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Market characteristics and entry strategy decision making: the market perspective of Croatian elderly care homes

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Abstract
Background: Socio-demographic changes increase the need for long-term elderly care. Consequently, providing formal institutional service in elderly care homes is an interesting opportunity for entrepreneurs. However, the entry strategy decision is influenced by numerous external variables.
Purpose: The main goal is to answer what determines market concentration as one of the most important market entry determinants.
Study design/methodology/approach: A linear regression model has been formed and tested on the Croatian elderly care home market, observed on a county level, using data for 2021. Further, a cluster analysis, as a decision-support tool, has been made to assess market characteristics that are more likely to attract new entrants to the elderly care home market.
Findings/conclusions: Results indicate that demand for long-term care services plays a significant role, and the market with more elderly will attract more competitors. When the level of GDP per capita and the unemployment rate are observed together, markets with stronger economies tend to attract entrepreneurs. In other words, it is more likely that someone will open an elderly care home in a densely populated county with individuals that can afford formal institutional long-term care for themselves or family members.
Limitations/future research: The shortcomings are mainly related to the lack of data on prices and quality measures. Further, information on the number of beds in each elderly care home would enable an alternative calculation of the Herfindahl-Hirschman index, while data on service prices and structure of employees as a proxy for quality (medical and non-medical staff) would enable a more reliable comparative analysis of obtained results. Future studies on this subject include variables related to the portion of unemployed females in the market since female family members more often provide informal care, and at the same time, they are more likely to be employed in formal long-term care institutions.

Keywords
long-term care (LTC), elderly care home, market concentration, market competition, new entrant, Herfindahl-Hirschman index (HHI), Croatia

Introduction

Ageing society, changes in family structure in the sense that the portion of multigenerational families decreases, and expanded life expectancy provide numerous business opportunities in the context of the silver economy. When we observe their nature, many elderly-adjusted products and services belong to the group of normal, i.e. luxury goods such as various hospitality industry products and services. However, in some cases, elderly consumers are compelled to use certain products/services, such as in the long-term care (LTC) industry. Therefore, the aforementioned socio-demographic changes and the nature of the LTC increase demand for LTC products/services (both formal/informal and institutional/non-institutional). Consequently, providing formal institutional LTC services in elderly care homes might be an interesting opportunity for investors.

However, even though existing demand is a necessary precondition, numerous internal and external factors determine the entrepreneurial decision to enter a specific market.

When it comes to the formal institutional LTC sector as an entrepreneurial opportunity, external determinants are rather specific. Users of the service are elderly individuals, often with physical and mental health issues, which makes this business both labor-intensive and specific in requiring more or less trained medical staff. Further, since the nature of the service requires residential premises, high capital investments are necessary if the company needs to rent or build them. Also, in many cases, along with consumers, family members and/or government subsidies cover the cost of the service. If they cannot cover it, families often provide informal non-institutional care or pay for formal non-institutional care for their elderly family members. Therefore, the decision on whether and where to open an elderly care home is under the influence of several complex external and internal determinants, ranging from level of demand, consumers' ability to pay for the service, choice consumers have in terms of substitutes for the service, to availability of suitable employees.

In that sense, this paper is focused on determinants of the formal institutional LTC market structure, i.e. market concentration as an external choice element, to provide a decision support tool while deciding whether to enter the respective market in the context described in Figure 1.

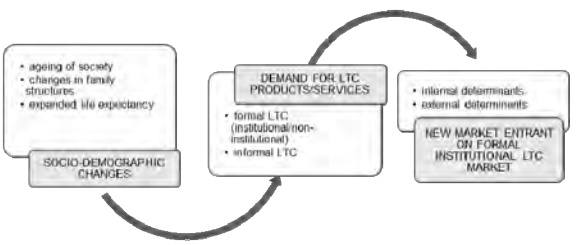

Figure 1 New market entrant – context of formal institutional LTC market
Source: the author

A market concentration determining market structure is considered one of the most important elements of the decision whether to enter the market. Namely, it is reasonable to expect that market structure, i.e. market concentration, is correlated to the company's profitability. However, the nature of their correlation and causality is a source of debate. On the one hand, according to the Harvard school of economic thought, a company will strive to increase its market share to increase its market power manifested via more control over prices resulting in higher profits (for detailed insight on market concentration as a determinant of profitability cf. Pervan, Pervan, & Ćurak, 2019). In that setting, a higher market concentration would imply a lower level of competition, which might attract new entrants. On the other hand, lower market concentration resulting from higher competition might indicate demand sufficient to accommodate additional entrants to the market. Therefore, it is reasonable to expect market concentration to influence the new entrant's decision. Still, the outcome will result from a combined analysis of the entrant's internal and external factors.

Here presented analysis is an additional tool because the information entrepreneurs can derive from their internal factors should be complemented by market concentration. More precisely, their business outcome will be, among other factors, influenced by the fact whether they own appropriate real estate, the amount and cost of the available capital, specific knowledge about the LTC sector in terms of optimizing work processes, and the possibility of using innovations to increase efficiency.

Another important element of formal institutional LTC markets, besides overlapping of their social care and healthcare elements, is their diversity depending on the respective country. In that sense, LTC systems in countries that spent a relatively low portion of their GDP on LTC are rarely the focus of scientific interest. This is even more emphasized if we focus on their market concentration. Croatia belongs to those insufficiently analyzed, growing LTC markets. Consequently, here presented analysis will, on the sample of the Croatian formal institutional LTC market, try to answer two following research questions:

1. What determines the market concentration on market for formal institutional LTC?
2. What market characteristics are more likely to attract new entrants to the elderly care home market?

This paper adds to the field in several aspects. To the authors' best knowledge, it is the only paper that focuses on determinants of market concentration in LTC markets in countries that spend a rather modest portion of GDP for LTC and do not have highly developed quality control systems in formal institutional elderly care homes. Meaning that this paper might serve as a decision-

support tool for both possible new entrants to the formal institutional LTC market and for policymakers in the respective country since obtained results can serve as an indicator of probable market concentration. The rationale behind it is that it is easier to make entrepreneurial decisions if there are available detailed data on existing competitors, i.e. characteristics of their elderly care homes, consumers satisfaction etc., but there is room for improvements when it comes to making these decisions on under-analyzed areas. Therefore, since empirical analysis was made in Croatia, the presented analysis can be applied in countries with similar LTC systems and a lack of publicly available data on this sector. Further, policymakers might find presented findings useful in a situation when it is necessary to anticipate the level of market concentration. In other words, when it is necessary to predict which areas are more likely to be underserved by privately owned elderly care homes and consequently to plan for public action or development of substitutional LTC products.

The following chapter provides a brief literature overview. Chapter 2 provides data and a sample description. The methodology is explained in the third chapter, and it is followed by results presented in the fourth chapter. Discussion is given in Chapter 5 while concluding remarks are presented in the last chapter.

1. A brief literature review

Studies dealing with a market concentration in LTC systems are often directed to a connection between market concentration on one side and price and/or quality on the other. As expected, more studies deal with the US market (Fulton, 2017; Nyman, 1994; Zinn, 1994 etc.), and there are studies dealing with elderly care homes in European countries with developed LTC systems, such as Sweden (e.g. Broms, Dahlström & Nistotskaya, 2020), England (e.g. Forder & Allan, 2014), Netherlands (e.g. Mosca, Pomp & Shestalova, 2010). However, market competition is also analyzed from different perspectives. In that sense, Gandhi, Song and Upadrashta (2020) focused on the impact of private equity acquisitions on the quality of care in US nursing homes. Grant, Kesternich and Van Biesebroeck (2020) analyzed competition between non-profit and for-profit LTC homes in Germany, while Yeh, Tsay, Wang, Lo and Shi (2021) used market concentration as one of the variables that determine nursing home accreditation in Taiwan. Grabowski (2008), on the other hand, deals with several issues related to LTC research and, along with emphasizing unanswered policy questions, raises the question of the construction of standard measures of LTC market boundaries. Although his research is focused on the US market, his critical standpoints are widely applicable. Scourfield (2007) also criticized marketization and the privatization of the LTC elderly care system. Even though his focus was on the UK, concerns expressed in the term "caretalization" might be applied to all countries with developed or developing LTC systems. In other words, this criticism of the commodification of long-term care for the elderly can serve as a corrective to both researchers and policymakers while advocating for efficiency increase and marketization without taking into account possible adverse effects on users of these services.

Besides the aforementioned papers that deal with market concentration, there are numerous papers on LTC covering various economic aspects of this specific sector. Productivity and efficiency have often been at the center of many studies focused on one country (Barsanti, Bunea, & Colombini, 2021; Višić & Kordić, 2021; Luasa, Dineen, & Zieba, 2018; Veloso, Vaz, & Alves, 2017; Garavaglia, Lettieri, Agasisti, & Lopez, 2011; Laine, Finne-Soveri, Björkgren, Linna, Noro, & Häkkinen, 2005, etc.) or more countries (Wichmann, et al., 2018; Ozbugday, Tirgil, & Kose, 2020, etc.).

Institutional elderly care is a substitute for home care, and the financial repercussions of these options are interesting from an individual as well as from a state perspective, where it is necessary to project the demand for these services and analyses the development and sustainability of the social protection system (Manojlović, 2020; Bađun, 2017; Mihić, Todorović, & Obradović, 2014). Closely related to the issue of sustainability of this sector are products such as LTC insurance that are designed to satisfy customers' needs and, at the same time, relieve financial pressure on the government (e.g. Fuino, Ugarte Montero, & Wagner, 2022; Karagiannidou & Wittenberg, 2022; Bađun & Krišto, 2021; Wang, Abiiro, Yang, Li, & De Allegri, 2021; Eling & Ghavibazoo, 2019; Courbage, 2010, Zhou-Richter, Browne, & Gründl, 2010, etc.). Besides financial-type innovations such as LTC insurance, the very nature of long-term care requires continuous improvements in the social aspect of the provided service, and there is

growing literature focused on social innovations (e.g. Mali (2019) provides an excellent overview of innovations mainly related to improving quality life in elderly nursing homes). Closely related, residents' quality of life in elderly care homes is a focus of many studies (e.g. Orr, et al., 2023; Xu, et al., 2023; Harouni, Tabrizi, Fallahi-Khoshknab, Fadayevatan, & Maddah, 2022; Olumekor, Stojić, Kehler, & Polo, 2022; Sjölund, Mamhidir, & Engström, 2021; Lovreković & Leutar, 2010, etc.)

Further, there is rising interest in technological innovations related to social robots (cf. Lavin, et al., 2022; Blindheim, Solberg, Hameed, & Alnes, 2022, etc.) while Lapp, et al., (2022) for example provide an overview of studies focused on clinical decision support tools in elderly LTC homes. Similar, Chiang, Hsieh and Wu (2022) analyses the implementation and acceptance of information and communication technology (ICT) in LTC institutions in Taiwan.

In countries with highly developed LTC systems, such as Sweden, more specific themes gather researchers' attention, such as the question of inequality in the use of this care in diverse ageing societies with sizable migrant populations (cf. Innes, Walsh, & Österberg, 2021).

2. Data and sample description

Empirical analysis has been made on Croatian companies operating in activities under code 87.3 Residential care activities for the elderly and disabled in NACE Rev. 2 classification of economic activities in the European Community. Data on each business subject registered for this formal institutional LTC service were retrieved in January 2023 from Croatian Financial Agency (FINA) database named info.BIZ. The sample covers 233 companies that operate in the respective sector with total revenue for 2021 higher than 0 euros.

The elderly prefer to stay in nursing homes relatively close to their family, friends and primary healthcare providers. Therefore, following the rationale presented in Zwanziger, Mukamel and Indridason (2002) and Grant et al. (2020), counties are selected as separate markets for elderly care homes. Hence, 198 micro and 35 small-sized companies have been grouped according to the 21 counties they are registered.

Herfindahl-Hirschman index (HHI) has been selected as a standard measure of market concentration. It is calculated by summing the squared market shares of each competing company in the industry, and its value lies between 0 and 10 000 (the higher the value, the more concentrated market; in a monopoly, it is 100^2=10 000). There are other several widely used market concentration measures, such as concentration ratio and Gini coefficient, but following Yeh et al. (2021), Fulton (2017), Forder and Allan (2014), Mosca et al. (2010), Zwanziger et al. (2002), Zinn (1994) and Nyman (1994) we used HHI. However, the aforementioned studies mainly used the number of beds to measure the size of an elderly care home. Since the aim of this paper is rather different, the market share of each company has been calculated based on the respective total revenue so it can better relate with the entrepreneurial segment of decision that is based on the level of market concentration.

Since the main purpose is to find what determines the level of market concentration in the formal institutional LTC market, it was necessary to select explanatory variables. Demand for products/services is positively correlated with the population, yet when it comes to the LTC market for the elderly, it is necessary to slightly adjust this variable. Namely, it is expected that the higher number of elderly will increase demand for elderly care homes, consequently increasing market competition, i.e. lowering market concentration. Therefore, the analysis includes the number of individuals that are 65 and older in each county. Further, the cost of formal institutional LTC in the majority of cases is covered by users of this care or by their family members. Hence, it is expected that higher purchasing power will have the same effect on market concentration as higher demand. Or in other words, higher GDP per capita will more likely mean that those in need can afford to be admitted to elderly care homes, which will indirectly attract more entrants to the market and decrease market concentration. These two variables have often been used in studies related to market competition (Yeh et al., 2021; Nyman, 1994; Fulton, 2017, Forder & Allan, 2014).

The unemployment rate is another important variable that seems to have a relevant direct impact on market competition in the respective market. However, its influence is twofold. On one side, a higher unemployment rate indicates a higher number of individuals potentially available to take care of the elderly, whether in an informal non-institutional way, i.e. taking care of their family members, or taking care of non-related elderly that are not admitted in elderly care homes. In this sense, a higher unemployment rate

would imply a lower demand for elderly care homes, i.e. higher unemployment rate would mean lower market competition and higher market concentration. However, LTC is labor-intensive, and as in many other (health-related) industries, companies struggle to find employees. From this perspective, a higher unemployment rate might be perceived as an opportunity for new entrants to the LTC market since they represent a possible source of necessary inputs (employees) that might attract new entrants. Or in other words, there is a possibility that this variable might have an adverse effect than in the previous case depending on which effect prevails.

All data on these three variables have been retrieved from the Croatian Bureau of Statistics ("Census of population, households and dwellings in 2021" and for data on GDP "Gross domestic product for Republic of Croatia, HR_NUTS 2021. – HR NUTS 2 AND COUNTIES, 2020"). IBM Statistics SPSS 23 has been used for the analysis.

3. Methodology

The empirical segment of this paper is divided into two parts. The first part is focused on the determinants of market concentration on the market for formal institutional elderly long-term care measured by HHI. Therefore, to test whether selected explanatory variables affect HHI as a measure of market concentration and what is the nature and strength of their impact, the following linear regression has been used:

$$HHI_{it}=\beta_0+\beta_1 GDPPC+ \beta_2 POP65 +\beta_3 UNEMP+\varepsilon_{it} \quad (1)$$

i=1, 2,…, 21; t=2021
HHI - Herfindahl-Hirschman index, county level (units)
POP65 - the number of individuals in a county that is 65 and older
GDPPC - gross domestic product per capita, county level (units, EUR)
UNEMP - registered unemployment rate, county level (percentage).

In this manner, by analyzing data for a single year, it will be possible to answer the first research question.

The aim of the second empirical part is to determine what characteristics of the market are more likely to attract new entrants to the elderly care home market. Hence, to answer the second research question and detect how objects (counties) are classified into groups, a cluster analysis has been performed following the same logic Morrison and Bryan (2010) used to find spatial clusters of elderly consumers in the U.S.A. Three previously mentioned explanatory variables (POP65, GDPPC, UNEMP) have been used in k-means clustering. In order to perform the analysis, this method requires selecting the number of clusters prior to the analysis. Consequently, taking into consideration studies with similar logic (Kočanová, Kováč, Serzhanov, & Buleca, 2023; Zhang, et al., 2022; Tobis, et al., 2021) and the size of Croatia, the analysis is set to be performed with three cluster groups.

4. Results

As previously stated, the empirical analysis consists of two segments. Consequently, obtained results for regression and cluster analysis are presented separately.

4.1. Regression analysis

The model summary is presented in Table 1, and according to the Durbin-Watson test, there is no autocorrelation in this model since the value of 2.429 is within the acceptable range (1.5-2.5). Results of the Breusch-Pagan test for heteroscedasticity are available at request, and they indicate that heteroscedasticity is not present (p=0.09; p>0.05). With a p-value of 0.013, the estimated regression model is statistically significant (Table 2).

Table 1 Model Summary

R	R Square	Adjusted R Square	Std. The error of the Estimate	Durbin-Watson
.680[a]	.463	.368	2351.34346	2.429

Source: the author
Note: a. Predictors: (Constant), UNEMP, POP65, GDPPC;
b. Dependent Variable: HHI

Table 2 ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	80908281.487	3	26969427.162	4.878	.013
Residual	93989873.423	17	5528816.084		
Total	174898154.909	20			

Source: the author
Note: Predictors: (Constant), UNEMP, POP65, GDPPC;
Dependent Variable: HHI

As seen in Table 3, all explanatory variables, except for the constant, have a statistically significant impact on the dependent variable. Values for Tolerance are greater than 0.2, and all Variance Inflation Factors (VIF) are less than 5, indicating no multicollinearity problem.

Table 3 Model coefficients

	Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
Model	B	Std. Error	Beta	t		Tolerance	VIF
(Constant)	-6692.328	4140.559		-1.616	.124		
GDPPC	1.017	.365	1.046	2.783	.013	.224	4.471
POP65	-.102	.029	-1.152	-3.550	.002	.300	3.334
UNEMP	336.297	144.762	.535	2.323	.033	.595	1.680

Source: the author

4.2. Cluster analysis

As previously stated, a cluster analysis has been used to answer the second research question, and three previously used explanatory variables, along with the value of HHI for each county have been included in the analysis. Their descriptive analysis is given in Table 4. Sixteen out of twenty-one counties belong to cluster 1, City of Zagreb is the only member of cluster 2, while the remaining four counties belong to cluster 3 (Table 7).

Table 4 Descriptive statistics

	N	Minimum	Maximum	Mean	Std. Deviation
HHI	21	564.16	10000.00	3410.0240	2957.17902
GDPPC	21	7514.00	21829.00	10402.7143	3043.58935
POP65	21	11098.00	158714,00	41250.9524	33559.39787
UNEMP	21	4.00	18.50	11.0476	4,70814
Valid N (listwise)	21				

Source: the author

Table 5 Cluster membership

County	Cluster	Distance
Bjelovar-Bilogora	1	3249.922
Slavonski Brod-Posavina	1	4136.603
Dubrovnik-Neretva	1	6044.241
City of Zagreb	2	.000
Istria	1	20672.165
Karlovac	1	1875.329
Koprivnica-Križevci	1	5389.096
Krapina-Zagorje	1	3215.087
Lika-Senj	1	16667.131
Međimurje	1	6085.183
Osijek-Baranja	3	13654.871
Požega-Slavonia	1	12583.540
Primorje-Gorski Kotar	3	3246.227
Sisak-Moslavina	1	7769.209
Split-Dalmatia	3	21835.625

Šibenik-Knin	1	3302.808
Varaždin	1	7061.562
Virovitica-Podravina	1	11669.894
Vukovar-Sirmium	1	6621.320
Zadar	1	11568.309
Zagreb County	3	6438.816

Source: the author

The presented Euclidean distance between each case, i.e. county (Table 5), as measures of similarity, and final cluster centers (Table 6) reveal that clusters are not uniform. It is evident that Cluster 2, with intense competition (the lowest level of HHI), also has the highest GDP per capita and the number of individuals 65 and older, while the unemployment level is the lowest. The difference between "mid-range competition" Cluster 3 and "low competition" Cluster 1 is most pronounced in the population segment, while concerning GDP per capita and unemployment level differences are not as drastic.

Table 6 Final Cluster Centers

	Cluster		
	1	2	3
HHI	4110.15	625.79	1305.57
GDPPC	9604.31	21829.00	10739.75
POP65	26670.75	158714.00	70206.00
UNEMP	11.21	4.30	12.08

Source: the author

Table 7 Distances between Final Cluster Centers

1	2	3
	132653.698	43640.267
132653.698		89202.577
43640.267	89202.577	

Source: the author

5. Discussion

Considering both regression and cluster analysis results, it is evident that when it comes to GDP per capita, its effect is stronger in terms of increased demand for elderly care homes. In other words, in areas with higher GDP per capita, individuals and their family members will be able to afford formal institutional LTC, which will attract new entrants to the market and decrease market concentration. This logic is supported by results for the unemployment rate indicating that in the areas with a higher unemployment rate, it is more likely that unemployed individuals will provide non-institutional care for the elderly, consequently leading to lower competition and higher levels of HHI. Li, Li and Huang (2022) indirectly confirmed results presented here since their research indicates that rural areas, usually with lower GDP per capita and higher unemployment levels than urban areas, have underdeveloped elderly care institutions. However, managing elderly care homes in areas with low unemployment levels might result in problems of labor shortages. In that sense, Vogt and König (2021) propose increased use of robotic devices and ICT to reduce employees' physical hardships and mental stress. Even though their study is focused on Japan, their findings are beneficial to both managers and policymakers in all areas with high levels of emigration of medical and nursing staff (Cabanda, 2023; Byrne, et al., 2021; Lanati & Thiele, 2021; Żuk, Żuk, & Lisiewicz-Jakubaszko, 2019, etc.).

The importance of a population aged 65 and older is confirmed by both methodologies. Namely, more individuals that are potential residents in elderly care homes increase demand for this service, attract new entrants, decrease market concentration and increase market competition. June, et al., (2022) obtained similar results regarding population density, and even though their research deals with factors that are associated with the closure of assisted living facilities, respective results take into consideration that an oversaturated market increases the risk of being unprofitable. However, a new entrant in the formal institutional LTC market should, along with the level and portion of the population older than 65, take into consideration a growing trend of ageing-in-place, i.e. deinstitutionalization of ageing individuals (Szweda-Lewandowska, 2022; Salime, Clesse, Jeffredo, & Batt, 2022, etc.). Namely, future demand for this type of service will increasingly consist of high-need elderly (Alders & Schut, 2019), and in that sense, market entrants should adopt their supply of institutional LTC care to residents that have severe physical and mental health issues. In other words, demand for elderly care homes is likely to be delayed, observed from the age of a resident entering the LTC institution, because of aforementioned efforts invested in deinstitutionalization on the government's level and substitutes developed on the free market, such as assisted living facilities (Bogataj, Bogataj, & Drobne, 2023; Kim, et al., 2022; Bowblis, 2014, etc.).

Additional comparative analysis of here obtained results shows that the variable related to

population seems to have the same effect as in Yeh et al. (2021) and Fulton (2017). Further, both papers used household income variable and obtained contradictory results, while Fulton's (2017) analysis revealed the negative impact of unemployment level on HHI. However, a comparison of here presented results should be made with caution. Namely, these two studies, even though they follow the same logic regarding the LTC sector as a segment of the health sector, are different since one is focused on determinants of accreditation scores for nursing homes (Yeh et al., 2021) and the other on the market concentration for hospitals, physician organizations and health insurers (Fulton, 2017).

