EXAMINATION AND CONTROL OF THE EFFICIENCY OF ENTERPRISES OPERATING WITHIN THE HEALTH CARE SECTOR

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Abstract

In the scope of our research, the efficiency of companies operating in the health care sector and the correlation between efficiency indicators and macroeconomic indicators were examined. One of the research questions is how the efficiency indicators of companies applying IFRS will develop during the analysed period. The other research question is whether and to what extent changes in individual macroeconomic indicators affect the efficiency of companies. It was an important consideration regarding the analysed companies that their consolidated annual statements are prepared in accordance with International IFRS. In addition, the selected sample was narrowed to companies of 5 countries within the European Union. The efficiency indicators of the companies were presented by creating quartiles and preparing descriptive statistics. When presenting the efficiency indicators, specifics of the IFRS accounting system depending on the content of the indicator were highlighted. Then it was examined, whether and to what extent the efficiency indicators are affected by the changes in macroeconomic indicators. This analysis was conducted using the Stata statistical system and applying random linear panel regression. As a result of the study, it can be concluded that the development of macroeconomic indicators has no effect on the efficiency indicators, their impact can only be measured in a complex sense.

Keywords: IFRS, Efficiency, Health Care Sector, Macro Economy

1. INTRODUCTION

The primary objective of the present research is to examine the efficiency of companies operating in the health care sector within the European Union that prepare their consolidated annual statements in accordance with International Financial Reporting Standards (IFRS 15, 2014). Therefore, only companies listed on the stock exchange were analysed because it is compulsory for them to prepare their consolidated annual statements in accordance with IFRS. Our research is limited to the field of the health care sector, therefore the selection of companies was primarily based on their activities to be carried out in the health care sector, which among others includes pharmaceutical production, health tourism, and sports businesses. Beyond efficiency, it was also considered important to examine whether and to what extent changes in certain macroeconomic indicators have an impact on the efficiency of the examined companies. The study was performed using the Stata statistical system by means of regression calculation.

In our opinion, it is of utmost importance to examine the effectiveness of companies applying IFRS, because this accounting system is characterized by the provision of investor-centred information in the preparation of financial statements. Consequently, examination of efficiency is a useful and indispensable source of information about the company for both internal and external stakeholders, with particular regard to corporate owners and controlling.

Our research started with a review of scientific literature, which consists of multiple parts, in conformity with the research topic. Since our research is IFRS-based, we considered it important to start the scientific literature review by presenting the development and basic features of IFRS. Following the above, we presented the most important efficiency indicators used for our study, the wage efficiency indicator, the asset efficiency indicator, the inventory efficiency indicator, and the complex efficiency indicator. The method of calculating each efficiency indicator as well as their accounting and economic content were described here. In the final section of the scientific literature review, we presented the macroeconomic indicators applied in our research, which include changes in inventories, gross fixed capital formation, productivity, minimum wages, and employment rates.

The next section of our article is Research Methodology, which describes in detail the used sample and the methodology applied for the examinations. The sample required for our study has been narrowed to the regional level, to companies in 5 countries within the European Union. As a result of a certain screening procedure, this sample decreased to 52 companies during the observed 5 year period.

In the next section, we presented the results of our examinations. As mentioned earlier, one of our research questions concerned the development of the efficiency indicators of companies that prepare their financial statements in accordance with IFRS during the observed period. We formed quartiles from the calculated efficiency indicators and then performed descriptive statistics about these indicators. Regarding the development of the indicators, we highlighted the specific features of the IFRS accounting system depending on the content of the given indicator. Our other research question is whether the changes in certain macroeconomic indicators have an effect and, if so, to what extent they affect the efficiency of companies. This study was performed using random effect linear regression using the Stata statistical system. At the end of our article, we summarized the results of our examinations and presented our conclusions.

2. LITERATURE REVIEW

This chapter introduces the fundamental theoretical background to our research question. First, the essence and importance of IFRS are briefly explained. Next, the efficiency indicators calculated during our study and the utilized macroeconomic indicators are introduced.

2.1. Origins of the International Financial Reporting Standards

In our time, the most important purpose of the preparation of financial statements of companies is to provide information to the internal and external stakeholders of the companies, especially towards investors, therefore it became necessary to develop a uniform system of accounting and of financial statements, which allows their comparison (Beke, 2014). The enforcement of decrees is compulsory for the Member States in the legal system of the European Union. For example decree 1606/2002 on the Application of IFRS, which was passed by the European Parliament and the Council of the European Union on 19th July 2002 (Madarasiné et al., 2018). According to the decision of the European Union, as of 2005, companies that are listed at a stock exchange are required to use IFRS for the preparation of their consolidated annual statements in order to enhance comparability at international (EU and global) level (Regulation 1606/2002).

The European Union allows Member States to require the application of IFRS for other business entities other than companies listed at a stock exchange or at least to provide an option to do so. It is an important objective of IFRS and the European Union, for financial statements of companies to be internationally comparable, for example, to enable potential investors to compare companies from different countries. In IFRS, annual statements are referred to as financial statements (Rózsa, 2015). The financial statements include the statement of financial position, a comprehensive profit and loss account, statement of cash flow, statement of changes in equity and the notes (Lakatos, Kovács, Mohl, Rózsa, & Szirmai, 2018). Of these, the notes is considered important to be emphasized, as it contains textual explanatory parts related to other statements (Fenyves, Bács, Droj, & Tarnóczi, 2018a), which may serve as a basis for decision-making by internal and external stakeholders of the company (Fenyves, Bács, Zéman, Böcskei, & Tarnóczi, 2018b).

