Global Advanced Research Journal of Agricultural Science (ISSN: 2315-5094) Vol. 8(4) pp. 151-158, April, 2019 Issue.
Available online http://garj.org/garjas/home

Full Length Research Paper

Profit persistence examination in the Hungarian agriculture

Tibor Bareith

Assistant lecturer at Department of Finance and Economics, Kaposvár University, Kaposvár, Hungary and PhD Student at Pallas Athene Domus Education is Foundation, Budapest, Hungary H-7400, Kaposvár, Guba Sándor str. 40.
Email: mbareith.tibor@ke.hu

Accepted 26 February, 2019

In this study I examine the profit persistence of the entire Hungarian agriculture with dynamic panel GMM estimation. The estimated profit persistence is low (close to zero) but is significant. There are many small farmers in Hungary; this market structure is closest to the perfect competition where the abnormal profit is zero. Based on the model, companies with a fast growth rate can gain abnormal profits. Persistence is mostly reduced by the share of subsidies received, i.e. non-refundable subsidies compensate for market competition and direct economies towards equilibrium profit. Taking short and long-term risk has a negative impact on profit persistence.

Keywords: abnormal profit, profit persistence, firm performance, agriculture

INTRODUCTION

One of the indicators of market competition is profit persistence. According to theoretical economics, competition reduces abnormal profit, and in case of perfect competition it is not possible to gain extra profit. In the short term, abnormal profits can be expected, but in the long run, due to the competition, prices are adjusted to market price. This process can be seen in Figure 1. Profit persistence measures the speed of correction, how fast the profit reaches the equilibrium level. In reality, however, its practical implementation is rarely seen. The only exceptions are the financial markets where the conditions of the perfect competition are the best, but temporary imperfections are also found here, yet correction is fast.

In Hungary agriculture contributes about 4% to the GDP (Hungarian Central Statistical Office – hereinafter KSH, 2017). This is the double of the value of the European Union average and roughly the same as the world average. 79% of Hungary's total area is production area, a significant part of which is good quality land. In addition to the regional characteristics, climatic conditions also make the country suitable for agricultural activities (Szűcs, 2017). The European Union and the current government policy pay particular attention to agriculture. The amount of subsidies is outstanding in agriculture compared to other industries. The subsidies received under the Common Agricultural Policy (CAP)have had a strong influence on the profitability of agricultural holdings and on the production structure, as well (Rajczi and Wickert, 2018).

The specialty of the study is that analysis of profit persistence has not yet been carried out for the Hungarian agriculture, and to the best of my knowledge, not even for the Central Eastern European region. In my study I relied on the FADN database, so the results are also suitable for international comparison. In such an industry where the

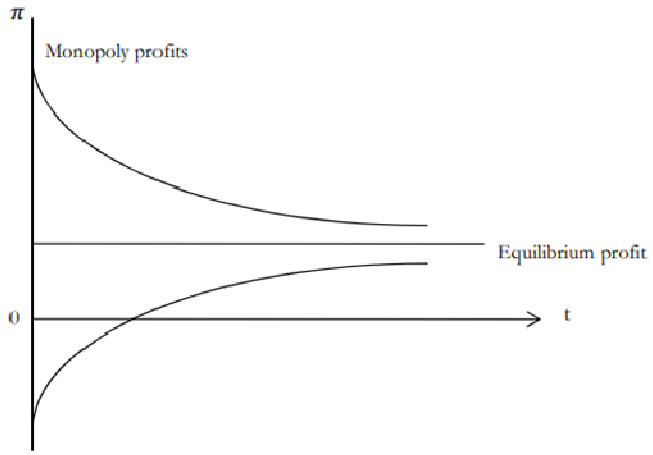

Figure 1: Profit convergence
Source: Schwalbach et al. (1989)

amount of subsidies is outstanding, it is an important question how competition is evolving. Do grants increase or decrease competition? Is the profit of farms more influenced by industry or company-specific factors?

Nowadays, profit persistence is tested with AR or dynamic panel models. Mueller's article (1977) was the first to examine abnormal profit. Mueller did not work with an AR model but with a so-called PCM model. The first use of profit persistence with the AR model is also related to Mueller (1986).

Schumacher and Boland wrote one of the first studies (2005) to investigate the profit persistence of the food industry. The data range was between 1980 and 2001, in terms of the methodology of the study, the authors used the sequential-weighted least square method. Their main result is that profit is influenced more by industry variables than corporate influences.

