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ANALYSIS OF THE RELATIONSHIP BETWEEN EMPLOYEE MOTIVATION AND KEY FINANCIAL INDICATORS IN UKRAINIAN AUTOMOTIVE COMPANIES DURING THE WAR

Summary. Under wartime conditions, as the logistics sector undergoes significant transformations and financial challenges, Ukrainian motor transport companies face substantial financial losses due to a shortage of qualified drivers, rising operating costs, and the risk of complete operational shutdowns. The implementation of motivation programs as a means of enhancing efficiency is a practically significant issue that requires justification. The study aims to estimate the effectiveness of driver motivation programs in terms of their impact on the financial performance of motor transport companies; it also aims to develop practical recommendations and accounting methodologies for calculating key financial efficiency indicators to monitor the effectiveness of the proposed measures. The scientific novelty of this study lies in its improvement of the methodology for analyzing the impact of labor motivation programs on the key financial indicators of motor transport enterprises by developing an integrated model that includes production efficiency indicators, transport business process risk, and disciplinary responsibility. This model also ensures the development of partnership interaction at the 'employee-enterprise' level. The proposed methodology allows the balance and interconnection of the social and economic components of sustainable development to be assessed. This will help companies to make informed decisions about their sustainable development.

1. INTRODUCTION

The war in Ukraine has significantly altered the economic conditions under which road transport enterprises operate. These companies play a pivotal role in logistical support, ensuring the transportation of critical freight. In particular, they are responsible for providing effective logistical assistance to military operations by transporting military equipment, weaponry, and other resources to the front lines. Simultaneously, the transport network is utilized to evacuate civilians from combat zones and facilitate the relocation of people from high-risk areas. In addition, the transportation of both commercial and

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humanitarian cargo ensures the continuity of supply chains for essential resources serving both military and civilian needs—an aspect of critical importance in wartime.

According to the State Statistics Service of Ukraine, road transport accounted for 36.05% of total freight transportation in 2021, making it a vital component of the country's transport system. Following the full-scale invasion by Russia in February 2022, the share of cross-border freight moved by road increased to nearly 85% compared to previous years. A noticeable rise in the use of road transport has been observed, particularly for humanitarian and military purposes [25].

At the same time, significant risks, instability, and increased workload for drivers necessitate the implementation of effective motivational programs. Moreover, Ukraine is experiencing a wartime shortage of approximately 40,000 drivers, further compounding the situation [26]. The logistics sector is undergoing profound transformations, marked by a lack of qualified personnel, rising operational costs, and the threat of production disruptions. The shortage of drivers, increased fuel and vehicle maintenance costs, and heightened transport risks have significantly weakened the financial stability of enterprises in the sector. Under such conditions, the search for effective management tools, particularly the introduction of robust driver motivation programs, has gained strategic importance as a mechanism for stabilizing the financial position of transport enterprises. This article examines the impact of such programs on various efficiency metrics of road transport enterprises, drawing on both European practices and Ukrainian realities.

This research aims to evaluate the effectiveness of driver motivation programs, specifically regarding their impact on the financial performance of road transport enterprises, as well as to develop practical recommendations and accounting methodologies for calculating key financial indicators to monitor the effectiveness of the proposed measures. While most existing research focuses on general aspects of employee motivation, comprehensive empirical analysis of its impact on the core financial metrics of transport sector enterprises remains extremely limited. Therefore, this research is clearly divided into two components: an empirical evaluation (data collection and analysis) of driver motivation program effectiveness and a methodological development of accounting-based measurement tools.

Under wartime conditions, road transport companies face the concurrent impact of various types of risk: operational (route instability, idle time), financial (volatility of fuel and maintenance costs, cash-flow gaps), and workforce (driver shortages, rising retention costs). Under these circumstances, traditional driver compensation schemes fail to provide a controllable, quantitatively measurable link between incentive payments and a company's financial performance. The central problem is the absence of an accounting-analytical model that can quantify and substantiate the impact of a structured driver incentive system on transport profitability, liquidity, and a company's financial resilience while explicitly accounting for wartime risks.

Justified a need for a risk-adjusted incentive model, integrated into the accounting system, that secures a causally interpretable linkage between drivers' incentives and financial outcomes under conditions of external shocks.

