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A research for the competitive environment hypothesis in the short-run for the Turkish manufacturing industry

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ABSTRACT

The competitive environment hypothesis is one of the basic ideas in mainstream economic theory. It states that the competitive process eliminates all economic profits and losses in the long-run so profits do not persist. This article studies the competitive environment hypothesis of 125 Istanbul Stock Exchange (ISE) quoted manufacturing firms that survived during the period of 2009:1–2010:4, which can be considered as the short-run. Net income after tax to total assets (return on assets [ROA]) and net income after tax to total equity (return on equity [ROE]) are both used as profit measures. Starting with Levin et al. and Im et al.'s panel unit root tests, pooled Ordinary Least Squares (OLS), panel fixed effects and cross-sectional analysis are employed. The results indicate that competitive environment hypothesis is viable and profits do not persist in the short-run.

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1. Introduction

In a competitive market, all economic profits and losses are expected to vanish in the long-run. In other words, the increase in the competition continues until profitability in the sectors is equalised at a competitive rate. This is known as the competitive environment hypothesis. Under the pressure of competition, there will not be any more profits below or above the average. As a matter of fact, the profits or losses will not persist under competition. Since the seminal contributions made by Mueller (1977, 1986), there has been a flourishing literature on this area of research. Starting with the first contributions made by Mueller (1977, 1986) and Geroski and Jacquemin (1988), a number of studies have been initiated in order to verify the existence of competitive environment hypothesis. Cubbin and Geroski (1987), Schwalbach, Grasshoff, and Mahmood (1989), Odagiri and Yamawaki (1990), Schwalbach and Mahmood (1990), Mueller (1990), Cubbin and Geroski (1990), Schohl (1990), Kambhampati (Kambahampati, 1995), Waring (1996), Goddard and Wilson (1996, 1999), McGahan and Porter (1999), Cable, Jackson, and Rhys (2001), Glen, Lee, and Singh (2001), Maruyama and Odagiri (Marayuma

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& Odagiri, 2002), Glen, Lee, and Singh (2003), Ioannidis, Peel, and Venetis (2003), Gschwandtner (2005), Yurtoglu (2004), Cable and Jackson (2008), Gschwandtner and Hauser (2008), McMillian and Wohar (2011) are just some of the papers that searched for evidence of persistence of profit for different economies and different time periods in the non-financial sector. However, there are also other studies regarding the persistence of profit in the financial sector, such as Levonian (1993), Berger, Bonime, Covitz, and Hancock (2000), Goddard, Molyneux, and Wilson (2004a, 2004b), Agostino, Leonida, and Trivieri (2005), Gibson (2005), Knapp, Gart, and Chaudhry (2006), Bektas (2007), Athanasoglou, Brissimis, and Delis (2008), Kaplan and Çelik (2008), Goddard, Liu, et al. (2009, 2010), Flamini, McDonald, and Schumacher (2009).

The vast majority of these studies follow an autoregressive regression methodology in testing profits persistence. This includes testing for a unit root in firm level profitability series, which would indicate that shocks to profitability persist indefinitely and that competitive pressures never eliminate differences in profitability. One might easily argue that the competition process did not have enough time to eliminate all economic profits and losses. Therefore, it becomes a standard to search profit persistence for the long-run. Attempts to search profit persistence in the long-run with limited number of data is criticised by econometricians. Short time series present certain econometric problems, and raise the question of whether one can really infer the long-run persistence from those short time series. But what if a very limited time is enough to eliminate all profits above the average under heavy competition? In other words, do profits persist in the short-run? Thus, this article contributes to the existing literature by examining this issue in the short-run analysis.

