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ASSESSMENT OF THE IMPACT OF MACROECONOMIC CRISES AND WAR ON THE ACTIVITIES OF JSC "UKRZALIZNYTSIA"

ABSTRACT

Despite the substantial threat that macroeconomic crisis and war pose to the economic activity of organizations, little attention is paid in the existing literature to the rigorous identification and quantification of such effects. Given this fact, the purpose of the study is to rigorously estimate and quantify the effects of military aggression on the economic activity of organizations in the context of macroeconomic crises. The research methodology includes empirical and quantitative analysis. The empirical analysis was conducted on the basis of official statistical data of JSC "Ukrzaliznytsia" and the Ministry of Finance of Ukraine. Quantitative analysis is based on Event Study and Difference-in-Difference methods to quantify the impact of macroeconomic crises and the war on the organization. Quantitative estimates of the negative impacts of two macroeconomic crises (2009 and 2014–2015) and military action (which began in 2014, but does not take into account its new stage – war from 2022) in Ukraine on the freight traffic of JSC "Ukrzaliznytsia" were obtained. The application of the proposed approach to assessing the effect of war due to its universality is possible for the needs and goals not only of transport companies but also of other organizations. The novelty – among the available developments on this issue, a formal assessment of the effect of military aggression which began in 2014 in the macroeconomic crises' context was conducted for the first time using the existing methods, which allows obtaining parameter estimates resistant to individual-specific and time-specific heterogeneity.

Keywords: macroeconomic crisis, war, organization, event study method, difference-in-difference method

JEL Classification: C51, D74, G01

INTRODUCTION

In modern conditions, characterized by a high level of dynamism in economic situations, the successful operation of organizations largely depends on their ability to respond to changes in the external and internal environment. Such changes, on one hand, are manifested in the fact that technological know-how, new products, and services, hyperdynamic consumer behaviour from new markets, and new areas of competition, stimulate "traditional" industries, creating a new situation for society (Prokopenko et al., 2020; Shpak et al., 2019; Vytvytska et al., 2020). On the other hand, modern economic conditions are characterized by a high level of uncertainty and turbulence. Turbulence in business is defined as unpredictable and rapid changes in the internal and external environment of the organization that affect its activities. Since today governments, companies, and individuals are interconnected to some degree, others feel the impact of turbulence on one of them in some way in a globally connected environment (Kotler, 2009).

Despite the high level of development, modern society cannot always effectively resist the negative effects of exogenous factors (Prokopenko et al., 2020). This is evidenced by the looming shortage of all resources, economic crises, global migration, demographic threats, the Covid-19 pandemic, and ongoing armed conflicts in different parts of the world (Top 10-armed conflicts in 2020, 2020) and in particular, the Russia's war in Ukraine, which began in 2014 in its two eastern regions and became full-scale on February 24, 2022. One should underline that exogenous factors are often interrelated.

In particular, during the war, there is a double negative impact on organizations, i.e. the war has a negative impact on the country's economy and organizations in general, and a weak economy and war negatively affect the performance of organizations. This requires further research to study the negative effects of macroeconomic crises and military conflict on organizations.

Our study focuses on the activities of an organization in Ukraine from 2002 to 2020. The peculiarity of the Ukrainian situation is that after the global financial and economic crisis of 2008–2009, its economy was in a long-term recession. There was some economic growth during 2010–2011, while during 2012–2013 the economic growth rate was virtually zero. In 2014, Ukraine simultaneously faced the largest challenges in the XXI century that significantly affected the trajectory of its economic development: the economic crisis, the annexation of Crimea by Russia, and the military aggression in the Luhansk and Donetsk regions. Russian aggression in eastern Ukraine (before the full-scale war) has caused significant direct and indirect losses to both Ukraine's economy as a whole and to businesses operating in the occupied territories. GDP in 2014 decreased by 28.10% and in 2015 – by 31.3%. The main losses caused by the hostilities in the Luhansk and Donetsk regions were, among others, connected to the destruction of transport infrastructure (roads, railways, airports, and power lines). This, in turn, led to a decline in freight traffic by various modes of transport and disruption of global supply chains.

Given that the share of rail transport in the total freight turnover of all modes of transport in Ukraine is the largest (State Statistics Service of Ukraine, 2021), the activity of JSC "Ukrzaliznytsia" is analyzed in the study. In 2014, the operational freight turnover of this company decreased by 10.5%; in particular, a significant decrease was observed in its two regional branches: in the Donetsk railway – by 38.36%; in the Prydniprovsk – by 26.29%. The dynamics of GDP and operational freight turnover of the Donetsk and Prydniprovsk branches of JSC "Ukrzaliznytsia" in 2014 were approximately the same. Thereby, Russia's armed aggression, which began in 2014, has significantly deepened the crisis at the macroeconomic level and has had a direct negative impact on organizations, especially those located in the conflict zone.

