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THE PERSISTENCE OF ABNORMAL RETURNS: ANALYSIS OF POLISH MANUFACTURING INDUSTRY

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ABSTRACT. The ultimate goal of a company is to build the enterprise value, which is achievable thanks to abnormal profits generated in particular period. Moreover, firms are expected to take measures to maintain abnormal profit in the future. On the other hand, abnormal profits attract competitors, who increase competition and as a result abnormal profits disappear. The persistence of profit is a term that describes a situation, when the company is successful in maintaining the abnormal profit over time. The main aim of this paper is to investigate the persistence of abnormal profit in Polish manufacturing sector. In other words, the question is whether Polish manufacturing companies are able to maintain their abnormal profits over time. The persistence of abnormal profits is investigated using dynamic panel model with generalized method-of-moments estimators. The method is applied to a panel of 5303 Polish companies from manufacturing sector observed over the period 2006-2014. This paper contributes to the existing literature in two ways. First, analysis is performed for developing country. Second, analysis is performed both at the level of entire sector and at division level. Three main conclusions can be drawn from the conducted research: there are significant differences between profit rates within the same industry at division level; estimated persistence of abnormal profit coefficients are at moderate level; there are substantial differences between estimated persistence of profit coefficients for divisions in the same industry.

JEL Classification: C23, D22, L13, L60

Keywords: panel data, firm profitability, abnormal returns, persistence of profits.

Introduction

Since the pioneering studies on persistence of profit conducted by Mueller (1977), Mueller (1986) and Geroski and Jacquemin (1988) the literature has developed considerably. One of the reasons is the availability of firm-level data. Having comparable datasets about large number of companies, we are able to test theoretical models. This paper aims at testing the expected mean-reverting property of abnormal profit. From the theoretical point of view the competitive process should erode any abnormal profit in the market. In other words, in the competitive environment companies are not expected to have abnormal returns for long

period of time and profit rates should converge to industry equilibrium level. However empirical data show that, at a given point in time profit rates differ widely not only across industries, but also across companies from the same industry. Moreover, many studies proved that abnormal profits are observed over longer period of time and this phenomenon is known in the literature as "persistence" of abnormal returns (Muller, 1986, 1990).

Although the research literature about differences in profitability of firms is enormous, the question remains still open whether these differences disappear eventually. Theory assumes that abnormal profit attracts new entrants and if there are no significant barriers to entry, this finally leads to the reduction of prices and profit margins of all firms in the industry. This process persists until the profitability level of equilibrium is reached. This is possible only if the industry is competitive as a structure. Conversely, if firms are able to retain their abnormal profits over time it means that the competition in the industry fails to control the adjustment to long-run equilibrium level. Another question is the rate at which profits are converging to the equilibrium level and this is correlated with the level of competition in the industry. This is especially important from the antitrust law perspective. If abnormal profits disappear at a high pace this means that the competition in the industry is high, while if the rate is rather low this means that the intervention is needed in the industry to achieve competitive environment.

1. Persistence of profit – literature review

The persistence of profit was investigated by various methods. A number of studies have tested profit persistence using OLS autoregressive method (e.g. Goddard and Wilson, 1999; Gschwandtner, 2005), while the others have been using panel unit-root tests (e.g. Yurtoglu. 2004; Resende, 2006; Aslan *et al.*, 2010, 2011). More recent research departed from OLS method and used state space AR(1) model (Gschwandtner, 2012), Markov chain analysis and GMM (Stephan and Tsapin, 2008), non-linear threshold model (Crespo *et al.*, 2008), asymmetric autoregressive model (McMillan and Wohar, 2011), dynamic panel model estimator (Goddard *et al.*, 2004; Wolszczak-Derlacz and Parteka, 2015; Simionescu *et al.*, 2016).

There are studies focused on the question whether the persistence of profit exists as well as studies focused on the factors that impact the profitability of firms. Moreover, some studies are aimed at the analysis of a single country, while the others are performing multinational analysis. Previous results shows that profit persistence coefficient vary by country, industry and period. Many research done for developed countries showed that the persistence coefficient was somewhere between 0.2 to even 0.6. To mention only the outcomes of the pioneer research of Mueller (1990), who founded persistence coefficient for USA at the level of 0.18; Geroski and Jacquemin (1988), who founded 0.49 for UK 0.41 for France and Germany and most recent outcomes of Goddard *et al.* (2011) found the average for 65 countries (banking industry only) at the level of 0.42; Gschwandtner and Hirsch (2013), who founded 0.06 for Belgium, 0.19 for France, 0.14 for Italy, 0.20 for Spain and 0.23 for UK; researchers from Growth Analysis organization (Growth Analysis, 2015) analyzed profit persistence in 33 OECD countries and found that the coefficient was from 0.42 to even 0.89. Based on the abovementioned examples one can state that in the most of cases the coefficient is around 0.4, which means that abnormal profit is rather persistent and companies in the researched countries are able to transfer their abnormal profits from year to year.