Hirsch and Gschwandtner (2013) examined the profit persistence of the food industry in five European countries based on data from 1996 to 2008. Short-term abnormal returns are present in all five countries. The highest one can be found in the UK, while the lowest short-run persistence is in Belgium. However, these values are lower than in other industries (Hirsch and Gschwandtner, 2013). Based on the results of these five European countries, there is a competition on the basis of the profit persistence of the European food industry, but past abnormal yields have an impact on current yields (Hirsch and Gschwandtner, 2013). High profit persistence can be observed in case of young and large companies.

Gschwandtner (2012) investigated the profit persistent of US companies between 1950 and 1999, and he divided it into three periods. Profit persistence decreased in the period under review, which the author explained with international competition and lower market entry barriers (Gschwandtner, 2012). The effect of increasing competition can also be seen on the abnormal profits.

McMillan and Wohar (2011) investigated profit persistence in the United Kingdom. In their research, data from 57 companies were analyzed between 1980 and 2007. A high entry barrier was observed in the markets of companies with high profit persistence, in case of low profit persistence, the entrybarrier is low (McMillan and Wohar, 2011).

Hirsch and Hartmann (2014) examined the companies of the European dairy industry. A total of 590 companies have been studied in five Western European countries. The period covered is from 1996 to 2008. There is no exceptionally high profit persistence in the dairy sector, compared to the manufacturing industry; it is lower in the whole food industry (Hirsch and Hartmann, 2014). The low profit persistence is due to the high rate of state interventions and the high rate of co-operatives compared to other industries.

A summary of researches related to agriculture (especially food industry) available in the literature can be found in Table 1.

MATERIAL AND METHODS

During the research we used data from the Farm Accountancy Data Network (FADN) of the Agricultural Research Institute (ARI). The FADN system operates in European Union countries, and it collects data about more than 80,000 agricultural holdings, while the entire EU-wide database represents a population around 6,4 million. (Keszthelyi, 2017). The database is representative of the region, size and activity.

Table 1: Summary of researches related to agriculture

Authors	Countries	Time span	Industry	No. of firms	Method	Mean $\hat{\lambda}$
Alarcon and Sanchez (2013)	Spain	2000–2008	Food industry	341	GMM	0,160
Hirsch and Gschwandtner (2013)	Belgium, France, Italy, Spain,UK	1996-2008	Food manufacturing	841	GMM	0,204
Hirsch and Hartmann (2014)	EU-5	1996-2008	Food manufacturing	351	GMM	0,173
Gschwandtner and Hirsch (2015)	USA	1990-2012	Food manufacturing	125	GMM and OLS	0.361

Source: Hirsch (2018)

Individual and social farms with at least 4,000 SOs may be included in the database. The Hungarian Farm Accountancy Data Network covers 2% of the population, and the observed plants provide more than 5,000 data annually. The data provided include labour, balance sheet, profit and loss statement, and land area data. The unbalanced panel database contains a total of 3,350 farm data for the period of 2006 to 2016. The average observation time of a plant is 7.24 years.

According to the 2015 data, 63% of the Hungarian agriculture is medium in size (EUR 25,000-500,000 SO), this size category is the most characteristic in the sector. In addition, the most popular form of activity is plant production.

For testing profit persistence, the generally accepted profitability index is the Return On Assets: ROA. When examining abnormal returns, the difference in the ROA value of the given year is examined from the average profitability level. Due to normalization, we can filter the impact of macroeconomic cycles, and interpret profit as deviation from market price (Gschwandtner, 2012).

$\pi_{i,t} = ROA_{i,t} - \overline{ROA_t}$ (1)

$\pi_{i,t} = \frac{ROA_{i,t} - \overline{ROA_t}}{\overline{ROA_t}}$ (2)

$\pi_{t,i}$ denotes abnormal return. There is no difference in content between the abnormal profit measuring methods (1) and (2), and the correlation between them is 1. Among others, Gschwandtner (2005) and McMillan et. al. (2011) used method (2), Hirsch at. al. (2014) and Resende (2016) conducted their research according to method (1). In our study, we measure abnormal profit according to method (2). The normal profit ($\overline{ROA_t}$) was calculated persectors separately for each year.

The methodology used to measure profit persistence in the literature is the auto regression process 1, AR(1). The profits of companies are explained by the profit of the previous period.

