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CONCERNING THE ISSUE OF MAXIMIZING AND BALANCING THE COMPONENTS OF THE TRIPLE BOTTOM LINE IN SUSTAINABLE BUSINESS DEVELOPMEN

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ABSTRACT

A literature review reveals that in recent years, global theories and practices of sustainable development have shifted their focus from the abstract maximization of the triple bottom line to the creation of a balanced and resilient economy. In this framework, economic, social, and environmental components must interact and complement each other. In Ukraine, this evolution remains in its early stages. The authors emphasize that the issue of balancing these components is not yet a fundamental principle of the country's business practices. The lack of resolution on this matter prevents businesses from achieving optimal effectiveness—measured by economic, social, and environmental factors—without adverse long-term consequences.

Given these considerations, it is evident that the concept of sustainable development for business entities must advance within both international and domestic scientific discourse. Research that establishes the prerequisites for shifting sustainable development theory and practice from abstract maximization to mathematically justified balancing is of critical importance. Thus, the authors have made the first attempt to provide a clear answer regarding the feasibility of identifying an effective set of actions for adjusting the components of the triple bottom line of sustainable development through the use of correlation models. This article aims to develop an approach for adjusting the components of sustainable development in cases of imbalance.

The essence of the issue under study lies in the fact that the authors have, for the first time, confirmed the hypothesis that enterprises can overcome efficiency constraints without incurring negative future consequences, namely, by logically modifying the key variables in multiple regression equations. This refers not only to achieving the maximum cumulative sustainable development effect, but also to ensuring a state in which the economic, social, and environmental effects are balanced—thus tending towards equilibrium and equivalence.

At the same time, it should be noted that achieving full equilibrium in practice is an extremely challenging task. This is due to the fact that each component of sustainable development has its own dynamics, specific priorities, and is measured by different indicators. In many cases, competition or conflict of interests arises between these effects, which makes their simultaneous and equivalent optimization impossible. Therefore, the authors have refined the conceptual approach to the category of equilibrium by shifting the focus from attaining absolute balance to the notion of convergence, viewed as a more realistic and pragmatic objective.

The potential value of solving this problem lies in the formation of both a system for monitoring the effects of harmonious development and a clear framework for overcoming constraints on enterprise efficiency, already at the stage of aligning the economic, social, and environmental components of the triple bottom line of sustainable development. This can be achieved through their gradual convergence, even under conditions of limited financial and technological resources allocated to the implementation of environmental and social initiatives, by programming changes targeted at the behaviour of the key variable with the highest beta coefficient in the multiple regression equation.

Keywords: economic effects, social effects, environmental effects, triple bottom line, business entity, natural capital depletion

JEL Classification: O4, C33

INTRODUCTION

Referring to the most significant international documents on sustainable development, it is worth noting that on December 11, 2019, the European Green Deal (EGD) was presented in the European Parliament. This document shifted Europe's focus from merely maximizing the values of the triple effect toward building a balanced and resilient economy by 2050, where all three components—economic, social, and environmental—must interact and complement one another (The European Green Deal, 2019).

Equally important in establishing and promoting this global shift—and integrating it at the level of individual business entities—is the incorporation of the United Nations Sustainable Development Goals (UN SDGs), as updated in 2015, into international legislation. This ensures coherence and coordination of actions across nations, as set out in the 2030 Agenda for Sustainable Development, adopted at the UN Sustainable Development Summit in New York on September 25, 2015.

It is noteworthy that, in Ukraine, this specificity highlights the need to reconsider the sustainable development concept. It points to the importance of transforming the approach toward one in which the evolution of domestic business entities is based not only on convergence but also on maximizing the values of economic, social, and environmental effects. This perspective is reflected in the provisions of Ukraine's Sustainable Development Strategy until 2050, which currently exists in draft form [Section 1].

The main issue arises from the fact that since the integration of the concept of sustainable development into domestic theory and practice of management, only the maximization of the components of the triple effect or the sustainable growth of its total value has become one of the fundamental foundations of both sustainable development and the sustainable transformation of the activities of domestic business entities. This is confirmed both by the provisions of the current Strategy for Sustainable Development of Ukraine until 2030 [Chapter 3] and by the content of modern sustainable business practices, according to which the achievement of goals related to performance, environmental care, and social responsibility is specified through the value-added increase in the overall result obtained from the implementation of a number of measures addressing various priorities. Among them are:

- transition to a more efficient model of production, distribution, and exchange of goods based on innovation, optimization of resource use, and increasing energy efficiency in business operations;
- transition to social justice, including improving working conditions, social protection of workers, and ensuring equal opportunities for all segments of the population;
- transition to environmental responsibility, aimed at achieving ecological neutrality by reducing environmental impact.

Clearly, the issue of balancing the components of the triple effect of sustainable development lies beyond the fundamental foundations and existing practices of sustainable business in Ukraine. The failure to address this issue effectively prevents a business entity from entering the zone of effective business with economic, social, and ecological effects without negative consequences in the future.

LITERATURE REVIEW

The concept of sustainable development for national economies, their regions, and business entities, based on the enhancement of the triple effect with balanced components, is part of the international scientific discourse conducted within the framework of alternative growth theories (Daly, 1996; Brandt et al., 2013; Lang et al., 2012). At the same time, at the domestic level, the development of this issue is limited, which is due both to the insufficient integration of modern international concepts into Ukraine's scientific and practical space and the lack of comprehensive studies aimed at regulating the transition from quantitative economic growth to qualitative development of the national economy and its individual entities.

T. Barker is one of the first representatives of the international scientific discourse who not only considered sustainability as a qualitative alternative to traditional economic growth but also emphasized the need to maintain a balance between the components of the triple effect. He stated that the implementation of this task is possible through the ability to maneuver at the upper limits of growth, formed by the lag between intermediate and capital output and expenditures (Barker, 1971).

Regarding a more comprehensive approach to sustainable development of a business entity through balancing its components, its developer is Bartelmus P. (Bartelmus, 1992). The scientist emphasized the advisability of the business entity functioning within the production volume that is possible, given the available level of consumption of produced capital, which does not lead to the depletion and degradation of natural capital. According to existing provisions, it is stated that the values of all components of the sustainable development effect should be adjusted, "taking into account whether past trends of depletion and degradation of natural capital can be compensated or mitigated through technological progress, the substitution of natural resources, and changes in consumption models" (Bartelmus, 1992).

To summarize the presented provisions, it can be stated that within the classical economic-theoretical international discourse, both the category of "sustainable development of a business entity" and the corresponding balance of its effects are defined as non-permanent and not clearly determined. Specific methods for such adjustments have not been proposed.

