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CROSS-BORDER MERGERS AND ACQUISITIONS IN MANUFACTURING SECTOR IN THE EUROPEAN AREA*

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Abstract. Ongoing globalization tendencies of business in general and manufacturing in particular has increased rapidly during the last decades as companies have internationalized their value-chains in a search of competitive advantage through scale and scope throughout the world. Precisely cross-border mergers and acquisitions represent a key strategic and dynamic tool for gaining long-term competitive advantage, diversification, geographical expansion or strengthening its own position in the global market. The main goal of the paper is to analyze the impact of the predictors we have chosen on the volume and frequency of realized cross-border mergers and acquisitions in the manufacturing sector with regard to the origin of the source (19) and target (28) countries in the European area in the time period of 1998 and 2021 through analysis of variance (ANOVA). Through partial analyses, we find out how the manufacturing sector affects the total value of cross-border mergers and acquisitions transactions and whether there is a significant difference in the total value of cross-border mergers and acquisitions within the branches of the manufacturing sector. Attention is also paid to the impact of source and target country membership in the EU on the overall value of cross-border mergers and acquisitions. In the analyses, we also identify other significant influences that have an impact on the conditional value of cross-border mergers and acquisitions.

Keywords: cross-border mergers; cross-border acquisitions; ANOVA; analysis of variance, manufacturing sector; sustainability

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1. Introduction and theoretical framework

Mergers and acquisitions (M&As) simply refer to the coming together of two or more enterprises into a single entity. It is an effective way to sustain growth in performance (Zhang et al., 2022) and socio-economic conditions (Stefko et al., 2022a). They play an important role in companies' growth and competitiveness. Nowadays, when the impact of globalization is visible in every respect, but especially in business activity and human resources (Mura et al. 2017), competitiveness is the main factor that can differentiate companies and increase their performance (Pereira-Moliner et al., 2021; Čabinová et al., 2021). Competitiveness is significantly influenced by the latest knowledge, whether in the field of innovation, technology or digital economy (Kiselačková, Širá, Šofranková 2021). Industry competitiveness might also be increased by the innovativeness in industrial processes and products (Stefko et al., 2019). Innovativeness also increases competitive advantages that firms can gain against their rivals (Ključnikov et al., 2021; Cortes et al., 2021; Škare et al., 2022, Al-Omouh et al., 2022) because businesses can create innovative tools (Civelek et al., 2020; Ključnikov et al., 2020; Kolková & Ključnikov, 2021), new ideas and products more than other companies (Civelek et al., 2021; Stefko et al., 2021). Thus, firms firstly need to focus on innovative activities for their operations (Stefko et al., 2020) to increase their competitiveness (Stefko et al., 2022b; Nassar, Strielkowski, 2022; Gavurova et al. 2021). In this regard, according to Dezi et al. (2018), mergers and acquisitions are a suitable solution to the need for rapid integration of innovative elements into the business model, especially in this global and dynamic environment. Cross-border M&As are defined as mergers and acquisitions, where the acquiring and target firms are from different countries (Dzenopoljac et al., 2022). Merger is defined as the fusing of two or more companies, whether voluntary or enforced (Anyanwu and Agwor, 2015). According to Ahmed (2000), mergers are the joining and unification of separate businesses into one corporation. Nelson (2018) emphasizes that the assets and liabilities of the selling firms are absorbed by the buying firm. In an acquisition, the acquiring company purchases a majority ownership or purchase property to merge the interest of two or more companies. The purchase of assets is the main aspect of an acquisition. Mergers and acquisitions can occur in the form of a vertical or horizontal (Anyanwu and Agwor, 2015). Horizontal cross-border acquisitions are acquisitions within an industry, between competing firms, with the aim of increasing market share. The essence of a vertical acquisition is that the acquirer and the target are connected through the supply chain (Dzenopoljac et al., 2022). The third type is conglomerate acquisitions, which do not include horizontal or vertical forms of acquisitions. In a conglomerate acquisition, an undervalued company is purchased, which is mainly for financial reasons (Dzenopoljac et al., 2022). Emerging multinational enterprises venturing into advanced economies emerge as a timely and important phenomenon that contributes to the theoretical refinement of internationalization of firms and has practical implications for a firm's globalization endeavors in both emerging and advanced economies (Xing et al., 2017; Masood et al. 2017). The market for mergers and acquisitions is characterized by waves. Specifically, there are regularly alternating periods of low and high levels of M&As activities. Especially in the manufacturing industry, regulatory, economic and technological changes cause industry waves and therefore also M&As waves (Andriuškevičius and Štreimikienė, 2021). According to Harford (2005), whether regulatory, economic and technological shocks would lead to a real M&As wave depends on sufficient capital liquidity. There are few factors that can influence the spread of mergers and acquisitions creating the waves, such as economic, financial and legal. In fact, M&As are not extraordinary events that cause these waves but are only one of the strategic options for how a business can prosper (Dezi et al., 2018), (Wang et al., 2022).

