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Methodological Techniques for Assessing the Unevenness of Economic Development in the World

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Abstract

This paper is devoted to developing a set of approaches to assessing the unevenness of economic development in the world. Based on the theory of competitive advantage, the authors propose an integrated indicator of competitiveness that divides nations' economic development into various stages. The research attests that, based on the integrated indicator of competitiveness, the level of technogenic development of countries coincides with their level of overall development. In today's conditions of internationalization and globalization of production and capital, this kind of methodology for assessing indicators of national economic development, and, accordingly, the country's place in the international arena, has proven to be quite effective, with the integrated indicator of competitiveness taking account of various approaches and factors. It was proven that countries, the economic development of which is between any of the stages are to be regarded as countries with the transitional economy.

Keywords: Unevenness; Economic development; World economy; System; Effectiveness; Competitiveness; Globalization.

1. Introduction

Uneven economic development is a naturally determined process within the world's economic space. Yet, in recent years the issue has taken on special relevance, as, in the light of dynamic changes taking place in the world, mankind's significant scientific and technical achievements, the accelerated development of the world economy, and major transformations of economic systems, major disparities in development can be observed around the world.

Under these conditions, it is necessary to try to reassess, through the prism of distinct national characteristics, some of the key issues related to the formation and development of the world economy, taking into account the challenges posed to humanity by globalization. Research attests that most of the key attributes of global economic unevenness emerged back in the 19th century when the West achieved an economic breakthrough based on the industrial revolution, which resulted in the expansion of European capital and the first wave of economic globalization.

At the same time, the evolution of the world economy shows that it is not enough to investigate the multiaspect issue of uneven economic development just from the standpoint of economics since the present-day trends in the development of the world economy interact shaping various economic, political, and social factors. Remediating uneven economic development in the world is a primary global objective for the international community, and success in resolving it largely depends on the efficiency of supranational institutions, which do not always meet the expectations.

Issues related to uneven economic development in the world have been investigated by Kirillov (2016), Moskalenko (2014), Perskaya (2017), Polozhentseva (2016), Smirnov and Terelyanskii (2017), Feigin (2009) and others. Most scholars focus on the causes of uneven economic development, without devoting sufficient attention to exploring the phenomenon of uneven economic development fundamentally – in particular, investigating the impact of institutions and their role in national economic development. The lack of scholarly attention to the issue and its growing relevance served as the basis for establishing this paper's key subject matter.

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2. Methods

The study's methodological basis is grounded in the systematic approach, methods of scientific abstraction, analysis and synthesis, the dialectical method for cognizing economic phenomena, and certain tenets of strategic and anticrisis management. To resolve specific objectives in this study, the authors employed the following methods: theoretical generalization, logical, scientific abstraction, associations and analogies – to explore and summarize the methodological foundations of uneven economic development in the world; methods of systems analysis, generalization, and comparison – to explore methodological techniques and methods of diagnosing the management of crisis situations in the world economy.

The study's information basis is grounded in the relevant government statutes and regulations, statistical materials from federal and local authorities, and research publications by Russian and foreign scholars related to issues of uneven economic development in the conditions of globalization (Cherkasov *et al.*, 2017; Karpov *et al.*, 2017; Saadulaeva *et al.*, 2018).

The study intends to develop a set of methodological techniques for assessing the unevenness of economic development in the world and provide a rationale for a set of strategies for managing global economic processes. In addition, it was sought to provide a rationale for a set of techniques for assessing the factors influencing global economic processes and establish and formulate some of the key areas of the development of the world economy under various risky conditions.

3. Results

The econometric model for the impact of institutional and economic variables is employed by the authors as their key empirical research technique for verifying the theoretical supposition that a nation's economic development depends on the efficiency of its institutional mechanism. In constructing econometric models, it is impossible to figure out straightaway which specific type of the model will best reflect the dependence one needs. For this reason, the paper explores various types of the models for the purpose of comparing them and choosing the one, which most adequately reflects the dependence of GDP on institutional and economic variables.