By the 2000s, the concept of alternative growth theory had not only undergone significant evolution in the international scientific discourse but also been integrated into business practices under the influence of escalating environmental problems, social inequality, and the limited availability of natural resources. It was natural that the perspective on the balance of sustainable development effects of a business entity, which had previously been primarily abstract, gradually transformed into a more concrete category. For instance, Pap J., Annandale D., and Morrison-Saunders A. explicitly stated that the three components of the triple effect of a business entity are balanced when they have equal weight; meanwhile, Randall A. defined balance as a state where material benefits are fully compensated by investments in human well-being (Pope, Annandale, Morrison-Saunders, 2004). This shift towards specificity was reflected in the conceptual positions regarding the possibilities of adjusting the ratio of the components of the triple effect and their impact on the sustainability of business entities in a competitive environment. However, a specific method for such adjustments was not proposed.

Thus, in the context of modernized economic theory of alternative growth, developed in the works of T. Kulman and J. Farrington, the principles of transitioning from an abstract to a concrete balance of the triple effect of sustainable development for a business entity were outlined, based on Hartwick's rule, translated into numerical terms (Kulman et al., 2010). In summary, these rules encompass the following:

1. Balancing economic, social, and environmental effects through the introduction of charges for businesses using production factors, which contributes to a fair distribution of resources.
2. The obligation to rationally use natural resources necessary for both production and human survival, ensuring their restoration and preservation for future generations.
3. Forming the components of the triple effect of sustainable development in a way and at a time that is most appropriate for the business entity (this refers to the variability and distribution over time of investing the income generated from resource use into the future).

The purpose of the outlined principles was to provide a cost assessment of resource depletion and the associated losses from business operations, as well as to define the path for their compensation during the gradual reduction or exhaustion of resources. However, in practice, the principles proposed by T. Kulman and J. Farrington complicated the balancing of the components of the triple effect of sustainable development (Kulman et al., 2010). This is because business entities, aiming to maximize profits in the short term, did not see the necessity of long-term investments in resource restoration and environmental initiatives.

Lang D.J. and Wiek A. described sustainable development as a complex system, where even a small shift can lead to fundamental changes. The authors propose ideas for forming and adjusting balanced sustainable development for business entities through the gradual equilibrium of economic, social, and environmental effects (Lang et al., 2012). Among the key rules for achieving this balance are: striving for equilibrium between effects through their value; the ability of business entities to adjust effects through the use of "deep points of impact;" and making decisions to find equilibrium based on existing imbalances.

Brandt P. et al. viewed sustainable development for a business entity as the pursuit of a state of economic, social, and environmental effects that would ensure the maximization of business efficiency without negative future consequences (Brandt et al., 2018). They identified this state as the only principle for achieving the balance of the components of the triple effect.

Moreover, Brandt P. et al. essentially initiated the process of forming a methodological basis for balancing the components of the triple effect (Brandt et al., 2018; 2013). They suggested the gradual adjustment of their proportions towards convergence, which they believe maximizes business efficiency without future negative consequences, justifying this by stating that:

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1. The dominance of the economic effect without proper social and environmental responsibility can cause social tension, emissions of toxic or hazardous substances, etc.
2. The dominance of the social effect without economic development threatens the viability of the business entity.
3. Focusing on the ecological aspect without considering economic efficiency may limit business volumes due to high costs.

Brandt P. (Brandt et al., 2018), Lang D.J., Wiek A. et al. (Lang et al., 2022; 2017), Zhu J., Hua W. (Zhu, 2017), Siregar I. (Siregar, 2021) noted that the process of adjusting the components of the triple effect can be carried out by determining the nature of their interrelationships and ratios with influencing factors. A similar search for balance in the components of the triple effect (although without proper specification of its content) through the use of various mathematical and statistical models is characteristic of the works of Hak T., Janoušková S., Moldan B. (Hak et al., 2016), Abubakar I. (Abubakar, 2017), Aldieri L., Amendola A., Candila V. (Aldieri et al., 2023), Gibson, R. (Gibson, 2001), Fatima T., Elbanna S. (Fatima, et al., 2023), Steinhart J. (Steinhart, 2024).

It should be noted that in most sources, correlation models are used as the basis for achieving and adjusting the balance of the triple effect components. However, the practical aspects of this process at the level of business entities are almost not highlighted in these sources.

An exception is Steinhart J. (Steinhart, 2024), who, although applying correlation models in a different field—specifically to describe developments in the area of sustainable development—clearly demonstrated a number of features related to their high adaptability.

From the presented provisions, it is clear that the idea of sustainable development for business entities should evolve not only in the international but also in the domestic scientific discourse, as the transition from the abstract maximization and characterization of the components of the triple effect of sustainable development to their specific, mathematically justified balancing is crucial. Of course, at the level of an individual business entity, depending on its goals, volumes, and areas of activity (which affect the value of assets and liabilities, as well as the number of employees), approaches to forming the effects of sustainable development will vary (Makarenko et al., 2023). However, the reasoned adjustment of their values allows us to propose and test the hypothesis that there are opportunities to remove restrictions on achieving business efficiency without negative future consequences.

AIMS AND OBJECTIVES

Considering that the provisions of international scientific discourse and international regulatory frameworks for sustainable development have established the priority for business entities to balance economic, social, and environmental effects over the general value maximization of the triple effect, the goal of this study is to develop an approach to adjusting the components of sustainable development effects in the context of their imbalance. The key objectives of the study are:

1. To analyze structural approaches to forming the triple effect of sustainable development for domestic business entities.
2. Define and test an approach to justifying the adjustment of the values of economic, social, and environmental effects.
3. Formulate proposals for balancing the components of the triple effect of sustainable development for domestic business entities.

METHODS

The theoretical basis of the study is represented by the foundational works of globally recognized economists who not only explored the issues of alternative economic growth, its regions, and business entities but also integrated into the international scientific discourse views on the priority of the triple effect of sustainable development (hereafter E3) with balanced components. An important element of the research was also the study of existing approaches to forming a methodological basis for adjusting the components of the triple effect of sustainable development for business entities.

The study was conducted using general scientific and specific methods.

