
Competitive Advantage in Co-operation of Enterprises Using Kaizen Costing Concept in Times of Extraordinary Dangers

Submitted 01/10/21, 1st revision 26/10/21, 2nd revision 12/11/21, accepted 30/11/21

Aneta Ejsmont¹, Magdalena Majchrzak², Jacek Grzywacz³

Abstract:

Purpose: The main aim of the study is to examine empirically the possibility of the impact of the use of the concept of kaizen costing by enterprises on shaping a competitive advantage in crisis conditions in the process of creating cooperation with other economic entities from several countries.

Design/ Methodology/Approach: A logarithmic model was used in the research. Authors test the influence of selected explanatory variables on the dependent variable which is the company's market value.

Findings: The data used to build the econometric model come from the website of the Warsaw Stock Exchange, 400 companies in the form of joint stock companies were analyzed. The paper examined the greatest impact of such explanatory variables as sales revenues, other operating income, profit (loss) from operations, profit (loss) gross, assets, equity of the shareholders of the parent entity, core capital, long-term liabilities, short-term liabilities, financial flows, net cash flow and earnings before interest, taxes, depreciation and amortization (EBITDA) on the market value of enterprises cooperating with other companies and also using the kaizen costing concept in the face of the coronavirus pandemic. The data used in the research cover from the first quarter of 2020 to first quarter of 2021.

Practical implications: The assembled empirical evidence shows that in times of extraordinary global dangers of survival and gaining a competitive advantage and, consequently, increasing the company's market value as a result of establishing cooperation, the use of recommendations resulting from the kaizen costing concept may be favorable.

Originality/ Value: The paper contains an original study of a representative group of a group of companies of various sizes. The above variables positively determined the market value of 400 listed companies. This dependence was also confirmed by the high value of the coefficient of determination $R^2=92\%$, as well as very low p-values.

Keywords: Market value, competitive advantage, co-operation, concept of kaizen costing.

JEL codes: D40, E30, G32, O31, P49.

Paper type: Research article.

¹Corresponding author, Assoc. Prof., Kazimierz Pulaski University of Technology and Humanities, Faculty of Economic and Finance, Radom, Poland, ORCID-0000-0002-7320-2274, a.ejsmont@uthrad.pl;

²Assoc. Prof., Warsaw University of Technology, ORCID-0000-0002-0936-4519, Magdalena.Majchrzak@pw.edu.pl;

³Professor, Institute of Corporate Finance and Investment, Collegium of Business Administration, Warsaw School of Economics, ORCID-0000-0003-3127-9684, jacekgrzywacz@wp.pl;

1. Introduction

The production of goods or the provision of services as the essence of business activity is the basis for generating profit by meeting the needs of consumers. From a financial point of view, the goal of both smaller and larger enterprises is to increase their market value in the medium and long term. The above variable is related to the broadly understood competitiveness, meaning the ability to achieve or maintain a competitive advantage (Gorynia and Banaszyk, 2020), which reflects the potential of each company, regardless of its size, additionally increased by the cooperation aspect. Competitiveness is therefore a multidimensional feature of an enterprise cooperating with other economic entities, both resulting from its internal characteristics and related to the ability to adapt to changes taking place in the environment. It is a feature that distinguishes the ability of a given economic unit to undertake such activities that ensure its stable and long-term development and contribute to building market value in the context of cooperative relations (Walczak, 2010).

However, in the face of threats caused by, for example, the coronavirus pandemic, this value shows a downward trend, especially in relation to the smaller size of economic entities. The spread of the SARS-CoV-2 virus calls into question the future of the sector of both micro, small and medium-sized and large enterprises. Admittedly, large companies are less important for the economy in terms of generating GDP and employment, nevertheless, in the face of the pandemic, all enterprises are exposed to all negative economic changes.

In times of extraordinary global threats, survival and gaining a competitive advantage as a result of establishing cooperation may be supported by the use of recommendations resulting from the concept of kaizen costing. There are many theories in the world literature explaining the sense of implementing this concept of management in both industrial and service enterprises. Due to globalization and fast developing technologies, enterprises are under consistent pressure to produce quality products or provide high-quality services and facing challenges to lessen various costs during conversion of raw material to finished product or in the process of providing services (Arya and Jain, 2014).

So, many firms are continuously training their employees for optimizing productivity and quality using lean tools and techniques which would help them to minimize that costs across the organization (Dhingra *et al.*, 2019). Heads of organizations using the kaizen costing concept should benefit from creating a favorable context for the birth and growth of internal cooperation, which is understood to be the ability to create and innovate on the part of the whole company, which is made up of its employees (Akehurst *et al.*, 2009).

The aim of the article is to present the possibility of adapting the concept of kaizen costing to the analytical instruments of economic sciences, with the intention of

using in practice the functioning of modern enterprises that, wanting to be competitive, to a greater or lesser extent cooperate with other economic entities. Therefore, the essence of the research conducted in this article is the analysis of the activities of companies cooperating with other economic entities from such countries as Poland, Great Britain, USA, Bulgaria, Ukraine, Cyprus, Switzerland and the Netherlands.

The research uses a logarithmic econometric model, which adopts the influence of such explanatory variables as: sales revenues, sales profit / loss, other operating revenues, operating profit / loss, gross profit / loss, net profit / loss for shareholders of the entity, dominant entity, assets, equity of the parent entity's shareholders, share capital, long-term and short-term liabilities, operating flows, financial flows, net cash flows and EBITDA on the dependent variable, which in this case is the market value determining the company's position and competitive advantage on the market.

In particular, the impact of the explanatory variables described above on the market value of enterprises cooperating with other economic entities, while also applying the kaizen cost concept in the face of the coronavirus pandemic, is investigated. The data used in the research cover Q1 2020 - Q1 2021. The accumulated empirical evidence shows that the use of the kaizen cost concept by companies that establish cooperation with other economic entities in times of extraordinary global threats becomes beneficial in terms of gaining a competitive advantage by them, and thus increase in their market value.