2.2. The essence of efficiency and introduction of efficiency indicators

When the analysis of the corporate activities are mentioned, we mostly think about the analysis of efficiency, profitability and financial position (Körmendi, 2006). When analysing efficiency, we primarily look for the question of how much performance a company achieves with resources at its disposal over a given period of time. The term performance refers to the output of activities, which varies significantly depending on the nature of the activity. In the present article, companies operating in producing and service sectors were examined where the output of their economic activity can be measured in net revenues (Bíró, Kresalek, Pucsek, & Sztanó, 2016).

With respect to the occasional necessity of resources required for production and the requirements of the competition in the market, increasing the production of material goods at appropriate pace needs a regular reduction of resource demand related to production or other elements of activity. In this way, faster growth of

the production of material goods can be achieved or grow even if some of our resources are not expanding (Bán, Kresalek, & Pucsek, 2017).

The goal of economic activity is always to achieve performance (output), which, however, always requires resources. The relationship between output and the utilization of resources determines the profitability of an activity. Improved efficiency is achieved if a given performance is achieved by utilizing fewer resources or more output is achieved with a certain amount of resources. Thus, efficiency means the economicalness of utilizing resources (Bíró et al., 2016).

Efficiency can be examined from the point of view of the national economy, the enterprise itself, and even at the level of (self-accounting) units within the enterprise. Due to the complexity of traffic, efficiency cannot be measured with a single indicator, only a system of indicators is able to provide an appropriate approach for its development.

Efficiency indicators that can be created based on the known data are the following:

$$Complex\ efficiency =$$
$$= \frac{Net\ production\ value}{0.15\ x\ Net\ Asset\ Value + 1.8\ x\ Wage\ costs} \quad (1)$$

The value of assets fixed in production within the denominator of efficiency indicators is usually the sum of the net value of tangible assets and the chronological average of stock values, but depending on the decision of the enterprise, the net value of intangible assets can also be taken into account (Bíró et al., 2016).

In the form of the utilized multipliers and weights, the average output requirement is indicated for each resource. Currently, their size is basically determined by the enterprise. Obviously, the degree of expected output is closely related to the useful, productive lifespan of the given assets and the amount of human resource-related expenditure. If the fixed assets of a company are mostly based on assets that are rapidly worn out morally or physically, then a significantly higher expected output can be set than in the case of assets with a longer lifespan. The multiplier numbers in the formula are commonly used multipliers of expected output (Bán et al., 2017).

The acceptable value of the complex efficiency indicator is above 1. Reaching that value represents the fact that the utilized resources have jointly provided the output that was expected from them by the enterprise. The indicator can be utilized for measuring the development of the given enterprise or for its comparison of other enterprises. It is clear that the value of the indicator is influenced not only by the expectations of the enterprise but also by the internal resource ratios (asset/wage developments). Therefore, it is advisable to analyse the efficiency of each resource separately (Bíró et al., 2016).

Indicators suitable for assessing the efficiency of the utilization of each resource are the following:

$$Wage\ efficiency\ indicator = \frac{Net\ production\ value}{Wage\ costs} \quad (2)$$

The indicator expresses the ability of wages paid by the enterprise to create new value. Its analysis is important in view of the fact that labour

and the costs of utilizing labour play a fundamental role in the development of complex efficiency. Since the cost of utilizing labour is not merely based on wage costs, it might be justified to take into account personnel costs instead of wage costs when calculating the indicator (Birher, Pucsek, & Sztanó, 2009).

Accordingly, the indicator is calculated as follows:

$$Wage\ efficiency\ indicator = \frac{Net\ production\ value}{Personnel\ costs} \quad (3)$$

Asset efficiency indicators express the creation of value based on fixed tangible assets and inventories in a quotient form. They are suitable for dynamic analyses and the comparison of businesses. In the case of dynamic analyses, important indicators reflecting background effects such as the efficiency of tangible assets and efficiency of inventories are of particular importance (Bán et al., 2017).

They are calculated as follows:

$$Efficiency\ of\ tangible\ assets =$$
$$= \frac{Net\ production\ value}{Average\ net\ value\ of\ tangible\ assets} \quad (4)$$

$$Efficiency\ of\ inventories =$$
$$= \frac{Net\ production\ value}{Average\ value\ of\ inventories} \quad (5)$$

It is evident that invested financial assets were not taken into account in any of the asset efficiency indicators, which is logically explained by the fact the "performance and product" of this group of fixed assets is not included in the output of productive activity (Bíró et al., 2016).

In the course of the examinations, revenue was used instead of net production value as a measure of output because there was insufficient available information for the calculation of net production value.

2.3. Macroeconomic indicators

The macroeconomic concept closely related to the efficiency of inventories indicator is inventory investment or inventory carrying. One important reason for carrying inventory is to balance the timing of production. This is mostly important due to the elimination of seasonal effects. Another important objective for it to improve the efficiency of the operation of the company. Inventory carrying prevents a company from running out of its products in case of a larger order (Mankiw, 2005). Closely related to inventory carrying, a macroeconomic indicator, change of inventory was applied.

