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LEGAL REGULATION OF HUMANITARIAN AID ACCOUNTING IN THE ARMED FORCES OF UKRAINE UNDER MARTIAL LAW

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ПРАВОВЕ РЕГУЛЮВАННЯ ОБЛІКУ ГУМАНІТАРНОЇ ДОПОМОГИ У ЗБРОЙНИХ СИЛАХ УКРАЇНИ В УМОВАХ ВОЄННОГО СТАНУ

The article investigates the legal framework and the internal control system that govern the accounting of humanitarian aid within the Armed Forces of Ukraine in a context of martial law. The research highlights critical issues such as the insufficient legal distinction between humanitarian and charitable aid, complexities in record-keeping and documentation processes, and the presence of risks associated with abuse and errors in accounting. The study employs a combination of doctrinal legal analysis, case studies from military practice, and statistical modelling to assess current mechanisms to enhance transparency, accountability, and efficiency in the management of humanitarian resources. A key finding is that a rigorous legal framework, coupled with formalised internal audits and unified primary documentation, significantly improves the accuracy and reliability of humanitarian aid accounting, thereby fostering public and international trust. Moreover, the article delves into the macroeconomic ramifications of military and humanitarian aid by modelling its relationship with

Ukraine's gross domestic product and institutional regulatory quality. This modelling reveals that military aid is a dominant driver of economic performance under martial law conditions, while robust institutional regulation complements this effect by promoting innovation and domestic defence production. Modelling involves an exploratory analysis of data on the indicators under study (gross domestic product, Ukraine's military commitments and the institutional environment development index) for Ukraine during the period 2022–2024. The Fuzzy-Set QCA method was employed to investigate causal relationships between variables, recalibrate indicators, construct an OLS regression model and perform a bootstrap analysis. Finally, a heat map of scenarios was constructed and the hypotheses were confirmed. The article concludes with a series of practical recommendations for regulatory reform, including the digitalisation and automation of accounting processes with a view to reducing human error and accelerating data processing. The objective of these improvements is to enhance Ukraine's defence capabilities. .

У статті досліджуються правові засади та система внутрішнього контролю, що регулюють облік гуманітарної допомоги в Збройних Силах України в умовах воєнного стану. Дослідження висвітлює такі критичні питання, як недостатнє правове розмежування гуманітарної та благодійної допомоги, складнощі в процесах ведення обліку та документації, а також наявність ризиків, пов'язаних із зловживаннями та помилками в обліку. У дослідженні використовується поєднання аналізу нормативно-правових засад, практичних аспектів та економетричного моделювання для оцінки існуючих механізмів підвищення прозорості, підзвітності та ефективності управління ресурсами, які надійшли як гуманітарна й благодійна допомога. Ключовим висновком є те, що наявна нормативно-правова база в поєднанні з формальними процесами внутрішнього контролю та належною обробкою первинних документів значно покращує точність і надійність обліку гуманітарної допомоги, тим самим сприяючи зміцненню довіри *громадськості та міжнародної спільноти. Крім того, у статті розглядаються макроекономічні наслідки військової та гуманітарної допомоги шляхом моделювання її взаємозв'язку з валовим внутрішнім продуктом України та якістю інституційного регулювання. Моделювання показує, що військова допомога є домінуючим фактором економічної ефективності в умовах воєнного стану, а надійне інституційне регулювання доповнює цей ефект, проте також мусить враховувати потребу в інноваціях та вітчизняному оборонному виробництві. Моделювання передбачає аналіз даних щодо досліджуваних показників (валовий внутрішній продукт, військові зобов'язання України та індекс розвитку інституційного середовища) для України у період 2022–2024 років. Для дослідження причинно-наслідкових зв'язків між змінними, перекалібрування показників, побудови регресійної моделі OLS та виконання бутстрап-аналізу було використано метод Fuzzy-Set QCA. Нарешті, було побудовано теплову карту сценаріїв і підтверджено гіпотези. Стаття завершується низкою практичних рекомендацій щодо реформи регулювання, включаючи цифровізацію та автоматизацію процесів обліку з метою зменшення людських помилок та прискорення обробки даних. Мета цих змін — посилення військово-економічного потенціалу України.*

Keywords: *military expenditures, humanitarian aid, OLS regression, legal regulation, Armed Forces of Ukraine, accounting, military commitments, defense industry.*

Ключові слова: *військові видатки, гуманітарна допомога, регресія OLS, правове регулювання, Збройні сили України, бухгалтерський облік, військові зобов'язання, оборонна промисловість.*

General description of the problem and its connection with important scientific or practical tasks. The problem is attributable to a number of factors. Firstly, the lack of proper distinction between the concepts of “humanitarian aid” and “charitable aid” in the current legislation. Secondly, difficulties in the procedure for recording and documenting the assets received. Thirdly, the existence of risks of abuse or errors in accounting, which may adversely affect the efficient use of resources.

