









“War impact on the market value of the industrial complex enterprises of Ukraine”

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WAR IMPACT ON THE MARKET VALUE OF THE INDUSTRIAL COMPLEX ENTERPRISES OF UKRAINE

Abstract

The purpose of the paper is to assess the war impact on the market value of the industrial complex enterprises of Ukraine. This is an important task for determining the investment needs to restore the Ukrainian economy, substantiating the reparations for Russia's aggression against Ukraine, which should include the damage caused after the unleashing of a full-scale war from 24.02.2022, and losses in the early phases of military aggression (after 22.02.2014).

The author's method of assessing the market value is based on the CVA concept. The war impact on the enterprises market value should be manifested through changes in the effects of exploitation and financing liabilities, which show a differentiated effect from changes in the internal and external business environment of enterprises in war-time. Estimates should be based on the possibility of both negative and positive effects. The main direction of the negative influence is the financing effect, which is due to the action of the external business environment factor. The Kane-Essian argument should be considered in the estimates by calculating normalized effect sizes.

The normalized cumulative war impact equaled 165.1 billion dollars, which corresponds to 44.4% of the total market value of industrial enterprises of Ukraine, estimated for the period 2014–2022. About 14.4% of the total war impact on the market value of Ukraine's industrial enterprises is attributed to the financing effect. Loss assessments can be used to evaluate the investment needs to restore destroyed and damaged business property. To determine the amount of compensation for damage caused by the war, the market value of an enterprise according to the CVA method can be used.

Keywords

Cash Value Added, economic war losses, investment needs, investment in recovery

JEL Classification

G32, H56

INTRODUCTION

Nowadays, the countries of the whole world are facing new complex tasks of finding, accumulating and mobilizing the resources necessary to overcome the crisis caused by Russia's military aggression in Ukraine. At the same time, the most destructive challenges of the war are manifested in the economy of Ukraine, they are felt in various spheres of Ukrainian society, from the state as a whole to the life of every Ukrainian.

One of the important tasks is to identify and adequately assess the impact of the consequences of the war on the economy, to determine the economic losses caused by the war, which is a basis for determining the investment needs for the recovery of the Ukrainian economy in the post-war period, to justify the amount of reparations that the aggressor must pay. This task belongs to the tasks of early preparation of the country for recovery and ensuring accelerated development of the economy after the war.

In this context, the development and improvement of scientific and methodological approaches for assessing the war impact on the market value of enterprises is particularly relevant. Estimated damage to the economy of Ukraine in the field of enterprises and industrial production is 8% to 20% in the structure of their total volume, formed because of the war (KSE, 2022). However, despite this, the actual war impact on economic entities is much more, as it leads to the destruction of the integrity of value chains, thanks to which the processes of formation, capitalization and increase of added value in the economy take place, and, as a result, causes the loss of part of the enterprises' market value. Enterprises are the element that provides primary value creation, and therefore their destruction should be considered as a factor that undermines the foundations of the national economy as a whole.

1. LITERATURE REVIEW

The issue of assessing the impact of the war on a country's economy is being studied by various research teams and government institutions. Unfortunately, nowadays this problem has not been fully disclosed in the scientific literature.

In the historical context, the first conceptual foundations of the political economy of war were proposed by Pigou (1921). During the 20th century, this theory has undergone certain changes, in particular: regarding the study of the economic causes of war – Robbins (1939), the cost and benefits of violence and war from the point of view of needs – Burton and Azar (1986), the allocation of costs and benefits – Boulding (1989) and Dolfisma and Kesting (2013), the expected usefulness of international conflicts – Bueno de Mesquita (1980, 1981, 1988, 1989), justification of the economic factors of nuclear defense – McGuire (1992), and analysis of the costs and benefits of terrorist attacks – Hausken (2016).

For example, Keen (2000) investigates the economic causes and consequences of both interstate wars and civil conflicts, focusing on the indirect costs of war, noting that war can bring substantial intended or unintended economic benefits. According to the theory of the political economy of war, its functions and causes should be considered precisely from the standpoint of how the expected benefits arise of war, forming certain economic advantages for its participants. Unlike most researchers who classify and detail various types of economic benefits and costs of war, Ho (2014) argues that “war is never economically profitable except for those who can profit from military spending”.

To form a methodological toolkit for the analysis of state military policy, several researchers developed appropriate models. Allison (1971) proposed and tested three models for the empirical economic analysis of war on the example of the Cuban Missile Crisis of 1962 – the rational actor model, the organizational process model that considers bounded rationality, and the public policy model that considers judicial politics. In turn, Berman et al. (2011), using the economic situation of the Iraq war (2003–2011) as an example, developed a three-way competition between insurgents, the government, and civilians, where the economics of counterinsurgency points to the importance of governance issues.

Hausken's research (2016) is interesting for understanding the general methodology of estimating the enterprises value in wartime. An attempt was made to formalize the justification of decisions based on the analysis of prospective costs and benefits of war, considering the interests of various categories of economic agents (population, politicians, various stakeholders). At the same time, the author distinguishes three types of values – human, economic and influence, which can be gained or lost by initiating a war. Hausken observes that the resulting economic value of war is extremely difficult to estimate. Based on the approaches of modeling the behavior of a rational agent, a model of decision-making was proposed considering the benefits and costs of war, which considers the value assessments of various participants, parties, and stakeholders.

In estimating the war impact on economic value, we believe that a rule known as the Kane-Essian argument (Markwell, 2006) is expedient. According to it, war is justified to the extent that it provides an improvement in economic activity

compared to the state in which could be achieved without war. When assessing the impact of war on the market value of enterprises, it is necessary to consider alternative incomes and expenses that arise because of alternative use of wartime investments in peacetime.

