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Estimation of Efficiency of State Regulation in Economic Restructuring Based on the Environmental Factor

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Abstract

This article has improved the approach for assessing the level of effectiveness of state regulation in the process of economic restructuring, considering its environmental factor. The proposed approach is based on the adaptation of the Kubin and Stern models by constructing a nonlinear econometric model of the dependence of expenditures logarithm on the implementation of reforms (considering the environmental factor) from the integral indicators: Dynamic shifts, Inclusiveness, Sustainable Development, Adjustment and Worldwide Governance Indicator (WGI). The WGI Kaufman and Krau Index is calculated on the basis of the application of the UCM approach as a general characteristic of the following components: publicity and accountability; political stability and lack of pressure, the effectiveness of the government; quality of regulation, the rule of law, control over corruption. The parameters formalization of the econometric model was carried out in applying parametric methods by preliminary normalization of the input parameters of the Harrington method. A qualitative interpretation of findings of the level of efficiency in state regulation in the process of economic restructuring, considering its environmental factor, is made by building a correlation matrix.

Keywords: effectiveness, state regulation, economic restructuring, environmental factor.

Introduction

The economics of the world enters a new stage of its development, experiencing the fourth industrial revolution − the creation of a self-regulating system that will be based on the Big Date, their analysis, automated production, augmented reality and minimal human intervention in these processes.

At the same time the modern infrastructure of the economy of most states of the world is not able to transform independently itself into an effective system for ensuring sustainable development of society. Not only the structure of the economy of the states of the world is adapted to new innovative conditions for the development of society, but also the enterprises of heavy and light industries. transport, communications and other industries use obsolete equipment, and the cost of production includes a significant share of labor costs.

The above situation, necessitates the activity of public authorities in the processes of restructuring the national economy, the formation of a unified strategy for its implementation and the clear implementation of tasks at all levels of government.

At the same time the policy on economic restructuring formed by state authorities should consider the environmental factor of implemented activities. This is due to the fact that further pollution of the environment can lead to a global ecological catastrophe, which is inherited by any progress in the sphere of production and services.

So, in the situation of limited budget revenues of any country, increasing the responsibility of government regulatory agencies for the reforms and priorities for environmental protection, the development of approach to assessing the state regulation of economic restructuring based on an environmental factor becomes relevant.

Literature review and discussion

The need for state regulation of the processes of economic development and economic restructuring, despite market mechanisms for adjusting supply and demand in the market, has been proved by many scientists. Thus, studies on the relationship between effective state regulation and state development processes were carried out by D. Kaufmann, A. Kraay and M. Mastruzzi [17]. J. Stern, as well as his colleagues S. Holder, F. Trillas, J.S. Cubbin have a significant scientific achievement in the field of research on the influence of state regulation instruments on various economic phenomena and processes [27, 28, 29, 30]. Thus, the team of authors carried out research to determine criteria for assessing the performance of regulatory systems, various aspects of telecoms regulation, the analysis of expected results of public administration and the regulation of utility services. A careful study of the impact of state and non-state regulation of unemployment on various processes of economic restructuring is carried out by C. Coglianese, A. M. Finkel, & C. Carrigan [7].

A significant scientific potential is devoted to the study of the relationship between economic growth and the environment. Such a group of scientists as C. Davidson [8], T. Panayotou [23], P. R. Portney [24] consider the direct and reverse influence of the development of entrepreneurship on the environment, as well as the processes of increasing the requirements for the preservation of the environment on the country's economic growth.

Other aspects of the relationship between the economic restructuring and the environment are explored by F. Cimato, M. Mullan [6], P. Ekins [11], J. M. Harris and N. R. Goodwin [14]. These scientists determine the possibility of parallel sustainable development of economic processes in the state and preservation of the environment. In addition, F. Cimato and M. Mullan, analyzing the role of public administration in the process of coordinated development of the state, determine its paramount role for the balanced growth of economic indicators and the ecological environment.