The aim of this study is to present further evidence on the persistence of profit in the short-run by employing several alternative methods in the empirical analysis. In this respect, persistence of profit in Turkish manufacturing industry is investigated with eight quarters of 125 firms which gives a total number of 1000 observations (2009:1–2010:4) which are econometrically enough to be analysed. The sample consists of 125 manufacturing companies quoted on the Istanbul Stock Exchange (ISE). In the empirical analysis, two different but complementary methods are employed. First; as an ordinary routine, panel unit roots are tested by Levin, Lin and Chu (2002) and Im, Peseran and Shin (2003). Then regression analysis employed by pooled Ordinary Least Squares (OLS), panel fixed effects, cross-sectional, separately. There are two basic differences between the present study and previous examinations of persistence of profit. First, this study investigates persistence of profit for the short-run with both return on assets (ROA) and return on equity (ROE). Second, in addition to classical panel regression, cross-sectional regression analysis is employed to eliminate time-dependent variable effects.

The remainder of the article is composed of four sections. Section 2 presents the data and methodology. Section 3 provides the empirical findings, whereas the research findings and their interpretation are presented in Section 4.

2. Data and methodology

This study investigates competitive environment hypothesis in the profits of complete 125 manufacturing firms which are quoted on the ISE and survived between 2009 and 2010. In other words, this study analyses profit persistency in Turkish manufacturing companies. Data is figured out from balance sheet and income statements of related companies on a quarterly basis. Net income after tax to total assets (ROA) and net income after tax to total

Table 1. Descriptive statistics.

	Mean	Median	Maximum	Minimum	Std. Dev.	n	N	T
ROA	0.0195	0.0142	0.3613	-0.2676	0.0591	125	1000	8
ROE	0.0243	0.0253	0.5798	-0.7704	0.1279			

Source: Authors.

equity (ROE) are both employed as profit measures separately. Table 1 shows the descriptive statistics related to the data set.

There are several different methodologies used to define profit persistency. Some studies use well-known unit root tests to figure out profit persistency. As a matter of fact, if profit rates follow a stationary process, this implies that profit rates are converging. In other words, a result of a stationary profit rates means that competition exists among the surviving firms. Nevertheless, existence of unit root results that there are excess profits which is inconsistent under the competitive environment hypothesis. That is to say, abnormal profits are expected to be eliminated under competition. In different perspectives, the firms which have abnormal losses are expected to perish.

In addition to unit root tests, another methodology is to utilise classic regression analysis to find out whether profit persistency exists. The common regression models are formerly known as lag dependent variable models, which tend to explain present profits by past. According to these studies under valid diagnosis tests of the regressions, the coefficient of lag dependent variable will give a clue about competition level. High coefficient of lag dependent variable means that past high profits will create a high profit in present or vice versa. Such profits are persistent and competition is low. However, a low coefficient means that past profits merely explain a little of present profits. Such profits are not persistent and competition is high. The results of these studies are useful only if a comparison exists. Otherwise, the result itself is not sufficient to explain profit persistence.

An intense research of profit persistency needs both unit root and regression analysis to have strong outline. Thus, profit persistency is examined by unit root tests, pooled OLS, panel fixed effects and cross-sectional regression analysis in this study.

It is assumed that the seminal contribution to econometric theory is the unit root process. Starting with Dickey and Fuller (1979), Nelson and Plosser (1982), Campbell and Mankiw (1987), Cochrane (1988), Philips and Perron (1988) and Perron (1989), unit root process becomes a irrevocable tool for time series econometrics. However, it is proven that unit root applications have low statistical power on time series analysis (Baltagi, 2005). To overcome this problem, panel data econometrics is developed, which contains both time series and cross-sections. In this respect, significance levels of unit tests are improved due to increase in data. Levin and Lin (1992, 1993), Breitung and Meyer (1994), Quah (1994), Maddala and Wu (1999), Choi (1999), Breitung (2000), Hadri (2000), Levin, Lin and Chu ([LLC] 2002) and Im, Pesaran and Shin ([IPS] 2003) are well-known studies that improved unit root process on panel data.

In this study, unit root is analysed by two different tests which give supplementary information and increase the confidence of results. First, the LLC test is employed which is proposed by Levin et al. (2002) and then the IPS test is employed which is proposed by Im et al. (2003).