The synthesis and systematic approach methods were employed to analyze specialized scientific literature. In particular, the synthesis method served as a means of integrating diverse ideas regarding the balance between economic, environmental, and social components in order to construct a comprehensive understanding of an acceptable structure of the triple bottom line of sustainable development. Meanwhile, the systems approach enabled the examination of these components as interrelated elements within a unified system, which, respectively, made it possible to identify their mutual interactions, influence on one another, and their cumulative impact on the overall performance of the enterprise. This aligns with the use of structural and technical analysis methods, which allowed for the identification of the components and approaches to forming the triple effect of sustainable development for domestic business entities. The application of methods for interpreting the relationships among the components of the triple bottom line effect and their dependencies on key influencing factors, along with formalization techniques (in particular, the introduction of business efficiency constraints, the balancing of economic, social, and environmental components of the triple effect, and the programming of changes through manipulation of key independent variables), allowed for representing the interconnections between the elements of sustainable development and the influencing factors of the studied business entities as a formal system.

Specifically, the method of introducing business efficiency constraints made it possible to formulate recommendations for avoiding potential negative consequences that may arise from one-sided growth. This method was applied to promote convergence among the economic, social, and environmental components of the triple bottom line effect.

The balancing method enabled the identification of pathways to reconcile the economic, social, and environmental dimensions of sustainability by applying structural analysis tools to diagnose the level of balance among the components.

The method of interpreting the relationships and dependencies among the components of the triple bottom line effect through the construction of regression equations made it possible to quantitatively assess the nature and strength of the interrelationships between economic (Y_1), social (Y_2), and environmental (Y_3) indicators (based on the estimated regression equations).

Finally, the method of programming changes through the manipulation of key independent variables ($X_1...n$) allowed for a detailed representation of the impact of key variable(s) in the form of a constrained optimization program, which accounts for the fact that not every factor, but only the one with the highest β-coefficient, qualifies as a key factor. Interventions were designed to (↥) increase the influence of key variables on Y_1, Y_2, and Y_3, while efforts to (↓) reduce the influence of non-key variables on these same indicators were also implemented.

For the visual representation of the formalization, a conditional description method was used in the multiple regression model, where the conditional measure of increase was taken as UAH 1.

Recommendations for adjusting and balancing the effects of sustainable development were formulated using the logical interpretation method, examining the influence of variables through the parameters of the multiple regression models.

The formulation and verification of the hypothesis regarding the possibility of removing the limitations on achieving business efficiency without negative future consequences were carried out using the logical assumption regarding the influence of changes in key variables of the multiple regression equations and the systemic adjustment of their impact.

RESULTS

Having researched the overall profile of domestic business entities (hereinafter referred to as DBEs) that officially declared their support for sustainable development (specifically, PP "ARTON" (1), LLC "TESLA – MONTAGE" (2), LLC "INTERM" (3), Collective Enterprise "SIGMA" (4), LLC "TRITEL" (5), LLC "CKS-INVEST" (6), LLC "TOPSTREAM" (7)), it was found that despite significant diversity in terms of revenue volume and dynamics, asset and liability value, and the number of employees, the balance between economic growth, social responsibility, and environmental sustainability is not their priority (Table 1).

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Table 1. Dynamics of the social, economic, and environmental effects of Ukrainian business entities supporting sustainable development, 2020–2023, UAH thousand. Note: Net profit and the economic effect of sustainable development are different categories. Net profit is calculated according to financial reporting standards, while the economic effect of harmonious development only considers the direct financial benefits from initiatives. *(Source: compiled from: EY)*

DBEs	Triple bottom line components											
	economic				social				environmental			
	2020	2021	2022	2023	2020	2021	2022	2023	2020	2021	2022	2023
1	9913120	8912000	8010100	9400100	5191000	4012100	3320120	3789000	3020100	3345000	2218000	2890110
2	553490	52805	55143	65130	228890	254570	201300	195670	89340	88120	103900	93400
3	1204900	2340400	1510020	1490870	11800	105800	90450	89674	126700	107800	129000	142800
4	11290	22800	41890	42450	300	1200	230	430	6180	5340	6130	800
5	0	223800	458700	567900	0	1290	2500	13500	0	300	10200	1100
6	52000	43800	91900	73890	3400	14000	2500	3200	6000	7700	5200	4390
7	12900	15909	175400	153800	16700	220000	17900	17000	16900	13600	19000	20000

For the highlighted business entities, from 2020 to 2023, the economic component in the structure of the triple effect of sustainable development increasingly dominates. In fact, there is a noticeable trend of giving more attention to economic growth (for example, increasing profit, revenue, growing market share, etc.) rather than social or environmental aspects of sustainable development. This specificity can be clearly visualized using the structural analysis data of the triple effect formats of sustainable development outlined by us (Table 2).

Table 2. Structure of the triple bottom line of sustainable development for business entities in Ukraine, 2020-2023, %. *(Source: compiled according to the data of Table 1)*

DBEs	Triple bottom line structure											
	economic				social				environmental			
	2020	2021	2022	2023	2020	2021	2022	2023	2020	2021	2022	2023
1	54.7	54.78	59.12	58.46	28.64	24.66	24.51	23.56	16.66	20.56	16.37	17.97
2	63.49	13.35	15.3	18.39	26.26	64.37	55.86	55.24	10.25	22.28	28.83	26.37
3	89.69	91.64	87.31	86.51	0.88	4.14	5.23	5.2	9.43	4.22	7.46	8.29
4	63.53	47.25	86.82	97.18	1.69	2.49	0.48	0.98	34.78	0.21	12.7	1.83
5	0	99.29	97.31	90.68	0	0.57	0.53	2.32	0	0.13	2.16	0.19
6	84.69	66.87	92.27	90.68	5.54	21.37	2.51	3.93	9.77	11.78	5.22	5.39
7	27.74	6.38	82.62	80.61	35.91	88.17	8.43	8.91	36.34	5.45	8.95	10.48

Thus, for most domestic business entities that declared their commitment to sustainable development, the harmonization of economic, social, and environmental effects has not been achieved. It is important to note that this situation is caused by the following factors:

1. The lack of a systematic monitoring of the effects of harmonious development, which makes timely adjustments to sustainable development strategies impossible.
2. The limitation of financial and technological resources allocated to the implementation of environmental and social initiatives which reduces their effectiveness.
3. The low level of consumer demand for "responsible" products, which reduces the motivation for producers to invest in sustainable practices.
4. Focus on short-term profitability, which leads to the neglect of long-term benefits from the harmonization of economic, social, and environmental effects.

Given that the trigger for the formation of each of these factors is the high level of uncertainty in the business environment (in particular, the inability to determine equilibrium points between the effects, which leads to the dominance of one component over the others), the key problem is the lack of scientifically grounded methods for adjusting the values of the economic, social, and environmental effects. This significantly complicates the development and implementation of balanced sustainable development strategies and, as we can see, reduces their practical effectiveness.

