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ASSESSING THE RESILIENCE OF TRANSPORT INDUSTRY FIRMS IN TIMES OF CRISIS

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Abstract
The recent overlapping crises have had a significant impact on the global economy, causing major changes within many industries, reconfiguring virtually entire businesses. In this context, resilience has become a crucial concept for most companies, representing an indicator that assesses their ability to face the challenges of crises and recover. The aim of the research is to assess the resilience and strategies adopted by companies in the European transport industry to maintain their long-term sustainability. The research focuses on the analysis of performance indicators of 566 companies in the European transport industry for the period of 2014-2022. The research results highlight the challenges faced by the sample in the context of overlapping crises, highlighting the need to implement robust strategies to ensure sustainable growth and long-term success in a volatile and unpredictable economic environment.

Keywords: *resilience; overlapping crises; sustainability; logistics; transport.*

JEL Classification: G32; L91; R41.

I. INTRODUCTION

In an unstable economic environment, resilience is a vital characteristic for companies and investors as it highlights the ability to adapt to and recover from crises, thus ensuring long-term sustainability. Recently, the business environment has been severely affected by various crises, including the COVID-19 pandemic, the energy crisis and the military crisis generated by the conflict in Ukraine (started on February 2021). The COVID-19 pandemic has caused significant disruptions in supply chains, leading to production declines and affecting international trade, and the energy crisis has highlighted the dependence of many countries on Russian energy resources, revealing their vulnerabilities in this area.

Investors and international companies have had to reassess their risks and adjust their business strategies to meet new challenges and strengthen their resilience. In this context, the research aims to assess the resilience and strategies adopted by companies in the European transport industry to strengthen their ability to cope with the changes brought about by the health, energy, economic and military crises. The study therefore underlines the importance of effective resource management to strengthen resilience and promote sustainable development.

II. LITERATURE REVIEW

Lately, the concept of resilience has started to be widely used by economists as they try to find answers and solutions to how business, society and national economies manage to overcome periods of crisis and recover. However, according to Windle (1999) the resilience literature provides "no organizational framework for integrating studies, for assessing common and unique findings across different subject populations, variable domains, or spacing intervals, or for studying the impact of alternative operational definitions and classification procedures on the identification of resilient individuals." At the same time, Kaplan (1999) argued that resilience is "a concept whose time has come and gone", which is not true, as the overlapping crises manifested from 2020 to the present have underscored the importance of this concept, demonstrated by the record of an explosion of empirical research (see Figure 1) that examines and assesses the resilience of the business environment, national

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and international economies, as well as society in general. Barasa et. al. (2018) emphasize that organizational resilience refers to "maintaining a positive adaptation under difficult conditions so that the organization emerges from these conditions strengthened and more resourceful", more specifically the ability of an organization to recover from a given significant disruption, regardless of the internal or external nature of the impact factors that generated this disruption.

This concept of organisational resilience is one of the most commonly used buzzwords by researchers in the context of resilience, reflecting the growing interest in how organisations can develop and maintain their ability to survive and thrive during and after shocks. Another key word that is highlighted in scientific research is community resilience which emphasises the importance of building resilience at the community level as well, highlighting the importance of collaboration and solidarity in the face of various threats by using available resources to "prepare for, respond to, withstand and recover from extreme events such as natural disasters, economic shocks and disease outbreaks" (Robertson, et. al., 2021). At the same time, researchers have recognized the need to develop tools and methodologies to assess and quantify resilience levels in various contexts, indicating a more systematic approach in research that focuses on developing the applicability of the concept of resilience, with specific concerns for different levels and domains, from organizations and cities to individuals and communities (see Figure 1(b)).