The LLC test starts by estimating the following equation:

$$\Delta y_{i,t} = \alpha_{i,k} + \rho y_{i,t-1} + \sum_{k=1}^{n} \varphi_k \Delta y_{i,t-k} + \lambda_{i,t} + \delta t + \varepsilon_{i,t} \quad \text{i = 1,.....,N t = 1, ...,T}$$

The panel OLS of the normalised residuals is run to obtain the ρ estimates. The LLC test shows that under null hypothesis $H_0 : \rho = 0$, the regression t statistics of ρ has a standard normal limiting distribution. Besides the alternative hypothesis of LLC has a limitation of homogenous autoregressive coefficient. Nevertheless Im et al. (2003) propose this limitation as a weakness of the test. Im et al. (2003) offer an alternative hypothesis under heterogeneous autoregressive coefficient.

The IPS test starts by estimating the following equation

$$\Delta y_{it} = \rho_i y_{i,t-1} + \sum_{L=1}^{p_i} \phi_{iL} \Delta y_{i,t-L} + z'_{it}\gamma + u_{it} \quad \text{i = 1,.....,N t = 1, ...,T}$$

The IPS uses a group mean t -bar statistics to test no unit root hypothesis, based on the average of the individual ADF *t* statistics In short, the test statistics of t-bar are given as:

$$\Gamma_{\bar{t}} = \frac{\sqrt{N}\bar{t}_{NT} - E(t_T|\beta_i = 0)}{\sqrt{Var(t_T|\beta_i = 0)}} \rightarrow \text{N}(0,1), \text{where } \bar{t}_{\text{NT}} = \frac{1}{N}\sum\nolimits_{i=1}^{N} t_{iT}$$

Such that $\bar{t}_{\text{NT}}$ is the average ADF t-statistics for individual firms. The terms $E\,(t_T \,|\, \beta_i = 0)$ and $Var\,(t_T \,|\, \rho_i = 0)$ are the finite common mean and variance of the individual ADF statistics $t_{iT,}$ tabulated in the IPS.

The IPS and LLC unit root tests differ mainly in the assumptions regarding the nature of the hypotheses being tested. The main difference between the tests is that the LLC assumes the unit root is common to all the cross-sections in the model, whereas the IPS test assumes they can differ. Both tests assume that different lag lengths can be used across the different cross-sections. The hypotheses also differ, as the alternative hypothesis in the LLC test is that all individual cross-sections are stationary, whereas with the IPS test the alternative is that at least one is stationary.

After determination of stationary results, as a comparison between ROA and ROE, following first order auto-regressive equation is tested:

$$\rho_{i,t} = \alpha_i + \lambda i \rho_{i,t-1} + \varepsilon_{i,t}$$

where $\rho_{i,t}$is the profitability of firm i at time t which is measured by ROA and ROE separately. The term $\alpha$is constant and $\lambda i$is the parameter that represents the speed of adjustment coefficients of excess profits to the norm and $\varepsilon_{i,t}$is the usual error term. By regressing $\rho_{i,t\text{-}1}$, on $\rho_{i,t}$, the impact of previous years' profit rates to the current year's profit rates can be estimated. In other words, the value of λi predicts the intensity of competition or speed of adjustment towards the mean profit of the industry. Hence, it can be used to measure the persistency of the profits in a particular industry or market. In the industries where competitive firms exist and are functional, the value of λ_i is assumed to be at lower values.

In the expectation of panel models there are three different methodologies. They are pooled OLS, fixed effects and random effects. If there is no distinction between cross-section and time series, a regression over all the data using ordinary least squares is called a pooled

OLS regression. However, there could be random or fixed effects between cross-sections. The Hausman test is the standard procedure used in empirical panel data analysis in order to discriminate between the fixed effects and random effects models.

For an intense perspective a cross-sectional analysis is done to limit time dependent effects. Using the quarterly ROA and ROE values of 2009 and 2010, cross-sectional regression model can be defined as:

$$\rho_{i,2010} = \alpha_i + \lambda i \rho_{i,2009} + \varepsilon_{i,t}$$

Cross-sectional regression analysis is exempt of time series assumptions. So it is expected to give a detailed look to persistence phenomena without time dependent variables.