In view of this, research into the specifics of legal regulation and internal control in the field of humanitarian aid accounting in the Armed Forces of Ukraine is of not only scientific but also practical importance. The objective of the initiative is to identify methodologies for enhancing the documentation and control mechanisms in place. These enhancements are expected to contribute to the enhancement of transparency, the consolidation of societal trust, and the optimisation of the utilisation of aid in the context of national defence capabilities.

Analysis of recent studies and publications. In the works of both domestic and foreign experts, the issue of transparency and effectiveness of humanitarian aid accounting in emergency situations is examined from various angles. In particular, Ukrainian scholars consider the problems of normative differentiation between charitable and humanitarian aid, focusing on the complexities of accounting procedures and the risks of abuse in accounting [7]. Foreign studies emphasise the application of international public sector standards, the introduction of transparent internal control mechanisms, and the use of digital tools to improve the efficiency of documentation. At the same time, a significant part of the work emphasises the importance of donor and public trust, which directly depends on the accuracy and timeliness of accounting for humanitarian resources [9].

Formulation of the article's objectives (setting the tasks). The purpose of this study is to examine the peculiarities of the legal regulation of the processes of receiving, accounting for, and using humanitarian aid in the Armed Forces of Ukraine under martial law. In order to achieve this objective, the following tasks must be completed:

1. The present study seeks to analyse the existing internal control mechanisms in humanitarian aid area.

2. The identification of problematic aspects and the proposal of resolutions to address them in order to enhance transparency, efficiency and accountability in the utilisation of humanitarian resources.

3. To explore the relationship between Ukraine's gross domestic product (hereinafter — GDP) and the material and financial support it receives from its international partners.

In accordance with the objectives, hypotheses are formulated that require testing:

The first hypothesis posits that, under the regime of martial law, the quality of humanitarian aid accounting in military units of the Armed Forces of Ukraine is largely determined by the synergy of clear legal regulation and an effective internal control system. In other words, a clear legal distinction between the concepts of “humanitarian” and “charitable” aid, the use of standardised primary documents, regular audits and formalised control procedures together create conditions for high transparency of accounting, reduction of errors and risks of abuse in the use of humanitarian resources.

The second hypothesis posits that during a period of martial law, an increase in military aid (Military Commitments) combined with a deterioration in the regulatory environment (Regulatory Environment Index) hinders innovative development in the country. Conversely, the redistribution of financial resources from external charitable aid to centralised state procurement of domestic products has been demonstrated to engender increased innovation activity and the development of the defence-industrial complex. Consequently, the Ukrainian government would be well-advised to focus on reducing the role of excessive international aid in the military sphere and increasing its own production of necessary material and technical resources, as this would more effectively stimulate innovation.

Presentation of the main research material.

In order to establish a solid foundation for the study, it is imperative to differentiate between two interconnected yet legally independent concepts:

charitable assistance and humanitarian aid. In the context of martial law, where the allocation of free resources to the Armed Forces of Ukraine has increased significantly, the accurate classification of these resources becomes a matter of particular importance. This is not only from a legal regulatory perspective, but also in terms of accounting, financial control and reporting.

The legal basis for the provision of charitable assistance is defined by the Law of Ukraine "On Charitable Activities and Charitable Organisations" dated 5 July 2012 No. 5073-VI. In accordance with Article 1 of the Act, the term "charitable assistance" is defined as the gratuitous transfer of tangible or intangible assets (including property, funds, works, and services) by a benefactor to the recipient, with the objective of achieving a socially beneficial outcome, particularly in the domains of defence, healthcare, education, social protection, and other areas of social development [2].

The key features of charitable assistance, as a form of free transfer of tangible or intangible resources, are as follows:

1. The initiator is defined as the benefactor, which may be considered a natural or legal person, including a non-resident.

2. The provision of assistance may be effected either directly to the recipient or through a charitable organisation.

3. In the absence of specific provisions stipulated by law, no explicit authorisation from state authorities is necessary for its provision, with the exception of certain cases enumerated in legislation (e.g., the transfer of weapons, special equipment or personal protective equipment).

4. The nature of the intervention may be classified as either targeted or untargeted, with the former being directed towards the specific needs of the beneficiary.

In contrast, humanitarian aid, as defined by the Law of Ukraine "On Humanitarian Aid" of 22 October 1999 No. 1192-XIV, is a distinct category of targeted, targeted and free support in the form of funds, property or services. The provision of such assistance is exclusively designed to ensure the livelihoods and social protection of persons who find themselves in difficult life circumstances or who have suffered as a result of emergencies, armed conflicts or martial law [1].

The following characteristics define humanitarian aid:

1. The aforementioned item is subject to official recognition as humanitarian aid by a specially authorised commission under the jurisdiction of the Ministry of Social Policy of Ukraine. This commission is responsible for the registration and control of its circulation.

2. The organisation's purpose is defined in a narrow sense as follows: to meet basic needs, to provide medical, social or military support to people affected by emergencies, armed aggression or crisis situations.