In order to assess the impact of military aggression on organizations, it is necessary to take into account the effect of macroeconomic crises. In connection with this, the following research questions were formulated:

- What were the negative effects caused by the macroeconomic crises of 2009 and 2014–2015 on Ukrzaliznytsia JSC?
- What was the negative effect of Russia's military aggression in Ukraine, which began in 2014 (before the full-scale war in 2022), on JSC "Ukrzaliznytsia" and its branches?

The current study proposes a framework for assessing the impact of two factors, i.e. (i) the macroeconomic crises of 2009 and 2014–2015; and (ii) military aggression by Russia since 2014 (before the full-scale war in February 2022) on the activities of JSC "Ukrzaliznytsia". Quantifying the impact of the macroeconomic crises and war is important in terms of improving management efficiency, as the cumulative negative effect on organizations is the result of not only the economic crisis and war but also other exogenous and endogenous factors, which need to be identified and evaluated in order to make sound management decisions.

The paper is structured as follows. Section 1 presents a literature review that is devoted to the analyzed topic. In section 2 we present the methodology which is used in our study. This is followed by the research results and discussion (section 3). And finally, a conclusion.

LITERATURE REVIEW

Economic systems are characterized by cyclical development, accompanied by periodic phases of crises and depressions, which negatively affect the performance of organizations. In addition, the root cause of economic crises of various scales may be exogenous factors, in particular: natural disasters, epidemics, wars, etc. Auvinen (1997), considering the problem of internal conflicts in 70 less-developed countries during the 80s of the twentieth century, identified the following main factors: political conflict and political protest, rebellion, and irregular executive transfer. The handbook (Coyne & Mathers, 2011) presents several publications on political economy and war in interdisciplinary research. From a scientific point of view, the problems of the impact of war on economic and political systems are considered. Other authors, Fabro & Aixala (2012), also studied the impact of various factors on economic systems and their growth, covering 79 countries from 1976 to 2005. Herrera & Gentilucci (2013) present a critical study of existing macroeconomic models of the defence economy and their components and the role of military spending. An interesting study conducted by Waqas & Hussain (2018) attempts to assess the impact of social, economic, and military roles in politics and other factors on the conflicts of 28 low-income countries from 1984 to 2011.

The impact of economic crises on various economic systems has been studied by many scientific sources. It is clear that the most studied in the last decade is the global financial crisis of 2008-2009. Several studies provide an assessment of its impact on the economies of different countries. In the dissertation thesis, Hoffmann (2011) identified the effects of the financial crisis as unemployment on low working conditions, comparing it to the Great Depression of 1929. The author studied the consequences of this crisis in the example of Brazil and Germany. The impact of the global financial crisis on the German economy has been in the field of view of other researchers (Barsauskas et al., 2011). They concluded that Germany had suffered significant losses in export markets and extremely high debt levels. In the study (Wojtowicz et al., 2014), the authors used a combination of quantitative and qualitative methods to assess the impact of the financial crisis in Italy, Bulgaria, Germany, and Poland. Raj & Roy (2014) examined the financial crisis in the US and European Union systems in the context of the economies of developing Asian countries (China, Malaysia, Singapore, Indonesia, the Philippines, South Korea, and India) from 1985 to 2010. For this purpose, a gravitational model with an appropriate system of variables was used. In turn, the impact of the 1997–1998 Asian financial crisis and the 2008–2009 global financial crisis on micro, small and medium-sized enterprises in several countries in Southeast Asia was studied by Tambunan (2018). The article by Rakauskienė & Krinickienė (2009) deals with the reasons for the formation of global crises (the cyclic development of the economy, non-compliance of the global financial system with modern requirements and its inability to self-regulate, increasing polarization of the countries and societies of the world), as well as their consequences and the measures to overcome the crisis.

In recent studies, the methodological toolkit for assessing the level of sustainability of enterprises has been substantiated, as well as an assessment of the risk of shock periods and the investment attractiveness of agro holdings of Ukraine (Klymenko et al., 2023) has been carried out.

Existing studies assessing the impact of military conflicts on economic systems include the following. Examining the impact of the Vietnam War (Riddell, 1970) on the US economy identified the main consequences of its deterioration: inflationary pressures on the economy, rising interest rates, rising future financial liabilities, and more. A study (Rasler & Thompson, 1985) of the net impact of war on economic growth in the world is based on the hypothesis that the impact of war on economic growth is primarily temporary. It is concluded that global wars have a significant impact. Theoretical and practical achievements in solving the problem of assessing the war on the country's economy were made by Kosuke & Weinstein (2000), who studied the impact of economic channels on the potential for economic growth. Glick & Taylor (2005) used the gravity model to assess the impact of simultaneous and delayed effects of war on trade between warring states and neutral countries. The authors report on the significant and lasting impact of the war on trade, national income, and global economic prosperity. Howell (2011), in a study examining the relationship between the cost of war and economic growth for 71 countries from 1956 to 2007 through a quantitative analysis of existing Miletex data and its changes over time, concluded that there is no correlation and also no linear dependence. A study conducted by a group of researchers (Kesternich et al., 2012) on the impact of World War II on socio-economic status using a survey in 13 European countries found that this impact has very significant prolonged consequences. The application of econometric analysis in the work of Thies & Baum (2020) allowed us to assess the impact of war on GDP per capita for all major countries from 1955 to 2015.