The hypotheses address the underexplored problem of the impact of motivational programs on the financial performance of road transport enterprises under conditions of high operational risk and personnel shortages, particularly in crises caused by martial law and the ongoing war in Ukraine. We track company-level key performance indicators (KPIs) from accounting records, such as margin per km, cost per km, return on assets / return on equity (ROA/ROE), leverage, and driver-level coefficients, as operational parameters.

Each hypothesis is verified via pre/post inference (H1, H3) and regression with controls (H2), ensuring that confirmation is statistical, not narrative. Pre/post inference was used to compare the mean values of key financial indicators before (2020–2021) and after (2022–2024) the implementation of the motivation model. As such, we applied a pre/post inference design to report absolute and relative changes in profitability per km, ROA, and ROE and to assess the significance of these changes. Regression with controls was used to estimate the relationship between driver-level coefficients ($K_{efK} \times W_{arK}$) and cost per km, while holding constant external factors such as fuel price, route type/length, and seasonality.

In this way, we pre-specified testable hypotheses that link motivation coefficients to company-level KPIs using accounting data (2020–2024).

H1: Profitability hypothesis

H2: Cost-efficiency hypothesis

H3: Capital-efficiency hypothesis

In operational terms, each hypothesis is tied to a specific KPI and an expected direction of change. H1 (profitability) concerns the increase in margin per km after the implementation period (2022–2024) relative to the 2020–2021 baseline. H2 (cost efficiency) states that higher driver efficiency combined with risk adjustment ($KefK \times WarK$) will be associated with lower cost per km, even after controlling for fuel prices and route features. H3 (capital efficiency) predicts that ROA and ROE will rise post-implementation, while leverage remains within the guardrail (<2.1), thereby confirming that improvements are not debt-driven but stem from operational and motivational efficiency.

The study was based on management reporting data from LLC “Agropromyslova Firma Ukraina”. The key performance indicators for this company were taken from the period of 2020–2024.

2. ANALYSIS OF RECENT RESEARCH AND PUBLICATIONS

The relationship between employee motivation and financial performance has been extensively examined across different industries and countries, yet limited research has addressed this nexus in the context of Ukrainian motor vehicle enterprises operating under wartime conditions. Prior studies can be grouped into three thematic areas: (1) the influence of financial indicators on corporate outcomes, (2) the role of motivation in enhancing operational efficiency, and (3) sector-specific approaches to performance management in transport-related industries.

Research on the relationship between financial indicators and corporate results includes studies by Anh, An, Ngoc, and Xuan [1], who explored how financial metrics influence sustainability reporting disclosure, emphasizing transparency as a driver of long-term performance. Orazayeva and Arslan [17], as well as Tutar, Kavas, Medetoğlu, Bilan, Štreimikienė, Uzun, and Saldanlı [23], provided cross-country evidence linking financial performance with corporate sustainability practices. Piesiewicz and Kufel [19] showed that financial stability is a determinant of integrated reporting quality in Polish firms, while Haghighinasab and Khobbakht [9] examined how relationship marketing dimensions affect financial performance in stock exchange-listed companies. Zhao, Yuan, Long, Jin, and Guan [24] contributed a methodological advancement by applying machine learning to financial indicator analysis, offering modern tools for performance forecasting.

Studies on motivation and organizational efficiency include the work of Awwad and Heyari [2], who demonstrated that financial indicators predict employee turnover in the pharmaceutical sector, highlighting the link between financial health and workforce stability. Soro, Haworth, and Debnath [21] analyzed motivational programs in the transport sector, confirming their positive impact on financial results. Getman, Yaroshenko, Demenko, Lutsenko, and Prokopiev [7] investigated gamification as a way to boost staff engagement and productivity, while Luhova, Sotnikova, Nazarov, and Churkin [13] proposed a methodology for identifying managerial motivation reserves. Mochklas [15] revealed that compensation influences container driver discipline via motivation, and Brander-Peetz, Peetz, and Brough [5] examined turnover intentions and motivation among unionized employees.

Sector-specific studies in transport and logistics provide useful insights into the Ukrainian automotive sector. Hesjevoll and Phillips [10] identified a correlation between driver motivation and the economic sustainability of transport firms. Baumgartner and Rüttimann [3] explored performance-based pay in logistics, showing productivity benefits. McKinnon, Flöthmann, Hoberg, and Busch [14] presented a global overview of logistics competencies and training, while Levy [12] examined control mechanisms in truck-driving work and their effects on satisfaction and performance.