As Thies and Baum (2000) point out, the total cost of war includes three components: 1) the opportunity cost of the resources used for its conduct; 2) the value of the lives of people who died, and the physical and human capital destroyed during the war; and 3) reduction of gross domestic product (GDP) per capita during and after the war. Therefore, the impact of a military conflict or war on the economy is traditionally measured by estimating economic losses, which include both components that can be estimated with high reliability (for example, destroyed businesses, housing, infrastructure, etc.) and elements that cannot be estimated takes place expertly on the basis of knowledge and assumptions (losses of underachieved GDP, losses due to population deaths and migration, etc.).

There is no single point of view regarding the nature of the impact of war on GDP per capita: if Barro (1991) and Murdoch and Sandler (2004) prove that the impact of wars on GDP per capita is negative, then Jong-A-Pin (2009) denies the existence of any relationship between those categories, while Barro and Lee (1993) find an insignificant positive effect.

Quantitative estimates of the loss of unrealized GDP presented by Bluszcz and Valente (2020) indicate that the loss of GDP per capita in Ukraine due to the war during 2013–2017 averaged 15.1%, and for the affected regions of Donetsk and Luhansk – 47 % for 2013–2016.

According to estimates by the Kyiv School of Economics (KSE) and the Ministry of Economy of Ukraine, as of August 1, 2022, the volume of direct losses to the Ukrainian economy from damage and destruction of residential and non-residential buildings and infrastructure amounted to about 237.1 billion dollars, of which direct losses are 108.3 billion dollars (KSE, 2022). Moreover, 47.7 billion dollars or 44% of the total volume of direct losses was caused by property damage and destruction, 31.6 billion dollars or 29.2% – in the field of infrastructure, and the losses caused to en-

terprises and industry were estimated at 8.8 billion dollars. The share of losses in the industry sphere and Ukrainian enterprises (29.8 billion dollars or 23.1%) is the largest part of the indirect losses of the Ukrainian economy because of the full-scale war. According to preliminary estimates, the economic losses of the Ukrainian economy due to the invasion of the Russian Federation in the part of the industrial activity of enterprises amount to 38.6 billion dollars or 16.3% of their total volume. During the first five months of Russia's war against Ukraine, at least 388 enterprises were damaged, destroyed or captured, which is 0.8% of industrial enterprises and 0.1% of Ukrainian enterprises as of the beginning of the war.

The structure of the monetary assessment of the physical capital loss, which is provided by the National Bank of Ukraine (NBU), is different from the assessments of the KSE. Thus, according to the NBU's estimates (Vdovychenko & Lepushynskiy, 2022), 12.9% (11.9 billion dollars) of material losses of Ukraine due to the invasion of the Russian Federation are attributable to mining and processing industry facilities.

A separate direction of the war impact research is the study of the reaction of financial markets. The following studies can be noted here: Weidenmier (2002), Willard et al. (1996), Burdekin (2006), Ferguson (2006), Frey and Waldenstrom (2004), Pecquet and Thies (2010), Weidenmier and Oosterlinck (2007), and Schneider and Troeger (2006), in which the war impact and changes in the economic activity on stock market indices and various financial instruments are studied using the example of data from the military history of different countries of the world. With the beginning of Russia's military aggression in Ukraine, researchers also began to study the influence of various factors on ensuring economic security in the conditions of war (Shkolnyk et al., 2022; Hakobyan N. & Khachatryan A., 2022).

The market value of enterprises, methodological aspects of its assessment, the influence of formation factors are the subject of numerous studies (Brychko M. et al., 2022; Camska et al., 2021; Virglerova et al., 2020; Habib A., 2022; Šimaitė G. & Keliuotytė-Staniulėnienė G., 2022; Anouar Faiteh & Mohammed Rachid Aasri, 2023).

However, the aspect of identifying the war impact on the change in the enterprises market value has not been sufficiently studied. In this regard, one can note the work of Ivanov (2015), who developed the basic theoretical and methodological provisions, principles, and approaches to estimating the value of an enterprise considering the war factor.

According to Ivanov (2015), “the subject of assessing the impact of the war factor on the value of the enterprise is the quantification of war losses, the quantification of possible risks of losses and damages, and the quantification of the possibility of their compensation”, and the object assessments – “measures to prevent the negative impact of this factor” and “measures to eliminate the consequences of the war on economic and other activities”. With this approach, the assessment of the impact of war on the value of a property object (enterprise) takes place from the standpoint of considering the negative effects of factors.

Therefore, the maximum value of the property, considering the influence of war factors, is determined at the minimum losses from war factor and the maximum amount of compensation for damage to the recipient. Two types of losses are distinguished, which form the loss of the market value of the business from the war factor and can occur both separately and simultaneously: 1) costs of preventing the impact of the war factor (in cases when such prevention, partial or full, technically possible); 2) losses caused by the influence of the war factor.

The methodological approaches proposed by Ivanov (2015) are quite complex and require an in-depth study and accounting of all the components that form the economic damage from the war to enterprises.

Therefore, the scientific problem of the formation of methodical approaches for a complete, reliable, and relevant assessment of the influence of war factors on the market value of enterprises needs further resolution.

The purpose of the paper is to assess the war impact on the market value of the industrial complex enterprises of Ukraine in the period from 2014 to 2020, which includes the initial, first and second phases of Russia’s armed aggression against Ukraine.

