Modelling of Factors Influencing Corporate Performance on the Bases of Domestic Empirical Studies

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In this paper, I reviewed the development, from year 2001 to 2006, of the effects influencing the performance of businesses operating in the Hungarian economy. Studying the international special literature, I discovered a number of works focusing on this subject using a wide range of methodologies and tools. The novelty of my study is reinforced by both the subject group of businesses, and the sector, in which the same operate. Small and medium size enterprises account for a considerable economic weight in Hungary as well, just like in the European Union.

The analysis of the data shows correlation, where in practice, the parties concerned also assume and perceive – without sufficient theoretical background – that the intensifying competition makes the price-cost margins – and therefore profitability as well – decrease. Through the analyses performed on the database containing the data made available to me, and related to the subject period, I managed to support this unequivocally. My former studies already indicated the verifiability of the assumption related to the effect of labour productivity on profitability. There may be a positive relationship between labour productivity and profitability, meaning that an increase in labour productivity brings about increase in the profitability, while companies demonstrating a decreasing labour productivity also show decrease in their profitability.

Keywords: competition, performance, profitability, productivity

1. Introduction

It is a widely argued question whether competition and an intensified market concentration have a favourable effect on the businesses' profitability, productivity or efficiency. Many researchers found a positive relation between competition and the development of corporate performance. Both theoretical and empirical studies support, however, that on markets characterised with moderate technological progress and innovation, there are many players operating, and competition tends to work efficiently, with the margin converging to zero. In such cases, the price-cost margin can be an effective indicator of the intensity of competition. In this paper, I will ex-

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amine, which factors have an effect on the development of corporate performance, based on a model built on the accounting figures of companies keeping double-entry books from 2001 to 2006.

2. Competition and its measurability

Researchers dealing with economics have been interested in the role of competition and its influence on economic efficiency for a long time. Most of them emphasize the 'beneficial' role of competition, although competition is not omnipotent, which is proved by the financial world crisis at the end of 2008, for example. Competition can be linked to certain markets (e.g. the market of services).

A market can be described on the basis of its structure, form, size and the number of players. These factors determine the possibilities of the players and the strength of the competition. The forms of the market can be judged by *the number* of sellers and buyers, whether it is easy or difficult for *new players* to enter the market and whether a player is able to influence the market price alone. The two extreme forms of market competition are perfect competition and pure monopoly. In one of the most well-known transitional market situations (Stackelberg describes nine possible market situations in his book. (Leontief 1936)), some companies knowing one another and being able to adapt to one another compete on the given market. This is called a multi-participant *oligopolistic* market.

A basic issue of the literature dealing with the relationship between competition and the performance of companies is defining the intensity of competition numerically. Competition is hard to measure directly. For the lack of exact index numbers, empirical studies attempt to demonstrate the intensity of competition based on an observable factor relating to competition indirectly. On the literature studied, I can declare that there are no universal index numbers that could give a really reliable picture of the extent of competition on a given market.

2.1. Index numbers of competition intensity

Of the indicators used for measuring competition, I can distinguish between *static* and *dynamic* index numbers. Static indexes provide information on the state of a given market at the time of the investigation, whereas dynamic indexes are applied to show the *changes* taking place on the market. The indicators based on the demography (establishment and closing down) and the market share changes of companies can provide further useful information on the intensity of competition.

In addition to and completing static and dynamic index numbers, several other approaches to assessing the extent and trends of competition can be found while studying the literature. Among others are index numbers demonstrating the existence of certain institutional conditions, the *regulation* level of the market or *freedom* of international trade and *innovation*.

I focus on the following indicators used for measuring market structure: a) concentration rate (CR), b) Hirschman–Herfindahl index (HHI) and c) Lerner index (L) or price–cost margin (PCM).

2.1.1. Concentration rate

The *concentration rate* shows what percentage the largest companies have of the total production or total turnover of a market. The concentration rate can be calculated on the 2, 4, 8, 16, etc. largest companies relating to the division and class concerned. The CR4 and CR8 indexes of the logistics division are in columns 3 and 4 of Table 1.

2.1.2. The Hirschman-Herfindahl index

The *Hirschman-Herfindahl index* is the index number of market concentration in the industrial sector, which is calculated by squaring and summing the market share of each firm. The maximal value of the index is 10 000 (100^2).[2] The HHI index is shown in the last column of Table 1.

