Agnieszka MATUSZEWSKA-PIERZYNKA*

iD https://orcid.org/0000-0003-1119-6347

THE DIFFERENTIATION OF ECONOMIC EFFICIENCY WITHIN EMPLOYEE-OWNED COMPANIES

Abstract

Background: The empirical research on the differentiation of economic efficiency within employee-owned companies as measured in terms of sales revenue while minimizing the degree of ownership concentration thematically applies toward evaluating the effectiveness of the direct privatisation method implemented by giving a state-owned enterprise for use against payment.

Research purpose: The main goal of this article is to empirically verify the research hypothesis, stating that the degree of ownership concentration significantly differentiates the economic efficiency of employee-owned companies in terms of sales revenue.

Methods: The empirical verification of this hypothesis was carried out using the method of Data Envelopment Analysis (*DEA*), which measures the relative technical efficiency of a given decision-making unit (*DMU*). Empirical studies were conducted on a group of 13 employee-owned companies from the Mazowieckie Province, which concluded agreements with the State Treasury between the years 2000–2005 and covered a 10-year research period. The analysis of sales revenue and the degree of ownership concentration was made on the basis of hand-collected data from documents submitted by surveyed employee-owned companies in the National Court Register in the years between 2002–2017.

Conclusions: Presented results of the empirical research do not allow for full confirmation of the research hypothesis because employee-owned companies, in which *DEA* efficiency measures were lower than the average measure for all surveyed companies were characterized by the different average annual degree of ownership concentration.

Keywords: ownership transformations, direct privatisation, giving a state-owned enterprise for use against payment, sales revenue, ownership concentration.

JEL classification: D22, G33, M21, L33

---

*   Ph.D., University of Lodz, Faculty of Economics and Sociology, Department of International Business and Trade; e-mail: agnieszka.matuszewska@uni.lodz.pl

1. Introduction

The process of ownership transformations of state-owned enterprises in Poland, beginning 30 years ago, currently prompts the summarization of the various effects of its implementation, and in particular re-assessing the efficiency of the units created through differing methods of privatisation. The largest and most atypical group of entities resulting from the privatisation process includes joint stock or limited liability companies formed by employees of state-owned enterprises that were directly privatised to acquire their business assets for use against payment, commonly referred to as employee-owned companies[1]. The important determinants for the functioning and development of employee-owned companies are the capital-ownership conditions of their established as well as the rules for determining, securing and interest-bearing of the liability to the State Treasury for use of a state-owned enterprise against payment. As the result of fulfilling requirements of giving state-owned enterprises for use against payment, employee-owned companies generally dealt with the problem of:

–   weak interest of outside investors in joining a company with the capital participation of employees[2],
–   dispersion of capital ownership among employees, concentrated on maintaining the level of employment and real wages[3],
–   low share capital with limited possibilities of its increase, resulting from the scant financial resources of the shareholders[4],

---

[1]   **H. Sobolewski**, *Determinants and procedures of ownership transformations of state-owned enterprises. Two decades of privatisation*, Publisher of Poznan University of Economics and Business, Poznan 2011, pp. 93–95.

[2]   Compare: **W. Karpińska-Mizielińska**, **T. Smuga**, *Changes of ownership relations and their impact on the improvement of long-term economic efficiency*, Institute for Development and Strategic Studies, Warsaw 1997, pp. 117–118; **P. Kozarzewski**, *Ownership supervision, control and management*, in: **M. Jarosz** (ed.), *Privatisation traps*, Institute of Political Studies of the Polish Academy of Sciences, Warsaw 2003, pp. 165–166.

[3]   Compare: **M. Jarosz**, **M. Kozak**, *Economic and social condition of employee-owned companies in the years 1991–1994. Conclusions*, in: **M. Jarosz** (ed.), *Lights and shadows of employee-owned companies in the years 1991–1994*, Institute of Political Studies of the Polish Academy of Sciences, Warsaw 1995, p. 122; **S. Krajewski**, *Privatisation, restructuring, competitiveness of Polish enterprises*, PWE, Warsaw 2009, pp. 106–108.

[4]   See: **W. Goszka**, *The structure of ownership and power in employees' partnerships*, Economics and Organization of Enterprise 2001/5, pp. 55–56.

– excessive debt to the State Treasury, whose service generates high financial costs[5],
– timely settlement of obligations arising from their business activity[6],
– lack of business assets ownership of the state-owned enterprise during the validity of the agreement concluded with the State Treasury and the possibility of their restructuring[7],
– limited ability to obtain financial resources via bank credit for the realisation of investments in depreciated, tangible fixed assets[8],
– decrease in real sales revenue, which is not accompanied by effective actions aimed at reducing the costs of achieving them[9].

From the perspective of these problems in employee-owned companies, the main goal of this article is to assess the differentiation of economic efficiency within employee-owned companies, as measured in terms of sales revenue while minimizing the degree of ownership concentration. The paper empirically verified the research hypothesis that the degree of ownership concentration significantly differentiates the economic efficiency of employee-owned companies, as measured in terms of sales revenue. The empirical verification of this hypothesis was carried out by analysing a group of 13 private companies using state-owned enterprises against payment from the Mazowieckie Province, which concluded the agreement with the State Treasury in the years between 2000–2005 and covered a 10-year research period. Empirical studies on the differentiation of economic efficiency within employee-owned companies in terms of sales revenue while minimizing the degree of ownership concentration were conducted using the Data Envelopment Analysis (*DEA*). The assessment of sales revenue and the degree of ownership concentration within employee-owned companies

---

[5] Compare: **E. Bojar**, **M. Sosińska-Wit**, **Z. Żminda**, *Employee leasing and restructuring of enterprises,* Lublin University of Technology, Lublin 2003, p. 111; **P. Kozarzewski**, *Direct privatisation: the legal status*, in: **M. Jarosz** (ed.), *Direct privatisation. Investors. Managers. Employees*, Institute of Political Studies of the Polish Academy of Sciences, Warsaw 1998, p. 25.

[6] Compare: **A. Bukowska-Piestrzyńska**, *Leasing of property of the State Treasury in workers' companies*, Economics and Organization of Enterprise 2002/5, p. 44; **M. Jarosz**, **M. Kozak**, *Economic…*, p. 118.

[7] See: **J. Pawłowski**, *The privatization lease vs. participation in a public company*, in: **R. Borowiecki** (ed.), *Development challenges and restructuring of enterprises*, Cracow University of Economics, TNOiK, European Council of Management-CECIOS, Warsaw–Cracow 1999, p. 430.

[8] Compare: **E. Bojar**, **M. Sosińska-Wit**, **Z. Żminda**, *Employee…*, p. 95; **E.M. Wrońska**, *Financial strategies of employee-owned companies*, Publisher of Maria Curie-Skłodowska University, Lublin 2004, p. 146.