For example, according to the data from Ukrainian business entities that declared their support for sustainable development within their strategies:

1. Regarding the economic effect, LLC "TRITEL" (5) increased it from 0% (2020) to 90% in 2023, while LLC "CKS-INVEST" (6) increased it from 84.69% to 90.68% in 2023. Additionally, the Collective Enterprise "SIGMA" (4), LLC "INTERM" (3), and LLC "TOPSTREAM" (7) achieved over 80% of the economic effect by 2023. Private Enterprise "ARTON" (1) reached 58.46%. The exception is LLC "TESLA-MONTAZH" (2), where the economic effect decreased from 63.5% (2020) to 15–18% (2022–2023) in favour of social and environmental components.
2. Regarding the social effect, there are sharp fluctuations in LLC "TOPSTREAM" (the value increased from 35.9% in 2020 to 88.2% in 2021, but then dropped to 8.9% by 2023). At first glance, there appears to be relative stability in this effect for Private Enterprise "ARTON"; however, the company gradually reduced it (from 28.6% to 23.5%), demonstrating a decreasing priority for social initiatives. Minimal attention to this effect is observed in LLC "INTERM", LLC "CKS-INVEST", and the Collective Enterprise "SIGMA", where the value remains at only 0.98–5.2%.
3. Regarding the environmental component, the leader in this effect is LLC "TESLA-MONTAZH", which increased its value from 10.3% (2020) to 26.4% by 2023. A sharp decline in this effect is characteristic of Collective Enterprise "SIGMA" and LLC "TOPSTREAM", which may indicate the curtailment of environmental initiatives. Relative stability in this effect is observed in Private Enterprise "ARTON" and LLC "CKS-INVEST"; however, they have maintained the environmental effect only at the level of 5–20%, with no significant changes.

The application of a mathematically grounded approach to adjusting and balancing the components of the triple-effect model is possible within the framework of classical multiple regression methods.

Compliance with the set of instructions outlined in Table 3 will contribute to the fulfillment of specific conditions, these methods allow for the most accurate formalization of the relationships and interdependencies between effect parameters (as dependent variables Y) and influencing factors (as independent variables X), combined into a multiple regression equation (Nastenko et al., 2017).

Table 3. A generalized set of instructions required for the adjustment and balancing of the components of the triple bottom line of sustainable development. Note: * Construction of a multiple regression equation to establish quantitative relationships between influencing factors (X) and outcomes (Y)

Input	Set of steps for determining the sustainable development priorities of an enterprise ▪ Step 1. Embedding in strategic actions the primary goal: ensuring a balance between the economic, social, and environmental effects takes precedence over merely maximizing the overall effect. ▪ Step 2. Incorporating sustainable development priorities into strategic actions in accordance with the relevant regulatory and legal framework.
	Set of steps for establishing strategic management principles ▪ Step 1. Initial control of the ratios among the components of the triple effect (economic, social, environmental). ▪ Step 2. Ensuring the highest possible awareness of key influencing factors and the limitations of financial resources that can be allocated for sustainable development. ▪ Step 3. Eliminating multicollinear or statistically insignificant factors from the model. ▪ Step 4. Formalizing the relationships between the components of the triple effect (dependent variable) and the key influencing factors through a mathematical model (independent variables*). The model should be represented by a high-quality multiple regression equation.
	Set of steps for balancing the components of the triple bottom line effect can be implemented within the framework of classical multiple regression methods. ▪ Step 1. Construction of an integral indicator of harmony (in particular, formation of vector Y as a set of effects with corresponding weights, calculation of β-coefficients adjusted for ε (residuals), construction of a vector of total influence). ▪ Step 2. Description of the procedure required to balance the components of the triple bottom line effect and development of a sustainable development action plan using the obtained models.
Output	Set of steps for adjusting strategic plans in response to changes in the effect ratios and the emergence of new influencing factors (or Monitoring and updating the model). ▪ Step 1. Timely model update in case: one of the effects begins to dominate or lose significance, new influencing factors arise. ▪ Step 2. Incorporation of new factors into the regression model (matrix X), which may alter the values of the β-coefficients and the outcomes Y. ▪ Step 3. Potential shift in priorities (e.g., temporary reinforcement of social programs or reduction of pressure on natural capital).

Regarding these conditions, it is emphasized that only a high-quality representation of relationships and interdependencies in the form of a general vector clarifies these dependencies through the values of β-coefficients for X, adjusted for the volume of residuals (or through qualitative proportionality (Aldieri et al., 2023):

$$Y = X\beta + \varepsilon, \quad (1)$$

where: Y is the vector of dependent variables, which can be formed for economic (Y1), social (Y2), and environmental (Y3) effects (dimension: n×1); X is the matrix of independent variables (dimension: n×kn×k, where n is the number of

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observations and k is the number of predictors); β is the vector of parameters or regression coefficients (dimension: k×1). ε is the vector of random errors (dimension: n×1).

This contributes to the rapid elimination of uncertainty in the business environment.

By obtaining high-quality multiple regression equations (or qualitative representations of relationships), we mean refining the proportions and interdependencies by removing multicollinear and insignificant factors through ridge regression or second-type statistical criteria (via hypothesis testing of sample variance characteristics) and F-statistics (Bezverkhyi, 2019).

Since the calculation rules for these methods are well established and widely covered in scientific literature (Schober et al., 2018; Nastenko et al., 2017) we will focus only on their application in real-world conditions, specifically on the formalization of the outlined proportions and interdependencies for the studied business entities in 2025. It should be noted that this task is based on data from 2023 (as data on the components of the triple effect for 2024 were incomplete and not fully available at the time of the study).

Since the formalization must encompass all components of the triple effect, the authors have developed separate multiple regression equations for economic (Y1), social (Y2), and environmental (Y3) effects.

The approach to constructing three separate multiple regression equations is the following:

For the economic effect: $Y_1 = X\beta_1 + \varepsilon_1$, (2)

For the social effect: $Y_2 = X\beta_2 + \varepsilon_2$, (3)

For the environmental effect: $Y_3 = X\beta_3 + \varepsilon_3$, (4)

To simplify the interpretation of the relationships between Y1, Y2, Y3, and their dependence on independent variables (X1, ..., Xn), a conditional measure of increase of UAH 1 was adopted (Table 4).