[2] In compliance with the Merger Guide, we speak about moderate concentration if the index is between 1000 and 1800, and concentration if it is over 1800.
http://www.usdoj.gov/atr/public/guidelines/horiz_book/15.html

Table 1. The ten most highly concentrated classes in the service sector in Hungary in 2006

Industries	Company	CR4	CR8	MCR8	HHI
Air transport	67	93.51	97.05	3.54	5,785
Post and telecommunications	1,026	69.43	80.69	11.26	1,603
Water transport	79	64.14	77.52	13.38	1,182
Renting of machinery & equipment without operator	1,673	40.32	48.89	8.57	776
Recreational, cultural and sporting activities	8,269	41.45	44.25	2.80	752
Sewage and refuse disposal, sanitation and similar activities	749	32.76	40.62	7.86	422
Land transport; transport via pipelines	6,902	30.66	38.57	7.91	328
Sale, maintenance & repair of motor vehicles, etc.; retail sale of automotive fuel	10,994	21.45	32.24	10.79	169
Retail trade, except of motor veh. etc.; repair of personal & hh. goods	35,821	21.38	28.36	6.98	166
Other service activities	3,318	17.91	26.65	8.74	132

Source: own creation

There is a strong correlation between the concentration rates calculated with Hungarian corporate data on class level. The strongest relationship ($r = 0.981$) is between CR4 and CR8, but there is a close connection between CR4 and the HHI index ($r = 0.849$), as well as CR8 and the HHI index ($r = 0.777$). Correlations are significant at level $p<0.001$.

2.1.3. Lerner index

The *Lerner index* is an indicator determining the market power of the company as the difference between price and marginal cost. (Lerner 1934) The higher the Lerner index, the more market power the company has, as the company needs more and more power to be able to deviate from the price equal to the marginal cost.

2.1.4. International empirical studies on the above indicators

In empirical studies, both the concentration rate and the Lerner index are frequently applied (to measure competition). See for example: (Collins – Preston 1966, 1969; Saving 1970; Ornstein 1975; Rosenthal 1980; Domowitz et al. 1986, 1988; Amir – Lambson 2000; Nevo 2001), etc.

However, not all the publications we have studied led to an unambiguous result. Ornstein's investigations (1975), for instance, justified Collins and Preston's (1966, 1969) conclusions, stating that, in the industrial sector manufacturing of consumer goods,[3] the Lerner index shows statistically significant results with market concentration trends, but in sectors producing durable consumer goods, the results did not prove to be significant. Similarly, no significant relations could be detected in more capital-intensive divisions.

Domowitz (1986) and his co-authors came to the conclusion that, in the 1970s, there was a dramatic narrowing of the spread between the average price–cost margins of concentrated and non-concentrated divisions in the USA. The change in the spread between the margins of concentrated and non-concentrated sectors can be largely attributed to the different changes of adaptation and demand, which suggests that, in the explanation of price–cost margin fluctuation, the aggregate impact of demand is of greater importance than the effects of local demand (Domowitz et al. 1986).

Nevertheless, both theoretical and empirical research supports the hypothesis that, on markets characterized by moderate technological development and innovation, with lots of players, where competition functions efficiently, the margin approaches zero. In such cases, the price–cost margin can indicate the strength of competition well. A value close to zero indicates strong competition, whereas higher values point to the weakness of competition. The higher the index value, the weaker the competition. (I proved this thesis through utilizing the – independent – international research results of the 1990s.)

The vast majority of the empirical studies found on the effect of market share on profitability published in the last decades confirmed a positive correlation. The increase of productivity showed different extents taken as a function of the features of the samples, the methodology and the model applied, but according to the conclusions drawn from the studies, the increase in market share is equal to the rise in profitability (Szymanski et al. 1993).[4]

- Shepherd (1972) also found a positive and significant link between market share and profitability, but the relationship among companies in the service

[3] For more about 'nondurable goods', see for example: http://www.census.gov/epcd/naics02/def/NDEF424.HTM

[4] The authors examined 28 other studies on the relationship between market share and profitability, but they did not include the extent of the effect.

sector appeared to be stronger than among those in the production sphere. He pointed out the variability of the connection between market share and profitability, dividing the period under survey into parts. More profitable companies lost some of their market share later (Shepherd 1972).