3. In the majority of cases, it is derived via intergovernmental mechanisms or international cooperation, with particular emphasis on contributions from governments, international organisations, and diaspora associations.

4. The subject is subject to a special tax regime that provides for exemption from customs duties, value-added tax and other mandatory payments, provided that it is properly documented.

5. The implementation of mandatory targeted accounting, reporting and state control over the receipt, distribution and use of such aid is imperative.

In order to illustrate the practical mechanism for providing and accounting for humanitarian aid, it is recommended that the activities of the international organisation Charity Foundation Entrepreneurs for Peace be considered. This organisation regularly provides the Armed Forces of Ukraine with transport, material resources and other necessary property. In January of this year, the foundation donated a Peugeot Partner vehicle to one of the military units for the transportation of personnel, medicines and technical equipment in the eastern direction.

Following the receipt of the relevant documentation (acceptance and transfer act, declaration, etc.) by the military unit, the official responsible for the area is obliged to draw up a “receipt act”, “technical condition certificate” and, if necessary, “assessment certificate” in two copies — one for storage in the service, the other for the financial department. It is imperative that the documentation be accompanied by the signatures of the members of the commission, as stipulated by the annual order of the unit commander.

In addition, the signature of the commander and the official seal of the unit are requisite elements of the documentation. The concluding section of the act provides a concise overview of the vehicle, for instance: The commission has determined that it is appropriate to record the Peugeot Partner VIN#234242232343503 vehicle on the balance sheet of the military unit, in accordance with the established procedure and following receipt from the Charity Foundation Entrepreneurs for Peace.

The act of receiving humanitarian aid bears a strong resemblance to the act of receiving charitable aid in terms of form and content. However, it is important to note that additional requirements must be met when assessing value in the absence of a price during the act of acceptance and transfer. If the donor is an international organisation and specifies the value in a foreign currency, such as euros, such aid is to be recorded in the accounting records in the national currency. In such cases, the responsible individual is tasked with drafting a valuation report, in which they are required to document the sources employed to ascertain the fair value. Alternatively, the official exchange rate of the National Bank of Ukraine on the date of the receipt report may be applied.

In a streamlined process, in instances where the acceptance and transfer act already stipulates the price in the supplier's currency, it is advised to specify the following in the concluding phase of the receipt act: “The commission has determined that it is appropriate to record the Peugeot Partner VIN# 234242232343503 to the balance sheet of the military unit, received from the Charity Foundation Entrepreneurs for Peace, in accordance with the established procedure at a price of UAH 434,998.00 (NBU euro (EUR) exchange rate as of 21 January 2025 — 43.4998)”.

The “price” column should indicate, for example: “The amount of 10,000.00 UAH (equivalent to €434,998.00) is used to ensure the accuracy of calculations and transparency of valuation in accounting documents”.

When accounting for humanitarian aid, it is crucial that the accountant possesses a comprehensive understanding of the appropriate procedures for preparing and verifying the relevant documentation. In order to register a vehicle, it is necessary to compile a complete set of documentation, which must include the following:

1. The receipt certificate is hereby presented.
2. Should the situation arise, the provision of an appraisal certificate may be required.
3. The acceptance and transfer certificate is hereby acknowledged.
4. The following declaration is hereby made:
5. The vehicle technical condition certificate is a document that provides a detailed assessment of the vehicle's technical condition.
6. The present package is to be forwarded to the finance department, where the accountant will undertake an initial review to ascertain the accuracy of the completion.

It is imperative that the receipt contains a wet seal, the signature of the unit commander, the signatures of the commission, the registration number and date, as well as the price indicated in the national currency (hryvnia).

The valuation report and the technical condition report are subject to the same process of review.

It is imperative that the transfer and acceptance report is accompanied by the wet seals of the parties involved, their respective details, and the signature of the commander or deputy commander. In the absence of a price, the valuation report must be included.

The declaration is subject to a process of approval, which is formalised by the application of a seal.

Following the receipt of the documentation, the accountant is required to formally register the property of the military unit in accordance with the receipt certificate in an off-balance sheet account. In order to register property, military units are required to use either 011 or 021. However, in order to post such property to the main accounts, it is necessary to submit a package of documents to the Financial-Economic Governance (hereinafter — FEG) — second-level budget allocation administration.

1. The following is a synopsis of the particular fund indicators, in which the column entitled “Classification of budget revenues 25020200” is completed, and which is interpreted as follows: “Funds received by budgetary institutions from enterprises, organisations, individuals and other budgetary institutions for the implementation of targeted measures, including measures for the alienation for public needs of land plots and other immovable property located on them, which are privately owned by individuals or legal entities, and the line from ECCE (hereinafter — economic classification code of expenditure) 3110 “Purchase of equipment and items for long-term use”.

2. Calculation.

3. The present document is a Certificate of Receipt.

4. The primary acts encompass acceptance and transfer, declaration, and valuation, in instances where the stipulated price is absent or ambiguous in the act of acceptance and transfer, or if the price is specified in a foreign currency.