In recent years, sustainability has become a key factor in several industries. Adopting a sustainable strategy (Adamišin et al., 2015) contributes to the development of the company and the industry (Risitano et al., 2022; Gavurova et al. 2019). In today's globalized world, more and more emphasis and importance are placed on M&As processes. In addition, the role of sustainability as a prerequisite for success is highlighted in this area. Sustainability is still an open concept which can be divided into three sections; economic, environmental and social, while the mergers and acquisitions have a very specific definition (Belas et al. 2019; Dvorsky et al. 2021). With the pillar of economics, firms aim to attain economic sustainability, through which companies can contribute

to prosperity. Preserving the environment and the resources for the future generations is the pillar of the Environment. Lastly, providing a lasting value to the society is the aspect of the social pillar (González-Torres et al., 2020). From the long-term point of view of sustainability, a company's position in the competitive environment competitiveness, knowledge, research, and development is the priority (Širá et al., 2020), (Škare et al., 2021).

From the point of view of competitiveness and sustainability, it is an advantage for the company and its business activity, if it operates in a country that is part of a larger economic unit. The advantage of monetary union is undoubtedly the facilitation of the movement of equity capital by promoting financial integration. It has several indisputable financial advantages, mainly consisting in the reduction of capital costs, the elimination of exchange rate risk, the sharing of common trading platforms and others. In addition, membership in the monetary union has an advantage for the country in that it reduces macroeconomic uncertainty by eliminating exchange rate volatility and stabilizes inflation. Subsequently, already made cross-border capital investments between the countries of the monetary union are considered less risky (Coeurdacier et al., 2009).

There are different motives behind cross-border mergers and acquisitions. M&As have a great impact on the resulting corporate strategy and management of corporate finances. Their importance is mainly to ensure the rapid growth of the company, significant consolidation of the place in a specific region or sector, and all this without creating a subsidiary company (Anyanwu and Agwor, 2015). Mergers and acquisitions are in many ways the most important way to increase the value of a business. It is also the fastest way to increase market share, e.g., enter a new market. This time factor is the subject of research at Dezi et al. (2018), too. Dzenopoljac et al. (2022) pointed out that M&As strategies appear to be crucial for knowledge flows.

Other benefits include, for example, that mergers and acquisitions increase the efficiency of the participating companies in the short term, which in the long term can manifest as a monopoly on the market (Mishra 2019). According to González-Torres (2020), the motivation for M&As is also increasing financial synergy alongside a clear expansion strategy. Global trends in mergers and acquisitions show that market leaders prefer to act quickly when expanding and therefore opt for these forms. M&As mainly represent solutions of a strategic nature. In the long term, with the right configuration, they can ensure economies of scale, efficient use of excess resources and increase the efficiency of managers (Pandya et al., 2018). The other motive for M&As is also to avoid the disadvantages of working through a foreign firm.

A firm can gain resources such as a knowledge base, technology and human resources from a local company through the process of cross-border mergers (Warter and Warter, 2014). Lehto and Böckerman (2008) found that cross-border mergers and acquisitions lead to a reduction in the number of employees in production. The impact on employment in the service sector is much weaker.

Manufacturing enterprises, due to the processes and technologies used in production, are to a large extent global and interconnected. For this reason, in the manufacturing sector, restrictions on competition can be considered rare in all types of mergers and acquisitions (Lehto and Böckerman, 2008). In service industries, a domestic buyer may be more interested than a foreign buyer in buying another firm in order to limit competition. This applies to services such as retail (Lehto and Böckerman, 2008; Škare and Riberio Soriano, 2022).

Development trends and procedures are often the impetus for M&As. Especially for the manufacturing sector, technological change, innovation, liberalization, and others are driving forces for M&As, as they have the ability to reconfigure resources and improve business efficiency. Whether economic and technological shocks will lead to an M&A wave depends on sufficient capital liquidity (Andriuskevičius and Štreimikienė, 2021).

Given that the market for services and some manufacturing industries is sometimes geographically limited (Rovňák, 2020), the sharing of assets may encounter these geographical limitations. Thus, in the aforementioned sectors, asset sharing, and downsizing are more typical for domestic mergers and acquisitions than for cross-border M&As. Therefore, in the service and construction industries, domestic mergers and acquisitions have a greater negative impact on employment than cross-border mergers and acquisitions. In production, such a difference is not expected (Lehto and Böckerman, 2008).