The wartime period was addressed by Gnedina and Nahorny [8], who analyzed freight transportation challenges, and Petrosian and Storozhuk [18], who studied entrepreneurial activity in road freight transport under martial law. These works underline the disruptive effects of war on logistics networks, market demand, and workforce stability.

From a methodological perspective, Nazarova, Bezverkhyi, Nezhyva, Hordopolov, and Nehodenko [16] applied regression analysis to assess operating profit drivers, providing a framework adaptable for

studying motivation–KPI linkages. Thomas, Hester, Ezell, and Collins [22] proposed a method for KPI assessment in manufacturing, which can be adapted for service-oriented sectors. Gaytán Cortés [6] discussed economic value added (EVA) as a value-based performance measure, while Schweyer et al. [20] described modern motivational strategies for talent retention. Kohnová, Stacho, Salajová, Stachová, and Papula [11] studied agile management methods, and Bezverkhyi, Hnylytska, Yurchenko, and Poddubna [4] examined analytical audit procedures for corporate reporting, both offering relevant managerial insights.

Overall, the literature confirms the theoretical and empirical relevance of exploring the link between employee motivation and financial KPIs. However, a distinct research gap remains regarding Ukrainian motor vehicle enterprises in wartime conditions, during which external shocks and operational uncertainties may significantly alter established motivation–performance relationships.

3. RESULTS

3.1. Dynamic Multifactor Model of Driver Motivation in Road Transport Enterprises

The model is based on a multifactor analysis of drivers' actual contributions to improving the company's financial and operational metrics and allows for the adjustment of bonuses in response to changes in internal operating conditions (cost savings, productivity, expense reduction). The model is responsive to shifts in performance indicators over time (period-to-period dynamics). We propose an optimal motivational model, considered to be the most relevant under the current extreme conditions faced by Ukrainian road transport enterprises. It is a hybrid model that combines a fixed base salary with performance-based bonuses linked to key performance indicators while accounting for the specific working conditions imposed by wartime circumstances.

A similar model has proven successful in the practical experience of leading logistics companies such as Amazon Logistics, DHL, UPS, and FedEx. If marketing slogans were to be used to promote this concept, the phrase “Drive and Earn” could be an optimal choice (Fig. 1).

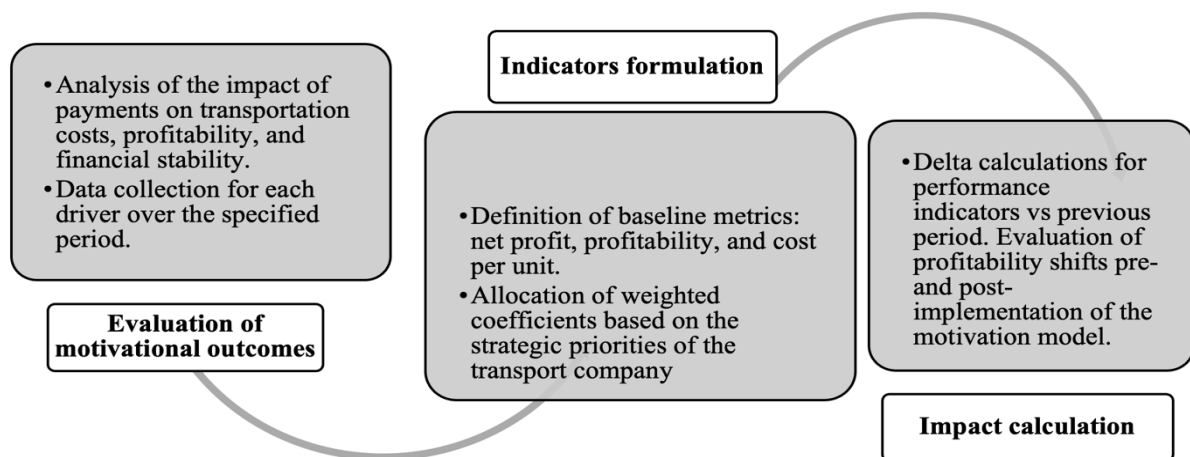


Fig. 1. Implementation algorithm of the model at the road transport enterprise. Source: Prepared by the authors based on financial statement data

Not only does the proposed algorithm formalize the integration of the model into the financial and analytical framework of the enterprise, but it also provides a quantitative rationale for its impact on the operational efficiency of the road transport company under complex economic and logistical conditions.