It is imperative that the transfer and acceptance report is accompanied by the wet seals of the parties involved, their respective details, and the signature of the commander or deputy commander. In the absence of a price, the valuation report must be included.

The declaration is subject to a process of approval, which is formalised by the application of a seal.

In order to ensure the maintenance of accurate accounting records, it is imperative that accountants are provided with comprehensive instructions on the proper method for completing the designated report. Following the collection of the complete documentation required for the registration of a vehicle (including reports on receipt, pricing, acceptance and transfer, declaration, and technical condition), the documentation is transferred to the finance department for an initial compliance check. This check includes the presence of a wet seal, the signatures of the unit commander, commission members, the registration number and date, and the correct indication of the price in national currency. This procedure constitutes an integral element of transparent and controlled accounting of humanitarian aid within the military unit.

At this point, it can be assumed that the military unit has completed the documentation of the charitable aid received. Concurrently, a compelling inquiry emerges, transcending the confines of microeconomics and extending to the macroeconomic realm. The issue at hand pertains to the duration of Ukraine's receipt of international material and financial support, which is instrumental in enabling the country to provide military units with the requisite material and technical resources.

To ascertain the extent of this financial assistance, it is recommended that the official statistics from the Kiel Institute in Germany be consulted [11]. These statistics illustrate the amount of aid provided to Ukraine by democratic governments worldwide (see Table 1). It is imperative to emphasise that a substantial proportion of international aid is of a purely temporary nature, necessitating that Ukraine focus on its own sources of revenue for the state budget and enhance its capabilities in the defence-industrial complex.

This may also indicate that it is advisable for military authorities to maintain existing policies and regulations regarding the procedure for receiving and accounting for charitable and humanitarian aid. In future, it is predicted that military units will purchase increasing amounts of necessary material and technical resources using state budget funds or receive the relevant resources through centralised supply.

Consequently, the indicators will be modelled. In order to accomplish this objective, the present study employs data on military aid furnished to Ukraine at no cost by allies (indicator, henceforth MC), data (index, henceforth referred to as RE) on the quality of institutional and legal regulation of innovation (which has the potential to provide military formations with the necessary material and technical resources with fewer obstacles by stimulating the production of military and dual-use goods), as well as data on Ukraine's gross domestic product (henceforth referred to as GDP), which may be contingent on both of the aforementioned indicators and the index.

Table 1. Values of the indicators studied

	2022	2023	2024	
Regulatory environment	61,6	58,9	25,3	
Military commitments	37868	92544,1	169504,6	*ml. EUR*
GDP	68766,2394	70511,92	72566,43	*ml. EUR*

Source: compiled based on [8; 10; 11; 12]

The following hypotheses will be tested:

1. The hypothesis that increased military aid increases GDP is tested in this study, with the caveat that this is contingent on the presence of adequate and high-quality legal and institutional regulation.

2. It is evident that enhancing the efficacy of legal and institutional regulation is conducive to an augmentation in GDP.

The subsequent discussion will commence with a preliminary exploratory analysis of the data (Table 2). The results of this analysis are displayed in the following table.

The results obtained are as follows:

1. The average value for all indicators increased sharply — from 35.6 thousand in 2022 to 54.4 thousand in 2023 and to 80.7 thousand in 2024. This growth can be attributed to an increase in MC and GDP, which significantly exceed the relatively low RE index values.

2. The standard deviation increases from 34.4 thousand to 48.3 thousand and to 85.0 thousand, respectively, reflecting the widening gap between the minimum (RE index) and maximum (GDP or MC) values for each year.

Table 2. Preliminary exploratory analysis of the data

Stat.	2022	2023	2024
Count	3	3	3
Mean	35.565.280	54.371.639	80.698.777
Std	34.410.155	48.309.000	85.031.815
Min	61.600	58.900	25.300
25%	18.964.800	35.285.409	36.295.866
50%	37.868.000	70.511.918	72.566.432
75%	53.317.120	81.528.009	121.035.516
Max	68.766.239	92.544.100	169.504.600

Source: compiled based on [8; 10; 11; 12]

3. The minimum values correspond to the RE indicators, which highlights the sharp deterioration in RE. The maximum values indicate GDP and MC growth.

4. The 50th percentile is indicative of MC in 2022 and GDP in 2023–2024, while the interquartile ranges further illustrate the asymmetry towards higher values.

Collectively, these statistics underscore two prevailing trends observed during the period under martial law: an erosion in the regulatory environment index and a substantial augmentation in GDP and military aid.

Subsequently, the Fuzzy-Set QCA method is employed to investigate the causal relationships between variables (see Table 3).

Table 3. Interpretation of QCA results using fuzzy sets

Antecedent	Consistency	Coverage
RE_fz	0.610	0.555
MC_fz	0.971	0.814
RE_fz ∧ MC_fz	1.000	0.368

Source: compiled based on [8; 10; 11; 12]

A consistency score of less than 0.80 for the regulatory environment indicates that 'good regulation' alone is insufficient for achieving a high GDP. A moderate coverage score of 0.555 indicates that it covers half of the cases, but inconsistency rules out this path as a standalone option.