2. Research methodology

The localization of cross-border transaction flows of multinational companies in the form of mergers and acquisitions in the manufacturing sector was based on scientific studies by Head and Ries (2008), McFadden's discrete choice (McFadden, 1974) and studies by Hečková et al. (Hečková et al., 2016). The database consisted of 117,561 data on cross-border mergers and acquisitions implemented in the countries of the European area in the period from 1998 to 2021, divided into 19 source countries (*i*): *Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Poland, Portugal, Spain, Sweden, Turkey, United Kingdom* a 28 cieľových krajín (*j*): *Austria, Belgium, Bulgaria, Cyprus, Czech republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Turkey, United Kingdom*. The basic information sources within the analyzed database were data from the Zephyr and Orbis databases (Bureau van Dijk, 2022) and Eurostat (European Commission, 2022). The extreme value of a cross-border transaction in 2000 with a capitalization volume of 204.73 million euros between the source country United Kingdom and the destination country Germany was excluded from the data-base. The subject of the analysis was cross-border transactions of mergers and acquisitions in the manufacturing sector with a minimum value of one transaction in the amount of 1 million euros. After excluding extreme values, the total number of analyzed data for the manufacturing sector was $N = 2527$. The analyzed manufacturing sectors are based on the classification of manufacturing sectors used by Bureau van Dijk in the Zephyr and Orbis databases (Bureau van Dijk, 2022) divided into (*s*): 1 - *Chemicals, rubber, plastics, non-metallic products*, 2 - *Food, beverages, tobacco*, 3 - *Gas, Water, Electricity*, 4 - *Machinery, equipment, furniture, recycling*, 5 - *Metals & metal products*, 6 - *Primary Sector (agriculture, mining, etc.)*, 7 - *Publishing, printing*, 8 - *Textiles, wearing apparel, leather*, 9 - *Wood, cork, paper*, 10 - *Construction*.

The main goal is to analyze the influence of our selected predictors on the volume and frequency of realized cross-border mergers and acquisitions in the manufacturing sector with regard to the origin of the source and destination countries within the countries of the European area between 1998 and 2021. The partial objectives (research questions) of the paper are to identify whether, (a) the manufacturing sector affects the total value of cross-border mergers and acquisitions, (b) there is a significant difference between manufacturing sectors in the total value of cross-border mergers and acquisitions, (c) the membership of the source and target countries in the EU total value of cross-border mergers and acquisitions, (d) there is a significant interaction between the manufacturing sector and the EU membership of the target and source country with an impact on the total value of cross-border mergers and acquisitions.

The dependent variable in the analysis is the total value of cross-border assets acquired through mergers and acquisitions by the source country *i* in the target country *j* in the sector *s* and at time *t* ($M\&A_{ij,s,t}$). The independent variables are the branches of the manufacturing sector (*s*) and dummy variable source membership (*i*) and target country (*j*) in European Union ($EU_{i,t} EU_{j,t}$) acquiring the value 1 in the event that both the source country *i* and the target country *j* were members of the European Union at time *t*, otherwise acquiring the value 0.

In order to fulfill the partial goals of the contribution, the Analysis of Variance (ANOVA) was chosen, where we implemented the basic statistical analysis of the general factor model (1) to predict the investigated response *y*

depending on the change of the investigated independent variables x_i . The variance analysis for the investigated parameter y represents a basic statistical analysis of the appropriateness of the used general model (1).

$$\hat{y} = b_0 \cdot x_0 + \sum_{j=1}^N b_j \cdot x_j + \sum_{\substack{u,j=1 \\ u \neq j}}^N b_{uj} \cdot x_u \cdot x_j \quad (1)$$

where b_0 , b_j , b_{uj} , b_{ji} are the respective regression coefficients and x_j are the respective independent variables, factors.

Using variance analysis, on the one hand, it is analyzed whether the variability caused by random errors is significantly smaller than the variability of the measured values explained by the model. The second statistical view of ANOVA arises from its basic nature, where we test the null statistical hypothesis, which states that none of the effects used in the model has an effect on a significant change in the investigated variable (y). The basic general ANOVA table is shown in Table 1.

Table 1. General ANOVA table

Source	DF	Sum of Squares	Mean Square	F Ratio	Prob > F
Model	$DF_{\text{Model}}=a-1$	S_{Model}	$MS_{\text{Model}}= S_{\text{Model}}/ DF_{\text{Model}}$	$F= MS_{\text{Model}}/ MS_{\text{Error}}$	pM
Error	$DF_{\text{Error}}=N-a$	S_{Error}	$MS_{\text{Error}}= S_{\text{Error}}/ DF_{\text{Error}}$		
C. Total	$DF_{\text{C.Total}}=N-1$	$S_{\text{C.Total}}$	$MS_{\text{C.Total}}= S_{\text{C.Total}} / DF_{\text{C.Total}}$		

Source: own sourcing

Thus, if we consider as a dependent variable the total value of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) and the independent variables of the manufacturing sector (s) and the membership of countries in the European Union $EU_{i,t}EU_{j,t}$, where the value 1 means that the source country i as the target country j was also a member of the European Union at time t , otherwise it takes on the value 0, so in accordance with the general model (1) and in terms of partial goals (research questions), we will also subsequently analyze the mutual interaction of the variables of the manufacturing sector (s) and membership of countries in the European Union $EU_{i,t}EU_{j,t}$.