This paper is structured as follows. In the first-introductory part, the research issues are outlined and the aim of the article was formulated. In Section 2, authors provide the literature review of an activity of firms cooperating with other economic entities and using the kaizen costing concept. In Section 3, is presented the model specification and data. In that part of an article are described the definitions and sources of main explanatory variables and discuss the statistical methodology. In Section 4, the authors reports her empirical results. The summary of the main findings and potentially fruitful future research avenues are located in the concluding section.

2. Literature Review

Globalization and the threats it entails make enterprises search for previously undiscovered market niches. The coronavirus pandemic almost forces entrepreneurs to take an innovative approach to doing business based on digitization and digitization. Remote work as well as limited customer access to the company's headquarters encourage the introduction of innovative solutions both in the service and production process. Thus, enterprises, cooperating with other economic entities, are constantly looking for effective and innovative management methods in order to increase their competitive advantage, the main determinant of which is the position

on the international market. Then a company can be considered competitive if its activities lead to an increase in its market value.

In the literature, there are many concepts, both classic and new, relating to the essence of competitive advantage in the activities of enterprises. Although from the point of view of broadly understood cooperation of business entities, an attempt to gain an advantage on the market by a specific company may be difficult, companies prefer to compete with each other, as opposed to establishing cooperation, although in times of extraordinary global threats (i.e., in the era of the coronavirus pandemic), companies in order to fight for survival, they should even cooperate with other economic units.

Contemporary market conditions more and more often encourage enterprises to establish various forms of cooperation with external entities in order to gain an additional competitive advantage (Poznańska, 2009). This fact is confirmed by the analysis of world literature devoted to the search for positive relationships between competitive advantage and cooperation between enterprises.

According to Philip Kotler's definition, a competitive advantage is an advantage of an organization, especially a specific economic unit, over competitors, which results from offering products or services at lower prices than competitors, or providing greater benefits justifying offering higher prices as opposed to other companies (Kotler and Armstrong, 2018). According to Michael Porter, one of the most prominent marketing experts on the world market, it is based on a matrix containing three main competition strategies. They are cost leadership, differentiation and focus (Porter, 1998).

Cost leadership is a strategy that is about gaining an advantage by minimizing direct and overhead costs. The essence of the strategy is to reduce costs based on the possessed experience, control and optimization. The idea of the strategy of diversification focuses on the process of producing products or services that will be perceived as unique in the industry. The strategy of concentration focuses on a specific segment, i.e. on a specific group of buyers, product lines or geographic market. It is based on a carefully selected goal, while cost leadership and differentiation seek to achieve goals across the sector (Porter, 1998).

So, Porter defines the competitiveness of a location as the productivity that companies can achieve. He uses this definition of competitiveness to understand the drivers of sustainable economic prosperity at a given location (Ketels, 2006). Productivity is the stem of Porter's definition of competitiveness reached by a company. It takes the central role because productivity is the key factor of the prosperity a location which can sustain over time and the economic growth differences (Porter, 2004).

Competitive advantage could be relating to Ricardian comparative advantage and then to domestic resource costs, too (Siggel, 2006), according to which if two countries have relative capacities to produce two goods reflecting their comparative production costs, then both benefit as they each specialize in producing a good whose costs are comparatively lower and selling its surplus in excess of domestic demand in order to obtain a second good from its business partner (Acocella, 1998).

According to the Ricardian trade model, competitive advantage is the same as cost competitiveness (Siggel, 2006). David Ricardo's theory explaining the essence of competitive advantage, referring to comparative advantage, thus refers to the benefits of cooperative relations between enterprises. An example of this type of relationship are, for example, clusters. According to Porter's studies, firms located in regional clusters of industries enjoy high levels of international competitiveness. This competitiveness is due to a variety of positive feedbacks and spillovers which individual companies enjoy due to the activities of other firms in the cluster, where there are both small and large companies (Porter, 1990; Weder and Grubel, 1993).

In developed market economies, clusters create to improve the competitiveness of businesses that produce homogeneous goods for commodity markets, based on concurrent economic interests (Mal'tseva and Galeev, 2013). The competitive advantage in clusters is created by increased competition, improved access to resources for the companies and specialized suppliers. The geographic proximity of many companies from the same economic sector leads to voluntary and involuntary, formal and informal channels that stimulate knowledge transfer in particular between companies in the cluster region which leads to increasing of their market value (Schröder, 2014).

Therefore, the cluster creates perfect conditions for tightening business cooperation (in various areas) and development. However, it depends on the will of the companies, their mutual trust and relationship (Coughlin, 1985). The cluster is created for a mutual benefit that could not be achieved by any individual vendor (Dyer and Singh, 1998).

According with a theory of duality, small firms indirectly compete with the large entities in terms of capturing market niches, but directly they cooperate with each other (Audretsch *et al.*, 1999). Relationship between cooperation and competition effectively could capture the reciprocally interplay between them at the global area (Ricciardi *et al.*, 2021). Interfirm cooperation and relational networks allows firms to specialize in core businesses, to outsource value-chain stages, to act more quickly than competitors, and try to achieve a competitive advantage (Wong, 2011; Zakrzewska-Bielawska, 2019). Additionally, profitability of certain forms of cooperation (in this case, alliances and mergers) as strategic substitutes for entrepreneurial firms has good effect on the cost-cutting advantage. In general, given the number of firms in the global market, an alliance is preferred when the cost-cutting achieved is large and a merge or acquire when it is low (Antelo and Peón,

2019). Mergers and restructuring activities increase the value of firms. Although, the high rates of merger activity do not increase concentration levels (Weston, 2001).

Outsourcing is another form of cooperation, in this case - non-capital cooperation. Enterprises cooperating with each other as part of this type of cooperative relationship also strive to gain a competitive advantage. Outsourcing decisions could be mainly driven by the search for cost-cutting (Gilley and Rasheed, 2000; Jiang and Qureshi, 2006). Outsourcing can allow significant cost reductions either because the supplier can achieve a higher productivity (Cerruti, 2008).

Competitive advantage combined with cooperation is expected to produce entrepreneurship and innovation dynamics. Because integration lowers the costs of doing business, firms have to decide on new ways of outdoing their rivals and conceive adequate competitive strategies (Cojanu, 2006).