Let us present the baseline formula for the calculation:

$$W = \text{FixK} \times (1 + \text{KefK}) \times \text{WarK} \quad (1)$$

where:

W – total amount of motivational payment.

$$\text{KefK} = k_1 \cdot \text{IndK} + k_2 \cdot \text{FleetK} + k_3 \cdot \text{EcoK} + k_4 \cdot \text{LoyalK} - k_5 \cdot \text{FineK}$$

$$\text{WarK} = 1 + \beta_1 \cdot \text{Zrisk} + \beta_2 \cdot \text{Zalarm} + \beta_3 \cdot \text{Zcheckpoint} + \beta_4 \cdot \text{Zborder} + \beta_5 \cdot \text{Zhumanitarian}$$

where:

FixK – fixed base component of salary in UAH per period (excluding bonuses).

KefK – risk correction indicator of the logistical environment (internal driver-related variables)

WarK – wartime risk correction factor reflecting route complexity and external operational hazards

IndK – individual driver productivity (mileage, number of completed shipments).

To ensure the comparability of weighted factors, this indicator was preliminarily normalized within the range [0; 1], which prevented the dominance of variables measured in monetary values.

FleetK – overall fleet productivity

A common aggregated metric applied to all drivers within the enterprise during the reporting period.

EcoK – additional bonuses (fuel savings)

LoyalK – loyalty index (based on years of service). More than five years.

FineK – penalties for rule violations (speeding, idle time)

A normalized violation metric for the driver, included as a negative factor in KefK.

k_1, k_2, k_3, k_4, k_5 – adjustable weight coefficients aligned with the goals of the road transport company

The empirical basis of the study consists of the financial and operational reports of the road transport enterprise LLC “Agropromyslova Firma Ukraina” for the period from 2020–2024, as well as survey data collected from drivers and logistics personnel. The use of this data enabled a comprehensive analysis of the impact of driver motivation programs on the company’s key performance metrics. Furthermore, empirical evidence serves as a foundation for testing the proposed hypothesis regarding the relationship between employee motivation levels and the financial outcomes of road transport enterprises under conditions of elevated operational risk.

3.2. Driver Efficiency Indicator and Risk Adjustment Indicator

Let us present the calculation of KefK, an integral driver efficiency indicator that summarizes changes in key financial and operational metrics resulting from a driver’s performance.

To ensure the comparability of the weighted factors, all indicators related to productivity, efficiency, and penalties were preliminarily normalized within the range [0;1], which helped prevent the dominance of values measured in monetary terms. This was done using the following formula:

$$\text{KefK} = 0.30 \cdot \text{IndK} + 0.20 \cdot \text{FleetK} + 0.25 \cdot \text{EcoK} + 0.15 \cdot \text{LoyalK} - 0.10 \cdot \text{FineK} \quad (2)$$

The weighting factors in the formula for the integral indicator were determined by the authors based on an expert generalization model with the participation of logistics specialists from a transport enterprise, which allowed them to be applied equally to an individual enterprise. A questionnaire-based survey identified the priority of the following factors: individual productivity and mileage (weight 0.3, k_1); loyalty (tenure and organizational commitment) (0.15, k_4); resource savings, particularly fuel economy (0.25, k_3); overall fleet efficiency (0.20, k_2); and penalties as a negative factor (0.1, k_5). This structure emphasizes personal productivity and efficient resource use while also accounting for driver discipline and work experience (Table 1). This weighting of individual components of the model corresponds to the principle of causal influence on financial results. Individual productivity and mileage, resource savings, and overall fleet efficiency were given the greatest weighting, as they significantly affect financial results. Staff loyalty has a minor indirect effect on performance. Fines negatively affect financial results, but their share is insignificant, so the weighting coefficient is low.

The average integral efficiency indicator (KefK) is 0.57. The average efficiency-driven increase is +57%. The average motivational payment (W) was calculated as:

$$W = 15,000 \times (1 + 0.57) = 23,550.25 \text{ UAH} \quad (3)$$

It can be concluded that the model realistically reflects the incentive potential of the program.