3. Methodology

The presented The data preparation process started with the extraction of 117 561 data on the number and volume of realized cross-border mergers and acquisitions with a minimum value of one transaction in the amount of 1 million euros in 19 source and 28 target countries of the European area and the values of the other predictors selected by us. We use a comprehensive dataset on global mergers and acquisitions from Bureau van Dijk Zephyr and Orbis database (Bureau van Dijk, 2022), spanning the period 1998-2021. The dataset consists of individual cross border equity deals between the home country of the acquirer and the host country where the target firm is domiciled. The source of other statistical data used is Eurostat (European Commission, 2022). The basis for the modeling was the scientific studies of Head and Ries (2008), Coeurdacier, De Santis, Aviat (2009), McFadden's discrete choice (McFadden, 1974) and the study of Hečková, et al. (Hečková, et al., 2016). The extreme value of the capitalization volume of 204.73 million euro was excluded from the research set between the United Kingdom as a source country and Germany as a target country implemented in 2000.

$M\&A_{ij,s,t}$ represents the total value of assets acquired through cross-border mergers and acquisitions by source country i in target country j in sector s and at time t . An important predictor that affects the volume of cross-border mergers and acquisitions can be considered the value of the gross domestic product of the source (i) and target country (j) in sectore s and at time t ($GDP_{j,s,t}$, $GDP_{i,s,t}$). Using the logarithm of their values eliminates their

elasticity and does not affect the overall result. The following variables were further included in the model: the proximity of the countries, the specificity of their culture and the relatedness of the language. Proximity of the source and target countries is quantified by the distance of their capitals denoted as $distance_{ij}$, the sharing of a common border is quantified by the binary variable $border_{ij}$, which takes the value 1 in the positive case and the value 0 in the negative case. The binary variable $common\ language_{ij}$ assumes the value 1 in the case of the same official language and the value 0 otherwise, and was considered to quantify the influence of language relatedness on the volume of cross-border assets. The goal is to estimate the weights of the considered predictors on the total value of assets acquired through cross-border mergers and acquisitions $M\&A_{ij,s,t}$ by source country i in target country j in sector s and at time t . The other predictors in the considered model represent dummy variables that relate to the membership of the source and target countries in the European Union and in the European Monetary Union, namely $EU_{i,t}EU_{j,t}$ takes the value 1 if the source country i as well as the target country j was a member of the European Union at time t , otherwise it takes the value 0. The variable $EMU_{i,t}EMU_{j,t}$ take the value 1, if the source country i as well as the target country j was a member of the European Monetary Union at time t , otherwise it takes the value 0.

Analysis of the effect of selected predictors and estimation of their regression weights on the total value of assets acquired through cross-border mergers and acquisitions $M\&A_{ij,s,t}$ by source country i in target country j in sector s and time t is carried out using a regression equation in the form:

$$\log(M\&A_{ij,s,t}) = \beta_0 + \beta_1 \cdot \log(HDP_{i,s,t}) + \beta_2 \cdot \log(HDP_{j,s,t}) + \beta_3 \cdot \log(Distance_{i,j}) + \beta_4 \cdot Border_{i,j} + \beta_5 \cdot ComLang_{i,j} + \beta_6 \cdot (EU_{i,t}EU_{j,t}) + \beta_7 \cdot (EMU_{i,t}EMU_{j,t}) \quad (1)$$

For the analysis itself, a generalized linear regression model with a gamma distribution and a logarithmic linking function was chosen. Generalized regression models, both linear and non-linear, cover a wide range of statistical methods with different types of variables that are widely used in economics and management fields. As part of the analysis itself, several regression models were tested, while their results were comparable in terms of the significance of the regression coefficients.

Generalized linear regression model with normal distribution and linking function ident was identical to the selected model in terms of the significance of the predictors and their effect. A similar result was also achieved with the classical linear model by forward stepwise regression analysis with the achieved level of significance $p = 0.000$ for Fisher's F-test, and with a value of adjusted index of determination at the level of 0.883. The simulation of the model by expanding the interactions of individual predictors no longer led to a clearly better result in terms of quality.

4. Results

The analysis of the source countries (i) shows that the largest number of cross-border mergers and acquisitions in the manufacturing sector in the period under review was directed from Great Britain with a total of 363 mergers and acquisitions with a total value of €95,337 million, while the average value of the total value for one cross-border merger and acquisition in the manufacturing sector thus represents €262,637,001 ± €110,698,034. The second most important source country in terms of the number of cross-border mergers and acquisitions in the manufacturing sector is France with a total of 309 transactions, followed by Germany with 297 transactions and the Netherlands with 288 transactions. In terms of the total value of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) the most important position in the manufacturing sector belongs to France, with a total volume of cross-border mergers and acquisitions worth €205,425 million. In a more detailed analysis, we find that French cross-border mergers and acquisitions were directed primarily to Italy with a total value of €48,085 million with the number of 50 cross-border mergers and acquisitions. Other important countries where French cross-border assets