The literature on the profit persistence for developed countries is rather vast, while the number of research conducted for companies from developing countries is still not enough, however it is worth mentioning research conducted by Amidu and Harvey (2016), who

analyzed banking sector in Africa, Sinha and Sharma (2016), who analyzed banking sector in India, Esmeray and Esmeray (2016), who analyzed Turkish energy market, Zaren and Ozturk (2015), who analyzed public manufacturing companies in Turkey or Pervan *et al.* (2013), who analyzed profit persistence of insurers in Croatia. This paper contributes to the existing persistence of profit literature in two ways. First, the analysis is performed for Poland, which is still developing country. Second, the analysis is performed for manufacturing industry, which is further broken down by 23 divisions in order to conduct deeper analysis. Obviously, the persistence profit coefficients are expected to be different when comparing countries and industries as the mean-reverting process is taking very long time. However, if we define industry narrowly we should expect to see faster process of mean-reversion, assuming that the analyzed industry is competitive. In the existing literature industries were defined in a broad manner, for example at the level of sections using NACE nomenclature. This paper uses not only section, but also divisions.

This paper is designed to estimate the persistence of profit in manufacturing industry as a whole and in 23 manufacturing divisions. As noticed by Canarella *et al.* (2013), the most empirical literature on profit persistence includes data before 2000. Being aware that after 2000 we had suffered one of the most severe global crises in history (2008), it is important to see if such a shock for economy affected behavior of profits. Moreover, Goddard *et al.* (2011) state that most academic research on competition and its effect on profitability are static in nature and such cross-sectional data usually does not contain sufficient information on which to base policy decision to intervene in the industry to promote competitive environment. This paper uses a dynamic panel model to test if competition eliminates abnormal profits and what is the speed of convergence of abnormal profits to the long-run equilibrium value.

The remainder of the paper is structured as follows: Section 2 describes the empirical methods used for the specification of short-run profit persistence. Section 3 presents dataset used in the research as well as some basic descriptive statistics. Section 4 reports estimates of persistence of profit coefficients for 23 manufacturing divisions based on ROA as profitability measure for period 2006-2014. In the last section conclusions are drawn.

2. Methodology

This paper used dynamic panel first-order autoregressive model to investigate the behavior of Polish companies' rate of profit in the manufacturing industry. The normalized profit rate of firm i in year t is denoted y_{it}. In order to eliminate the effects of cyclical fluctuations that impact similarly on the profit rates of all firms in the same industry, the normalizing transformation expresses y_{it} as a deviation from the industry mean profit rate in year t.

In the theoretical model presented by Goddard *et al.* (2011), the yearly change in the normalized profit rate of firm i, which is denoted Δy_{it}, depends on current and past entry that impacts profitability, while entry is a function of past realizations of firm i's normalized profit rate. These assumptions yield an autoregressive model of normalized profit rate for firm i's of the following form:

$$y_{it} = \alpha_i + \sum_{k=1}^{\infty} \lambda_{jk} y_{it-k} + \mu_{it} \qquad (1)$$

where μ_{it} is idiosyncratic, α_i is the firm i's specific constant, the coefficients λ_{jk} refelct the impact of y_{it-k} on y_{it} and are assumed to be the same for all firms in the industry (section or division). As stated by Goddard *et al.* (2011), it is convenient to adopt first-order autoregressive specification for y_{it} $(k = 1)$, while higher lags are suppressed if the panel data

contains short time-dimension. The above assumptions lead to the following equation for firm i's normalized profit rate:

$$y_{it} = \alpha_i + \lambda_j y_{it-1} + \mu_{it} \qquad (2)$$

In the above equation λ_{j1} is substituted by λ_j and is called the persistence of profit coefficient and indicates the speed of convergence of profit to a mean value (equilibrium value). This coefficient is estimated by system GMM estimator (Arellano, Bover, 1995). The system GMM estimator is assumed to be consistent and effective, if there is no second-order autocorrelation of the error term, and if the instruments used are exogenous. The validity of instruments is verified using J Hansen test (Hansen, 1982), which is robust to heteroscedasticity of the disturbance term (Windmeijer, 2000)[1]. For the purpose of testing, the second-order autocorrelation in the disturbance term the Arellano-Bond test is used (Roodman, 2006).