Nevertheless, as of the end of the twentieth century, firms have been facing a new economic environment that is evolving towards the globalization of markets and therefore towards the integration of the various domestic economies. It is foreseeable that the integration of the various domestic economies into a single market will have a direct consequence on firm profits due to an easing of the barriers that protect the markets in which domestic firms operate.

This is being driven by the new information technologies that allow the distances between countries to be reduced and allow greater knowledge to be obtained about other countries, which could affect on consumer needs to be homogenized. By giving rise to broader markets, this process of integration will generate competitive dynamics to which firms will progressively adapt and build their market value (Alcalde-Fradejas *et al.*, 2003). The volume of capital flows plays an important role in the process of building that value, acting alternative measure of the degree of the integration not only from an economic but also financial perspective. Thanks to that value, as markets become more integrated, asset prices often adjust in anticipation of capital flows that would otherwise occur (Lemmen and Eijffinger, 1996).

In the face of the coronavirus pandemic, gaining a competitive advantage by companies cooperating with each other in relation to other economic entities becomes possible thanks to the implementation of the kaizen costing concept, referred to as the cost of continuous improvement. It is treated as a tool of a strategic approach to the continuous reduction of the costs of running a business.

General concept of kaizen originated in Japan in 1950 when the management and government acknowledge that there was a problem in the current confrontational management system and a pending labor shortage. Japan sought to resolve this problem in cooperation with the employees. The main focus was on the labor contracts championed by the government and was taken up by most major companies, which introduced lifetime employment and guidelines for distribution of

benefits for the development of the company. This contract remains the background for all kaizen activities providing the necessary security to ensure confidence between employees (Brunet, 2000). First, it was been introduced and applied by Imai in 1986 to improve efficiency, productivity and competitiveness in Toyota, a Japanese carmaker company. Since then, kaizen has become a part of the Japanese manufacturing system and has contributed enormously to the manufacturing development (Ashmore, 2001).

Currently, many companies, both production and service, use this concept in order to achieve a competitive advantage characterized by the implementation of the process of optimizing the costs of running a business. Thanks to this, companies are able to survive on the market despite the global threat, which is the continuous SARS-CoV-2 pandemic in conjunction with other economic entities.

Kaizen costing focuses on the market value and profitability of the manufacturing phase, both of new and existing products and services. Kaizen costing activities should be a part of a process of business improvement continuously, with improvements in quality, product functionality and service jointly. Kaizen costing provides a basis of the total life-cost management, managing cost throughout both the product life cycle and service life cycle (Williamson, 1997).

According to this concept, companies use group improvement practices defined as a new production philosophy integrated to TQM (a type of quality management philosophy based on continuous diagnosis and improvement of all elements of the enterprise) programs and is based in the introduction of continuous and permanent improvements in the production processes (Matusiak, 2011; Façanha and Resende, 2010). Kaizen costing is a concept, which helps to enhance efficiency by reducing operating expenses and wastages. Based on the strategic objectives of the foreign and domestic private investors' of maximizing the value of their shares and developing the long term business ties, it is expected that it has a positive impact on the profitability of the firms and their market value (Ullah, 2017).

The literature review contained in this article confirms the role of competitive advantage in the activities of enterprises in the time of the coronavirus pandemic, which additionally establish cooperation with other economic entities of various sizes. The common denominator of the activity of the surveyed business entities is the fact that they apply the concept of kaizen costing.

3. Data Sources and Statistical Methodology

The financial data presented in the article constitute the basis for the construction of the econometric model. In this case, it becomes important to assess the significance of the influence of individual explanatory variables on the dependent variable. The selection of variables for the model is made on the basis of the use of the correlation matrix, which is a mathematical tool used to precisely determine the degree of

matching of these variables. The use of exploratory analysis of data provided by the Stock Exchange and the NewConnect market is based on demonstrating the existence or absence of autocorrelation between the studied variables adopted in the estimated model (Santos and Vieira, 2020).

3.1 Data Description

The data used to build the econometric model come from the website of the Warsaw Stock Exchange. 400 companies in the form of joint-stock companies were analyzed, of which 252 are large entities operating on the WSE Main Market, the rest are small and medium-sized companies developing their activity on the NewConnect market, financing the development of SME sector enterprises with high growth potential. The data covers the period from Q1 2020 to Q1 2021. The surveyed economic entities conduct business activity in almost all industries, except for such as: banks, games, internet portals, internet commerce, leasing and factoring, media, advertising and marketing, real estate and their sale and rental, health care, recreation and leisure, sports and sports clubs, travel agencies, stock exchanges and brokerage houses, capital market, retail chains, hospitals and clinics, insurance, receivables, hotels and restaurants, publishing houses, asset management.

The headquarters of the analyzed enterprises are located in such countries as: Poland, Great Britain, the United States, Bulgaria, Ukraine, Cyprus, Switzerland and the Netherlands. For this reason, the econometric model used in the article is also spatial. Additionally, spatial econometrics becomes very important in the context of research on the impact of the concept of kaizen costing on the competitiveness of enterprises in the time of the coronavirus pandemic (Anselin, 1988). All the more so, the focus on spatial interaction has gained enormous importance in econometrics (Anselin, 2003). The common feature of the surveyed business entities is the fact that they conduct their business activities based on the concept of kaizen costing. In order to be competitive, they try to cooperate effectively with other economic entities.

3.2 Model Specification

Model describes a continuous response variable as a function of one or more predictor variables. They can help potential investors understand and predict the behavior of complex systems or analyze financial data. Due to the above, the most important stage in building a model is determining the purpose of the study. Its precise formulation should lead to the proper selection of both the explained variable and the explanatory variables. In the presented model, the authors assumed the market value of the analyzed joint-stock companies as the dependent variable, the common feature of which in the pursuit of competitive advantage is the use of the kaizen costing concept.

