conjectural variation oligopoly.

---

[4] Several assumptions need to be made to use this model in this study. The assumptions are: a) insurance firms are single product firms; b) higher input prices are not associated with higher quality services that generate higher revenues, since such a correlation may bias the computed *H*-statistic; c) insurance firms are in long-run equilibrium. Further assumptions include profit maximization and normally shaped revenue and cost functions.

[5] Shaffer (1982) shows that the same results might be obtained for a natural monopolist operating in a perfectly contestable market.

[6] Vesala (1995) proves that the same results hold for monopolistic competition without the threat of entry, i.e. with a fixed number of insurance firms. Moreover, Shaffer shows that *H* is negative also for any conjectural variations oligopoly.

To estimate the *H*-statistic, the following specification of the reduced-form revenue equation for a panel data set is used:

$$\ln TR_{it} = a + b_1 \ln PL_{it} + b_2 \ln PBS_{it} + b_3 \ln PFK_{it} + b_4 \ln TA_{it} + b_5 \ln ETA_{it} + b_6 \ln LTA_{it} + e_{it} \quad (4)$$

Where *it* is the subscript indicating insurance firm *i* at time *t*, *TR* is the total revenue. Insurance firms engage in two branches of activities; first, they serve as financial intermediaries and receive a financial income through this channel. Second, they provide risk pooling and risk bearing services, from which they generate technical income. Hence, the total revenue of an individual insurance firm in the industry is defined as the sum of financial and technical income. The *PL*, *PBS*, and *PFK* are the unit price of labor, unit price of business services, and unit price of financial capital, respectively. *TA*, *ETA*, and *LTA* are the control variables and represent total assets, the ratio of equity capital to total assets, and ratio of losses paid to total assets, respectively[7].

In this study, we assume that insurance firms generate their revenues by employing three major inputs: labor, business services and financial capital in line with the previous studies (see Cummins and Weiss, 1993; Cummins and Zi, 1998; Cummins et al., 2004; Cummins et al., 2006). Since P-R methodology rests on testing the sum of the input price elasticities of the firm's revenue, we should define the input prices. Personnel expenses over the number of employees are used as a proxy for the unit price of labor, PL. Insurance firms use various non-labor inputs such as buildings, computers, office materials, etc. to produce insurance services. Non-labor inputs can be commonly named as business services. The price of business services, PBS, is measured as the ratio of non-labor expenses to total assets. Financial capital, *PFK*, is the third input of the insurance firms which serves as a primary input for risk bearing and risk pooling functions. Insurance firms hold capital to back the losses they promised to pay which are larger than expected and to satisfy the regularity requirements (Cummins and Zi, 1998). Following Cummins and Zi (1998), we measure the price of financial capital by taking the three year moving average of the ratio of net income to equity capital.

Our reduced-form revenue function includes three firm-specific explanatory variables to account for the size, capital structure and risk-compensation of the firms. We use total assets (*TA)* to control for the scale of the insurance firms. We expect a positive relationship between the size of the insurance firms and the revenue generated. The second control variable is the ratio of equity capital to total assets (*ETA*). This ratio represents the capital structure of the insurance firms. The expected sign of this variable is uncertain. A higher ratio implies lower insolvency probabilities and hence may induce higher revenue. However, a higher ratio may also prevent firms from producing their own outputs which in turn may curtail their revenue. The third variable, ratio of losses paid to total assets (*LTA*) represent the ability of insurance firms to compensate risk. Amount of losses that an insurance company undertakes is uncertain. A higher ratio means the company needs better risk management policies to guard against future possible loss payments. We expect a positive sign for the coefficient of this variable since higher loss payments may be an indicator of higher possible income.

---

[7] For testing equilibrium assumption of the model, following equation is estimated:
$\ln ROA_{it} = a + b_1 \ln PL_{it} + b_2 \ln PBS_{it} + b_3 \ln PFK_{it} + b_4 \ln TA_{it} + b_5 \ln ETA_{it} + b_6 \ln LTA_{it} + e_{it}$ where ROA represents net income before tax to total assets. Other variables remained unchanged as defined in Eq. (4)

In the notation of Equation (4), the *H*-statistic is given by $\beta_1 + \beta_2 + \beta_3$. In contrast to most of the literature, we do not rely on a simple cross-sectional estimation, but carry out a panel estimation with fixed effects. The fixed effects model has several advantages. First, by including insurance firm fixed effects, unobserved heterogeneity can be controlled[8]. All firm-specific, non time-varying determinants of revenues not explicitly addressed in the regression specification are captured by the fixed effects. Second, panel estimation allows us to obtain more reliable estimates by observing the behavior of firms over time and testing for changes in the coefficients. Since the Turkish insurance industry has experienced significant changes during the sample period (1996-2004) due to the liberalization and deregulation, it is worthwhile to check whether competitive structure has changed over time. To verify whether the competitive structure has changed over time, the sample period is divided into three sub-periods and *H*-statistic for each sub-period is computed by applying model (4) to each sub-periods.