2. METHODS

The market value of an industrial complex is defined as the aggregate value of its components – industrial enterprises. One of the effective tools for solving the set research tasks is the model of Ottoson and Weissenrieder (1997), as well as its modifications, which involve the use of indicators of CVA, ICVA or their modified versions (MCVA, MCVA Index, Cumulative MCVA Index). This is recognized throughout the world as the most theoretically grounded method of estimating the market value of an operating enterprise: when estimating the value of large and medium-sized enterprises, this method is used in 80-90% of cases (Fernandez, 2002).

In the general case, the indicator of the market value according to the concept of CVA (Weissenrieder, 1997) is formed as the sum of the net balance sheet assets of the enterprise and the expected added value of the cash flow of future periods, reduced to the time of evaluation:

$$MV = NA + \frac{CVA}{r}, \quad (1)$$

where MV – market value of an enterprise (or aggregates of enterprises), currency units; NA – net assets, currency units; r – forecast rate of return on investments, units; CVA – Cash Value Added, currency units which is determined by the formula:

$$CVA = AOCF - WACC \cdot TA, \quad (2)$$

where $AOCF$ – cash flow from operating activities, currency units; $WACC$ – weighted average cost of capital, units; TA – total balance sheet assets of the enterprise (or aggregates of enterprises), currency units.

Previous research (Boiarko, 2011, 2019, 2022; Hrytsenko, 2019) proposed an extended factor model for calculating the market value of an enterprise:

$$MV = L \cdot \frac{\frac{NP}{NS} \cdot \frac{NS}{WC} \cdot \frac{WC}{E} \cdot \frac{1}{L/E} + \frac{A}{C} \cdot \frac{C}{L}}{r} - E \cdot \frac{\left(r_E + (1-tx) \cdot i \cdot \frac{L}{E} \right) - \bar{r}}{\bar{r}}, \quad (3)$$

where NP/NS – coefficient of net profitability of sales, units; NS/WC – turnover ratio of working capital, units; WC/E – coefficient of maneuverability of own capital, units; L/E – coefficient of financial risk (financial leverage), units; A/C – specific weight of amortization expenses in the cost price of the enterprise's sold products, units; C/L – turnover ratio of liabilities, units; L – liabilities of the enterprise, currency units; E – equity capital of the enterprise, currency units; r_E – equity value, units; tx – income tax rate, units; i – interest rate on loan capital, units.

According to formula (3), the market value of an enterprise or their complex is formed from two components, each of which is the current value of an infinite annuity. On the other hand, each of these components is a multiplicative model for adjusting the amounts of liabilities and equity by certain coefficients, the value of which depends on the functional combination of a few internal and external factors provided by the model.

Previous studies (Boiarko, 2019) substantiated that these components reflect the action of two effects, the interaction of which depends on the size of the market value of the enterprises in a certain year of its activity the effect of the exploitation of financial liabilities and the financing effect.

The effect of the exploitation of financial liabilities (MV_L) assumes that in each year of the forecast period, the company's activities on average generate market value in the form of own financial resources (operational cash flow of the year for which the market value is calculated), which is determined by the multiplicative growth of the funds involved to finance its activities in excess of equity (liabilities):

$$MV_L = L \cdot \frac{\frac{NP}{NS} \cdot \frac{NS}{WC} \cdot \frac{WC}{E} \cdot \frac{1}{L/E} + \frac{A}{C} \cdot \frac{C}{L}}{r} \quad (4)$$

The magnitude of this effect is determined by the amount of liabilities and a set of internal factors related to the current financial state of the enterprises, namely, profitability of activity (net profitability of sales), business activity (turnover of working capital, turnover of liabilities), solvency (maneuverability of own capital), operational (specific weight

of depreciation costs in the cost of goods sold) and financial risks (financial risk ratio).

The financing effect (MV_{FL}) assumes that the net assets formed by the enterprise or their complex in each year during the entire forecast period of the use of equity capital available at the time of the market value assessment will be equal annually to the value of the average market costs for the formation of this equity capital, reduced by the amount of costs for attracting own and borrowed funds to finance the companies' activities, taking into account the effect of financial leverage:

$$MV_{FL} = E \cdot \frac{\left(r_E + (1 - tx) \cdot i \cdot \frac{L}{E} \right) - \bar{r}}{\bar{r}} \quad (5)$$

Its value is formed under the influence of changes in the amount of companies' equity capital and a set of external factors that determine the cost of attracting various elements of sources of financing the companies' activities (equity and liabilities) in the financial market.

The financing effect in general reflects the volume of creation or destruction of the market value of enterprises, generated in connection with the companies' choice of conditions for attracting investment capital, which differ from the average on the market.

In this study, the volume of CVA and market value was estimated according to the consolidated balance sheet of industrial enterprises of Ukraine in 2014–2020, based on statistical data of the State Statistics Service of Ukraine and the NBU and the described method. Data for 2008–2013 were also studied to determine changes under the influence of war compared to peacetime conditions.

3. RESULTS

Available statistics allow us to assess the impact of the war factor on the market value of enterprises of the industrial complex of Ukraine during the first three phases of Russia's military aggression against Ukraine. These are the preparatory, first and second phases, which have been ongoing since February 20, 2014 (Extended Commentary, 2023).

Since 2014, which is the beginning of the military invasion of the Russian Federation into Ukraine, the volume of annual creation of added value of cash flow by industrial enterprises of Ukraine has increased relatively compared to pre-war by 1.8 times and amounted to UAH 920.9 billion. This indicates that the impact of the war factor on the aggregate market value of industrial enterprises of Ukraine during 2014–2020 was generally positive.