An attempt to assess the impact of Russia's war in Ukraine on the value of the enterprise is presented by Ivanov (2015). The works of other authors summarize the assessment of economic losses from the military aggression in eastern Ukraine and the annexation of the Crimean peninsula (Polchanov, 2017), evaluation of the economic crisis in various sectors of the economy due to the military confrontation in eastern Ukraine (Makogon, 2017), assessment of economic and derivative fiscal losses in absolute terms due to the hybrid war of the Russian against Ukraine (Kasperovich, 2018), analyzing the problem of determining the impact of increasing military spending on the economic development of countries (Kolinets & Radynsky, 2020). In the article by Bluszcz & Valente (2022), the actual costs of the war in Donbas for the economy of Ukraine are quantified. However, the number of studies that comprehensively examine the impact of macroeconomic crisis and war on an organization is limited.

The presented study complements the previous quantitative assessment of the direct impact of Russia's war in Ukraine on the performance of the organization, provided that this impact is isolated from the impact of the macroeconomic crisis to a certain level of accuracy.

As a result of the review of the literature and best practices of organizations, it was concluded that there are different approaches to qualitative and quantitative assessment (with a certain level of accuracy) of economic crises and military conflicts at the macro and micro levels. However, each case requires careful study of the negative impact of exogenous factors, the selection of appropriate indicators, and assessment methods. For this study, tools were selected to assess the impact of military aggression on the activities of the organization in the context of macroeconomic crises.

AIMS AND OBJECTIVES

The purpose of the study is to rigorously estimate and quantify the effects of military conflict on the economic activity of organizations in the context of macroeconomic crises.

In accordance with the purpose of the study, the following tasks were solved:

- on the basis of statistical data on the operational freight turnover of regional branches of JSC "Ukrzaliznytsia" to determine the development trends of the specified organization in the pre-war period and during the war;
- to determine the relationship between macroeconomic crises, military aggression and operational freight turnover of JSC "Ukrzaliznytsia".

METHODS

The scope of the study was limited to the operational freight traffic of JSC "Ukrzaliznytsia", which has a high share in the total volume of freight transportation by all modes of transport in Ukraine and is the most profitable business segment for this company. In turn, to evaluate the effectiveness of the business in the field of freight transport, operational freight turnover was chosen as one of the main indicators that characterize the volume of transported goods and take into account the actual distance of their moving.

Data from 2002 to 2020 were collected from the Directories of the main performance indicators of six regional branches of JSC "Ukrzaliznytsia" and the official website of the company. Data on Ukraine's GDP for this period in millions of US dollars were formed based on site data (Minfin, 2021), which were published according to the World Bank and the IMF.

The following methods were used in our study: in the 1st step – Event Study and Difference-in-Difference in the 2nd step. Event Study showed that there is a correlation between macroeconomic crises, military aggression, and Ukrzaliznytsia's operational freight turnover. This was the reason to use the Difference-in-Difference method in the next step to assess the impact of the war on the company's operational turnover, as this method allows better identification of causal effects than conventional regression analysis.

The Difference-in-Difference method cannot be used in the case of macroeconomic crises, because it is impossible to form a control group of railways that have not been affected by such crises.

Regression analysis for the Event Study was performed based on the following model (1):

$$\text{turnover}(i, t) = \text{crisis}_t + \text{war}_t + u_i + \eta(i, t), \quad (1)$$

where $\text{turnover}(i, t)$ – operational freight turnover of the i -th regional branch of JSC "Ukrzaliznytsia", million tkm; $I = \{1, 2, 3, 4, 5, 6\}$; t – year, $t = 2002, 2003, \dots, 2020$; crisis_t – a variable that can take on such values:

$$\begin{cases} 1 & \text{for years when there was an economic crisis} \\ & (t = 2009; t = 2014; t = 2015); \\ 0 & \text{otherwise} \end{cases}$$

war_t – a variable that can take on such values:

$$\begin{cases} 1 & \text{for years when there was a military aggression (} t \geq 2014 \text{);} \\ 0 & \text{otherwise} \end{cases}$$

u_i – individual fixed effects for the i -th regional branch of JSC "Ukrzaliznytsia", which are stable over time; $\eta(i, t)$ – error term.

Ukrzaliznytsia", all regression models take into account individual fixed effects.

The above regression model does not include time-fixed effects, which are common to all regional branches in individual years. This is due to the fact that the variables whose influence the authors studied (*crisist*, *wart*) vary only in time. Therefore, the connection between economic crises, military aggression, and operational freight turnover of JSC "Ukrzaliznytsia" cannot be unambiguously interpreted as a causal effect.