went were the Netherlands (€33,291 million; 27), Germany (€31,869 million; 41), Great Britain (€28,314 million; 47) and Belgium (€27,005 million; 31). The second most important country in terms of the total amount of cross-border mergers and acquisitions in the manufacturing sector is Germany with a total volume of assets of €200,548 million (297), whose cross-border assets were directed primarily to Spain (€53,379 million; 27), Great Britain (€53,186 million; 54), France (€42,594 million; 32) and the Netherlands (€15,559 million; 31)). The third most important country in terms of the amount of cross-border mergers and acquisitions is the Netherlands with a total value of €126,424 million and 288 completed mergers and acquisitions, which were directed primarily to Luxembourg (€31,786 million; 5), Great Britain (€24,449 million; 50), Germany (€15,727 million; 44), France (€13,287 million; 33) and Sweden (€11,289 million; 6). Within the analysis of the three most important source countries (*i*), we also see cross-border mergers and acquisitions that were directed in the manufacturing sector from France (€162,453,570; 4), from Germany (€3,259 million; 3) and from the Netherlands (€9,168,550; 3) to Slovakia.

From the analysis of target countries (*j*), the most significant country with the most cross-border mergers and acquisitions within the manufacturing sector is Germany with a total of 402 transactions, followed by France with 333 transactions, Great Britain with 249 transactions, Spain with 220 transactions, the Netherlands with 218 transactions and Italy with 212 transactions. From the point of view of the total value of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) the most important target country (*j*) is Spain with the amount of cross-border assets of €163,733 million. Cross-border assets went to Spain primarily from Italy (€57,962 million; 44), Germany (€53,379 million; 27), Great Britain (€24,007 million; 30) and France (€13,296 million). The second most important target country to which cross-border assets in the form of mergers and acquisitions were directed is Germany (€150,695 million; 402), while cross-border assets were directed to Germany primarily from Ireland (€33,015 million; 9), France (€31,869 million; 41), Great Britain (€15,918 million; 87), the Netherlands (€15,727 million; 44), Luxembourg (€14,087 million; 19) and Denmark (€10,347 million; 19). The third most important target country in terms of the total amount of cross-border assets in the form of mergers and acquisitions is Great Britain (€135,481 million; 249), while cross-border assets to Great Britain were directed primarily from Germany (€53,186 million; 54), France (€28,314 million; 47), the Netherlands (€24,449 million; 50) and Belgium (€12,292 million; 23) and Italy (€5,567 million; 20). A total of 19 cross-border mergers and acquisitions in the amount of €5,288 million were implemented in Slovakia as the target country, primarily from Germany (€3,259 million; 3); Denmark (€970,281,750; 3), Italy (€840,000,000; 1) and France (€162,453,570; 4). From the point of view of the basic variance analysis, it follows that the first independent variable manufacturing sector (*s*) with a significant influence on the change in the total value of cross-border mergers and acquisitions at the chosen significance level $\alpha = 0.05$ ($p = 0.00030$) also significantly influences the change in the value of the investigated variable ($M\&A_{ij,s,t}$) and membership of the source (*i*) and destination (*j*) countries at time *t* in the European Union ($p = 0.009053$), as documented in Table 2. At the same time, however, we also observe the influence of the absolute member of the model (Intercept) with a significance level of $p = 0.000249$. This fact suggests that there are other significant influences that affect the conditional value of cross-border mergers and acquisitions, which we did not consider in the paper.

Table 2. ANOVA table for the analysis of the manufacturing sector

Effect	SS	df	MS	F	p
Intercept	3.950629E+13	1	3.950629E+13	13.45767	0.000249*
Sector	1.083702E+14	9	1.204113E+13	4.10177	0.000030*
$EU_{i,t}EU_{j,t}$	2.002965E+13	1	2.002965E+13	6.82302	0.009053*
Error	7.385963E+15	2516	2.935597E+12		

SS – Sum of Squares, df – degree of freedom, MS – Mean Square, F – F-ratio, * - signifikantné na hladine významnosti $\alpha = 0.05$

Source: own sourcing

As already mentioned, the first analyzed independent variable is the manufacturing sector. From the point of view of the total value of cross-border mergers and acquisitions, most of them went to the *Gas, Water, Electricity* (s3) sector, amounting to €211,525 million (245), followed by the *Chemicals, rubber, plastics, non-metallic products sector* (s1) with 416 acquisitions and mergers with a total value of €210,164 million, followed by the *Machinery, equipment, furniture, recycling sector* (s4) with 805 acquisitions and mergers with a total value of €175,759 million and the *Food, beverages, tobacco sector* (s2) with 310 acquisitions and mergers in the total value of €104,309 million. Cross-border mergers and acquisitions in the *Metals & metal products sector* (s5) with the number of 177 transactions and a total value of €77,692 million can also be considered significant and to the *Construction sector* (s10) with 152 acquisitions and mergers with a total value of €73,679 million, with a value higher than 50 million euro. More detailed average values of cross-border mergers and acquisitions according to the individual analyzed production sectors are provided in Figure 1.