Along with presented factors that affect new entrants' decisions, the elderly care homes market structure in highly developed countries has an additional element that concerns policymakers. Namely, observed increased ownership transfers might result in the emergence of local monopolies, which increases the possibility of a decline in the quality of care for residents (Holden, 2002). Even though this research does not include quality in empirical analysis, concerns related to the connection between market concentration and quality should not be neglected and should be taken into consideration by both managers and policymakers involved in formal institution LTC care (c.f. Espuny Pujol, Hancock, Hviid, Morciano, & Pudney, 2021; Hirth, et al., 2019; Castle, Engberg, & Liu, 2007, etc.).

Conclusion

The main purpose of this paper has been to analyses what determines the market concentration on the formal institutional LTC market, i.e. to detect characteristics of the market that is more likely to have higher market competition. This is important both for new market entrants and policymakers since LTC has a social and health dimension, and providing this service should not be left solely to market forces. By observing obtained results, it is evident that all analyzed variables play a significant role. As expected, demand for LTC service plays a significant role, and the market with a higher number of elderly will attract more competitors. When the level of GDP per capita and the unemployment rate are observed together, it appears that markets with stronger economies tend to attract entrepreneurs. In other words, it is more likely that someone will open an elderly care home in a densely populated county with individuals who can afford formal institutional LTC for themselves or their family members. From an entrepreneurial perspective, this is expected and logical. Still, from the perspective of necessary social and health protection, obtained results can serve policymakers to more easily detect areas/counties where the free market economy might not satisfy the needs for LTC for all elderly in need. In other words, this study helps detect areas where: a) developing non-institutional formal LTC might be needed or b) it might be beneficial to develop measures/incentives to attract entrepreneurs to the formal institutional LTC market.

However, even though empirical analysis has been made on Croatian counties, obtained results and conclusions are applicable in all countries with similar social protection and health care systems. This is especially important in areas where there is no (publicly available) data on many segments of LTC for the elderly such as internal characteristics of LTC providers and their users that might help entrepreneurs decide whether to enter the respective market.

The shortcomings of this paper are mainly related to the lack of data on prices and quality measures. Information on the number of beds in each elderly care home would enable an alternative calculation of HHI, while data on service prices and structure of employees as a proxy for quality (medical and non-medical staff) would enable a more reliable comparative analysis of obtained results. Further, as Grabowski (2008) stated, changing market boundaries might distort the results, but the analysis has been optimized according to the available data.

Therefore, future studies on this subject will be directed at minimizing the aforementioned shortcomings. Further, the analysis will be widened by including variables related to the portion of unemployed females in the market since many studies indicate that female family members more often provide informal care, which is a substitute for the observed formal institutional LTC market, and at the same time, they are more likely to be employed in formal LTC institutions. Hence, including additional variables might provide additional information to potential entrants and policymakers related to the LTC system.

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Blockchain in supply chain management in automotive industry: systematic literature review

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Abstract
Background: Although Blockchain Technology (BT) is one of the innovations that has considerable potential to improve business processes and enable new services for potential users, its implementation in supply chain management (SCM) of the automotive industry is only at its beginnings. From the growing number of publications focused on this issue, it is evident that the application of BT would significantly contribute to the development of the automotive industry and improve the supply chain of automotive components.
Purpose: In this regard, the paper aims to analyze the challenges to the implementation of BT in SCM in the automotive industry sector through a systematic review of the literature and precise definition of the advantages and limitations that appear in supply chains after the application of BT.
Study design/methodology/approach: The research is based on the application of systematic literature review methods. The paper presents the results and conclusions of 21 studies based on the search criteria outlined by the Web of Science, Scopus, and SpringerLink index databases.
Findings/conclusions: The results suggest that insufficiently developed technology, lack of clear guidelines for implementation, incomplete standardization, legislative ambiguity, conflicts and insufficient cooperation between chain members appear as the biggest challenges for BT implementation. On the other hand, BT has great potential in reducing costs, providing higher quality products and services, and improving chain visibility in the automotive industry.
Limitations/future research: The analysis of the papers in the above mentioned databases exclusively in English and the absence of empirical research stand out as the most prominent shortcomings. However, the obtained results of this study represent a quality basis for future research, which, judging by the popularity of the issue, will increase in frequency.

Keywords
Blockchain Technology (BT), Supply Chain Management (SCM), automotive industry, systematic literature review, digitalization.

Introduction

In their 2021 study, Raj Kumar Reddy, Gunasekaran, Kalpana, Sreedharan, & Kumar provide a complete view of Blockchain Technology (BT), which they view as a distributed ledger technology (DLT) that stores transaction records in a tamper-proof manner. Shahbazi, & Byun (2021), Aich, Chakraborty, Sain, Lee, & Kim (2019), Anand, Seetharaman, & Maddulety (2022) and Dursun, Birinci, Alptekin, Sertkaya, Hasekioglu, Tunaboylu & Zaim follow this view (2022) and believe that BT is a solution that contributes to the incorporation of flexibility, transparency, and traceability in traditional supply chains.

In recent years, academic research (Xu, Tatge, Xu, & Liu, 2022; Patro, Ahmad, Yaqoob, Salah, & Jayaraman, 2021; Surjandy, Meyliana, H. L. H. Spits Warnars & E. Abdurachman, 2020; Alabi, & Telukdarie, 2021) offers the dominant view that supply chain participants should be more encouraged to implement BT in their business processes. The authors (Yuksel, Bolat, Bozkurt, & Yucekaya, 2021; Upadhyay, Ayodele, Kumar, & Garza-Reyes, 2020; Raj Kumur Reddy, Gunasekaran, Kalpana, Sreedharan, & Kumar, 2021) emphasize that the application of BT is still in its infancy, especially in complex sectors like the automotive industry. Xu et al. (2022) indicate that the automotive industry is particularly suitable for the implementation of BT-based applications. The authors' opinion is that such modern technology would simplify the procurement processes of automotive components, improve the chain flexibility and provide various additional services to existing and potential customers (Fernández-Caramés, Blanco-Novoa, Froiz-Míguez, Fraga-Lamas, 2019; Cichosz, 2018). A similar belief is shared by Chung (2021), who considers the implementation of modern information and communication technologies based on the Internet of Things (IoT) and BT to be crucial for increasing efficiency and effectiveness in logistics and transport systems. Erol, Ar, Ozdemir, Peker, Asgary, Medeni, & Medeni, T. (2020) state that the flexibility of blockchain platforms and their ability to adapt and respond to different user needs makes them suitable for application in agricultural supply chain management (SCM), and the food industry, pharmaceutical industry, energy industry, automotive industry, etc. However, despite BT being a buzzword today, its application in the automotive industry is limited, as evidenced by studies by Antônio Rufino Júnior, Sanseverino, Gallo, Koch, Schweiger, & Zanin (2022) and Surjandy, Meyliana, H. L. H. Spits Warnars & E. Abdurachman (2020). In this regard, it is necessary to instruct the supply chain participants in the automotive industry in detail about all the advantages and disadvantages that the application of this technology brings.

According to Meyliana, Fernando, Widjaja, Cassandra, & Tan (2021), the most important benefits from the application of BT in the automotive industry are reflected in the protection, accuracy, and security of data, integration of data into unique blockchain technology systems, timely exchange of information among chain participants, etc. Therefore, BT contributes to the reduction of risks that occur, particularly in the exploitation of data along the entire supply chain from the beginning of production to the production of the finished vehicle, as well as the production of spare parts for the vehicle itself. Zuksel et al. (2021) state that BT effectively solves practical problems, such as records of defective parts, contract expiration dates, recording information on the transfer of physical assets, creation of smart contracts, transparency of physical destruction of used spare parts, etc. Research results related to the German automotive industry (Xu et al., 2022) suggest a more efficient collection of product information, provision of information on transactions and establishment of a reliable supply chain, reduction of process costs, assurance of product and service quality, improved chain visibility as the most important benefits of BT implementation supply and digitalization of all production and service processes. Upadhyay et al. (2020) emphasize the benefits in the form of information exchange among chain participants with minimal risks of access to the sizeable amount of data generated along the entire chain and stronger connections between the flow of information and the flow of materials. Syed, Siddique, Nadeem, Alzahrani, Jan, & Khattak (2020) see the effective application of BT in the vehicle life cycle itself, such as the creation of databases in relation to change of ownership, registration, transfer, and rental of vehicles, insurance, service, repairs, etc.

On the other hand, Xu et al. (2022) cited the lack of guidelines and clear industry standards, non-cooperation of supply chain members, technological immaturity, and legislative ambiguity as the biggest obstacles to the adoption of BT in the automotive industry. Upadhyay et al. (2020) consider that one of the challenges for BT management is the limited knowledge of BT application opportunities that most supply chain managers in the automotive industry lack. Aich et al. (2019) highlight the lack of advanced technology, lack of trust in security among chain participants, lack of flexibility for sudden demand-side gaps, fraud, code violations, illegal behavior etc. as key barriers. According to Pustokhin & Pustokhin (2019), these also include administrative and legislative barriers between countries, unfit communication infrastructure, and different customs clearance and data entry methodologies.

Based on the search results of the main index databases (Web of Science, Scopus, and SpringerLink), BT is a topic that has been increasingly present in academic research in recent years. As a time frame suitable for research, we searched works for the period from 2010-2022 by keywords: Blockchain Technology (BT), Distributed Ledger Technology (DLT), and Supply Chain Management (SCM) in the automotive/car/vehicle industry. The results of the analysis suggest that the understanding of the BT implementation process in the automotive industry began in the second half of the previous decade. The interest of researchers is particularly emphasized between 2018 and 2022, as evidenced by the hits we got with keywords.

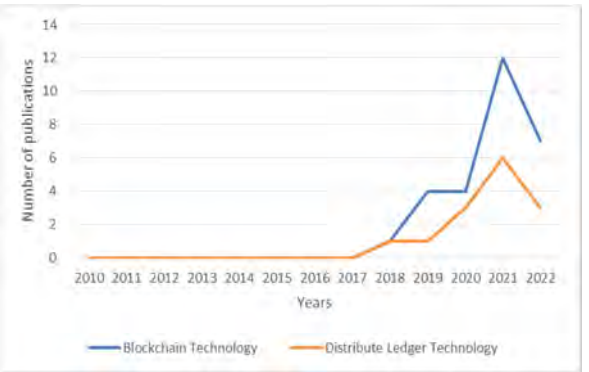

Figure 1 Number of publication – BT & DLT
Source: the authors' calculation

Only a decade after the first papers dealing with the issue of BT implementation as support for online payment were published (Nakamoto, 2008), there was an increase in academic interest in this area in the automotive industry. By detailed filtering of the search by keywords and by eliminating papers due to the irrelevance of the topic, duplication of papers, etc., this study reached 38 direct hits. An increasing trend was observed from 2018 to 2022. Two publications appeared in 2018, followed by a noticeable increase of five in 2019. In 2020 there were seven publications, and in 2021 there was an increase of over 15 publications. The year 2022 started with 10 publications. From the 38 hits obtained, this research study exclusively examines 21 papers selected for further discussion and analysis.

This paper aims to explore attitudes regarding the possibilities of implementing BT in SCM in the automotive industry and the advantages and limitations of such implementation through a systematic review of the literature. Based on the search in the index databases, we obtained a list of papers needed to define the research questions. Table 1 presents the research questions as well as the motivation.

Table 1 Research questions

No.	Research question	Motivation
RQ_1	What are the possibilities of BT implementation in SCM in the automotive industry?	The possibilities of implementing BT must be clearly defined, as well as the willingness of supply chain managers to implement BT.
RQ_2	What are the advantages and limitations to the SCM in the automotive industry after adopting BT?	All the advantages and limitations that appear in relation to the application of BT in the automotive industry must be clearly presented.

Source: the authors

The paper consists of six parts. After the introductory discussion of the research subject in the Introduction chapter, the second chapter, Methodology, describes the methodology used and the research procedure. The chapter subtitled "Conducting" the review lists the systematic review of literature, whereas the chapter "Findings" gives answers to research questions. Limitations are presented in the chapter "Threats to validity", and future research and practical implications of the work are presented in the chapter "Conclusion and future research". The last part of the work, "References", contains an overview of the literature used.

1. Methodology

With regard to the stated subject of the work and the research questions, a systematic review of the literature was chosen as the most appropriate research method. Xiao & Watson (2019) conducted a systematic literature review in eight steps grouped into three phases (Planning, Conducting, and Reporting).

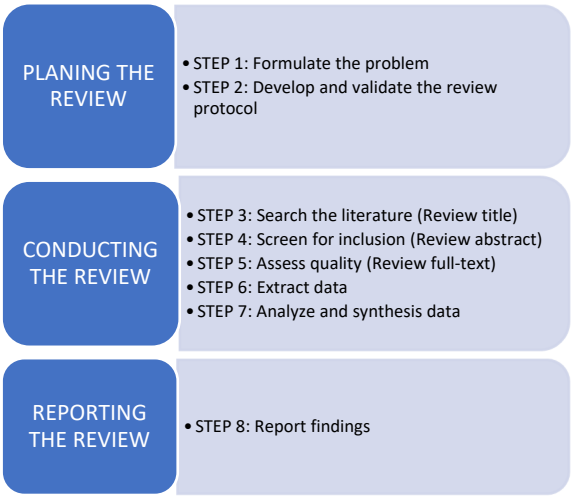

Figure 2 Process of systematic literature review.
Source: Xiao, & Watson, 2019, pp. 103

In the first phase of the research, the first two steps refer to the definition of the research subject and the development and definition of the literature review protocol. The second phase includes filtering, which begins with a review of the literature (exclusively the titles of publications), continues with a review of abstracts, and in the fifth step, a review and analysis of the entire texts. The phase ends with data extraction, analysis, and synthesis. The last stage is the reporting of the obtained findings.

Based on the protocol built by Upadhyay et al. (2020), Surjandy, Meyliana, H. L. H. Spits Warnars & E. Abdurachman (2020), and Xiao & Watson (2019), research questions were identified, and search strategy and review protocol were defined. All analyzed articles were retrieved from Web of Science, Scopus, and SpringerLink databases as the most comprehensive databases on a global level that provide the best academic information. The search process was performed using the keywords: Blockchain Technology (BT), Distributed Ledger Technology (DLT), Supply Chain Management (SCM), automotive industry, car industry, and vehicle industry. We have searched only high-quality peer-reviewed publications. In the first step, only keywords were searched individually by the database. In the second step, the titles and abstracts of the works that appeared in the hit list were reviewed. In the last step, the papers that have the potential to provide answers to the research questions were selected. This group also included those works for which the authors were unsure, based on the title, keywords, and abstract, that they were directly related to the problem of the study. The last step involved merging the works from the specified databases into a single list and then removing duplicates.

The above search methodology identified 38 papers, 21 of which were used for further in-depth analysis and the search for answers to research questions.

2. Conducting the review

The search for papers included three renowned citation databases: Web of Science, Scopus, and SpringerLink. The search was performed using keywords relevant to the research questions: Blockchain AND Supply chain management AND Automotive industry, Distributed Ledger Technology AND Supply Chain Management AND Automotive industry, Blockchain AND Supply chain management AND Car industry, Distributed Ledger Technology AND Supply Chain Management AND Car industry, Blockchain AND Supply chain management AND Vehicle industry, Distributed Ledger Technology AND Supply Chain Management AND Vehicle industry. The period covered by the search is from 2010 to June 2022. Table 2 shows the initial numbers of the papers found based on previously defined keywords.

Table 2 Number of papers based on keywords

Data base	Keywords	Number of hits
Web of science	Blockchain AND Supply chain management AND Automotive industry	19
	Distributed Ledger Technology AND Supply Chain Management AND Automotive industry	4
	Blockchain AND Supply chain management AND Car industry	4
	Distributed Ledger Technology AND Supply Chain Management AND Car industry	2
	Blockchain AND Supply chain management AND Vehicle industry	19
	Distributed Ledger Technology AND Supply Chain Management AND Vehicle industry	2

Scopus	Blockchain AND Supply chain management AND Automotive industry	15
	Distributed Ledger Technology AND Supply Chain Management AND Automotive industry	3
	Blockchain AND Supply chain management AND Car industry	3
	Distributed Ledger Technology AND Supply Chain Management AND Car industry	0
	Blockchain AND Supply chain management AND Vehicle industry	19
	Distributed Ledger Technology AND Supply Chain Management AND Vehicle industry	3
SpringerLink	Blockchain AND Supply chain management AND Automotive industry	19
	Distributed Ledger Technology AND Supply Chain Management AND Automotive industry	4
	Blockchain AND Supply chain management AND Car industry	4
	Distributed Ledger Technology AND Supply Chain Management AND Car industry	2
	Blockchain AND Supply chain management AND Vehicle industry	19
	Distributed Ledger Technology AND Supply Chain Management AND Vehicle industry	2

Source: the authors

Based on reading the title, abstract, and keywords, a total of 65 papers were selected to be the subject of further analysis since they fit in with the topic of the paper. There were 14 duplicates which were excluded from further analysis. The remaining 51 papers were read and 13 of them were discarded since they do not give answers to the research questions. Of the remaining 38 papers, 17 papers are general, that is, they include the application of Blockchain technology in SCM in various areas, while the remaining 21 papers are entirely in line with the research questions, that is, the application of Blockchain technology in SCM in the automotive industry. They are presented in Table 3. After applying exclusion and inclusion criteria 21 publications are left and are shown in Table 3.

Table 3 Papers that passed detail analysis

No	Year	Authors	Publication type	Aim(s)	Methodology	Theoretical framework
1	2020	Surjandy, Meyliana; Warnars & Abdurachman	Procceeding paper	To identify open problems in the SCM of the automotive industry where blockchain technology can help solve the problems	Systematic literature review	Not explicitly stated
2	2021	Meyliana, Fernando, Surjandy, Eka Widjaja, Cassandra, & Tan	Procceeding paper	To identify perspectives and trending topics in the application of blockchain in the automotive industry	Systematic literature review and Bibliometric analysis	Not explicitly stated
3	2021	Patro, Ahmad, Yaqoob, Salah, & Jayaraman	Journal article	To show how blockchain can effectively improve existing cars; product recall management process	Case study	Not explicitly stated
4	2021	Yuksel, Bolat, Bozkurt, & Yucekaya,	Procceeding paper	To point out the potential that blockchain technology has in providing a high degree of competitiveness, especially for automotive service providers	Case study	A distributed, blockchain-based spare parts disposal process.
5	2022	Xu, Tatge, Xu, & Liu	Journal article	To research the potential and existing challenges in the application of blockchain technology in German OEMs (original equipment manufacturers)	Collective case study and in-depth interviews	an overall framework for the impact of blockchain technology in the German automotive supply chain by evaluating supply chain management, quality control, information testing, and a comprehensive assessment of German OEMs

6	2020	Upadhyay, Ayodele, Kumar, & Garza-Reyes	Journal article	To explore the challenges and opportunities of blockchain technology from the perspective of the TOE framework (technological–organizational–environmental) for operational excellence in the UK automotive industry	Literature Review	technological and management challenges and opportunities of blockchain from the TOE framework angle for operational excellence
7	2019	Aich, Chakraborty, Sain, Lee, & Kim	Procceeding paper	To point out the differences between a conventional supply chain and a supply chain based on blockchain technology, as well as pointing out the benefits of implementing blockchain in various areas, including the automotive industry	Case study	Not explicitly stated
8	2020	Syed, Siddique, Nadeem, Alzahrani, Jan, & Khattak	Journal article	To design and develop a framework for monitoring the complete life cycle based on blockchain technology.	Exploratory Research	A blockchain-based framework for vehicle tracking
9	2022	Antônio Rufino Júnior, Sanseverino, Gallo, Koch, Schweiger, & Zanin	Journal article	To use the literature to justify the use of blockchain technology for battery tracking	Systematic Literature Review	Not explicitly stated
10	2021	Ada, N., Ethirajan, M., Kumar, A., K.E.K, V., Nadeem, S. P., Kazancoglu, Y., & Kandasamy	Journal article	To identify different problems in tracking different nodes in one supply chain of the automotive industry.	Case study	A framework for blockchain is developed for the automotive supply chain
11	2021	Kamble, Gunasekaran, Subramanian, Ghadge, B elhadi, & Venkatesh	Journal Paper	To identify the relationship between blockchain technology (BT) and sustainable supply chain performance (SSCP) Examining the direct influence of BT on supply chain integration (SCI) and SSCP; To analyze interactive effect of BT and SCI on SSCP	Survey	Blockchain technology adoption, supply chain integration, and sustainable supply chain performance
12	2017	Al-Saif, Wasim Ahmad, Salah, Yaqoob, Jayaraman, & Omar	Journal Paper	To identify the potential advantages of blockchain technology to manage energy trading operations between electric vehicles	Multiple Case study	Blockchain-based research projects and case studies to highlight the practicability of blockchain technology in electric vehicles' energy trading
13	2022	Jabbar, Dhib, Ben Said, Krichen, Fetais, Zaidan, & Barkaoui	Journal Paper	To provide a systematic review of Blockchain application to intelligent transportation systems and the Internet of Vehicles (IoV); to identify the different Blockchain applications in intelligent transport applications for IoV networks	Systematic literature review	Based on the available literature, a framework of the evolution of Blockchain, the Blockchain 1.0 phase and 2.0 phase, and the state of the art of Blockchain-based IoV solutions (BIoV)
14	2018	Kumar Sharma, Kumar, & Hyuk Park	Journal Paper	To identify a blockchain-based distributed framework for the automotive industry in the smart city; to identify a novel miner node selection algorithm for the blockchain-based distributed network architecture	Exploratory Research	Blockchain-based framework for the automotive industry in the smart city

15	2016	Debe, Hasan, Salah, Yaqoob, & Jayaraman	Journal Paper	Identifying a blockchain-based solution to enable energy trading using an auctioning and reputation scheme between EVs in a manner that is reliable, secure, and trustworthy; developing an Ethereum smart contracts which enable owners of EVs to automatically request electricity to charge their vehicles in a reliable, cost-effective, secure, and trustworthy manner; implementation of the deployed system on a test Ethereum blockchain platform	Qualitative Research	P2P energy trading schemes Energy trading between EPs and energy consumers (i.e., EVs)
16	2021	Raj Kumur Reddy, Gunasekaran, Kalpana, Sreedharan, & Kumar	Journal Paper	To analyze how to link supply chain visibility and information transparency with BCT for an efficient ASC in VUCA world Exploring the role of BCT in ASC; to analyze what kind of BCT is required to digitize ASC practices; to develop a BCT enabled framework for ASC in the VUCA world	Systematic literature review	Based on the available literature, a framework were automotive supply chain (ASC), blockchain technology (BCT), smart contracts, digitalizing the ASC, integrating BCT with digitized ASC, VUCA in the automotive industry
17	2021	Saibani, Ghania , Hassan Shamsul Akmara , Boon, Ravia, Nawawia & Mohd Asri	Journal Paper	To identify how the supply chain process can be improved with the aid of the latest technologies; to analyze the latest technologies in SCM and logistics; to analyze the latest technologies in SCM for achieving customer satisfaction	Reviewing existing literature	Supply Chain Management (SCM); latest technologies related to SCM
18	2020	Markov & Vitliemov	Proceedings Paper	To investigate the potential possibilities for implementation of Logistics 4.0 and Supply Chain 4.0 in the automotive industry plants in Bulgaria	Survey	Special feature of industry 4.0 Logistics 4.0 application model
19	2019	Miehle, Henze, Seitz, Luckow, & Bruegge	Proceedings Paper	To implement decentralized supply chain traceability mobile application called PartChain that enables the creation, monitoring, and sharing of a unique digital representation of a physical part across a supply chain network using blockchain technology (BT)	Event study	Distributed Ledger Technologies (DLTs) Smart Contracts Digital Twin
20	2021	Shahbazi & Byun	Journal Paper	To identify a real-time monitoring system based on the integration of IoT sensors, big data, and a hybrid prediction model Using the hybrid prediction model and the random forest model for classification to avoid the outlier dataset; To make the detection of the abnormal process more accurate through the steps of manufacturing; Real-time data extraction to improve the automotive industry prediction preservation	Quantitative Research	Brief review of the smart manufacturing and monitoring system literature in the automotive industry with four main topics: monitoring systems based on IoT technology, big data in manufacturing, machine learning in manufacturing, and Blockchain in manufacturing

21	2020	Hossain, Khaled, Ahamed Saju, Roy, Biswas & and Aminur Rahaman	Proceedings Paper	To propose a BC-based distributed ledger framework that is capable of maintaining a vehicle registration and information management system across platforms; To identify the required data fields to manage a vehicle registration and information management system To analyses the impact of BC-based distributed ledger in terms of managing vehicle registration	Exploratory Research	Based on the available literature, a framework were vehicle registration process, traditional paper based workflow and Blockchain impacts (BC)

Source: the authors

Figure 3 shows the works identified for analysis by year of publication. Since the search was done in June 2022, the result for 2022 does not represent complete information about the number of works published this year.