Difference-in-Difference method, namely its advanced approach – Fixed effect specification (Wooldridge, 2002; Angrist & Pischke, 2009) was used to confirm the existence of a causal effect between the military aggression and the operational freight turnover of some regional branches of JSC "Ukrzaliznytsia". The conclusion about the possibility and expediency of using this method was made as a result of the analysis of the dynamics of operational freight turnover of regional branches of JSC "Ukrzaliznytsia", which is graphically presented in Figure 3. The graphs made it possible to identify parallel trends in the operational freight turnover of all regional branches before the war and changes in the trend of this indicator for Donetsk and Prydniprovsk railway at the beginning of the war.

Taking into account the results of the study, the six regional branches were divided into two groups – the treatment group and the control group. Donetsk and Prydniprovsk railway are assigned to the treatment group. The other four regional branches (Lvivska, Pivdenna, Pivdenno-Zakhidna, Odeska) are assigned to the control group.

In the case of the Difference-in-Difference method, the regression analysis was performed on the basis of the following model (2):

$$\text{turnover}_{s,t} = \text{post_treat}_{i,t} + \text{year}_t + u_i + \eta_{i,t}, \quad (2)$$

where $\text{turnover}(i, t)$ – operational freight turnover of the i -th regional branch of JSC "Ukrzaliznytsia", million tkm; $I = \{1, 2, 3, 4, 5, 6\}$; $t = 2002, 2003, \dots, 2020$; $\text{post_treat}_{i,t}$ – a variable that can take on such values:

$$\begin{cases} 1 & \text{– if the railway was affected by military aggression} \\ & \text{in the year } t; \\ 0 & \text{– otherwise} \end{cases}$$

year_t – time fixed effects/year fixed effects; u_i – individual fixed effects for the i -th regional branch of JSC "Ukrzaliznytsia" in a year t ; $\eta(i, t)$ – error term.

The Fixed effect specification of the Difference-in-Difference approach used in our study has several advantages. Firstly, there are factors that equally affect all regional branches of JSC "Ukrzaliznytsia" at the same time (economic crisis caused by hostilities, certain changes at JSC "Ukrzaliznytsia", etc.). This can lead to an error in the obtained parameter estimates. Such factors can be controlled by time-fixed effects year_t . Secondly, even within the control group and treatment group, regional branches of JSC "Ukrzaliznytsia" are fundamentally different. This can also lead to an error in the obtained parameter estimates. You can get rid of these fundamental differences with the help of individual fixed effects u_i . Thirdly, time-fixed effects and individual fixed effects automatically eliminate the differences between the control group and treatment group.

Despite the small sample size (six regional railways), the parameter estimates obtained using the least squares method are unbiased, so the mathematical expectation of the population parameter is equal to the parameter estimate even in small samples.

The calculations were performed using the statistical software package Stata / MP 15.0.

RESULTS

The trajectory of the development of the Ukrainian economy over the past two decades is represented in Figure 1.

Based on Figure 1, two periods of a significant decline in the Ukrainian economy, i.e., 2009 and 2014–2015 can be distinguished. In 2009, Ukraine's economy was in crisis, caused by the global financial and economic crisis of 2008–2009. This year Ukraine's GDP decreased by 34.9%. The last two years before the military aggression of Russia (2012–2013) are characterized by a general decline in economic activity, – in 2012 GDP increased by 7.74%, and in 2013 – only by 4.28%. As a result of the war in 2014, GDP decreased by 28.10%, and in 2015 – by 31.3%.

Railway transport enterprises are part of the basic branches of Ukraine's economy and the most important component of the transport system (Shpak et al., 2018). Railway transport in Ukraine has an operational length of railways of more than 20 thousand km and occupies a prominent place among European railway companies. There are 50 railroad border crossings with the 7 neighbouring countries (Belarus, Poland, Hungary, Russia, Slovakia, Romania, and Moldova). JSC "Ukrzaliznytsia" includes six regional branches: Lvivska, Pivdenna, Donetsk, Odeska, Prydniprovsk, and Pivdenno-Zakhidna Railways. In terms of freight traffic, the Ukrainian railway ranks fourth on the Eurasian continent, after the railways of China, Russia, and India.