Nominal wage and real wage are macroeconomic concepts closely related to the wage efficiency indicator. Nominal wage is the price of labour, namely the amount of money the user of labour pays to the owner of the labour. With respect to the fact that we are not dealing with the behaviour of individual economic entities, but with relations between aggregates, nominal wage, in this case, is a money wage characteristic to the national economy as a whole, namely an average

wage. Real wage is the number of goods that a consumer is able to purchase at consumer price from his/her nominal wage. Real wage is the quotient of nominal wage and price level. If wages of employees decline and price level decreases to the same extent, real wage does not change (Krugman & Wells, 2018). In this context, the minimum wage was applied as a macroeconomic indicator for our study.

Unemployment rate is a macroeconomic indicator that characterises the economy of a country very well. Unemployment rate can be calculated as the ratio of the number of unemployed and the active workforce (Mankiw, 2011). It is important to emphasize that there is a negative correlation between the unemployment rate and efficiency indicators such as GDP, which is called Okun's law (Cuaresma, 2003). For this reason, employment rate was applied for the present study instead of unemployment rate. Employment rate is the ratio of the number of employees and the active workforce (Leamer, 2008).

Productivity is the amount of output produced per unit of input. Since labour is the most important factor, labour productivity is the most important indicator of productivity. When productivity is addressed, it usually refers to labour productivity. The broader indicator of productivity is total factor productivity, namely the ratio of output to generalized unit of input. In addition to labour, the generalized unit takes into account capital, energy, and utilized materials. Productivity growth allows real wages to increase (Hall & Taylor, 1997).

3. RESEARCH METHODOLOGY

The primary objective of the present research is to examine the efficiency of companies operating in the health care sector and the correlations, interrelations of efficiency indicators and the macroeconomic indicators that influence them. Since the present research is IFRS-based, the primary consideration regarding analysed companies was that their consolidated annual statements are prepared in accordance with International Financial Reporting Standards (IFRS). Our research concerns health care sector companies of the European Union that are listed at the stock exchange, because as of 2005, it is compulsory for enterprises listed at a stock exchange of an EU Member State to apply IFRS for the preparation of their consolidated annual statements. The scope of the research is limited to 5 countries of the European Union, namely Poland, Hungary, Croatia, Latvia, and Bulgaria. Our objective was to select countries that do not play the most significant economic role within the European Union and the EU accession of which took place after 2004. The data required for the calculations were downloaded via the EMIS database.

A 5-year dataset of companies operating in the pharmaceutical sector and in health-tourism (within the tourism sector) was collected from the EMIS database. Companies that did not have a 5-year series of data or personnel costs (the exclusive reason for which can be that the given company does not have any employees), were removed from the sample. Personnel costs are an essential part of the study as they are required for the calculation of numerous efficiency indicators, which are important components of our research. Consequently, it was absolutely necessary to remove companies with no employees from the sample. As a result of the above-mentioned removals, many companies are no longer included in the sample, therefore our examination was narrowed down to 52 companies. The percentile distribution of companies by country are presented in the following section. Subsequently, certain macroeconomic indicators of the involved countries were collected, which are available on the tradingeconomics.com website. In our opinion, the most important macroeconomic indicators in terms of the research question are change of inventory, gross fixed capital formation, productivity, minimum wage, and employment rate.

The first step in the study is to calculate efficiency ratios, more specifically tangible asset efficiency, efficiency of inventory, wage efficiency and complex efficiency. Calculation of efficiency indicators was based on the data of consolidated annual statements downloaded from the EMIS database, as the data required for the calculations are included in the statements of the involved companies. Subsequently, descriptive statistics were compiled from the calculated indicators, where – among others – minimum, maximum values, standard deviation, sample size were determined and quartiles were generated. With regard to the efficiency indicators, specifics of the IFRS accounting system were highlighted in accordance with the content of the indicator. The second step of our study is to determine the correlation between the change in the calculated efficiency indicators and the change in macroeconomic indicators. Always the macroeconomic indicators of the country were compared to the efficiency indicators in which the company is present. In addition, we sought to answer the question of whether and to what extent the development of the complex efficiency indicator is influenced by the development of other efficiency indicators. The analysis was performed using the Stata statistical system, and the linear panel regression model was applied to analyse the data.