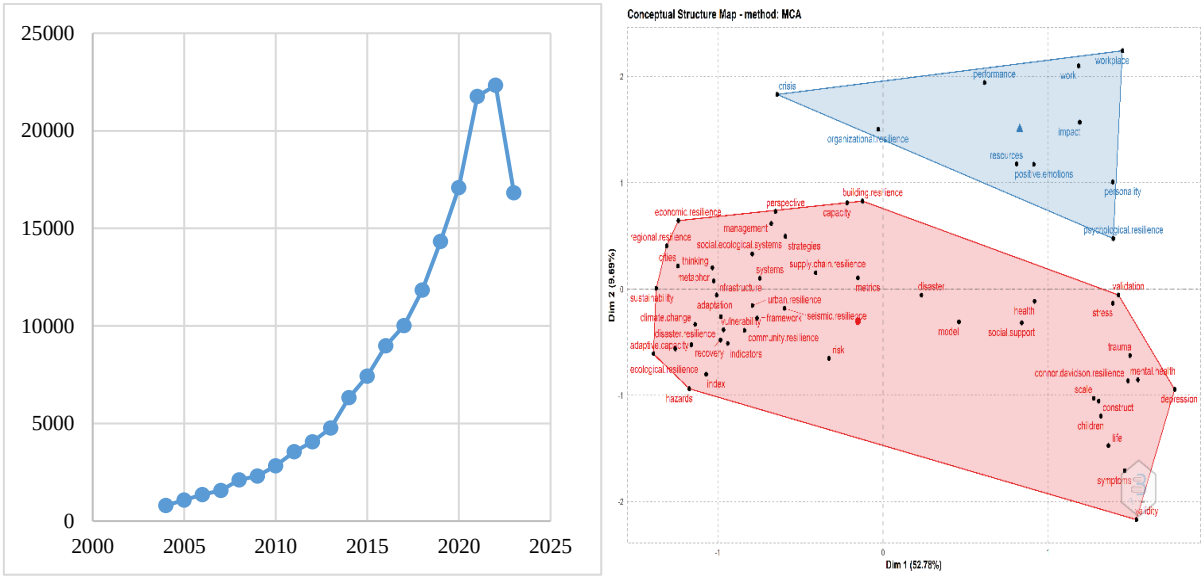

Figure 1. Evolution of the scientific production with the topic "resilience" and the highlighting of the concept map

Source: developed by the authors based on data from Web of Science

The development of transport and logistics infrastructure is a fundamental element for the progress and sustainability of economies at both national and international level. This importance has become particularly evident in recent times, marked by the health crisis and the war in Ukraine which have had a significant negative impact on supply chains and passenger transport. This has highlighted the need for a flexible and resilient transport infrastructure capable of managing exceptional situations and ensuring the continuation of trade flows despite difficult circumstances and crisis contexts. Against this background, the European Commission (2022) has adopted a contingency plan for the logistics system which stresses the importance of ensuring minimum connectivity and passenger protection, establishing resilience against cyber attacks and conducting resilience tests. In addition, the plan underlines the importance of 'green lanes' principles, designed to facilitate the rapid cross-border movement of land freight. It also reinforces the key role of the network of contact points within national transport authorities, which proved essential not only during the COVID-19 pandemic, but also in the current crisis generated by Russian aggression against Ukraine. In this context, the importance of the internal resilience of a supply chain should not be downplayed either, which according to Hosseini et al. (2019) is underpinned by two main quantitative factors and namely its absorptive and adaptive capacity, with the restorative capacity given by context-specific exogenous capacity.

Recently, a significant increase in the number of publications analysing and assessing the resilience of transmission networks and companies operating in this field can be identified. For example, Zhang et al. (2023) analysed the resilience of China's road transport system during the COVID-19 pandemic, highlighting the importance of absorptive, adaptive and recovery capacities for the sustainable development of road transport, with the authors observing differences in the resilience of road passenger and freight transport, with the latter