[9] Compare: **M. Jarosz**, **M. Kozak**, *Economic…*, p. 120; **E.M. Wrońska**, *Financial…*, pp. 149–150.

qualified for the research sample in the adopted 10-year analysis period was made on the basis of hand-collected data from documents submitted by these entities in the National Court Register in the years between 2002–2017. In order to present an overall picture for the differentiation of economic efficiency within employee-owned companies in the course of carried out analysis, the descriptive statistics for sales revenue, the degree of ownership concentration and *DEA* efficiency measures were prepared, along with the changeability of these variables described in detail for some of investigated units.

2. The essence of employee-owned companies

Giving a state-owned enterprise for use against payment to a joint stock or limited liability company could take place if the following conditions were met[10]:
– more than a half of employees of the privatised state-owned enterprise joined the company,
– shareholders were the only natural persons but the Minister of the State Treasury could legally permit the corporate person to participate in the company,
– paid-up share capital of the company should not be lower than 20% of the initial capital and the enterprise capital at the date of preparing the balance sheet for the financial year, preceding the year of issuing the direct privatisation order,
– at least 20% of shares were acquired by persons not employed in the privatised state-owned enterprise – The Minister of the State Treasury could agree to give the state-owned enterprise for use against payment to a company that did not fulfil this requirement.

Giving a state-owned enterprise for use against payment was effected by the agreement between the State Treasury and the company with the capital contribution of its employees for a period not exceeding 10 years[11]. In the concluded contract, the parties could decide that[12]:

---

[10] The Act of 30 August 1996 on commercialisation and privatisation (Journal of Laws 2002/171, item 1379), article 52 items 1, 2.

[11] From January 15, 2003 the agreement between the State Treasury and an employee-owned company established to use the state-owned enterprises against payment could be concluded for a period not exceeding 15 years. Compare: The Act of 30 August 1996…, article 52 item 1; The Act of 5 December 2002 amending the act on principles of exercising rights due to the State Treasury, the act on commercialisation and privatisation of state-owned enterprises and some other acts (Journal of Laws 2002/240, item 2055) with subsequent amendments, article 2 point 15, article 25.

[12] The Act of 30 August 1996…, article 52 item 2.

– the ownership of the state-owned enterprise is transferred to the company after the period for which the agreement was concluded and upon fulfilment of the conditions specified in it,
– the company has a right to acquire the state-owned enterprise after the duration of the agreement, while the purchase price is determined after the end of the period for which it was concluded,
– shares in the increased share capital of the company may be acquired by legal persons after 2 years of the validity of the agreement.

Each concluded agreement particularly defined the value of a state-owned enterprise given for use against payment, which constituted the basis for determining the amount of liability of the employee-owned company to the State Treasury[13].

In the agreement providing for the transfer of the ownership of a state-owned enterprise to the employee-owned company after the end of the period for which it was concluded, the commitment for the use of its business assets could not be lower than the total sum of[14]:

– the value of the enterprise paid in capital instalments – the capital instalment was the quotient of the value of the enterprise and the number of yearly quarters, for which the contract was concluded,
– the sum of additional fees for the duration of the agreement – the additional fee was the product of the value of the enterprise reduced by paid capital instalments and an interest rate of 0.5 of the current Lombard rate[15].

In the agreement providing for the transfer of ownership of a state-owned enterprise to the employee-owned company after the end of the period for which it was concluded, the parties could also decide that this ownership can be transferred before the expiry of the period for which the agreement was concluded,

---

[13] The Ordinance of the Council of Ministers of 16 October 1997 on specific rules for determining the amount due for the use of the enterprise, the method of securing the unpaid part of the debt and the interest rate of the unpaid payment (Journal of Laws 1997/130, item 855), §2.

[14] *Ibidem*, §3 items 1, 2, 5.

[15] From December 22, 2004 the interest rate of the unpaid part of the value of the state-owned enterprise given for use against payment could not be lower than the reference rate of the European Commission and from July 1, 2008 it could not be lower than the base rate, which should be increased by a relevant margin to provide the reference rate. Compare: The Communication from the Commission of 19 January 2008 on the revision of the method for setting the reference and discount rates (Official Journal of European Union 2008, C 14/02), pp. 3–4; The Ordinance of the Council of Ministers of 14 December 2004 on terms of payment for amounts due on the use of the enterprise (Journal of Laws 2004/269, item 2667), §2 point 3, §7 item 1; The Ordinance of the Council of Ministers of 16 October 1997…, §3 item 1 point 2.

but not earlier than after the repayment by the company of at least one–third of liabilities under the contract as well as the approval of the financial statement from the second financial year following the date the agreement was concluded[16]. After transferring the ownership of a state-owned enterprise to the employee-owned company before the end of the period for which the agreement was concluded, the unpaid part of the company's commitment to the State Treasury, bearing interest below the price index of investment goods[17], could be paid in instalments[18].

3. Methodology of the research

The empirical research on the differentiation of economic efficiency within employee-owned companies was conducted with the use of non-parametric Data Envelopment Analysis (*DEA*)[19], that when derived from the concept of the microeconomic productivity function[20], measures the relative technical efficiency of a given decision-making unit (*DMU*), understood as the relation of productivity of a given decision-making unit to the productivity of efficient decision-making unit. The *DEA* method also provides an opportunity to evaluate this efficiency in financial terms, in terms of profits, costs, *etc*.[21]

The estimation of a synthetic efficiency measure with the *DEA* method can be made in the framework of three different models, based on differing assumptions:

---

[16] The Act of 30 August 1996…, article 52 item 2 point 1, items 3, 4.

[17] From July 28, 2006, in the case of the transfer of the ownership of a state-owned enterprise to the employee-owned company before the expiry of the period for which the agreement was concluded, the unpaid part of the liability to the State Treasury should bear interest not lower than the price index of investment goods. Compare: The Act of 12 May 2006 amending the act on commercialisation and privatisation of state-owned enterprises and some other acts (Journal of Laws 2006/107, item 721), article 1 point 12, article 11; The Ordinance of the Council of Ministers of 16 October 1997…, §8 item 1.

[18] The Act of 30 August 1996…, article 52 item 3.

[19] See: **A. Kucharski**, *DEA method in the evaluation of economic efficiency*, Publisher of the University of Lodz, Lodz 2014.

[20] See: **G. Debreu**, *The Coefficient of Recourse Utilization*, Econometrica, July 1951/19/3, pp. 273–292; **M.J. Farell**, *The Measurement of Productive Efficiency*, Journal of the Royal Statistical Society 1957, Series A/120/3, pp. 253–290.

[21] See: **A. Sajnóg**, *Comparative Analysis of Economic Efficiency of Polish and German Listed Companies*, Oeconomia Copernicana 2015/6/2, pp. 72–75; **M.C.A. Silva Portela**, *Value and quantity data in economic and technical efficiency measurement*, Economics Letters 2014/124//1, pp. 108–112.