Specification of common empirical model (univariate AR(1) process) means that the maximum speed of mean-reversion is when $\lambda_j = 0$. If this is true then firm i's profit is constant over time and equal to the equilibrium value (mean for industry): $\bar{y}_i = y_{it} = y_{it-1}$ and the long-run profit is given be the following formula:

$$\bar{y}_i = \frac{\alpha_i}{1-\lambda_j} \qquad (3)$$

If all firms from the same industry earn the same profit then $\bar{y}_i = \alpha_i$ and any firm-specific permanent rent must equal zero. If λ_j is close to zero, the firm profit is characterized by no persistence, which means that the profit from previous period has no impact on current profit. On the other hand, if λ_j is close to 1, then profit is characterized by persistence. The higher λ_j the higher influence of last year profit on the current profit rate. This methodology assumes that the profit generating process is stationary and it may be regarded as a limitation, because if $\lambda_j = 1$, which means that this is unit-root process, then $\bar{y}_i$ does not exist. One has to bear in mind that it would be very specific situation, when the entire abnormal profit from the past is being transferred to the current period all the time. Although it is theoretically possible, it still remains very little possible in the economic reality. There is even quite vast literature on this issue, where unit-root tests were employed to investigate, whether firm profitability is a non-stationary process. To mention only the latest research of Aslan *et al.* (2011) or Canarella *et al.* (2013), there is only partial or even no evidence that support unit-root process hypothesis. If one once reject *a priori* this specific situation and assume that firm profitability is a stationary process then the appropriate estimators for testing short-run persistence are required. First of all, the consistent and effective estimator was needed to estimate the dynamic panel model. The decision to use the system GMM estimator (Arellano and Bover, 1995) was undertaken after the research of the existing literature on possible GMM estimators made by Roodman in his pedagogic paper (2006), where the author finally stated that this specific estimator should be used for dynamic panel model with small number of time observations and large number of individuals (companies), which is exactly the case of research conducted in this paper. Since the publication of Arellano and Bover (1995) paper on system GMM estimator, it was applied many times and it proved to be consistent and the most effective estimator for dynamic panel models used in the literature of profit persistence.

[1] Standard errors of the coefficients are estimated using Windmeijer's correction.

3. Database

For the purpose of this research annual data on 159005 companies over the period 2006-2014 were obtained from Bureau van Dijk Amadeus database. According to official statistics (Eurostat database) there were 180639 companies registered in Manufacturing sector at the end of 2014. This means that the initial sample covers more than 88% of all companies. NACE Rev. 2 statistical classification of economic activities in the European Community was used to define companies from section C, which is manufacturing industry. This section is divided into 23 divisions ranging from C.10 to C.32. After downloading data about companies assets and operating profits (EBIT) the profitability measure (ROA) was calculated. The ROA measure was not obtained for all selected companies due to the lack of underlying data. The number of companies with calculated ROA differs from year to year. The highest number of firms with available data was 2012 (17210 companies), while in 2006 the ROA was calculated only for 9528 firms. In order to receive balanced panel some companies were deleted from the data set. Finally, complete information (all firms and all years) was available for 5571 companies. Taking such assumption for final database means that there are no entrants or exiters in the panel. Additionally, to eliminate outliers, observations for which the profit rate (ROA) was more than three standard deviations from the yearly sample mean were deleted. The final data set include 47727 observations for 5303 firms for period 2006-2014. It means that the final sample covers 3,43% of all registered companies in manufacturing sector according to Eurostat database. Thus, it is in fact the entire population of companies, which were operating in the researched period.

Table 1 offers description of dataset used in the research regarding distribution of firms in divisions of section C – Manufacturing in Poland in years 2006-2014. First column presents NACE Rev. 2 code for section/division, second column present the name of the section/division, third column shows the number of companies in each division and the last three columns present descriptive statistics for ROA: mean (column 4), standard deviation (column 5) and coefficient of variation (column 6).

At the level of entire sector there are 5303 firms and the average ROA for years 2006-2014 was 0.094, however within this sector there are substantial differences of ROA as the standard deviation was 0.147, which means that on the average there were companies, which have ROA more than twice as high as the average, but at the same time there were companies that have negative ROA values. Coefficient of variation reached almost 160%.