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demonstrating a higher level of resilience. The results of the study also showed that the speed of impact of disruptions on freight transport was lower and the period of disruption was shorter compared to passenger transport. On the other hand, Beer et al. (2023) analysed the reactions of different types of transport such as maritime, air, rail and road transport, as well as the infrastructure used in managing the health crisis, while also highlighting the resilience strategies of companies operating in this sector in response to the COVID-19 pandemic. According to the authors, the implementation of digital solutions and advanced technologies are the most important resilience-building strategy, as they enable a more efficient response to rapid market changes and flexible management of operations, including through automation and real-time monitoring. Wang et al. (2020) focused on identifying methods to measure the resilience of transprort infrastructure based on network diversity characteristics to quantitatively measure the system and node resilience of transmission infrastructure networks, as did Shofiq and Kakan (2020) who identified resilience metrics that can be used to formulate strategies to quantify and improve the resilience of a transmission system. Meanwhile, Liu et al. (2021) conducted a detailed analysis and identified the critical factors for ensuring the resilience of the transportation business, highlighting the crucial role of strong leadership in managing and promoting resilience, especially by providing consistent management support for resilience. Similarly, reflective and continuous learning at the organisational level was identified as another key component, alongside an organisational culture that encourages and supports continuous improvement in resilience processes and practices. These findings are also supported by research conducted by Akpinar and Özer-Çaylan (2022) who point out that the adoption of a complex adaptive system by an organisation enables learning and adaptation of the concept of organisational resilience by designing, understanding and preparing for new trends, these contribute to the development of dynamic capacity to withstand turbulent change and achieve sustainable competitiveness in the market.

III. RESEARCH METHODOLOGY

In order to assess the resilience of companies in the transport and logistics industry, a statistical analysis was carried out based on which a multiple linear regression was developed in order to understand and quantify the influence of different factors on the ability of firms to resist and adapt in a difficult economic environment. To this end, data were collected from financial reports on key performance indicators of 566 firms in the European transport and logistics industry for the period 2014-2022 (see Table 1).

Table 1. Description and definition of research variables

Variable name	Explanation	Variable type
RI	Resilience index	dependent
Net income	Aggregated value of net income across all companies in the group.	independent
EV/EBIT	Aggregate enterprise value divided by aggregate earnings before interest and taxes, across all firms in group.	independent
PBV	Aggregated market capitalization divided by aggregated book value of equity, across all firms in the group.	independent
Net Margin	Aggregated net profits as a percent of aggregated revenues, across companies in the group.	independent
Equity EVA	Excess dollar returns earned by equity investors	independent
EVA	Excess dollar returns earned by all investors	independent
EV/EBITDA	Aggregate enterprise value divided by aggregate earnings before interest, taxes and depreciation, across all firms in group.	independent
ROE-COE	Excess percentage returns earned by equity investors	independent
EV/Invested Capital	Aggregated enterprise value divided by aggregated invested capital, across all firms in the group.	independent
BV of Capital	Measure of capital invested in existing assets	independent
BV of Equity	Aggregated Book Value of Equity, in most recent balance sheet, across all firms in the group. Measure of equity invested in existing assets.	independent
ROIC	Aggregate after-tax operating income divided by aggregated invested capital, across companies in group.	independent
EV/EBIT(1-t)	Aggregate enterprise value divided by aggregate earnings before interest, but after taxes, across all firms in group.	independent

Source: developed by the authors

The regression equation for assessing the resilience of companies in the transport and logistics industry is designed as follows:

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$$RI = \beta_0 + \beta_1 * NetIncome + \beta_2 * \frac{EV}{EBIT} + \beta_3 * PBV * + \beta_4 * NetMargin + \beta_5 * EquityEVA + \beta_6 * EVA + \beta_7 * \frac{EV}{EBITDA} + \beta_8 * (ROE - COE) * \beta_9 * \frac{EV}{InvestedCapital} + \beta_{10} * BVofCapital + \beta_{11} * BVofEquity + \beta_{12} * ROIC + \beta_{13} * \frac{EV}{EBIT(1-t)} + £ \quad (1)$$

Where:
RI- independent variable
$\beta_0, \beta_{1,\ldots\ldots}\beta_{13}$ – coeficienții regresiei
£ – eroarea standard.

Multiple linear regression was used to assess resilience because this statistical method provides a more accurate control on the potential effect of the independent variables on the dependent variable. This is useful to avoid misinterpretation and to gain a better understanding of the relationship between variables. At the same time, multiple linear regression allows the modelling of more complex relationships, such as interactions between variables or non-linear relationships.