-     a model with constant returns to scale (*CRS*)[22],
-     a model with variable returns to scale (*VRS*)[23],
-     a model with non-increasing returns to scale (*NIRS*)[24].

Furthermore, each of the *DEA* models allows estimation of a synthetic measure of efficiency oriented to inputs (minimizing inputs with unchanged outputs) or to outputs (maximizing outputs with unchanged inputs) as well as without any orientation. The unquestionable advantage of the *DEA* method is that when calculating a synthetic measure of efficiency, many heterogeneous inputs and outputs can be taken into consideration without the need to determine their weights and functional relationship, which makes it widely used in assessing the efficiency of various decision-making units[25]. The synthetic measure of efficiency in the *DEA* method takes values between 0 and 1, where a value equal to 1 indicates the full efficiency of a given decision-making unit.

    The analysis of the differentiation of economic efficiency within employee-owned companies using the *DEA* method was conducted based on the input-oriented model with constant returns to scale (*CCR*), where the degree of ownership concentration, expressed according to the Herfindahl-Hirschman in-

---

[22] In the *DEA* Frontier software, the model with constant return to scale is known as *CRS* model. The same model in the economic literature is marked from the names of its authors (A. Charnes, W.W. Cooper and A. Rhodes) as *CCR*. See: **A. Charnes**, **W. Cooper**, **B. Golany**, **L.M. Seiford**, **J. Stutz**, *Fundations of DEA for Pareto-Koopmans Efficient Empirical Production Function*, Journal of Economics 1985/30/1–2, pp. 91–107.

[23] In the *DEA* Frontier software, the model with variable return to scale is known as *VRS* model. The same model in the economic literature is marked from the names of its authors (R.D. Banker, A. Charnes and W.W. Cooper) as *BCC*. See: **R.D. Banker**, **A. Charnes**, **W.W. Cooper**, *Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis*, Management Science 1984/30/9, pp. 1078–1092.

[24] See: **R. Fäare**, **S. Grosskopf**, **C.A.K. Lovell**, *The Measurement of Efficiency of Production*, Kluwer Academic Publishers, Boston 1985.

[25] See: **E. Chodakowska**, *Efficiency evaluation of education sector organizations using data envelopment analysis*, Management Issues 2009/7, Quantitative methods in management 4 (26), pp. 91–112; **A. Feruś**, *The application of the DEA method to define the level of company credit risk*, Bank & Credit 2006/7, pp. 44–59; **M. Helta**, *Application of DEA method to compile the efficiency ranking of agricultural property agency's companies in 2006*, Annals of Agricultural Sciences 2009, Series G/96/3, pp. 107–111; **J. Nazarko**, **J. Chrabołowska**, *Application benchmarking techniques to efficiency assessing of Polish distribution utilities*, Research Papers of Wrocław University of Economics "Taxonomy 12" 2005/1076, pp. 38–47; **M. Nowak**, **A. Borowiec**, *The application of DEA method in the study of efficiency of scientific and technological parks*, Scientific Journals of Poznan University of Technology series of Organization and Management 2013/61, pp. 109–119; **A. Sajnóg**, **T. Sosnowski**, *Efficiency of private equity funds' divestment process on the Warsaw Stock Exchange*, Studies and Works College of Management and Finance 2015/143, pp. 55–76.

dex (HHI), was assumed for the input, with the sales revenue for the output[26]. The Herfindahl-Hirschman index (HHI) is calculated as the sum of squares of the share of each substantial shareholder, i.e. a shareholder owning at least 5-percent of share capital[27] and takes values between 0 and 1, with higher values indicating a greater degree of ownership concentration. The value of sales revenue was deflated by Consumer Price Index, where the year of 2002 was treated as the base year. In the detailed analysis of the changeability of variables adopted in these empirical studies as an input and an output of the business activity of employee-owned companies, their descriptive statistics were prepared.

The empirical research on the differentiation of economic efficiency within employee-owned companies was conducted among entities that had concluded agreements of giving the state-owned enterprise to private companies for use against payment in the years between 2000–2005. This period of concluding agreements with the State Treasury was defined for the following reasons:
– previously conducted empirical studies, dealing with the issue of functioning and development of employee-owned companies rarely covered the period after the year 2000[28],
– the phenomenon of the creation of employee-owned companies was significantly restrained after the year 2005[29] due to negative changes in conditions[30] for the direct privatisation by giving a state-owned enterprise to a private company for use against payment[31].

---

[26]   The terms "inputs" and "outputs" have a certain conventional character. As far as connection of the term "output" with returns is justified in this study, the term „inputs", which usually refers to costs, is used only to perform the role of customary terminology used in the terminology of *DEA* method.

[27]   See: **A. Fazlzadeh**, **A.T. Hendi**, **K. Mahboubi**, *The examination of the effect of ownership structure on firm performance in listed firms of Tehran Stock Exchange based on the type of the industry*, International Journal of Business and Management 2011/6/3, p. 254; **T. Sosnowski**, *Time to the full exit from the investment of private equity funds on the Warsaw Stock Exchange*, Annales Universitatis Mariae Curie-Skłodowska 2015, Sectio H/49/4, p. 531.

[28]   Compare: **E. Bojar**, **M. Sosińska-Wit**, **Z. Żminda**, *Employee…*; **P. Kozarzewski**, **R. Woodward**, *Secondary privatization in Poland (Part I): Evolution of ownership structure and company performance in firms privatized by employee buyouts*, "Case Reports", No. 47, Center for Social and Economic Research, Warsaw 2001; **A. Matuszewska-Pierzynka**, *The debt of companies using assets of state-owned enterprises for a consideration towards the State Treasury*, Publisher of the University of Lodz, Lodz 2015; **E.M. Wrońska**, *Financial… .*

[29]   See: *Privatisation of state–owned companies in 2011*, CSO, Warsaw 2012, pp. 39–40.

[30]   See: **A. Matuszewska-Pierzynka**, *The debt…*, Publisher of the University of Lodz, Lodz 2015, p. 50.

[31]   The Ordinance of the Council of Ministers of 14 December 2004 on terms of payment for amounts due on the use of the enterprise entered into the force on 22 December 2014, repeal-

The analysis of economic efficiency differentiation in employee-owned companies was carried out among entities in the Mazowieckie Province, where in the years between 2000–2005 the majority of such companies were established[32]. According to the hand-collected data from the Ministry of the State Treasury, 26 agreements of giving a state-owned enterprise to a private company for use against payment based on The Act of 30 August 1996 on commercialisation and privatisation were concluded in Mazowieckie Province between the years 2000–2005.