- Nickell et al. (1992) believe that productivity growth is usually stronger in the case of companies with a large market share (Nickell et al. 1992). Nickell later (1996) adds that this growth effect is a cross-sectional result; therefore, it is not free from the problem that, in the long run, companies producing a relatively high rise in productivity usually grow faster and gain a larger market share. Thus, it cannot be regarded as an original competition effect (Nickell 1996).
- Hay and Liu (1997) say that the shifts of market shares are connected with the levels of efficiency, the price flexibility of demand and the company management, as well as with the number of companies on the market. If the competitor uses similar prices, the equation applied by the authors suggests that the market share of a company is in direct proportion to its relative costs; furthermore, the share of the players on the market decreases if the number of companies goes up. The shifts of market shares, or in other words, the reallocation effect, is less marked if the number of companies was originally high. It can also be concluded from the equation that, if the price flexibility increases or competitors' reaction regresses, efficient companies gain market share at the expense of the less efficient ones (Hay – Liu 1997).
- Halpern and Kőrösi (2001) examined the relationship between efficiency and market share in the Hungarian corporate sector over the period 1990–1998. In their study, in order to measure concentration, they used the reciprocal of the number of companies operating in the classes (Halpern - Kőrösi 2001). In the period I examined, the concentration rate derived from the number of companies can mainly be connected with the HHI index. If I make the calculations concerning groups and classes (less aggregate data), the relationships between the indicators slightly weaken.

2.2. The basic model of my calculations

Besides the concentration rate, the price–cost margin is one of the most frequently used index numbers for measuring the intensity of competition. In the model of economic theory describing a perfectly competing market, none of the players depart from the market price, which will be equal to the marginal cost in the long run. In a monopoly, it is only the demand that can limit the trend of prices; therefore, the less elastic the demand for a product, the bigger the market power and the price–cost margin of the company in a monopolistic position.

Collins and Preston (1966) explain the differences in the price–cost margins (PCM) of industries with the following model:

$$\mathbf{Y_{tu} = \alpha + \beta_1\, CR4_{tu} + \beta_2\, CR4_{tu}^2 + \beta_3\, IGEOD_{tu} + \beta_4\, K\_S\_R_{t0} + \beta_5\, G_{tu/t0}}$$

Y_{tu} = price–cost margin (PCM) in the last year of the examined period.
$CR4_{tu}$ = concentration rate calculated on the four largest companies of the class in the last year of the examined period.
$IGEOD_{tu}$ = index of geographical dispersion.
$K\_S\_R_{t0}$ = value of total assets output in the first year of the examined period.
$G_{tu/t0}$ = percentage change in the output of classes over the examined period.

The price–cost margin (PCM) was defined in two different ways. When calculating the numerator of PCM1, staff costs and material costs are deducted from the periodic output corrected with the variation in stocks; in the case of PCM2, besides material costs, material-type expenditures are also deducted. In both cases, the denominator is the periodic output corrected with the variation in stocks.

The index of geographical dispersion was calculated concerning the last year of the examined period as the sectoral sum of the absolute differences between the aggregated percentage of industry output on a regional level and the percentage of population in that region. The higher the geographical dispersion, the smaller the index.

In the value of total assets output ($K\_S\_R_{t0}$), the difference between the asset intensiveness of class output is taken into consideration. The quantity of assets (particularly the ratio of current assets and tangible assets, and intangible assets) can influence the trend of the price–cost margin differently.

3. The database examined

I worked with the data of 2001–2006, aggregated on class level, of companies having double-entry book-keeping. A total of *95,214* companies with double-entry book-keeping submitted legitimate corporate tax returns in each year of the subject period. This group of companies accounted for 30.08% of all companies having double-entry book-keeping in 2006, and employed 69.74% of all workers employed by all companies having double-entry book-keeping. In 2006, the books of these 95,214 companies accounted for 81.64% of the net sales revenues (which was 90.67% of the net export sales revenues!), and 84.30% of the pre-tax profit of all companies submitting tax returns with double-entry book-keeping.

I measured corporate performance using the average values, calculated in the class, of profitability indexes widely applied in foreign literature (ROE, ROA, ROS)[5] and the gross value added per capita6 index.

[5] **ROE** = EBIT / [(Equity $_t$ + Equity $_{t-1}$) / 2], **EBIT** = Company's usual profit + Interests to be paid and other interest-type expenditures – Other interests received and interest-type revenues; **ROA** = EBIT / [(Total assets $_t$ + Total assets $_{t-1}$) / 2]; **ROS** = EBIT / Net sales revenues.