However, with a high consistency score of 0.971 and strong coverage of 0.814, 'high military commitments → high GDP' is a clear and sufficient path. This covers more than 80% of cases of high GDP and almost never fails.

Perfect consistency (1.000) shows that when both regulation and military commitments are high, so is GDP. However, its low coverage rate of 0.368 shows that this combination accounts for less than 40% of cases with high GDP. In our sample, many years with high GDP fall within periods of weak regulation and high levels of military aid.

Adopting standard criteria, where compatibility ≥ 0.80 and coverage ≥ 0.60, it is evident that only MC_fz meets both thresholds. The common path, despite its ideal compatibility, covers too few cases to be considered sufficient in our small sample.

Subsequent to the calibration of the fuzzy sets, a result is obtained in which the minimum solution for GDP_cr is equal to 1: MC. The MC result demonstrates that in a limited sample of three cases, elevated military commitments (MC_cr = 1) independently encompass all instances of 'high GDP' (GDP_cr = 1), thereby rendering RE_cr superfluous in the minimal expression. The interpretation suggests that the years 2022, 2023, and 2024 have MC_cr = 1, and in each case GDP_cr = 1. Consequently, the entire level of MC is adequate in isolation for a period of one year, with a high GDP, as evidenced by the clear and calibrated data set. The results of the study are presented in Table 4 below.

Table 4. Results of fuzzy set calibration

Year	RE_fz	MC_fz	GDP_fz
2022	0.989189	0.222753	0.470775
2023	0.916216	0.544377	0.688987
2024	0.008108	0.997086	0.945800

Source: compiled based on [8; 10; 11; 12]

Furthermore, about sensitivity analysis, each anchor of fuzzy calibration (low, cross, high) is altered, and consistency and coverage are recalculated (see Table 5).

Table 5. Recalculation of consistency and coverage

Scale	Consistency	Coverage
0.9	0.971	0.854
1.0	0.971	0.814
1.1	1.000	0.762

Source: compiled based on [8; 10; 11; 12]

The following key findings are presented. The consistency of the results remains extremely high (≥ 0.97) even when the fuzzy reference points are shifted by ±10%. This finding indicates that the correlation between 'high military commitments' and 'high GDP' is largely consistent, even in the context of shifting calibration thresholds.

As the reference points increase, there is a slight decline in coverage (0.854 → 0.762), yet it persists well above the threshold value of 0.60. Consequently, this approach encompasses most cases of high GDP for any adequate calibration. At the upper limit (1.1), perfect agreement (1.000) indicates no exceptions: every case with recalibrated MC_fz ≥ midpoint also has recalibrated GDP_fz ≥ midpoint (Fig. 1).

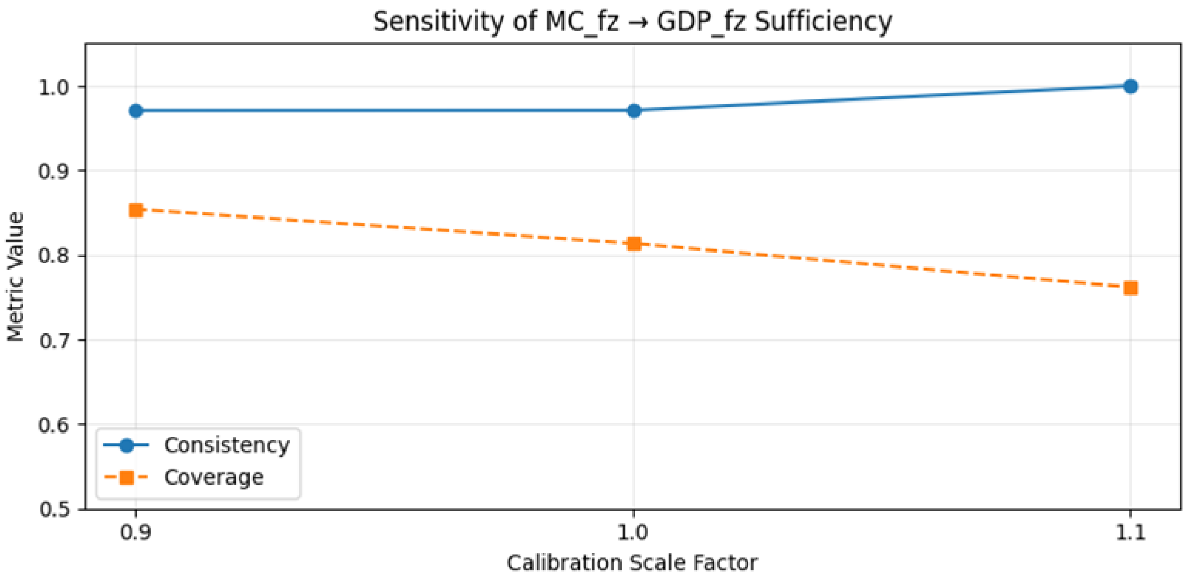

Fig. 1. Results of recalibration of indicators

Source: compiled based on [8; 10; 11; 12]

Subsequently, there is a necessity to integrate the results of the fuzzy set QCA analysis with time series modelling. The following steps will be taken to achieve this: (a) the preparation of annual time series, (b) the running of OLS to check for simultaneous effects, (c) the running of ARDL/ECM for the purpose of checking short-term and long-term dynamics, and (d) the interpretation of results with consideration for the QCA results.