The study of purposeful impact of environmental regulation on various economic processes also has a separate set of scientific papers. A detailed analysis of the effect of environmental regulations on industry productivity was conducted by A. J. Barbera, V. D. McConnell [2], B. R. Domazlicky & W. L. Weber [9], E. Berman and L. T. Bui [5]. These scientists analyzed the vector of the impact of environmental regulation on productivity and came to the conclusion that the environmental impact on productivity is positive. In parallel, E. Berman and L. T. Bui [4] investigated the effect of environmental regulation on labor demand.

Environmental regulation did not leave aside the problems of digitalization of the economy. Thus, the works of S. Ambec, M. A. Cohen, S. Elgie, P. Lanoie [1], A. B. Jaffe, K. Palmer evidenced about the influence of environmental regulation on innovations [16]. In their studies scientists use an analytical method to prove the direct interdependence between the indicators of the effectiveness of state environmental regulation and the development of innovations, and also note the influence of IT technologies for maintaining a high level of environmental safety.

A significant amount of research has also been devoted to mathematical analysis of the processes of interrelation of economic development and its environmental factor . Thus, the features of formalizing the assessment of environmental protection components were considered by M. K. Evans [13], a quantitative study of environmentalism and economic prosperity is reflected in the work of S. M. Meyer [22], the assessments of the impact of various economic processes on the environmental safety of the state were carried out by R. Rogerson [26].

Having carried out a detailed analysis of existing opinions on the state regulation of economic growth, economic restructuring and the influence of environmental factor on the various processes of state formation, it is fair to note that all scientists hold a common opinion regarding the possibility of obtaining a positive result for the economy from the use of state regulation instruments only under the condition of effective activity of executive and legislative institutions.

Thus, it is the development of a model for assessing the effectiveness of state regulation of economic restructuring based on an environmental factor, which will allow monitoring of the public administration system.

Methodology

Carrying out a step-by-step development of approach to assessing the effectiveness of state regulation in economic restructuring based on the environmental factor, we note that at the first stage it is advisable to

analyze the mathematical tools for its implementation. So, the methods used to assess the effectiveness of state regulation can be divided into two groups (Table 1) [34]: parametric methods based on econometric analysis and required the definition of the functional form of the production function and nonparametric methods based on mathematical programming tools.

Table 1. Methods for assessing the effectiveness of state regulation

Group methods	Method	Advantages	Disadvantages
Parametric methods	➢ Ordinary Least Squares (OLS); ➢ Corrected Ordinary Least Squares (COLS); ➢ Stochastic Frontier Approach (SFA); ➢ Distribution-Free Approach (DFA); ➢ Thick Frontier Approach (TFA).	➢ considering such characteristic of efficiency as stochasticity, that is, its evaluation, rather than a clear calculation; ➢ no need to check the significance of received estimates and the influence of various factors; taking into account the possibility of random errors.	the need for a clear specification of the form of the "border", that is, the previously known function of the "border" of efficiency.
Non-parametric methods	➢ Data Envelopment Analysis (DEA); ➢ Free Disposal Hull (FDH); ➢ Productivity indexes.	➢ there is no need to define clearly the form of the "border" of effectiveness; ➢ mandatory presence of objects with 100% efficiency.	➢ a clear calculation (rather than an evaluation) of the effectiveness values; ➢ the initial assumption about the absence of random errors.

The analysis of Table 1 allows us to state that it is expedient to apply parametric methods to assess the effectiveness of state regulation in economic restructuring. This is due, first, to the possibility considering cause-effect relationships, allowing the construction of econometric models. Secondly, the randomness is characteristic for economic phenomena and processes, which is formalized by solving stochastic problems, where regularities are manifested only on average for all objects under study.