4. Data and Empirical Results

Data

Our data set consists of a sample of 38 non-life insurance firms representing about 80 percent of the industry assets over the period 1996-2004. We use a firm-level data. The annual balance sheets, technical and financial income statements of the firms are obtained from the Insurance Supervisory Board of Republic of Turkey Prime Ministry Undersecretariat of Treasury. The insurance firms, which have non-positive general expenses, total premiums, total assets, equity capital, personnel expenses and fixed assets are excluded from the sample. Hence we obtain an unbalanced sample. The number of firms in each year of our sample period is reported in Table 2.

Table 2. Number of firms in the sample

Year	Number of Firms
1996	19
1997	24
1998	23
1999	24
2000	28
2001	25
2002	19
2003	15
2004	13

Empirical Results

The estimates of the reduced-form revenue equation and industry equilibrium test results as derived from a panel data set analysis are reported in Table 3 and 4[9]. The regression model in (4) is estimated using the fixed effects model for the three sub-periods in order to control for unobserved heterogeneity[10]. The choice of the fixed effects over the

[8] This is important because OLS regression is biased if a variable is omitted that is related to the dependent variable.

[9] To correct standard errors, the White's (1980) heteroscedasticity consistent t-statistics were used.

[10] As discussed in the previous section, panel data models allow us to obtain more reliable estimates by observing the behavior of firms over time and testing for changes in the coefficients. The test is implemented by dividing the sample period 1996–2004 into three sub-periods (1996-1998, 1999-2001, 2002-2004) and interacting the input price variables with a dummy variable that takes the value of one in the second sub-period when we compare first two sub-periods and dummy variable takes the value of one in the third sub-period when we compare last two sub-periods. If the interaction term yields significant estimates, they indicate a structural break in the statistical relationship between input prices and revenues, which means that

random effects estimators is based on the result of the Hausman test[11]. As seen in Table 3 and 4, the $\overline{R}^2$'s take very high values, which is a sign of better fit. The Wald test that follows an F distribution is used in the competition models to test whether the estimated *H*-statistics are statistically different from zero and unity. For the period 1996-1998, the *H* value of 0.034 is not statistically different from zero but different from unity. Hence, we are unable to reject the monopoly or conjectural variations short-run oligopoly hypotheses for the Turkish insurance firms. All three cost elements, input prices, are statistically significant. The major contribution to the *H*-statistic comes from the labor costs. Among the firm-specific control variables, the total assets, which controls the size has a positive sign and statistically significant. For the second sub-period, the estimated value of the *H*-statistic (0.087) is positive and statistically different from unity but not zero. Therefore, as in the first sub-period, we are unable to reject the monopoly or conjectural variations short-run oligopoly hypotheses for the Turkish insurance firms. All the coefficients of input prices are positively related to firm revenue and however, only the coefficient of price of business services is statistically significant. The firm-specific control variables are statistically significant. The firm size and ratio of losses paid to total assets are positively related to total revenue, and the ratio of equity capital to total assets is, however, negatively related to total revenue.

As for the last sub-period, the results suggest that in the Turkish insurance industry, market structure can be characterized by monopolistic competition. The *H* value of 0.798 is statistically different from both zero and unity at the one-percent level. This results rejects the monopoly hypothesis and perfect competition hypothesis. Turkish insurance firms' revenues behave as if they were earned under monopolistic competition for the period 2002-2004. Two coefficients of the costs components are statistically significant and are positively related with the total revenues. In case of the firm-specific variables, only the coefficient of total assets is statistically significant. The sign of *TA* is positive, indicating that size-induced differences among insurance firms lead to higher total revenue. Hence, the regression results indicate that total assets appears to capture the size effect in the model.

Celik and Kaplan (2007) also focus on the 2002-2004 period and investigate the competition in the non-life Turkish insurance industry using two different revenue variables; net premium income and total income (including total premium income plus interest and other income). They assume three input prices namely, unit labor costs, unit fixed asset costs and commission expenditure per asset, and use capital-asset ratio and total assets as control variables. They do not control for the heteroscedasticity in the regressions and do not perform the equilibrium test. Their results suggest that firms in the Turkish non-life insurance industry over the period 2002-2004 generated their revenues under monopoly conditions[12]. Since our variable definitions and conduct of the study is entirely different, our findings are not comparable with theirs.