4. ANALYSIS OF EFFICIENCY AND THE CORRELATION BETWEEN EFFICIENCY AND MACROECONOMIC INDICATORS

This chapter presents the development of each efficiency indicator and the interrelations between efficiency indicators and various macroeconomic indicators. Before presenting the results of the performed examinations, we consider it important to present the distribution of the surveyed companies by their country, which is illustrated in the following figure:

Figure 1. Geographic distribution of the analysed companies
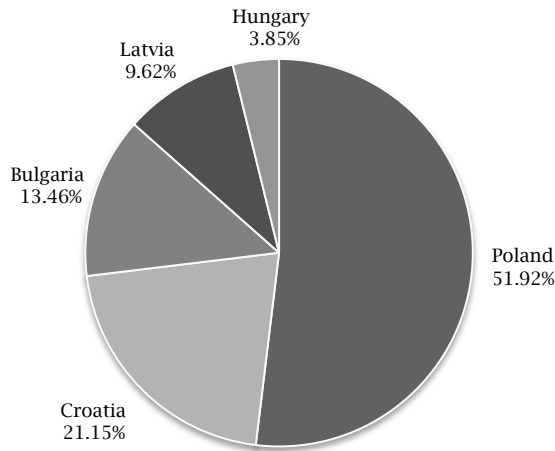
As shown in Figure 1, the Croatian, Bulgarian, Latvian and Hungarian companies account for slightly less than the half, while Polish companies account for more than half (51.92%) of the analysed companies. The main reason for this is that the Polish stock exchange is considered to be extremely strong compared to other European countries, due to the fact that Polish companies are trying to get listed as early as possible. Following the above, macroeconomic indicators, the development of which can be related to the changes in the efficiency indicators are presented. Given that 5 indicators from 5 countries over a 5-year cycle were used for the analyses in terms of macroeconomic indicators, we considered the presentation of only one country as an example rather than the complete dataset. Poland was selected as an example since most of the examined companies operate in that country. Poland's macroeconomic indicators are presented in the table below:

Table 1. Development of Poland's macroeconomic indicators between 2014 and 2018

	2014	*2015*	*2016*	*2017*	*2018*
Change of inventory	683,41	420,36	1605,43	2265,13	3138,12
Gross fixed capital formation	20127,41	21138,30	19482,18	20329,64	22148,22
Profitability	9,58	1,68	4,03	9,30	6,65
Minimum wage	6,17	2,29	2,88	8,91	6,06
Employment rate	61,68	62,93	64,50	66,13	67,40

As shown in Table 1, the correlation between macroeconomic indicators (changes in inventory, gross fixed capital formation, productivity, minimum wage and employment rate) and changes of the calculated efficiency indicators are examined. Due to differences in official currencies in the involved countries, change of inventory and gross fixed capital formation indicators were converted into a single currency, EUR. In order to avoid the effect of exchange rate fluctuations occurring in the value of the indicators, the conversion was performed uniformly at the EUR exchange rate of the date of calculation for the entire period. Productivity and minimum wage indicators measure the change in percentage, compared to the previous year. The employment rate indicator shows the current share of the employed compared to the active population.

4.1. Development of efficiency indicators

This chapter presents the development of efficiency indicators. Tangible asset efficiency, inventory efficiency, wage efficiency and complex efficiency indicators of the companies from the 5 involved countries have been calculated. Due to the fact that the calculation of efficiency indicators is based on the 5-year cycle of 52 companies, a large amount of data is available. In order to manage the amount of data, quartiles were created and the efficiency indicators of 13 companies were assigned to each quartile. In the case of efficiency indicators, the utilized production resource was compared to the revenue. We used revenue as the basis of income, as revenue is the factor that most expresses income. The first indicator is the tangible asset efficiency indicator, which is presented in the following table:

Table 2. Development of the tangible asset efficiency indicator of the analysed companies

	2014	*2015*	*2016*	*2017*	*2018*
Minimum	0.18	0.16	0.17	0.18	0.24
1st quartile	0.86	0.77	0.72	0.64	0.83
Median	1.86	1.56	1.60	1.56	1.96
3rd quartile	3.26	2.55	4.31	2.53	5.08
Maximum	61.00	33.66	52.50	45.86	62.00
Mean	3.93	2.85	4.08	3.16	4.49
Standard deviation	8.74	5.03	8.09	6.80	8.85
Relative standard deviation	222.42%	176.62%	198.18%	215.12%	197.23%
Sample size	60.82	33.50	52.33	45.68	61.76
Size of 1st quartile	0.68	0.61	0.54	0.46	0.59
Size of 2nd quartile	1.01	0.78	0.88	0.92	1.13
Size of 3rd quartile	1.40	0.99	2.71	0.97	3.12
Size of 4th quartile	57.74	31.11	48.19	43.33	56.92

Source: Own calculation based on the data of the EMIS database

The tangible assets efficiency indicator compares the annual average stock of tangible assets to revenues. Table 2 shows that the 4th quartile has the largest value and size. The primary reason for this might be that companies belonging to the 4th quartile generated significant revenue compared to their tangible assets. It is important to emphasize that the indicator has a high standard deviation, which is closely related to the above. The high standard deviation is caused by the top quartile, which is confirmed by the size of the 4th quartile. Table 2 shows that the mean value of the indicator fluctuated continuously over the examined period. In addition, it can be observed that compared to the higher value of 2014, there has been a decrease or fluctuation in the rest of the years, however, 2018 is characterised by a significant increase. Overall, it can be established for each of the four quartiles that the value of the indicators has increased between 2014 and 2018, which is considered favourable. The fluctuation of the indicator is caused by fluctuations of either tangible assets or revenues. In our opinion, the reason is more likely the fluctuation in revenues, since these are primarily producer companies, where on the one hand, continuous production requires a constant stock of tangible assets.