$\pi_{i,t} = \alpha_i + \lambda_i \pi_{i,t-1} + \varepsilon_{i,t}$ (3)

The $\varepsilon_{i,t}$ error term is white noise with zero expected value and a constant variance.

The parameter $\hat{\lambda}_i$ specifies the short-run persistence, the stickiness of the profit (Hirsch and Gschwandtner, 2013). The AR(1) process is stationary if $|\hat{\lambda}_i| < 1$.The closer parameter $\hat{\lambda}_i$ is to one, the higher the profit persistence is. In case of high profit persistence, the company's profit is approaching slowly the normal profit in the market, so the market is characterized by weak competition. In case of low lambda, the market is approaching the perfect competition.

Long-run profit persistence is defined by the expected value of the AR(1) process.

$\hat{p}_i = \frac{\hat{\alpha}_i}{1-\hat{\lambda}_i}$ (4)

If $\hat{p}_i$ does not differ significantly from zero, the companies examined are in perfect competition. The $\hat{p}_i$ is also known as long-term profit rate. If every company achieves normal profit, $\hat{p}_i$ is equal at all companies (Gschwandtner, 2005).

Due to the limitations of OLS estimations, the dynamic panel model is the most suitable for examining profit persistence with Arellano-Bond GMM estimator (Hirsch et al. 2013, 2014). The estimation is the most applicable if the study period is short but there are several companies under investigation (small T, large N).

$\pi_{i,t} = \sum_j \alpha_j (X_{j,i,t)} + \lambda \pi_{i,t-1} + \varepsilon_{i,t}$ (5)

Where $\varepsilon_{i,t} = \eta_i + \nu_{i,t}$. The Arellano-Bond GMM estimator takes the first difference in the equation, which results in the release of time-independent company-specific (η_i) effects (Hirsch and Gschwandtner, 2013, Kozlenko, 2015). The model has included company and industry-specific variables (X_j) that can explain the profit persistence of

Table 2: Data structure of the database (2015)

	small size (pcs)	medium size (pcs)	large size (pcs)	Total
Poultry	28	112	20	160
Fruit	50	96	1	147
Cattle and sheep	47	86	1	134
Cereals oilseeds protein	192	685	68	945
Pigs	17	28	15	60
Wine	41	22	0	63
Milk	26	78	35	139
Mixed farming	88	48	29	165
Horticulture	16	28	0	44
Other field corps	31	62	13	106
Összesen	536	1245	182	1963

Source: ARI FADN database

companies. The delayed dependent is a variable endogenous; all the others are exogenous variables in the model (Hirsch and Gschwandtner, 2013).

The upper and lower one percent of the distribution of variables was treated by winsorization due to the outliers. The database almost certainly contains human error, uploading data to the database is done through several steps, and there may also be problems during searches. For this reason, the one percent data management is justified.

RESULTS AND DISCUSSIONS

The chapter of results is divided into two parts, on the one hand we present the variables included in the model, on the other hand the empirical results.

Company Size (**lnTA**)

The difference between the profit persistence and the company size (the logarithm of all devices) is unclear; it can be both positive and negative. In case of large size, the principle of economies of scale can work but there are several studies that were written on the inefficiencies of large companies. Enterprise size plays a significant role in food industry (Hirsch and Gschwandtner, 2013; Hirsch and Hartmann, 2014).

Company Size Growth (**GrTA**)

From a theoretical point of view – similarly to the company's assets – the growth of the company size (the growth rate of all the assets) should have a positive impact on profit persistence. According to Dorey and Boland (2009) if the motive of the food company growth is not the expansion of its core business (but rather diversification), it may have a negative impact on profit.

Diversification of activities (**pdiff; percrop**)

The pdiff measures the diversification of the activity. The higher the value of the indicator is, the less business the economy does. In its calculation, the output rate per actuation was taken from the total output, and then they were raised to square and added. According to Dorey and Boland (2009), a positive coefficient should be obtained in regression. The percrop shows the output of crop production from total output. Crop production accounts for 60% of the total output of Hungarian agriculture (KSH, 2017).

Risk measurement (**1/curr; gear; SDROA**)

The 1/curr is the reciprocal of the quotient of current assets and short-term liabilities, a means of short-term risk measurement. The long-term proxy for risk is the gear and SDROA indicators. The gear ratio is the long-term liabilities and the loan received from the owners divided by the equity. The SDROA shows the deviation of the given company's profit. It is expected that high risk will result in high profit (e.g. CAPM model). Browman (1980) found a nedative correlation between risk and profit, as evidenced by the practice of profit smoothing.