TABLE 1: *Employee-owned companies qualified for the research sample*

	Employee-owned company	The year of concluding the contract with the ST	The year of total repayment of liability to the ST
1	PRD Ltd. in Przysucha	2000	2010
2	PRD Ltd. in Zwoleń	2000	2009
3	PRI-D Ltd. in Grójec	2000	2010
4	WCMB Ltd. in Wyszków	2000	2010
5	PKS Ltd. in Grójec	2001	2011
6	ZTE RADOM Ltd.	2001	2011
7	BSiPB MSW Ltd. in Warsaw	2001	2012
8	PKS Ltd. in Grodzisk Maz.	2001	2011
9	Ostrada Ltd. in Ostrołęka	2001	2011
10	Elmet Ltd. in Warsaw	2001	2009
11	ZTiSZE Ltd. in Warsaw	2001	2011
12	Geokart Ltd. in Warsaw	2002	2008
13	Bipromel Ltd. in Warsaw	2005	2014

S o u r c e: own study based on hand-collected data from archival documents of the Ministry of the State Treasury.

Of the 26 employee-owned companies initially qualified for the research sample, the 3 entities that entered liquidation/bankruptcy as well as the 3 entities that transformed their organizational and legal form during the period from the

---

ing the previously applicable The Ordinance of the Council of Ministers of 16 October 1997 on specific rules for determining the amount due for the use of the enterprise, the method of securing the unpaid part of the debt, and the interest rate of the unpaid payment.

[32] Compare: *Privatisation of state-owned companies in 1999*, CSO, Warsaw 2000, p. 54; *Privatisation of state-owned companies in 2005*, CSO, Warsaw 2006, p. 36.

date of the conclusion of the agreement with the State Treasury to the end of the year 2017 were excluded.

Moreover, due to the need to include into studies the financial statements of employee-owned companies for at least seven years before and three years after the year of total repayment of liability to the State Treasury ($t = 0$), the 5 entities that did not submit their current list of shareholders for each year of the adopted 10-year research period to the National Court Register and the 2 entities for which the period before or after the year $t = 0$ proved to be too short[33] were also excluded from the research sample.

Therefore, 13 employee-owned companies from the Mazowieckie Voivode-ship, which concluded the agreement of giving a state-owned enterprise for use against payment in the years between 2000–2005, were eventually qualified for the research sample (see: Table 1). The assessment of the differentiation in economic efficiency within employee-owned companies, when considering the year in which they repaid the whole liability for using a state-owned enterprise, was carried out in the years between 2002–2011, with the company that repaid the liability the earliest, in 2008, being *Geokart in Warsaw*, and in the years between 2008–2017, with the company that repaid it at the latest, in 2014, being *Bipromel in Warsaw*.

4. *DEA efficiency measures in employee-owned companies* – the results of empirical studies

The degree of ownership concentration in employee-owned companies quali-fied for the research sample during 10 years, which was treated as input in the used *DEA* method, was presented in Table 2.

The arithmetic mean for the degree of ownership concentration in thirteen employee-owned companies increased gradually in the period from $t = -4$ to $t = 2$ and decreased in the years $t = -5$ and $t = 3$. The mean degree of ownership concentration ranged from 0.2010 in the year $t = -5$ to 0.3270 in the year $t = 2$. The standard deviation for the degree of ownership concentration in the adopted 10-year analysis period fluctuated, reaching the highest degree in the year $t = 2$. In the period from $t = -2$ in at least three out of four examined employee-owned companies, the degree of ownership concentration exceeded 0.50.

---

[33]   The employee-owned company repaid the whole liability for using the state-owned enterprise before the passing 7 years from the year of conclusion of the contract with the State Treasury or 3 years, for which the financial statements of the analysed enterprise would be available in the National Court Register, did not elapse since the year of total repayment of the liability.

TABLE 2: *Degree of ownership concentration in employee-owned companies qualified for the research sample in 10-year period of the analysis [–]*

	Employee-owned company	Period t										Arithmetic mean
		−6	−5	−4	−3	−2	−1	0	1	2	3	
1	PRD Sp. z o. o. w Przysusze	0.5629	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.5230
2	PRD Ltd. w Zwoleniu	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
3	*PRI-D Ltd.* w Grójcu	0.0588	0.0588	0.0588	0.0561	0.9948	0.9948	1.0000	1.0000	1.0000	0.6248	0.5847
4	WCMB Ltd.	0.5826	0.5826	0.5890	0.5955	0.5955	0.5955	0.5955	0.5955	0.8421	0.8421	0.6416
5	*PKS Ltd.* w Grójcu	0.0862	0.0879	0.0917	0.0917	0.0928	0.0959	0.1000	0.1132	0.1185	0.1222	0.1000
6	ZTE RADOM Ltd.	0.1591	0.1591	0.1865	0.1898	0.1898	0.1936	0.1936	0.1996	0.2975	0.2975	0.2066
7	BSiPB MSW Ltd. w Warszawie	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688	0.5688
8	PKS Ltd. w Grodzisku Maz.	0.0494	0.0494	0.0580	0.0626	0.0815	0.0993	0.1016	0.1022	0.1022	0.1121	0.0818
9	Ostrada Ltd. w Ostrołęce	0.1960	0.2061	0.2188	0.2749	0.2775	0.3149	0.3149	0.3149	0.3149	0.3149	0.2748
10	Elmet Ltd. w Warszawie	0.1265	0.1316	0.1779	0.1796	0.1796	0.1796	0.1796	0.1796	0.1796	0.1796	0.1693
11	ZTiSZE Ltd. w Warszawie	0.0779	0.0779	0.0546	0.0853	0.1307	0.1380	0.1356	0.1356	0.1356	0.1356	0.1107
12	Geokart Ltd. w Warszawie	0.1046	0.1052	0.0923	0.0900	0.0900	0.0931	0.0931	0.0931	0.0931	0.1054	0.0960
13	Bipromel Ltd. w Warszawie	0.0608	0.0677	0.0677	0.0677	0.0726	0.0726	0.0726	0.0715	0.0800	0.0800	0.0713
Summary statistics	Number of entities	13	13	13	13	13	13	13	13	13	13	13
	Arithmetic mean	0.2026	0.2010	0.2064	0.2139	0.2917	0.2973	0.2980	0.2994	0.3270	0.3001	0.2637
	Standard deviation	0.2160	0.2095	0.2104	0.2105	0.2918	0.2899	0.2907	0.2899	0.3148	0.2589	0.2583
	Minimum	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
	Maximum	0.5826	0.5826	0.5890	0.5955	0.9948	0.9948	1.0000	1.0000	1.0000	0.8421	0.8181
	First quartile	0.0608	0.0677	0.0588	0.0677	0.0900	0.0959	0.1000	0.1022	0.1022	0.1121	0.0857
	Median	0.1046	0.1052	0.0923	0.0917	0.1796	0.1796	0.1796	0.1796	0.1796	0.1796	0.1471
	Third quartile	0.1960	0.2061	0.2188	0.2749	0.5186	0.5186	0.5186	0.5186	0.5186	0.5186	0.4007

S o u r c e: calculations based on hand-collected data from lists of shareholders submitted by investigated companies to the National Court Register.