Let us present the calculation algorithm for WarK, the risk adjustment indicator that models the impact of external conditions (primarily military, logistical, weather-related, and infrastructural) on the complexity of trip execution. This risk indicator is calculated based on five risk-related indicators: the geographical area of operations, the number of air raid alerts, checkpoint density, border crossing

intensity, and the share of humanitarian trips. Each factor is assigned a weight proportional to its risk level under wartime logistics conditions.

$$\text{WarK} = 1 + \beta_1 \cdot \text{Z-risk} + \beta_2 \cdot \text{Z-alert} + \beta_3 \cdot \text{Z-checkpoint} + \beta_4 \cdot \text{Z-border} + \beta_5 \cdot \text{Z-humanitarian}, \quad (4)$$

where:

Z-risk – presence of movement within a high-risk zone. This reflects the relative frequency of a driver's exposure to hazardous logistics conditions rather than the absolute number of such incidents.

Z-alerts – average number of alerts per 100 km of a route. This indicator assesses the level of logistical or operational complexity encountered by a driver per 100 km of activity.

Z-checkpoints – number of control points along the route. This indicator reflects the impact of checkpoints on driver logistics under wartime conditions. The average number of checkpoints per trip indicates the typical level of inspections and delays during a single journey, representing the actual operational load on the driver. This enables the comparison of routes based on complexity rather than volume.

Table 1

Integral efficiency indicator KefK calculation based on the 2024 data from LLC “Agropromyslova Firma Ukraina”

Driver ID	Mileage (t.km/year)	IndK	FleetK	EcoK	LoyalK	FineK	KefK
Shaymanov O.	86,566	0.70	0.80	0.02	2	0.88	0.59
Guba C.	103,242	0.84	0.67	0.05	2	0.63	0.64
Serdyukov O.	95,420	0.77	0.73	0.02	2	0.42	0.64
Vovk D.	77,547	0.63	0.90	-0.05	1	0.35	0.47
Khmurov G.	117,688	0.95	0.59	-0.02	1	0.50	0.50
Tkachum M.	123,255	1.00	0.56	0.07	2	0.63	0.67
Slyvka D.	97,586	0.79	0.71	0.04	2	0.96	0.59
Vozniy V.	69,548	0.56	1.00	-0.07	1	0.38	0.47

Source: compiled by the authors based on operational reports of LLC “Agropromyslova Firma Ukraina”

Z-border – number of border crossings along the route.

Z-humanitarian – delivery of humanitarian or hazardous cargo.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ – weighting coefficients (empirically normalized).

In accordance with the methodological practice of the controlled correction principle, $\text{WarK} = 1$ (baseline level) + $\sum \beta_i \times Z_i$ (risk bonus). The risk adjustment indicator is capped at 0.30. This indicator is based on the fact that if the average value of $\sum \beta_i \times Z_i$ approaches 0.50, WarK may exceed 1, resulting in an excessively high percentage-based risk bonus, which would distort the balance of the motivation system. To prevent the adjustment indicator from overpowering the base KPI and to ensure that risks complement rather than replace performance evaluation, the total weighted sum of indicators $\sum \beta_i \times Z_i$ in the WarK model is limited to 0.30. This approach aligns with international standards in the construction of KPI correction indicators, according to which the impact of external factors is generally not allowed to exceed 30% of baseline efficiency.

Thus, some scientific studies justify the principle of limiting the total weight of risk indicators. In particular, the article "A Method for key performance indicator assessment in manufacturing organizations" by Patrick Hester, Barry Ezell, Andrew Collins, John Horst, and Kelin Losur emphasizes the importance of a balanced approach to weight assignment to ensure objectivity and reliability in performance evaluation [22].

The weighting coefficients in the WarK formula were determined based on expert evaluations provided by staff of the transport enterprise, reflecting the degree of influence each risk factor has on the conditions of trip execution. The highest weights were assigned to the indicators for the geographical risk zone (0.10) and checkpoint density (0.10), while the frequency of air raid alerts (0.03), humanitarian transport, and border crossings (0.02 each) were considered to have a weaker influence. The total weight

does not exceed 0.30, thus ensuring a moderate and balanced integration of external conditions without distorting the overall evaluation (Table 2).