Subsidy Dependence (**persubs**)

The persubs variable defines the proportion of grants compared to the grant plus the net sales revenue. On the one hand, the relative size of grants is expected to affect positively the profit persistence, help with smoothing the annual profit. On the other hand, subsidies complement the revenue and eliminate the difference among farmers.

Form of entrepreneurship (**legal**)

The form of the enterprise is a dummy variable whether the plant operates in an individual or a corporate form. Almost eighty percent of the farmers on the Hungarian agricultural sector prefer the individual form because of the small farm size and the more favourable taxation conditions. In Hungarian agriculture individual farms predominate.

Table 3: Descriptive Statistics for Variables

	Mean	Median	Std. Dev.
aROA	-0,057	-0,140	6,364
lnTA	10,962	10,906	1,352
GrTA	1,006	1,004	0,017
pdiv	0,747	0,848	0,281
percrop	0,502	0,513	0,413
_curr	0,426	0,166	0,862
gear	0,182	0,000	0,568
SD	2,942	0,801	6,667
persubs	0,235	0,210	0,163
EME	4,743	1,659	10,138
legal	0,198	0,000	0,398
MS10	0,322	0,295	0,222

Source: own editing (ARI FADN database)

Live Work (**EME**)

The live work variable specifies the number of full-time employees at work. My assumption is that live work is more costly than using machines but there are activities that cannot be performed by machines, or in case of small farm size they are not cost-effective.

Market Saturation (**C10**)

Market Saturation specifies the ratio of the top ten companies with the highest revenue in a given business activity compared to the total sales revenue of the activity. The more saturated the market is, the more difficult it is to gain abnormal profit.

The descriptive statistics for variables can be found in Table 3. Its ROA indicator is defined as zero, so on average, none of the economies can realize abnormal profit. The deviation of the abnormal profit rate, however, is very high. Half of the farms' revenue comes from plant production (percrop), with diversification index (pdiv) 0.747, that is, on the basis of the sample, farmers deal with few activities.

The value of the variable measuring long-term risk (gear) is low, the median value is zero, that is, more than half of the farms have no long-term foreign source. The reciprocal of the liquidity ratio (1/curr) is high, the average amount of short-term liabilities exceeds its current assets, but the median value refers to excessive security. On average, farms have fewer than five full-time employees. The top ten farms cover up to 30% of the market per sectors on average, but the deviation is also significant here.

Table 4 shows the estimated results of the dynamic panel. The model has a total of 19 instruments, no secondary autocorrelation, and based on the Sargan and Hansen test, the model is robust and the number of instruments is adequate.

Abnormal profit persistence is significant at one percent, but the value of the coefficient is very close to zero. Based on the model, the abnormal profit disappears in a year's time, with no stickiness. According to the literature, profit persistence is lower in agriculture than in the processing industry, but persistence around zero is surprising but not impossible. Hirsch és Gschwandtner (2013) measured abnormal profit persistence between 0.1 and 0.3 in their research in five European countries.

The size of the company (lnTA) has no effect on abnormal yield. Hirsch és Gschwandtner (2013) as well as Hirsch és Hartmann (2014) found a negative or neutral relationship between size and abnormal profit. Goddard et al. (2005) found a negative relationship between profitability and large enterprise size. In case of Hungarian agriculture – as it can be seen from the database – we cannot talk about exceptionally large economies. Presumably, this is the reason why there is no negative relationship, but the neutral connection itself partially contradicts the hypothesis of economics of scale. Contrary to the effect of the size, the company's growth rate (GrTA) increases abnormal yields significantly. In the international literature the growth rate has a neutral or negative relationship with the profit. According to Dorey and Boland (2009) growth will reduce profit when it is combined with diversification, but if the company's main profile is expanded, growth has a positive effect. This is supported by Rajczi and Wickert (2018), who believe that the support system affects the activity and profitability of the companies.