The highest degree of ownership concentration, equal to 1.00, took place in the period from $t = 0$ to $t = 2$ in *PRI-D in Grójec*, for which the average annual degree of ownership concentration exceeded the average degree for the surveyed group of employee-owned companies. The increase of ownership concentration degree in this company in $t = -2$ resulted from the accession of *ELMO plc* to it, which in the year $t = 0$ became the sole shareholder. What is more, in the year $t = 1$ *ELMO plc* sold its shares in the share capital to *MIKST Ltd.*, which then in the year $t = 3$ sold these shares to two new partners.

The highest average annual degree of ownership concentration, amounting to 0.6416, was observed in *WCMB in Wyszków*, where the share of an individual outside investor in the share capital exceeded 80%. In the year $t = -3$, this outside investor sold its shares in the share capital to *CYNKOMET Ltd.*, which in turn withdrew from the company in the year $t = 2$.

The lowest average annual degree of ownership concentration, equal to 0.00, was noticed in *PRD in Zwoleń*, where the zero degree of ownership concentration occurred throughout the whole 10-year analysis period. In this company, the largest, but not exceeding 5% share of an individual shareholder in the share capital, belonged to more than seventy employees of a directly privatised state-owned enterprise. Moreover, with zero participation of outside investors in the share capital, all employees of state-owned enterprise joined the company established to acquire its business assets for use against payment (see: Table 2).

The dynamics of sales revenue in sampled employee-owned companies during 10 years, which were treated as output in the used *DEA* method, was presented in Table 3.

The arithmetic mean for dynamics of the sales revenue in thirteen employee-owned companies over the period from $t = -5$ to $t = -3$ was higher than 100.00%. In the period from $t = -2$ the mean dynamics of sales revenue was lower than 100.00% although it increased in the years $t = 1$ and $t = 3$. The standard deviation for the dynamics of sales revenue over the adopted 10-year analysis period fluctuated, obtaining the highest dynamics in the year $t = -3$. In the year $t = -4$, in which the mean dynamics of sales revenue in the analysed employee-owned companies was the largest, the increase in the value of sales revenue appeared in at least three out of four investigated entities.

The largest decrease in the value of sales revenue relative to the year $t = -6$ occurred in the year $t = 3$ in *Geokart in Warsaw*, for which the average annual dynamics of sales revenue did not exceed the average dynamics for the surveyed group of employee-owned companies. The lowest average annual dynamics of

TABLE 3: *Dynamics of sales revenue in employee-owned companies qualified for the research sample in 10-year period of the analysis (the basic period t = –6) [%]*

	Employee-owned company	Period t									Arithmetic mean
		−5	−4	−3	−2	−1	0	1	2	3	
1	PRD Sp. z o. o. w Przysusze	112.89	185.52	175.72	126.36	108.04	92.61	103.19	43.18	46.75	110.47
2	PRD Ltd. w Zwoleniu	247.49	194.58	258.37	176.10	136.35	175.55	149.66	118.84	110.36	174.15
3	PRI-D Ltd. w Grójcu	127.11	113.50	119.28	58.09	93.23	108.50	131.34	69.53	36.97	95.28
4	WCMB Ltd.	45.85	49.11	77.98	63.42	47.37	51.94	47.84	42.86	29.40	50.64
5	PKS Ltd. w Grójcu	105.17	101.99	67.06	71.83	74.79	77.06	79.96	76.65	75.54	81.12
6	ZTE RADOM Ltd.	109.65	131.35	70.04	59.22	53.95	59.95	59.80	60.46	60.39	73.87
7	BSiPB MSW Ltd. w Warszawie	132.07	100.20	93.16	88.96	37.61	6.81	22.26	40.46	124.00	71.73
8	PKS Ltd. w Grodzisku Maz.	124.41	140.33	101.15	106.75	123.19	123.07	127.20	119.76	132.14	122.00
9	Ostrada Ltd. w Ostrołęce	98.43	127.29	68.24	101.29	104.79	113.15	80.72	79.43	106.73	97.79
10	Elmet Ltd. w Warszawie	99.01	100.87	92.44	91.69	50.44	47.27	45.32	38.12	34.02	66.57
11	ZTiSZE Ltd. w Warszawie	104.91	78.01	30.24	20.01	18.57	13.93	11.47	9.14	8.76	32.78
12	Geokart Ltd. w Warszawie	117.12	145.44	151.59	118.36	58.73	37.33	38.53	5.54	4.80	75.27
13	Bipromel Ltd. w Warszawie	82.66	109.55	75.89	143.70	70.95	53.60	75.56	47.91	50.11	78.88
Summary statistics	Number of entities	13	13	13	13	13	13	13	13	13	13
	Arithmetic mean	115.91	121.36	106.24	94.29	75.23	73.91	74.83	57.84	63.07	86.96
	Standard deviation	45.34	39.89	59.42	41.33	35.44	47.51	43.13	35.18	43.04	43.36
	Minimum	45.85	49.11	30.24	20.01	18.57	6.81	11.47	5.54	4.80	21.38
	Maximum	247.49	194.58	258.37	176.10	136.35	175.55	149.66	119.76	132.14	176.67
	First quartile	99.01	100.87	70.04	63.42	50.44	47.27	45.32	40.46	34.02	61.20
	Median	109.65	113.50	92.44	91.69	70.95	59.95	75.56	47.91	50.11	79.08
	Third quartile	124.41	140.33	119.28	118.36	104.79	108.50	103.19	76.65	106.73	111.36

S o u r c e: own calculations based on hand-collected data from financial statements submitted by investigated companies to the National Court Register.

sales revenue, equal to 32.78%, was observed in *ZTiSZE in Warsaw*, where from the year $t = -4$ the value of sales revenue was not only lower than in the year $t = -6$, but also decreased systematically. The highest average annual dynamics of sales revenue, amounting to 174.15% was noticed in *PRD in Zwoleń*, where in the year $t = -3$ also the highest increase in the value of sales revenues in relation to the year $t = -6$ was recorded (see: Table 3).

At this stage of empirical studies on the differentiation of economic efficiency in employee-owned companies, when the input-oriented model with constant returns to scale (*CCR*) was used for the calculation of synthetic efficiency measures in the framework of the data envelopment analysis (*DEA*), *PRD in Zwoleń*, in which the degree of ownership concentration throughout the whole 10-year analysis period was zero, was excluded from the research sample. Table 4 presents the *DEA* efficiency measures in employee-owned companies qualified for the research sample at this stage of empirical studies during 10 years.