Table 1. Description of the sample by two-digit division NACE code

NACE rev.2 code	Sector name	No. of companies	ROA mean	ROA s.d.	ROA c.v.
10	Manufacture of food products	892	0.082	0.133	1.618
11	Manufacture of beverages	71	0.058	0.123	2.118
12	Manufacture of tobacco products	6	0.011	0.127	11.231
13	Manufacture of textiles	129	0.076	0.130	1.726
14	Manufacture of wearing apparel	140	0.077	0.157	2.040
15	Manufacture of leather and related products	44	0.107	0.118	1.104
16	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	246	0.078	0.157	2.015
17	Manufacture of paper and paper products	180	0.093	0.125	1.344
18	Printing and reproduction of recorded media	166	0.096	0.172	1.790

19	Manufacture of coke and refined petroleum products	25	0.118	0.162	1.373
20	Manufacture of chemicals and chemical products	250	0.109	0.142	1.300
21	Manufacture of basic pharmaceutical products and pharmaceutical preparations	60	0.086	0.141	1.636
22	Manufacture of rubber and plastic products	514	0.094	0.125	1.326
23	Manufacture of other non-metallic mineral products	308	0.090	0.162	1.805
24	Manufacture of basic metals	112	0.080	0.139	1.731
25	Manufacture of fabricated metal products, except machinery and equipment	844	0.104	0.151	1.451
26	Manufacture of computer, electronic and optical products	155	0.106	0.181	1.715
27	Manufacture of electrical equipment	216	0.105	0.134	1.274
28	Manufacture of machinery and equipment nec	401	0.104	0.149	1.432
29	Manufacture of motor vehicles, trailers and semi-trailers	164	0.091	0.132	1.454
30	Manufacture of other transport equipment	66	0.071	0.253	3.544
31	Manufacture of furniture	208	0.110	0.168	1.532
32	Other manufacturing	106	0.098	0.137	1.391
C	Manufacturing	5303	0.094	0.147	1.572

In the final sample there were large differences in the number of companies across divisions. The largest number of companies was present in division C.10 – Manufacturing of food products (892), while in division C.12 – Manufacturing of tobacco products there were only 6 entities.

As we can observe differences in the sample were rather high both in case of mean ROA and measures of variability. Mean ROA was the lowest in division C.12 – Manufacture of tobacco products at the level of 0.011and the highest in division C.19 – Manufacture of coke and refined petroleum products at the level of 0.118. Besides the extremely low ROA in division C.12, the ROA was at similar level in the rest of divisions. This can be an argument that deeper analysis is not required, however if we take into consideration differences in coefficient of variations we see that companies are surely not homogenous as the standard microeconomic theory assumes. Instead we can see that there were large differences in profit rates across divisions at firm level and this is the main reason why deeper analysis for profit persistence should be conducted. Based on nine years of observations we can conclude that Manufacturing sector consists of heterogeneous group of companies. Coefficient of variation showed that even if we define an economic sector in a narrower way we still see high differences in profit rates. In the analyzed sample the lowest coefficient of variation for ROA was observed in division C.15 – Manufacture of leather and related products at the level of 1.104 and the highest in division C.12 – Manufacture of tobacco products at the level of 11.231. Even for the division C.15 characterized by the lowest coefficient of variation we still observe that ROA differed significantly (more than 110% on the average).

Table 2 presents data on the sample mean (column 2), coefficient of variation (column 3) and correlations (columns 4-12) of firms‘ ROA over the nine years. For example: 0.335 is the correlations between the ROA of years 2008 and 2012 across 5303 firms. As expected, we can observe that the correlation coefficient was getting smaller for subsequent years. It is worth noticing that the correlations were positive and quite high for one-year distance. In

most of the cases it was more than 0.5, which means profitability rate in year $t+1$ was highly and positively correlated with profitability rate in year t. This kind of observation may indicate that profits may be persistent.

Table 2. Means, standard deviations, coefficients of variation and correlations for ROA

Year	ROA mean	ROA c.v.	2006	2007	2008	2009	2010	2011	2012	2013	2014
			Correlations								
2006	0.122	1.195	1.000								
2007	0.131	1.113	0.592	1.000							
2008	0.106	1.339	0.475	0.608	1.000						
2009	0.091	1.579	0.333	0.361	0.473	1.000					
2010	0.078	1.684	0.335	0.351	0.398	0.563	1.000				
2011	0.085	1.502	0.322	0.347	0.384	0.458	0.588	1.000			
2012	0.073	1.707	0.264	0.287	0.335	0.385	0.487	0.599	1.000		
2013	0.077	2.218	0.163	0.219	0.227	0.279	0.372	0.393	0.483	1.000	
2014	0.080	2.164	0.171	0.210	0.229	0.237	0.321	0.361	0.406	0.353	1.000

Observing ROA mean, one can conclude that there was a slight decrease over time. The highest rates were observed at the beginning of the research period in 2006 and 2007. After the financial crisis in 2008 the profit rates dropped below 10% and since 2010 profit rates were stable at around 8% level. At the same time we can observe an increase in variability of ROA over time. At the beginning of the researched period it was around 1.2, and after the crisis it increased to around 1.6. Especially high coefficient of variation was observed in the last two years, when it increased to values around 2.2. It means that profitability of Polish companies from manufacturing industry was decreasing and the differences in profitability across firms were increasing. This observation is in the opposition to what the theory predicts, because the differences should be decreasing over time and companies' profit should converge to industry mean value.