Accordingly, the dynamics of the CVA of industrial enterprises of Ukraine showed a decrease in its volume in 2011–2014 and an increase in 2014–2020 (except for 2017). This indicates that in the specified period the cumulate market value of industrial enterprises of Ukraine was not significantly negatively affected by the war consequences. The existing economic losses, negative effects on the market value due to the loss of part of the enterprises that were in the annexed territories of the Crimea and the Luhansk and Donetsk republics, were compensated by increasing the efficiency of industrial production in general.

The cycle of changes in the added value of the cash flow of industrial enterprises of Ukraine in the studied period was not synchronous with changes in the financial results of operational activities. This indicates that the formation of this indicator is influenced by other factors that are more external than internal to the enterprise, including war factor.

However, the analysis of the dynamics of the CVA index (Figure 1) demonstrates a decrease in the efficiency of the process of creating the market value of industrial enterprises of Ukraine. This index has a clearly expressed downward trend during 2008–2020. If in 2008 ICVA was equal to 0.45, and in 2011 by 1 UAH total assets of industrial enterprises accounted for 53 kopecks of the added value of the cash flow generated during the year of economic activity, in 2020, compared to 2011, its value decreased by 19.1%.

However, it is during wartime (starting from 2014) that the interval dynamics of the CVA index differs from the general trend. So, if in 2014 (in the conditions of the initial reaction of the economy to the loss of a part of industrial enterprises due to the annexation of Crimea and the seizure of

the eastern territories of Luhansk and Donetsk regions) the additional cash flow amounted to 17.9% of the total assets of industrial enterprises of Ukraine, 82.1% of assets the remaining industrial enterprises of Ukraine were at risk of their possible loss in the event of a significant deterioration in operating conditions, then in 2020 the CVA index increased to 42.9% (2.4 times).

This is evidence of the improvement in the efficiency of value generation by industrial enterprises of Ukraine during the first stage of the war between the Russian Federation and Ukraine, which contributed to the increase in the protection of invested resources from adverse changes in the business environment due to the creation of additional cash flow. Thus, in 2020, 57.1% of the total assets of industrial enterprises were at risk of possible loss in the event of a significant deterioration in operating conditions, to which we attribute, first, the aggravation of the war and the transition to a new stage – a full-scale invasion of the aggressor country into the territory of Ukraine.

In assessing the impact of the consequences of the war on the market value of enterprises, an important limiting condition is the threshold value for the corresponding negative impact. The starting assumption for its establishment is that even under the worst circumstances (complete destruction and the impossibility of further functioning), the enterprise cannot lose its market value in amounts higher than the current assessment of this value in pre-war times or at the time of the beginning of a certain phase of the war (if the assessment is carried out according to war stages).

Figure 2 presents the results of the assessment of the aggregate market value of Ukrainian industrial enterprises based on the CVA concept.

According to the estimates, during 2014–2020, the total market value of industrial enterprises of Ukraine increased by 3.62 times and amounted to UAH 15,114.7 billion in 2020. On average, during 2014–2020, the market value of Ukrainian industrial enterprises grew by 16.8% per year.

In the dynamics of changes in the market value during 2008–2020, two periods of destruction of the created value can be distinguished: 1) in

Source: Own calculations based on the data from the State Statistics Service of Ukraine and the NBU.

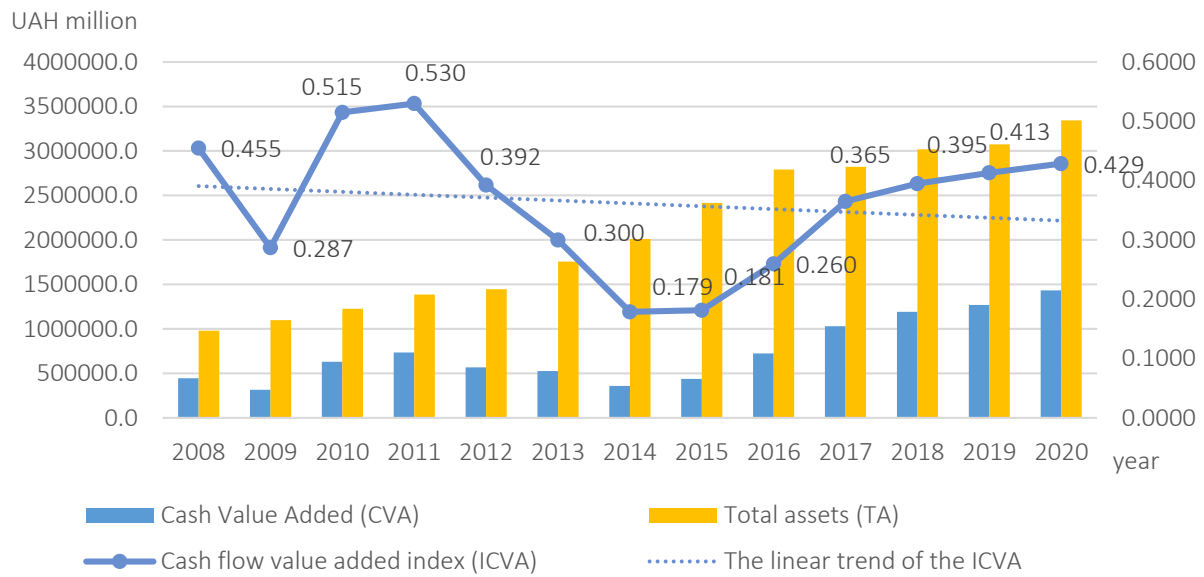


Figure 1. Dynamics of the CVA indicator according to the consolidated balance sheet of Ukrainian industrial enterprises in 2008–2020

2009, as a result of the global financial crisis, the market value of industrial enterprises of Ukraine decreased by 26.59% compared to 2008; 2) during 2012–2014, as a result of the internal financial, economic and political crisis in Ukraine, as

well as aggression from the Russian Federation, 46.57% of the market value of industrial enterprises formed at the end of 2011 was lost, on average per year during this period the cost decreased by 18.86%.