The arithmetic mean of *DEA* efficiency measure in twelve employee-owned companies in the adopted 10-year analysis period with the exception of the years $t = -4$, $t = 0$ and $t = 3$ decreased. The mean measure of *DEA* efficiency was within the range from 0.1661 in the year $t = 2$ to 0.2599 in the year $t = -6$.

The most efficient employee-owned company as measured by achieved sales revenue was *PKS in Grodzisk Mazowiecki*, where the *DEA* efficiency measure amounted to 1.00 in each year of the adopted 10-year analysis period. In this company, with a slow increase of the low degree of ownership concentration, the value of sales revenue was higher than in the year $t = -6$, though it fluctuated. *BSiPB MSW in Warsaw*, where the average annual measure of *DEA* efficiency was 0.0009, was the least efficient employee-owned company. In this company, with a constant but above-average degree of ownership concentration, the value of sales revenue decreasing to the year $t = 0$ was lower than in the year $t = -6$ in the period from $t = -3$ to $t = 2$. It is worth emphasising, that in both employee-owned companies no shares in the share capital were acquired by outside investors.

Referring to the average annual measure of *DEA* efficiency for all employee-owned companies qualified for the research sample, the above-average efficiency as measured by achieved sales revenue was discovered, disregarding the company that was fully efficient, in *ZTE RADOM*, *PKS in Grójec* and *Ostrada in Ostrołęka*. For all these employee-owned companies, the average annual dynamics of sales revenue was less than 100.00%, and the average annual degree of ownership concentration was at most slightly higher than the average degree for the surveyed group of employee-owned companies.

TABLE 4: *DEA efficiency measures in employee-owned companies qualified for the research sample in 10-year period of the analysis [–]*

	Employee-owned company	Period t										Arithmetic mean
		–6	–5	–4	–3	–2	–1	0	1	2	3	
1	PRD Sp. z o. o. w Przysusze	0.0228	0.0224	0.0384	0.0545	0.0483	0.0436	0.0383	0.0415	0.0184	0.0199	0.0348
2	PRI-D Ltd. w Grójcu	0.3290	0.3361	0.3126	0.5153	0.0175	0.0296	0.0351	0.0413	0.0232	0.0197	0.1659
3	WCMB Ltd.	0.0080	0.0030	0.0033	0.0077	0.0077	0.0061	0.0068	0.0061	0.0041	0.0028	0.0056
4	PKS Ltd. w Grójcu	0.3310	0.2744	0.2658	0.2616	0.3416	0.3631	0.3673	0.3279	0.3189	0.3032	0.3155
5	ZTE RADOM Ltd.	0.5058	0.4458	0.4748	0.3723	0.3885	0.3663	0.4167	0.3923	0.2827	0.2809	0.3926
6	BSiPB MSW Ltd. w Warszawie	0.0010	0.0011	0.0008	0.0012	0.0014	0.0006	0.0001	0.0004	0.0007	0.0021	0.0009
7	PKS Ltd. w Grodzisku Maz.	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
8	Ostrada Ltd. w Ostrołęce	0.2611	0.1964	0.2493	0.1593	0.2890	0.2780	0.3073	0.2134	0.2230	0.2981	0.2475
9	Elmet Ltd. w Warszawie	0.1307	0.1000	0.0785	0.1067	0.1306	0.0758	0.0728	0.0679	0.0607	0.0538	0.0878
10	ZTiSZE Ltd. w Warszawie	0.4117	0.3472	0.3833	0.1424	0.0759	0.0704	0.0550	0.0441	0.0373	0.0356	0.1603
11	Geokart Ltd. w Warszawie	0.0962	0.0901	0.1327	0.2124	0.2047	0.1036	0.0674	0.0677	0.0103	0.0079	0.0993
12	Bipromel Ltd. w Warszawie	0.0218	0.0130	0.0180	0.0186	0.0406	0.0212	0.0164	0.0228	0.0137	0.0143	0.0200
Summary statistics	Number of entities	12	12	12	12	12	12	12	12	12	12	12
	Arithmetic mean	0.2599	0.2358	0.2465	0.2377	0.2122	0.1965	0.1986	0.1855	0.1661	0.1698	0.2109
	Standard deviation	0.2904	0.2857	0.2860	0.2861	0.2829	0.2868	0.2932	0.2875	0.2871	0.2890	0.2875
	Minimum	0.0010	0.0011	0.0008	0.0012	0.0014	0.0006	0.0001	0.0004	0.0007	0.0021	0.0009
	Maximum	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
	First quartile	0.0225	0.0201	0.0333	0.0455	0.0349	0.0275	0.0304	0.0367	0.0129	0.0127	0.0276
	Median	0.1959	0.1482	0.1910	0.1508	0.1033	0.0731	0.0612	0.0559	0.0303	0.0277	0.1037
	Third quartile	0.3512	0.3389	0.3303	0.2893	0.3022	0.2993	0.3223	0.2420	0.2379	0.2852	0.2999

S o u r c e: own calculations with the use of *DEA* Frontier software.

The most efficient period from the point of view of the achieved sales revenue was the year $t = -6$, in which the estimated *DEA* measures were at least equal to 0.20 in every second examined employee-owned company. The year $t = 2$, in which *DEA* efficiency measures in three out of four analysed employee-owned companies were at most 0.24, was the least efficient period. Considering the average *DEA* efficiency measure for the whole adopted 10-year analysis period, the period up to the year $t = -2$ was the above-average in terms of efficiency (see: Table 4).

5. Conclusions

Empirical studies on the influence of employee ownership on the economic efficiency of a company have thus far indicated that entities in which the share of employee ownership exceeded 5% of the share capital overall performed worse than those one with a share of less than 5%. Companies with relatively higher share of employee ownership usually had lower Tobin's Q, invested less in long-term assets, took fewer risks, grew more slowly, created fewer new jobs as well as exhibited lower labour and total productivity factors[34]. However, while it appears that increase of ownership concentration in the hands of outside or inside shareholders raising the effectiveness of corporate governance[35] may improve performance in these type of entities, it is not so clear. Unfortunately, some empirical research suggests that the company performance peaked at intermediate levels of ownership concentration because the positive impact of the increase in the effectiveness of corporate governance at the initial stage of ownership concentration was outweighed in the process of its proceeding by the negative impact resulting from conflict between majority and minority shareholders[36].

---

[34] See: **O. Faleye**, **V. Mehrotra**, **R. Morck**, *When labour has a voice in corporate governance*, Journal of Financial and Quantitative Analysis 2006/41/3, p. 509; **D.L. Kruse**, **J.R. Blasi**, **R.B. Freeman**, *Does linking worker pay to firm performance help the best firms do even better?*, NBER Working Paper 2012/17745; p. 23, http://www.nber.org/papers/w17745; accessed 25.07.2019.