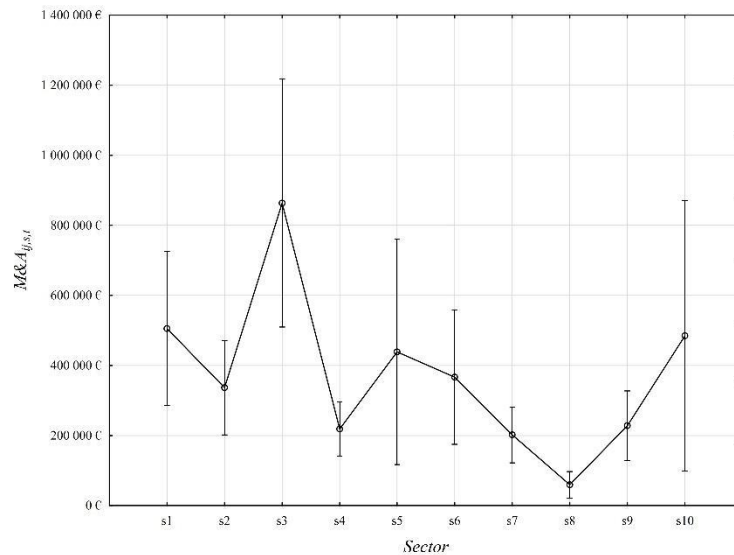


Figure 1. Average values cross-border mergers and acquisitions by individual analyzed manufacturing sectors

(s1 - Chemicals, rubber, plastics, non-metallic products, s2 - Food, beverages, tobacco, s3 - Gas, Water, Electricity, s4 - Machinery, equipment, furniture, recycling, s5 - Metals & metal products, s6 - Primary Sector, s7 - Publishing, printing, s8 - Textiles, wearing apparel, leather, s9 - Wood, cork, paper, s10 - Construction)

Source: own sourcing

Within the mean values of cross-border mergers and acquisitions ($M\&A_{i,j,s,t}$) there are some significant differences at the significance level $\alpha = 0.05$ between the individual analyzed manufacturing sectors. The stated differences between the mean values are given with consideration of $\pm 95\%$ confidence intervals of the individual values, and it is also necessary to remember that in the case of a positive sign of the difference, the first mentioned sector has a higher mean value than the second in order. Significant differences in mean values are observed primarily between the sector Gas, Water, Electricity (s3) and the sector Chemicals, rubber, plastics, non-metallic products (s1) with a difference value of €358 582.108 ($p = 0.009$), between the sector Machinery, equipment, furniture, recycling (s4) and the Chemicals, rubber, plastics, non-metallic products sector (s1) with a difference value of - €308 205.034 ($p = 0.003$), other significant differences are observed between the Textiles, wearing apparel, leather sector (s8) and the Chemicals, rubber, plastics, non-metallic products (s1) (- €449 438.113; $p = 0.044$), between Gas, Water, Electricity sector (s3) and the Construction sector (s10) (€387 791.808; $p = 0.028$), between the Gas, Water, Electricity sector (s3) and the Food, beverages, tobacco sector (s2) (€518 085.083; $p = 0.028$), between the Machinery, equipment, furniture, recycling sector (s4) and the Gas, Water, Electricity sector (s3) (- €666 787.142; $p = 0.000$), between the Metals & metal products sector (s5) and the Gas, Water, Electricity sector (s3) (- €426 641.821; $p = 0.012$), between the Primary Sector (s6) and the Gas, Water, Electricity sector

(s3) (- €487 312.105; $p = 0.021$), between the Publishing, printing sector (s7) and the Gas, Water, Electricity sector (s3) (-€697 934.894; $p = 0.000$), between the Textiles, wearing apparel, leather sector (s8) and the Gas, Water, Electricity sector (s3) (- €808 020.221; $p = 0.001$) and between the Wood, cork, paper sector (s9) and the Gas, Water, Electricity sector (s3) (- €642 403.547; $p = 0.000$). Figure 2 provides a graphical representation of all the differences in the mean values of the average height of cross-border mergers and acquisitions for individual manufacturing sectors.