4. Results

Table 3 reports estimates of the short-run persistence of profit coefficients $\hat{\lambda}_j$ in (2) based on ROA, by manufacturing divisions. Before we proceed to the interpretation of the results, we first have to verify important statistical hypotheses to ensure that results are reliable. Standard errors of the coefficients were estimated using Windmeijer's correction (Windmeijer, 2000), robust to heteroscedasticity of the disturbance term. Using J Hansen test, validity of the over-identifying restrictions were verified. Using Arellano-Bond test, second-order autocorrelation of the disturbance term was verified.

Results of J Hansen test (column 9) suggest that null hypothesis can be rejected only in two cases (divisions C.10 and C. 23). It means that the number of instruments used for estimation was inappropriate. After limiting the number of instruments, valid estimations were received (estimations are presented in italics). Second-order autocorrelation test (column 8) suggests that null hypothesis can be rejected only in division C.26. Moreover, values for F test (column 7) proof that the estimated models are not significant for only four divisions (C.19, C.21, C.29 and C.30). Thus, estimations reported in *Table 3* are, in general, appropriately specified and are significant.

For entire manufacturing industry the estimated persistence of profit coefficient equals 0.221 and this is statistically significant at 1-percent level. This outcome is somehow smaller

than the results received for developed countries in the previously mentioned studies. However, one has to state that profitability of companies in polish manufacturing sector is quite persistent. The main contribution of this paper is to conduct deeper analysis. At the level of divisions the results are mixed. The estimated persistence of profit coefficient was negative only for one division (C.30 – Manufacture of other transport equipment). This means that in divisions were characterized by persistent profit rates.

Only in case of four divisions (C.19, C.21, C.29 and C.30) estimated persistence of profit coefficient were not significantly different from zero. This leads to the conclusions that there are no bases to state that companies were transferring abnormal profit from one year to another.

Overall, we received 18 significant persistence of profit coefficients (out of 23 divisions). The highest coefficient was received for division C.12 – Manufacture of tobacco products. The estimated persistence of profit coefficient equals 0.554 and it means that more than 50% of the last year abnormal profit was transferred to the next period. This is not surprising as this division consist only of 6 companies. It makes this division rather an oligopoly market structure. As standard theory predicts, the competition is weaker when the number of companies in the industry is smaller. Companies can easily transfer their abnormal profits over time due to potential entry barriers and lack of competition.

Table 3. Estimation of short-run persistence coefficient by manufacturing divisions

NACE rev.2 code	$\widehat{\lambda_J}$ (ROA)	Constant term	no. of firms	No. of obs	no. of instruments	F-statistics	AR(2) test	J Hansen test
10	0.272*	-0.033**	892	7136	8	43.15*	1.83	19.32*
10	*0.179**	*-0.047**	*892*	*7136*	*3*	*21.56**	*1.58*	*2.18*
11	0.456*	-0.091	71	568	8	8.74*	0.13	6.25
12	0.554*	-0.122	6	48	8	20.27*	-0.98	4.13
13	0.329*	-0.101**	129	1032	8	12.48*	1.33	7.79
14	0.299*	-0.060	140	1120	8	17.26*	0.58	3.52
15	0.329**	0.096	44	352	8	4.81**	1.07	5.61
16	0.217*	-0.071**	246	1968	8	14.00*	-0.96	3.99
17	0.306*	0.019	180	1440	8	19.63*	-0.17	9.18
18	0.157*	-0.027	166	1328	8	17.44*	0.92	2.04
19	0.149	0.168	25	200	8	0.71	0.43	4.84
20	0.255*	0.087*	250	2000	8	25.19*	0.28	2.06
21	0.331	-0.023	60	480	8	3.25	0.21	7.58
22	0.267*	0.002	514	4112	8	30.27*	-0.13	8.65
23	0.291*	-0.048	308	2464	8	16.19*	-0.22	12.91**
23	*0.339**	*-0.051*	*308*	*2464*	*4*	*17.04**	*-0.08*	*4.5*
24	0.264**	-0.104*	112	896	8	6.70**	0.91	5.17
25	0.288*	0.037**	844	6752	8	103.27*	0.67	4.34
26	0.281*	0.084	155	1240	8	25.53*	-2.18**	7.91
27	0.182*	0.060	216	1728	8	10.95*	0.34	3.34
28	0.224*	0.049	401	3208	8	27.09*	-0.61	4.19
29	0.098	0.007	164	1312	8	1.16	1.06	5.32
30	-0.295	-0.142	66	528	8	1.47	-0.19	10.79
31	0.433*	0.041	208	1664	8	28.54*	1.74	10.77
32	0.322*	0.024	106	848	8	30.64*	-1.03	3.33
C	0.221*	0	5303	42424	8	177.88*	0.26	7.35