In the empirical studies performed during my research, I surveyed the performance of companies in the service sector, on the bases of the figures included in the tax returns submitted by companies with double-entry book-keeping assigned to industries 50 to 93 (except Financial mediation) under the TEÁOR'03 system, as such data were collected by HCSO (Hungarian Central Statistical Office)[7]. Based on the data of 2006, 76.88% of all companies operated in these industries in Hungary producing 51.91% of all net sales revenues, employing 53.23% of all labour force. Additionally, this sector generated 47.29% of the total gross added value. *In this respect*, the service sector forms the largest sector of the Hungarian national economy in our days.

4. Empirical results of the investigation

In the course of the literature review, I explored the ways of demonstrating corporate competition. Based on the databases available, using the SPSS 15.0 for Windows program package, I carried out descriptive statistical calculations, comparing analyses of divisions and classes and comparing ratio analyses, as well as regression and variance analysis (ANOVA), in accordance with the mathematical methods used in the literature. Following the development of the basic model to be described, in addition to the compliance conditions of the regression analysis, the validity of the model in use was checked, too.

Similarly to the sample of Collins and Preston (1966), the values of the parameters received indicate a negative relation among concentration, the value of total assets output and the price–cost margin; moreover, the release growth of the classes shows a significant relation with the price–cost margin.

The parameters received on the basis of the model run on the 2001–2006 class data of Hungarian companies, if $R^2 = 22.8\%$,[8] are as follows (see Table 2).

[6] With the balance of taxes on products and subsidies on products, the **gross value added** index shows the company's contribution to GDP.
[7] The HCSO database does not include data for financial and off-shore enterprises.
[8] The unbiased estimator of the explained proportion of the statistical population.

Table 2. Testing the initial model with Hungarian data

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,536	,018		29,700	,000
	CR4t6	-,005	,001	-,659	-7,321	,000
	NNCR4t6	7,78E-006	,000	,117	1,347	,178
	IGEODtu	,003	,000	,318	15,100	,000
	K_S_Rt0	,010	,005	,038	2,183	,029
	Gtut0	2,38E-007	,000	,015	,863	,388

a. Dependent Variable: PCM106

Source: own creation

In this form, the model with explanatory power of about 20% does not meet the requirements of regression analysis perfectly. The concentration rate ($CR4_{t6}$) and its square indicate a rather strong correlation (r = 0.978) and, looking at Table 2, I find that the percentage change in the output of classes over the examined period ($G_{tu/t0)}$ are not significant.

During the further development of the model, considering the models of Collins and Preston (1969), Ornstein (1975) and Domowitz et al. (1986), by omitting the square of the concentration rate ($NNCR4_{t6}$) from the basic model and replacing the dependent variable with the price–cost margins of the specific business years, I obtained the following regression equation:

$$\mathbf{Y_{ti} = \alpha + \beta_1 CR4_{t0} + \beta_2 IGEOD_{tu} + \beta_3 K\_S\_R_{t0} + \beta_4 G_{t/t-1} + \beta_4 VTK\_M1_{ti} + \beta_6 Sz}$$

Y_{ti} = price–cost margin (PCM) in class *i* in year *t*.
$CR4_{t0}$ = concentration rate calculated on the four largest companies of the class in the last year of the examined period.
$IGEOD_{tu}$ = index of geographical dispersion.
$K\_S\_R_{t0}$ = the value of total assets output in the first year of the examined period.
$G_{t/t-1}$ = percentage change in output of classes over the examined period.
VTK_M1ti = labor productivity in class *i* in year *t*.
Sz = a dummy variable with a value of one when services sector and of zero otherwise.

The explanatory power of the model slightly fell (R^2 = 58.57%), but its reliability improved remarkably. The standard error of the estimation is rather low,

which indicates that the model can estimate quite well. The significance of the F-test also verifies the existence of the relation, and in the t-test, on the basis of the significance of the variables determining the slope, the explanatory variables really influence the value of the dependent variable (see Table 3).

Table 3. Summarizing table of the model supplemented with the productivity index

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	,767[a]	,588	,587	,15248	,588	596,792	6	2508	,000

a. Predictors: (Constant), Szolgáltató, IGEODtu, Gtt1, K_S_Rt0, VTK_M1, CR4to

Source: own creation

According to the beta values, the price–cost margin is the most strongly influenced by geographical dispersion ($IGEOD_{tu}$) and the percentage change in class output ($G_{t/t-1}$). Similarly to the model of Collins and Preston (1966), concentration ($CR4_{t0}$) shows a negative relation to price–cost margin and to the value of total assets output ($K\_S\_R_{t0}$) as well.