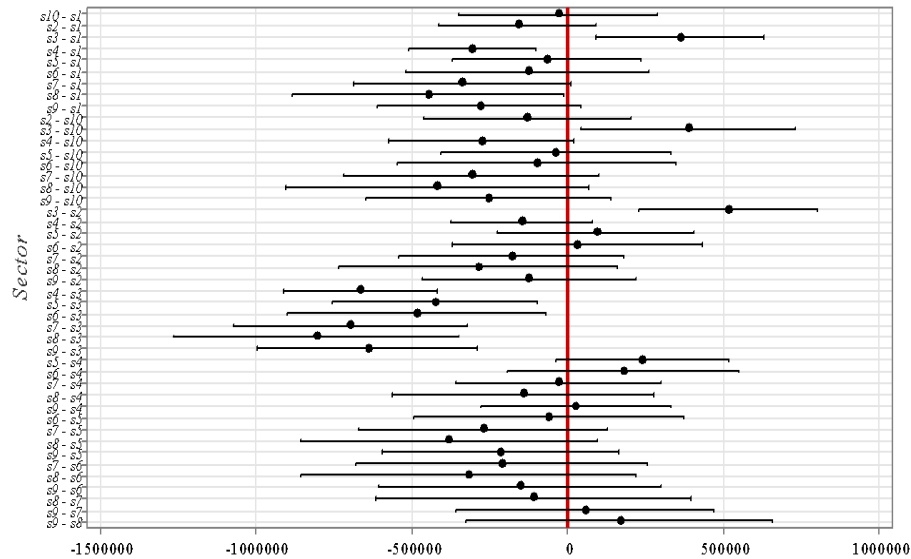


Figure 2. Graphic representation of the differences in the mean values of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) for individual manufacturing sectors (s1 - Chemicals, rubber, plastics, non-metallic products, s2 - Food, beverages, tobacco, s3 - Gas, Water, Electricity, s4 - Machinery, equipment, furniture, recycling, s5 - Metals & metal products, s6 - Primary Sector, s7 - Publishing, printing, s8 - Textiles, wearing apparel, leather, s9 - Wood, cork, paper, s10 – Construction)

Source: own sourcing

The second analyzed independent variable, which, according to the results of the variance analysis (Table 1), is significant at the selected significance level $\alpha = 0.05$, is the membership of the source (i) and target (j) countries at time t in the European Union. From the point of view of the total value of cross-border mergers and acquisitions, the most cross-border financial assets were among the countries that were members of the European Union at time t , namely €916,361 million ($N = 2306$). In the opposite case ($EU_{i,t}EU_{j,t} = 0$) the total amount of cross-border mergers and acquisitions is €30,676 million ($N = 221$). Based on this fact, there is at the same time a significant difference between the mean values of the amount of cross-border mergers and acquisitions in the case where $EU_{i,t}EU_{j,t} = 1$ a $EU_{i,t}EU_{j,t} = 0$. The total amount of the difference, taking into account the confidence intervals of individual mean values, amounts to €318,366,308 which reached the level of significance $p = 0.009$ (Figure 3).

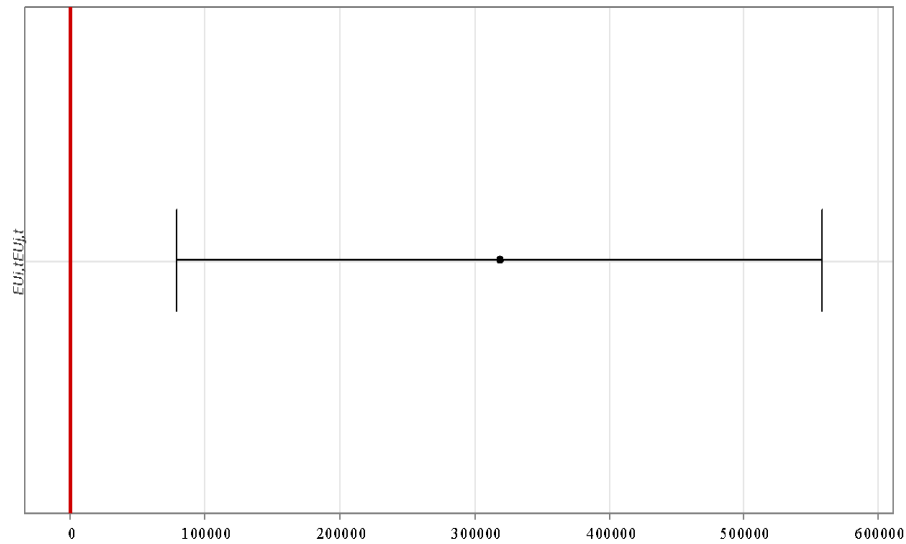


Figure 3. Graphic representation of the difference in the mean values of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) for the membership of the source (i) and target (j) countries in the European Union
Source: own sourcing

The last partial goal was to identify the impact of the existence of a significant interaction between the industry of the manufacturing sector (s) and the membership of the source (i) and target (j) countries in the European Union at time t . Based on the analysis, we can say that the analyzed interaction is not significant at the selected level of significance $\alpha = 0.05$ ($p=0.958$), which is also evident from Figure 4.