Notes: * 1 - percent level significance. ** 5 - percent significance level.

The lowest, but still statistically significant persistence coefficient was received for C.18 – Printing and reproduction of recorded media. Although this division is not the largest one (in respect of the number of entities) in the analyzed sample, the level of competition was quite high and abnormal profits are eroding rather fast. The reason might be the fact that there were no high entry barriers and firm behave in a competitive way.

Table 4 reports the frequency distribution of the estimated persistence of profit coefficients. As abovementioned, we received estimated coefficients for 23 manufacturing divisions, but 18 were appropriately specified and can be interpreted in a conclusive manner. Mean profit persistence coefficient based on 18 manufacturing divisions' equals 0.300 and this is significantly higher that the estimation received for entire industry (0.221). This means that deeper analysis showed that the profit of the companies in the manufacturing industry is more persistent comparing to the observation that can be done at the more aggregated level.

Table 4. Frequency of estimated short-run persistence coefficients

	Number of divisions	
	All	Only significant
$\widehat{\lambda_j} < 0$	1	0
$0 \leq \widehat{\lambda_j} < 0.2$	5	3
$0.2 \leq \widehat{\lambda_j} < 0.4$	14	12
$0.4 \leq \widehat{\lambda_j} < 0.6$	3	3
$0.6 \leq \widehat{\lambda_j}$	0	0
TOTAL	23	18
Mean $\widehat{\lambda_j}$	0.259	0.300

In most of the cases the estimated persistence of profit coefficient lies within the interval 0.2–0.4. This is comparable to the results received by other authors for developed countries, however estimations for Poland are a little bit lower. Based on the results, one can state that Polish manufacturing companies were able to transfer around 22% of their abnormal profit over time. This result is not very high comparing to developed countries, where persistence coefficient was around 0.4 and even more. This means that Polish manufacturing sector was rather competitive one and abnormal profits due to existing competition disappearing quickly. The potential explanation is that, Polish manufacturing sector is quite young (comparing to this sector in other European Union countries) and firms haven't got enough time and opportunity to make their position very strong in the market. Thus, one should conclude that this is rather monopolistic competition than oligopoly structure as companies are not able to strongly influence the market, for example by building entry barriers for other companies, which protect abnormal profits, which is the case of oligopolies. On the other hand, one should notice that, while at the aggregated level there is no concern about the lack of competition, there are divisions, where persistence coefficient is quite high. It is obvious that not every division within manufacturing sector looks the same, but 3 divisions out of 23 had persistence coefficient higher than 0.4, which already makes them comparable with coefficient for developed countries. This leads to the conclusion that the attention should be focused on more disaggregated level and situations, when regulator should observe the competitive intensity in order to intervene if necessary. This is especially important when the processes of mergers and acquisitions are taken into consideration. These processes, especially horizontal mergers, are always generating higher degree of concentration in the market and as a result this can lead to higher profit persistence coefficient observed in the future. Continuous observation of persistence profit coefficient is necessary as

mergers or acquisitions may lead to oligopoly and further to lower social benefits from existing markets. The potential reason behind the fact, that persistence coefficient is higher in case of developed countries is that the industries in these countries are subject of mergers and acquisitions for a longer period of time and causing individuals firms have more market power.