The Kubin and Stern model is one of the parametric approaches to the estimation of regulatory efficiency for the implementation of which the least squares method is used [29]. This approach was used to evaluate the system for the process regulation of electricity generation. The essence of this approach fully meets our requirements for the task. The mathematical formalization of this approach is represented by equation 1.

$$Log(ELCAPPC)_{it} = a_0 + a_i + a_1 \log(GDPPC)_{it} + a_2 Industry_{it} + a_3 Debt_{it} + a_4 RegIndex_{it} + a_5 X_{it} + u_{it} \quad (1)$$

where $Log(ELCAPPC)_{it}$ is the logarithm of electricity production per capita per gigawatt for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T) time interval;

a_0 is the constant value of the regression;

a_i is a specific fixed effect, time invariant;

$GDPPC$ is a real national income per capita;

$Industry_{it}$ is the logarithm of industrial value added as a percentage of GDP;

$Debt_{it}$ is a share of public debt service as a percentage of gross national income;

$RegIndex_{it}$ is the index of regulatory management (or its individual components);

X_{it} is a vector of other potentially significant variables (for example, the rule of law and corruption measures, the age of the regulator, the method of price regulation, etc.);

u_{it} is a random causative agent.

The next (second) stage of implementation of the proposed methodology will consist in adapting the selected parametric approach to assessing the effectiveness of state regulation of Ukrainian economy restructuring, taking into account the environmental factor. So, on the basis of the transformation of the model of Kubin

and Stern [29], it is proposed to construct the following econometric model for assessing the effectiveness of state regulation of the restructuring of the Ukrainian economy, considering the environmental factor:

$$Log(VPR)_{it} = a_0 + a_1 RR_{it} + a_2 I_{it} + a_3 PPU_{it} +$$

$$+a_4 K_{it} + a_5 RegIndex_{it} + a_6 X_{it} + u_{it} \qquad (2)$$

where $Log(VPR)_{it}$ is the logarithm of the costs of reforms related to the economic restructuring (considering the environmental factor) for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T);

a_0 is the constant value of the regression;

a_j is a specific effect in the j-th (j = 1, ..., 6) section of the research direction;

RR_{it} is an integral indicator of Dynamic shifts as a generalizing characteristic of the following components: GDP per capita, labor productivity in GDP per employee, life expectancy (years);

I_{it} is an integral indicator of Inclusiveness as a generalizing characteristic of the following components: the coefficient of society stratification by income (from 0, that is, without stratification, to 100); poverty level (percent) coefficient of stratification of the society by the distribution of wealth (from 0, that is, without unevenness, to 100), the median income;

PPU_{it} is an integral indicator of Sustainable development as a generalizing characteristic of the following components: adjusted net savings (percent of gross national income), greenhouse intensity of GDP (kilograms of CO_2 emissions per dollar) public debt (percent of GDP) and demographic load factor (percent);

$RegIndex_{it}$ is the index of state regulation of economic restructuring − the WGI index (World Governance Indicators [17]) by Kauffman and Kraay as a generalizing characteristic of the following components: publicity and accountability, political stability and lack of pressure, the effectiveness of the government, quality of regulation, the rule of law, control over corruption;

K_{it} is the integral indicator of Adjustment as a generalizing characteristic of the following components: the index of democracy, index promotion of corruption, a rating of openness of budgets, the state incapacity index;

X_{it} is the vector of other potentially relevant variables;

u_{it} is a random causative agent.

Let's consider each of the above-mentioned parameters of the model in more detail and break its economic changes. Thus, the costs of reform should include all transfers from the budget to activities related to the economic restructuring. In addition, it is necessary to determine the amount of public funds spent on activities related to environmental protection in the framework of these reforms.

The parameters of the presented model describe the effect that is achieved due to the state policy of restructuring in the context of relevant parameter of the characteristics on the process of innovative development of the state.