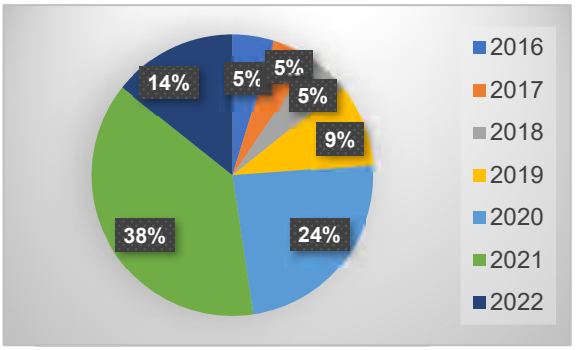

Figure 3 Number of papers per year of publication
Source: the authors

Case studies and Research articles are equally represented in the identified works for analysis at 33.33% each, Review articles at 9.52%, and Systematic literature review at 23.8%.

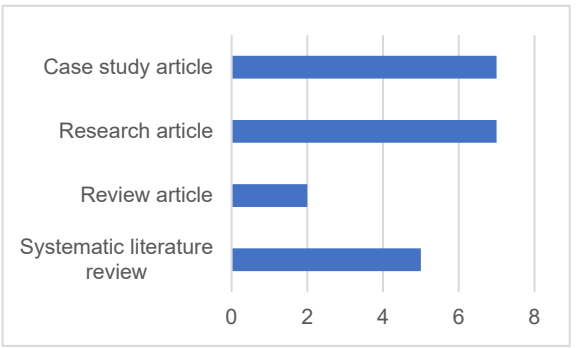

Figure 4 Distribution of paper types
Source: the authors

3. Findings

3.1. Implementation of BT in SCM in automotive industry

BT can contribute to minimizing counterfeit automotive components, monitoring and controlling logistics or distribution processes, improving the production process, improving product quality, and besides that, a more active relationship with suppliers (Surjandy, Meyliana; Warnars & Abdurachman, 2020). BT strongly influences data security, ensuring data accuracy and integrating data into the blockchain technology system for the process of information exchange between vehicles and autonomous vehicles. (Meyliana, Fernando, Surjandy, Eka Widjaja, Cassandra, & Tan, 2021). Patro, Ahmad, Yaqoob, Salah, & Jayaraman (2021) proposed a blockchain-based approach that enables a comprehensive car towing management process in a decentralized, secure, reliable, and transparent manner. It is developed, tested, and validated on the public Ethereum platform to meet the requirements of traceability, transparency, and safety of product recalls in the supply chain. They presented cost and security analyses that indicate that the proposed solution is cost-effective and sufficiently secure from cyber-attacks and is not vulnerable. Also, they compared their option with a solution that is not based on blockchain technology to show the innovation of their solution. Yuksel, Bolat, Bozkurt, and Yucekaya (2021) proposed a distributed, blockchain-based spare parts disposal process. In this way, the process is digitized and made much more secure by using intelligent contracts created with the Hyperledger Fabric infrastructure. The proposed methodology will enable more efficient monitoring of the supply process by allowing access to the system to obtain approval from partners while monitoring all transactions and parts. During the entire process, financial losses resulting from various errors in

documents as well as possible physical failures are going to be minimized.

Syed, Siddique, Nadeem, Alzahrani, Jan, & Khattak (2020) designed and developed a BT-based vehicle life cycle monitoring framework. It integrates several components related to the vehicle life cycle monitoring, starting from ordering new vehicles to the write-off (discarding) of vehicles. In addition, the solution includes features for buying and selling used vehicles, value/price estimation related to used vehicles, integration with transport authorities, maintenance of takaful insurance, verification of traffic documents, etc. Core features of the presented solution include efficiency, scalability, transparency, and modularity, and all of the above mentioned can be implemented in any country.

BT can be used for data storage which enables the execution of metric calculations to estimate greenhouse gas emissions and better management of batteries that are nearing the end of their working life. That can ensure that batteries are recycled in appropriate processes and with adequate efficiency. BT also enables the tracking of all battery materials and components in such a way that it is possible to have information on the origin of inputs, extraction of raw materials, battery production, testing and certification, first use, second use, and recycling so that all participants can make decisions based on this information. Features such as transparency, immutability, security, authenticity, and auditability justify the use of this technology to eliminate any opportunistic behavior of parties in the battery market (Antônio Rufino Júnior, Sanseverino, Gallo, Koch, Schweiger, & Zanin, 2022).

A study by Kamble et al. (2021) shows that in the automotive industry the implementation of BT in SCI improves sustainable supply chain performance (SSCP). The study supports the fact that most industrial managers are ready to invest in this technology. BT in the automotive sector can strengthen trust and cooperation between all business partners, including customers and vehicles.

Jabbar et al. (2022) confirm the necessity of BT integration in transportation systems in the automotive industry. The authors believe that blockchain implementation is necessary for the system of creating transport applications, a safe payment system, a security system, database management (big data), and energy optimization, and for the development of a transparent network of communication and information exchange between the participants of the automatic supply chain (ASC).

Kumar Sharma, Kumar, & Hyuk Park (2018) propose a distributed framework model for BT implementation in the automotive industry. This model is based on the implementation of BT in a way that interconnects the seven stages of SC, which include legislative regulation and standards, manufacturers, sellers (dealers), leasing companies, buyers (users), and the methodology of disposal of used products.

The implementation of BT in ASC is a crucial task in the modern era of digitalization. According to Kumar et al. (2021), the need to apply BT arises from the shortcomings of the traditional databases on which the functioning of ASC is based. The authors propose the adoption of IoT-based BT, which provides additional benefits such as accurate real-time information acquisition, more efficient information transfer, removal of unnecessary mediation, reliable environment, faster and more secure transactions with multi-tier suppliers, and management of critical data throughout the entire life cycle of products.

Saibania et al. (2021) suggest that SCs with integrated BT contribute to greater product transparency at all stages of the supply chain. The full implementation of BT in all IoT-based supply chain activities facilitates the planning, control, and coordination of supply chain processes. Technological advances in SCM in automotive industry and logistics include the application of machine learning (ML), autonomous vehicles/drones, advanced analytics, cloud logistics, super grid logistics, anticipatory logistics, omnichannel logistics, and additive manufacturing.

Miehle et al. (2019) advocate implementing a specific mobile application for the traceability of a decentralized supply chain in the automotive industry called PartChain. The implemented PartChain application would enable the creation, monitoring, and sharing of unique digital content of information about all products, services, processes, and activities among ASC participants by using blockchain technology (BT).

In their paper, Shahbazi & Byun (2021) conclude that the application of IoT-based BT in SCM improves the performance of the business process monitoring system in the manufacturing environment, removes errors during the production process, and similarly, prevents problems in the assembly line and final product delivery. Using IoT sensors embedded in product components, a large

amount of sensor data is collected in real-time. Owing to this technique, handling data sets and extracting appropriate information for SCM needs becomes easier and more accessible.

3.2. Advantages and disadvantages of BT in Automotive SCM

Xu, Tatge, Xu, and Liu (2022) suggest that the application of blockchain technology brings an advantage in aggregating product information, ensures the security of transaction information, and establishes a reliable supply chain. The biggest obstacles to the implementation of blockchain technology in the automotive supply chain are the immaturity of the technology, lack of guidelines and industry standards, non-cooperation of chain members, and legislative ambiguity. Based on research, BT has great potential with car manufacturers in reducing process costs, ensuring product quality and improving visibility, and digitizing the supply chain in the automotive industry.

Upadhyay, Ayodele, Kumar, and Garza-Reyes (2020) identified that blockchain as a distributed ledger technology could improve the automotive industry by eliminating many of the shortcomings of the traditional supply chain. BT would enable sustainable supply chain management, a circular economy, improved efficiency, reduced paperwork and costs, the need for man-hours, and increase customer satisfaction (e.g., customer order management). Furthermore, it would indicate the traceability of orders and increase visibility for various participants in the supply chain.

Infrastructure and expertise, technology or innovation support, technological resources and infrastructure, and innovation capacity are important organizational aspects for implementing BT. For this reason, the lack of an advanced level of technical expertise in BT, knowledge sharing, and the ability to manage the supply chain as well as the new business model enabled by BT may affect the adoption of blockchain in companies. The use of an IoT-integrated blockchain system that uses smart IoT sensors and various smart devices that can track the location of parts, quantity, and other useful information in real-time is an improvement of the system that provides numerous benefits for the manufacturing company such as planned production schedule, improvement in material flow and information, as well as improvement in the goods tracking system. On the other hand, the benefits for the suppliers are the reduction in incorrect orders, storage costs, and the optimization of stock levels. The system can also track the location of the vehicle as well as other helpful information in real-time. Such an improvement in the system for the manufacturing company provides benefits such as just-in-time logistics, reduction of damaged vehicles, and improvement in inventory control. At the same time, the benefit for the dealer and importer is the shortening of the lead time in build-to-order vehicles and the reduction of storage costs. (Aich, Chakraborty, Sain, Lee, & Kim, 2019)

The main advantages of adopting BT for battery tracking are to prevent batteries from being disposed of in inappropriate places, to ensure that they are used under the conditions prescribed by the manufacturer, and to define the battery owner. The results also indicate the ability of blockchain technology to track batteries and solve the issue of shifting responsibility in accidents and conflicts of interest that exist in the battery supply chain (Antônio Rufino Júnior, Sanseverino, Gallo, Koch, Schweiger, & Zanin, 2022).

Ada, Ethirajan, Kumar, Nadeem, Kazancoglu, & Kandasamy (2021) proposed a new blockchain architecture for the automotive supply chain. The results were obtained after optimizing the current supply chain with consideration of BT integration which enabled improved communication between partners resulting in improved inventory traceability leading to improved IQR and reduced average waiting time improving overall supply chain efficiency. It appears that the average daily costs of the entire supply chain can be reduced and the traceability of waiting times and inventory can be improved with the help of hyper ledger-based blockchain. A supply chain with applied BT is more capable of eliminating the risks and uncertainties that characterize the automotive supply chain. All of the above represents the benefits of adopting blockchain technology in the automotive supply chain.

Kamble et al. (2021) conclude that BT has a direct positive effect on three dimensions of SCM. 1) Improves external (suppliers and customers) competencies and internal integration, 2) reduces the role of intermediaries in SC networks, making the supply chain safer and more reliable, and 3) enables building SCM of the automotive industry based on trust and partnership.

Al-Saif et al. (2017) cite the lack of standards, the absence of effective guidelines, legal and regulatory frameworks, and the lack of understanding about blockchain technology as the

biggest challenges to the implementation of BT in the automotive industry. The development of high-performance quantum computers that pose a serious threat to the information security of blockchain-based energy trading systems is also some of the shortcomings of this technology. The immutability of blockchain in the electric vehicle energy trading business and ensuring the privacy of data and information that is open and available to everyone is also a disadvantage.

According to Debe, Hasan, Salah, Yaqoob, & Jayaraman (2016), the main benefits of introducing blockchain in the automotive industry relate to more efficient trading and savings in electricity intended for charging electric vehicles (EVs). The application of BT enables the efficient management of energy trade between energy suppliers and energy consumers which can meet the high demand for EV charging while reducing costs. Given that the current traditional systems, which are centralized, show deficiencies in providing transparency, reliability, auditability, security, and trust, the authors propose BT-based energy trading using auction and reputation schemes. They are developing Ethereum smart contracts that allow electric vehicle owners to automatically request electricity to charge their vehicles in a reliable, cost-effective, and secure way.

In addition to the obvious advantages of blockchain technology compared to traditional databases, Kumar et al. (2021) also warn about certain shortcomings of BT that all supply chain managers must bear in mind. These disadvantages relate, first of all, to the emergence of complications without a suitable business case and requirements, slow response time compared to traditional databases, inability to change information one time, data accumulation (creating silos in data), and challenges in managing public and private keys.

According to Saibania et al. (2021), application of modern technologies and BT in SCM improves inventory scanning and verification, tracking of goods and services, reduction of operating costs, more efficient supply of all chain participants, accuracy in delivery systems, and greater traceability of all items. Robotic machines can automate tasks in applications and systems through interaction with existing IT architectures and eliminate monotonous tasks performed by individuals. Based on this, BT in the automotive industry can provide control, connectivity, and visibility throughout the ASC and effectively link logistics operations among all ASC participants.

The results of the study by Markov & Vitliemov (2020) showed that production transparency achieved based on BT has the greatest value for SCM, while cyber security and data corruption are the main challenges. At the same time, ASC managers see autonomous vehicles as a technology that could provide the best results in reducing delivery delays in logistics processes in automotive plants. On the other hand, the main challenges facing autonomous vehicles are higher implementation costs and safety regulations.

Hossain et al. (2020) cite safer and faster vehicle registration as one of the main advantages BT brings to the automotive sector. Based on BT, the construction of a more efficient system for intelligent and secure information management through a distributed ledger is achieved, which solves the problem of the shortcomings of the traditional paper-based registration system.

4. Threats to validity

There are certain shortcomings in the conducted research that may negatively affect the results, although the research was done according to the systematic literature review protocol based on Xiao & Watson (2019). The first is the omission of some index databases of scientific papers, that is, limiting the search of papers to three index databases Web of Knowledge, Scopus, and SpringerLink. Although these are renowned databases, the quality of research would be raised to a higher level if at least two more index databases of scientific works were included. The second is the failure to conduct a backward and forward analysis of the papers, which reduced the number of studies analyzed in detail and the results presented in the Findings chapter. Also, the work would be complete if a case study was added to systematic review of the literature.

5. Conclusions and future research

Supply chain management in the automotive industry is increasingly moving towards complete digitalization through the implementation of BT. In recent years, a large number of papers have appeared in academic research that analyze the implementation possibilities, as well as all the advantages and disadvantages of BT application in SCM in the automotive industry. Based on a systematic review of the literature, which included a search of three index databases (Web of Science, Scopus, and SpringerLink) for the keywords BT,

DLT, SCM, automotive industry, car industry, and vehicle industry, a list of 21 papers were obtained for defining two research questions. What are the implementations of BT in SCM in the automotive industry? What are the benefits and limitations for the SCM in the automotive industry after adopting BT?

The conducted research found that the implementation of BT in ASC can make a significant contribution to protecting data security (Meyliana et. al., 2021), monitoring the complete vehicle life cycle (Syed et al., 2020), improving SSC performance (Kamble et al., 2021), more efficient transfer of information in real-time based on IoT (Kumar et al., 2021), integrating all phases of SC into a single whole (Kumar Sharma, et. al., 2018) and greater transparency of products through SC (Saibania et al. 2021). The most common benefits of applying BT in SCM in the automotive industry are the security of transactional information (Xu et al., 2022), improvement of efficiency and visibility of SC, reduction of paperwork, reduction of costs, and reduction of man-hours requirements (Upadhyay et al., 2020), more efficient planning of production schedule, the flow of materials and information and improvement of product tracking system (Aich et al., 2019), more efficient trading and achieving savings in electricity (Debe et al., 2016), and timely supply of all SC participants and accuracy in delivery systems (Saibania et al., 2021).

On the other hand, this research has shown that BT also has certain shortcomings. They are primarily reflected in the immaturity of the available technology, the lack of guidelines and industry standards (Xu et al., 2022), the lack of an advanced level of technical expertise in BT (Upadhyay et al., 2020), information security based on BT (Al-Saif et. al., 2017), data accumulation (Kumar et al., 2021), high costs of implementation and cyber security (Markov & Vitliemov, 2020), etc.

In this way, it is possible to conclude that despite certain shortcomings, practice and conducted research in real environment show that the implementation of BT in SCM in the automotive industry provides a comprehensive process of managing all products and services in ASC in a decentralized, safe, reliable and transparent way.

This paper was written as a systematic literature review of the application of BT in SCM in the automotive industry. Its results, which indicate the areas of application of this technology, advantages and disadvantages, represent an excellent starting point for future research. Our next research would be empirical and aimed at identifying a specific problem in the domain of SCM in an automotive company and finding a possible optimal solution that BT could offer.

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Pricing strategy as a leading predictor of the profitability in creative industry companies

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Abstract
Background: Price setting is a determinant of a company's profitability especially in the sector of creative industry (CI) and is intensively discussed in academic and business area.
Purpose: The aim of this research paper is to investigate whether a well-defined and successfully implemented pricing strategy can significantly affect the profitability of companies in the creative industry.
Study design/methodology/approach: This study investigates the differences in interval variables, including financial indicators, number of price management techniques, and price management metrics, between companies that have implemented pricing strategies and those that have not. To assess this, a two-sample t-test was used to compare the variables between the two groups. Since the creative industry is highly heterogeneous, we have analyzed the profitability of creative sub-industries more in detail through ANOVA test.
Findings/conclusions: As it turned out, the analyzed parameters do not differ significantly in their average values, except for the parameter “Gross margin”, where a statistically significant difference in average values was confirmed. Based on the findings of studies conducted by other authors as well as our own analyses, we conclude that assessing CI's profitability relative to other industries is inappropriate and represents only a simplistic view of the industry's performance. It is important to observe the profitability in each subindustry of CI, because the nature of the product (output) is different in each segment of this industry.
Limitations/future research: Despite the initial findings, it was recognized that the research was limited to a single country and a specific industry. To gain further insight into the pricing and profitability of companies in the creative sub-industries and cultural industry, subsequent research should be conducted. It would also be useful to link the topic of pricing and profitability with the theme of revenue models including pricing models, pricing metrics and payment systems.

Keywords
creative industry (CI), pricing strategy, price management, pricing, profitability

Introduction

According to the UK Government's 2001 *Creative Industries Mapping Documents* the creative industry was outlined as those industries which have their source in individual creativeness, skill, and talent and which have a capacity potential for creation of occupation and wealth through the formation and utilization of intellectual property (Smith, 2001; Higgs & Cunningham 2008; Wilkins & Holtham, 2012; Zhao & Cao, 2014). Under the term creative industry, we can comprehend the entire structure of the cultural and creative industries (Miller, 2009; Markusen, Wassall, DeNatale & Cohen, 2008; Cunningham, 2002). Inside a deeper comprehension of the extent of the creative industry, manufacturing, utilization, and distribution are deemed to be the implementation of the outcomes of creation and creativity rather than a direct portion of the creative industry (Department for Digital, Culture, Media & Sport, 2015). It is very difficult to create adequate indicators in order to define the creative and cultural industry and ascertain who exactly belongs to the creative class, due to the fact that there are no existing uniform definitions of terms related to the creative economy (Noeri, 2020; Galloway & Dunlop 2007; Dong, Zhu & Hu, 2015). Different views on the definition of the creative industry are also caused by its different forms of measurement. These different views are based on historical developments and the cultural and economic environment (Dronyuk, Moiseienko & Greguš, 2019), where, for example, O'Connor (2009) stresses the idea of the creative-consumer-citizen. However, the creative economy is constantly growing and needs to be quantified (Cunningham, 2002; Flew & Cunningham, 2010; Galloway & Dunlop, 2006; Imperiale, Fasiello & Adamo, 2021).

According to the European Commission, which set up a Programme Creative Europe for the programme period 2021-2027 (European Commission, 2018), Europe's cultural heritage and dynamic cultural and creative sectors are a part of European identity. The cultural and creative sectors fully contribute to the Union's economic development, generating jobs and growth, and thus are the key for Europe's future (European Commission, 2023). They also promote European excellence on the world stage, reinforcing the Union's global position. From an economic point of view, Cultural and creative industry generates US$ 2,250 billion of revenues and 29.5 million jobs worldwide (UNESCO, 2015).

Taking everything in consideration, people are the carries of creative value, hence investment in human capital plays a key role at national and business level. According to the results of a study conducted by Creative Industries Federation and Creative England (Giles, Spilsbury & Carey, 2020), companies must invest in creativity. Recent figures demonstrate that the creative industry is a stimulant for post-pandemic recovery, capable of forming 300,000 new positions and producing an augmented £28bn for the economic system by 2025 (Norbury, 2022). The creative industry represents an important pillar of the economic success of EU countries (4.4% of EU GDP), so in the next part of this research paper we will look at the profitability and pricing of companies operating in this sector and the efficient way to get there. The reason why a well-defined pricing strategy is crucial for succeeding on the market, is its ability to directly influence a company's profitability, market position and overall success. Without a clearly defined pricing strategy, creative industry companies lack a blueprint for implementing and controlling pricing decisions. This issue has emerged as a clear research gap, therefore the aim of our research is to investigate whether well-defined and successfully implemented pricing strategy can significantly affect profitability of companies in the creative industry.

1. Theoretical background

Pricing is one of the most challenging company's decisions, because of many variables and steps (Baldin, Bille, Ellero & Favaretto, 2018; Estelami, Estelami & Lichtmann, 2019; Laamanen, 2013) incorporated into the decision-making process in price management. The decision-making process in price management refers to a specific decision-making process within a company, which encompasses internal business data as well as external variables such as market share, demand, perceived value, customer decision-making process, brand image, or competition (Remeňová & Kintler, 2020).

A usual custom in the performing arts is to grant incentives to customers to differentiate themselves according to their reservation cost, offering a catalogue of distinct prices corresponding to different seats in the venue (Zieba, 2009; Davis & Swanson, 2009). In this context, price and allocation of seating are decision variables that empower managers to pursue their conflicting objectives. As Kang (2010) argued, regardless of

the grounds of a customer's price sensibility, the performing art organisation should price in agreement with the worth expectations of the intended audience. The larger the company, the more variables enter the decision-making process in such price management (Holden & Burton, 2010). Therefore, it is necessary to analyse several internal and external factors that influence pricing decisions (Ringstad & Løyland, 2011; Kolhede, Gomez-Arias & Maximova, 2022; Liozu & Hinterhuber, 2013). To avoid obvious price management failures occurring in companies, marketing experts and price specialists have proposed a standardised price management process (Bernstein & Macias, 2002; Dutta, Zbaracki & Bergen, 2003), consisting of pricing strategy, pricing, price tactics and price metrics. Pricing refers to use of different approaches such as cost-based pricing, demand-based pricing, competition-based pricing, value-based pricing, and their combinations (Smith & Colgate, 2007; Schindler 2011; Grisáková & Štetka, 2022).