On the other hand, even in the case of damage, scrapping or major investments during the examined years, such fluctuation is not justified. A significant change in the value of tangible assets might be explained by their valuation at their fair value. It has an effect on the value of the indicator if companies possess property with investment purposes and use the fair value model recommended by IAS 40 - Investment Property standard. The above is especially important, only the application of the fair value model has an effect on net revenue (IAS 40 standard). This factor can have a significant impact on the value of the efficiency indicator only if the fair value of the properties has also changed significantly.

The specific requirements of IFRS 15 - Revenue from Contracts with Customers can greatly contribute to the fluctuation of revenue of the examined companies. The IFRS 15 standard strictly sets out the criteria for the accounting of revenue. For example, if the sold product contains a right of withdrawal, the resulting revenue cannot be recognized unless the right of withdrawal is terminated (IFRS 15, 2014). The standard provides an opportunity for the company not to account the portion of the revenue from sold products that is expected to be returned based on reliable estimations. Another common example that occurs often, when a company makes a warranty commitment beyond the legal requirements for its sold products. In this case, the warranty commitment shall be recognized as a revenue-reducing item, the amount of which is estimated on the basis of the experience of previous years. The tangible assets efficiency indicator measures the efficiency of fixed assets through tangible assets as the most important and most common group among fixed assets. Efficiency of current assets is then examined using the inventory efficiency indicator. Inventories are the most important and the least liquid group of current assets. The following table shows the development of the inventory efficiency indicator:

Table 3. Development of the inventory efficiency indicators of the examined companies

	2014	*2015*	*2016*	*2017*	*2018*
Minimum	1.99	2.01	2.15	2.23	2.28
1st quartile	6.02	5.89	7.06	5.18	8.31
Median	13.50	13.62	15.84	14.18	16.23
3rd quartile	59.08	61.38	75.86	67.47	63.49
Maximum	251.40	258.00	262.00	271.60	275.30
Mean	40.12	43.12	44.99	39.79	46.29
Standard deviation	50.40	55.59	55.23	53.56	62.91
Relative standard deviation	125.64%	128.92%	122.76%	134.60%	135.90%
Sample size	249.41	255.99	259.85	269.37	273.02
Size of 1st quartile	4.03	3.88	4.91	2.96	6.03
Size of 2nd quartile	7.48	7.73	8.78	9.00	7.91
Size of 3rd quartile	45.58	47.76	60.02	53.29	47.26
Size of 4th quartile	192.32	196.63	186.14	204.13	211.81

Source: Own calculation based on the data of the EMIS database

The inventory efficiency indicator compares the average annual stock of inventories to revenues. Table 3 shows that, similarly to the tangible asset efficiency indicator, the 4th quartile has the largest size and value in the case of inventory efficiency indicators as well. The primary difference between the two indicators is that they do not show the same difference in terms of the quartile ratios of the inventory efficiency indicator as in the case of the previous indicator. Companies belonging to

the 4ᵗʰ quartile achieved higher sales revenue compared to their own stock of inventory than companies belonging to other quartiles. It is important to emphasize that this indicator also has a high standard deviation, which in this case is also explained by the size of the 4ᵗʰ quartile. Table 3 shows that the value of the indicator shows an increasing tendency over the examined 5-year period. The continuous growth of the indicators is favourable for the companies because the higher the value of the efficiency indicator, the more effective the company is. The increase in the indicators is due either to the increase in revenue or the decrease in the value of inventories. Possible reasons for the change in revenue have already been explained.

Recognition, measurement, and accounting of inventories are regulated by the IAS 2 – Inventories standard. The decrease in the value of inventories may be due to lower production volume or changes

in the market value of inventories. Provisions of the IAS 2 standard require inventories to be accounted either their cost or net realizable value (whichever is lower). Net realizable value is the estimated selling price decreased with costs related to sales and with other incremental costs (IAS 2 standard). On this basis, it may lead to the increase of the inventory efficiency indicator if the companies did not decrease their stock levels significantly as compared to revenue during the examined period, but there was a significant decrease in the market value of inventories. Even in the case of companies that have a low amount or almost no inventories, the indicator might have high values. The level of stocks of inventories may also depend on the business policy of companies. The next indicator is the wage efficiency indicator, which measures the efficiency of a very important factor in the operation of companies. The following table illustrates the evolution of the wage efficiency ratio:

Table 4. Development of the wage efficiency indicators of the examined companies

	2014	*2015*	*2016*	*2017*	*2018*
Minimum	2.48	2.20	2.11	1.72	0.79
1ˢᵗ quartile	4.27	4.05	3.70	3.22	2.68
Median	5.19	5.05	4.75	4.61	4.23
3ʳᵈ quartile	7.98	7.89	7.40	5.87	5.43
Maximum	23.45	19.88	19.60	18.20	16.80
Mean	6.89	6.79	6.72	5.10	4.86
Standard deviation	4.71	4.38	4.67	2.99	3.49
Relative standard deviation	68.34%	64.42%	69.62%	58.65%	71.83%
Sample size	20.97	17.68	17.49	16.48	16.01
Size of 1ˢᵗ quartile	1.79	1.85	1.59	1.50	1.89
Size of 2ⁿᵈ quartile	0.92	1.00	1.05	1.39	1.55
Size of 3ʳᵈ quartile	2.79	2.85	2.66	1.26	1.20
Size of 4ᵗʰ quartile	15.47	11.99	12.20	12.33	11.37