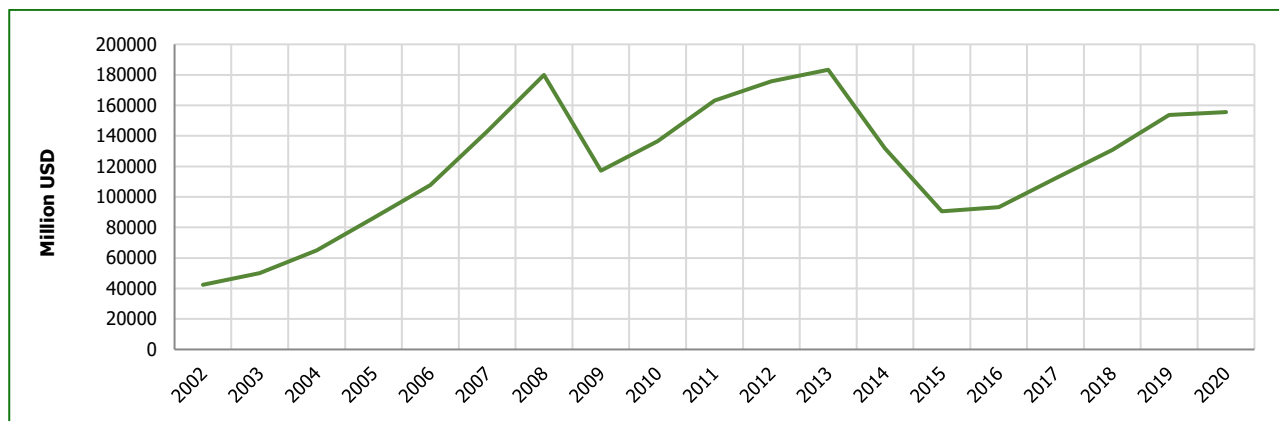


Figure 1. Dynamics of nominal GDP of Ukraine, mln USD. (Source: authors' findings based on Minfin, 2021)

The comparison of the dynamics of Ukraine's GDP and the total operational freight turnover of regional branches of JSC "Ukrzaliznytsia" was carried out on the basis of growth rates (Figure 2).

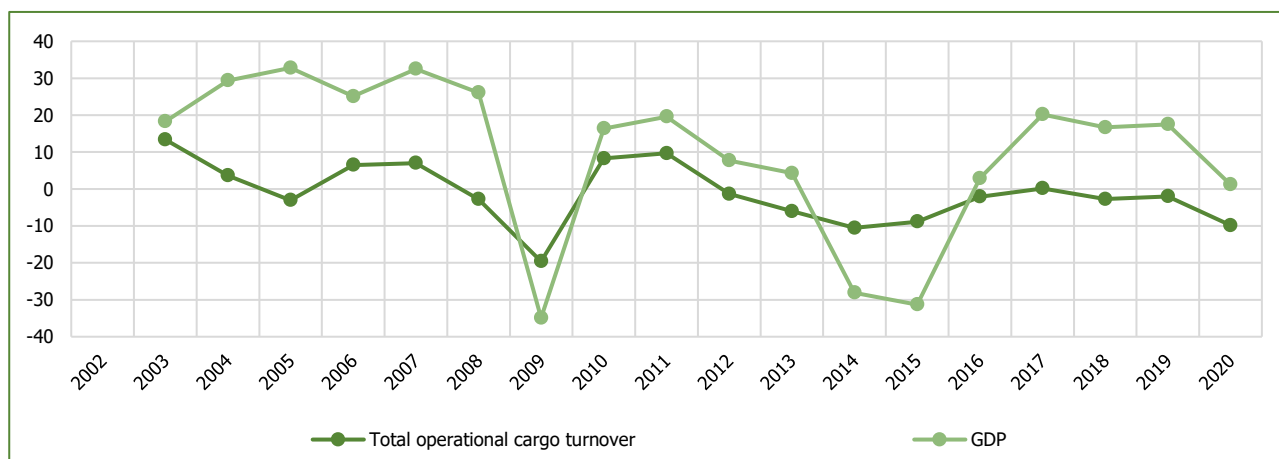


Figure 2. Growth rates of Ukraine's GDP and total operational freight turnover of regional branches of JSC "Ukrzaliznytsia", %. (Source: authors' findings based on Minfin, 2021; Kravets et al., 2019; JSC "Ukrainian Railway", 2021)

As can be seen in Figure 2, since 2007 the dynamics of the total operational freight turnover of regional branches correlates with the dynamics of Ukraine's GDP.

The dynamics of the operational freight turnover of the regional branches of JSC "Ukrzaliznytsia" for 2002–2020 are graphically presented in Figure 3.