As a relatively young economic sector, creative industry draws attention from both academia and industry to explore factors that influence financial performance of the creative industry (Hou, Lu & Hung, 2019; Kitsios, Champipi & Grigoroudis 2017; Askerud & Engelhardt, 2007; Gosman, Kelly, Olsson & Warfield, 2004). Some authors have studied the impact of price decisions on the sustainability of business, profitability, and the stability of sales channel strength (Zhang, Liu & Wang, 2012; Ma, Zhang, Guo & Liu, 2012; Huanga, Yanga & Zhang, 2012). According to authors Cross and Dixit (2005), pricing is perhaps the most accessible lever to manage profitability (De Toni, Milan, Saciloto & Larentis, 2017). According to Potts and Cunningham (2008), who compared the profitability of creative industry companies with aggregate profitability, creative industry entities grew at a cumulative annual growth rate (CAGR) of 11.3%. Compared to the Potts and Cunningham's (2008) study, European estimates of average profitability measured by return on invested capital (ROIC) in the cultural and creative industries in 1999-2003, were 9%, which is similar to Australian estimates. Other studies, conducted in German cultural and creative industries in rural areas, stress two important challenges concerning the profitability of the CCI company - price-based competition and declining willingness to pay for cultural and creative services (Andres, Erdsiek, Ohnemus, Rammer & Viete, 2019).

Despite the fact that some authors describe the creative industries as a profit-generating alternative (Setiadi, Boediprasetya & Wahdiaman, 2012; Aldianto, Wirawan, Anggadwita & Rizqi, 2020; Zheng & Chan, 2014; Fox, 2004), currently, a small percentage of scientific studies on pricing and profitability are dedicated to the creative industry (Boix-Domenech & Soler-Marco, 2017; Labaronne & Slembeck, 2015; Rentschler, Hede & White, 2007; Chamberlain, 1986; Vaccaro & Cohn, 2004; Selwood, 2015; Björk & Solomon, 2012).

At this point, scientists recommend perceiving the creativity as a sector's economic potential (Cunningham, 2006) where the value and price have important consequences for the price policy and profitability (Hracs, 2012; Lyubareva, Benghozi & Fidele, 2014; Dickens, 2010; Chung, 2008; Herliana, 2014). Rushton (2015) stresses the fact that pricing is paramount to success in the creative industry and is not currently included in any existing textbook.

2. Materials and methods

The aim of this research paper is to investigate whether well-defined and successfully implemented pricing strategy can significantly positively affect profitability of companies of creative industries. At the same time, we investigated whether the level of profitability varies by output type and creative industry sector. We have tested the following hypotheses:

- H0: CI companies do not achieve better results in financial indicators (Revenue, Profit, Gross margin, Assets, Own capital, Total indebtedness) than companies from non-creative industries.
- H1: CI companies achieve better results in financial indicators (Revenue, Profit, Gross margin, Assets, Own capital, Total indebtedness) than companies from non-creative industries.

Because creative industries include profit and non-profit organizations (Goto, 2017), we have focused on companies generating profit.

The research sample (N=143 respondents) consists of managers working at all levels of management (operational, tactical, strategic), in functional areas such as product management, marketing, finance, human resources, IT, senior management (CEO), etc. The questionnaire *Decision Making in Price Management*, which was the basic research tool,

consisted of open and closed questions, divided into several thematic areas: factographic data, financial data, price and revenue management activities, metrics, and tools, decision-making process in price management. For this purpose, a questionnaire taken from researchers from the University of Worms was used to map decision-making, decision-making process, techniques and metrics in price management, with the permission of its authors. To focus on the topic of profitability and price management tools, individual consultations and structured interviews with chosen companies and experts in price and revenue management were taken.

The research looked at price management tools referring to price techniques and price metrics used in the implementation and control of pricing strategy. Only selected ones are presented - Quantification of customer value, Conjoint analysis, Price-value map, Price elasticity, Willing to pay, Prices, Segment Discounts, Market Share, Total Sales, Sales Per Customer Segment, Sales Volume, Sales Margin, Price Sensitivity, or Customer churn rate.

To ensure the accuracy of the measurements taken during the research process, electronic data collection tools were utilized in order to avoid any potential influence on the research subject (Silverstein & Auerbach, 2009). Following this, the validity and reliability of the questionnaire were evaluated (Jones et al., 2015; Kennedy et al., 2019). Reliability, which is a statistical method for determining the degree of internal consistency and reliability of a research tool (Geiger & Shelton, 2019) was used to confirm the measured construct. The Cronbach's alpha was used to analyse the reliability of the questionnaire's items in the Slovak companies. For a sample of 143 respondents, the value α=0.88 was obtained (Table 1). This value represents an acceptable level of internal consistency, i.e., how the group of items is closely related within the group.

Table 1 Reliability of the questionnaire

Cronbach's Alpha	*Number of items*
.88	52

Source: the authors' own calculations

Another parameter of the accuracy and quality of measurement employing a questionnaire is its content validity (Beck & Gable, 2001). The content validity of the questionnaire was measured using the CVR Lawshe index (content validity ratio) (Ayre & Scally, 2014; Zamanzadeh et al., 2015). The CVR of each item did not fall below 0.7, and the overall CVI reached 0.95.

Obtained relevant information from respondents is successful from the researchers' point of view, with an eighty percent return rate (265 questionnaires). However, for further analyses in the context of fulfilling the scientific aim of the paper, we could only include 143 fully completed questionnaires. Subsequently, a statistical sample was created in the PSPP software by random selection.

The two-sample t-test was used to identify and determine the size of the difference in achieved financial indicators and price management variables (price management techniques and metrics) related to CI industry and non-CI industry results, where we have monitored the differences in interval values for the two groups of variables (companies of CI and companies of non-CCI). The following formula defines the magnitude of the effect for a two-sample t-test:

$$r = \sqrt{\frac{t^2}{t^2+df}} \quad (1)$$

where r is the Pearson correlation coefficient, t^2 is the t score, and df is the number of degrees of freedom.

ANOVA was used to determine the difference in interval values for more than two categories of variables, where one independent variable affects the dependent variable. We have concentrated on analyses of financial results and price management tools used actively in sub-industries of CI. In terms of significance, we are talking about the statistical significance of our results, but there is still significance or the strength of significance, called the effect size. The more significant the difference between the groups compared, the greater the effect. The magnitude of the effect of t-test and ANOVA was calculated by Pearson's r:

$$r = \sqrt{\frac{SSM}{SST}} \quad (2)$$

where SSM is the variance between the groups and SST is the total variance.

3. Results and discussion

Outcome of the transformation process of CIs is specific product of intellectual property, which can be determined as an end product of creative work or activities (Roecker, Mocker & Novales, 2017; Tepper, 2002; Gadrey, 2000), also referred to as creative goods and services (Luo, 2021; Gouvea &

Vora, 2018; Huang, Ting & Chen, 2014; Lan & Kaufman, 2012; Bariletti & Sanfilippo, 2017; Dong & Truong, 2020). The table below represents the distribution of the research sample according to the nature of the final output. More than 46% of respondents selected service as the main result of their creative activities (Table 2). More than 32% of examined companies sell both services and products. Only less than 22% of companies have their business model based on production.

Table 2 Companies by the result of business activity

Result of business activity	*%*	*% cumulated*
services	46.13	46.13
products	21.63	67.76
product & service	32.24	100.00
Total	100.0	

Source: the authors' own calculations

As we can see in the table above, 67.76 % of the respondents (CIs) stated that they focus on one type of output activity in their business activities. Irrespective of whether the CIs are focused on one type (product or service) or multiple types (product and service) in their business activities, properly implemented pricing plays critical role for company's profitability.

Even though pricing is a determinant of a company's profitability especially in CI environment and is intensively discussed in academic and business area, there is a lack of publications on this subject. This can be caused by the heterogeneity of the creative industry structure itself, which consists of the different entities operating in different areas of the business environment, such as: arts and culture (literature, theatre, music, audio-visual, visual arts, design), architecture, crafts, fashion, publishing, software, games, advertising, communication media, ICT, etc. Some authors look at the impact of the creative industries on the performance of selected regions in Europe by analysing labour productivity (Boix-Domenech, Peiró-Palomino & Rausell-Köster, 2021).

According to the above presented studies profitability in creative industries is generated through the higher creative value. Therefore, we examined the profitability performance of Slovak companies in creative industries (CI) on selected financial indicators.

Table 3 Descriptive table for financial indicators for CI companies

Variable	**N**	**Mean**	**Std Dev**	**Variance**	**Kurtosis**	**Skewness**	**Min**	**Max**
Revenue	143	28177299	81988606	6,7E+015	25,36	4,77	6518	485482987
Profit	143	2082615	10379844	1,1E+014	38,50	5,98	-9443181	68137938
Assets	143	12279884	28627643	8,2E+014	16,94	3,79	4492	158677861
Equity	143	6167349	21913165	4,8E+014	33,77	5,58	-5224804	139698627
Indebtedness	143	4116,10	5045,96	25461668	2,09	1,46	3,460	21422,000
Gross margin	143	1782,63	2296,80	5275269	1,22	1,36	,00	8.773,00

Source: the authors' own calculations

Based on the descriptive statistical results mentioned in the table 3, we stated that the average revenue (in euros) of CI companies is $M=28x10^6$ with variability $SD=8.2x10^6$. The minimum value of the achieved revenue is Min=6518 EUR, maximum value is $Max=48{,}5x10^7$. The average gross margin value is M=1782.6 EUR (SD= 2296.80) and gross margin interval is Min=0.00, Max=8.773.

The CI companies generated an average annual profit of $M=20.8x10^5$ ($SD=10.4x10^6$), where the highest profitable company reached profit of Max =EUR $68x10^6$. Average value of assets CI companies reach level $M=12.3x10^6$ EUR, where the highest amount of the company assets in this industry was observed at the highest level of Max $=158.7x10^6$. The average value of the equity corresponds to half part of its assets, $M=6.17x10^6$. Average indebtedness of these companies M=4116.10 EUR, and level of the highest indebtedness is Max=21422 EUR.

The statistical sample shows the highest positive value of the skewness in the variable "Profit" (Skewness=5.98), which provides the information on a larger representation of companies with lower values of "Profit". Furthermore, there are more companies with a minor "Revenue" value (Skewness=4.77). Based on the facts about kurtosis, we established how the values of the factors are condensed about the mean. The variable "Revenue" shows a positive value for the kurtosis coefficient (γ=25.36), which signposts that most of the values are condensed about the mean.

"Profit" values show the same tendency (γ=38.50). The variables on "Assets" (γ=16.94), "Equity" (γ=33.77), total "Indebtedness" (γ =2.09) and "Gross margin" (γ =1.22) are positive, giving

a clear concentration around the mean, although with different variability.

Since the studies cited in the theoretical background, associate higher profitability with creative value creation, we investigated whether a statistically significant difference arises in the financial ratios of companies from creative industry and companies which do not belong to the creative industry. Nevertheless, we think that highly profitable business outcomes can be achieved without higher creative value proposition. This assertion would undermine the very principle of an industry's profitability. To verify this, we applied the independent t - test, which told us how significant the difference between two groups is, non-CI companies and CI companies in profitability indicators.

Table 4 Summary results of t-test and homogeneity test for the Pricing Strategy and Financial indicators

Variables	t-test				
	Levene's Statistic	Sig.	t	Sig.	r
Revenue	23.92	.000	3.22	.002	
Profit	17.06	.000	2.37	.019	
Assets	2.50	**.115**	.87	.385	
Equity	7.53	.007	1.66	.099	
Indebtedness	2.60	**.109**	1.18	.238	
Gross margin	5.53	**.200**	1.29	**.020**	.03

Source: the authors' own calculations

Results of the two-sample t-test show statistically significant differences achieved in some financial variables in relation to the implemented pricing strategy (table 4). Statistically significant distinguishing indicator is the "Gross margin" (Lev.Stat=5.53, p-value=.200, t=1.29, p-value=.020) with the overall effect of r=.03. CI companies with well-defined and successfully implemented price strategy achieve on average 3.5 times higher gross margin than CI companies without implemented pricing strategy.

The difference in average values between the groups of CI companies with implemented and not implemented price strategy was shown for the variable Number of approaches to pricing (Lev.Stat=.90, p-value=.343, t=2.75, p-value =.006) as statistically significant, with the overall effect size of r=.17 (table 6). Companies with an implemented price strategy use on average two approaches in pricing (M=2.06, SD=.68), while companies without implemented pricing strategy, use only one approach (M=1.81, SD=.67). As it turned out, CI companies still rely primarily on a cost-based pricing approach, combined with competitive-based pricing.

Table 5 Summary results of t-test and homogeneity test for the Pricing Strategy and Price management tools

Variables	t-test				
	Levene's Statistic	Sig.	t	Sig.	r
Number of approaches	.90	**.343**	2.75	**.006**	.17
Number of key price management techniques	27.20	**.100**	5.09	**.000**	.30
Number of additional price management techniques	2.84	**.093**	2.12	**.035**	.135
Total number of price management techniques	15.54	.000	4.20	.000	
Number of key price management metrics	5.47	**.020**	3.78	**.000**	.24
Total number of price management metrics	3.06	**.082**	3.02	**.003**	.19

Source: the authors' own calculations

Companies with an implemented price strategy differ statistically in the average number of used key techniques (Lev.Stat=27.20, p-value=.100, t =5.09, p-value=.000) with the overall effect of r =.30. On average, companies with an implemented price strategy use twice more techniques (M= 6.09, SD=4.66) compared to the entities without pricing strategy (M=3.61, SD=2.98). A significant difference can also be confirmed for the variable additional price techniques (Lev.Stat=2.84, p-value=.093, t=2.12, p-value=.035) with the overall effect of r=.135. We also confirmed a statistically significant dependence between the number of key metrics (Lev.Stat=5.47, p-value=.020, t=3.78, p-

value=.000, (M=3.82, SD =2.37) with the overall effect of r=.24 and the total number of price metrics (Lev.Stat=3.06, p-value=.082, t=3.02, p-value=.003), (M=6.20, SD=3.40) with the overall effect of r=.19 in companies that have implemented pricing strategy.

Although the average revenues of companies with an implemented pricing strategy differ significantly from companies without an implemented pricing strategy, this difference is not statistically significant (Lev.Stat=23.92, p-value =.000, t=3.22, p-value=.002). Companies with an implemented pricing strategy achieve better results in the indicators Total indebtedness (Lev.Stat=2.60, p-value=.109, t=1.18, p-value =.385), (M=.69, SD =.48 / do not have M=.96) and Assets (M=3x109/ do not have M =1.12x109), but this difference could not be statistically confirmed (Lev.Stat=2.50, p-value=.115, t=.87, p-value=.238).

As shown by a profitability analysis of CI companies and non-creative industry companies, we could not confirm the hypothesis about higher profitability level of CI companies. It is because of the high heterogeneity of CI industry itself, which is also highlighted in Table 2.

Therefore, in the next part of the analysis, we focused on the profitability of sub-creative industries, which we divided into categories defined in terms of output: audio-visual production (movies, broadcasting, and music industry), ICT, publishing (press and book market), architecture (architecture market), event services (events), hardware and software (software and games industry), advertising (advertising market), crafts (design industry), art (art market). A parametric ANOVA test was used to compare the ten sub-sectors of the creative industry based on financial indicators. Based on the results of the Levene's test for the analysis of sphericity and homogeneity of variance, which does not confirm a violation of this assumption (if $p > 0.05$), we followed the primary hypothesis of statistically significant differences in main parameters.

Table 6 Summary results of ANOVA and homogeneity test for the Price Strategy and Fin. indicators in CI sub-industries

Variables	*ANOVA*				
	Levene Statistic	Sig.	F	Sig.	r
Revenue	1.14	.367	.42	.915	
Profit	1.3	.372	.30	.982	
Assets	1.45	.208	.57	.814	
Equity	.81	.617	.32	.970	
Indebtedness	2.88	.004	1.63	.098	
Gross margin	5.07	.200	2.04	**.042**	**0.44**
Number of approaches	.98	.469	1.06	.406	

Source: Source: the authors' own calculations

Results of the analysis of variance show that the differences achieved in average values of financial variables are not statistically significant (table 6). Average revenue and Profit vary significantly among the sub-industries, but this difference is not statistically significant (Lev.Stat (revenue) = 1.14, p-value = .367, F = .42, p-value = .915; Lev.Stat (profit) = 1.3, p-value = .372, F = .30, p-value = .982). Also, the economic indicators such as Assets (Lev.Stat = 1.45, p-value = .208, F = .57, p-value = .814), Equity (Lev.Stat = .81, p-value = .617, F = .32, p-value = .970) and Indebtedness (Lev.Stat = 2.88, p-value = .004, F = 1.63, p-value = .098) show wider differences in the average values, but these differences are not statistically significant. Average indebtedness of the industry is 69%, with companies in the art and architectural services sub-industries contributing the most.

As it turned out, the analysed parameters do not differ significantly in their average values, excluding Gross margin, where the statistically significant difference was confirmed (Lev.Stat= 5.07, p-value=.200, F=2.04, p-value=.042) with the total effect r =.44. The average value of "Gross margin" varies significantly between creative sub-industries. The most profitably sub-industry turns out the architecture services with the average "Gross margin" 75%, followed by Software sub-industry sM(GM) = 58%. Average "Gross margin" from 35% to 41% was observed in the sub – industries fashion and textile design (35%), Art (36%), advertising (38%), publishing (39%) and ICT (41%), with the lowest "Gross margin" work companies in CI oriented on event services (23%). Based on the above analysis, we can talk about low-margin and high-margin CI industries.

Table 7 Summary results of ANOVA and homogeneity test for the Price Stra. and Price Manag. tools in creative sub-ind.

Variables	*ANOVA*				
	Levene Statistic	Sig.	F	Sig.	r
Number of approaches	.98	.469	1.06	.406	
Number of key price management techniques	1.20	.303	.97	.478	
Number of supplementary techniques	2.58	.09	1.72	.088	
Total number of price management techniques	1.69	.096	1.38	.201	
Number of key price management metrics	1.33	.230	1.23	.287	
Number of supplementary price management metrics	4.63	.000	1.45	.171	
Total number of price management metrics	.70	.732	1.21	.299	

Source: the authors' own calculations

According to Lu, Kweh, He & Shih (2017), companies in the publishing industry, creative life, popular music, and cultural content sector averagely perform better than those in the other three types of CIs in terms of profitability. From the pricing approach point of view, CI companies usually use cost-based and competitive-based pricing. However, the average total number of used price management metrics varies significantly among the sub-industries; also, significant difference cannot be confirmed within the variable "Total number of price management metrics" (Lev.Stat =.70, p-value =.732, F=1.21, p-value =.299) (table 8). The most price management metrics by companies in publishing sub-industry (M=8), on the other end, the least are used in audio-visual production (Mean=4). Publishing sub-industry mostly uses price management techniques (M=9), but the difference in their usage among creative sub-industries is not statistically significant.

Conclusion

Pricing is one of the most challenging business decisions, because it involves several variables and steps that ensure company's profitability and it sustain to the future. Profitability of a business is directly dependent on the sales level, costs, and of the nature of output, including its specific characteristics.

The aim of this research study was to investigate whether the well-defined and successfully implemented price strategy can significantly positively affect profitability of companies of creative industries. At the same time, we investigated whether the level of profitability varies by output type and creative industry sector. Because creative industries include profit and non-profit organizations (Goto, 2017), we have focused on the companies generating profit.

The difference between the profitability of the CI and non-CI companies was not statistically significant. Therefore, we looked more deeply at the CI companies in relation to the implemented price management tools and metrics.

The main goal of our study was to prove the idea of the positive impact of the well-defined and successfully implemented price strategy on profitability of the company. We applied the two-sample t-test to test this hypothesis. We looked at differences in the main financial indicators and price management tools (techniques and metrics which are the core of a price strategy) of companies that have implemented price strategy and those that haven't. Then we could confirm the significant differences achieved in some financial variables in relation to the implemented price strategy. Statistically significant distinguishing indicator is the Gross margin with the overall effect of r =.03. CI companies with well-defined and successfully implemented price strategy achieve on average 3.5 times higher gross margin than CI companies without implemented pricing strategy. We were also able to confirm an interesting fact, that companies with an implemented price strategy differ statistically in the average number of used key techniques with the overall effect of r =.30. On average, companies with an implemented price strategy use twice more techniques compared to the entities without pricing strategy.

Using Analysis of Variance, we compared the creative sub-industry companies to find out the difference in profitability level. Results of the analysis show that the differences achieved in average values of financial and economic variables and price management tools are not statistically significant. Average Revenue and Profit vary significantly among the sub-industries, but this difference is not statistically significant. As it turned out, the analysed parameters do not differ significantly in their average values, excluding gross margin, where the statistically significant difference was confirmed.

When analysing the creative sub-industry, we were inspired by the study from Lu et al. (2017),

where authors stated that companies in the industries of publishing, creative life, popular music, and cultural content averagely perform better than those in the other three types of CIs in terms of profitability. We confirmed a similar result in our study, but only at the level of the parameter "Gross margin". However, we were able to identify other associations related to pricing strategy (defined through price management tools). However, the average total number of used price management metrics varies significantly among the sub-industries, and significant difference cannot be also confirmed within the variable "Total number of price management metrics". The most price management metrics are used by companies in sub-industry publishing (M=8), on the contrary, the least in audio visual production (Mean=4). Publishing sub-industry mostly uses price management technics (M=9), but the difference in their usage among creative sub-industries is not statistically significant.

Based on the findings of studies conducted by other authors as well as our own analyses, we conclude that assessing CI's profitability relative to other industries is inappropriate and represents only a simplistic view of the industry's performance. It is important to observe the profitability in each subindustry of CI, because the nature of the product (output) is different in each segment of this industry.

Limitation of the study

This research paper provides a theoretical background on pricing and price strategy in the creative industry based on research analysis conducted by well-known foreign authors. From our own research, we have been able to establish a correlation between pricing strategy and the profitability of creative industry (CI) companies.

While the results are thought-provoking, the research is limited to a single country and industry. Even though pricing is a determinant of a company's profitability, especially in CI environment, and is intensively discussed in academic and business area, there is a lack of publications on this subject. The heterogeneity of the creative industry structure, which consists of the different entities operating in different areas of the business environment, such as: arts and culture (literature, theatre, music, audio visual, visual arts, design), architecture, crafts, fashion, publishing, software, games, advertising, communication media, ICT, etc. can be seen as a key role of this theoretical and scientific insufficiency in this field.

Further research is necessary to gain a more granular insight into pricing and profitability of companies in the creative sub-industries and cultural industry. It would also be beneficial to explore the relationship between pricing and profitability with revenue models, including pricing models, pricing metrics, and payment systems.

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The challenges of economic freedom and the influence on financial performance of China's development: A Strategic Approach

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Abstract
Background: As one of the world's most important economies, China has faced the problems and challenges caused by geopolitical changes, the consequences of the COVID-19 coronavirus pandemic, financial crises and other challenges in the last decade to the fullest extent. An overview of previous research studies shows the effects of partial elements of economic freedom on the financial performance of China's development. The focus of our research is on a strategic approach to the given problem, taking into account the possibility of modeling and improving the situation in response to new challenges and problems in the future.
Purpose: The focus of the work is aimed at measuring the impact of economic freedoms on foreign direct investment decisions and the financial performance of China's development. Based on that, the main goal of the work is to model and determine new elements for improving the model based on a strategic approach.
Study design: The research revealed that a strategic approach through the elements of economic freedom is an important factor of the model we investigated and represents the improvement of the situation and can contribute to the improvement of the financial performance of China's development.
Findings: Based on the research, we obtained the result of a high degree of direct dependence and a positive correlation of the impact of economic freedom and strategic decisions on foreign direct investment on the financial performance of China's development. Economic freedoms represent a significant influencing factor and provide opportunities for the improvement of a model based on a strategic approach.
Limitations: The limitations of the research refer to the unpredictable state of geopolitical changes in the world, which directly reflect on many factors of the model. Future research directions can be directed towards measuring which countries make up the largest part of China's foreign direct investments, as well as how much their influence is.