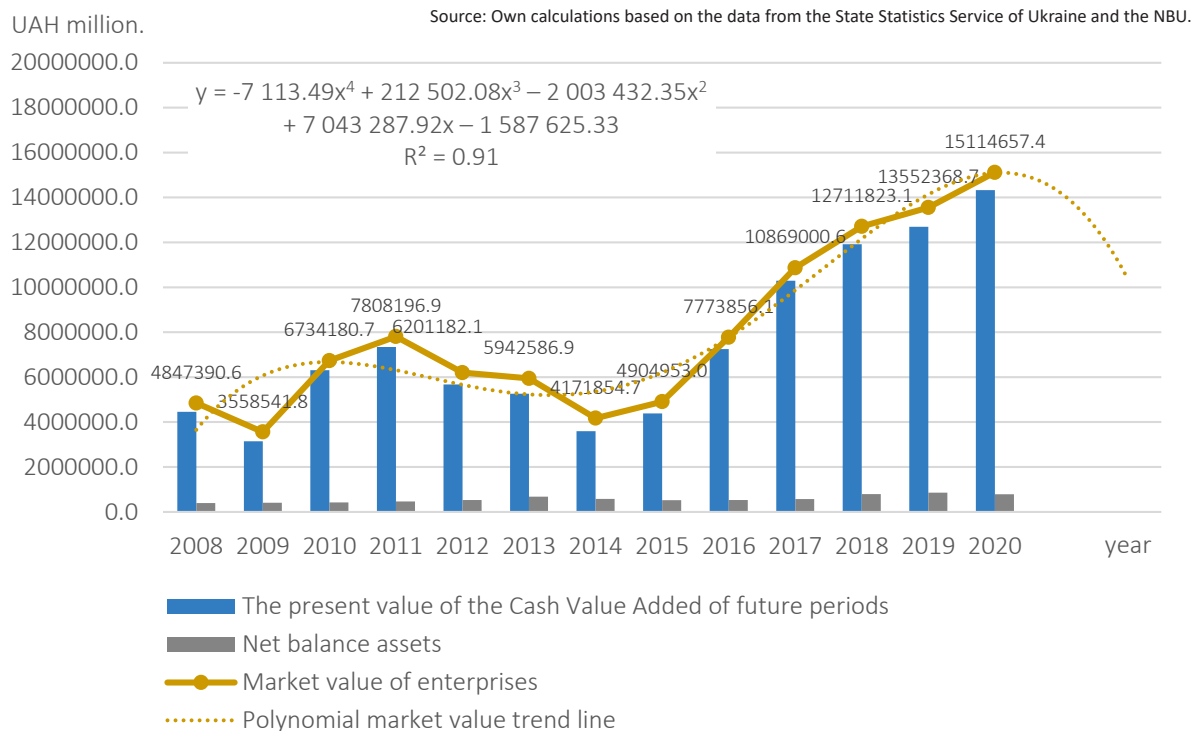


Figure 2. Dynamics of the aggregate market value of Ukrainian industrial enterprises, calculated by the CVA indicator in 2008–2020

Given the open military aggression at the beginning of 2022, this factor caused the new period of created value destruction. At the same time, it is quite pessimistic that these processes coincide in time with the beginning of the recession stage in the next economic cycle of market value formation, which is clearly shown on the forecast trend line of the market value of industrial enterprises of Ukraine in Figure 2. The coefficient of determination of the polynomial trend is 0.91 and is statistically significant by Fisher's test, indicating that 91% of the market value is explained by the regression equation used for forecasting.

The impact of war on market value should be manifested, first, through changes in the effect of the exploitation of financial liabilities and financing effect, which show the differential impact of changes in the internal and external business environment of enterprises in wartime.

In the wartimes, the main direction of influence on the enterprises market value is the financing effect. It is an external effect caused by the action of factors exclusively of the external business environment. The ability of this effect to reflect riskiness that conditions the ability to be an indicator of the war impact on the formation of the enterprises market value.

The mechanism of the financing effect assumes that the market value is created under the condition that it is not profitable for the enterprise to refuse the use of its own capital in favor of the formation of liabilities in the same volumes.

In the context of war, estimates of the financing effect and effect of liabilities exploitation should take into account the Kane-Essian argument (Markwell, 2006), which in this case may mean that the increase in the effect of exploitation of obligations and/or the decrease in the financing effect in wartimes cannot be considered as an unambiguous and indisputable evidence of a positive influence on the formation of the market value of an enterprise, if such an enterprise successfully functioned in the economy even in the absence of war.

This provision can be considered by clearing the value of the effects obtained for estimates of the

market value of enterprises in the wartime from the part whose achievement was ensured in pre-war peacetime:

$$EMV_L^{norm} = MV_L^W - \overline{MV}_L, \quad (6)$$

$$EMV_{FL}^{norm} = MV_{FL}^W - \overline{MV}_{FL}, \quad (7)$$

where EMV_L^{norm} , EMV_{FL}^{norm} – normalized indicators of the effects of exploitation of liabilities and of financing, respectively; MV_L^W , MV_{FL}^W – respectively, indicators of the effects of exploitation of liabilities and of financing in wartime; \overline{MV}_L , \overline{MV}_{FL} – respectively, indicators of the effects of the exploitation of liabilities and of financing in the pre-war period.