The following four integral indicators are indicators of a comprehensive description of the current and future situation in the state. So, the next three: Dynamic shifts, Inclusiveness, Sustainable development, are a composite rating of inclusive development index, proposed as an alternative to GDP for assessing the state of the economy of the state under study [31]. The last fourth index of WGI, describes the form and specificity of state regulation in the country.

Thus, we will get a model in which the cost parameters for restructuring, the effect of its implementation for the economy, society and the environment, as well as indicators of the effectiveness of the work of state authorities, are correlated with possible destructive factors of public administration and the development of global economy.

In addition, the last integral indicator of Adjustment and the last two parameters (the vector of other potentially relevant variables and random causative agent) allow the model to consider additional possible influence factors, which significantly improves the adequacy of findings.

The third stage will consist in the direct calculation of the components (factor attributes) of the econometric model for assessing the effectiveness of state regulation on the restructuring of the Ukrainian economy, con-

sidering the environmental factor. So, at the first stage of this stage, there is a need to quantify the integral indicator of Dynamic growth. The components of this indicator are GDP per capita, labor productivity is GDP per employee, life expectancy (years) of employment (percent). These indicators have different units of measure, so with a view to their further aggregation into a single indicator, we will carry out a normalization by the Harrington method (equation 3). The expediency of using the Harrington method is due to the possibility of normalizing both the indicators of stimulants and the indices of destimulators by a single approach, reduction to a comparable type of both positive and negative values, taking into account the scope for the time period under study, which makes it possible to realize the adaptive properties of the model [17].

$$\widetilde{GDP}_{it} = \frac{2 \cdot GDP_{it} - \left(\max_t GDP_{it} + \min_t GDP_{it} \right)}{\max_t GDP_{it} - \min_t GDP_{it}}$$

$$\widetilde{PP}_{it} = \frac{2 \cdot PP_{it} - \left(\max_t PP_{it} + \min_t PP_{it} \right)}{\max_t PP_{it} - \min_t PP_{it}}$$

(3)

$$\widetilde{OTZ}_{it} = \frac{2 \cdot OTZ_{it} - \left(\max_t OTZ_{it} + \min_t OTZ_{it} \right)}{\max_t OTZ_{it} - \min_t OTZ_{it}}$$

$$\widetilde{ZN}_{it} = \frac{2 \cdot ZN_{it} - \left(\max_t ZN_{it} + \min_t ZN_{it} \right)}{\max_t ZN_{it} - \min_t ZN_{it}}$$

where $\widetilde{GDP}_{it}$, $\widetilde{PP}_{it}$, $\widetilde{OTZ}_{it}$, $\widetilde{ZN}_{it}$ are the normalized values: GDP per capita, labor productivity − GDP per employee, life expectancy, employment of the population for the i-th (i = 1, ..., I) country during the t-th (t = 1, ..., T) interval of time;

Based on the results of calculations and using equations (3), the arithmetic mean of normalized indicators is determined as a generalizing characteristic of Dynamic growth [17]:

$$RR_{it} = \frac{\sum_{q=1}^{4} RR_{itq}}{4} = \frac{\widetilde{GDP}_{it} + \widetilde{PP}_{it} + \widetilde{OTZ}_{it} + \widetilde{ZN}_{it}}{4}$$

(4)

At the second step of this stage, the integral indicator of Inclusiveness, the integral indicator Sustainable development and the integral indicator of Adjustment are calculated in a manner similar to the above equations (3) and (4):

$$I_{it} = \frac{\sum_{q=1}^{4} I_{itq}}{4} = \frac{\widetilde{RSD}_{it} + \widetilde{RB}_{it} + \widetilde{RSB}_{it} + \widetilde{MD}_{it}}{4}$$