---

the direction of the sum of the elasticities (i.e., *H*) changed. The test results indicate that the interaction terms are significant at the conventional levels for the first and second, and second and third sub-periods. Although the results are not reported they are available from the authors upon request.

[11] Hausman and Taylor (1981) developed a test on the correlation between individual effects and regressors. The null hypothesis is no correlation between individual effects and regressors. Random effects model assumes that individual effects and regressors are uncorrelated. Hence, random effects model is more efficient than fixed effects model, which is inefficient but consistent.

[12] Since they do not perform the equilibrium tests, their results on the market structure of the Turkish non-life insurance industry could be misleading.

Table 3. Competitive Structure Test Results

Variable	1996-1998		1999-2001		2002-2004	
Dependent variable: $\ln TR$	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
$\ln PL$	0.125*	0.024	0.035	0.820	0.744*	0.134
$\ln PBS$	-0.050***	0.027	0.034***	0.083	0.074*	0.013
$\ln PFK$	-0.041*	0.012	0.018	0.648	-0.020	0.057
$\ln TA$	0.712*	0.137	0.959*	0.099	0.496**	0.228
$\ln ETA$	-0.136	0.122	-0.045**	0.0218	0.189	0.436
$\ln LTA$	0.178	0.108	0.434*	0.047	0.169	0.176
Constant	1.655*	0.465	1.646***	0.841	6.001*	0.675
$\bar{R}^2$	0.972		0.981		0.983	
N	66		77		47	
H	0.034		0.087		0.798	
F0	0.097		0.204		4.376*	
F1	97.960*		37.476*		11.396*	

Note: *TR, PL, PBS, PFK, TA, ETA*, and *LTA* represent total revenue, the unit price of labor, unit price of business services, and unit price of financial capital, total assets, the ratio of equity capital to total assets, and ratio of losses paid to total assets, respectively.
*,**,*** denote significance level at the 1%, 5%, and 10%, respectively.
H = the sum of elasticities of reduced form revenue function with respect to input prices.
F0 = *F*-statistic for testing the hypothesis *H = 0*.
F1 = *F*-statistic for testing the hypothesis *H = 1*.

The estimates of the *H*-statistics for the long-run equilibrium, which use the return on assets (ROA) as the dependent variable, are reported in Table 4. The estimated values of *H* for the long-run equilibrium test are not statistically different from zero. Hence, the long-run equilibrium condition appears to be established in each of the sub-periods and therefore, the interpretation of *H*-statistics above is meaningful.

Table 4. Equilibrium Test Results

Variable	1996-1998		1999-2001		2002-2004	
Dependent variable: $\ln ROA$	Coefficient	Standard Error	Coefficient	Standard Error	Coefficient	Standard Error
$\ln PL$	-0.065	0.052	0.236***	0.137	-0.346*	0.073
$\ln PBS$	-0.054**	0.024	-0.099*	0.011	0.009	0.046
$\ln PFK$	0.143*	0.038	0.095*	0.029	0.220*	0.038
$\ln TA$	-0.665*	0.135	-0.941*	0.140	-0.488	0.299
$\ln ETA$	-0.448*	0.156	-0.008	0.016	-0.094	1.050
$\ln LTA$	-0.063	0.052	-0.081**	0.034	0.087	0.152
Constant	0.194	0.707	2.604*	0.956	-0.530*	0.058
R^2	0.967		0.959		0.918	
N	66		77		47	
H	0.024		0.231		-0.116	
F0	0.044		1.43		0.039	

Note: *TR, PL, PBS, PFK, TA, ETA*, and *LTA* represent total revenue, the unit price of labor, unit price of business services, and unit price of financial capital, total assets, the ratio of equity capital to total assets, and ratio of losses paid to total assets, respectively.
*,**,*** denote significance level at the 1%, 5%, and 10%, respectively.
H = the sum of elasticities of reduced form revenue function with respect to input prices.
F0 = *F*-statistic for testing the hypothesis *H = 0*.

One could argue that the Turkish insurance firms could exercise market power due to the high concentration and decline of the number of firms, impairing competitiveness in the insurance market in recent years. The empirical findings of this paper suggest that even though the Turkish insurance industry is dominated by large firms, revenues were earned

as if the industry was monopolistically competitive in recent years. Overall results show that *H*-statistics have changed over the sample period.