Table 4. Formalization of relationships and interdependencies between the parameters of the triple bottom line of sustainable development and influencing factors, for 2025. Note: $X_1, ..., X_n$ are determined based on EY data, according to which their quantitative impact is visualized through average values per one business entity (BE). The only exception is LLC 'TRITEL' (5), which is not included in the visualization due to an insufficient number of observations. *(Source: compiled according to the data of Table 1 and EY data)*

DBEs	Effect (У)	Multiple regression equations for Y_1, Y_2, Y_3	Formal system of relationships and interdependencies between effects (Y) and independent variables (X)* (↑- increase; ↓ - decrease)
1	Economic (У1)[1]	Y1=-429758+15.79X1+393.28X2+ 45.66X3	Regarding Y_1: ↑X_1 by UAH 1 → ↑Y_1 by UAH 15.79; ↑X_2 ↑Y_1 by UAH 393.28, ↑X_3 ↑Y_1 by UAH 45.66. Regarding Y_2: ↑X_1 by UAH 1 → ↑Y_2 by UAH 26.84, ↑X_3 ↑Y_2 by UAH 160.8, ↑X_2 ↓Y_2 by UAH 118.3. Regarding Y_3: ↑X_1 by UAH 1 → ↑Y_3 by UAH 86.6, ↑X_3 ↑Y_3 by UAH 60.67, ↑X_2 ↓Y_3 by UAH 77.
	Social (У2) [2]	Y2=-2545904.34+26.84X1-118.3X2+160.8X3	
	Environmental (У3) [3]	Y3=253604.95+86.6X1-77X2+60.67X3	
2	Economic (У1)[1]	Y=-142880,8+8.3X1-35.864X2 + 17.839X3	Regarding Y_1: ↑X_4 by UAH 1 → ↑Y_1 by UAH 8.3, ↑X_2 ↓Y_1 by UAH 35.86, ↑X_5 ↑Y_1 by UAH 17.8. Regarding Y_2: ↑X_1 by UAH 1 → ↓Y_2 by UAH 1.417, ↑X_4 ↑Y_2 by UAH 3.3, and ↑X_3 ↑Y_2 by UAH 8.4. Regarding Y_3: ↑X_1 by UAH 1 →↑Y_3 by UAH 1.07, ↑X_4 ↑Y_3 by UAH 1.79, and ↑X_3 ↓Y_3 by UAH 1.6.
	Social (У2) [2]	Y2=331532-1.4X1+3.3X4+8.4X3	
	Environmental (У3) [3]	Y3=50084+1.07X1+1.79X4-1.6X3	
3	Economic (У1)[1]	Y1=-1485096+12.4X4-11.5X2+19.3X5	Regarding Y_1: ↑X_4 by 1 →↑Y_1 by 12.4; ↑X_2 ↓Y_1 by 11.5; ↑X_5 ↑Y_1 by 19.3. Regarding Y_2: ↑X_4 by 1 → ↑Y_2 by 12.685; ↑X_3 ↓Y_2 by 10.633; ↑X_5 ↑Y_2 by 9.4. Regarding Y_3: ↑X_1 by 1 → ↑Y_3 by 3.4; ↑X_2 ↓Y_3 by 1.9.
	Social (У2) [2]	Y2=-151023.86+12.7X4-10.6X3 + 9.4X5	
	Environmental (У3) [3]	Y3=31023.9+3.4X1-1.9X3	
4	Economic (У1)[1]	Y1=-13906+0.2X4+ 1.26X2	Regarding Y_1: ↑X_1 by UAH 1 → ↑Y_1 by UAH 0.2; ↑X_2 ↑Y_1 by UAH 1.26. Regarding Y_2: its change has a corresponding effect on other effects. Regarding Y_3: ↕X_5 by UAH 1 → ↕Y_3 by UAH 5.6; ↕X_6 ↕Y_3 by UAH 15.7.
	Social (У2) [2]	Not found	
	Environmental (У3) [3]	Y3=-9096.7+5.6X5+15.7X6	
6	Economic (У1)[1]	Y3=88571.6+ 1.48X1-6.8X2	Regarding Y_1: ↑X_4 by UAH 1 → ↑Y_1 by UAH 1.48; ↑X_7 ↓Y_1 by UAH 6.8. Regarding Y_2: ↑X_4 by UAH 1 → ↓Y_2 by UAH 0.21; ↕X_6 ↕Y_2 by UAH 3.9. Regarding Y_3: ↕X_5 by UAH 1 → ↕Y_3 by UAH 1.96; ↕X_6 ↕Y_3 by UAH 6.3.
	Social (У2) [2]	Y2=-856-0.21X4+ 3.9X6.	
	Environmental (У3) [3]	Y3=588.58+1.96X5+ 6.3X6	
7	Economic (У1)[1]	Y1=116133.6+ 4.54X4 +0.6X2-1.28X6	Regarding Y_1: ↑X_4 by UAH 1 → ↑Y_1 by UAH 4.54; ↑X_2 ↕Y_1 by UAH 0.6; ↕X_6 ↓Y_1 by UAH 1.28. Regarding Y_2: ↑X_3 by UAH 1 → ↓Y_2 by UAH 2.83; ↑X_7 ↑Y_2 by UAH 2.17. Regarding Y_3: ↑X_1 by UAH 1 → ↑Y_3 by UAH 4.1; ↑X_2 ↓Y_3 by UAH 1.71.
	Social (У2) [2]	Y2=39290-2.8X3+ 2.17X7.	
	Environmental (У3) [3]	Y3= 26371+ 4.1X5-1.71X2	

For clarity in formalizing the relationships, the variables X_1, ..., X_n are arranged according to the sequence in which they contribute to the overall visualization, treated as independent and significant:

1. Economic independent variables (per one business entity): (X_1) investments in the implementation of "green" technologies; (X_2) investments in resource-use optimization; (X_3) investments in expanding export potential (X_4) investments in the automation of production processes; (X_5) investments in equipment upgrades and repairs; (X_6) investments in adaptive production lines; (X_7) investments in the transition to environmentally safe materials.
2. Social independent variables (per one business entity) are as follows: (X_1) investments in technological modernization combined with investments in human capital development; (X_2) investments in community cooperation programs and communication with consumers; (X_3) investments in improving safety standards; (X_4) investments in workplace automation; (X_5) average expenses for community cooperation programs and effective communication with consumers per electronics manufacturer; (X_6) average investments in the improvement of contaminated sites; (X_7) investments in programming robotic systems for performing physical tasks.
3. Environmental independent variables (per one business entity): (X_1) investments in waste disposal; (X_2) investments in full recycling of products into raw materials after their life cycle; (X_3) investments in production greening; (X_4) expenses for installing energy-saving windows and wall insulation; (X_5) expenses for organizing the collection and transportation of old appliances; (X_6) average investments in waste sorting; (X_7) investments in pyrolysis, gasification, and depolymerization of plastics.