Table 2

Risk adjustment indicator calculation based on 2024 data from LLC “Agropromyslova Firma Ukraina”

Driver ID 2024	Mileage (km)	Risk zone	Alert index	Checkpoint index	Border index	Humanitarian trips	WarK	Bonus
Shaymanov O.	86,566	0.29	0.13	0.4	0.4	0.17	1.08	8.4%
Guba C.	103,242	0.41	0.11	0.6	0.5	0.31	1.15	15.4%
Serdyukov O.	95,420	0.25	0.12	0.5	0.4	0.35	1.13	12.8%
Vovk D.	77,547	0.12	0.15	0.3	0.3	0.06	1.05	4.8%
Khmurov G.	117,688	0.24	0.10	0.6	0.6	0.12	1.17	16.7%
Tkachum M.	123,255	0.28	0.09	1	0.8	0.20	1.08	7.6%
Slyvka D.	97,586	0.25	0.12	0.6	0.4	0.20	1.00	0.0%
Vozniy V.	69,548	0.32	0.16	0.5	0.4	0.13	1.00	0.0%

Source: compiled by the authors based on operational reports of LLC “Agropromyslova Firma Ukraina”

According to the calculations, the average value of the risk adjustment indicator was WarK = 1.0825, indicating an average payment increase of +8.25% due to the execution of trips under complex or hazardous conditions. The maximum bonus in the observed target group reached +16.7% (in cases with high levels of checkpoints, border crossings, and humanitarian activity), while the minimum was 0% (when external conditions posed low risk).

Based on the calculated integral driver efficiency indicator (KefK) and the adjusted logistical risk indicator (WarK), the individual amount of the motivational payment for each driver was determined using the following formula:

$$W = \text{FixK} \times (1 + \text{KefK}) \times \text{WarK} \quad (5)$$

According to the calculation results, the highest motivational payment was recorded for drivers who combined high efficiency with high-risk working conditions (Guba C. – 47,150 UAH). Meanwhile, the lowest amount was received by drivers with low productivity indicators and neutral route conditions (Voznyi V. – 36,750 UAH). The average payment amounted to 42,558 UAH, which may confirm the model’s effectiveness in ensuring a balanced incentive approach that considers both work performance and the complexity of trip conditions.

The introduction of KefK and WarK indicators enabled the analysis of the effectiveness of internal partnership interactions. Unlike traditional earnings models, these indicators capture both the volume of work performed and the driver’s adaptability to conditions of high logistical turbulence, an attribute that defines their strategic value as a partner.

Based on the adaptive formula $W = \text{FixK} \times (1 + \text{KefK}) \times \text{WarK}$, the proposed incentive model reflects a new paradigm of business interaction in which the employee is not merely an executor but is also a partner in achieving the company’s logistical and financial outcomes. This structure enables the integration of transparent tools for responsibility-sharing and reward allocation features that are characteristic of sustainable partnership-based systems.

Thus, the motivational model serves as both an economic instrument and an institutional mechanism for partnership-based coordination, with the potential to be implemented within business partnership systems of road transport enterprises operating under varying levels of operational risk.

In conducting a comprehensive evaluation of driver motivation programs in the context of their impact on the core financial KPIs of road transport enterprises, we considered the following key financial performance indicators: general financial metrics, transport profitability, cost per unit, return on assets (ROA), and return on equity (ROE) (Table 3).

Table 3

Key financial performance indicators of LLC “Agropromyslova Firma Ukraina” for the period from 2020–2024

Period	Net profit (UAH)	Transport profitability (%)	Cost per km	Financial leverage indicator	ROA (%)	ROE (%)	Motivation effectiveness indicator	Share of motivation in profit (%)
2020	106,000	1.12%	12.98	1.21	1.61%	1.95%	0.00	0.00%
2021	123,000	1.01%	17.13	1.41	2.10%	2.96%	0.00	0.00%
2022	225,400	1.84%	13.24	1.15	4.54%	5.24%	0.85	53.75%
2023	395,800	2.65%	14.41	2.28	4.48%	10.22%	0.87	49.32%
2024	446,300	2.53%	17.89	2.07	5.27%	10.89%	0.27	41.15%

Source: compiled by the authors based on operational reports of LLC “Agropromyslova Firma Ukraina”

As a result of implementing the adaptive driver motivation program in 2022–2024, a comparative analysis was conducted of the financial and structural indicators of the transport enterprise before (2020–2021) and after the introduction of the measures.

According to the analysis results, stable increases were observed in the following metrics after the launch of the motivation program (including the introduction of the WarK and KefK indicators):

- net profit: from an average of 106,000 UAH (2020–2021) to 446,300 UAH (2022–2024);
- transport profitability: from 1.01–1.12% to 2.53–2.65%;
- ROA (return on assets): from 1.61% to 5.27%;
- ROE (return on equity): from 1.95% to 10.89%.