(5)

$$\widetilde{RSD}_{it} = \frac{2 \cdot RSD_{it} - \left(\max_t RSD_{it} + \min_t RSD_{it} \right)}{\max_t RSD_{it} - \min_t RSD_{it}}$$

$$\widetilde{RB}_{it} = \frac{2 \cdot RB_{it} - \left(\max_t RB_{it} + \min_t RB_{it} \right)}{\max_t RB_{it} - \min_t RB_{it}}$$

$$\widetilde{RSB}_{it} = \frac{2 \cdot RSB_{it} - \left(\max_t RSB_{it} + \min_t RSB_{it} \right)}{\max_t RSB_{it} - \min_t RSB_{it}}$$

$$\widetilde{MD}_{it} = \frac{2 \cdot MD_{it} - \left(\max_t MD_{it} + \min_t MD_{it} \right)}{\max_t MD_{it} - \min_t MD_{it}}$$

where I_{it} is an integral indicator of Inclusiveness for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T) time interval;

$\widetilde{RSD}_{it}, \widetilde{RB}_{it}, \widetilde{RSB}_{it}, \widetilde{MD}_{it}$ are the values of the indicators are normalized: the coefficient of the stratification of society by income (share of the unit), poverty level (share of the unit), coefficient of stratification of society by the distribution of wealth (share of a unit), median income (share of unit) for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T) time interval;

$$PPU_{it} = \frac{\sum_{q=1}^{4} PPU_{itq}}{4} = \frac{\widetilde{SCHZ}_{it} + \widetilde{PIGDP}_{it} + \widetilde{DB}_{it} + \widetilde{KDN}_{it}}{4} \qquad (6)$$

$$\widetilde{SCHZ}_{it} = \frac{2 \cdot SCHZ_{it} - \left(\max_t SCHZ_{it} + \min_t SCHZ_{it} \right)}{\max_t SCHZ_{it} - \min_t SCHZ_{it}}$$

$$\widetilde{PIGDP}_{it} = \frac{2 \cdot PIGDP_{it} - \left(\max_t PIGDP_{it} + \min_t PIGDP_{it} \right)}{\max_t PIGDP_{it} - \min_t PIGDP_{it}}$$

$$\widetilde{DB}_{it} = \frac{2 \cdot DB_{it} - \left(\max_t DB_{it} + \min_t DB_{it} \right)}{\max_t DB_{it} - \min_t DB_{it}}$$

$$\widetilde{KDN}_{it} = \frac{2 \cdot KDN_{it} - \left(\max_t KDN_{it} + \min_t KDN_{it} \right)}{\max_t KDN_{it} - \min_t KDN_{it}}$$

where PPU_{it} is the integral indicator of Sustainable development for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T) time interval;

$\widetilde{SCHZ}_{it}, \widetilde{PIGDP}_{it}, \widetilde{DB}_{it}, \widetilde{KDN}_{it}$ are the normalized values of indicators: net savings (share of a unit) were adjusted, greenhouse intensity of GDP (share of a unit); public debt (share of a unit), coefficient of demographic load (share of unit) for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T) time interval;

$SCHZ_{it}$, $PIGDP_{it}$, DB_{it}, KDN_{it} are the absolute values of indicators: net savings adjusted; greenhouse intensity of GDP, public debt (the coefficient of demographic burden (percent) for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T) time interval.

$$K_{it} = \frac{\sum_{q=1}^{4} K_{itq}}{4} = \frac{\widetilde{ID}_{it} + \widetilde{ISK}_{it} + \widetilde{RVB}_{it} + \widetilde{IND}_{it}}{4} \qquad (7)$$

$$\widetilde{ID}_{it} = \frac{2 \cdot ID_{it} - \left(\max_t ID_{it} + \min_t ID_{it} \right)}{\max_t ID_{it} - \min_t ID_{it}}$$

$$\widetilde{ISK}_{it} = \frac{2 \cdot ISK_{it} - \left(\max_t ISK_{it} + \min_t ISK_{it} \right)}{\max_t ISK_{it} - \min_t ISK_{it}}$$

$$\widetilde{RVB}_{it} = \frac{2 \cdot RVB_{it} - \left(\max_t RVB_{it} + \min_t RVB_{it} \right)}{\max_t RVB_{it} - \min_t RVB_{it}}$$

$$\widetilde{IND}_{it} = \frac{2 \cdot IND_{it} - \left(\max_t IND_{it} + \min_t IND_{it} \right)}{\max_t IND_{it} - \min_t IND_{it}}$$