Source: Own calculation based on the data of the EMIS database

The wage efficiency indicator is the ratio of revenue and personnel costs. Personnel costs include the cost of wages paid to the employee, the contributions to be paid by the employer, and the cost of any other personnel payments. Table 4 shows that the standard deviation of the data is not significant and the difference among quartiles is not as significant as experienced in the case of the previous indicators. Additionally, it can be observed that the mean value of the indicator shows a declining tendency. The main reason for this may be a significant decrease in revenue or an increase in

personnel expenses. In our opinion, the decrease in revenue as a possible cause can be excluded based on the development of the previous two indicators. The constant increase in personnel costs is explained by the increase in gross wages year after year. This suggests that higher wages do not improve the efficiency of companies. The next chapter will elaborate on this issue. The final indicator that was calculated is the complex efficiency indicator. The development of the indicator over the examined period is shown in the following table:

Table 5. Development of the complex efficiency indicators of the examined companies

	2014	*2015*	*2016*	*2017*	*2018*
Minimum	0.61	0.52	0.71	0.72	0.36
1ˢᵗ quartile	1.52	1.40	1.42	1.15	0.96
Median	1.82	1.98	2.11	1.36	1.40
3ʳᵈ quartile	2.83	2.73	3.19	2.04	2.25
Maximum	9.46	5.99	10.36	5.76	9.38
Mean	2.37	2.17	2.77	1.72	2.03
Standard deviation	1.65	1.12	2.17	1.02	1.89
Relative standard deviation	69.84%	51.54%	78.30%	59.39%	92.92%
Sample size	8.85	5.47	9.65	5.03	9.02
Size of 1ˢᵗ quartile	0.91	0.87	0.71	0.43	0.60
Size of 2ⁿᵈ quartile	0.30	0.59	0.68	0.20	0.45
Size of 3ʳᵈ quartile	1.01	0.74	1.08	0.68	0.85
Size of 4ᵗʰ quartile	6.63	3.26	7.18	3.72	7.13

Source: Own calculation based on the data of the EMIS database

The complex efficiency ratio is closely related to the efficiency of tangible assets, as well as to inventory efficiency and wage efficiency since its calculation requires personnel costs and the value of fixed assets. Fixed asset value refers to fixed assets and inventories. Table 5 shows that after some fluctuation, the value of the complex efficiency index declines towards the end of the period

compared to the beginning of the period. The exact reason for this would currently be difficult to determine since the development of the indicator is influenced by numerous factors. This issue will also be discussed in detail in the next chapter in the scope of another analysis.

4.2. Correlation analysis of efficiency indicators and macroeconomic indicators

The chapter presents the results of the correlation analysis of efficiency indicators and macroeconomic indicators. In addition, it was examined, which efficiency indicator is closely related to the changes in the complex efficiency indicator. As mentioned in a previous chapter, the analyses were performed using random effect linear panel regression.

The method is used to determine the closeness of the correlation between variables and the strength of their relationship. The first analysis focused on the correlation between changes in the tangible asset efficiency indicator and changes in selected macroeconomic indicators. It is assumed that the change of the indicator might mostly be related to the change in gross fixed capital formation. The results of the test are presented in the following table:

Table 6. Result of a random effect linear panel regression, in the case of the tangible asset efficiency indicator as an independent variable

	Coef.	*Std. Err*	*z*	*P > |z|*	*[95% Conf. Interval]*	
Year	.2617018	9.207746	0.03	0.977	-17.78515	18.30855
Change of inventories	.028235	.0179948	1.57	0.117	-.0070342	.0635042
Gross fixed capital formation	-.0006896	.002121	-0.33	0.745	-.0048467	.0034676
Productivity	-1.040048	3.363072	-0.31	0.757	-7.631547	5.551451
Employment	-.6816436	2.905375	-0.23	0.815	-6.376074	5.012787
Minimum wage	-.3923535	2.848685	-0.14	0.890	-5.975674	5.190967
Cons	-481.8911	18496.87	-0.03	0.979	-36735.09	35771.31
R^2	0.0256					
Correlation	0.16					

Source: Own editing based on the data calculated by the Stata statistical software

Table 6 illustrates the analysis, where macroeconomic indicators are the independent variables, while the efficiency indicator of tangible assets is the dependent variable. The coefficient of determination (R^2) shows the strength of the correlation between dependent and independent variables. Thus, a higher value represents a stronger correlation between the two variables. Correlation can be determined with the root of R^2. Since the correlation value is below 0.2 (it is exactly 0.16), it can be concluded that there is a weak but positive correlation between the variables. Based on

the results of the regression, none of the macroeconomic indicators influences the efficiency indicator of tangible assets, as the significance level (P) is higher than 0.05 in each case.