Keywords
strategic approach, economic freedoms, foreign direct investment, China development

Introduction

Strategic decisions concern the long-term decision-making horizon and include the choice of where and when to invest. The focus of the research is on the Chinese market, as the country with the greatest market potential. Looking at the market potential, this team's decisions are strategic. Strategic decisions are by their nature unrepeatable, specific, affect the entire company, connect the past, present and future. They include the strategic mission and vision, strategic goals and general strategy at the level of the entire company. Foreign direct investment is a form of capital investment that provides a foreign investor with the acquisition of property rights, control and management on the basis of invested capital. The purpose of these investments is to create a permanent economic and legal interest, and such an interest, which includes the aspiration of investors to make a profit through control and management of invested capital. What was the amount of foreign direct investment in China in the period 1995-2020, what is their impact on China's development, measured by gross domestic product (GDP), what are the indicators in terms of economic freedoms and whether and how they affect foreign direct investment in China. Attracting foreign direct investment is a basic condition for increasing production and challenges of the host country to a level that would enable stable economic growth, as well as successful debt servicing and based on that, the basic goals of strategic managers is to create an investment environment for the arrival of foreign investors and their investments. Today, economic and social development cannot be imagined without investment. In the era of globalization, it is important to understand the business logic behind foreign investment, as well as the impact that foreign investment has to the positive movement of the gross domestic product, the development of the domestic economy and society as a whole. The goal of the methodological research is to influence the solution of the problem and investigate whether economic freedoms influence strategic decisions on foreign direct investment (FDI) in China. Also, the goal is to measure the impact and model a strategic approach in the management of economic freedoms, with the aim of better performance. It is certainly necessary to influence the solution to the problem of improving the financial performance of the Chinese economy. In this regard, we created an econometric model for measuring the impact of economic freedoms on China's development.

According to Joseph Stigliz, professor at Columbia University in New York and Nobel laureate, the focus is precisely on strategic managers and their decisions, on which foreign direct investments also depend (Stiglitz, 2008).

The methodological research platform includes an econometric model based on the modeling of multi-criteria variables that build the parameters of economic freedom, strategic decisions and financial performance of China's economic development (Wu, 2021). The analysis includes a multiple correlation analysis model based on the Pearson Correlation model. The research covers the period from 1995 to 2020. In times of great geopolitical challenges, capital knows no borders and inevitably leads to the creation of foreign trade transactions. Foreign trade transactions that result in a foreign trade surplus represent an important factor.

1. Review of the literature and previous research

The influence of economic freedoms on foreign direct investments is the subject of study by numerous authors. A large number of scientific articles analyze the impact of individual segments and variables of economic freedom on foreign direct investments, which consequently affects the financial performance of the country. The level of economic freedom in an individual country is very important, because they significantly influence the analysis of the investment and business environment (Busenbark, Semadeni, Arrfelt, & Withers, 2021). A greater degree of economic freedom also means a greater degree of flexibility, positive reactions to investments and growth of the real sector. A higher level of foreign direct investments consequently affects domestic investments, which are very important for a country. We can see this best on the example of China. This creates the conditions for the creation of a positive investment atmosphere, good conditions, a market way of doing business and a reliable economic environment. All this is an excellent platform for creating a quality investment policy to attract foreign direct investments (Drabek & Payne, 2001). Also, the impact of globalization is expressed. An important factor is the synergy of joint action, trade freedom, investment freedom, financial freedom, which significantly depend on and influence the trends of economic globalization (Stiglitz, 2008).

Kim (2010) argues that foreign direct investment is usually categorized as horizontal, vertical, and conglomerates. In general, economic freedoms imply a high degree of freedom in deciding on other economic elements and parameters that are independent of other processes (Gwartney, Hall & Lawson, 2017). There is a significant number of research endeavors that consider the relationships and impacts of economic freedom, foreign direct investment and development (Sovbetov & Moussa, 2017).

Research focus includes multivariate modeling. As a solution, there is a need to create a strategic approach in order to improve economic freedoms that would affect greater foreign direct investments, and thus the financial performance of China's development (Falchetti, Cattani & Ferriani, 2021; Osei & Kim, 2020; Bernsau, Gattringer, Raiß & Grund, 2021).

In such conditions, strategic decisions become a necessary prerequisite for success. In addition to analysis, diagnosis of problems and creation of strategic alternatives, a very important phase of strategic decision-making, is also the phase of implementation and realization of strategic decisions (Karadag & Poppo, 2021). In creating a strategic environment for decision-making, economic freedoms represent a very important factor. In addition to the aforementioned strategic approach, it is also very important to respect the determinants of the systemic approach, in the creation of which the previously mentioned elements participate. In addition to the financial performance of China's economic development, a very important factor is social responsibility, social responsibility and other aspects that influence the creation of a strategic environment for decision-making (Jacimovic, Deichmann & Tianping, 2023).

According to Nordhaus, development can be built through increasing knowledge, tax burden and government spending. Nordhaus (2018) believes that the economic growth rate of 3% represents a level for maintenance, which depends on labr freedom, monetary freedom and trade freedom, as elements of economic freedom. According to Nordhaus & Boyer (2000), analyzing trends showed that economic freedoms influence the exit from the crisis, and then the growth and development of the country (Nordhaus & Boyer, 2000; Radovanović, Grandov & Filijović, 2019; Callao, Jarne, Wroblewski, 2020). Based on their research, Gregory, Romer and Weil (1992) believe that the growth of financial performance in retail development depends on the integrity of the government in the creation of economic policies, which represents the parameters of economic freedom and foreign direct investment. Based on "Optimum Tariffs and Retaliation" research project (1953), Harry Johnson proved that the elements of economic freedom significantly influence foreign direct investment (FDI) and the economic development of a country (Johnson, 1953) (see also Kuga, 1973; Mayer, 1981; Riezman, 1982; Kennan & Riezman, 1988; Grossman & Helpman, 1994; Jiang & Wang, 2020).

Major geopolitical changes in 2022, the coronavirus pandemic, migration trends, economic crises and other global factors significantly affected the level of economic freedom.

Economic freedoms are a characteristic of a market economy based on free exchange, free formation of prices at the intersection of supply and demand, and free competitive bidding. O'Driscoll Holmes & Kirkpatrick (2001), consider that economic freedoms represent a reduction in government influence, production restrictions, strong tariff barriers and free investment. In such conditions, economic freedoms are imposed as one of the main economic parameters of growth in a country (Berggren, 2003), especially in countries that strive to build their performance on their economic advantages.

The results of FDI include higher productivity, technological progress, technology transfer, better management, strategic restructuring, marketing skills, which generates technological and economic growth (Boghean & State, 2015; Xiao, Gao, Xu L., Wang, & Wei, 2023). Research by Estrin (2017) shows that government policy (government integrity, tax burden, government spending, fiscal health business, freedom labor freedom, monetary freedom, financial freedom) has an important role in attracting foreign direct institutions (FDI) (Chen, et al., 2021; Minović, Stevanović & Aleksić, 2021). The aforementioned elements form the basis of economic freedom. In this regard, a strategic approach to the modeling of the mentioned elements can create the best variant and create a positive scenario for the growth and development of a country's economy. The results of research by Zongzheng and Mao (2019) confirm the existence of a strong relationship between elements of strategic management, elements of economic freedom, foreign direct investment and the country's development performance. Elements of economic freedom are reflected in

macroeconomic variables, which significantly affect FDI in developing and developed countries (Walsh & Yu, 2010; Cicea & Marinescu, 2020; Zhang & Chen, 2020). Economic freedoms also depend on the level of development of the market economy, freedom of exchange, level of competition, protection of property and capital of investors, as well as free investment and foreign direct investment (Caetano & Caleiro, 2009).

2. Hypotheses research

The ways of realizing foreign direct investments can be very different (Ćirović, 2000), (1) opening a new company (greenfield investment) whose owner is a foreigner or on the basis of a joint venture, (2) buying a company in another country or through recapitalization, (3) cross-border mergers of companies, (4) possible combinations of greenfield investments and acquisitions, (5) joint ventures without ownership rights and (6) concessions. Foreign direct investments contribute to the development of many countries, and represent an inflow of capital suitable for investments in development or accumulation of funds. They are very important, especially if foreign direct investments form a common partnership cash flow with domestic investors. This represents joint investment and significantly contributes to increased responsibility, as well as strict adherence to investment methodology and rules. Certainly, if it is about domestic investments, it is necessary to analyze well the causes, signals, motives and goals of foreign direct investments (FDI). They must certainly be part of the global (general) strategy. The research concept starts from the research hypothesis H1a: "Economic freedoms significantly affect foreign direct investment, which positively reflects on the financial performance of China's development".

The importance of foreign direct investments (FDI) is growing, especially at the level of global economic trends. It becomes especially important for developing and underdeveloped countries, where foreign direct investments significantly affect the economic development of those countries. FDI especially contributes to the growth of the country's financial performance, productivity growth, increase in technological progress and encouragement of domestic investments (Sekkat & Veganzones-Varoudakis, 2007). On the basis of the intensity of defined risk factors, such as geopolitical changes, the coronavirus pandemic COVID 19, migration movements, economic crises and other factors, significantly affect the level of economic freedom, the analysis of which represents a very important strategic landmark for defining decisions and growing trust (Voyer & Beamish, 2004).

Research hypothesis H2a: "In the last ten years, there has been an increase in economic freedom in China, which creates more favorable conditions for foreign direct investment (FDI) in the country."

Since the availability of resources is limited to individual countries and requires investment to reduce input costs by approaching the natural resource itself, it is possible to achieve vertical investment by physically separating individual stages in the production process and locating labor-intensive stages in low-tech countries. In developed countries where there is the necessary technology and highly qualified workforce, conglomerate investments arise when a company expands its current activities by conquering the production of various products located in plants in different countries. Conglomerate TNCs are usually formed by purchasing a controlling stake in a foreign company, or by merging with a foreign company of another type of production. They rarely arise in the form of greenfield investments because the parent company usually does not have the necessary knowledge and expertise to conquer and produce new and different products. It is certainly an optimal combination if foreign direct investments and domestic investments are combined, in the function of obtaining the necessary funds for economic development (Ketabforoush & Poorabdollahi, 2017; Quazi, 2007).

3. Research methodology and sampling

The research methodology includes the Heritage Foundation Index of Economic Freedom and measuring impact with the UNCTAD foreign direct investment (FDI) index. The research model is based on fuzzy logical grouping that includes several econometric variables (Caetano & Caleiro, 2009; Bacovic, Jacimovic, Lipovina Bozovic & Ivanovic, 2021). The research period covers the period 1995-2020. The basis of the Heritage Index of Economic Freedom is a research platform created by The Heritage Foundation and The Wall Street Journal. The base of this model consists of 10 variables that make up the index of economic freedom, business freedom, trade freedom, fiscal freedom, state sector spending, monetary freedom, investment freedom, financial freedom, property rights, absence of corruption, freedom of labor and

work. The research methodology includes the scaling of each element of the platform, on a scale of 0 - 100 points. The assessment and evaluation of the mentioned parameters influence the strategic decision on foreign direct investments (FDI).

For our analysis, the strategic model consists of twelve endogenous variables (RVPRt, RVGIt, RVJEt, RVTBt, RVGSt, RVFHt, RVBFt, RVLFt, RVMFt, RVTFt, RVIFt, RVFFt).

Formula 1. Functional dependence of research variables of economic freedom (The Heritage Foundation, 2022):

EF=F(RVPRt, RVGIt, RVJEt, RVTBt, RVGSt, RVFHt, RVBFt, RVLFt, RVMFt, RVTFt, RVIFt, RVFFt)

Formula 2. Functional dependence of research variables: Strategic model of the impact of economic freedoms (EF) on foreign direct investments (FDI) and development (D) (The Heritage Foundation, 2022; World Bank, 2021):

SMEFFDIt=F(EF, FDI, D)

Table 1 Operationalization of research econometric variables

Variable	Initials	Interpretation
Property Rights	RVPRt	Subjective and objective rights whose value can be expressed in money. Property rights include property rights and other real rights, mandatory rights, and all other rights.
Government Integrity	RVGIt	Government Integrity refers to the completeness of decisions, uniqueness, indivisibility, support for business entities, impeccability, honesty, adherence to created plans, stimulating fiscal policy and others.
Judicial Effectiveness	RVJEt	Judicial Effectiveness is reflected in the number of resolved cases, the speed of resolving cases, the quality of court decisions, respect for international law, and more.
Tax Burden	RVTBt	Tax Burden implies the creation of a tax environment suitable for starting and developing a business. It also includes elements of fiscal policy aimed at generating and redistributing cash flows.
Government Spending	RVGSt	Government Spending includes elements that are included in the state budget. They are tied to the elements that make up the consumption of different segments of society.
Fiscal Health	RVFHt	Fiscal Health includes a development economic platform aimed at creating a development fiscal policy, as well as directing fiscal cash flows into healthy development projects.
Business Freedom	RVBFt	Business Freedom includes free market formation of prices, free investment, free decision-making and management, support for startups, entrepreneurship and more.
Labor Freedom	RVLFt	Labor Freedom includes respect for workers' rights, working conditions, wages and benefits to employees, labor benefits and trade union activities.
Monetary Freedom	RVMFt	Monetary Freedom refers to the freedom to conduct monetary policy (expansive and restrictive monetary policy), money issuance, open market operations (through issuance and purchase of securities), exchange rate policy, and more.
Trade Freedom	RVTFt	Trade Freedom includes the creation and management of foreign policy in accordance with international agreements, the created foreign policy of the state, export promotion measures, export control measures and an optimal foreign trade balance.
Investment Freedom	RVIFt	Investment Freedom includes opportunities for investors to freely decide where to invest and under what conditions. It also refers to the possibility of finding partners for joint investments.
Financial Freedom	RVFFt	Financial Freedom implies financing opportunities from available financing sources, equally for everyone. Also, equal financial management activities, equal investment opportunities, equal market opportunities that generate financial cash flows and others.

Source: the authors; The Heritage Foundation, 2022; World Bank, 2021

On the basis of their research, Adkins, Moomaw, & Savvides (2002) confirm the existence of the influence of the growth of economic freedom parameters on economic growth in the later stages. Also, there are studies that confirm this in the earlier stages of growth (Weede & Kämpf, 2002). Based on the analysis of previous research, we can draw a general conclusion of the necessity of analyzing the impact of economic freedoms on economic growth, regardless of the stage of development it is in. The strategic approach includes modeling and econometric measurement of impact, based on the model, i.e. straight lines (Y = a + bX or Y = b0 + b1X). This gives us the best basis for evaluation. If we have more variables, we include multi-criteria decision-making based on the model (Y=a+bX+cX2) in the analysis (Draper & Smith, 1998).

Formula 3. Research econometric model, where Y has a normal distribution (Draper & Smith, 1998):

$$Y = \beta_0 + \beta_1 X_1 + \ldots + \beta\rho X\rho + \sigma(Y), \ \text{sd}(Y) = \sigma \text{ (independent of X's)}$$

The variables β0 + β1 + +βρ and σ are calculated on the basis of research:

β0 = intercept

β1 βρ = regression coefficients

$\sigma = \sigma_{res}$ = residual standard deviation

β1 is the average growth of Y, in case of unit increase of Xi. For the purpose of evaluation and analysis of variables, the method of least squares is used.

Formula 4. The model of econometric analysis, the partial correlation coefficient and functional dependence of variables (Draper and Smith, 1998):

$$R^2_{Y/X_1X_2} = \frac{r^2_{x_1y} + r^2_{x_2y} - 2r_{x_1y}r_{x_2y}r_{x_1x_2}}{1 - r^2_{x_1x_2}}$$

Formula 5. The model of econometric analysis, the partial determination coefficient and functional dependence of variables (Draper and Smith, 1998):

$$r_{yx_1 \cdot x_2} = \frac{r_{yx_1} - r_{yx_2} \cdot r_{x_1x_2}}{\sqrt{1 - r^2_{yx_2}}\sqrt{1 - r^2_{x_1x_2}}}$$

The parameters of the econometric model, i.e. the input variables of Chinese economic freedoms are given below in tabular form. The calculated values of the variables are given in Table 3.

The research data presented above show the variability in the previous period, as well as the variables that build it. According to the data, the movement of the parameters of the economic freedom index from 1995 until 2019, 2020 (years affected by the corona virus COVID 19) is visible. Given that the research focus requires an analysis of the parameters of the impact of foreign direct investments (FDI) and gross domestic product (GDP), an in-depth analysis was performed below. The research focus is on measuring the interaction between foreign direct investment (FDI) and China's development. The calculated values of the variables are given in Table 4.

The data above show us trends in GDP growth. FDI contributes to the increase of trade flows, affects economic growth and development and the creation of new jobs. In connection with the previous, FDI depends on macroeconomic, socio-political, corporate and technological factors. Also, research has shown that technological changes have a great impact on development, thanks to new investments in that sector of the economy, which creates greater security. Also, risk management in that situation becomes an especially important segment of the strategy.

4. Research results

On the basis of the created elements of the econometric model and the operationalization of the variables of the research model, we came to the results of the research, which define the laws between the research variables. Previous values of China's economic freedom variables show an upward trend in recent years. Also, the existence of volatility in the period ten years ago is visible. The growth of economic freedom parameters was significantly influenced by the variables judicial effectiveness and property rights. Also, the growth of the business freedom parameter 76.8 in 2020 is visible. It is certainly important to note that the movement of the financial freedom variables, where for many years there has been no progress in the value of the indicators. This means that improvements are not being made in the area of fiscal policy in the country, primarily as a factor of support for economic entities. Also, if we look at the period 2019 and 2020 (the period of the coronavirus COVID 19), it is evident that there was a drop in the value of the variable investment freedom, government integrity and fiscal health. This is completely logical, given that during the period of the coronavirus, economic and investment activity decreased.

Also, on the basis of the deductive method, we came to concrete results that are in favor of the research of the article's research hypothesis. The results of the research were created on the basis of a thorough analysis, research focus and modeling of variables in order to arrive at the results of the research.

The need to undertake changes and research opportunities for progress and improvements is the first and inevitable step for undertaking activities in the field of strategic approach in the field of modeling elements of economic freedom and foreign direct investment (FDI) for development. Diagnostics of the situation as it is in terms of economic freedoms requires both an analysis of the current situation and an analysis of the need for changes. If the research results show the significance of the impact, we can confirm the research hypothesis.

Table 2 Results of the econometric model research

	Index Score	FDI (billion $)	GDP (billion $)
Observations	26	26	26
Mean	53,5308	138.703.319.130,8790	5.781.697.467.785,6700
Stdevp	2,3219	85.606.809.718,3284	4.811.550.706.983,2100
Variance	5,3914	7.328.525.870.150.080.000.000,0000	23.151.020.205.870.600.000.000.000,0000
Coefficient of variation	0,0434	0,6172	0,8322
Median	52,6500	137.713.526.434,7500	4.072.324.884.835,8200
Max	59,5000	290.928.431.467,0030	14.722.840.000.000,0000
Min	51,0000	35.849.200.000,0000	734.547.898.220,5080
Coefficient of determination-one	0,001093942		
Coefficient of determination-two		0,266415712	
Coefficient of determination-three			0,546710238
Pearson Correlation-one	-0,033074798		
Pearson Correlation-two		0,516154737	
Pearson Correlation-three			0,739398565
Correlation	0,88369935	0,88369935	0,88369935
(1-α)	0,95	0,95	0,95
α	0,05	0,95	0,95

Source: the authors' own research

Key categorical activities and elements of the strategic management process can be modeled by structure and intensity depending on the position and degree of economic development in which China is located. Only by consistent application of all activities and elements of the strategic approach enable quality management of the process and effects of foreign direct investments on economic development. The results of the previously conducted research and analysis show the existence of a strong econometric relationship of direct correlation through the impact of economic freedom on foreign direct investment (FDI) and the financial performance of China's economic development (0.88369935). The results of the research also reveal the possibilities of modeling the independent variables of the econometric model, which are related to economic freedom, through a strategic approach. We have analyzed the results of the research on the financial parameters of China's development below.

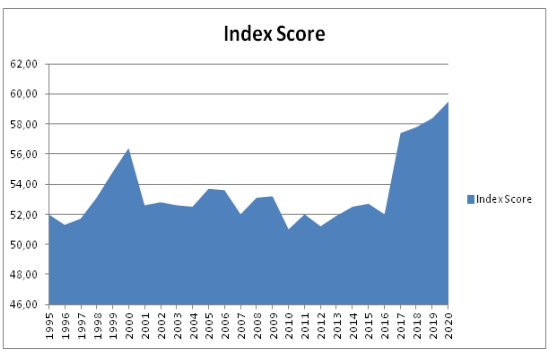

Figure 1 Values of economic freedom parameters in China
Source: the authors' own research

The analysis of economic freedoms in China shows a significant degree of variability. In the last few years, there has been a positive trend of movement and growth, measured by the index of economic freedoms. It is important to point out that the Financial Freedom parameter, which determines the value of the index of economic

freedoms, has decreased in recent years. Also, the indicator related to Investment Freedom. In this regard, the influence of Trade Freedom has increased, which has been at a much higher level in recent years. As well as Property Rights, Government Integrity, Judicial Effectiveness, Tax Burden, which have been significantly improved, which significantly affects foreign direct investment, and thus China's gross margin product. It is important to welcome the positive developments in China, in terms of the parameters of economic freedoms in general.

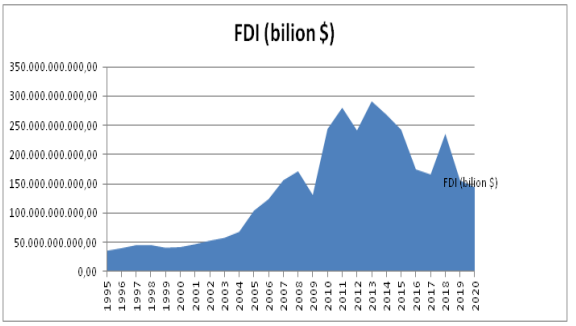

Figure 2 Values of parameters of foreign direct investment in China
Source: the authors' own research

Foreign direct investment in China has been growing steadily in recent years, which has significantly affected the growth of the Chinese economy in general. If we look at the last few years, the value of FDI has tripled compared to the period before 2003.

Major changes, primarily geopolitical and the consequences of the corona virus, have left consequences in many companies, and despite this, the main investors of the Chinese economy have remained stable. The basis of inflows from the USA and Europe disappeared, with the fact that regional investments continued the growth trend, parallel to the growth of inflows from ASEAN countries. The main investors in this value chain are Japan, Germany and the United States, as well as other countries, such as Hong Kong, Singapore and South Korea.

Basic investments are mostly related to production, followed by the construction and real estate sector, services sector, IT sector, retail chains, financial intermediation, education and research, transport, energy and others. If we look at it in general, compared to the same period, foreign direct investment in China increased by 4%, which is mostly due to the activities of mergers and acquisitions of 84%, and mostly in the IT services sector and e-commerce.