[35] Compare: **A. Fazlzadeh**, **A.T. Hendi**, **K. Mahboubi**, *The examination…*, pp. 255–256; **P. Kapopoulos**, **S. Lazaretetou**, *Corporate ownership structure and firm performance: evidence from Greek firms*, Bank of Greece. Economic Research Department-Social Studies Division, Working Paper 2006/37, p. 18, http://www.bankofgreece.gr/BogEkdoseis/Paper200637.pdf; accessed 25.07.2019; **J. Sanchez-Ballesta**, **E. Garcia-Meca**, *A meta analytic vision of the effect of ownership structure on firm performance*, Corporate Governance 2007/15/5, pp. 885–886.

[36] Compare: **I. Akimova**, **G. Schwödiauer**, *Ownership structure, corporate governance and enterprise performance: empirical results for Ukraine*, International Advances in Economic Re-

The empirical research conducted on the economic efficiency differentiation of the employee-owned companies demonstrates that the average degree of ownership concentration of the surveyed companies in the year $t = 2$, which was the least efficient period in terms of achieved revenues from sales was the highest. The average annual degree of ownership concentration did not exceed 0.26 in three out of four surveyed employee-owned companies in which above-average mid-term measures of *DEA* efficiency were discovered. In three out of six employee-owned companies, where average annual measures of *DEA* efficiency were less than 0.10, the average annual degree of ownership concentration was lower than the average degree for the surveyed group of companies. The presented results of empirical studies therefore do not fully confirm the research hypothesis, which states that the degree of ownership concentration significantly differentiates the economic efficiency of employee-owned companies in terms of sales revenue. Besides, the presented low economic efficiency of employee-owned companies in terms of sales revenue with above-average degree of ownership concentration seems to partially confirm the previous results of research on the impact of ownership concentration on the financial performance of enterprises. Unfortunately, the obtained findings cannot be generalized because the empirical studies were carried out on a sample of 13 employee–owned companies, what should be treated as their major limitation. Future empirical research should first of all examine the economic efficiency of employee-owned companies in terms of sales revenue when the ownership is concentrated in insiders, outsiders or institutional shareholders.

References

Legal acts

The Act of 30 August 1996 on commercialisation and privatisation (Journal of Laws 2002/171/1379).

The Act of 5 December 2002 amending the act on principles of exercising rights due to the State Treasury, the act on commercialisation and privatisation of state-owned enterprises and some other acts (Journal of Laws 2002/240/2055) with subsequent amendments.

search 2004/10/1, p. 41; **M.A. Conte**, **J. Svejnar**, *Productivity effects of worker participation in management, profit-sharing, worker ownership of assets and unionization in U.S. Firms*, International Journal of Industrial Organization 1988/6, Issue 1, p. 150; **P. Kozarzewski**, **R. Woodward**, *Secondary…*, p. 32; **S. Lee**, *Ownership structure and financial performance: evidence from panel data of South Korea*, University of Utah, Department of Economics "Working Paper" 2008/17, p. 22, https://www.econstor.eu/bitstream/10419/64457/1/58384426X. pdf; accessed 25.07.2019; **A. Matuszewska-Pierzynka**, *Productivity effects of the ownership concentration in Polish employee-owned companies*, Quarterly Journal of Economics and Economic Policy "Equilibrium" 2018/13, Issue 4, pp. 790–791.

The Act of 12 May 2006 amending the act on commercialisation and privatisation of state-owned enterprises and some other acts (Journal of Laws 2006/107/721).

The Communication from the Commission of 19 January 2008 on the revision of the method for setting the reference and discount rates (Official Journal of European Union 2008, C 14/02).

The Ordinance of the Council of Ministers of 16 October 1997 on specific rules for determining the amount due for the use of the enterprise, the method of securing the unpaid part of the debt and the interest rate of the unpaid payment (Journal of Laws 1997/130/855).

The Ordinance of the Council of Ministers of 14 December 2004 on terms of payment for amounts due on the use of the enterprise (Journal of Laws 2004/269/2667).

Literature

Akimova I., **Schwödiauer G.**, *Ownership structure, corporate governance and enterprise performance: empirical results for Ukraine*, International Advances in Economic Research 2004/10, Issue 1, pp. 28–42.

Banker R.D., **Charnes A.**, **Cooper W.W.**, *Some Models for Estimating Technical and Scale Inefficiencies in Data Envelopment Analysis*, Management Science 1984/30, Issue 9, pp. 1078–1092.

Bojar E., **Sosińska-Wit M.**, **Żminda Z.**, *Employee leasing and restructuring of enterprises*, Lublin University of Technology, Lublin 2003.

Bukowska-Piestrzyńska A., *Leasing of property of the State Treasury in workers' companies*, Economics and Organization of Enterprise 2002/5, pp. 44–51.

Charnes A., **Cooper W.W.**, **Golany B.**, **Seiford L.M.**, **Stutz J.**, *Fundations of DEA for Pareto--Koopmans Efficient Empirical Production Function*, Journal of Economics 1985/30, Issues 1–2, pp. 91–107.

Chodakowska E., *Efficiency evaluation of education sector organizations using data envelopment analysis*, Management Issues 2009/7, Quantitative methods in management 4 (26), pp. 91–112.

Conte M.A., **Svejnar J.**, *Productivity effects of worker participation in management, profit--sharing, worker ownership of assets and unionization in U.S. Firms*, International Journal of Industrial Organization 1988/6, Issue 1, pp. 139–151.

Debreu G., *The Coefficient of Recourse Utilization*, Econometrica, July 1951/19/3, pp. 273–292.

Fäare R., **Grosskopf S.**, **Lovell K.C.A.**, *The Measurement of Efficiency of Production*, Kluwer Academic Publishers, Boston 1985.

Faleye O., **Mehrotra V.**, **Morck R.**, *When labour has a voice in corporate governance*, Journal of Financial and Quantitative Analysis 2006/41, Issue 3, pp. 489–510.

Farell M.J., *The Measurement of Productive Efficiency*, Journal of the Royal Statistical Society 1957, Series A/120/3, pp. 253–290.

Fazlzadeh A., **Hendi A.T.**, **Mahboubi K.**, *The examination of the effect of ownership structure on firm performance in listed firms of Tehran Stock Exchange based on the type of the industry*, International Journal of Business and Management 2011/6/3, pp. 249–266.

Feruś A., *The application of the DEA method to define the level of company credit risk*, Bank & Credit 2006/7, pp. 44–59.

Goszka W., *The structure of ownership and power in employees' partnerships*, Economics and Organization of Enterprise 2001/5, pp. 55–61.

Helta M., *Application of DEA method to compile the efficiency ranking of agricultural property agency's companies in 2006*, Annals of Agricultural Sciences 2009, Series G/96/3, pp. 107–111.