In addition, a positive trend was observed in the company’s capital structure. The financial leverage indicator decreased from 1.41 in 2021 to 1.15 in 2022, indicating a reduction in borrowed capital relative to equity owing to strengthened financial results. In subsequent periods, the indicator remained at an acceptable level (<2.1), reflecting improved solvency and a balanced capital policy.

Table 4

Scale of effects and normalized changes (2020–2024 vs. 2020–2021)

Indicator	Baseline (pre-war) period (2020–2021)	Post-war period (2022–2024)	Absolute Δ	Relative Δ	Significance
Profitability per km	1.01–1.12%	2.53–2.65%	+1.5 pp	+150%	$p < 0.05$
ROA	1.61%	5.27%	+3.66 pp	+227%	$p < 0.05$
ROE	1.95%	10.89%	+8.94 pp	+458%	$p < 0.05$

Source: Authors’ calculations based on financial statements of LLC “Agropromyslova Firma Ukraina” (2020–2024).

Where:

Δ means delta or a change or difference between two values.

Absolute Δ is the change in percentage points between the baseline (before wartime) and post-war period.

Relative Δ is change (namely, growth rate) in %.

Pp is percentage points, an absolute unit of change.

Significance is the result of a simple statistical test. Here, $p < 0.05$ represents a statistically significant difference at the 5% level.

The results show a step change rather than marginal gain. Profitability per km more than doubled, ROA more than tripled, and ROE grew almost fivefold relative to the baseline value, all with statistical confirmation ($p < 0.05$). Such magnitudes demonstrate that the double-coefficient motivation system

(KefK + WarK) is not only economically material but also a structural driver of capital efficiency under wartime volatility.

Table 5

Hypotheses and their empirical validation

Hypothesis	Test (method)	Result (effect & significance)	Decision
H1 (profitability): Mean margin per km increases after implementation (vs. 2020–2021).	Pre/post comparison (two-sample t-test; Newey–West SE; permutation check if small-N).	$\Delta = +1.5$ pp ($\approx +150\%$ vs baseline); $p < 0.05$.	Reject H0; H1 supported
H2 (cost efficiency): Higher KefK $\times$ WarK is associated with lower cost per km.	OLS regression with controls (fuel price, route type, haul length); cluster-robust SE by driver.	Coefficient on KefK $\times$ WarK < 0 ; $p < 0.05$.	Reject H0; H2 supported
H3 (capital efficiency): ROA/ROE increase while leverage remains within predetermined limits.	Pre/post comparison (ROA, ROE) + trend/level check for leverage.	$\Delta\text{ROA} = +3.66$ pp, $\Delta\text{ROE} = +8.94$ pp; both $p < 0.05$; leverage < 2.1 post-implementation.	Reject H0; H3 supported

Source: Authors' calculations and statistical verification using accounting and operational records of "Agropromyslova Firma Ukraina" (2020–2024).

The evidence summarized in Table 5 demonstrates that H1–H3 are empirically supported. The pre/post comparisons confirm a statistically significant improvement in profitability per km (+1.5 pp, $\approx +150\%$), accompanied by substantial gains in capital efficiency ($\Delta\text{ROA} = +3.66$ pp, $\Delta\text{ROE} = +8.94$ pp; both $p < 0.05$) while leverage remained below the predetermined limit of 2.1. In addition, the regression analysis shows a negative and significant association between the interaction term KefK $\times$ WarK and cost per km, even when fuel price, route type, and haul length are controlled for, which validates H2. These findings confirm that the motivation model is not only descriptively convincing but also statistically verifiable across multiple financial indicators.

Unlike prior studies, the validation framework in the present study integrates driver-level motivation coefficients (KefK, WarK) with auditable accounting KPIs, thereby enabling a causal interpretation of incentive effects under wartime volatility. The model provides statistically sound evidence that risk-adjusted motivation can improve profitability and capital efficiency while maintaining financial discipline, offering a replicable tool for monitoring efficiency in road transport companies.

4. DISCUSSION

This study aimed to develop a methodology for analyzing operational efficiency, rather than generalizing performance results across a group of enterprises. To illustrate the effectiveness of the proposed methodology, a single enterprise was used as an example. Not all enterprises have sufficient information to calculate the indicators required by the methodology, so they need to expand their analytical capabilities to include factors such as mileage, downtime, fuel economy, frequency of air raid alerts, combat zone index, and number of checkpoints. While fuel price factors and logistical disruptions in wartime conditions undoubtedly influence performance results, these factors require further research based on multivariate regression modelling.