5. Conclusion

The Turkish insurance industry has undergone significant changes due to the re-regulation and deregulation over the past decades. Hence, this process has considerable implications for the structure of the industry and conduct of the firms. In this paper the competitive conditions of the Turkish non-life insurance industry have been examined for the period 1996-2004, using non-structural method developed by Rosse and Panzar (1977) and Panzar and Rosse (1987). This approach, previously, has been applied mainly to the banking industries of the developed countries. However, the literature focusing on the competitive structure of the insurance industry is relatively poor. Murat et al. (2002) assess the competition in the Australian general insurance industry using the Panzar and Rosse approach. Celik and Kaplan (2007) also follow the same approach and focus on the competitive structure of the Turkish insurance industry for the period 2002-2004. However, these studies do not analyze the competitive structure in an evolutionary perspective. To the authors' best knowledge, this is the first paper applying the Panzar and Rosse approach to investigate market structure of the insurance industry in an evolutionary perspective. Moreover, existing studies do not provide consistent variable definitions for the revenue equation. Hence, we contribute to the existing literature by defining an insurance industry specific revenue function. Our regression results indicate that, in the first (1996-1998) and second (1999-2001) sub-periods, the insurance firms operating in the Turkish insurance industry earned revenues under the monopoly or conjectural variations short-run oligopoly. As for the third period (2002-2004), the results indicate that insurance market was neither monopolistic nor perfectly competitive. Firm revenues behave as if they were earned under monopolistic competition. Overall, results suggest that market conduct in the Turkish insurance market has changed during the sample period. Therefore, the recent increase in concentration appears not to have had a significant impact on the conduct of the firms operating in the Turkish insurance industry, since the data reject the hypotheses of both monopolistic and oligopolistic behavior in the third sub-period. We hope that our findings may reveal some inferences about the market structure and the conduct of the firms of similar developing countries' insurance industries.

References

Bain, J. S. (1951). Relation of profit rate to industry concentration: American manufacturing, 1936-1940. *Quarterly Journal of Economics* 65: 293-324.

Bikker, J. A. and K. Haaf (2002). Competition, concentration and their relationship: an empirical analysis of the banking industry. *Journal of Banking and Finance* 26: 2191-2214.

Baumol, W.J. (1982). Contestable markets: an uprising in the theory of industry structure. *American Economic Review* 72: 1-15.

Bresnahan, T.F. (1982). The oligopoly solution concept is identified. *Economic Letters* 10: 87-92.

Celik, T. and M. Kaplan (2007). Türk sigortacılık sektöründe rekabet: 2002-2004. *Iktisat, Isletme ve Finans* 251: 50-62.

Cummins, J. D. , G. Dionne, R. Gagre and A. Nouria (2006). Efficiency of insurance firms with endogenous risk management and financial intermediation activities. Canada Research Chair in Risk Management, Working Paper 06-06, Montreal: Canada.

Cummins, J. D. , M. Rubio-Misas and H. Zi (2004). The effect of organizational structure on efficiency: evidence from the Spanish insurance industry. *Journal of Banking and Finance* 28: 3113-3150.

Cummins, J. D. and M.A.Weiss (1993). Measuring cost-efficiency in property-liability insurance industry. *Journal of Banking and Finance* 17: 463-481.

Cummins, J.D. and H. Zi (1998). Comparison of frontier efficiency methods: an application to the U.S. life insurance industry. *Journal of Productivity Analysis* 10: 131-152.

Demsetz, H. (1973). Industry structure, market rivalry and public policy. *Journal of Law and Economics* 16: 1-9.

Hausman, J. A. and W.E. Taylor (1981). Panel data and unobservable individual effects. *Journal of Econometrics* 16: 155-155.

Iwata, G. (1974). The measurement of conjectural variations in oligopoly. *Econometrica* 42: 947-966.

Murat, G., R.S. Tonkin and D.J. Jüttner (2002). Competition in the general insurance industry. *Zeitschrift fur die Gesamte Versicherungswissenschaft* 91: 453 - 481.

Panzar, J. C. and J.N. Rosse (1987). Testing for monopoly equilibrium. *Journal of Industrial Economics* 35: 443-456.

Rosse, J.N. and J.C. Panzar (1977). Chamberlin versus Robinson: an empirical test for monopoly rents, Studies in Industry Economics, Research Paper no. 77, Stanford University, Stanford: California.

Shaffer, S. (1982). A non-structural test for competition in financial markets. Bank Structure and Competition, *Conference Proceedings, Federal Reserve Bank of Chicago:* 225-243.

Smirlock, M. (1985). Evidence on the (non) relationship between concentration and profitability in banking. *Journal of Money, Credit and Banking* 17: 69-83.

Vesala, J. (1995). Testing for competition in banking: Behavioral evidence from Finland, *Bank of Finland Studies, E1,* Bank of Finland.

White, H. (1980). A heteroscedasticity-consistent covariance matrix estimator and a direct test for heteroscedasticity. *Econometrica* 48: 817-838.