IV. RESULTS AND DISCUSSIONS

Measuring a company's resilience is a complex and controversial topic in the literature, with some research using self-reported performance indicators as a means of assessing company resilience (Melega et al., 2023, Johnson, Gheorghe, 2013; Ruiz-Martin, Lopez-Paredes, Wainer, 2018). This approach is based on the idea that a resilient company will be able to maintain or improve its performance despite external shocks or disruptions. However, according to researchers Ruiz-Martin et al. (2018) the method of measuring resilience based on performance indicators lacks evaluation and empirical evidence and there are some challenges and criticisms related to this method. One of the main arguments is that the indicators reported by companies can be influenced by various communication or management strategies so as to give a more favourable picture of their situation than it is in reality. Moreover, there are aspects of a company's resilience that may be difficult to quantify or express in simple terms of financial performance, such as its capacity to innovate, the flexibility of its organisational culture or its ability to regain customer trust after a negative incident.

In our view, however, business performance and business resilience are two interlinked attributes. An underperforming firm will struggle to cope with the challenges and shocks caused by crisis situations, while at the same time there is the possibility that they may go bankrupt. Of course, resilience is an attribute that is influenced by a number of factors such as the company's financial situation, the development strategies adopted or even the organisational culture. In this respect, to design the econometric model to assess the resilience of companies in the European transport and logistics industry, the financial performance indicators reported by them were used.

Table 2. Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.998[a]	.996	.990	.005986378094842
a. Predictors: (Constant), Net Income , EV/EBIT, PBV, Net Margin, Equity EVA, EVA, EV/EBITDA, (ROE - COE), EV/ Invested Capital, BV of Capital, BV of Equity, ROIC, EV/EBIT (1-t)				

Source: developed by the authors with SPSS

According to the data in Table 2 it can be seen that the coefficient of determination (R Square) is around 0.996, which means that about 99.6% of the variation in the resilience index (RI) is explained by the variation in the independent variables included in the model (Net Income, EV/EBIT, PBV, Net Margin, Equity EVA, EVA, EV/EBITDA, (ROE - COE), EV/ Invested Capital, BV of Capital, BV of Equity, ROIC, EV/EBIT (1-t)). At the same time the adjusted R Square is around 0.990, indicating a good robustness of the model, and the standard error is around 0.005986, suggesting a high accuracy of the model in estimating the resilience index. Thus, we can state that the financial indicators analyzed in the model are key factors influencing the resilience of companies in the transport and logistics industry to economic changes or other shocks.

Table 3. ANOVA

Model		Sum of Squares	df	Mean Square	F	Mr
1	Regression	.080	15	.005	148.298	.000[b]
	Residual	.000	8	.000		
	Total	.080	23			
a. Dependent Variable: IR						

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b. Predictors: (Constant), Net Income , EV/EBIT, PBV, Net Margin, Equity EVA, EVA, EV/EBITDA, (ROE - COE), EV/ Invested Capital, BV of Capital, BV of Equity, ROIC, EV/EBIT (1-t)

Source: developed by the authors with SPSS

The results of the ANOVA test (see Table 3) suggest that the multiple linear regression model for assessing the resilience of companies in the transport and logistics industry is significant, as the Sig value does not exceed the significance threshold of 0.05 points. Basically, the model can explain a significant part of the variation in the resilience indicator, having a significant statistical significance (F=148.298).

Table 4. Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Mr
		B	Std. Error	Beta		
1	(Constant)	.062	.027		2.271	.053
	(ROE - COE)	1.083	.125	1.040	8.661	.000
	BV of Equity	-1.585E-6	.000	-.680	-2.499	.037
	Equity EVA	-1.545E-5	.000	-.414	-2.510	.036
	BV of Capital	4.600E-7	.000	.315	1.649	.138
	EVA	2.196E-6	.000	.108	1.076	.313
	PBV	-9.004E-5	.015	-.001	-.006	.995
	EV/ Invested Capital	-.016	.025	-.087	-.655	.531
	ROIC	.883	.399	.682	2.213	.058
	EV/EBITDA	-.002	.003	-.108	-.604	.563
	EV/EBIT (1-t)	.000	.003	-.076	-.171	.869
	Net Margin	-.141	.259	-.044	-.547	.599
	Net Income	1.144E-5	.000	.648	1.950	.087
a. Dependent Variable: RI						