Since the size of the effects is changed annually, we believe that in the process of such normalization it is appropriate to use the average annual size of the effects in the pre-war period. At the same time, the period for which data are taken for averaging should correspond to the war duration at the time of assessing the impact of the war on the formation of the market value of enterprises.

In the process of analyzing, it is advisable to calculate the coefficient of the ratio of the financing effect and the effect of liabilities exploitation (Boiarko, 2019), which serves as a measure of the efficiency of the processes of generating market value by enterprises.

As can be seen from the dynamics of the ratio of the effects of Figure 3, in 2014, with the beginning of the war on the territory of Ukraine, the country's industrial enterprises lost 43.61% of the potential annual increase in market value due to the negative impact of the financing effect. In 2016–2017, there was a decrease in the ratio of the effects of Ukrainian industrial enterprises (to 31.91% and 22.88%, respectively, in 2016 and 2017). At the same time, since the level reached in 2017 is lower than the average value of the ratio of effects calculated for the period 2008–2020 (24.97%), it can be argued that the negative impact of the financing effect was minimized to historically formed acceptable values. In 2018–2019, the deterioration of the conditions for the formation of the market value of industrial enterprises in Ukraine is evidenced by the increase in the ratio of the effects compared

Source: Own calculations based on the data from the State Statistics Service of Ukraine and the NBU.

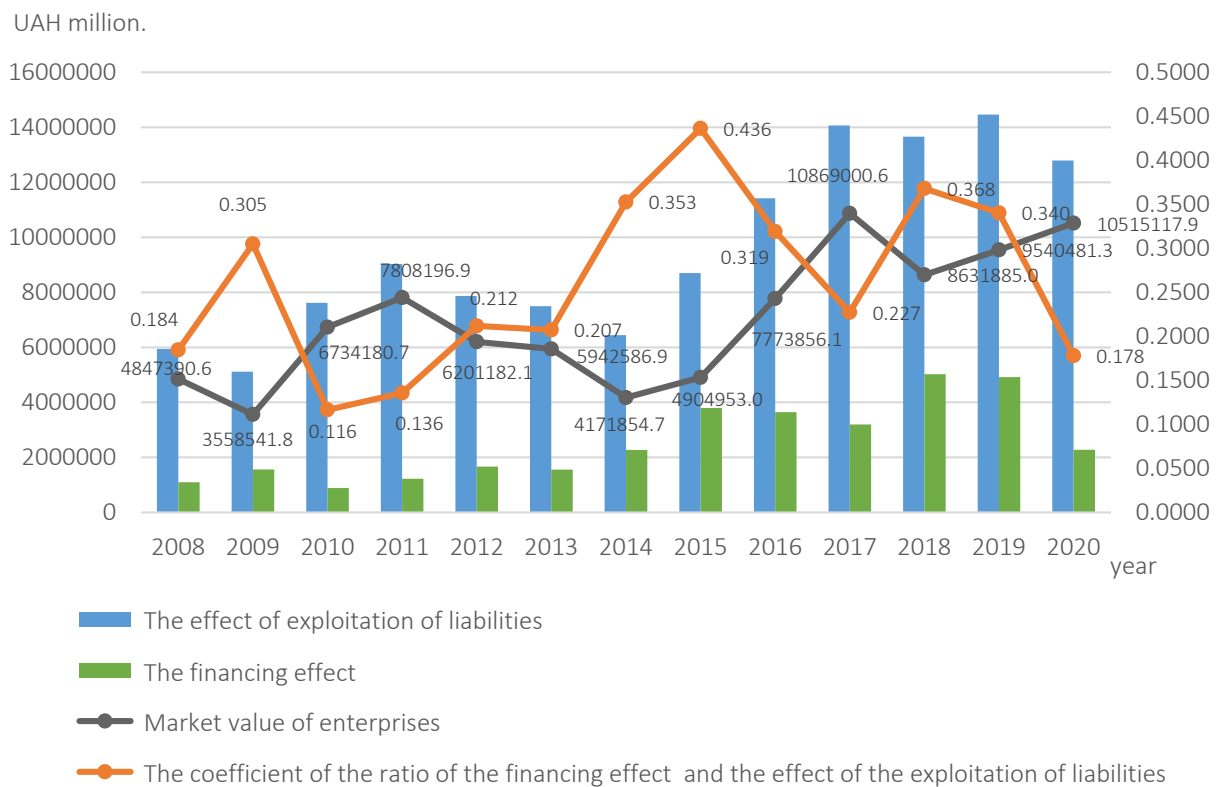


Figure 3. Indicators of formation of the industrial enterprises' market value in Ukraine in 2008–2020

to 2017 (up to 36.8% and 34.0% in 2018 and 2019, respectively). However, in 2019–2020, the studied ratio decreased again, which indicates the existence in this period of favorable conditions for preserving the market value of enterprises formed in previous periods. In 2020, only 17.8% of the potential annual increase in market value generated by operating profit was lost because of financing effect, which is 1.9 times less than in 2019.

Fundamentally different results of the assessment of the war impact on the market value are provided by the application of the procedure of normalization of the effects proposed by us (Figure 4).