In the course of regression analysis, the compliance of the model can only be declared after checking the fulfilment of numerous conditions: a) there are no correlation coefficients of high value among the explanatory variables and the 'tolerance' indexes are also favourable, so there is no multicollinearity either; b) residual variance seems constant, too, and the residuals have a normal distribution according to the histogram, which is confirmed by the Kolmogorov–Smirnov (K–S) one-sample test.[9]

Beyond graphical representation, I also verified the stability of the variance of remainder terms through calculations. The standard deviation of the residuals of ten percentage samples taken after sorting the independent variables in ascending order were tested using F-probe. As a result of the calculations performed, in can be concluded, with the level of significance being either five percent or *one percent*, that **t**he *condition of homoscedasticity* is also met.

Beyond the published verifications of the calculations carried out for individual industries, I also verified the operation of the model several times through dividing the full sample into two parts comprising the same number of elements. By applying the regression model to the first part of the sample, I provided estimations for the values of the dependent variable in the second part of the sample using theses

[9] The calculations were made by the SPSS 15.0 program package.

regression factors. The tests performed during the comparison of the standard deviations of residuals indicated no significant differences among the variance values, whereby the *validity* of the model is unquestionable.

The explanatory power of the model can be further increased if the labour productivity of classes is also involved in the independent variables (R^2 = 59.4%). The effect of the headcount (L_A) on the price/cost margin (PCM1) is clearly negative, while such headcount also slightly decreases the effect of labour productivity on the dependent variable (see Table 4).

Table 4. Parameters of the developed model

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	,468	,013		35,665	,000
	CR4to	-,002	,000	-,200	-12,912	,000
	IGEODtu	,000	,000	,052	3,654	,000
	K_S_Rt0	-,018	,004	-,065	-4,772	,000
	Gtt1	,000	,000	,045	3,510	,000
	VTK_M1	3,86E-006	,000	,148	10,741	,000
	Szolgáltató	,326	,007	,665	47,706	,000
	L_A	-2,51E-006	,000	-,088	-6,568	,000

a. Dependent Variable: PCM1

Source: own creation

Proceeding with the examination of the effects of the individual factors in the corporate database related to the service sector, one may conclude that, in classes where the intensity of competition rose in the examined period (PCM fell), the profitability indexes and labour productivity are *significantly* lower than in classes where the intensity of competition lessened.[10]

Dividing the examined period into two parts, years 2001–2003 and 2004–2006, in classes showing *increasing competition*, the average profitability (ROA, ROE) is significantly lower than in less competing ones in the first half of the examined period. In classes with higher concentration (over 70%), *bigger values* of profitability can be detected than in less concentrated ones.

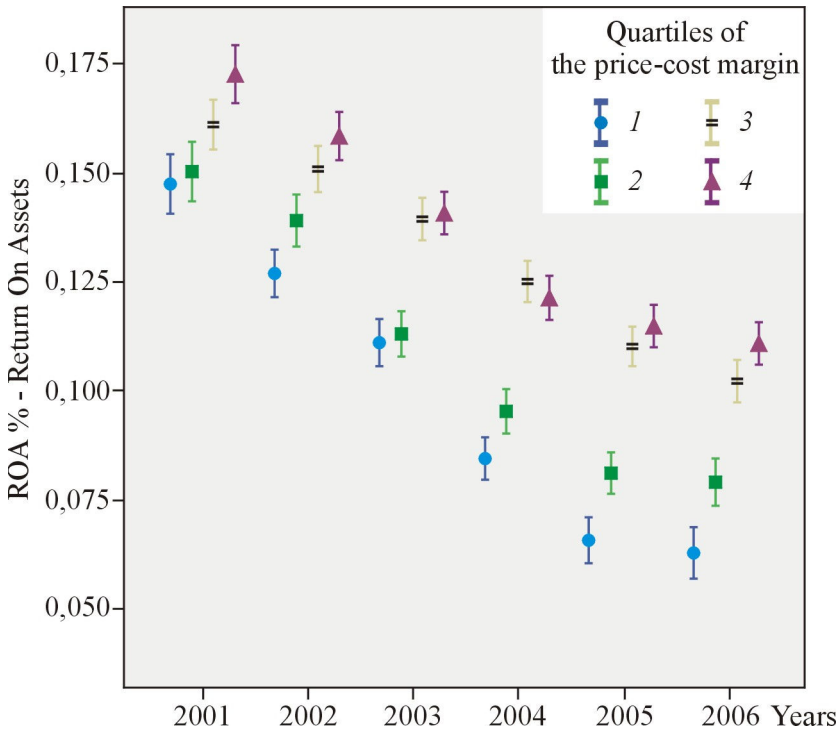
In the second half of the examined period (2004–2006), however, in classes with lower concentration and increasing competition, the average profitability (ROA, ROE, ROS) is higher, whereas in classes with higher concentration (over