Selected financial data of the researched economic entities were adopted as explanatory variables. In order to thoroughly examine the impact of individual parameters of the financial condition of companies on their market value, the authors adopted the following explanatory variables: x_1 – sales revenues, x_2 – profit / loss on sales, x_3 – other operating income, x_4 – profit / loss on operating activities, x_5 – gross profit / loss, x_6 – net profit / loss for the shareholders of the parent company, x_7 – assets, x_8 – equity of the shareholders of the parent entity, x_9 – share capital, x_{10} – long-term liabilities, x_{11} – short-term liabilities, x_{12} – operating flows, x_{13} – financial flows, x_{14} – net cash flows, x_{15} – EBITDA.

The financial data of selected joint-stock companies constitute a knowledge base about their financial condition. It becomes obvious that they are used by business owners who analyze the obtained financial results. Competitive companies also benefit, trying to carefully observe the results of the opponent, but also investors making decisions on further investment opportunities on this basis. The components of financial statements selected for the study are also the basis for the construction of an econometric model in which they play the role of regressors, having a greater or lesser impact on the dependent variable, which is assumed to be the market value of a specific joint-stock company.

4. Empirical Results

The estimation of the parameters used in the econometric model is carried out by the authors using the classical method of the least squares. The model building process using Gretl software is based on panel data (two units of cross-sectional data were included in the model). The research sample consists of 400 joint-stock companies from different parts of the world characterized by various financial results having a more or less significant impact on the market value achieved by them (time series = 200).

The presented descriptive statistics clearly show that the average market value of the surveyed joint stock companies in the period from Q1 2020 to Q1 2021 was PLN 75.65 million (it was about € 16.48 million). The median value indicates the fact that taking into account the above-mentioned market value, sales revenues, sales profit or loss, other operating revenues, operating profit or loss, gross profit or loss, net profit or loss for the shareholders of the parent company, equity of the parent company's shareholders, share capital, long-term and short-term liabilities, operating flows and EBITDA, the financial results obtained were higher than the median of large joint-stock companies whose shares are listed on the Stock Exchange, as opposed to the results of smaller units whose shares are listed on the NewConnect market.

In the case of financial flows and net cash flows, the opposite was true, in the case of smaller economic entities, the obtained results were higher than the median. When analyzing the standard deviation, all the values of the variables are higher compared to the arithmetic mean, which proves that they are less concentrated around the mean. Additionally, the basic descriptive statistics prepared confirm the fact that the coefficients calculated for all variables are within the assumed confidence intervals.

4.1 Correlation Significance Study

Another tool used in the process of estimating the econometric model, which is the correlation, allows for a quantitative assessment of the relationship between the explained variable and the explanatory variables. The analysis of the data concerning the examination of the correlation between the variables shows that the set of regressors used in the constructed model is not strongly correlated with each other.

The variable x_{14} is negatively correlated with other explanatory variables. This is due to the fact that in 54% of the joint stock companies the net cash flow was negative, which proves that in the entire period under review the companies did not manage to generate cash from their core business. The main cause was the coronavirus pandemic freezing the economies of individual countries, especially at the turn of March and April 2020. In addition, significant cash resources were allocated to the repayment of previously taken investment loans.

The variable x_{13} is negatively correlated with the variable Y , which was also caused by the fact that 66% of the analyzed enterprises recorded negative values of financial flows as a result of SARS COVID 19. In turn, the variable x_{15} is negatively correlated with the variable x_{14} , as 78% of companies recorded positive EBITDA, as opposed to net cash flow, generating high profits without taking into account depreciation as a cost that is not an expense on the cash register and the amount of interest depending on the method financing of the company's assets. The remaining variables are positively correlated with each other.

4.2 Stages of the Econometric Model Estimation Process

The sample size of $n = 400$ in conjunction with the p-values calculated for individual variables indicates other relationships. The estimation of the model showed that in terms of p-value, the explanatory $x_1, x_3-x_5, x_7-x_{11}, x_{13}-x_{15}$ has the highest influence on the significantly affecting the variable Y . The results of the final estimate of the econometric model are presented in Table 1. In the econometric model estimated by the authors, the p-value is below the level of 0.01, therefore it should be assumed that the market value of a company is most influenced by sales revenues, other

operating revenues, operating profit or loss (68% of the surveyed companies showed profit), gross profit or loss (67% of the analyzed business entities also showed profit), assets, equity of the shareholders of the parent entity (in 92% of the surveyed companies the capital was positive), share capital, 79% of short-term liabilities exceeded long-term liabilities, cash flows, net cash flows and EBITDA.

Table 1. Model estimation. Panel MLS with using of 400 observations (included 2 units of the cross-sectional data). Time series of length = 200. Dependent variable Y

| | Coefficient | Standard error | T- Student | p-value |
|---|--------------|----------------|--|--------------|
| const | 221.307 | 73.6858 | 3.003 | 0.0028*** |
| x1 | 0.00138840 | 0.000193549 | 7.173 | 3.75e-012*** |
| x3 | 0.00923982 | 0.00188549 | 4.900 | 1.41e-06*** |
| x4 | 0.0415964 | 0.00460294 | 9.037 | 7.80e-018*** |
| x5 | -0.0308121 | 0.00387581 | -7.950 | 2.07e-014*** |
| x7 | -0.00210874 | 0.000443687 | -4.753 | 2.83e-06*** |
| x8 | 0.00291600 | 0.000505366 | 5.770 | 1.62e-08*** |
| x9 | -0.000963757 | 0.000135975 | -7.088 | 6.50e-012*** |
| x10 | 0.00275558 | 0.000413905 | 6.658 | 9.56e-011*** |
| x11 | 0.00220404 | 0.000506622 | 4.350 | 1.74e-05*** |
| x13 | -0.0201222 | 0.00169505 | -11.87 | 6.25e-028*** |
| x14 | -0.00262400 | 0.000487819 | -5.379 | 1.30e-07*** |
| x15 | -0.0237497 | 0.00152301 | -15.59 | 6.92e-043*** |
| Arithmetic average of dependent variable | | 1102.231 | Standard Deviation of dependent variable | 4944.938 |
| Sum of square | | 7.48e+08 | Standard error of residuals | 1390.110 |
| Coefficient of determination R ² | | 0.923350 | Corrected R ² | 0.920973 |
| F(12,387) | | 388.4914 | P-value for F test | 2.3e-207 |
| Credibility Logarithm | | -3455.823 | Akaike Information Criterion | 6937.645 |
| Bayesian Information Criterion | | 6989.534 | Hannan-Quinn Information Criterion | 6958.194 |
| Autocorrelation of residuals - rho1 | | 0.027965 | Durbin-Watson (DW) Statistic | 1.942757 |

Source: Own elaboration

Admittedly, the analysis of the correlation matrix showed that the explanatory variables describing such financial data as financial flows, net cash flows and EBITDA are negatively correlated, although the positive values of the EBITDA index recorded in most of the analyzed companies compensate for the negative values of financial flows and net cash flows. Therefore, further model estimation and the critical p-values that characterize these variables confirm the fact that they should not be rejected.