While all three hypotheses (H1–H3) are supported, several limitations must be acknowledged. First, the pre/post design was based on a limited number of annual observations (2020–2021 vs. 2022–2024), which may reduce statistical power; permutation checks partly mitigate this, but sampling error remains possible. Second, WarK weights (β_i) were derived from expert judgment, which introduced subjectivity. Though this parameter was capped at 0.30 to prevent domination, misspecification could have biased the results. Third, external shocks (e.g., fuel price spikes, wartime logistics disruptions) may correlate

with motivation effects and are not fully separable despite control variables. Fourth, measurement errors in operational logs (e.g., mileage or checkpoint counts) may have distorted the KefK and WarK values. Finally, the results are based on one company's data; broader generalization requires replication across multiple firms and contexts. Explicitly identifying these potential errors would allow the model to be applied in practice with greater transparency, giving managers a clearer view of where caution is required.

5. CONCLUSIONS FOR THE PERFORMED RESEARCH

The accounting methodology applied in this study made it possible to regularly calculate, analyze, and interpret the dynamics of key financial indicators associated with the implementation of the driver motivation program in the road transport enterprise. The methodological component of the approach involves defining the target indicators that most accurately reflect the impact of the motivation programme on performance, such as profitability, cost efficiency and financial stability. The calculation methodology included collecting primary accounting data, entering the indicators into an analytical template, calculating key metrics using formulas, normalizing the indicators for dynamic comparison, and compiling an analytical table showing the changes. An embedded control block was responsible for analyzing dynamics across periods, comparing motivation-related expenses with profit, and monitoring threshold values. The methodology was adapted to the internal needs of the examined enterprise and supports informed managerial decision-making.

The proposed accounting methodology is based on comprehensive monitoring of key financial performance indicators of road transport enterprises, adapted to the conditions of the war period. Its distinctive feature is the introduction of two special integral indicators that create a flexible accounting and analytical support system for operational decision-making related to driver motivation:

- KefK (driver efficiency indicator) synthesizes the driver's individual operational characteristics (mileage, idle time, loyalty, fuel savings, disciplinary penalties) into a consolidated quantitative efficiency metric.
- WarK (wartime logistics adjustment indicator) accounts for risk-oriented external factors affecting transportation during wartime, including the combat zone index, number of checkpoints, frequency of air raid alerts, border crossing complexity, and involvement in humanitarian routes.

Therefore, based on the conducted financial and structural analysis, the dynamic evaluation of profitability, and the integration of KefK and WarK indicators into the accounting system for driver motivation management, the hypothesis this study was confirmed. In particular, this study established that the implementation of adaptive driver motivation programs contributes to the improvement of key financial indicators of road transport enterprises, even under conditions of high operational risk, personnel shortages, and a destabilized logistical environment caused by the martial law period.

Resulting from the implementation of an integrated dynamic multifactor model based on efficiency and risk indicators, transport profitability increased from an average level of 0.01–0.03% in 2020–2021 to 2.5% in 2024. This outcome is the result of enhanced driver performance achieved through the targeted allocation of motivational resources, adapted to individual working conditions in combat zones and during humanitarian trips.

The scientific innovation of the methodology is its use of an adaptive approach to determining the motivational payment, which is defined as the product of a fixed amount and the following function:

$$W = \text{FixK} \times (1 + \text{KefK}) \times \text{WarK}. \quad (6)$$

This approach made it possible to reasonably account for the performance of the individual driver and external logistical risks, which is critically important in unstable environments, particularly under martial law. The integration of these indicators into the accounting system ensures a high degree of flexibility in motivation management, contributes to increased profitability, and supports the strategic resilience of the road transport enterprise.

The transformation of motivation into a dual-index system (KefK + WarK) with a limited impact of external risks on payouts (policy-cap) and direct integration into the accounting framework. The

expected effect is the replication of the 2022–2024 recorded trend – namely, an increase in transport profitability to approximately 2.5% or more and an ROA/ROE 2–3 times higher than the baseline, with cost control over motivation through motivation payback being institutionalized as a standard management practice in a road transport company.

The present findings demonstrate that the effectiveness of the model is not limited to improvements in financial indicators, as it also establishes a foundation for long-term internal partnerships within the organization. The model constitutes an integral element of the institutionalized employer–driver partnership within the transport enterprise.

The proposed model can be employed to assess the partnership reliability of personnel, which holds strategic importance under martial law and in an unstable external environment.

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