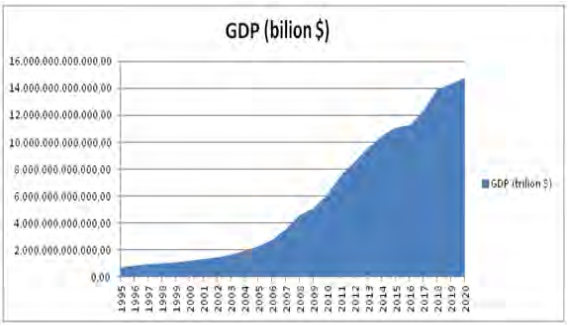

Figure 3 Values of the financial performance parameters of China's development (GDP)
Source: the authors' own research

The value of China's gross domestic product (GDP) in 2019 was $14342.90 billion. From a macroeconomic point of view, China's GDP represents 11.81 percent of the world economy in that period. According to projections and forecasts, China's GDP will reach 14.600.00 billion USD by the end of 2021, and in the long run, through 2022, China's GDP will be around 15.700.00 billion USD.

5. Discussion

The strategic approach implies making decisions about foreign direct investments based on a multi-phase model, which includes a strategic analysis, based on which the state of all important elements that affect the current state is identified. The next phase refers to the strategic choice, where we choose the best and most adequate strategy for growth and development. In certain situations, a decision is made to formulate a new strategic option or strategic restructuring. At the end, strategic implementation and control of results is carried out based on the application of an adequate strategic option. The influence of a strategic approach to this problem is great, because it also includes the effects of a systemic approach, especially through the variables that build economic freedom.

The strategic approach in this model refers to long-term modeling results. It is particularly important to identify the key variables that influence the investment environment for foreign direct investments (FDI). Affirmative fiscal policy favors foreign direct investments. Market freedoms and foreign trade policy significantly affect the arrival of foreign investors. Also, direct incentives affect the financial performance of economic development, in our case China. In connection with the previous one, the level of competitiveness also affects the arrival of foreign investors. The reason

for choosing China as a sample for research is based on several factors, some of which are certainly the size of the country, the foreign trade war with the USA, the great trade importance that China has on the world market and the high degree of volatility of the financial performance of China's development in the last twenty years. In this regard, we have included the last twenty years in the analysis.

Depending on which production phase the investment includes, vertical investments can be divided into, forwards vertical investments and background of vertical investment (Dimitrijević, 2000). FDI corresponds to special types of TNCs (transnational companies), which are also the bearers of these investments. Horizontal FDI occurs when a company locates the production of the same product or group of related products in multiple facilities in different countries. In the case of horizontally integrated FDI, the ownership structure is the main source of their advantages. It is possible that the TNC owns a brand or production technology that is not available to its local competitors. As this type of capital is typically the result of fixed costs such as investment in research and development (R&D), there is a link to large economies of scale. Therefore, the investing company is encouraged to spread these fixed costs over as many different markets as possible. Vertical FDI occurs when a company locates individual operations in the production and marketing chain of a product across facilities in different countries.

6. Theoretical and practical implications

Also, foreign direct investment requires a very transparent process, which creates accountability and trust and eliminates many negative impacts (political influence, theft, fraud, mistrust, scandals, failed investments) on investments in the country (Gwartney et al., 2017). Research results confirm the existence of influence and correlation between economic freedoms and foreign direct investments in correlation with development (Sovbetov & Moussa, 2017). The previous research represents an introduction to the development of a model of strategic management of economic freedoms in the function of foreign direct investments (FDI) and financial performance of China's economic development.

The scientific contribution of the research is reflected in the systematization and development of the Conceptual model of the strategic management of economic freedoms as a function of foreign direct investment (FDI) and the financial performance of China's economic development. On the basis of scientific methods of deduction and multiple regression models, models of analysis and synthesis, the most important factors on which the application of the conceptual model of the strategic management of economic freedoms as a function of foreign direct investment (FDI) and financial performance of China's economic development depends are described.

In the process of developing a model of strategic management of economic freedoms in the function of foreign direct investments (FDI) and financial performance of China's economic development, analyses of the actual state of values of individual parameters that build the model were carried out. In this regard, the analysis includes all scientifically proven benefits and empirically confirmed benefits from the introduction of the model. The effects of connection, causes, consequences and results of dependence between the econometric variables of economic freedom, elements of foreign direct investments and the effects of applying the model are explained through the results of the financial performance of China's development.

The scientific contribution is reflected in the systematization of previous research, the latest values of the parameters of the econometric model, the synthesis of partial research and the testing of the econometric significance of interdependence and mutual influence. The mentioned model creates a strategic approach to the given problem. Also, research of results and parameters in the last twenty years show that a strategic approach is of essential importance, especially in the current time of great geopolitical turbulence and changes, a high degree of fierce competition, as well as trade wars. Also, the results of the research provide the possibility of measurement, creation of influence and strategic approach, as well as strategic policy of process management.

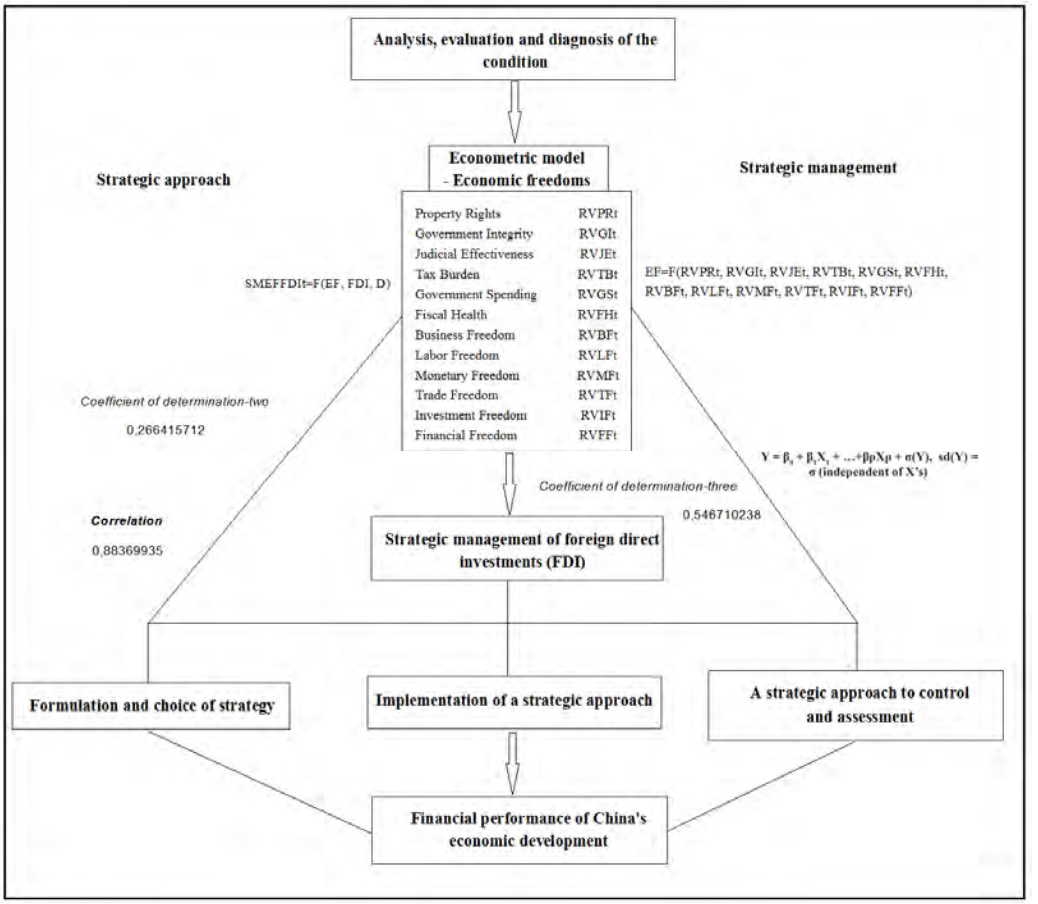

Figure 4 Conceptual model of the strategic management of economic freedoms as a function of foreign direct investment (FDI) and financial performance of China's economic development
Source: the authors' own research

Concluding remarks

The elements of a given research platform through a strategic approach are particularly significant due to the influence of market trends. The model answers the question of how to deal with market changes and turbulence. The strategic approach offers solutions in crisis situations, especially at the time of reduction of foreign direct investments. Foreign direct investment in China has been growing steadily in recent years. Economic freedoms are a significant factor that generally affects many elements and determines foreign direct investment. Decisions in that domain are strategic decisions. Are you investing in China? These are strategic decisions that also relate to trust in the Chinese economic system, society, companies and individuals.

Based on the research results (0.88369935), we can state that there is a positive correlation between the research variables of the model, economic freedom for foreign direct investment (FDI) and the financial performance of China's development. The research focus generated through the research hypothesis of the article, research hypothesis, H1a: "Economic freedoms significantly affect foreign direct investment, which positively reflects on the financial performance of China's development". The analysis showed that Monetary Freedom and Trade Freedom are among the most significant factors affecting China's economic freedoms. Also, these factors must be significantly involved in creating China's development strategy for the future. The importance of strategic decisions in this phase is of crucial importance. They arise as a result of the process and focus of the most important parameters of strategic decision-making. In the domain of research on the importance of the impact of economic freedoms on foreign direct investments, strategic decisions are the most important. Strategic planning is also very important here, as a platform for strategic decision-making and the result of the modeling process. In this regard, the goal was the integral modeling of parameters into a unique strategic decision-making model.

The values of economic freedom recorded constant growth from the value of 51.00, and by 2020 the value was 59.50. The research results we obtained show that the research hypothesis H2a is confirmed: "In the last ten years, there has been an increase in economic freedom in China, which creates more favorable conditions for foreign direct investment (FDI) in the country."

The importance of foreign direct investment for countries that have a preference for high growth rates is very high. They provide fresh capital and technology transfer. China ranks 31st among 190 countries in the world based on the World Bank's Doing Business report for 2020. This represents a significant improvement compared to the previous year in 2019, when it ranked 46th. Based on the results of research into and monitoring of China's development, it is noticeable that China is one of the ten economies that grew the most in the period 2019-2020. There are several parameters that are responsible for these developments, and the most important are certainly starting a business, energy issues, developing new technology and obtaining building permits. All of this is embodied in reform agendas whose goal is the growth and development of the Chinese economy in the future. Economic freedom and foreign direct investment are certainly important factors that contribute to this, which we have confirmed on the basis of research. In order to improve the investment environment, China has introduced a number of other factors, such as incentives for large foreign investment projects, tax incentives, balanced foreign trade policy, tariff policy, customs policy suitable for foreign direct investment and others.

The strategic decisions that are made should certainly integrate all the parameters of China's development, and economic freedoms significantly affect the strategic decision-making on investment, primarily foreign direct investment, which significantly affects China's GDP.

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Appendix

Table 3 Input parameters of the econometric model of Chinese economic freedoms (1995-2020)

Year	Index Score	Property Rights	Government Integrity	Judicial Effectiveness	Tax Burden	Government Spending	Fiscal Health	Business Freedom	Labor Freedom	Monetary Freedom	Trade Freedom	Investment Freedom	Financial Freedom
1995	52.00	30.0	30,0	N/A	70,6	93.7	N/A	55,0	N/A	68,4	20,0	50,0	50,0
1996	51.30	30,0	30,0	N/A	70,7	94.6	N/A	55,0	N/A	61,5	20,0	50,0	50,0
1997	51.70	30.0	22.0	N/A	70.4	95.4	N/A	55.0	N/A	62.7	30.0	50.0	50.0
1998	53.10	30.0	24.0	N/A	70.5	95.9	N/A	55.0	N/A	68.2	34.0	50.0	50.0
1999	54.80	30.0	29.0	N/A	70.5	95.1	N/A	55.0	N/A	75.2	38.2	50.0	50.0
2000	56.40	30.0	35.0	N/A	70.4	90.3	N/A	55.0	N/A	84.0	42.6	50.0	50.0
2001	52.60	30.0	34.0	N/A	70.4	94.1	N/A	55.0	N/A	84.1	46.0	30.0	30.0
2002	52.80	30.0	31.0	N/A	70.3	92.3	N/A	55.0	N/A	87.6	48.6	30.0	30.0
2003	52.60	30.0	35.0	N/A	66.9	90.2	N/A	55.0	N/A	85.8	50.6	30.0	30.0
2004	52.50	30.0	35.0	N/A	66.4	88.4	N/A	55.0	N/A	86.4	51.4	30.0	30.0
2005	53.70	30.0	34.0	N/A	67.9	86.0	N/A	55.0	65.0	84.8	54.4	30.0	30.0
2006	53.60	30.0	34.0	N/A	70.0	86.0	N/A	43.1	65.2	79.4	68.0	30.0	30.0
2007	52.00	20.0	32.0	N/A	66.6	87.0	N/A	46.9	64.2	75.5	68.0	30.0	30.0
2008	53.10	20.0	33.0	N/A	66.4	89.7	N/A	50.3	64.8	76.5	70.2	30.0	30,0
2009	53.20	20.0	35.0	N/A	70.6	88.9	N/A	51.6	61.8	72.9	71.4	30.0	30.0
2010	51.00	20.0	36.0	N/A	70.2	88.1	N/A	49.7	53.2	70.6	72.2	20.0	30.0
2011	52.00	20.0	36.0	N/A	70.3	87.0	N/A	49.8	54.9	75.3	71.6	25.0	30.0
2012	51.20	20.0	35.0	N/A	70.4	84.1	N/A	46.4	55.4	74.2	71.6	25.0	30.0
2013	51.90	20.0	36.0	N/A	70.2	83.3	N/A	48.0	62.6	71.6	72.0	25.0	30.0
2014	52.50	20.0	35.0	N/A	69.9	82.9	N/A	49.7	61.9	73.3	71.8	30.0	30.0
2015	52.70	20.0	40.0	N/A	69.7	81.5	N/A	52.1	63.0	74.2	71.8	25.0	30.0
2016	52.00	20.0	36.0	N/A	69.7	74.3	N/A	54.2	62.0	70.6	72.8	30.0	30.0
2017	57.40	48.3	41.6	60.7	70.0	73.0	92.5	53.9	63.4	71.8	73.6	20.0	20.0
2018	57.80	46.7	47.3	65.4	70.4	71.6	85.9	54.9	61.4	71.4	73.2	25.0	20.0
2019	58.40	49.9	49.1	75.2	70.4	70.1	76.0	56.2	64.2	71.9	73.0	25.0	20.0
2020	59.50	60.9	46.0	76.3	70.4	67.9	67.5	76.8	64.4	71.1	72.4	20.0	20.0

Source: The Heritage Foundation, 2022

Table 4 Values of dependent research variables (foreign direct investment (FDI) and China's development) in the econometric model (1995-2020)

Years	GDP (billion $)	FDI (billion $)
1995	734,547,898,220.51	35,849,200,000.00
1996	863,746,717,503.79	40,180,000,000.00
1997	961,603,952,951.82	45.439.000.000.00
1998	1,029,043,097,554.08	45.644.000.000.00
1999	1,093,997,267,271.06	41,014,000,000.00
2000	1,211,346,869,605.24	42,095,300,000,00
2001	1,339,395,718,865.30	47,053,000,000.00
2002	1,470,550,015,081.55	53,073,618,897.40
2003	1,660,287,965,662.68	57,900,937,467.39
2004	1,955,347,004,963.27	68,117,272,181.22
2005	2,285,965,892,360.54	104,108,693,867.09
2006	2,752,131,773,355.16	124,082,035,618.51
2007	3,550,342,737,010.84	156,249,335,203.20
2008	4,594,307,032,660.79	171,534,650,311.57
2009	5,101,703,073,086.04	131,057,052,869.50
2010	6,087,163,874,512,21	243,703,434,558.18
2011	7,551,500,124,203,36	280,072,219,149.94
2012	8,532,229,986,993.65	241,213,868,161.42
2013	9,570,406,235,659.64	290,928,431,467.00
2014	10,475,682,920,594.50	268,097,181,064.34
2015	11,061,553,079,876.40	242,489,331,627.40
2016	11,233,276,536,737.20	174,749,584,584.05
2017	12,310,409,370,892.80	166,083,755,721.65
2018	13,894,817,549,374.20	235,365,050,036.34
2019	14,279,937,467,431.00	155,815,344,616.66
2020	14,722,840,000,000.00	144,370,000,000.00

Source: The World Bank, 2021

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Firm value determinants: panel evidence from European listed companies

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Abstract
Background: To manage growth opportunities effectively and to make a significant impact on superior long-term performance, it is necessary to analyze firm value and diagnose its determinants. Increasing profit, providing prosperity to the company's stakeholders, and improving company value are the goals of every company's business.
Purpose: The paper aims to build a model of the company's optimal value by assessing company performance based on financial statement analysis of European companies over the period 2015-2020.
Study design/methodology/approach: The impact of financial indicators such as financial leverage, profitability, size, liquidity, growth, and asset tangibility on company value was thoroughly considered. The empirical research was founded on a sample of 158 Eastern and Western European companies, generating 948 observations. Panel regression analysis was conducted.
Findings/conclusions: The obtained results revealed that debt-to-assets ratio, return on equity, and assets tangibility have a significant adverse effect on company value, whereas the return on assets and firm size have a significant favorable effect. The obtained conclusions should serve as a beneficial tool for the strategy of reaching the targeted market company's value and ensuring the company's future viability by the market. Hence, stakeholders could assess the perspective of the future company's development and strengthen the importance and influence of financial variables on the company's value.
Limitations/future research: The research limitations, which are also opportunities for future research, are aimed at the investigation of company value indicators at the level of individual European economies or industries. One should look at the company's value factors before and after the Covid-19 pandemic and consider a longer time in the company's business. Other financial determinants that affect the value of the company could be considered, and the company value could be measured by some other indicators. Also, the influence of non-financial determinants on the company value could be researched.

Keywords
firm value, European companies, Tobin Q, panel analysis, financial determinants, ratio indicators, financial statement analysis

Introduction

The company value reflects the business value of the company as a whole or an economic measure of the company's performance. Improving the company's value is aimed at its sustainability by ensuring its operational continuity and improving profits and prosperity. The initial assumption of the company's market value growth is good corporate governance as a system that determines the best way corporations are managed and the purpose of management (Xie, Lin, & Li, 2022). In order to

ensure efficient company business, the corporate governance system regulates the relationship between the manager and the owner of the company, on the one hand, and ensures the coordination of various stakeholders' goals, on the other. In that direction, Kyere and Ausloos (2020) consider that good corporate governance provides strong internal mechanisms for managing different interest groups. There are several theories that have explored the relationship between the agents (managers) and the principals (shareholders). Agency theory and its associated agency costs, which are based on the shareholders' value loss due to the different interests of managers and company owners, were researched by Jensen and Meckling (1976), Famma (1980), Fama and Jensen (1983). As a normative alternative to agency theory, there is the stewardship theory based on prerequisite that managers in the achievement of organizational goals maximize the benefits of shareholders, which can lead to the minimization of agency costs (Donaldson & Davis, 1991).

One of the key corporate goals can be the maximization of the shareholders' wealth which is the basis of the shareholder theory introduced by Friedman (1970). High company value is usually accompanied by high shareholder welfare and prosperity. On the other hand, managers should be agents of all stakeholders, not only shareholders, which is the basis of the stakeholders' theory determined by Freeman (1984). In this way, Karpoff (2021) points out that this will ensure the building of stronger stakeholder relationships, reduce the company's risk, and contribute to the growth of the company's value through the growth of reputation and innovation. Well-run companies aim to maximize value or profit by promoting the interests of all stakeholders (Goyal, 2020).

In addition to financial, the company's value is affected by non-financial factors, such as technological trends, organizational structure, environmental factors, customer satisfaction, product quality and company competitiveness. In connection with technological progress, Salvi, Vitolla, Rubino, Giakoumelou and Raimo (2021) conducted studies which showed that the degree of company digitization positively affects its value. The research conducted by Bose, Shamsb, Ali and Mihret (2021) showed that companies based in countries with a more devastating impact of COVID-19 have a greater decline in enterprise value.

Belo, Gala, Salomao and Vitorino (2022) indicated the importance of intangible capital inputs and labor for company value understanding by analyzing the market value determinants of US publicly traded companies. They showed that installed labor force accounts for 14% to 22% of companies market value, physical capital accounts for 30% to 40%, knowledge capital accounts for 20% to 43%, and brand capital accounts for 6% to 25% of companies market value. In that way, Sisodia, Jadiyappa and Josep (2021) emphasize the importance of human capital in the company's performance and valuation. Human capital leads to value creation by using current growth opportunities and creating opportunities for future growth. Ullah, Irfan, Kim and Ullah (2021) points out the importance of hedging in increasing the value of the company by reducing the costs of bankruptcy, although it can also reduce the value of the company by maximizing the utility of the manager. Seth and Mahenthiran (2022) indicate that higher company value is associated with higher institutional ownership levels.

The study aims to research the direction and nature of the relationship among the financial determinants such as leverage, profitability, firm size, liquidity, sales growth, and asset tangibility on one side, and company value, on the other. Analysis of financial statements of European companies assesses a company's performance over the period 2015-2020 to build a model that will indicate the value indicators of European companies. The motives for this paper lie in the insufficient scope of research into determinants of company value. Previous research that this paper relied upon was done in other countries, outside the European market.

This paper contributes to existing research and empirical studies by providing new insights into the impact of financial determinants on company value. By identifying indicators that determine a company's value, managers seek to maximize value and improve the performance of observed companies. As an expression of company financial strength, the company value maximization is influenced by the access and availability of internal and external financing sources. Analyzing a company's value indicators provides a significant information basis for all stakeholders who want to research the factors of the company's ability to generate future income in the present value (Oh, Park, & Kim, 2020). In addition, information is provided to strengthen the competitive position and optimal use of available resources to maximize the company value. This research created the basis and added value to future research on this issue, as well

as providing a more detailed insight into understanding the value of a company and how it is improving.

The paper consists of several parts. After Introduction, research questions were presented in the Theoretical background. The observed sample and the applied methodology are presented in Data and methodology. The presentation and results interpretation are presented in the section on Results and discussion. Finally, the Conclusion presents the research limitations and recommendations for future research.

1. Theoretical background

The Tobin Q ratio reflects the company's investment or growth opportunities, making a significant impact on the company's future business performance and superior long-term performance. Santosa (2020) considers that Tobin's Q is a better indicator than the accounting returns indicator, which minimizes the accounting distortion risk. The use of the Tobin Q ratio is suitable in situations where owners and management want to give a good signal to investors so that their perception of the company is beneficial with, of course, an appropriate company book value (Setiawanta, Utomo, Ghozali, & Jumanto, 2020). Therefore, Tobin Q as a market expression of a company's value is a suitable measure for assessing investors' expectations regarding the company's ability to create value (Salvi et al., 2021). In this paper, Tobin Q was used as a variable on which the influence of chosen financial factors was measured.

Financial leverage is the debt financing usage in the company's capital structure (Al-Slehat, 2020). By additional financing, each firm reduces potential external financing capability, through rising financing costs, as well as worsening credit rating and deteriorating credit conditions (Tica, 2023). In circumstances when the company borrows to a greater extent and uses its capital to a lesser extent, most of the control is held by investors. Companies that are highly indebted are subject to the control of the capital market and they do not have an opportunity for superior control of management (Vuković, Mijić, Jakšić, & Saković, 2022a). If a company can pay its obligations despite high indebtedness, the value of the company is considered good. On the other hand, if a company is not heavily indebted because it can finance the business with its resources, the value of the company can also be considered good (Endria & Fathony, 2020). Additionally, due to shortage of funding, companies could opt to expand ownership via recapitalization (Tica, 2022). Managers should choose the capital structure that will achieve the greatest company value. Doorasamy (2021) pointed out studies that started from Modigliani and Miller's theory of capital structure irrelevance, which assumes that capital structure does not affect company performance. On the other hand, they also emphasize studies based on agency costs and pecking order theories, in which companies strive to balance the capital structure to enhance performance through an optimal capital structure. Consistent with the requirements of agency costs and pecking order theories, Huynh, Wu and Duong (2020) proved that information asymmetry has a significant negative impact on the value of the company and that financial leverage has only a limited role in mitigating the negative impact of information asymmetry on the company value. The requirements of the pecking order theory are based on the fact that the presence of information asymmetry affects the decision-making about the company's capital structure, limiting the possibility of using external financing sources (Sony & Bhaduri, 2020).