K_{it} is the integral indicator of Adjustment for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T) time interval;

$\widetilde{ID}_{it}, \widetilde{ISK}_{it}, \widetilde{RVB}_{it}, \widetilde{IND}_{it}$ are the values of indicators are normalized: the index of democracy; index of corruption promotion, a rating of budgets openness, the index of state incapacity for the i-th (i = 1, ..., I) countries during the t-th (t = 1, ..., T) time interval;

Turning to the assessment of the index of state regulation of economic restructuring, it is proposed to build a model of independent components (UCM), according to which for each of the six components of governance (publicity and accountability, political stability and lack of pressure, government efficiency, regulatory quality, rule of law, control over corruption) linear independent control function [17]:

$$y_{jk} = \alpha_k + \beta_k(g_j + \varepsilon_{jk}) \qquad (8)$$

where y_{jk} is the estimation of the j-th country in the context of the k-th component of management;

α_k, β_k are the parameters that indicate independent management in the j-th country;

g_j is an independent management in the country, presented as a normal-distributed random variable with zero mean and dispersion 1;

ε_{jk} is the term of violation of the k-th component of management in the j-th country.

These components of state regulation of economic restructuring are complex categories, which can be quantitatively described by the relevant indicators presented in Appendix 1.

After constructing six linear functions of independent management for each of these components of state regulation in economic restructuring, it becomes necessary to determine the quantitative evaluation of independent management for the j-th country for all k management components [17]:

$$E[g_j|y_{j1}, ..., y_{jk}] = \sum_{k=1}^{K} w_k \frac{y_{jk} - \alpha_k}{\beta_k} \qquad (9)$$

where $E[g_j|y_{j1}, ..., y_{jk}]$ is a quantitative assessment of independent management for the j-th country for all k management components;

w_k is the weight of the k-th control signal, which is proposed to be determined by the equation [17]:

$$w_k = \frac{\sigma_k^{-2}}{1 + \sum_{k=1}^{K} \sigma_k^{-2}} \qquad (11)$$

where σ_k is the mean square deviation of the random deviation of the kth control signal.

In turn, the standard error of quantitative estimation of independent control for the j-th country for all k control components is defined as follows [17]:

$$SD[g_j|y_{j1}, ..., y_{jk}] = \left(1 + \sum_{k=1}^{K} \sigma_k^{-2}\right)^{-1/2} \qquad (12)$$

where $SD[g_j|y_{j1}, ..., y_{jk}]$ is the standard error of quantitative assessment of independent management for the j-th country.

The expediency of applying the UCM approach to modeling the index of state regulation of economic restructuring is as follows:

➢ it is based on a certain set of basic data, rather than specific, appropriate to each country;
➢ it considers not only the country's rating position in comparison with others, but also the gap between them, both in general on the state regulation index, and in the context of specific management components;
➢ it is insensitive to extreme increase or decrease of input data, confirming its stability;
➢ it takes into account the different priorities of the management components, allows to provide the desired accuracy of the assessment of the integral index of state regulation;
➢ it considers the uncertainty associated with the evaluation of management indicators.

At the fourth stage, the econometric model is solved, namely, the search for its parameters based on the application of the method of least squares. For practical realization of this stage, it is suggested to use the toolkit Statistica Analysis → Advanced analysis methods → Generalizing regression models.

Proceeding from the fact that a_5 is the parameter of the variable $RegIndex_{it}$ (the index of state regulation of economic restructuring) to provide us with a quantitative description of the effectiveness of state regulation on economic restructuring based on the environmental factor, then in the fifth stage, we will perform a mathematical formalization of its qualitative assessment.