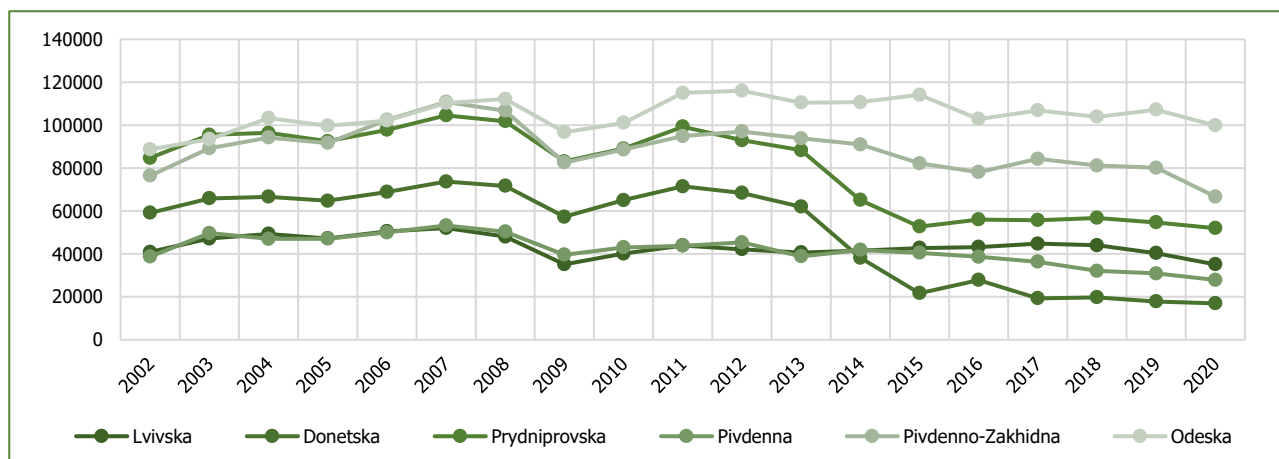


Figure 3. Operational freight turnover of regional branches of JSC "Ukrzaliznytsia" for 2002–2020, million tkm. (Source: authors' findings based on Kravets et al., 2019; JSC "Ukrainian Railway", 2021)

As can be seen from Figure 3, the indicators of operational freight turnover of all regional branches of JSC "Ukrzaliznytsia" had approximately the same direction of dynamics until 2014. In 2009, there was a significant decrease in it at all branches (as a result – by 19.6%), which, among other factors, was caused by the global financial and economic crisis. In 2010–2011, all regional branches slightly improved their results in the freight segment. However, already in 2012, the operational freight turnover of the Lvivska, Donetska, and Prydniprovka railways decreased, and in 2013 – of all branches, due to the economic recession. Since 2014, when the war began in the Donetsk and Luhansk regions, in particular: 2014 on the Donetska railway – by 38.36%, on the Prydniprovka – by 26.29%; in 2015 – by 43.22% and 18.96%, respectively.

Since 2014, the war has had a negative impact on the country's economy as a whole, as well as a direct impact on some regional branches of JSC "Ukrzaliznytsia". The Donetsk railway is located on the territory of hostilities, Prydniprovka railway covers some districts of the Donetsk region. Thus, the decline in the operational freight turnover of the Donetsk and Prydniprovka railways was due to the direct impact of the war and the economic crisis. The impact of the economic crisis on the South-Western Railway was stronger than on the other three regional branches, as it carries every sixth tonne of Ukraine's total freight traffic. Hence, until 2014, all regional branches had approximately the same direction of dynamics of operational freight turnover, but since 2014, the war has had a significant impact on the Donetska and Prydniprovka railways (see Figure 3).

Based on statistical data on the operational freight turnover of regional branches of JSC "Ukrzaliznytsia" for 2002–2020, the main statistical indicators were calculated (Table 1).

Railway	Mean	SD	p10	Median	p90	Max	Min
Donetsk	50348.7	22173.0	17824.0	62002.1	71666.4	73730.2	16959.0
Lvivska	43639.1	4635.8	35172.0	43196.3	50512.6	52071.6	35128.5
Odeska	105005.7	7493.7	93447.3	103960.3	115057.0	116059.3	88741.4
Pivdenna	41850.9	6989.4	30878.9	41860.0	50375.5	53258.6	27889.7
Pivdenno-Zahidna	89069.0	10930.6	76504.5	89241.4	106743.4	110779.1	66699.5
Prydniprovka	79955.7	19542.2	52756.3	88312.1	101802.3	104561.8	51998.2

According to the mean value of operational freight turnover, the Prydniprovka branch is inferior to the Odeska and Pivdenno-Zakhidna ones, while the Donetska railway is in fourth place. The standard deviation (sd) is the largest for Donetsk and Prydniprovka branches. The values of this indicator confirm the existence of significant fluctuations in operational freight turnover on these railways. This can also be seen from the maximum and minimum values of operating load.

Analysis of the relationship between the reduction of operational freight turnover and economic crises and hostilities in Eastern Ukraine is presented in Table 2.

Turnover	Coefficient	Robust std. err.	t	P> t	[95% conf. interval]	
<i>crisis</i> ₂₀₀₉	-7854.619	1284.865	-6.11	0.002	-11157.47	-4551.769
<i>crisis</i> _{2014_2015}	2153.518	2221.973	0.97	0.377	-3558.245	7865.281
<i>war</i> _{t (t≥2014)}	-41682.44	2402.411	-17.35	0.000	-47858.03	-35506.84
_cons	73617.12	237.5714	309.87	0.000	73006.42	74227.82

The level of significance $\alpha=0.05$ was chosen in the study.

To assess the significance of the model parameters, a t-test based on standard errors of the coefficients adjusted for possible heteroskedasticity and serial correlation was used.

The value of the t-test for the variable *crisis_t* ($t = 2009$) confirms that the relationship between the operational freight turnover of JSC "Ukrzaliznytsia" and the economic crisis of 2009 is statistically significant. The negative effect for JSC "Ukrzaliznytsia" in connection with this crisis can be estimated at 7854.619 million tkm.

The value of the t-criterion for the variable crisis ($t = 2014$ and $t = 2015$) gives grounds to conclude that the relationship between the crisis of 2014–2015 and the operational freight turnover of JSC “Ukrzaliznytsia” is statistically insignificant.