Considering Kane-Essian's argument (Markwell, 2006), the loss of the market value of industrial enterprises of Ukraine due to the war in 2014 amounted to UAH 1,676.8 billion, and as of the end of 2015 – UAH 1,166.9 billion. In 2016–2020, Ukraine's industry adapted to conducting business in the wartime, which proved to be able to obtain a positive effect in the form of generating added market value. As of the end of 2020, the normalized aggregate impact of the war on the

market value of industrial enterprises of Ukraine amounted to UAH 4,666.4 billion increase compared to the pre-war situation. At the same time, due to the use of internal reserves to increase the efficiency of economic activity, industrial enterprises of Ukraine ensured an increase in their market value compared to the pre-war period in the amount of UAH 5,612.1 billion 16.8% of this increase in market value was not achieved because of high financing risks in wartime, which led to the raising of capital on the financial markets by enterprises under unfavorable conditions for ensuring the growth of market value.

Thus, as of the end of 2020, the impact of the war factor amounted to 44.37% of the market value of Ukrainian industrial enterprises and had a positive character, stimulating the generation of added value due to the improvement of economic efficiency.

The Ukrainian economy managed to compensate for the lesion caused by the enterprises' loss in the annexed territories of Crimea and the captured territories of Donetsk and Luhansk regions in the first three phases of Russia's military aggression.

Source: Own calculations based on the data from the State Statistics Service of Ukraine and the NBU.

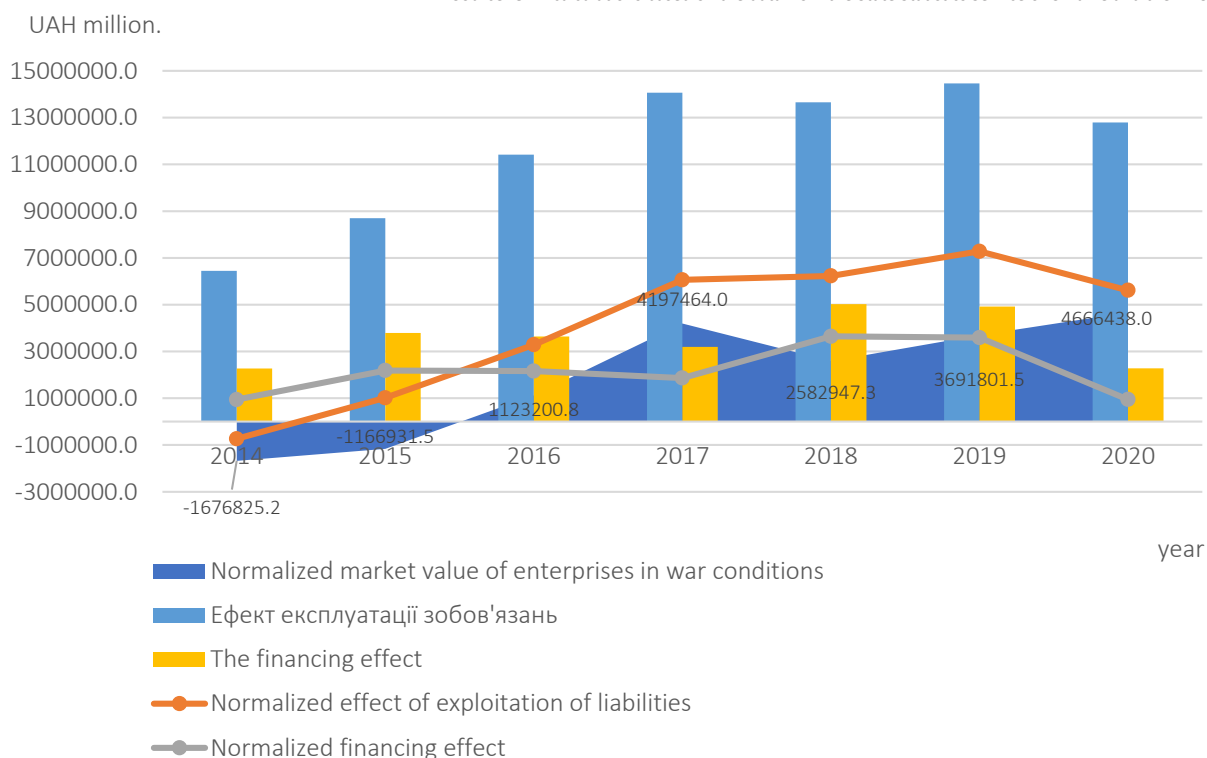


Figure 4. Actual and normalized indicators of the effects of the exploitation of liabilities and financing in the formation of the market value of Ukrainian enterprises in 2008–2020

This was achieved by increasing the efficiency of industry, as well as effective redistribution of displaced production capacities and resettled population. However, the large-scale invasion, which belongs to the fourth phase of Russia's military aggression against Ukraine, led to a significant destruction of the production potential and infrastructure of the country's economy. Such damage cannot be mitigated by intensifying the productivity of the remaining part of the country's industrial complex. Thus, according to the estimates of the Cabinet of Ministers of Ukraine, Russia has caused damage and destruction to Ukraine in the amount of 600-750 billion dollars as of the beginning of 2023. At the same time, according to World Bank experts, only the rapid recovery stage will cost 17 billion euros.

4. DISCUSSION

Ivanov's (2015) statement that "in the context of adequate consideration of the impact of the war factor in the structure of the market value of the enterprise, which is evaluated using the income

approach, it is necessary to identify the relevant costs as a burden on the net income stream of the given enterprise in wartimes", which "must be taken into account in aspects of the enterprise's risk consideration", seems indisputable. At the same time, this study allows us to state that the assessment of the war impact on the market value of enterprises using this approach should not be limited to the identification of relevant costs as a burden on the value because of the manifestation of relevant risks.