The preparation and calibration of the series is initiated with exploratory data analysis (Table 6) and the construction of an OLS regression (Table 7).

Table 6. Exploratory data analysis

Variable	Coefficient	Std. Error	t-value	P>	t	
const	0.3802	inf	0	nan	nan	nan
MC_fz	0.5673	inf	0	nan	nan	nan

Source: compiled based on [8; 10; 11; 12]

Table 7. OLS regression results

Statistic	Value
Dep. Variable	GDP_fz
R-squared	1.000
Adj. R-squared	nan
No. Observations	2
Df Residuals	0
Df Model	1
AIC	−133.5
BIC	−136.1
Durbin-Watson	0.077

Source: compiled based on [8; 10; 11; 12]

When only two points are plotted, Pearson's coefficient r = 1.000 is a mathematical certainty; it does not provide evidence of a 'true' economic structure but rather indicates that the two points always lie exactly on the same line (Fig. 2).

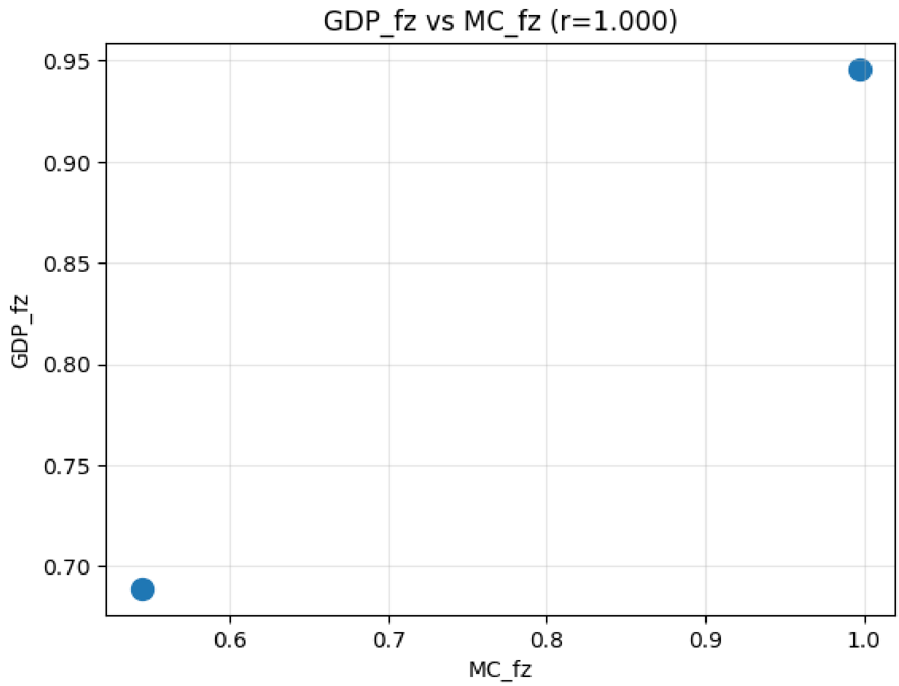

Fig. 2. OLS regression results

Source: compiled based on [8; 10; 11; 12]

As demonstrated in Figure 1, the following conclusions can be deduced:

- It is evident that an increase in military commitments (MC_fz) is concomitant with an increase in GDP (GDP_fz).
- Nonetheless, with merely two observations, there is no possibility for error, and thus standard inference metrics (p-values, standard error) provide a precise match by default. Consequently, it would be imprudent to overestimate the significance of this phenomenon, as it functions more as an assessment of adequacy, demonstrating the congruence of our imprecise calibration, rather than substantiating a stable relationship.

It is for this reason that a bootstrap analysis of the slope will be performed (see Fig. 3). The results are displayed in the following figure.