The diversification of the activity (pdiff) has a significant relationship with abnormal return, but this relationship is negative. The higher the value of the pdiff indicator means the lesser degree of diversification, so if a farm performs few activities (specializes), it can expect a higher abnormal return. Of course, at the same time, it can also face a higher risk. Diversification also includes the percentage of crop production (percrop) variable. According to the KSH

Table 4: Results in Dynamic Panel Estimator

Variables	Coef.	Prob.
$aROA_{i,t-1}$	0,029	0,001***
$lnTA_{i,t}$	0,031	0,498
$GrTA_{i,t}$	1,610	0,006***
$pdiff_{i,t}$	0,444	0,076*
$percrop_{i,t}$	-0,612	0,045**
$1/curr_{i,t}$	-0,651	0,003**
$gear_{i,t}$	-0,643	0,031**
$SD_{i,t}$	0,026	0,602
persubsi,t	-4,859	0,000***
$EME_{i,t}$	0,007	0,005***
$legal_{i,t}$	-0,739	0,000***
$MS10_{i,t}$	-1,358	0,000***
Tests		
AR(2)	z=-0,27	0,786
Sargan	Chi2(7)=5,72	0,573
Hansen	Chi2(7)=12,66	0,081

Source: own editing
***, **, *Significant at the 1, 5, 10 per cent level, respectively.

Table 5: ROA values per sectors

	Mean	Median	SD	RSD
Poultry	0,055	0,049	0,346	6,32292
Fruit	0,027	0,039	1,262	46,43894
Cattle and sheep	0,093	0,083	0,134	1,438635
Cereals oilseeds protein	0,134	0,115	0,154	1,148578
Pigs	0,088	0,073	0,194	2,202169
Wine	0,053	0,039	0,131	2,480707
Milk	0,118	0,108	0,127	1,071665
Mixed farming	0,097	0,088	0,134	1,384377
Horticulture	0,130	0,103	0,477	3,667078
Other field corps	0,160	0,134	0,436	2,733271
Total	0,110	0,099	0,411	3,751135

Source: own editing (ARI FADN database)

data, 60%, according to the database, 50% is the ratio of crop production of total output, which is the ratio of a report. However, there is a negative relationship between the abnormal return and crop production. The primary reason for this is exactly the competition; the support system directs farmers towards plant production. In the multiplayer market, the farmer's price maker role is lost and the prices have to be adjusted. In such a competitive environment it is much more difficult to achieve abnormal profit.

It is also important to point out that plant production is one of the most profitable activities. Table 5 shows ROA values per sectors. In case of crop production, the second largest is the profitability and the second lowest is the relative standard deviation. The goal is not necessarily the abnormal return.

I studied the relationship between risk and abnormal return with three different variables. Short-term risk is measured by the 1/curr variable; long-term risk is measured by the gear variable, and the ROA deviation (SDROA) is the third variable. The latter variable does not show a significant relationship, but the short- and long-term risk proxies clearly indicate a negative relationship. Farms financed from foreign sources are less able to gain

abnormal profits. The debt service is likely to erode the extra profit. In the international literature, negative or neutral relationships were found the most frequently (e.g. Gschwandtner (2005), Andersen et al. (2007)).

In agriculture subsidies have always played an important role, and this is not different nowadays. Subsidies compared to outputs (persubs) reduce abnormal returns. Among the control variables the greatest effect can be found here. The support system promotes competition and reduces abnormal profits significantly. It is important to note that "normal profit" is an average profit per sectors of the given year, which may differ from a general agricultural average profit significantly. This can be linked to plant production (percrop) variable, subsidies direct farmers towards plant production, which also reduces abnormal returns. The two effects reinforce each other.

The impact of live work (EME) is significant, but its impact is negligible and can be considered as zero. The Hungarian agricultural sector is characterized by micro and small size farms, where family and family members work in most cases. These working hours are also included in the database, but their reliability is questionable. If there were employees instead of family members, and they would get the minimum wage, a significant negative relationship would probably be experienced.

The form of enterprises (legal) has a significant negative relationship. If the enterprise is a business company, abnormal profit-making opportunities are reduced. The current Hungarian tax system strongly supports small companies and primary producers, so farmers do not want to get out of this preferential tax treatment. It is the easiest way to increase their results.

The relationship between market saturation (MS10) and abnormal return is negative, the more saturated the market is (per sectors), the more difficult it is to gain abnormal return. In case of perfect market competition, many small farms are assumed, so low market saturation is desirable. In case of high market saturation, the market resembles an oligopoly, where competition is already violated and abnormal profit is possible. However, based on the data, the abnormal profit decreases in the market structure similar to the oligopoly. On the other hand, entering such a market structure is very costly, making it difficult to gain extra profit. In the hope of abnormal profit, it is preferable to choose an activity where large economies are less dominant in the market.