In the context of adequate consideration of the influence of the war factor, as well as in any other assessment setting, all basic assessment principles must be followed. The main one is the principle of the best and most efficient use of property. The implementation of these conditions is possible only with comprehensive consideration of both the economic costs and the economic benefits of the war in the assessment of the market value of enterprises.

Therefore, regardless of the correct understanding of the economic content of the war factor, Ivanov

(2015) offers a limited methodological toolkit for taking it into account in the estimations of the market value of enterprises, reducing the effect of this factor mainly to a destructive effect, and the evaluation methodology to the estimation of costs and losses.

At the same time, one should not forget that the economy of war is always a comparison of its economic benefits and costs. Therefore, the factor of war should not be reduced exclusively to factors that lead to economic losses, since some of them can have the character of economic benefits in certain cases. First, it concerns the stimulating effect on the economic activity of enterprises of the military-industrial complex. Therefore, when assessing the war impact on market enterprises, one should proceed from the possibility of obtaining both negative and positive effects.

This is clearly demonstrated by the obtained estimates of the dynamics of the market value of Ukrainian enterprises after 2014, when, regardless of the beginning of the war, during the evacuation of part of the industries from the annexed territories, the positive effects of the influence of the war factor prevailed over the negative ones and there was an increase in the market value of Ukrainian industrial enterprises.

This determines the possibility and necessity of a comparative analysis of various scenarios of adaptation of the enterprise to the wartimes to choose the most effective (optimal) option that ensures the achievement of the maximum market value of the enterprise as a complete property complex.

A comparison of the results of this study with the expert assessments of Ukraine's losses in the war presented in the literature review (KSE, 2022; Vdovichenko & Lepushynskiy, 2002) allows us to state that the losses for five months of open aggression and large-scale invasion are from 8 to 11% of the limit indicator the maximum possible losses as a result of this war. At the same time, the corresponding estimates of the damage caused to the assets of industrial enterprises during the year of the full-scale war, according to the KSE estimates (KSE, 2023), as of the beginning of March 2023, amounted to USD 11.3 billion, which is 32.9% of the specified maximum possible losses.

In further studies, important tasks may be to identify differences in the impact of the war factor on the market value of enterprises in the conditions of its hybrid form and open military aggression, as well as substantiation of the amounts of compensation for the damage caused by reparation payments.

CONCLUSIONS

To implement the research task of assessing the war impact on the market value of Ukraine's industrial enterprises, the method of calculating the market value based on the added operating cash flow, which is formed because of the interaction of two components – the effect of exploitation of liabilities and the effect of financing, was applied. Due to the use of internal reserves to increase the efficiency of economic activity, industrial enterprises of Ukraine had the opportunity to ensure an increase in their market value in 2020 compared to the pre-war period in the amount of UAH 5,612.1 billion. 16.8% of this increase was not achieved because of high financing risks in wartime.

To implement the research task of assessing the war impact on the market value of Ukraine's industrial complex enterprises, the method of calculating based on the added operating cash flow was applied. Due to the use of internal reserves to increase the efficiency of economic activity, industrial complex of Ukraine had the opportunity to ensure an increase in enterprises market value in 2020 compared to the pre-war period in the amount of UAH 5,612.1 billion. 16.8% of this increase was not achieved because of high financing risks in wartime.

The study made it possible to formulate the following recommendations regarding the methodological features of assessing the impact of the war factor on the market value of enterprises:

- 1) such an impact may be manifested through changes in the liabilities exploitation effect and financing effect, which show a differentiated impact from changes in the internal and external business environment of enterprises in wartimes;
- 2) considering the principle of the best and most effective use, in the war impact evaluations on the enterprises market value, it is recommended to proceed from the possibility of receiving both negative and positive effects. Thus, according to the estimates, in 2014–2020, the total market value of industrial enterprises of Ukraine increased by 3.62 times, the average annual growth rate was 16.8%.
- 3) the financing effect, which is caused by the external influence of the business environment, in the conditions of war has the character of economic losses. According to our estimates, 16.8% of the potential increase in market value of the industrial complex enterprises of Ukraine of the end of 2020 was not achieved due to the financing effect;
- 4) the Kane-Essian argument should be considered in assessments of the effects of war. For this purpose, the calculation of normalized values of effects can be carried out (that is, excluding the change in the market value, which was ensured in pre-war peacetime). So, if, without taking this argument into account, the dynamics of indicators indicated that the influence of the war factor on the aggregate market value of industrial enterprises of Ukraine during 2014–2020 was generally positive, then the analysis of normalized indicators proved that the loss of the market value of industrial enterprises of Ukraine from the war of the conflict in 2014 amounted to UAH 1,676.8 billion, and as of the end of 2015 – UAH 1,166.9 billion;
- 5) the maximum marginal value of the negative impact is equal to the market value in pre-war peaceful conditions, at the time of the beginning of a certain war or its certain phase. For the war in Ukraine, this is the estimate of the market value of industrial enterprises in 2013 – UAH 5,942.6 billion or USD 743,8 billion;
- 6) loss assessments based on the book or recoverable value of destroyed and damaged enterprise property can be useful mainly for assessing of investment needs for the restoration of lost property. It is expedient to assess the compensation for war damage using the method of calculating the added cash flow. This allows taking into account indirect losses.

AUTHOR CONTRIBUTIONS

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