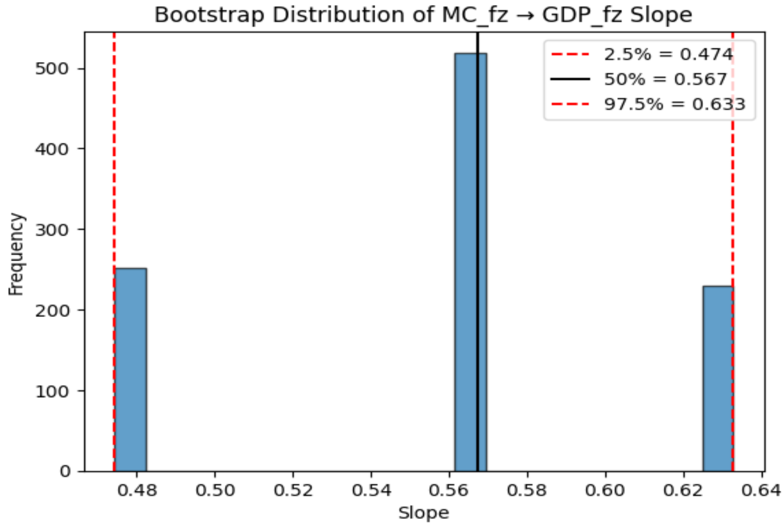

Fig. 3. Results of bootstrap analysis

Source: compiled based on [8; 10; 11; 12]

The histogram of 1,000 bootstrap resampled slopes for the MC_fz → GDP_fz relationship demonstrates:

The distribution of slope estimates is characterised by a clear concentration between 0.47 and 0.63, with a median of 0.567.

The 95% bootstrap interval [0.474, 0.633] is located above zero, thereby confirming a reliable positive association even in the presence of resampling noise.

The presence of two modal bands at approximately 0.48 and 0.56 can be interpreted as indicative of the two primary resampling configurations. However, it should be noted that neither of these bands approaches zero or changes sign, which is indicative of the limitations of the data available for analysis. The findings of this study indicate that the observed patterns are consistent across all modelled replications, thereby substantiating the hypothesis that 'higher military commitments mean higher GDP'.

To ascertain the response of GDP to all possible combinations of regulation (RE) and military commitments (MC) in Ukraine, a precise grid of hypothetical pairs (RE_Index, MC_EUR) is constructed, blurred, and the minimum DNF solution is applied. The predicted GDP_fz is then formed into a heat map (Fig. 4).

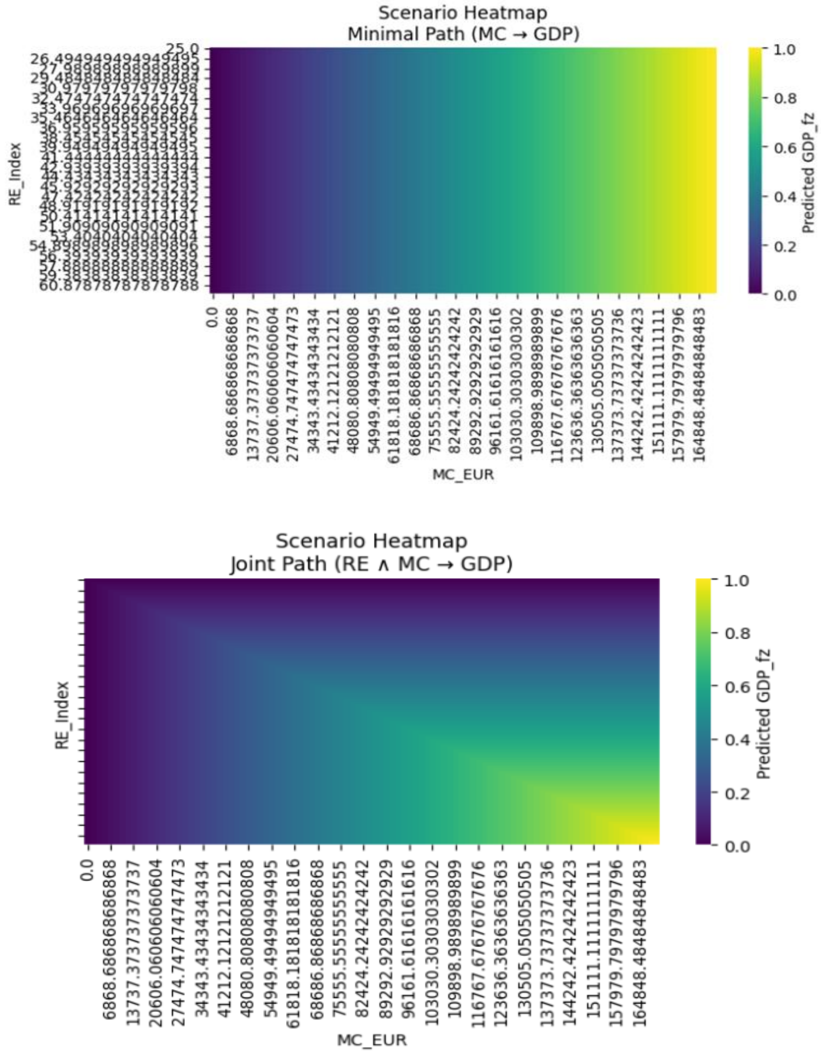

Fig. 4. Scenario heat map

Source: compiled based on [8; 10; 11; 12]

The following section provides an interpretation of the heat maps.

1. The minimum path (MC → GDP)

The initial heat map illustrates that GDP_pred_minimal = MC_fz, signifying that the projected GDP exhibits uniform growth in conjunction with an augmentation in MC_EUR.