CONCLUSION

In the study we examined the profit persistence of Hungarian agricultural holdings with the dynamic panel model from 2006 to 2016. Based on the study, abnormal profit persistence is significant, but very low, almost zero. Hirsch and Gschwandtner (2013) found the lowest profit persistence in Belgium at 0.11. The Hungarian profit level is close to the equilibrium profit per sector. Based on the market structure of the Hungarian agricultural economy, low profit persistence is not really surprising. Agriculture is a traditional industry that can be done in small sizes as well. Hirsch and Hartmann (2014) point out that the profit persistence is lower in the food industry than in the manufacturing industry, where companies are much larger due to the economies of scale, so companies have more power on the market.

The only instrument to grow the abnormal return is growth rate; fast-growing companies regardless of their size can skim off the market to the highest possible degree. Persistence is mostly reduced by the share of subsidies received, i.e. non-repayable subsidies compensate for market competition, and they direct the economy towards profit of equilibrium. This is followed by market saturation, which also negatively affects profit persistence. The legal form of the company also influences abnormal profit persistence significantly, while companies operating as individual companies are in a better position due to the more favourable taxation conditions. Taking short- and long-term risks has a negative impact on profit persistence.

ACKNOWLEDGMENTS

Article publishing charge was covered by the EFOP-3.6.1-16-2016-00007 (Intelligent Specialization Program at Kaposvár University) project.

BIBLIOGRAPHY

Andersen TJ, Jerker D, Richard AB (2017). "Strategic responsiveness and Bowman's risk–return paradox." *Strategic Management Journal* 28.4 (2007): 407-429.

Bowman EH (2017). "A risk/return paradox for strategic management." (1980).

Diána S (2017). "Magyarország mezőgazdaságának történelmi áttekintése." *Tanulmánykötet-Vállalkozásfejlesztés a XXI. században VII.* (2017): 580-601.

Dorsey S, Michael B (2009). "The impact of integration strategies on food business firm value." Journal of Agricultural and Applied Economics 41.3 (2009): 585-598.

Goddard J, Manouche T, John OSW (2005). "Determinants of profitability in European manufacturing and services: evidence from a dynamic panel model." Applied Financial Economics 15.18 (2005): 1269-1282.

Gschwandtner A (2005). "Profit persistence in the 'very'long run: evidence from survivors and exiters." Applied Economics 37.7 (2005): 793-806.

Gschwandtner A (2012). "Evolution of profit persistence in the USA: Evidence from three periods." *The Manchester School* 80.2 (2012): 172-209.

Hirsch S (2018). "Successful in the Long Run: A Meta□Regression Analysis of Persistent Firm Profits." Journal of Economic Surveys 32.1 (2018): 23-49.

Hirsch S, Adelina G (2013). "Profit persistence in the food industry: evidence from five European countries." *European Review of Agricultural Economics* 40.5 (2013): 741-759.

Hirsch S, Monika H (2014). "Persistence of firm□level profitability in the European dairy processing industry." *Agricultural economics* 45.S1 (2014): 53-63.

Keszthelyi S (2017). A tesztüzemi rendszer eredményei 2015", Agrárgazdasági Kutató Intézet (2017)
Kozlenko I (2015). "Analysis of profit persistence in the Spanish Food Industry." (2015).
KSH A (2016). mezőgazdaság szerepe a nemzetgazdaságban, 2016. https://www.ksh.hu/docs/hun/xftp/idoszaki/mezo/mezoszerepe16.pdf (2017).
McMillan DG, Mark EW (2011). "Profit persistence revisited: the case of the UK." *The Manchester School* 79.3 (2011): 510-527.
Mueller DC (1977). "The persistence of profits above the norm." *Economica* 44.176 (1977): 369-380.
Mueller DC (1986). *Profits in the long run*. Cambridge University Press, 1986.
Rajczi A, Irén W (2018). "A magyar agrárgazdaság jövedelmezősége az Európai Unió tükrében." *Acta Scientiarum Socialium* 18.44 (2018).
Resende M (2006). "Profit persistence in Brazil: a panel data study." *Estudos Econômicos (São Paulo)* 36.1 (2006): 115-126.
Schumacher SK, Michael AB (2005). "The persistence of profitability among firms in the food economy." *American Journal of Agricultural Economics* 87.1 (2005): 103-115.
Schwalbach J, Ulrike G, Talat M (1089). "The dynamics of corporate profits." *European Economic Review*33.8 (1989): 1625-1639.