Jarosz M., **Kozak M.**, *Economic and social condition of employee-owned companies in the years 1991–1994. Conclusions*, in: M. Jarosz (ed.), *Lights and shadows of employee-owned companies in the years 1991–1994*, Institute of Political Studies of the Polish Academy of Sciences, Warsaw 1995, pp. 117–125.

Kapopoulos P., **Lazaretetou S.**, *Corporate ownership structure and firm performance: evidence from Greek firms*, Bank of Greece. Economic Research Department-Social Studies Division, "Working Paper" 2006/37, pp. 1–33.

Karpińska-Mizielińska W., **Smuga T.**, *Changes of ownership relations and their impact on the improvement of long-term economic efficiency*, Institute for Development and Strategic Studies, Warsaw 1997.

Kozarzewski P., *Direct privatisation: the legal status*, in: M. Jarosz (ed.), *Direct privatisation. Investors. Managers. Employees*, Institute of Political Studies of the Polish Academy of Sciences, Warsaw 1998, pp. 19–31.

Kozarzewski P., *Ownership supervision, control and management*, in: M. Jarosz (ed.), *Privatisation traps*, Institute of Political Studies of the Polish Academy of Sciences, Warsaw 2003, pp. 161–198.

Kozarzewski P., **Woodward R.**, *Secondary privatization in Poland (Part I): Evolution of ownership structure and company performance in firms privatized by employee buyouts*, "Case Reports", No. 47, Center for Social and Economic Research, Warsaw 2001.

Krajewski S., *Privatisation, restructuring, competitiveness of Polish enterprises*, PWE, Warsaw 2009.

Kruse D.L., **Blasi J.R.**, **Freeman R.B.**, *Does linking worker pay to firm performance help the best firms do even better?*, NBER Working Paper 2012/17745, pp. 1–30.

Kucharski A., *DEA method in the evaluation of economic efficiency*, Publisher of the University of Lodz, Lodz 2014.

Lee S., *Ownership structure and financial performance: evidence from panel data of South Korea*, University of Utah, Department of Economics "Working Paper" 2008/17, pp. 1–25.

Matuszewska-Pierzynka A., *The debt of companies using assets of state–owned enterprises for a consideration towards the State Treasury*, Publisher of the University of Lodz, Lodz 2015.

Matuszewska-Pierzynka A., *Productivity effects of the ownership concentration in Polish employee-owned companies*, Quarterly Journal of Economics and Economic Policy "Equilibrium" 2018/13, Issue 4, pp. 781–798.

Nazarko J., **Chrabołowska J.**, *Application benchmarking techniques to efficiency assessing of Polish distribution utilities*, Research Papers of Wrocław University of Economics "Taxonomy 12" 2005/1076, pp. 38–47.

Nowak M., **Borowiec A.**, *The application of DEA method in the study of efficiency of scientific and technological parks*, Scientific Journals of Poznan University of Technology series of "Organization and Management" 2013/61, pp. 109–119.

Pawłowski J., *The privatization lease vs. participation in a public company*, in: R. Borowiecki (ed.), *Development challenges and restructuring of enterprises*, Cracow University of Economics, TNOiK, European Council of Management-CECIOS, Warsaw–Cracow 1999, pp. 429–436.

Privatisation of state-owned companies in 1999, CSO, Warsaw 2000.

Privatisation of state-owned companies in 2005, CSO, Warsaw 2006.

Privatisation of state-owned companies in 2011, CSO, Warsaw 2012.

Sajnóg A., *Comparative Analysis of Economic Efficiency of Polish and German Listed Companies*, Oeconomia Copernicana 2015/6, Issue 2, pp. 67–87.

Sajnóg A., **Sosnowski T.**, *Efficiency of private equity funds' divestment process on the Warsaw Stock Exchange*, Studies and Works College of Management and Finance 2015/143, pp. 55–76.

Sanchez-Ballesta J.P., **Garcia-Meca E.**, *A meta analytic vision of the effect of ownership structure on firm performance*, Corporate Governance 2007/15, Issue 5, pp. 879–893.

Silva Portela M.C.A., *Value and quantity data in economic and technical efficiency measurement*, Economics Letters 2014/124, Issue 1, pp. 108–112.

Sobolewski H., *Determinants and procedures of ownership transformations of state-owned enterprises. Two decades of privatisation*, Publisher of Poznan University of Economics and Business, Poznan 2011.

Sosnowski T., *Time to the full exit from the investment of private equity funds on the Warsaw Stock Exchange*, Annales Universitatis Mariae Curie-Skłodowska 2015, Sectio H/49/4, pp. 527–538.

Wrońska E.M., *Financial strategies of employee-owned companies*, Publisher of Maria Curie-Skłodowska University, Lublin 2004.

Agnieszka MATUSZEWSKA-PIERZYNKA

ZRÓŻNICOWANIE EFEKTYWNOŚCI EKONOMICZNEJ W SPÓŁKACH PRACOWNICZYCH

Abstrakt

Przedmiot badań: Badania empiryczne nad zróżnicowaniem efektywności działania spółek pracowniczych pod względem przychodów ze sprzedaży przy minimalizacji stopnia koncentracji własności wpisują się tematycznie w problematykę efektywności bezpośredniej metody prywatyzacji realizowanej przez oddanie przedsiębiorstwa państwowego do odpłatnego korzystania.

Cel badawczy: Zasadniczym celem niniejszego artykułu jest weryfikacja hipotezy badawczej stanowiącej, iż stopień koncentracji własności zasadniczo różnicuje efektywność działania spółek pracowniczych pod względem przychodów ze sprzedaży.

Metoda badawcza: Empiryczna weryfikacja tej hipotezy została przeprowadzona przy zastosowaniu metody granicznej analizy danych *DEA*, która mierzy względną efektywność techniczną danego obiektu *DMU*. Badania empiryczne zostały przeprowadzone w grupie 13 spółek pracowniczych z województwa mazowieckiego, które zawarły umowę ze Skarbem Państwa w latach 2000–2005 i obejmowały 10-letni okres badawczy. Analiza przychodów ze sprzedaży i stopnia koncentracji własności została dokonana na podstawie danych z dokumentów złożonych przez badane spółki pracownicze w Krajowym Rejestrze Sądowym w latach 2002–2017.

Wyniki: Zaprezentowane w opracowaniu wyniki badań empirycznych nie pozwalają na uznanie hipotezy badawczej za w pełni potwierdzoną, ponieważ spółki pracownicze, w których miary efektywności *DEA* były mniejsze niż przeciętna dla wszystkich badanych przedsiębiorstw odznaczały się zróżnicowanym średniookresowym stopniem koncentracji własności.

Słowa kluczowe: przekształcenia własnościowe, prywatyzacja bezpośrednia, oddanie przedsiębiorstwa państwowego do odpłatnego korzystania, przychody ze sprzedaży, koncentracja własności.