Source: developed by the authors with SPSS

According to the data in Table 4, the regression equation on the resilience assessment of companies in the transport and logistics industry is projected as follows:

$$IR = 0.062 + 1.083 * (ROE - COE) - 1.585 * 10^{-6} * BVof\ Equity - 1.545 * 10^{-5} * EquityEVA + 4.600 * 10^{-7} * BVof\ Capital + 2.196 * 10^{-6} * EVA - 9.004 * 10^{-5} * PBV - 0.016 * \frac{EV}{InvestedCapital} + 0.883 * ROIC - 0.002 * \frac{EV}{EBITDA} + 0.000 * \frac{EV}{EBIT(1-t)} - 0.141 * NetMargin + 1.144 * 10^{-5} * NetIncome \quad (2)$$

Thus, according to the data in Table 4, some significant aspects of the resilience of European transport and logistics companies in times of economic instability can be highlighted. The difference between Return on Equity and Cost of Equity (ROE - COE) is a particularly influential factor in the resilience of these companies. It can be seen that an increase in this gap is associated with increased resilience of these companies. Essentially, this spread indicates the ability of companies to generate returns above the cost of capital, thereby strengthening their ability to cope with economic crises and uncertainties. Basically, companies with a greater ability to generate returns above the cost of capital were more likely to be able to withstand and adapt to sudden changes in demand and supply chain disruptions caused by the overlapping crises of 2020-present.

On the other hand, BV of Equity and Equity EVA have a negative influence on the resilience of companies. A lower equity valuation or lower profitability seems to affect the ability of these companies to remain resilient in the face of challenges, as companies with lower equity values or lower expected profitability may have felt the impact of price fluctuations and supply disruptions caused by the health, energy and military crises more strongly.

At the same time, according to our model results, BV of Capital and EVA, although having positive coefficients, do not have a significant or stable influence on the resilience of companies in the European transport and logistics industry. The other variables, such as PBV, EV/ Invested Capital, ROIC, EV/EBITDA, EV/EBIT (1-t), Net Margin and Net Income, seem to have a less significant or insignificant influence on company resilience in this analysis. Thus, in the context of multiple crises, performance and ability to cope with change seem to be more closely related to the variables that define the difference between generated return and cost of capital, equity valuation and excess return on equity.

The research results highlight the fundamental importance of financial performance and an effective approach to managing capital resources in an unstable and volatile environment characterised by a multitude of crises. In essence, we can conclude that adaptability and the ability to generate returns above the cost of capital

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have played a key role in maintaining the resilience of companies in the transport and logistics industry in the face of multiple challenges generated by overlapping crises.

V. CONCLUSION

The detailed analysis of the results highlights important issues regarding the resilience of companies in the European transport and logistics industry in times of crisis. The difference between Return on Equity and Cost of Equity (ROE - COE) was found to be a crucial factor in determining the resilience of these companies. An increase in this spread indicated increased resilience, suggesting that the ability to achieve returns above the cost of equity was critical in adapting to the complex and uncertain economic challenges caused by the overlapping crises of the recent period. Thus, it can be noted that adaptability and the ability to achieve returns above the cost of capital are key elements in ensuring that these companies remain successful and competitive in the face of the multiple challenges of the last period.

In conclusion, these results provide an important insight into the drivers that can contribute to the resilience of European transport and logistics companies in times of economic instability. The research provides valuable information for future development strategies and resilience building in the transport and logistics industry.

The limitations of research into measuring the resilience of companies in the transport and logistics industry lie in the predominant use of financial indicators, which can provide limited insight into a company's ability to cope with challenges and disruptions caused by crisis situations. This exclusively financially focused approach may underestimate or ignore other key aspects of organisational resilience. In future research we therefore aim to include a more diverse range of indicators, including non-financial ones. The combination of financial and non-financial indicators can provide a much broader and more complete picture of how a company manages crises and adapts to change.

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