[10] For lack of normality of the analysed variables, besides variance analysis and a t-test, I made the calculations with non-parametric tests, too.

70%) and decreasing competition, these values are higher. Consequently, in the whole period examined, in *highly concentrated* classes, the relation between price–cost margin and profitability indicators is *much stronger*.

There is a positive, significant relationship between labour productivity, profitability indicators and the price–cost margin of company data, too, within the examined period. Dividing the price–cost margin into quartiles, based on ROA and ROE indicators, the profitability of companies in the lower quartile is smaller than in the upper quartile (see Figure 1).

Figure 1. Profitability indicators in the quartiles of price–cost margin



Source: own creation

While the profitability indicators (ROA, ROE) decline in the quartiles of the price–cost margin, labour productivity rises. In higher price–cost margin (PCM) quartiles, the average value of labour productivity is higher. A *significant difference* can be seen between the values of individual quartiles. In the examined period, indicators increase in every quartile year by year, which, with some exceptions, indicate a significant difference even between individual years and quartiles.

Looking at the tendency of labour productivity and profitability, I can state that the profitability of companies able to enhance labour productivity in each year of the examined period also increased, whereas the profitability of companies with decreasing labour productivity decreased. A *significant difference* can be observed between return on sales and return on equity (ROS, ROE) as well.

I can point out increasing labour productivity among companies showing rising profitability (ROA, ROE, ROS); the labour productivity of companies showing decreasing profitability, however, decreases in a strictly monotone manner. Between the two categories of companies, a *significant difference* can be noticed in the trend of labour productivity.

A survey of the trends of corporate market shares clearly indicates that, sooner or later, the price of growth *has to compensated* by the decrease in profitability. While those loosing markets also have continuously decreasing profitability, such profitability started to decrease for companies gaining market share as well, but during the first half of the subject period only. While, for years 2001 to 2003, there is a significant difference between those showing decreasing and increasing trends, the difference is not *substantial*, as regards return on sales (ROS) and return on assets (ROA), for years 2004 to 2006.

Companies capable of increasing their corporate market share could also boost their labour productivity, while the indicators turned downwards for those loosing market share. While this decrease was not significant for the "losers" between 2001 and 2003, the tests showed *significant* difference for the winners. The results of the calculations also indicate that the average labour productivity indicator stands higher for companies gaining market share, than for those losing market share. At the same time, companies belonging to the group losing market share had higher labour productivity, on an average, at the beginning of the subject period, and for years 2004 to 2006, there is no significant difference between the initial years.

5. Conclusions

Companies increasing their market share were able to raise their labour productivity, whereas the indicators of 'market losers' began to fall. While this drop was not significant for the 'losers' in the years of 2001–2003, the tests showed a significant difference in the case of market gainers. I can also conclude from the results of the calculations that the average labour productivity of companies increasing their market share exceed the labour productivity of market share losers by the end of both the first and the second halves of the examined period. This rather refers to the fact that an *increase in market share leads* to the enhancement of productivity. (Market share, however, can be increased much less by enhancing productivity!)

This statement is also reinforced by the results obtained from the investigation into labour productivity and corporate market share. The market share of companies showing decreasing labour productivity in the examined period decreased, too, but companies able to enhance their productivity could not increase their market share significantly, either. The results of the separate analysis of the first and second parts of the examined period *provide further support to the above.*

The calculations in connection with profitability have similar results. The market share of companies with decreasing profitability fell significantly, while not even a slight increase in the market share of companies with growing profitability can be detected in the case of every indicator.

Looking at the above results, I can imagine that these will be somewhat surprising for company strategy makers. Nevertheless, these are only Hungarian data. I am aware of the need for international comparison, which I intend to execute in the following period.

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