The following analysis involves the correlation between changes in the efficiency indicator of inventories and certain macroeconomic indicators. It is expected that the development of the efficiency indicator of inventories is influenced by the change of inventories the most. Results of the analysis are shown in the table below:

Table 7. Result of a random effect linear panel regression, in the case of the efficiency indicator of inventories as an independent variable

	Coef.	*Std. Err*	*z*	*P > |z|*	*[95% Conf. Interval]*	
Year	-1.602334	2.753102	-0.58	0.561	-6.998314	3.793647
Change of inventories	-.0005362	.0037673	-0.14	0.887	-.0079198	.0068475
Gross fixed capital formation	.0000814	.0010281	0.08	0.937	-.0019337	.0020965
Productivity	.1973838	.7082614	0.28	0.780	-1.190783	1.585551
Employment	1.940684	1.736915	1.12	0.264	-1.463607	5.344974
Minimum wage	-.4854409	.6531771	-0.74	0.457	-1.765645	.7947627
_Cons	3157.643	5475.847	0.58	0.564	-7574.82	13890.11
R^2	0.0625					
Correlation	0.25					

Source: Own editing based on the data calculated by the Stata statistical software

Table 7 shows the analysis, where macroeconomic indicators are the independent variables, while the efficiency indicator of inventories is the dependent variable. Since the correlation value is between 0.2 and 0.7 (it is exactly 0.25), it can be concluded that there is a weak, moderately positive correlation between the variables. Based on the results of the regression, none of the macroeconomic indicators influences the

efficiency indicator of inventories, as the significance level (P) is higher than 0.05 in each case.

The following analysis involves the correlation between changes in the wage efficiency indicator and macroeconomic indicators. It is expected that the development of the wage efficiency indicator is mostly influenced by the change in employment rate and minimum wage. Results of the analysis are shown in the table below:

Table 8. Result of a random effect linear panel regression, in the case of the wage efficiency indicator as an independent variable

	Coef.	*Std. Err*	*z*	*P > |z|*	*[95% Conf. Interval]*	
Year	-.3166752	.388239	-0.82	0.415	-1.07761	.4442593
Change of inventories	-.0008213	.0005508	-1.49	0.136	-.0019008	.0002582
Gross fixed capital formation	-.000201	.0001414	-1.42	0.155	-.000478	.0000761
Productivity	-.0064857	.1035711	-0.06	0.950	-.2094813	.1965099
Employment	.1939514	.2382395	0.81	0.416	-.2729895	.6608922
Minimum wage	-.162348	.0953248	-1.70	0.089	-.3491812	.0244851
_Cons	637.7611	772.7592	0.83	0.409	-876.8191	2152.341
R^2	0.1764					
Correlation	0.42					

Source: Own editing based on the data calculated by the Stata statistical software

In this case, macroeconomic indicators are the independent variables, while the wage efficiency indicator is the dependent variable. Since the correlation value is again between 0.2 and 0.7 (it is exactly 0.42), it can be concluded that there is a moderately positive correlation between the variables. As shown by Table 8, based on the results of the regression, none of the macroeconomic indicators influences the efficiency indicator of inventories, as the significance level (P) is higher than 0.05 in each case. However, it is important to point out that the minimum wage is close to the 0.05 threshold of the level of significance.

The following analysis involves the correlation between changes in the complex efficiency indicator and macroeconomic indicators. Results of the analysis are shown in the table below:

Table 9. Result of a random effect linear panel regression, in the case of the complex efficiency indicator as an independent variable

	Coef.	*Std. Err.*	*z*	*P > |z|*	*[95% Conf. Interval]*	
Year	.0203241	.1211841	0.17	0.867	-.2171924	.2578406
Change of inventories	-.0003091	.0001753	-1,76	0.078	-.0006528	.0000346
Gross fixed capital formation	-.000052	.0000435	-1.20	0.232	-.0001372	.0000332
Productivity	.0657911	.0329722	2.00	0.046	.0011667	.1304154
Employment	.2054489	.0731304	2.81	0.005	.062116	.3487818
Minimum wage	.3363211	.0303093	11.10	0.000	.276916	.3957261
_Cons	-51.97568	241.308	-0.22	0.829	-524.9307	420.9793
R²	0.1296					
Correlation	0.36					

Source: Own editing based on the data calculated by the Stata statistical software

Table 9 shows the analysis, where macroeconomic indicators are the independent variables, and complex efficiency indicator is the dependent variable. The correlation value is again between 0.2 and 0.7 (it is exactly 0.36), thus it can be concluded that there is a moderately positive correlation between the variables. Based on the results of the regression, some of the macroeconomic indicators influence the complex efficiency indicator as their level of significance (P) is lower than 0.05.

Wage minimum, followed by employment rate and productivity had the greatest impact on the development of the complex efficiency indicator.

It is interesting to note that macroeconomic indicators do not affect efficiency indicators that only express the efficiency of a single factor. In contrast, in a complex sense, development of certain macroeconomic indicators influences the development of the complex efficiency indicator. It can be observed that work-related indicators primarily influence the development of the complex efficiency indicator. Therefore, it is considered justified to examine which of the efficiency indicators is most correlated to the development of the complex efficiency indicator. The results of the analysis are presented in the following table:

Table 10. Result of a random effect linear panel regression, in the case of the complex efficiency indicator as a dependent variable and other efficiency indicators as independent variables