When estimating the econometric model, the authors carried out the necessary tests to evaluate the presented model. One of the tests is to verify the significance of the R² determination coefficient, which describes the degree of fit between the model and empirical data. In the estimated model, R² = 0.923350, which means that as much as 92% of the given explanatory variables enter the trend line, only 8% of the variation in Y is not explained by the linear regression. The corrected coefficient of determination R² in the estimated model is 0.920973, which also confirms the fit of the model to the analyzed data.

In order to verify the assumption of statistical significance of the studied variables, assuming a relatively high R^2 level of 92%, the Fischer test had to be performed as well. In this case, the significance of F was $2.3e-207$, and the significance of F is 388.4914. Therefore, the hypothesis assuming that the explanatory variables x_1 , x_3 - x_5 , x_7 - x_{11} , x_{13} - x_{15} do not positively affect the market value of the joint stock companies under research, which is also confirmed by the p value calculated for the F test, amounting to $2.3e-207$, should be rejected.

In addition to the t-Student test and the chi-square test, which will be analyzed later in the article, the model estimation process uses the Akaike Information Criterion, Bayesian Schwarz information criterion and Hannan-Quinn. The Akaike criterion is a coefficient that takes into account the effect of an excessive number of explanatory variables on the decrease in the sum of squared residuals. Assuming this criterion, the inclusion of an additional explanatory variable is advisable when AIC decreases.

The AIC and HQC information criteria depend on the residual sum of squares. In the presented model it was $7.48e + 08$. The estimation results confirmed the fact that the inclusion of an additional variable increases both the AIC, SBC and HQC criteria. Taking into account, in turn, the standard error, otherwise - the standard deviation of the theoretical distribution from the sample, when estimating the dependent variable Y, it should be emphasized that the authors, when building the econometric model, made a mistake on average by 73.6858 units.

4.3 Selected Tests Carried out for Explanatory Variables

In the process of estimating the econometric model, the authors conducted several important tests. The power analysis of the test for non-linearity (squares) clearly shows that in the estimated model $p < 0.01$, the obtained results indicate rejection of the null hypothesis H_0 assuming that the model is linear in favor of the alternative hypothesis H_1 confirming the logarithmic structure of the estimated model. By carrying out the test for the normality of the distribution of residuals, the authors also showed that the random component does not have a normal distribution.

In the conducted White's test for heteroscedasticity of residuals (variability of residual variance), the null hypothesis that in the model estimated by the authors of the model no heteroscedasticity did not occur, and the alternative hypothesis to the null hypothesis should be verified. In this case, the obtained test results also showed that $p < 0.01$, so the null hypothesis had to be rejected in favor of an alternative hypothesis confirming that the residual heteroscedasticity is present in the model constructed by the authors. The results of the Wooldridge autocorrelation test for panel data confirmed, in turn, that in the estimated model the p value is quite high ($p = 0.171641$), therefore it is higher than $\alpha = 0.01$, $\alpha = 0.05$ and even higher than $\alpha = 0.10$. Thus, the null hypothesis of no first-order autocorrelation should have been assumed.

The Durbin-Watson autocorrelation test involves the verification of two hypotheses: $H_0: \rho=0$ and $H_1: \rho>0$. The statistics of the Durbin-Watson test for the 5% significance level, where the number of observations is $n = 400$, and the model is estimated for the explanatory variables $x_1, x_3-x_5, x_7-x_{11}, x_{13}-x_{15}$ characterized by the following parameters: $dL = 1.7744$ and $dU = 1.8979$. That statistics, like the Wooldridge test, confirms the lack of autocorrelation. Referring to the above considerations, the econometric model estimated by the authors is a logarithmic model. This relationship is presented in the following formula:

$$Y = \alpha_0 + \alpha_1 \ln x_1 + \alpha_3 \ln x_3 + \alpha_4 \ln x_4 + \alpha_5 \ln x_5 + \alpha_7 \ln x_7 + \alpha_8 \ln x_8 + \alpha_9 \ln x_9 + \alpha_{10} \ln x_{10} + \alpha_{11} \ln x_{11} + \alpha_{13} \ln x_{13} + \alpha_{14} \ln x_{14} + \alpha_{15} \ln x_{15} + \varepsilon_t$$

where:

Y- the dependent variable defined as the level of sustainable development of production enterprises, measured by the gross value added in industry,

$x_1, x_3-x_5, x_7-x_{11}, x_{13}-x_{15}$ - explanatory variables examining the impact on the market value of joint-stock companies,

$\alpha_0, \alpha_1, \alpha_3-\alpha_5, \alpha_7-\alpha_{11}, \alpha_{13}-\alpha_{15}$ - model parameters,

ε_t – random component.

Due to the fact that the impact of sales revenues, other operating revenues, operating profit or loss, gross profit or loss, assets, equity of the parent company's shareholders, share capital, long and short-term liabilities, cash flows, cash flows is examined net and EBITDA on the market value of the analyzed listed companies, therefore, the built model was taken from the Cobb-Douglas production function. This function significantly links the studied explanatory variables with the dependent variable.