Each of the formalized relationships and interdependencies between the parameters of the triple bottom line of sustainable development and the influencing factors (variables) is unique.

For example, for PP "ARTON", assuming a conditional increase of all independent variables by UAH 1, the dependencies are as follows:

1. Economic effect (Y_1): investments in "green" technologies (X_1) increase (↑) Y_1 by UAH 15.79; investments in resource-use optimization (X_2) ↑ Y_1 by UAH 393.28; investments in expanding export potential (X_3) ↑Y_1 by UAH 45.66.
2. Social effect (Y_2): investments in technological modernization combined with investments in human capital development (X_1) ↑Y_2 by UAH 26.84; investments in improving safety standards (X_3) ↑Y_2 by UAH 160.8; investments in community cooperation programs and communication with consumers (X_2) reduce (↓) Y_2 by UAH 118.3.
3. Environmental effect (Y_3): investments in waste disposal (X_1) ↑ Y_3 by UAH 86.6; investments in production greening (X_3) ↑Y_3 by UAH 60.67; investments in product recycling after the end of its life cycle (X_2) ↓ Y_3 by UAH 77.

At the same time, LLC "TESLA-MONTAZH" demonstrates a different nature of relationships and interdependencies between the components of the threefold sustainable development effect and the influencing factors:

1. Economic effect (Y_1): Investments in production process automation (X_4) increase (↥) Y_1 by UAH 8.3; Investments in resource-use optimization (X_2) decrease (↓) Y_1 by UAH 35.86; Investments in equipment upgrades and repairs (X_5) ↥Y_1 by UAH 17.8.
2. Social effect (Y_2): Investments in technological modernization combined with human capital development (X_1) ↓Y_2 by UAH 1.417; Investments in workplace automation (X_4) ↥Y_2 by UAH 3.3; Investments in improving safety standards (X_3) ↥Y_2 by UAH 8.4.
3. Environmental effect (Y_3): Investments in waste disposal (X_1) and expenses for installing energy-saving windows and wall insulation (X_4) ↥ Y_3 by UAH 1.067 and UAH 1.789, respectively; investments in production greening (X_3) ↓ Y_3 by UAH 1.6.

It should be emphasized that the formalized relationships and interdependencies of the components of the threefold sustainable development effect and the influencing factors differ across all studied business entities that have declared their commitment to sustainable development. These differences reflect the actual logic of forming both the values and proportions of Y_1, Y_2, and Y_3. This creates opportunities for making justified adjustments.

It is important to note that the significance of the threefold effect for the sustainable development of a business entity always increases as Y_1, Y_2, and Y_3 approach equilibrium. Therefore, based on the essence of the formalized relationships and interdependencies, it is possible to initiate or accelerate the transition to efficient business practices without negative future consequences.

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We emphasize that the outlined relationships and interdependencies of the threefold sustainable development effect and influencing factors represent an effective tool for adjusting and balancing the economic, social, and environmental effects of a business entity. This tool operates by programming the impact on key independent variables ($X_{1}...n$). Specifically, this involves a detailed description of the impact of the key variable(s) in the form of a constraint program, which considers that not every factor, but only the one with the highest β-coefficient, is deemed key.

For key variables, actions aim to (↑ increase their impact on Y_1, Y_2, Y_3, while for non-key variables, actions focus on (↓) reducing the impact of X on Y_1, Y_2, Y_3.

The development of a constraint program has been implemented by the authors using examples of business entities for which the relationships and interdependencies of the threefold sustainable development effect and influencing factors have already been formalized. The results of applying such programs to adjust and balance the relationships between the components of the threefold effect of the studied business entities are presented in Table 5.

Table 5. The outcomes of adjusting and balancing the components of the triple bottom line for business entities that support sustainable development by 2025 2025. Note: *The business entity has no investments directed toward social aspects; therefore, it is impossible to adjust the social effect (Y_2); **It is possible to adjust the effect through additional investments, limited by the volume of financial resources that can be allocated for sustainable development. *(Source: compiled according to the data of Table 1, Table 4, and EY data)*

DBEs	Corrected value of the triple bottom line considering the Impact on key factors, UAH			Corrected triple bottom line structure for 2025 (Forecast), %			Financial resources that can be:		Programming the influence on $X_{1}...n$ (↥ - increase the influence of X on Y; ↓ - decrease the influence of X on Y)
	У1	У2	У3	У1	У2	У3	Additional invested	Redistributed	
1	9400100	6106345,6	4412395,4	47	31	22	19694,6	Y_2: UAH 1140 for X_2; Y_3: UAH 4000 for X_2.	Y_2: redistribution of funds to X_3, ↥ X_3**; Y_3: redistribution of funds to X_1 and ↥ X_1**.
2	150844,8	195670	114501,5	33	42	25	2460	Y_1: UAH 1600 from X_2; Y_3: UAH 4490 from X_3.	Y_1: redistribution of funds to X_3; Y_3: redistribution of funds to X_2 and ↥ X_4**.
3	1490870	263392,2	204080	76	13	11	21000	Y_2: UAH 3700 from X_3; Y_3: UAH 4490 from X_2.	Y_3: redistribution of funds to X_4 and ↥ X_4**; Y_3: redistribution of funds to X_1.
4	42450	430*	17546				1000	Y_3: UAH 100 from X_5.	Y_2*; Y_3: redistribution of funds to X_6 and ↥ X_6.
6	73890	27945,4	6390,4	68	26	6	7000	Y_2: UAH 6000 from X_4.	Y_2: redistribution of funds to X_6; Y_3: ↥ X_1**.
7	153800	35915,1	32036	72	17	15	0	Y_2: UAH 3750 from X_3; Y_3: UAH 2100 from X_2.	Y_2: redistribution of funds to X_7; Y_3: redistribution of funds to X_5.

Based on the data presented in Table 4, we state that the ratio (1), i.e., $Y = X\beta + \varepsilon$ is a mathematical expression where the left part (Y-component) and the right part (X-component) are separated by the equality sign.

Programming the impact is possible through a logical assumption regarding the feasible variability of $X_{1}...n$ from the perspective of how effectively *wt* maximizes and balances the Y-component.