	Coef.	*Std. Err.*	*z*	*P > |z|*	*[95% Conf. Interval]*	
Year	.44774	.0791101	5.66	0.000	.2926871	.6027928
Efficiency of inventories	.0023089	.0032906	0.70	0.483	-.0041406	.0087584
Efficiency of tangible assets	.0000553	.0008921	0.06	0.951	-.0016932	.0018038
Wage efficiency	.0683034	.0232862	2.93	0.003	.0226633	.1139434
_Cons	-900.3086	159.5042	-5.64	0.000	-1212.931	-587.6861
R²	0.0784					
Correlation	0.28					

Source: Own editing based on the data calculated by the Stata statistical software

Table 10 shows the analysis, where other efficiency indicators are the independent variables, and complex efficiency indicator is the dependent variable. The correlation value is between 0.2 and 0.7 (it is exactly 0.28), thus it can be concluded that there is a moderately positive correlation between the variables. Based on the results of the regression, it can be established that the development of the complex efficiency indicator is mostly influenced by the development of the wage efficiency indicator. Level of significance of the wage efficiency indicator is lower than 0.05. Based on the results of the previous analysis, it was concluded that macroeconomic indicators, and in particular work-related indicators, only affect efficiency at a complex level. Therefore it was expected that the wage efficiency indicator would be the main influencing factor of the complex efficiency indicator.

5. DISCUSSION

Present research may raise further research questions. In the future, it would be worth analysing the efficiency of companies in the analysed countries broken down by country. In this way, based on the findings of the research, it will be possible to compare the efficiency indicators of companies operating in each country. Then, the correlation between the efficiency of companies in the analysed countries and the country-specific macroeconomic indicators can be examined and compared across countries.

In addition, in the future, an interesting questions might be raised about the effect of the specifics of the IFRS accounting system and the characteristics of companies operating in the health care sector on the performed efficiency analysis. In order to compare sectors, it would be worthwhile to repeat the performed analyses for companies operating in other sectors.

The development of efficiency ratios may depend to a large extent on the applied accounting system, since individual accounting systems may differ significantly in terms of the presentation and measurement rules of each entry. In our current study, the most important question or uncertainty in terms of the obtained results is caused by

the calculations related to personnel expenses. There is no separate standard in IFRS that specifically regulates the accounting of personnel expenses, therefore it is difficult to judge which items are included in the profit and loss accounts of the companies and which are not. In IFRS, only the IAS 19 – Employee Benefits standard addresses all wage-like expenses, but this standard does not deal with the regulation of all personnel-related expenses. Consequently, it can be concluded that the efficiency of companies using different accounting systems may vary significantly.

6. CONCLUSION

In the course of the research, on the one hand, the efficiency of companies operating in the health care sector was examined. In the scope of the efficiency analysis, efficiency indicators of tangible assets, inventories of the companies and their wage efficiency and complex efficiency indicators were calculated. With some fluctuations, the efficiency indicator of tangible assets shows an increase by the end of the analysed period compared to its beginning. The efficiency indicator of inventories is constantly increasing during the studied period. In contrast, the wage efficiency indicator shows a declining tendency over the 5 year period. Overall, the complex efficiency indicator shows a decrease. As it is a complex indicator, it is difficult to determine exactly which factor influences the value of the indicator the most.

The other part of the present research was to examine the correlation between efficiency indicators and macroeconomic indicators. The analysis was performed utilizing the Stata statistical system using a random linear panel regression model. According to the results of the analyses, the development of tangible asset efficiency, inventory efficiency, and wage efficiency are not influenced by the changes of any macroeconomic indicator. In contrast, the complex efficiency indicator is influenced by the changes in wage minimum, employment rate, and productivity, as the level of significance level in each case is lower than 0.05. Based on that, it can be concluded that macroeconomic indicators do not influence the development of efficiency indicators if the indicator examines the efficiency of a single factor only. In contrast, analysed at a complex level, certain macroeconomic indicators have an impact on efficiency. In close connection with this, we examined which efficiency indicator has the most significant correlation with the development of the complex efficiency index. According to the results of the study, only the development of the wage efficiency index is related to the development of the complex efficiency index.

The efficiency of companies operating in the health care sector can be greatly affected by the specificities of the IFRS accounting system. The most important factor in the development of efficiency indicators is revenue, since it is included in all indicators. According to IFRS 15 standard, development of revenue can be affected if there is a right of withdrawal or a warranty commitment on the products of a company. In accordance with the provisions of the IAS 2 standard, valuation at net realizable value might affect the development of the inventory efficiency indicator, which primarily changes together with the change of market value. As for the tangible asset efficiency indicator, the most important factor is the fair value model, which is applied in the case of investment property. In accordance with the IAS 40 standard, properties should be constantly recorded at market value, so that changes in their market value may have a significant effect on the value of the indicator. In summary, it can be stated that the development of efficiency indicators can also be influenced by the applied accounting system.

Our research questions and examinations focused exclusively on effectiveness. We did not have to possibility to deal with the analysis of profitability, wealth or financial situation in the present article. In our opinion, it would be worthwhile researching and examining these areas as well in the future, since each field of analysis has a different basis of reference.

In an article published earlier, we compared a company operating in the health care sector and one operating in the telecommunications sector. It was an important consideration in terms of the selection process that their consolidated financial statements should be prepared in accordance with IFRS. The intangible assets of the two examined companies were compared, highlighting the characteristics of the industry and the accounting properties of IFRS. In contrast, our current research is limited to companies in the health care sector.

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