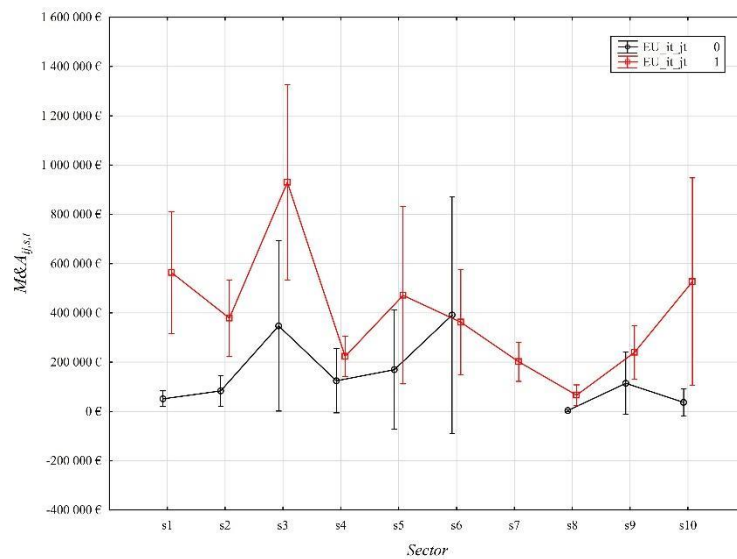


Figure 4. Average values of cross-border mergers and acquisitions according to the individual sectors analyzed and the EU membership of the source and target countries (s1 - Chemicals, rubber, plastics, non-metallic products, s2 - Food, beverages, tobacco, s3 - Gas, Water, Electricity, s4 - Machinery, equipment, furniture, recycling, s5 - Metals & metal products, s6 - Primary Sector, s7 - Publishing, printing, s8 - Textiles, wearing apparel, leather, s9 - Wood, cork, paper, s10 - Construction)
Source: own sourcing

In conclusion, it can be summarized that the analysis confirmed the significant influence of the manufacturing sector (s) and the membership of the source (i) and target (j) country in the EU on the conditional mean value of cross-border mergers and acquisitions ($M\&A_{ij,s,t}$) at the selected level of significance $\alpha = 0.05$ and at the same time there was no statistically significant effect of their joint interaction. Likewise, based on the results of the variance analysis (tab.1), where the absolute term (Intercept) of model (1) is significant, this model has further refinement potential by considering other possible significant influences.

5. Discussion and Conclusion

In conclusion, it can be concluded that the analysis confirmed the significant influence of the manufacturing sector and the membership of the source and destination countries in the EU on the conditional mean value of cross-border mergers and acquisitions (at the chosen level of significance $\alpha = 0.05$), and at the same time there was no statistically significant effect of their joint interaction.

Various regional, economic and currency agreements between countries have a significant impact on cross-border mergers and acquisitions. They make it possible to increase profitability, as regional agreements increase the size of the market and promote competition, while also reducing the costs of financial transactions related to financial integration, taking into account the stability of the exchange rate and the level of inflation (Coeurdacier, De Santis, Aviat 2009). The analysis of the source countries shows that the largest number of cross-border mergers and acquisitions in the manufacturing sector was directed from Great Britain. From the analysis of the target countries, Germany is the most significant country where the flow of cross-border mergers and acquisitions within the manufacturing sector was directed. From the analysis of the source and target countries, significant specificities related to the countries of Europe emerge. Moschieri and Campa (2014) also draw attention to this fact. Vasconcellos, Kish (1998) also pointed out the attractiveness of the M&As market in Europe. Another of our conclusions pointed to the fact that the manufacturing sector variable significantly affects the value of cross-border mergers and acquisitions and also has an equally significant effect on the membership of the source and target countries in the European Union. In this respect, our results agree with the conclusions of, for example, Coeurdacier, De Santis, Aviat (2009), who examined M&As in the manufacturing sector and pointed out that the membership of both countries in the EU is a significant determinant of the volume and number of M&As. If we were to analyze more closely the influence of individual production branches of the manufacturing sector, only the *Gas, Water, Electricity* branch with a significance value of $p = 0.000$ has a significant change in the value of assets acquired through cross-border mergers and acquisitions, while its influence on the investigated value of $M\&A_{ij,s,t}$ represents 19.983% and *Machinery, equipment, furniture, recycling sector* with an achieved significance value of $p = 0.000$ and 10.334% due to the change in the value of the analyzed dependent variable. Thus, the *Gas, Water, Electricity sector* achieved the first place among manufacturing sectors in our survey. In previous studies, the potential of this sector within M&As was pointed out in particular by Niemczyk et al. (2022), but also other authors, such as Andriuškevičius, Štreimikienė (2021), Codognet et al. (2002), Monastyrenko (2017). Codognet et al. (2002) also outlined that the leading countries in this area are Germany and the UK, which we also confirmed with our analyses. The last significant conclusion we reached is that the influence of the absolute member of the model (Intercept) with a significance level of $p = 0.000249$ points to the fact that there are other significant influences that affect the conditional value of cross-border mergers and acquisitions which was not considered within this contribution. In this context, it would be appropriate to verify with further research whether and what effect goodwill has on M&As in the manufacturing sector, as investigated by Zhang et al. (2022). However, their research was only carried out in Chinese manufacturing enterprises. It would be interesting to apply this predictor also in our research sample in order to confirm or refute their conclusions. The results of Liu et al. (2021) show that prospective firms are more likely to conduct innovation-driven M&As. In this regard, we could also examine the impact of innovation on M&As. The study by Kim, Davis (2019) is also interesting, according to which it would be appropriate to verify productive resource efficiency in connection with M&As on our sample.

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