3. Empirical results

The panel unit test results are expected to give some information about persistence of profits in Turkish manufacturing industry. Table 2 shows the unit root test results for ROA and ROE by LLC and IPS tests.

The results of unit root tests indicate that ROA and ROE data are stationary. In other words, the test results show that competition exists and ROA and ROE are in convergence. However, these results are not enough to explain the intensity of competition. With respect to this context, Table 3 results indicate the competition level of ROA and ROE with three different tests. To have a comprehensive view, pooled OLS (due to F test), fixed effects (due to Hausman X^2) and cross-sectional analysis is applied to consider the convergence. The advantage of the different methodologies helps to consider the results in a more detailed consensus. Similarities in the results will be useful to avoid contradictions between different methodologies.

The diagnosis tests prove that results are valid under each model. Besides the effect of previous profit rates have fixed effects on current profit rates, which can be seen from Hausman test results of ROA and ROE. Time dummies are employed to investigate the time

Table 2. Unit root test results.

Unit Root Test	Variable	Constant	Constant & Trend	None
LLC	ROA	-33.023(0.000)	-22.423(0.000)	-5.302(0.000)
	ROE	-13.692(0.000)	-54.973(0.000)	-7.227(0.000)
IPS	ROA	-2.500(0.006)	-2.3595(0.009)	-
	ROE	-2.014(0.022)	-1.831(0.033)	-

Source: Authors.

Table 3. Regression results.

	ROA			ROE		
Variables	POOLED OLS	FIXED EFFECTS	CROSS SEC.	POOLED OLS	FIXED EFFECTS	CROSS SEC.
α	0.0085(0.000)	0.0151(0.000)	0.0219(0.000)	0.0158(0.000)	0.0231(0.000)	0.0287(0.071)
λ	0.8981(0.000)	0.5079(0.000)	0.6898(0.000)	0.8361(0.000)	0.4884(0.000)	0.6176(0.000)
R^2	0.6416	0.7407	0.3920	0.5654	0.6825	0.2180
F-Stat	1563.246(0.000)	17.121(0.000)	-	1136.104(0.000)	12.881(0.000)	-
Durbin-Watson	2.0277	1.9353		1.956867	1.9413	
Hausman X^2	-	233.85(0.000)		-	180.13(0.000)	

Source: Authors.

dimension. However, it is found to be ineffective. While the results show a strong coordination with different methodologies, as a proof or convergence λ can easily interpreted. The coefficient of λ is significant in all analyses and Durbin Watson statistics shows that there is no autocorrelation problem. On Table 3, the λ coefficient shows that ROA and ROE are both similarly affected by competition. Such approximation of those values in the same analysis is not sufficient to compare intensity of competition in terms of ROA and ROE.

4. Conclusion

The increase in the competition eliminates firm-level abnormal profits and losses. This is formerly known as the competitive environment hypothesis. According to this hypothesis, under a competitive industry profitability of firms will not be persistent and hence profit differentials across firms will disappear in the long-run. But what if a very limited time is enough to eliminate all profits above the norm under heavy competition? The aim of this study is to present further evidence on the persistence of profit in the short-run. The profit persistence in the Turkish manufacturing industry is examined by using the data from 125 surviving ISE quoted firms for the period of 2009:1–2010:4.

The LLC and IPS unit root test results and relevant regression analysis indicate that the competitive environment hypothesis is viable in the short-run. In other words, convergence exists in the profits of Turkish manufacturing industry. Thus, entry and exit are sufficiently free to eliminate any firm's abnormal profit quickly and all firm's profit rates converged towards an identical long-run average value. Besides, there is no difference in the results of ROA and ROE which means that competition affects both of these profitability measures similarly.

Disclosure Statement

No potential conflict of interest was reported by the authors.

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