So, this parameter allows us to quantify the interdependence between the index of state regulation in the economic restructuring and the costs of conducting it directly. However, within the limits of the task set, in assessing the effectiveness of state regulation of economic restructuring, considering the environmental factor, it is actual to formalize the interdependence between the factorial features of the econometric model, that is, the study of the interdependence between the index of state regulation of economic restructuring and the integral indicators of Dynamic shifts, Inclusiveness and Sustainable development, since it is a complex study of all these parameters that will allow to give answers to questions. This is due to the fact that the direct relationship between costs and efficiency of state regulation does not provide an answer to the question of the effectiveness of the activities of state bodies specifically for the economy, society and the environment.

The formalization of the fifth stage is due to the implementation of the correlation analysis. The quantitative assessment of interdependence between the index of state regulation of economic restructuring and integral indicators of Dynamic shifts, Inclusiveness, Sustainable development, Adjustment with the help of correlation analysis. Thus, it is proposed to construct a correlation matrix, the elements of which are the paired correlation coefficients. Based on the calculated correlation coefficients that can take values from -1 to +1, one can draw conclusions about the direct or inverse relationship between the state regulation index of economic restructuring and the integral indicators of Dynamic shifts, Inclusiveness, Sustainable development, Adjustment, and also the force of statistically insignificant (from -0.3 to 0.3 parts of unit), weak (from -0.5 to -0.3, from 0.3 to 0.5 parts of unit), average (from - 0,7 to 0,5, from 0,5 to 0,7 parts units) or strong (from -1,0 to -0,7, from 0,7 to 1,0 parts of units) tightness of the connection.

Thus, it is fair to say that the evaluation of the effectiveness of state regulation of economic restructuring considering the environmental factor is based on the parameter of the regression equation, and the logic that determines the adequacy of its assessment is the following: effective government agencies should result in optimal spending of public funds (i.e., an increase in the efficiency of government agencies should lead to a decrease in a rate of spending of public funds on estructuring the and the effect of these measures should be traced in a rapid growth of indices of the characteristics of economic and public life of the population and the environment where they are located.

Conclusions

The estimation of the level of effectiveness of state regulation in the process of economic restructuring, considering its environmental factor, is planned to be carried out on the basis of nonlinear econometric model of the dependence of the costs logarithm of reforms (considering the environmental factor) from the integral indicators such as Dynamic shifts, Inclusiveness, Sustainable Development, Adjustment and Worldwide Governance Indicator (WGI). The regression equation parameter obtained from the modeling in WGI index will reflect the level of efficiency of the state process in economic restructuring. The level of this effectiveness is estimated through the impact of the amount of money spent on restructuring on the dynamics of socio-ecological and economic development of the state.

This formalization makes it possible to investigate the effectiveness of public management, considering the level of funds return spent on economic restructuring in economic and social spheres and the environment.

The assessment of state regulation effectiveness in economic restructuring on the performance indicators of business entities and the population is carried out using the parameters of the constructed model in the form of a regression equation. So, the parameter in the Dynamic shifts index allows to assert about the degree of influence of the efficiency of spending by the state authorities of the economic restructuring on the level of production of goods, works and services in the state, parameter in the Inclusiveness index indicates a corresponding influence on the problem of income inequality, the parameter in Sustainable development index allows to assert about the corresponding influence on the level of social welfare of the population in

the current conditions and the outlook for the future, as well as on the level of environmental pollution reduction. Despite the fact that the integral index of Adjustment was introduced into the model with the purpose of considering the peculiarities of functioning of state authorities in the state, the parameter is very informative and gives an opportunity to state the degree of interrelation between the efficiency of spending by the state authorities on economic restructuring and transparency of activities of these bodies.