Diantimala, Syahnur, Mulyany and Faisal (2021) point out that a company that adheres to the requirements of the trade-off theory starts from the target ratio of debt and equity and tries to move towards the goal. So small companies with higher debt ratios and lower profitability have a higher company value. Referring to the trade-off theory requirements, Alghifari, et al., (2022) indicate that any new borrowing will lead to growth in company value in circumstances where the capital structure is below the optimal level. A statistically significant positive impact of financial leverage on company value was found in research conducted by Farooq, & Masood (2016), Santosa (2020), Aprilyani, Heni Widyarti and Hamidah (2021). Zuhroh (2019) confirmed a statistically significant positive relationship emphasizing that greater leverage will affect the company's greater value due to the high investor confidence and improved company control over the freedom to use cash by management. On the other hand, Kanta, Hermanto and Surasni (2021) explained that higher indebtedness affects the reduction of the company's value, since the company will not be able to settle the debt out of the realized profit. Fajaria and Isnalita (2018) state that companies with high leverage are prone to bad credit conditions and bankruptcy and that the higher levels of borrowing would reduce the value of the company and this

impact is statistically significant. The statistically significant negative relationship was also confirmed in research conducted by Safitri, Handayani and Nuzula (2014), Tahu and Susilo (2017). Additionally, Jadiyappa, Hickman, Jyothi, Vunyale and Sireesha (2020) revealed the negative impact of debt diversification on the value of the company and the fact that changes in debt diversification were followed by corresponding inverse changes in the company value.

The relationship between the financial leverage as the debt-to-equity ratio and the Tobin Q scale was not statistically significant in research conducted by Manawaduge, De Zoysa, Chowdhury and Chandarakumara (2011), Chadha and Sharma (2015), Rachmi and Heykal (2020), Kanta and Hermanto, Surasni, (2021).

A statistically significant positive relationship between leverage as debt to asset ratio and company value was confirmed in research conducted by Manawaduge et al. (2011), Sudiyatno, Puspitasari and Kartika (2012), Obradovich and Gill (2012), Hermuningsih (2013), Rizqia, Aisjah and Sumiati (2013), Olokoyo (2013), Anton (2016), Liviani and Rachman (2021), Bose et al. (2021). Rizqia et al. (2013) asserted that financial leverage is an external means of striving to achieve the company's goal and maximizing the company's value by reducing the ability of managers to act against the interests of shareholders and providing insight into the company's performance. Kouki and Said (2011) indicated that financial leverage has a statistically significant positive impact on company value with managerial ownership between 20% and 80% which corresponds to the agency and signaling theory. Increased participation of liabilities in the financing structure leads to higher company value. On the other hand, a statistically significant negative relationship between leverage and company value as the debt-to-asset ratio was pointed out in research conducted by Salim and Yadav (2012) and Soumadi and Hayajneh (2012).

Relying on the above mentioned previous research, the following research hypothesis was set:

Hypothesis 1 (H1): Financial leverage as the debt-to-equity ratio has a statistically significant negative impact on company value.

Hypothesis 2 (H2): Financial leverage as the debt-to-asset ratio has a statistically significant negative impact on company value.

Companies that are unable to achieve a satisfactory level of profitability have the continuity of their business threatened. A company's ability to make a profit determines its sustainability (Vuković, Tica, & Jakšić, 2022b). High profitability is an expression of the good company condition and will affect the positive response of investors to the company's shares, which will lead to an increase in the company's value (Endria & Fathony, 2020). Based on this, there is a statistically significant positive relationship between the return on assets and the company's value which was also confirmed in research conducted by Safitri et al. (2014) and Dang, Vu, Ngo and Hoang (2019). By using multiple linear regression, Aprilyani et al. (2021) pointed out that there is a statistically significant positive relationship between profitability and company value, so that a company that generates net profit can create value. Relying on the requirements of signaling theory, Rizqia et al., (2013) showed that greater company profitability leads to a more effective company, confirming a statistically significant positive impact of return on assets on company value. On the other hand, pointing to a statistically significant negative relationship between the return on assets and the value of pharmaceutical firms listed on the Indonesia Stock Exchange, Rahmantari, Sitiari and Dharmanegara (2019) indicated that profitability growth is not accompanied by growth in stock prices, which leads to a decrease in the company value. However, Kouki and Said (2011), Anton (2016), Sugianto, Oemar, Hakim and Endri (2020) found that there is no statistically significant impact of return on assets on company value.

Based on the previously mentioned theoretical studies and empirical research, as well as the research conducted by Obradovich and Gill (2012), Santosa (2020), the following research hypothesis was set:

Hypothesis 3 (H3): Profitability as the return on assets has a statistically significant positive impact on company value.

Profitability as return on equity has a statistically significant positive impact on company value which was confirmed in research conducted by Safitri et al. (2014), Rahmadianti and Asandimitra (2017), Zuhroh (2019), Kanta and Hermanto, Surasni (2021). Dang et al. (2019) claimed that achieving the maximum company value means achieving the maximum return on equity. Research conducted by Fajaria and Isnalita (2018) confirmed a statistically significant positive relationship between return on equity and company value, pointing out that the high profitability is an

expression of an efficient company's resources management so that high income and high dividends are achieved. By analyzing 150 listed companies on the Indonesia Stock Exchange from 2006 to 2010, Hermuningsih (2013) also confirmed a statistically significant positive relationship and claimed that growth in return on capital employed indicates the efficiency of capital management and operating activities in order to make a profit, which affects profitability growth and better the company's prospects. The success of management in maximizing shareholder returns leads to an increase in the company value, confirming the statistical significance between these two variables (Rachmi & Heykal, 2020). Tahu and Susilo (2017) claimed that high profitability creates company added value by increasing Tobin Q value and this relationship is statistically significant. Finally, the research conducted by Putri and Rachmawatari (2017), Rosikah, Prananingrum, Muthalib, Azis and Rohansyah (2018) showed that return on equity does not have a significant effect on company value.

By summarizing all previous research and research results obtained by Jacob (2017), the following research hypothesis was set:

Hypothesis 4 (H4): Profitability as the return on equity has a statistically significant positive impact on company value.

As an important indicator of corporate performance, company size represents the size of the company's assets so that a large company will easily obtain capital and have more resources and capacity (Dada & Ghazali, 2016). They also create favorable growth opportunities by adding more returns to their engaged assets (Vuković, Milutinović, Mijić, Krsmanović, & Jakšić, 2022c). Rahmadianti and Asandimitra (2017) consider that larger company size in terms of total assets indicates an increase in the volume of funds that participate in the regular company activities. Accordingly, the company's performance increases and leads to an increase in stock price and company value. Company size indicates the development level of a company's business and has a statistically significant positive impact on company value (Rizqia et al., 2013). Growth in company size will facilitate access to the company's assets that will be used by management to increase the company value. Research conducted by Obradovich and Gill (2012) showed that firm size has a statistically significant positive impact on the value of American firms and that employees and managers make great efforts to maximize the value of the company or maximize the wealth of shareholders. Ayuba, Bambale, Ibrahim and Sulaiman (2019) emphasize that management should ensure the growth of enterprise size through turnover growth and opening new markets for both new and existing products, proving a statistically significant positive impact of company size on the company value. Modern companies seek to increase their size to gain a competitive advantage by reducing costs of production and increasing market share. Confirming the statistically significant positive impact of the company size on the company value, Rahmantari et al. (2019) emphasize that the company size through the size of total funds is an expression of the company's development wealth according to its activities. Research conducted by Zeitun and Tian (2007), Olokoyo (2013) and Dang et al. (2019) also confirmed the statistically significant positive relationship between company size and value.

On the other hand, Chadha and Sharma (2015) start with large companies with lower volatility of assets and greater efficiency of performance, providing research results that indicate a significant negative relationship between company size and value of 422 listed Indian manufacturing companies over a period of 10 years. A significant negative impact of company size on the company value was also confirmed in research conducted by Willim (2015), Ali, Jan & Atta (2015), Ibrahim (2017), Huynh et al. (2020), Oh et al. (2020), Ullah et al. (2021), Nguyen, Cuong, Nga, Trang, Nguyen and Truong (2021), Poretti and Heo (2022), Seth and Mahenthiran (2022). Analyzing the capital structure, profitability, and value of publicly quoted companies at the Nairobi Securities Exchange, Kodongo, Mokoaleli-Mokoteli and Maina, (2015) found that company size had a statistically significant impact on the company's value for small-sized companies, but this impact is insignificant for large-sized Kenyan companies. However, research conducted by Manawaduge et al. (2011), Salim and Yadav (2012), Dada and Ghazali (2016), Farooq and Masood (2016), Putri and Rachmawatari (2017), Rahmadianti and Asandimitra (2017), Febriyanto (2018), Zuhroh (2019), Endria and Fathony (2020), Aprilyani et al. (2021), Doorasamy (2021) showed that size does not significantly affect company value.

Considering all theoretical and empirical research, as well as research conducted by

Soumadi and Hayajneh (2012), the following hypothesis was set:

Hypothesis 5 (H5): Company size has a statistically significant positive impact on company value.

The ability to cover current liabilities with available current assets is shown by current liquidity ratio (Vuković, Milutinović, Mirović, & Milićević, 2020). High liquidity may give the impression that it is a company capable of settling its obligations and able to pay dividends to investors, likely to operate with a high profit. High profit can be an expression of positive signals for investors, so it leads to an increase in company value.

A too high current ratio can also indicate poor liquidity management, and that investor concludes that the funds are not managed optimally, which affects his perception of the company's value. Research conducted by Farooq and Masood (2016) showed that liquidity, as one of the bases of financial management from the aspect of the company working capital management, has a statistically significant positive impact on the company value of Pakistani cement companies from 2008 to 2012. Thus, efficient working capital management brings an increase in the company value. Jacob (2017) and Marsha and Murtaqi (2017) found that the current ratio has a statistically significant positive impact on the company value, which means that higher liquidity means settling liabilities in the short-term and increasing the company's value. On the other hand, a significant negative relationship between liquidity and company value was found in research conducted by Ibrahim (2017), Fajaria and Isnalita (2018), Febriyanto (2018). According to Zuhroh (2019), high current liquidity means that the company has enough internal funds to cover its operating costs, but the relationship between the current ratio and the company value of the public property and real estate companies in the Indonesia Stock Exchange in the period of 2012 to 2016 was insignificant.

Sublimating all mentioned previous research, we set the following hypothesis:

Hypothesis 6 (H6): Liquidity has a statistically significant positive impact on company value.

Company growth represents the ability of management to take advantage of the opportunity to grow assets and increase the company's profits or to achieve a satisfactory level of sales growth. Growth impacts the higher value increase and strengthening of the company, as well as the increase in economic activity (Vuković, Peštović, Mirović, Jakšić, & Milutinović, 2022d) which gives a positive signal to investors. Fajaria and Isnalita (2018) pointed out that the high growth of assets indicates a greater chance for the company to realize future benefits according to the requirements of signaling theory. A company with high growth will be the subject of consideration by investors, which will affect the growth of the company's value. Their research showed that growth has a statistically significant positive effect on company value, as well as research conducted by Hermuningsih (2013), Kodongo et al. (2015), Rehman (2016), Ibrahim (2017) and Bose et al. (2021). Indicating a statistically significant positive relationship between growth and company value, Febriyanto (2018) emphasizes that the company's growth reflects the constant growth of activities and the success of the previous investment period, so that good future prospects may affect the company's value growth. Liviani and Rachman (2021) confirmed that growth has a statistically significant positive impact on the company's value showing that sales growth leads to growth of the company's operating results and a good outlook of the company, which affects the growth of trust in the company by external stakeholders. On the other hand, research conducted by Zeitun and Tian (2007), Manawaduge et al. (2011), Chadha and Sharma (2015), Dada and Ghazali (2016), Sugianto et al. (2020) showed a statistically insignificant relationship between company growth and company value. Only Huynh et al. (2020) and Nguyen et al. (2021) found a significant negative impact of sales growth on company value.

Considering all summarized theoretical and empirical studies, the following hypothesis was set:

Hypothesis 7 (H7): Company growth has a statistically significant positive impact on company value.

As one of the key indicators of the company's performance, the high value of the asset tangibility indicator presents an expression of active investment policy. Defining tangibility as the investments in collateral assets and the company's long-term resources, Chadha and Sharma (2015) found that tangibility had a statistically significant positive impact on company value. Further, Dada and Ghazali (2016) defined that asset tangibility indicates the level of collateral that serves in capital structure decisions and has an impact on the creditor's risk and bankruptcy value of assets, confirming a significant positive relationship

between the asset tangibility and company value. Expecting that companies with higher collateral assets borrow more compared to companies whose borrowing costs are higher due to less fixed assets, Ibrahim (2017) proves a statistically significant positive relationship between the tangibility of assets and the value of Nigerian companies in the manufacturing industry for the period 2012-2016. Kouki and Said (2011) found that asset tangibility has a statistically significant positive impact on shareholders' wealth, so strongly controlled companies use tangible assets to a greater extent to make investments with a certain risk level and transfer wealth at the creditor's expense. He also states that companies that have fewer fixed assets have a bigger information asymmetry problem than companies that have a larger volume of tangible assets. On the other hand, a statistically significant negative relationship between asset tangibility and company value was found in research conducted by Mule, Mukras, Nzioka and Maloba (2015), noting that higher tangible assets level of manufacturing companies will affect earnings growth through a positive impact on production capacity. For companies in the service industry and retail sectors, the high level of fixed assets jeopardizes the provision of services or the sale of goods, because money is tied to fixed assets that do not generate revenue. Kodongo et al. (2015) confirmed the negative impact on company value by observing predominantly Kenyan non-manufacturing companies and points out that the sign of the tangible assets' indicator depends on the category of companies in the sample. Reliance on tangible in relation to intangible assets on a larger scale lead to lower financial distress costs.

Bearing in mind all presented research and relying on the research conducted by Zeitun and Tian (2007), Soumadi and Hayajneh (2012), Al-Slehat (2020), Huynh et al. (2020), the following research hypothesis was set:

Hypothesis 8 (H8): Asset tangibility has a statistically significant positive impact on company value.

2. Data and methodology

Financial statements retrieved from the TP Catalyst database are the source of financial information used in the research (Bureau Van Dijk, 2022). Mainly due to the Covid-19 pandemic, the most recent data accessible at the time of the study were from 2020. Considering the purpose of this paper, the sample consisted primarily of 3,558,265 companies from Western and Eastern Europe, including 27 European-origin countries. Further, the availability of necessary data for calculating the Tobin Q indicator for the period 2015–2020 decreased the sample size to 158 firms and generated 948 observations. The initial sample was therefore reduced based on data availability in the TP Catalyst database needed for the calculation of all variables in the observed period, which represents an information limitation of the research and conclusions drawn. The sample consists of very large, large, and medium-sized active private and public enterprises. This category of companies usually makes better use of advantages of the economies of scale, has greater market power, greater scope of diversification of activities, negligible risk of acquisition, expands to a larger market, and achieves a greater status and a greater volume of economic activity (Vuković, Milutinović, Mirović, & Milićević, 2020) which altogether leads to greater company value. As this category of companies has better conditions for value growth, it represents a suitable basis for evaluating the determinants of the optimal company's value.

Table 1 summarizes the final distribution of companies by Eastern and Western European countries.

Table 1 Overview of number of companies from sample per country

Country	Number of companies	Country	Number of companies
Belgium	16	Netherlands	5
Bosnia and Herzegovina	1	North Macedonia	14
Bulgaria	6	Norway	1
Croatia	9	Poland	6
Cyprus	4	Portugal	1
Czech Republic	2	Romania	18
Estonia	1	Russian Federation	3
France	3	Serbia	2
Greece	36	Slovenia	1
Hungary	2	Spain	6
Ireland	1	Switzerland	1
Italy	4	Turkey	1
Latvia	1	United Kingdom	9
Lithuania	4		
Total			158

Source: the authors

Tobin Q is selected as a dependent variable, representing company value, whereas liquidity, profitability, leverage, firm size, and asset efficiency are chosen as independent variables, including gross domestic product growth rate (GDP) and customer price index growth rate (CPI) as a control variable, in order to develop a model that indicates the factors of company value. Gross domestic product is presented in the paper as annual growth expressed in percentages, while the customer price index is presented in the paper as inflation annual growth expressed in percentages. The dependent and independent variables are in detail described in Table 2.

Table 2 Summary of variable type, name, formulation, and source

Variable type	Variable name	Formulation
Dependent	Tobin Q	(Market value of equity/Total assets)
Independent	Financial leverage measured by debt-to-equity ratio	Total debt/Equity
	Financial leverage measured by debt-to-assets ratio	Total debt/Total assets
	Profitability measured by ROA	Net income/Total assets
	Profitability measured by ROE	Net income/Equity
	Company size	Ln Total assets
	Liquidity	Current assets/current liabilities
	Company growth	$(Sales_t-Sales_{t-1})/Sales_{t-1}$
	Asset tangibility	Fixed assets/Total assets

Source: the authors

To test the regression model with financial data collected over 6 years and over 158 companies, and to use the results to statistically prove the hypotheses, panel data analysis would be considered the most convenient econometric model to apply (Chadha & Sharma, 2015; Anton, 2016; Dada & Ghazali, 2016; Ayuba et al., 2019; Endria & Fathony, 2020; Sugianto et al., 2020).

3. Results and discussion

Based on presented results in Table 3, the range of the Tobin Q value is between 0.016 and 3.989, showing a significant value dispersion. Given that Tobin Q is the ratio of the company's market value to its replacement value or cost and that the minimal and the median value is between 0 and 1, it indicates that a company's assets would cost more to replace than its shares worth, suggesting that the company value is low. In contrast, the maximum value of Tobin Q is more than 1, suggesting that a company's assets are overpriced, considering that it is more valuable than its replacement cost. Further, the debt-to-equity ratio median is 0.892, while the debt-to-assets median ratio is 0.471, implying that, in general, European stock companies rely more on equity financing, with their capital structure slightly inclined to their own sources. These indicators of financial leverage could be indicative of a significant rate of investment risk if reaching high values. The median return on assets and return on equity, as measures of profitability, were 3.2% and 6.4%, respectively, which is significantly below the reference standard of 10%. If further analysis reveals that profitability is a significant variable of company value, firms should attempt to enhance their earning power. The current ratio had an average value of 1.522 with excessive fluctuations in value between 0.036 and 33.731. When compared to the reference value of 2, the median value indicates that the majority of the sampled companies do not settle their short-term debts with their short-term assets. Hence, concerns about sustaining liquidity are expressed even though highly liquid companies are included in the sample. Generally, the sample companies are not capable of balancing the maturity of their liabilities with the monetization time of their assets. The firm size is ranging from 8.234 to 19.310, confirming that the sample includes companies of different sizes, from very large to medium-sized. Further, the median tangibility of assets is 0.616. Thus, on average, companies have asset structures oriented towards fixed assets, which consequently states that sampled companies are predominantly capital-intensive. Considering sales growth capacities, median sales growth is 0.019, ranging from -0.999 to 78.333. This indicates that the company's assets could generate a significant return in the form of sales.

Table 3 Overview of descriptive statistics

Variable	Number of observations	Median	Mean	Standard deviation	Minimum	Maximum
Tobin Q	948	0.519	0.705	0.642	0.016	3.989
Financial leverage (Debt/Equity)	948	0.892	1.357	1.985	0.024	25.398
Financial leverage (Debt/Assets)	948	0.471	0.453	0.218	0.023	0.962
Profitability (ROA)	948	0.032	0.037	0.067	-0.368	0.401
Profitability (ROE)	948	0.064	0.048	0.234	-3.167	1.476
Company size	948	12.216	12.676	2.484	8.234	19.310
Liquidity	948	1.522	2.405	2.767	0.036	33.731
Company growth	948	0.019	0.182	3.096	-0.999	78.333
Asset tangibility	948	0.616	0.626	0.213	0.051	0.997
GDP	948	2.000	1.124	3.885	-10.800	25.200
CPI	948	0.800	0.985	1.926	-2.100	16.300

Source: the authors

The results, summed up in Table 4, highlighted the existence of a significant positive relationship between Tobin Q and financial leverage as the debt-to-equity, ROA, ROE, firm size, liquidity and CPI, while there is a negative and statistically significant relationship between Tobin Q and financial ratio as the debt-to-assets, as well as tangibility of assets. There is no significant relationship between Tobin Q, sales growth, and GDP. The most significant correlation is between Tobin Q and ROA (0.522), followed by the correlation between Tobin Q and ROE (0.335). Since there are no strong correlation coefficients between independent variables (above 0.80), the absence of multicollinearity could be assumed.

Table 4 Correlation matrix

	Tobin Q	Financial leverage (Debt/ Equity)	Financial leverage (Debt/ Assets)	Profitability (ROA)	Profitability (ROE)	Company size	Liquidity	Company growth	Asset tangibility	GDP	CPI
Tobin Q	1										
Financial leverage (Debt/ Equity)	0.216**	1									
Financial leverage (Debt/ Assets)	-0.290**	0.668**	1								
Profitability (ROA)	0.522**	-0.299**	-0.310**	1							
Profitability (ROE)	0.335**	-0.522**	-0.212**	0.713**	1						
Company size	0.106**	0.108**	0.399**	0.100**	0.178**	1					
Liquidity	0.194**	-0.262**	-0.560**	0.109**	0.048	-0.299**	1				
Company growth	-0.019	-0.017	-0.005	-0.014	0.005	-0.075*	-0.021	1			
Asset tangibility	-0.089**	-0.027	-0.004	-0.132**	-0.054	0.301**	-0.286**	0.030	1		
GDP	0.039	-0.142**	-0.151**	0.152**	0.153**	-0.054	0.029	0.047	0.028	1	
CPI	0.104**	-0.048	0.006	0.183**	0.207**	0.122**	-0.048	0.007	-0.054	0.167**	1

significance levels: ** $p < 0.01$; * $p < 0.05$

Source: the authors

Since the analysis data involves time dimensions in form of a six-years period from 2015 to 2020 and spatial dimensions including 948 companies from the sample, it proves necessary to apply panel data analysis. The presented results in Table 5 show an estimation of fixed-effect and random-effects panel regression analysis. The Hausman test is used to indicate the suitable category of regression model for further analysis. The Hausman test results have been revealed to be significant ($p < 0.001$), so we rejected the null hypothesis that assumes using the random-effects model. Accordingly, a model with a fixed specification would be applied to assess the significance and strength of financial factors on company value.

Table 5 Fixed-effects and Random-effects panel regression analysis results

Variable	Fixed-effects model	Random-effects model
Financial leverage (Debt/Equity)	-0.008 (0.008)	-0.004 (0.008)
Financial leverage (Debt/Assets)	-0.629*** (0.147)	-0.842*** (0.131)
Profitability (ROA)	1.003*** (0.226)	1.204*** (0.231)
Profitability (ROE)	-0.062 (0.064)	-0.107 (0.065)
Company size	-0.132*** (0.040)	-0.034** (0.016)
Liquidity	-0.008 (0.002)	-0.008 (0.005)
Company growth	-0.001 (0.002)	0.001 (0.002)
Asset tangibility	-0.068 (0.129)	-0.156 (0.113)
GDP	-0.003 (0.002)	-0.002 (0.002)
CPI	-0.002 (0.005)	-0.003 (0.005)
C	2.711*** (0.495)	0.742*** (0.196)
R^2 within between overall	 0.1206 0.0052 0.0071	 0.1007 0.2598 0.2377
F/Wald $\chi 2$	10.70***	134.16***

Dependent variable: Tobin Q **Source:** the authors
*** p < 0.01; ** p < 0.05; * p < 0.10
Note. Standard errors in parenthesis

Further, the p value results ($p < 0.001$) presented in Table 6 show that it proves necessary to evaluate the model with fixed effects, including time and individual effects.