4.4 Econometric Prediction Made on the Basis of the Estimated Model

The next step in the process of econometric model estimation is making forecasts. In the presented article, the authors make forecasts indicating an increase or decrease in the dependent variable. In the analyzed case, the econometric model takes into account the impact of individual explanatory variables that have been characterized above on the market value of 400 listed companies, being a more or less faithful reflection of the reality under study.

The constructed and comprehensively verified single-equation econometric model becomes a useful tool to analyze the relationship between the variables included in the model in the period from which the statistical data were derived to estimate the parameters of the estimated model. Additionally, the same econometric model can be the basis for forecasting the value of the dependent variable. In connection with the above, it can be assumed that forecasting is the last and, at the same time, the

most demanding test that can be subjected to the constructed econometric model (<http://www.ekonometria.4me.pl/prognozowanie-ekonometryczne-etapy/>).

While forecasters may wish to use as much information as possible to increase the accuracy of their forecasts, the estimation of models with a large number of different panel data sometimes causes huge technical difficulties. As the number of parameters to be estimated quickly becomes very large and the estimation even becomes infeasible (Pirschel and Wolters, 2018). The common feature of the quoted considerations on the essence of forecasting is that the forecast is a kind of judgment based on the future, although it does not take into account only the time period.

On the basis of certain statistical data, it is possible to approximate the future relating to the studied economic phenomena (Klaassen and Pawlowski, 1981). Due to the fact that the econometric model estimated by the authors does not fully meet the assumptions of KMNK, which is confirmed by the tests carried out earlier, the forecasting process is difficult.

In the presented article, the authors only conducted a preliminary forecast to check and confirm whether the values adopted for the dependent variable Y show an upward trend. The following measures of the accuracy of ex post forecasts were analyzed with the use of 400 observations:

- ME (mean error), which determines by how much on average the real values of the predicted variable Y deviate from the values of the estimated forecasts (Pawełek *et al.*, 2013);
- MSE (mean square error), which is the difference between the estimator and the estimated value;
- RMSE (root mean square error), which is the square root of MSE;
- MAE (mean absolute error) which measure of errors between paired observations expressing the same phenomenon (Willmott and Matsuura, 2005);
- MPE (mean percentage error), which is obtained by dividing the obtained residuals for a given model by the observed values of the dependent variable Y;
- MAPE mean absolute percentage error calculated as the average of the relative differences in absolute deviations of the forecast values and the actual values divided by the implementation of the forecast variable (Szmuksta-Zawadzka and Zawadzki, 2012);
- Theil's coefficient used to calculate the total relative error of the forecast in the testing period, (<http://visualmonsters.cba.pl/index.php/prognozowanie/wspolczynnik-theila/>; Kufel, 2013);
- the prediction bias reflecting for which it was impossible to guess the mean value of the forecast variable;
- insufficient flexibility in determining the extent to which both the volatility of the forecast and the forecast variable are similar to each other;

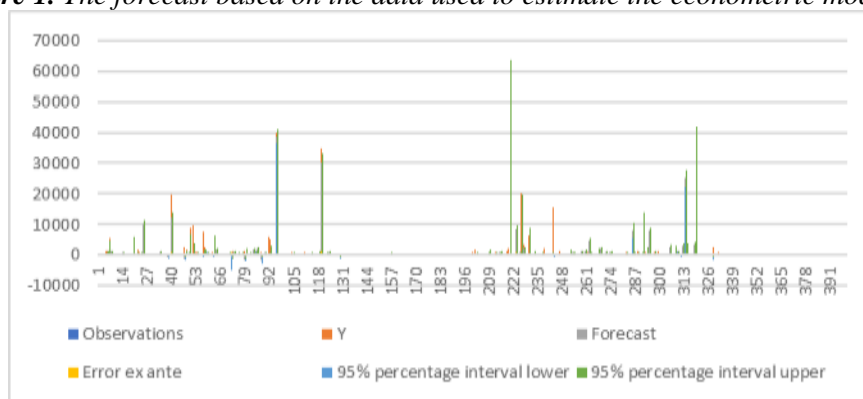
- inconsistency of the direction as a component informing about whether the directions of changes in forecasts are in line with the actual direction of the forecast change.

The preliminary forecasts carried out confirm the fact that in most joint-stock companies (304 listed companies) the market value under the influence of quite high:

sales revenues recorded in most of the surveyed business entities,
 other operating income,
 operating profit in most of the reported cases,
 gross profit,
 owned assets,
 equity of the shareholders of the parent company,
 share capital,
 value of short-term liabilities in excess of long-term liabilities,
 positive values of EBITDA to compensate for negative values of financial flows and net cash flows showed an upward trend.

If the number of surveyed joint-stock companies was increased to 410 or even 420, then the impact of this type of selected financial data on increasing their market value would be even higher in the following years. This dependence can also be read from Figure 1.

Figure 1. The forecast based on the data used to estimate the econometric model



Source: Own study.

The analysis of the data presented in that figure clearly shows that the explanatory variables X_1 , X_3 - X_5 , X_7 - X_{11} , X_{13} - X_{15} positively determine the market value of 400 listed companies. This dependence is confirmed by the high value of the coefficient of determination R^2 , amounting to over 92%, as well as very low p-values recorded for the above explanatory variables.

As indicated by the results of the econometric model estimation, the set of regressors is not strongly correlated with each other (apart from the presented correlation matrix, the Durbin-Watson statistics and the Wooldridge test also confirm the lack of autocorrelation), therefore the values defining ex ante error and ex post forecast accuracy measures, such as, ME, RMSE, MAE, MPE and also MAPE confirm this fact. The relatively low Theil coefficient of 0.13767 speaks in favor of the estimated model.

5. Discussion and Conclusions

The coronavirus crisis, more and more commonly referred to as the coronavirus crisis, has almost shocked the European and global economy since March 2020. Hence, it is quite a challenge. The economic impact of the coronavirus pandemic varies across businesses and depends on a number of factors. However, in any case, the problems caused by the global economic slowdown caused many companies to go bankrupt.