For example, in the case of PP "ARTON" (1), LLC "INTERM" (3), LLC "TOPSTREAM" (7), and LLC "CKS-INVEST" (6) in 2025, by programming the influence on the X-component, a significant reduction in imbalances between economic, social, and environmental effects is achievable. Additionally, for LLC "TESLA-MONTAZH" (2), maximum convergence between the components of the triune effect is attainable.

As for CE "SIGMA" (4), adjustment is only possible between the values of the economic and environmental effects. However, this will make sense only if the social effect is fully integrated to provide completeness to the sustainable development model.

We emphasize that the proposed adjustment meets the requirement of maximizing the cumulative value of the triune sustainable development effect since its overall volume increases after adjustments.

For instance:

1. In PP "ARTON" (1), this value may grow from UAH 16,079,210 (2023) to UAH 19,918,841.05 (2025).
2. In LLC "TESLA-MONTAZH" (2) — from UAH 354,200 in 2023 to UAH 461,016.26 in 2025.
3. In LLC "INTERM" (3) — from UAH 1,723,344 in 2023 to UAH 1,958,342.15 in 2025.
4. In CE "SIGMA" (4) — from UAH 43,680 in 2023 to UAH 60,043 in 2025.
5. In LLC "CKS-INVEST" (6) — from UAH 81,480 in 2023 to UAH 108,225.83 in 2025.
6. In LLC "TOPSTREAM" (7) — from UAH 190,800 in 2023 to UAH 221,751.13 in 2025.

DISCUSSION

As a result of the study, the hypothesis regarding the possibility of removing constraints on business efficiency without negative consequences in the future — through a logical assumption about the advisable change of key variables in multiple regression equations — has been confirmed.

It should be emphasized that the research materials make it possible to create prerequisites for a highly specific interpretation of the balance between the components of the triune sustainable development effect in domestic business entities, as well as for a clear view of its format. As rightly noted by Rohov H.K., this is important in the context of Ukraine's and domestic businesses' aspirations for European integration (Rohov, 2018).

In particular, in their works, Bulavinova N., Burdenko I., Lehenchuk S., Tsaruk I., Ostapchuk T. (Bulavinova, 2021). Rogov G. (Rogov, 2018), Efremov O. (Efremov, 2008), Kharchuk V., Oleksiv I., Shulyar R., Shpak N. (Kharchuk et al, 2024), and Kuzmina O.S. (Kuzmina O.S., 2015) convey the conditionality or abstract nature of the approach to the ratio of the components of the triune sustainable development effect of business entities.

For instance, Rogov G. (Rogov, 2018), Efremov O. (Efremov, 2008), Kharchuk V., Oleksiv I., Shulyar R., Shpak N. (Kharchuk et al, 2024) typically interpret this ratio as a certain balance (or proper proportional distribution) or even harmony (coordination, mutual correspondence). Bulavinova N., Burdenko I., Lehenchuk S., Tsaruk I., Ostapchuk T. (Bulavinova, 2021), however, state that such interpretation leaves room for ambiguity and discussion regarding the definition of optimal proportions of the triple bottom line of sustainable development effect components for specific business entities.

The claim by Kuzmina O.S. (Kuzmina, 2015) regarding the mandatory equality of the triune effect components finds no confirmation in reality — it is rather a theoretical ideal than a practical possibility. This is particularly illustrated by the example of the studied business entities: PP "ARTON" (1), LLC "TESLA-MONTAZH" (2), LLC "INTERM" (3), CE "SIGMA" (4), LLC "TRITEL" (5), LLC "CKS-INVEST" (6), LLC "TOPSTREAM" (7).

In contrast to these domestic approaches, the method implemented and tested in this study helps avoid abstract or idealized interpretations when determining the ratio of the components of the triune sustainable development effect of business entities. Furthermore, this research serves as a useful foundation for developing more concrete and effective practices for adjusting the ratios within the triple bottom line of sustainable development effect.

CONCLUSIONS

Based on the considerations presented it is evident that for business entities, prioritizing the balance among economic, social, and environmental effects takes precedence over the overall value maximization of the triple bottom line of sustainable development effect. This conclusion is linked to the potential for achieving business efficiency in Ukraine without adverse future consequences, provided that the components of sustainable development are adjusted in a way that eliminates their imbalance.

Based on the results of addressing the research objectives, it has been proven that:

1. There is an inherent conditionality and abstractness in the structural approaches of domestic business entities to the formation of the triune effect of sustainable development. This is due to the fact that since the integration of the sustainable development concept into domestic management theory and practice, its primary focus has been exclusively on the value increase of the aggregate triple bottom line. Consequently, the content of domestic business practices reflects the formation of such triple bottom line structures where one component dominates, while the others mostly remain at a declarative level.

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Specifically, this peculiarity is clearly visualized by the structural analysis data of the defined formats of the triple bottom line of sustainable development for the following enterprises: Private Enterprise "ARTON" (1), LLC "TESLA – MONTAGE" (2), LLC "INTERM" (3), Municipal Enterprise "SIGMA" (4), LLC "TRITEL" (5), LLC "CKS-INVEST" (6), LLC "TOPSTREAM" (7).

The analysis of these enterprises shows varying degrees of balance among the triple bottom line components. Most companies prioritized the economic effect, with firms such as LLC "TRITEL" and LLC "CKS-INVEST" achieving over 90%, whereas LLC "TESLA-MONTAGE" shifted the focus from the economy towards social and environmental aspects.

Social indicators were highly unstable, especially in LLC "TOPSTREAM", while companies like LLC "INTERM", LLC "CKS-INVEST", and Municipal Enterprise "SIGMA" demonstrated minimal engagement.

Regarding the environmental component, only LLC "TESLA-MONTAGE" showed noticeable growth. Most other companies, including Private Enterprise "ARTON" and LLC "CKS-INVEST", maintained low but relatively stable levels, indicating limited prioritization of environmental initiatives.

Overall, the study results emphasize a prevailing imbalance among the components of sustainable development, with economic objectives still dominating.

Since outside the scope of existing sustainable business practices the issue of balancing the components of the triple bottom line remains unresolved, a full transition to sustainable business without negative future consequences has yet to occur. In particular, achieving short-term or even long-term economic efficiency often comes at the expense of natural resource depletion, social capital degradation, neglect of environmental standards, or the emergence of other adverse effects.

This situation leaves room for ambiguity and debate regarding the determination of optimal proportions of the components of the triple bottom line of sustainable development for specific business entities and their adjustment.