All of the above allows us to carry out an impartial assessment of activities of state authorities on economic restructuring, to prove the need for state participation in the processes of comprehensive economic restructuring of the country, to determine the presence or absence of a quantitative relationship between the amount spent for restructuring funds and the welfare of business entities and the population.

Further scientific research will be aimed at practical assessment of state regulation effectiveness in the process of economic restructuring, considering its environmenral factor, the definition of tools to enhance public management in the sphere of economic restructuring, the development of economic restructuring methods that will affect all processes in the state synergistically, proof of the need for government bodies to take into account the environmental component of economic restructuring more actively, and also to formulate a strategic plan for economic restructuring of the state, depending on the level of technological progress in the world.

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Appendix 1. Definition of indicators of state regulation [33]

Management component	Indicators
Voice and Accountability	Electoral Index How much do you trust the parliament? Overall, how satisfied are you with the way democracy works in your country? Free and fair elections Political Participation (SI) Stability of Democratic Institutions (SI) Political and Social Integration (SI) Restrictions on domestic and foreign travel (CIRI) Freedom of political participation (CIRI) Imprisonments because of ethnicity, race, or political, religious beliefs (CIRI) Freedom of Speech (CIRI) Democracy Index Vested interests Accountablity of Public Officials Human Rights Freedom of association Political Rights (FRW) Civil Liberties (FRW) Press Freedom Index (FRP) Media (FNT) Civil Society (FNT) Electoral Process (FNT)
Political Stability and Absence of Violence	Frequency of political killings (CIRI) Frequency of disappearances (CIRI) Frequency of tortures (CIRI) Political terror scale (PTS) Orderly transfers Armed conflict Violent demonstrations Social Unrest International tensions / terrorist threat
Government Effectiveness	Quality of public administration Quality of budgetary and financial management Efficiency of revenue mobilization Government handling of public services (health, education) How problematic are telecommunications for the growth of your business ? How problematic is electricity for the growth of your business? How problematic is transportation for the growth of your business? Consensus Building (MI) Steering Capability (MI) Resource Efficiency (- Avg. of "Efficient use of assets" & "Policy Coordination" Quality of bureaucracy / institutional effectiveness Excessive bureaucracy / red tape
Regulatory Quality	Regional Integration Trade policy Business regulatory environment How problematic are labor regulations for the growth of your business? How problematic are tax regulations for the growth of your business? How problematic are customs and trade regulations for the growth of your business? Organization of the Market and Competition Price liberalisation Competition policy Trade & foreign exchange system Unfair competitive practices Price controls Discriminatory tariffs Excessive protections Discriminatory taxes
Rule of Law	Property rights and rule based governance Over the past year, how often have you or anyone in your family feared crime in your own home? Over the past year, how often have you or anyone in your family had something stolen from your house?

102	Over the past year, how often have you or anyone in your family been physically attacked? How much do you trust the courts of law? Trust in police How often is following characteristic associated with the court system: Fair and honest? How often is following characteristic associated with the court system: Enforceable? How often is following characteristic associated with the court system: Quick? How problematic is crime for the growth of your business? How problematic is judiciary for the growth of your business? Separation of powers Independent Judiciary Civil rights Independence of judiciary (CIRI) Violent crime Organized crime Fairness of judicial process Enforceability of contracts Speediness of judicial process Confiscation/expropriation Intellectual property rights protection Private property protection Judicial framework and independence (FNT)
Control of Corruption	Transparency, accountability and corruption in public sector How many elected leaders (parliamentarians) do you think are involved in corruption? How many judges and magistrates do you think are involved in corruption? How many government officials do you think are involved in corruption? How many border/tax officials do you think are involved in corruption? How common is for firms to have to pay irregular additional payments to get things done? Percentage of total annual sales do firms pay in unofficial payments to public officials? How often do firms make extra payments in connection with taxes, customs, and judiciary? How problematic is corruption for the growth of your business? Anti-corruption policy Prosecution of office abuse Corruption among public officials Corruption (FNT)