The indicator war t ($t \geq 2014$) has a statistically significant negative coefficient, which indicates that the war had a statistically significant negative impact on operational freight turnover. So, the decrease in operational freight turnover of JSC “Ukrzaliznytsia” by 41682.44 million tkm per year is associated with hostilities. The above assessment of the negative effect of the war is preliminary.

The Event Study method confirmed that the impact of the war was statistically significant, so the decline in the operational turnover since 2014 was due more to the impact of the military aggression than of the macroeconomic crisis. However, as noted earlier, the regression model for the Event Study does not include time-fixed effects, so the relationship between military aggression and JSC Ukrzaliznytsia’s operational freight turnover cannot be unambiguously interpreted as causal.

Analysis of the causal relationship between the reduction of operational freight turnover and the military aggression in eastern Ukraine is presented in Table 3.

Table 3. Results of Difference-in-Difference method (std. err. adjusted for 6 clusters in railway id).

Turnover (y)	Coefficient	Robust std. err.	t	$P > t $	[95% conf. interval]	
post_treat _{i,t}	-34334.71	4379.389	-7.84	0.001	-45592.29	-23077.14
2003	8681.816	1437.966	6.04	0.002	4985.406	12378.23
2004	11339.7	1837.773	6.17	0.002	6615.553	16063.85
2005	9024.599	1592.081	5.67	0.002	4932.025	13117.17
2006	13820.67	2746.615	5.03	0.004	6760.268	20881.07
2007	19328.8	3699.145	5.23	0.003	9819.845	28837.76
2008	17007.43	3812.243	4.46	0.007	7207.749	26807.12
2009	961.084	2338.251	0.41	0.698	-5049.581	6971.749
2010	6389.2	2269.997	2.81	0.037	553.9861	12224.41
2011	13264.67	3858.668	3.44	0.018	3345.644	23183.69
2012	12213.42	4355.4	2.80	0.038	1017.503	23409.33
2013	7558.884	4252.015	1.78	0.136	-3371.269	18489.04
2014	11387.57	4166.827	2.73	0.041	676.4003	22098.74
2015	5652.388	5307.105	1.07	0.336	-7989.96	19294.74
2016	4429.705	3370.322	1.31	0.246	-4233.983	13093.39
2017	4537.088	4280.371	1.06	0.338	-6465.956	15540.13
2018	2960.371	4209.586	0.70	0.513	-7860.714	13781.46
2019	1838.337	4968.69	0.37	0.727	-10934.09	14610.76
2020	-3589.646	4710.219	-0.76	0.480	-15697.65	8518.357
_cons	64801.42	2514.087	25.78	0.000	58338.75	71264.08

The indicator variable [post treat] (i, t) has a negative coefficient. According to t-statistics, this coefficient is statistically significant. The value of the coefficient of the variable indicates that the “net” causal effect of the military aggression on the operational freight turnover of the Donetsk and Prydniprovsk railway (hence, JSC “Ukrzaliznytsia”) is -34334.71 million tkm annually. Thus, the negative effect of the macroeconomic crisis (to a certain level of accuracy) was eliminated and a quantitative assessment of the direct impact of the military aggression on the operational cargo turnover of JSC “Ukrzaliznytsia” was obtained.

The presented results reflect quantitative estimates of negative effects for JSC “Ukrzaliznytsia” and its individual regional branches of the external shocks – macroeconomic crises of 2009 and 2014–2015 as well as Russia’s military aggression in Ukraine (before the full-scale war in February 2022).

It was proved, that the relationship between the resulting indicator (operational freight turnover) of JSC “Ukrzaliznytsia”

and the macroeconomic crisis of 2009 is statistically significant, and the negative effect on the company due to this crisis can be estimated at 7854.619 million tkm. The operational freight turnover of JSC "Ukrzaliznytsia" in 2009 amounted to 394575.1 million tkm and was lower by 96 278 million tkm (by 24.4%) compared to 2008. The negative effect received by JSC "Ukrzaliznytsia" in connection with the macroeconomic crisis of 2009 was only 8.16% of the total amount of the negative effect, that the company got in the field of freight transport in 2009. It is obvious that there were other factors that led to such a significant reduction in operational turnover.

The economic crisis of 2014–2015, caused by Russia's military aggression in the spring of 2014, did not have a statistically significant impact on the operational freight turnover of JSC "Ukrzaliznytsia". At the same time, this aggression significantly affected the activities of JSC "Ukrzaliznytsia". The negative effect of the impact of the military aggression on the affected railways (Donetska and Prydniprovskya), and, accordingly, on JSC "Ukrzaliznytsia" is 34334.71 million tkm annually. In 2014, the company's operational freight turnover decreased by 45697.3 million tkm, in particular, the impact of the war was 75.14% of the total negative effect.