2. The study results confirm the importance of well-founded adjustment of economic, social, and environmental effects. Based on considerations regarding the limitations of business efficiency without causing negative future consequences, we emphasize that the approach proposed by the authors provides for overcoming these limitations at the stage of convergence of the components of the triple bottom line of sustainable development.

Validation of the approach to the justified correction of economic, social, and environmental effect values demonstrates the effectiveness of balancing through programming their changes by regulating the influence of variables that ensure the maximization of the Y-component. This programming is implemented in the form of a constrained model, which recognizes that not all factors are equally important—the key factor is only the one with the highest β-coefficient in the multiple regression equation.

Specifically, based on the example of Private Enterprise "ARTON", LLC "INTERM", LLC "TOPSTREAM", and LLC "CKS-INVEST" in 2025, the adjustment of X-components reduces imbalances among economic, social, and environmental effects. For LLC "TESLA-MONTAGE", maximum convergence of components is achieved, while in Municipal Enterprise "SIGMA", adjustment is possible between the economic and environmental effects.

The overall volume of the triple bottom line increases after adjustments—for instance, in Private Enterprise "ARTON" from UAH 16.1 million (2023) to UAH 19.9 million (2025), in LLC "TESLA-MONTAGE" from UAH 354 thousand to UAH 461 thousand, and so forth.

Based on the illustration of the proposed approach in action, its usefulness is evident both in establishing systematic monitoring of harmonious development effects and in ensuring clear prospects for overcoming limitations for effective enterprise development already at the stage of coordinating the economic, social, and environmental components of the triple bottom line of sustainable development.

3. The study has made it possible to outline the following proposals for adjusting and balancing the components of the triple bottom line of sustainable development effect. In particular, this can be achieved

through:

- continuous monitoring of the ratios between the economic, environmental, and social components of the triune sustainable development effect through regular formalization of their interrelations and proportions;
- balancing the economic, environmental, and social components of the triune sustainable development effect based on the analysis of ratios determined by multiple regression equations;

- maximizing awareness of the key factors and the volume of financial resources, as these are the main constraints of the system and define the sustainable development of a business entity.

The research findings possess significant practical value for implementing a systemic approach to balancing the economic, social, and environmental effects of sustainable development at the enterprise level. The proposed methodology for adjusting the values of these effects enables not only the assessment of the current state of sustainable development, but also the purposeful programming of changes, focusing on key variables that have the greatest impact on both individual components of the triple bottom line and its integral value.

This approach is particularly relevant for enterprises in sectors such as industry, energy, construction, and transportation—especially those seeking to implement the principles of sustainable development under conditions of limited resources. Furthermore, the research results may be of use to government authorities, local self-government bodies, as well as consulting firms and analytical centers involved in evaluating enterprise performance based on ESG (Environmental, Social, and Governance) criteria.

Given the significance of the provisions formulated by the authors, further research will be focused specifically on the systematic characterization of key indicators and methods suitable for assessing the trends of convergence of the components of the triple bottom line of sustainable development, the effect of business entities.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ДО ПИТАННЯ ПРО МАКСИМІЗАЦІЮ ТА БАЛАНСУВАННЯ СКЛАДНИКІВ ТРИЄДИНОГО ЕФЕКТУ СТАЛОГО РОЗВИТКУ СУБ'ЄКТІВ ГОСПОДАРЮВАННЯ

Огляд літератури показав, що в останні роки світові теорії та практики сталого розвитку змістили акцент з абстрактної максимізації значень триєдиного ефекту на створення збалансованої та стійкої економіки, де всі три складові (економічний, соціальний та екологічний ефекти) повинні взаємодіяти й доповнювати одна одну. В Україні ця еволюція перебуває на початковому етапі. Автори звертають увагу на те, що питання балансування складників триєдиного ефекту сталого розвитку виходять за межі фундаментальних основ і наявних практик ведення вітчизняного бізнесу. Нерозв'язання цього питання ускладнює потрапляння суб'єктів господарювання в зону ефективного бізнесу без негативних наслідків у майбутньому.

Із наведених положень очевидно, що ідея сталого розвитку суб'єктів господарювання повинна еволюціонувати не лише в міжнародному, а й у вітчизняному науковому дискурсі. Тому вкрай важливим є дослідження, яке сформує передумови для переходу теорії та практики сталого розвитку від абстрактної максимізації та позначення характеру

складників триєдиного ефекту до конкретного, математично обґрунтованого їх балансування. Відтак, очевидною є важливість чіткого виділення дієвого набору заходів із коригування компонентів триєдиного ефекту сталого розвитку за допомогою кореляційних моделей.

Метою дослідження є розробка підходу до коригування складників ефекту сталого розвитку в умовах їхнього дисбалансу.

Суть досліджуваної проблеми полягає в тому, що автори вперше підтвердили гіпотезу про те, що підприємства можуть подолати обмеження ефективності своєї діяльності без виникнення негативних наслідків у майбутньому шляхом логічної модифікації ключових змінних у рівняннях множинної регресії. Ідеться не лише про досягнення максимального сукупного ефекту сталого розвитку, а й про забезпечення такого стану, за якого економічний, соціальний та екологічний ефекти перебувають у збалансованому співвідношенні — прагнуть до рівноваги та рівнозначності.

Водночас слід зазначити, що досягнення повної рівноваги на практиці є вкрай складним завданням. Це зумовлено тим, що кожен із компонентів сталого розвитку має власну динаміку, специфіку пріоритетів і вимірюється різними індикаторами. У багатьох випадках між цими ефектами виникає конкуренція або конфлікт інтересів, що унеможливлює їх одночасну та рівнозначну оптимізацію. Тому автори вдосконалили погляд на категорії рівноваги (зокрема замість акцентування на досягненні абсолютної рівноваги увага зміщена на поняття «зближення» як більш реалістичну й прагматичну ціль).

Потенційна цінність розв’язання цієї проблеми полягає у формуванні й системного моніторингу ефектів гармонійного розвитку, і чітких перспектив подолання обмежень на ефективний розвиток підприємства вже на етапі узгодження значень компонентів триєдиного ефекту сталого розвитку. Це можливо шляхом їх поступового зближення навіть в умовах обмежених фінансових і технологічних ресурсів, спрямованих на впровадження екологічних і соціальних ініціатив, — через програмування змін, орієнтованих на поведінку ключової змінної з найвищим бета-коефіцієнтом у рівнянні множинної регресії.

Ключові слова: економічні ефекти, соціальні ефекти, екологічні ефекти, триєдиний ефект, суб’єкт господарювання, виснаження природного капіталу

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