Conclusions

Since the change of economic system in 1989 in Poland, we could observe a formation of many market structures. The change of economic system had enormous impact on the level of competition in many markets. Manufacturing sector is one of the most important for the entire economy. Every rich nation has highly developed manufacturing sector and in many cases this sector was a key to prosperity. This sector is responsible for creating the means of production. This is the sector where many technological improvements take place, which are important for economic growth. Also services sector profoundly depends on manufactured goods. Over the couple of past decades, especially in Poland the competition in manufacturing industry has been affected by many regulatory and structural changes. As a result, companies display large differences in profitability and at the same time some firms earn profits below and some above the long-run equilibrium level. Thus the question arises, whether Polish manufacturing industry is a competitive environment or firms are able to transfer abnormal profits over time due to the lack of sufficient competition. Another issue is whether observations made at the level of entire industry are different from the observations made at lower level of aggregation. Generally, persistent abnormal profit can come from two different sources, which are market power and greater efficiency of the company. Firms can retain their abnormal profits, only if sufficient barriers separate firms from competitive forces. This is especially important for policy makers and regulatory decisions, whether to intervene in this sector or leave the situation to the market mechanism.

This paper, using a dataset for 5303 companies from manufacturing industry for the period 2006-2014, analyses profitability behavior measured by ROA. System GMM estimator was used to specify first-order autoregressive model to estimate the short-run persistence of firm profits. This kind of dynamic model of profitability is able to provide some indications of the effectiveness of competition in forcing the abnormal profits to converge to long-run equilibrium level. This is particularly important from regulatory and antitrust policy point of view. Such results can help the regulator to distinguish between cases when intervention is inevitable in order to achieve competitive environment and cases when market forces influence profits enough to achieve competitive outcome quickly without any interventions.

Results from specification of univariate first-order autoregressive model can be regarded as conclusive. At the aggregated level of entire manufacturing industry there are large deviations from the sample ROA mean. Observations made at the level of divisions showed that these deviations can be even larger. As expected, the correlation between ROA is getting weaker if the time distance is longer. The highest correlations were received for one year period at the level greater than 0.5.

During the researched period ROA mean slightly decreased, especially after the crisis in 2008. There was an opposite change in case of the variability of ROA. Coefficient of variation for ROA increased from 1.2 to 2.1, which is an interesting result as the theory predicts that abnormal profits should be disappearing over time and ROA should converge to industry mean value.

For entire manufacturing industry the estimated persistence of profit coefficient equals 0.221 and in comparison to other studies for industries in developed countries this value is smaller. However, the adjustment of profits to competitive equilibrium levels is not

instantaneous. At disaggregated level (division level) the results are mixed. Only for 5 divisions estimations are not conclusive, while for 18 divisions evidence for persistent profits can be found. Mean profit persistence coefficient based on 18 manufacturing divisions' equals 0.300 and this is significantly higher than the estimation received for entire industry. This means that profits of manufacturing companies in Poland are more persistent than an industry level research shows. In most of the cases the estimated persistence of profit coefficient lies within the interval 0.2–0.4, which is slightly lower that estimations obtained for developed countries. It seems that manufacturing industry in developed countries is more concentrated. One can expect that along with the economic growth in Poland the concentration in manufacturing industry may increase and this situation can let the companies preserve their abnormal returns and this is especially interesting from an antitrust law and regulatory perspective. Regulators should be still observing the situation in manufacturing industry and a dynamic model of profitability can provide an indication of the competition effectiveness in forcing convergence of profits to equilibrium value. This kind of study can assist regulators in distinguishing between situations when competitive outcome can be achieved without intervention and situations when intervention is required to achieve a competitive outcome.

The most obvious limitation of this research is that the results are only conclusive for the selected companies, which were present in the market for the entire research period. Inclusion of other companies, which were founded or companies which went bankrupt during this time might be beneficial, however this would led to unbalanced panel for which many of the econometric tools are not available. The other limitation is that the research focused solely on manufacturing industry, leaving other industries out of the research scope. However, this sector is exceptionally important for the entire economy due to the fact that it is the place where innovation activities take place to the greatest extent and the use of new technologies is also highly widespread. These two facts are also making such research on profit persistence additionally interesting, because industries where new technologies are involved are characterized by higher barriers to entry (due to patent law) which can lead to higher persistence profit coefficient.

Based on the above conclusion, it is very interesting to conduct further research on profit persistence in other developing countries, with particular emphasis on Central and Eastern Europe countries, which transformed from centrally planned economies to market economies, creating the possibility to market enter and exit. Moreover, it would be interesting to conduct research on profit persistence in case of Polish companies comparing to developed countries from European Union for the same period of time and on the data from the same source. These two things combined would make results more comparable and conclusive.

Besides the fact that obtained profit persistence coefficients are quite low for manufacturing industry in Poland it is highly recommended to continue this path of research, because standard concentration ratios for markets might be not enough to find situations where competitive environment is threatened. High concentration ratio is just a prerequisite for profit persistence, while there might be situation where firms are able to protect their abnormal profits although concentration ratio stays at low level. Thus, it is important to observe industries and intervene in particular cases, when firms are protecting their abnormal profits. The regulator should not intervene only when the industry is creating innovations, as abnormal profit is the only incentive for a company to engage in innovative activities, while in other cases companies generating abnormal profits are creating inefficient oligopolies that are leading to erosion of consumer surplus and social benefit from the existence of market.