Table 7 Time and individual fixed-effects test results

Test	Test statistics value	p
Wooldridge test	5.156	0.025
Modified Wald test for groupwise heteroskedasticity	79930.30	< 0.001
Pesaran cross-section independence test	18.379	< 0.001

Source: the authors

To overcome the assumption violation for applying panel regression analysis, an alternative model specification with panel-corrected standard errors is used in further analysis (Table 8).

Table 8 A regression model with panel-corrected standard errors results

Variable	PCSE model
Financial leverage (Debt/Equity)	-0.005 (0.007)
Financial leverage (Debt/Assets)	-0.818*** (0.095)
Profitability (ROA)	2.169*** (0.307)
Profitability (ROE)	-0.208*** (0.057)

Company size	0.083*** (0.008)
Liquidity	-0.005 (0.007)
Company growth	0.002 (0.003)
Asset tangibility	-0.424*** (0.092)
GDP	-0.002 (0.002)
CPI	0.009 (0.008)
C	0.209 (0.099)
R^2	0.4903
Wald χ^2	462.57***

Dependent variable: Tobin Q **Source:** the authors
*** p < 0.01; ** p < 0.05; * p < 0.10
Note. Standard errors in parenthesis

The presented results in Table 8 showed that financial leverage as the debt-to-equity ratio (-0.005) has a negative, but statistically insignificant effect on European listed firm value, which rejects Hypothesis 1. However, leverage as the debt-to-assets ratio (-0.818) has a negative impact on company value, whereby this effect is considered statistically significant, which means that Hypothesis 2 is confirmed. Every variation in the capital structure, involving an increase in the share of debts in the entire sources of financing, would surely attract the attention of stakeholders. Oh et al., (2020) state that capital cost reduction leads to an increase in the company value. The model estimation results in this paper show that any increase in external debt reduces the firm value. Since the capital structure of the European listed companies in the sample is generally oriented towards their sources (as presented in Table 3), it could be confirmed that, on average, the companies are not over-indebted. Good value of financial leverage means that the observed European companies do not use a large debt amount in their business, so they can efficiently and effectively use sources of financing which leads to an increase in the company value. The more favorable the leverage ratio, the better European companies' reputation and, corporate credibility, consequently enhancing their market value. Additionally, the observed European companies' orientation towards their financing instills the confidence of investors and shareholders in stable and sustainable business, as well as in the expected dividend, given that the earnings would not be used to settle high financial obligations. Moreover, the equity-oriented capital structures generate further opportunities for European companies to withdraw additional funds if destructive and unstable market positions evolve. The direction of the influence of financial leverage as the debt-to-equity ratio on firm value is consistent with Kodongo et al. (2015), Putri and Rachmawatari (2017), Al-Slehat (2020), Endria and Fathony (2020). Furthermore, Ayuba et al. (2019), and Dang et al. (2019) prove that measuring leverage by debt-to-asset ratio, if indebtedness enhances, will lead to decreased company value, highlighting a negative and statistically significant effect on firm value and confirming Hypothesis 2.

Further results confirm that ROA has a positive and statistically significant (2.169) impact on the firm value, accepting Hypothesis 3. In this direction, Rosikah et al. (2018) indicate that a higher return on engaged assets indicates that the company's performance has increased and that shareholders benefit from dividends that will encourage them to invest in the company and lead to the company's growth. The company's ability to operate profitably is associated with the company's ability to pay dividends, so high amounts of dividends lead to a higher company share price or a higher company value. Profitability and high company value contribute to the long-term competitive advantage of observed European businesses. A higher percentage of profitability determines the potential of European corporations to generate internal resources to facilitate company the further expansion. This impact is also empirically proven by the research conducted by Marsha and Murtaqi (2017), Ayuba et al. (2019), Doorasamy (2021). If we recall the descriptive statistics, the sampled European firms, in general, record a low profitability rate. So, if observed European companies intend to achieve high

company values, it proves necessary to discover a means of increasing the earning capacity and utilization of assets.

Despite the logical assumption that ROE has a positive effect on the company's market value, the results showed the presence of a negative and statistically significant influence, rejecting Hypothesis 4. Investors commonly form those expectations when the capital structure is strictly or slightly oriented towards borrowed sources of financing, as well as when the capital consists of shares or bonds. In all the mentioned instances, the company is obliged to pay dividends and interest from the realized profit, which further reduces the actual rate of return on invested capital. In addition, profitability is not a static category in financial analysis, therefore its values change dynamically from year to year. Ayuba et al. (2019) agreed that higher profitability leads to lower company value.

As far as firm size is concerned, the results verify that there is a positive and statistically significant impact of company size on company value, which requires Hypothesis 5 to be accepted. Higher total company funds provide the possibility of obtaining additional sources of financing which will affect the growth of business expansion or the growth and development of the observed European companies. The size of observed European companies impacts their potential to attain stability, better access to financial markets, and lower transaction expenses compared to small and starting European businesses. Additionally, economies of scale are a major benefit of large European companies, which is subsequently reflected in raised income. Generally, large European companies are significant market actors that have better market knowledge, achieve better conditions with customers and suppliers due to the turnover they perform, hire the best managers, and are able to create more tax savings. Al-Slehat (2020) concluded that large-scale companies affect the growth of investor confidence in the value of the company, indicating a statistically significant positive relationship between the size and the company value. This relationship was confirmed in research conducted by Kristi & Yanto (2020) who claimed that the ability to make a profit in large companies is higher as the volume of funds is higher, which is a positive market signal. The fact that firm size and firm value are directly related could also be found in research performed by Mule et al. (2015) and Anton (2016).

Considering liquidity displayed results envisage the existence of a positive, but statistically insignificant effect on firm value. A high current liquidity ratio can affect the growth of investors' desire to invest in observed European companies by buying company shares which will cause the rise of the company's share price in parallel with the company's value. The ideal organization of European companies' operational activities is achieved by the efficient use of current assets, considering that a high level of current assets might signal vast inventories and receivables, which are commonly the consequence of incompetent management. Recalling descriptive statistics results (Table 3), the majority of firms from the sample do not fulfill their short-term obligations with available current assets. Moreover, the results of the regression panel analysis showed that the influence of liquidity is not of crucial importance for the assessment of the market value by investors; however, it is viewed as a current category, prone to changes. Pointing out that the company does not consider liquidity when assessing value, Rachmi and Heykal (2020) concludes that liquidity does not have a statistically significant impact on the company value, as well as research conducted by Anton (2016).

Further, the results indicate that growth measured by variations in sales in the current year compared to the previous year (0.002) is a positive and statistically insignificant predictor of firm value, rejecting Hypothesis 7. The capacity of management to capitalize on possibilities to grow the companies' assets and enhance their profitability, as well as the ability of the companies to achieve sustainable sales growth, are two metrics that may be used to evaluate the corporate growth of European companies. The level at which observed European corporations can acquire new customers and expand existing operations is represented by the company's growth. Increases in business profitability are probable to occur from management that is capable of obtaining the most effective use of the assets that the company has available transformed into sales revenue. Great opportunities for a company's growth imply the use of shares to finance the operations, which leads to a high price of the company's shares that can affect the company's value growth. Such direction is present in the case of sampled companies, however, the results showed that the growth of revenues from sales is not crucial for stakeholders in the case of European listed companies in terms of determining the value of the company. Similar conducted research by Salim and Yadav (2012), Ali et al. (2015), Dang et al. (2019), Endria &

Fathony (2020) confirmed a statistically insignificant relationship between company growth and company value.

Considering the tangibility of assets, results show the existence of a negative (-0.424) and statistically significant effect on observed company value. This means that Hypothesis 8 is rejected. Although fixed assets increase the value of European companies because of their high values as well as the ability to represent collateral in debt-creditor relationships with financial institutions or with customers and suppliers, fixed assets due to their long-term characteristics make it challenging for the companies to be flexible for business transformations accompanied by rapid market changes. The higher value of this indicator in observed European companies leads to inefficient working capital usage, low management efficiency level, or a low level of cash reserves. Sampled European companies probably borrow at a relatively higher interest rate, providing a low degree of security to creditors. Stating that the nature of the relationship is conditioned by the usage of tangible assets efficiency, Manawaduge et al. (2011) also proved a significant negative impact of asset tangibility on the company value of Sri Lankan-listed firms showing that there is an inefficient non-current assets utilization. Researching a similar topic, Farooq and Masood (2016) obtained the same results.

Conclusion

A company's purpose is to engage all stakeholders in shared and sustained creation of value (Bose et al., 2021). Once a firm's value is high, investors are more inclined to invest in that company. Investors perform further investigation by a deeper financial analysis of various indicators that affect the company value. In that manner, examining trends in previous years, investors and other stakeholders could project the trends of stock prices, returns, and investment viability. Hence, the purpose of this research is to identify the firm value predictors. Applying panel regression analysis, the variables of firm value, including financial leverage, profitability, size, liquidity, growth, and tangibility of assets, were examined on the observations of a sample of 948 European companies.

The findings suggested that financial leverage has a negative effect on firm value. When leverage is observed as a debt-to-equity ratio, the impact is statistically insignificant. On the other hand, in the case of observing using a debt-to-asset ratio, the effect is judged as a statistically significant predictor of firm value as was in previous research conducted by Setiawanta et al. (2020), Oh et al. (2020) and Diantimala et al. (2021). A direct result of financial leverage oriented towards own financial funds is an enhancement in the European companies' image and corporate financial reliability. Consequently, the market value of the observed European companies would rise. In addition, the European companies rely on their financing to generate trust among shareholders and creditors in the companies' effort to maintain a sustained and profitable operation, followed by the distributed dividend. Considering the importance of profitability variables in financial planning, empirical analysis envisages that ROA is a positive and statistically significant factor of firm value which is consistent with the research of Oh et al. (2020), Diantimala et al. (2021), Salvi et al. (2021), Sisodia et al. (2021), Seth and Mahenthiran (2022) and Poretti and Heo (2022). However, the evaluation of ROE as a firm value determinant resulted in a statistically insignificant impact. As was to be anticipated, higher profitability establishes the foundation for advancements and tendencies in the observed European companies that are predictable, regulated, and sustainable over the course of several years, which is of crucial importance for investors trading in market investments. Given that the sampled businesses are categorized as a medium, large, and very large, the panel analysis findings indicate that firm size contributes positively and statistically significantly to company value as previously explored by Diantimala et al. (2021) and Salvi et al. (2021). Depending on its size, a company's capacity to achieve economies of scale, favorable negotiate terms, sustainable production, or provision of services due to long-term contracts, greater access to financial institutions, and reduced transaction fees as compared to small and startup companies may vary in favor of large corporations. Exactly such capacities and benefits that observed large European companies generate due to the high values of tangible and intangible assets, enhance the trust of stakeholders in the prospective high value of a company. Additionally, it was further confirmed that liquidity has a statistically significant negative effect on firm value. This outcome is supported by the principle of not permitting an excess of existing cash, which is perceived as a lost chance for investment or the accomplishment of expanded short objectives. Moreover, these results indicate that European enterprises should attempt to convert their short-

term obligations into long-term debts to alleviate the strain imposed by such obligations. Moreover, sales growth has a statistically insignificant positive impact on firm value. These results indicate that a high rate of increased growth might reflect the observed European companies' strong production or progress. Investors recognize a favorable signal from businesses, resulting in increased demand for the European companies' shares and a rise in the worth of the business. Finally, the obtained findings have shown that tangibility is a negative and statistically significant determinant of company value in line with the research of Sisodia et al. (2021). Given their long-term nature, fixed assets pose a challenge for a European corporation to be adaptable to business changes and turbulent market flows and trends.

The study comprises a couple of limitations, which may be seen as a suggestion for more investigation. It proves necessary to highlight that the sample contains enterprises from Western and Eastern Europe. In the future, research should be directed toward the investigation of the factors that determine firm value in individual European economies. Furthermore, a prospective analysis could target a particular sector. Additionally, it could be fundamental to compare company value determinants prior, and following the pandemic, to reveal the consequences of global disturbances. Also, future analysis may be devoted to investigating the impact of internal factors on the value of the company, which could be calculated using another market indicator. Any additional studies on this subject would extend to the primary conclusions of empirical analysis conducted in this paper. Awareness about the direction, strength, and significance of the influence of individual internal variables on the firm value provides a shortcut for the management and other responsible employees to the improvement of the mentioned categories with the aim of market value expansion. Other stakeholders opt to assess the results, since they could contribute to a clearer insight into the aspects to estimate future company value development prospects.

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Author, A. A., Author, B. B., & Author, C. C. (Year). Title of article. *Title of Periodical, volume number* (issue number), pages.

➲ Journal article, one author, paginated by issue

Journals paginated by issue begin with page 1 in every issue, so that the issue number is indicated in parentheses after the
volume. The parentheses and issue numbers are not italicized, e.g.

Seliverstova, Y. (2021). Workforce diversity management: A systematic literature review. *Strategic Management*, *26*(2), 3–11.
https://doi.org/10.5937/StraMan2102003S

➲ Journal article, one author, paginated by volume

Journals paginated by volume begin with page 1 in issue 1, and continue page numbering in issue 2 where issue 1 ended, e.g.

Perić, O. (2006). Bridging the gap: Complex adaptive knowledge management. *Strategic Management, 14*, 654–668.

➲ **Journal article, two authors, paginated by issue**

Dakić, S., & Mijić, K. (2020). Regression analysis of the impact of internal factors on return on assets: A case of meat processing enterprises in Serbia. *Strategic Management*, *25*(1), 29–34. https://doi.org/10.5937/StraMan2001029D

➲ **Journal article, two authors, paginated by volume**

Ljubojević, K., & Dimitrijević, M. (2007). Choosing your CRM strategy. *Strategic Management, 15*, 333-349.

➲ **Journal article, three to six authors, paginated by issue**

Marić, S., Uzelac, O., & Strugar-Jelača, M. (2019). Ownership structure as a measure of corporate performance. *Strategic Management*, *24*(4), 28–37. https://doi.org/10.5937/StraMan1904028M

➲ **Journal article, three to six authors, paginated by volume**

Boškov, T., Ljubojević, K., & Tanasijević, V. (2005). A new approach to CRM. *Strategic Management, 13*, 300-310.

➲ **Journal article, more than six authors, paginated by issue**

Ljubojević, K., Dimitrijević, M., Mirković, D., Tanasijević, V., Perić, O., Jovanov, N., et al. (2005). Putting the user at the center of software testing activity. *Management Information Systems, 3*(1), 99-106.

➲ **Journal article, more than six authors, paginated by volume**

Strakić, F., Mirković, D., Boškov, T., Ljubojević, K., Tanasijević, V., Dimitrijević, M., et al. (2003). Metadata in data
warehouse. *Strategic Management, 11*, 122-132.

➲ **Magazine article**

Strakić, F. (2005, October 15). Remembering users with cookies. *IT Review*, *130*, 20-21.

➲ **Newsletter article with author**

Dimitrijević, M. (2009, September). MySql server, writing library files. *Computing News, 57,* 10-12.

➲ **Newsletter article without author**

VBScript with active server pages. (2009, September). *Computing News,57,* 21-22.

B. BOOKS, BROCHURES, BOOK CHAPTERS, ENCYCLOPEDIA ENTRIES, AND BOOK REVIEWS

Basic format for books

Author, A. A. (Year of publication). *Title of work: Capital letter also for subtitle*. Location: Publisher.

Note: "Location" always refers to the town/city, but you should also include the state/country if the town/city could be mistaken for one in another country.

➲ **Book, one author**

Ljubojević, K. (2005). *Prototyping the interface design*. Subotica: Faculty of Economics in Subotica.

➲ **Book, one author, new edition**

Dimitrijević, M. (2007). *Customer relationship management* (6th ed.). Subotica: Faculty of Economics in Subotica.

➲ **Book, two authors**

Ljubojević, K., Dimitrijević, M. (2007). *The enterprise knowledge portal and its architecture*. Subotica: Faculty of Economics in Subotica.

➲ **Book, three to six authors**

Ljubojević, K., Dimitrijević, M., Mirković, D., Tanasijević, V., & Perić, O. (2006). *Importance of software testing*. Subotica:
Faculty of Economics in Subotica.

➲ **Book, more than six authors**

Mirković, D., Tanasijević, V., Perić, O., Jovanov, N., Boškov, T., Strakić, F., et al. (2007). *Supply chain management*.
Subotica: Faculty of Economics in Subotica.

➲ **Book, no author or editor**

Web user interface (10th ed.). (2003). Subotica: Faculty of Economics.

➲ **Group, corporate, or government author**

Statistical office of the Republic of Serbia. (1978). *Statistical abstract of the Republic of Serbia.*
Belgrade: Ministry of community and social services.

➲ **Edited book**

Dimitrijević, M., & Tanasijević, V. (Eds.). (2004). *Data warehouse architecture*. Subotica: Faculty of Economics.

➲ **Chapter in an edited book**

Boškov, T., & Strakić. F. (2008). Bridging the gap: Complex adaptive knowledge management. In T. Boškov, & V.
Tanasijević (Eds.), *The enterprise knowledge portal and its architecture* (pp. 55-89). Subotica: Faculty of Economics in Subotica.

➲ **Encyclopedia entry**

Mirković, D. (2006). History and the world of mathematicians. In *The new mathematics encyclopedia* (Vol. 56, pp. 23-45).
Subotica: Faculty of Economics.

C. UNPUBLISHED WORKS

➲ **Paper presented at a meeting or a conference**

Ljubojević, K., Tanasijević, V., Dimitrijević, M. (2003). *Designing a web form without tables*. Paper presented at the annual meeting of the Serbian computer alliance, Beograd.

➲ **Paper or manuscript**

Boškov, T., Strakić, F., Ljubojević, K., Dimitrijević, M., & Perić, O. (2007. May). *First steps in visual basic for applications*.
Unpublished paper, Faculty of Economics Subotica, Subotica.

➲ **Doctoral dissertation**

Strakić, F. (2000). *Managing network services: Managing DNS servers*. Unpublished doctoral dissertation, Faculty of
Economics Subotica, Subotica.

➲ **Master's thesis**

Dimitrijević, M. (2003). *Structural modeling: Class and object diagrams*. Unpublished master's thesis, Faculty of Economics
Subotica, Subotica.

D. ELECTRONIC MEDIA

The same guidelines apply for online articles as for printed articles. All the information that the online host makes available must be listed, including an issue number in parentheses:

Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Online Periodical, volume number* (issue number if
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➲ **Article in an internet-only journal**

Tanasijević, V. (2003, March). Putting the user at the center of software testing activity. *Strategic Management*, *8* (4).
Retrieved October 7, 2004, from https://www.ef.uns.ac.rs/sm2024

➲ **Document from an organization**

Faculty of Economics. (2008, March 5). *A new approach to CRM*. Retrieved July 25, 2008, from https://www.ef.uns.ac.rs/papers/acrm.html

➲ Article from an online periodical with DOI assigned

Jovanov, N., & Boškov, T. A PHP project test-driven end to end. *Management Information Systems*, 2 (2), 45-54.
https://doi.org/10.5937/StraMan213302003S

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Author, A. A., & Author, B. B. (Publication date). Title of article. *Title of Journal, volume number*. Retrieved from https://www.anyaddress.com/full/url/

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If a work is directly quoted from, then the author, year of publication and the page reference (preceded by "p.") must be included. The quotation is introduced with an introductory phrase including the author's last name followed by publication date in parentheses.

According to Mirković (2001, p. 201), "The use of data warehouses may be limited, especially if they contain confidential data".

Mirković (2001, p. 201), found that "the use of data warehouses may be limited". What unexpected impact does this have on the range of availability?

If the author is not named in the introductory phrase, the author's last name, publication year, and the page number in
parentheses must be placed at the end of the quotation, e.g.

He stated, "The use of data warehouses may be limited," but he did not fully explain the possible impact (Mirković, 2001, p. 201).

➲ Summary or paraphrase

According to Mirković (1991, p. 201), limitations on the use of databases can be external and software-based, or temporary and even discretion-based.

Limitations on the use of databases can be external and software-based, or temporary and even discretion-based
(Mirković, 1991, p. 201).

➲ **One author**

Boškov (2005) compared the access range…

In an early study of access range (Boškov, 2005), it was found...

➲ When there are **two authors**, both names are always cited:

Another study (Mirković & Boškov, 2006) concluded that…

➲ If there are **three to five authors**, all authors must be cited the first time. For subsequent references, the first author's
name will be cited, followed by "et al.".

(Jovanov, Boškov, Perić, Boškov, & Strakić, 2004).

In subsequent citations, only the first author's name is used, followed by "et al." in the introductory phrase or in parentheses: According to Jovanov et al. (2004), further occurences of the phenomenon tend to receive a much wider media coverage.

Further occurences of the phenomenon tend to receive a much wider media coverage (Jovanov et al., 2004). In "et al.", "et" is not followed by a full stop.

➲ **Six or more authors**

The first author's last name followed by "et al." is used in the introductory phrase or in parentheses:

Yossarian et al. (2004) argued that…

… not relevant (Yossarian et al., 2001).

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If the work does not have an author, the source is cited by its title in the introductory phrase, or the first 1-2 words are placed in the parentheses. Book and report titles must be italicized or underlined, while titles of articles and chapters are placed in quotation marks:

A similar survey was conducted on a number of organizations employing database managers (Limiting database access, 2005).

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> The overview is limited to towns with 10,000 inhabitants and up (Statistical Office of the Republic of Serbia [SORS], 1978).
>
> The list does not include schools that were listed as closed down in the previous statistical overview (SORS, 1978).

➲ When citing **more than one reference from the same author**: (Bezjak, 1999, 2002)
➲ When several **used works by the same author were published in the same year**, they must be cited adding a, b, c, and so on, to the publication date:

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When two or more works are cited parenthetically, they must be cited in the same order as they appear in the reference list, separated by a semicolon.

> (Bezjak, 1999; Griffith, 2004)

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If two or more sources used in the submission were published by the same author in the same year, the entries in the reference list must be ordered using lower-case letters (a, b, c…) with the year. Lower-case letters will also be used with the year in the in-text citation as well:

> Survey results published in Theissen (2004a) show that…

➲ To **credit an author for discovering a work**, when you have not read the original:

> Bergson's research (as cited in Mirković & Boškov, 2006)…

Here, Mirković & Boškov (2006) will appear in the reference list, while Bergson will not.

➲ When **citing more than one author**, the authors must be listed alphabetically:

> (Britten, 2001; Sturlasson, 2002; Wasserwandt, 1997)

➲ When there is **no publication date**: (Hessenberg, n.d.)

➲ **Page numbers must always be given for quotations**:

(Mirković & Boškov, 2006, p.12)

Mirković & Boškov (2006, p. 12) propose the approach by which "the initial viewpoint…

➲ **Referring to a specific part of a work**:

(Theissen, 2004a, chap. 3) (Keaton, 1997, pp. 85-94)

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(K. Ljubojević, personal communication, May 5, 2008).

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