In order for enterprises to survive in such difficult times, they must try to be competitive with companies operating in the same or similar industries. Gaining a competitive advantage is possible thanks to cooperation with those economic entities with which they are able to establish cooperation in order to gain this advantage. As the authors emphasized in their article, in times of extraordinary global threats, which include, of course, the coronavirus pandemic, surviving in a turbulent market and at the same time gaining a competitive advantage as a result of participation in the cooperation process on a large scale, the use of recommendations resulting from the concept of kaizen costing may be favorable. The use of this concept by the researched economic units becomes advantageous in terms of gaining their competitive advantage, and thus increasing their market value, which is an important measure of their competitive advantage.

The coronavirus crisis forces entrepreneurs to adopt an innovative approach to running a business based on digitization and digitization. Remote work, and thus limited customer access to the company's headquarters, encourage the introduction of innovative solutions used in many industries, both in service and production. These types of activities are conducive to the development of the applied concept, assuming continuous cost reduction while improving work efficiency and increasing the quality of services or products offered.

In order to investigate the impact of the kaizen costing concept on gaining a competitive advantage by cooperating enterprises, the authors decided to analyze selected financial data of 400 joint-stock companies, of which 252 are large entities operating on the WSE Main Market, the rest are small and medium-sized companies developing their activity on the NewConnect market. . The common feature of the surveyed business entities is that in their activities they try to apply the concept

described above. Data covering the period from the first quarter of 2020 to the first quarter of 2021 were used to build the econometric model.

In the estimated logarithmic econometric model, the authors adopted the market value of the analyzed joint-stock companies as the dependent variable, which is the main measure of competitive advantage. Selected financial data of the examined listed companies were adopted as explanatory variables, such as: sales revenues, profit / loss on sales, other operating revenues, operating profit / loss, gross profit / loss, net profit / loss of the shareholders of the parent company, assets equity, equity of the parent company's shareholders, share capital, long-term liabilities, short-term liabilities, operating flows, financial flows, net cash flows, EBITDA.

However, due to the very low p-value of less than 0.01, it should be assumed that the market value of a company is most influenced by sales revenues, other operating revenues, operating profit or loss (68% of the surveyed companies reported profit), gross profit or loss (67% of the analyzed business entities also showed profit), owned assets, equity of the shareholders of the parent entity (in 92% of the surveyed companies the capital was positive), share capital, values of short-term liabilities which in 79% exceeded long-term liabilities, cash flows financial statements, net cash flow and EBITDA, which was positive in most of the analyzed companies.

The final estimation of the model and the preliminary forecasts carried out confirm the fact that in the majority of joint-stock companies (304 listed companies) the market value showed an upward trend. Explanatory variables x_1 , x_3 - x_5 , x_7 - x_{11} , x_{13} - x_{15} positively determined the market value of 400 listed companies. This dependence was also confirmed by the high value of the coefficient of determination R^2 , amounting to over 92%, as well as very low p-values recorded for the above explanatory variables. Although the results of the econometric model estimation showed that the set of regressors is not strongly correlated with each other (apart from the correlation matrix, also the Durbin-Watson statistics and the Wooldridge test confirm the lack of autocorrelation), however, the above-mentioned high value of the coefficient of determination, p-value and also Theil's low coefficient speaks in favor of the model being built.

The presented financial data of selected listed companies confirmed the fact that thanks to the application of the kaizen-costing concept, both service and production companies are able to gain a competitive advantage on global markets despite the ongoing coronavirus pandemic. Companies, trying to participate on a large scale in the process of cooperation with other economic entities from the same or similar industries, increase profits, which translates into an increase in their market value, leading to an increase in the competitiveness of these economic units on the world stage.

The fact is that the described concept has a significant impact on the financial results of enterprises, regardless of the latitude in which they operate. Therefore, it can be

the subject of further research and analyzes taking into account, e.g., in Poland, a much larger group of economic entities, including, of course, also from outside the capital market.

References:

- Acocella, N. 1998. *The foundations of economic policy. Values and techniques.* Cambridge University Press, Cambridge.
- Akehurst, G., Comeche, J.M., Galindo, M.A. 2009. Job satisfaction and commitment in the entrepreneurial SME. *Small Business Economics*, 32, 277-289.
- Alcalde-Fradejas, N., Ramirez-Aleson, M., Espitia-Escuer, M. 2003. Profits in the long-term for the manufacturing sector. *International Advances in Economic Research*, 9(3), 233-247.
- Anselin, L. 1988. *Spatial econometrics: methods and models.* Kluwer Academic, Dordrecht.
- Anselin, L. 2003. Spatial externalities, spatial multipliers, and spatial econometrics. *International Regional Science Review*, 26(2), 153-166.
- Antelo, M., Peón, D. 2019. On cooperation through alliances and mergers. *Journal of Industry, Competition and Trade*, 19, 263-279.
- Arya, A.K., Jain, S.K. 2014. Impacts of Kaizen in a small-scale industry of India: A case study. *International Journal of Lean Six Sigma*, 5(1), 22-44.
- Ashmore, C. 2001. Kaizen and the Art of Motorcycle Manufacture. *Manufacturing Engineer*, 80(5), 220-222.
- Audretsch, D.B., Prince, Y.M., Thurik, A.R. 1999. Do small firms compete with large firms? *American Economic Journal: Applied Economics*, 27(2), 201-209.
- Brunet, P. 2000. Kaizen in Japan. IEE Seminar, Kaizen: From Understanding to Action, Ref. No. 2000/035, 1, 1-10.
- Cerruti, C. 2008. The impact of offshoring on firm competitiveness. *Transition Studies Review*, 15, 145-156.
- Cojanu, V. 2006. Optimum Competitive Area: Romania's Economic Integration in Southeast Europe. *Transition Studies Review*, 13(1), 175-198.
- Coughlin T. 1985. Competition and Cooperation in Marketing Channel Choice, Theory and Application. *Marketing Science*, 4(2), 110-129.
<https://pubsonline.informs.org/doi/abs/10.1287/mksc.4.2.110>.
- Dhingra, A.K., Kumar, S., Singh, B. 2019. Cost reduction and quality improvement through Lean-Kaizen concept using value stream map in Indian manufacturing firms. *International Journal of System Assurance Engineering and Management*, 10(4), 792-800.
- Dyer, J.H., Singh, H. 1998. The Relational View: Cooperative Strategy and Source of Interorganizational Competitive Advantage. *Academy of Management Review*, 23(4), 660-679. <https://doi.org/10.2307/259056>.
- Façanha, L.O., Resende, M. 2010. Determinants of hierarchical structure in industrial firms: an empirical study. *Economics of Governance*, 11, 295-308.
- Gilley, K.M., Rasheed, A. 2000. Making more by doing less: an analysis of outsourcing and its effects on firm performance. *Journal of Management*, 26, 63-79.
- Gorynia, M., Banaszyk, P. 2020. The COVID-19 pandemic and the company's competitiveness. *ICAN Management Review*, 4, August-September.
<https://www.ican.pl/a/pandemia-covid-19-a-konkurencyjnosc-przedsiębiorstwa/DuibZdnba>.
- Jiang, B., Qureshi, A. 2006. Research on outsourcing results: current literature and future