DISCUSSION

Thus, when discussing the obtained results, it should be noted that the assessment of the effect of specific military aggression in the macroeconomic crisis context was performed for the first time using the existing methods, which allows obtaining parameter estimates resistant to individual-specific and time-specific heterogeneity. These results can be used during compensation for damages, as well as when justifying post-war recovery measures, which should be carried out on an innovative basis, taking into account basic trends of postwar transformation of Ukraine's economy: industry 4.0, budgetary decentralization, regional energy management (Borodina, 2022). Also, the obtained results can be used by the managers of the investigated enterprise when making management decisions aimed at increasing the efficiency of its functioning.

The post-war development of the Ukrainian economy must take into account the experience of other countries' postwar development from a historical retrospective (in particular of Germany and Japan), the radically changed economic realities of the 21st century (Kulikov et al., 2022), as well as the EU experience in the field of financial and economic security of financial markets (Novak et al., 2022).

Taking into account the results of our research and the indicated experience will allow managers to avoid unnecessary problems during the design of the post-war innovation and investment development of JSC "Ukrzaliznytsia".

CONCLUSIONS

The ability to quantify the negative effects of exogenous factors allows owners and managers of different levels to identify bottlenecks and shortcomings in the implementation of economic policy in the face of external challenges, to model the value of performance, etc. Therefore, it is possible to outline ways to increase the efficiency of management, which will allow directing efforts (actions) and resources in the right direction for the development of the organization. It is worth mentioning that the application of the proposed approach to quantify the impact of macroeconomic crises and war is possible for the needs and goals not only of transport enterprises but also for other organizations because of their universality.

Our study contributes to the theory in several ways. The specific contribution is that among the available developments on this issue, a formal assessment of the effect of specific military aggression in the context of macroeconomic crises was conducted for the first time using the existing methods. This, in turn, allows to obtain parameter estimates resistant to individual-specific and time-specific heterogeneity. The impact of the war is isolated from the impact of the macroeconomic crisis to a certain level of accuracy. Secondly, the proposed approach can be used to form an information base for the development of strategic management decisions that integrate the resilience of economic systems to external shocks and their economic development on a spatial and temporal scale at the micro level, as well as at the regional, national and global levels.

Of course, our study is not free from some limitations. First of all, the use of the method of Difference-in-Difference has some limitations. It is expedient only in the case when in the studied sample it is possible to distinguish a group of organisations, which at a certain moment was influenced by an external factor(s) – a treatment group and changed the trend of their development, and a control group, which was not influenced. Secondly, one should also mention that it

analyses the company from an emerging economy and one doesn't know whether it could be fully applied to the organizations existing in developed countries. And thirdly, the invasion of Russia on Ukraine completely changed the situation. One should take this factor into account in further analyses. However, despite these limitations, the proposed approach allows a more thorough investigation of the problem of the impact of exogenous factors on the performance of a particular organisation.

One should also emphasize that the approbation of the proposed approach on the example of other economic entities will facilitate further scientific and practical discussions. In particular, further research may have different multi-vector directions and assess in particular the impact of (i) the full-scale Russia's war in Ukraine on organisations both in Ukraine and in the world; (ii) the COVID-19 pandemic on economic systems of various levels and scales, and in particular on the passenger transport market; and (iii) natural disasters on organizations.

ADDITIONAL INFORMATION

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ОЦІНКА ВПЛИВУ МАКРОЕКОНОМІЧНИХ КРИЗ І ВІЙНИ НА ДІЯЛЬНІСТЬ АТ «УКРЗАЛІЗНИЦЯ»

Незважаючи на значну загрозу, яку становлять макроекономічні кризи та війна для економічної діяльності організацій, в існуючій літературі мало уваги приділяється чіткій ідентифікації та кількісній оцінці таких наслідків. Ураховуючи цей факт, метою дослідження є оцінка впливу збройної агресії на економічну діяльність організацій в умовах макроекономічних криз. Методологія дослідження включає емпіричний і кількісний аналіз. Емпіричний аналіз проводився на основі офіційних статистичних даних АТ «Укрзалізниця» та Міністерства фінансів України. Кількісний аналіз ґрунтується на методах дослідження подій і різниці у відмінності для кількісної оцінки впливу макроекономічних криз і війни на організацію. Отримано кількісні оцінки негативних наслідків двох макроекономічних криз (2009 та 2014–2015 років) і воєнних дій (що розпочалися 2014 р., але не враховуючи її нового етапу – повномасштабної війни з 2022 р.) в Україні на вантажні перевезення АТ «Укрзалізниця». Застосування запропонованого підходу до оцінки наслідків війни завдяки його універсальності можливе для потреб і цілей не тільки транспортних компаній, а й інших організацій. Новизна: серед наявних розробок із цієї проблематики вперше за допомогою існуючих методів проведено формальну оцінку наслідків воєнної агресії рф, що розпочалася 2014 р., у контексті макроекономічних криз, що дозволяє отримати оцінки параметрів, стійких до індивідуально специфічних та часових неоднорідностей.

Ключові слова: макроекономічна криза, війна, організація, метод дослідження подій, метод різниці у відмінності

JEL Класифікація: C51, D74, G01