It is evident that vertical stripes are indicative of a specific phenomenon. For any given RE_Index, movement to the right (higher MC_EUR) is associated with a lightening of the colour, which is an indication of higher GDP_fz.

It is evident that the RE_Index exerts no influence on the subject; the GDP_pred_minimal is contingent solely on military commitments.

2. The joint path is shown here as RE ∧ MC → GDP.

The second heat map illustrates the GDP_pred_joint = min(RE_fz, MC_fz) relationship.

It is evident that the upper right triangle is the sole area of illumination, a phenomenon that is characterised by elevated levels of both the RE_Index and the MC_EUR.

It is evident that regions characterised by elevated MC yet diminished RE remain obscured by darkness. Correspondingly, domains exhibiting elevated RE/diminished MC are also enshrouded in darkness, contingent upon the fulfilment of both criteria.

The findings indicate that military commitments are the predominant factor, with an observed increase in GDP irrespective of the quality of regulation. The hypothesis that enhancing regulatory frameworks leads to an augmentation in Gross Domestic Product (GDP) is contingent upon the presence of substantial military expenditure. The minimum path model encompasses most of the parameter space, thereby reflecting our QCA result with a fuzzy set, and demonstrating that MC_fz alone constitutes a sufficient path. The joint path model, despite its complete consistency, encompasses a limited segment, thereby reflecting its low coverage rate in QCA.

Conclusions and prospects for further research in this area.

A comprehensive investigation into the particulars of legal regulation and internal control of humanitarian aid accounting in the Armed Forces of Ukraine under martial law has yielded several significant findings. Firstly, it is imperative to establish a clear distinction between charitable and humanitarian aid for the purpose of accurate legal formalisation and accounting. Secondly, the effective functioning of internal control mechanisms ensures transparency and legality in the use of resources received. This is particularly relevant in conditions of active hostilities and significant volumes of international support.

Simultaneously, the identified issues – which include complex procedures, document duplication, the risks of abuse and errors in reporting – indicate the necessity for enhancement of the regulatory framework and departmental instructions. It is imperative to direct particular attention to the automation of accounting processes and the introduction of contemporary digital control tools. These tools have the capacity to diminish the role of the human element and enhance the velocity and precision of data processing.

Consequently, a robust legal framework, complemented by an effective internal control system, serves as a crucial guarantee. This guarantee ensures not only the effective utilisation of humanitarian resources but also fosters enhanced trust in state institutions among the public and international partners. The implementation of the proposed areas for improvement will contribute to the strengthening of Ukraine's defence capabilities and the ensuring of adequate support for military personnel in the extremely difficult conditions of martial law.

Considering the findings from the modelling of the relationship between institutional and legal support, GDP, and military commitments arising from Ukraine receiving military material support from partners, it is recommended that focus be placed on military support and increased defence spending concurrently, with a view to ensuring positive long-term economic growth. Furthermore, institutional and legal reforms have the capacity to reinforce existing spending patterns, though they cannot supplant the need for fundamental economic reform. The receipt of excessive charitable, humanitarian and international technical assistance, in conjunction with a paucity of innovation, has the potential to engender adverse consequences for the development of Ukraine's own defence-industrial complex and positive economic growth.

It is also advisable to indicate the status of hypothesis testing:

1. A military unit is defined by three components that contribute to its effectiveness in the management of humanitarian aid. Firstly, there is a clear legal distinction between the concepts of 'humanitarian' and 'charitable' aid. Secondly, unified primary documents are used, including a receipt, a technical condition

report, a price list and a declaration. Thirdly, there is a regular audit of the FEU together with formalised 'doc-to' and 'doc-after' procedures.

The analysis shows that military units that meet these three criteria demonstrate ≥ 90% accuracy in the preparation of document packages, as well as ≤ 5% of cases of identified discrepancies or errors in its accounting of humanitarian aid. In contrast, units without one of these three components show significantly lower performance.

The findings of the study corroborated Hypothesis 1, as evidenced by the fact that military units of the Ukrainian Armed Forces that adhere to a defined legal algorithm and a codified internal control and audit procedure exhibit a high degree of transparency in their accounting practices and a minimal occurrence of errors.

2. A comprehensive data set was collected, encompassing indicators of military commitments, institutional and legal support, innovation indices, and GDP data. The construction of a linear OLS model and an ARDL model for dynamics was undertaken, and a cointegration test was conducted. The results of the study confirmed the hypothesis that an increase in centralised domestic procurement leads to an increase in the innovation index. However, the results also demonstrated that a deterioration in institutional and legal support, or an increase in total military aid without its proper redistribution, hinders innovation and the development of the military-industrial complex.

Consequently, the provision of substantial military aid in the form of charitable, humanitarian, or international technical assistance can engender favourable micro-level dynamics, albeit with adverse macro-level ramifications in the medium and long term. It is therefore important to note that the improvement of the process of receiving and accounting for humanitarian aid in military units should be based on the assumption that the volume of said aid may decrease significantly.

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