References

Amidu, M., Harvey, S. K. (2016), The persistence of profits of banks in Africa, *Review of Quantitative Finance and Accounting* 47 (1), pp. 83-108.

Arellano, M., and Bond, S. (1991), Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations, *Review of Economic Studies*, 58, pp. 277-297.

Arellano, M., Bover, O. (1995), Another look at the instrumental variable estimation of error-components models, *Journal of Econometrics* 68, pp. 29-51.

Canarella, G., Miller, M. S., Nourayi, M. M. (2013), Firm Profitability: Mean-Reverting or Random-Walk Behavior? *Journal of Economics and Business*, March-April 2013, pp. 76-97.

Esmeray, A., Esmeray, M. (2016), Re-examining profit persistence in the Turkish energy market: evidence from panel autoregressive-distributed lag, *International Journal of Business Quantitative Economics and Applied Management Research* 2 (8), pp. 54-59.

Geroski, P. A., Jacquemin, A. (1988), The persistence of profits: a European comparison, *Economic Journal* 98, pp. 375-389.

Goddard, J. A., and Wilson, J. O. S. (1999), The Persistence of Profit: A New Empirical Interpretation, *International Journal of Industrial Organization* 17, pp. 663-687.

Goddard, J., Molyneux, P., Wilson, J. O. S. (2001), *European Banking: Efficiency, Technology and Growth*, John Wiley, Chichester.

Goddard, J., Molyneux, P., Wilson, J. O. S. (2004), The profitability of European banks: a cross-sectional and dynamic panel analysis, *Manchester School* 72, pp. 363-381.

Goddard, J. A., Molyneux, P., and Wilson, J. O. S. (2011), The Persistence of Bank Profit, *Journal of Banking and Finance* 35, pp. 2881-2890.

Growth Analysis (2015), Profit dynamics and product market regulations in the OECD, *Swedish Agency for Growth Policy Analysis*, PM 2015, p. 26.

Gschwandtner, A. (2005), Profit Persistence in the 'Very' Long Run: Evidence from Survivors and Exiters, *Applied Economics* 37, pp. 793-806.

Gschwandtner, A. (2012), Evolution of Profit Persistence in the US: Evidence from Three Periods, *The Manchester School* 80, pp. 172-209.

Hansen, L. (1982), Large sample properties of generalized method of moments estimators, *Econometrica* 50, pp. 1029-1054.

McMillan, D. G., and Wohar, M. E. (2011), Profit Persistence Revisited: The Case of the UK, *The Manchester School* 79, pp. 510-527.

Mueller, D. C. (1977), The persistence of profits above the norm, *Economica* 44, pp. 369-380.

Mueller, D. C. (1986), *Profits in The Long Run. Cambridge University Press*, Cambridge.

Mueller, D. C. (Ed.), (1990), *The Dynamics of Company Profits*, Cambridge, England: Cambridge University Press.

Pervan, M., Arneric, J., Curak, M. (2013), The persistence of insurers profitability, *Croatian operational research review* 4 (1), pp. 132-141.

Resende, M. (2006), Profit Persistence in Brazil: A Panel Data Study, *Estudos Economicos* 36.

Simionescu, M., Dobeš, K., Brezina, I., Gaal, A. (2016), GDP rate in the European Union: simulations based on panel data models, *Journal of International Studies*, Vol. 9, No 3, pp. 191-202, DOI: 10.14254/2071-8330.2016/9-3/15.

Sinha, P., Sharma, S. (2016), Determinants of bank profits and its persistence in Indian Banks: a study in a dynamic panel data framework, *International Journal f System Assurance Engineering and Management* 7 (1), pp. 35-46.

Stephan, A., Tsapin, A. (2008), Persistence and determinants of firm profit in emerging markets, *Applied Economics Quarterly* 54, pp. 231-253.

Wolszczak-Derlacz, J., Parteka, A. (2015), Does offshoring affect industry employment? Evidence from a wide European panel of countries, *Journal of International Studies*, Vol. 8, No 1, 2015, pp. 41-52, DOI: 10.14254/2071-8330.2015/8-1/4.

Zaren, F., Ozturk, E. (2015), Testing for profit persistence of listed manufacturing companies in Istanbul stock exchange, *Ekonomika* 61, April-June, No. 2, pp. 1-10.