- opportunities. *Management Decision*, 44, 44-55.
- Ketels, C.H.M. 2006. Michael Porter's competitiveness framework-recent learnings and new research priorities. *Journal of Industry, Competition and Trade*, 6, 115-136.
- Klaassen, L.H., Pawlowski, Z. 1981. Long- term Forecasting: Meditations of Two Pitfall Collectors. *De Economist*, 129(4), 455-475.
- Kotler, P., Armstrong, G.T. 2018. *Principles of marketing*, 17th edition. Pearson Education, London.
- Kufel, T. 2013. *Econometrics. Troubleshooting using GRET, 3th edition*. Polish Scientific Publishers, Warsaw.
- Lemmen, J.J.G., Eijffinger, S.C.W. 1996. The fundamental determinants of financial integration in the European Union. *Review of World Economics*, 132(3), 432-456.
- Mal'tseva, A.P., Galeev, M.M. 2013. Integrative cooperation between agricultural market entities as the foundation for the stable functioning of enterprises in the dairy industry. *Studies on Russian Economic Development*, 24(2), 152-158.
- Matusiak, K.B. 2011. *Innovation and technology transfer. Dictionary of terms*. Polish Agency for Enterprise Development, Warsaw.
- Pawełek, B., Wanat, S., Zeliaś, A. 2013. *Economic Forecasting. Theory of Task Examples*. Polish Scientific Publishers, Warsaw.
- Pirschel, I., Wolters, M.H. 2018. Forecasting with Large Datasets: Compressing Information Before, During or After the Estimation? *Empirical Economics*, 55, 573-596.
- Porter, M.E. 2004. Building the microeconomic foundations of prosperity: Findings from the business competitiveness index in Sala-i-Martin, X. (ed.). *The Global Competitiveness Report 2003-2004*. Oxford University Press, New York.
- Porter, M.E. 1998. *Competitive strategy. Techniques for analyzing industries and competitors*. Free Press, Massachusetts.
- Porter, M.E. 1990. The competitive advantage of nations. *Harvard Business Review*, London.
- Poznańska, K. 2009, Współpraca przedsiębiorstw z podmiotami zewnętrznymi. In: Lichniak I. (eds.), *Nauka o przedsiębiorstwie. Wybrane zagadnienia*. Warsaw School of Economics, Warsaw.
- Ricciardi, F., Zardini, A., Czakon, W., Rossignoli, C., Kraus, S. 2021. Revisiting the Cooperation-competition Paradox: a Configurational Approach to Short and Long-term Cooperation Performance in Business Networks. *European Management Journal*. <https://doi.org/10.1016/j.emj.2021.07.002>, 1-46.
- Santos, L.D., Vieira, A.C. 2020. Tourism and Regional Development: a Spatial Econometric Model for Portugal at Municipal Level. *Portuguese Economic Journal*, 19, 285-299. <https://doi.org/10.1007/s10258-020-00179-z>.
- Schröder, C. 2014. Dynamics in ICT cooperation networks in selected German ICT clusters. *International Economics and Economic Policy*, 11, 197-230.
- Siggel, E. 2006. International competitiveness and comparative advantage: a survey and a proposal for measurement. *Journal of Industry, Competition and Trade*, 6(2), 137-159.
- Szmuksta- Zawadzka, M., Zawadzki, J. 2012. About Measures of the Accuracy of ex Post Forecasts in Forecasting Variables with a Strong Intensity of Seasonality. *Quantitative Methods in Economics*, 13(1), 212-223.
- Ullah, W. 2017. Evolving corporate governance and firms performance: evidence from Japanese firms. *Economics of Governance*, 18, 1-33.
- Walczak, W. 2010. Analysis of factors influencing the competitiveness of enterprises. *E-mentor*, 5(37). <http://www.e-mentor.edu.pl/mobi/artykul/index/numer/37/id/784>.

- Weder, R., Grubel, H.G. 1993. The new growth theory and Coasean economics: institutions to capture externalities. *Review of World Economics*, 129, 488-513.
- Weston, J.F. 2001. Merger and acquisition as adjustment processes. *Journal of Industry, Competition and Trade*, 1(4), 395-410.
- Williamson, A. 1997. Target and Kaizen Costing. *Manufacturing Engineer*, 76(1), 22-24.
- Willmott, C.J., Matsuura, K. 2005, Advantages of The Mean Absolute Error (MAE) over the Root Mean Square Error (RMSE) in Assessing Average Model Performance. *Climate Research*, 30, 79-82. doi:10.3354/cr030079.
- Wong, J.M. 2011. A relational view of resources-based theory: The case of internationalization of Li & Fung group. *The Journal of Human Resource and Adult Learning*, 7(2), 34-39.
- Zakrzewska-Bielawska, A. 2019. Recognition of relational strategy content: insight from the managers' view. *Eurasian Business Review*, 9, 193-211.

<http://www.ekonometria.4me.pl/prognozowanie-ekonometryczne-etapy/>.

<https://www.gpw.pl/spolki>.

<https://newconnect.pl/spolki>.

<http://visualmonsters.cba.pl/index.php/prognozowanie/wspolczynnik-theila/>.