The simplest model that makes it possible to model panel data is a model without effects or a joint regression model. Modeling the data this way, the authors admit that the relationships among the variables are constant in time and for all the crossing objects in the sample. Models of this type can be viewed as general panel data models, but in fact, they are regression models for panel data sets.

In this work, the authors employ an econometric panel data model with fixed effects. At the same time, joint regression models contain boundaries that are common to different nations and do not consider the individual characteristics of the formation of GDP in each nation. In these models, one could join data for different nations into one sample and approach this as observing one generalized abstract nation, i.e. assume that such GDP values could be exhibited by each nation based on preset values of exogenous variables.

Thus, for instance, if the Russian Federation had the same coefficients for labor and human and physical capital and the same level of economic and political freedom as the USA, then, based on the joint regression model, GDP values would be the same for the Russian Federation and the US. Nonetheless, due to the special characteristics of every nation and different geographical, historical, cultural, and other criteria, every nation will have a different GDP, even if the above coefficients are the same.

The advantage of employing modeling that is based on the use of panel data consists in the fact that this kind of research makes it possible to identify different effects of the impact of unmeasured factors for each object in the panel sample. Therefore, to explore a model that will consider different effects for different nations, let us expand the perturbation ε_{it} into components

$$\varepsilon_{it} = \alpha_i + u_{it} \qquad (1)$$

Then the model will turn into a single-component error panel data model, where α_i stands for the specific individual effects of factors for each of the nations, which are not subjected to observation and quantitative measurement, and for this reason, cannot be considered within the regression model, and u_{it} stands for random perturbations.

In addition to single-component error panel data models, one can also employ a two-component error panel data model, where the residual could be represented in the following form:

$$\varepsilon_{it} = \alpha_i + T_t + u_{it} \qquad (2)$$

where α_i is the nonobserved specific individual effects for a nation; T_t is the nonobserved temporal effects; u_{it} is the residual parameters.

In this case, the introduction of the T_t parameters makes it possible to additionally consider specific temporal effects. Depending on whether it is the components of perturbations or cases that are fixed, it is possible to identify data panel models with fixed effects and models with random effects.

The joint regression model is predicated on the supposition that there are common boundaries for all nations which are denoted by a certain coefficient. The panel data model with fixed effects generalizes the joint regression model by introducing different boundary values and thereby considers the fact that the dependence of the GDP level for one nation can differ from the dependence of the GDP level for another nation, although, nonetheless, it is sustainable for different time periods.

A peculiarity of the panel data model with fixed effects consists in the fact that for different nations different values of the α_i variables are assessed, which reflect the influence of factors that are specific for those particular nations. Thus, the differences between nations are presented as differences between constant summands.

Let us presume that the perturbations u_{it} of the panel data model are independent and there are equally distributed random quantities for all objects and periods of time with zero mathematical expectation and a constant dispersion σ_u^2. Then the panel data model with fixed effects is a regression model, in which the sections vary depending on the *i* number. At the same time, the technique with fixed variables can be supplemented with consideration of temporal effects.

One of the ways to generalize it this way is to add into the model the r_t factors, which characterize temporal effects. This kind of modeling is characterized by the introduction of additional dummy variables. If one introduces a constant into the model, to avoid total collinearity they need to give up one of the temporal effects. However, a model of this kind will have a certain degree of asymmetry. In that case, to achieve a symmetrical model one needs to introduce a constant summand and determine the limitation.

$$\sum_{t=1}^{T} T_t = 0 \quad (3)$$

In using a panel data model with fixed effects, it is important to check whether or not the values of the limitations differ statistically. Significant differences in nations' fixed effects can be checked through checking the null hypothesis:

$$H_0 \div \alpha_1 = \alpha_2 = ... = \alpha_N \quad (4)$$

To test the null hypothesis, the authors propose using the following statistic:

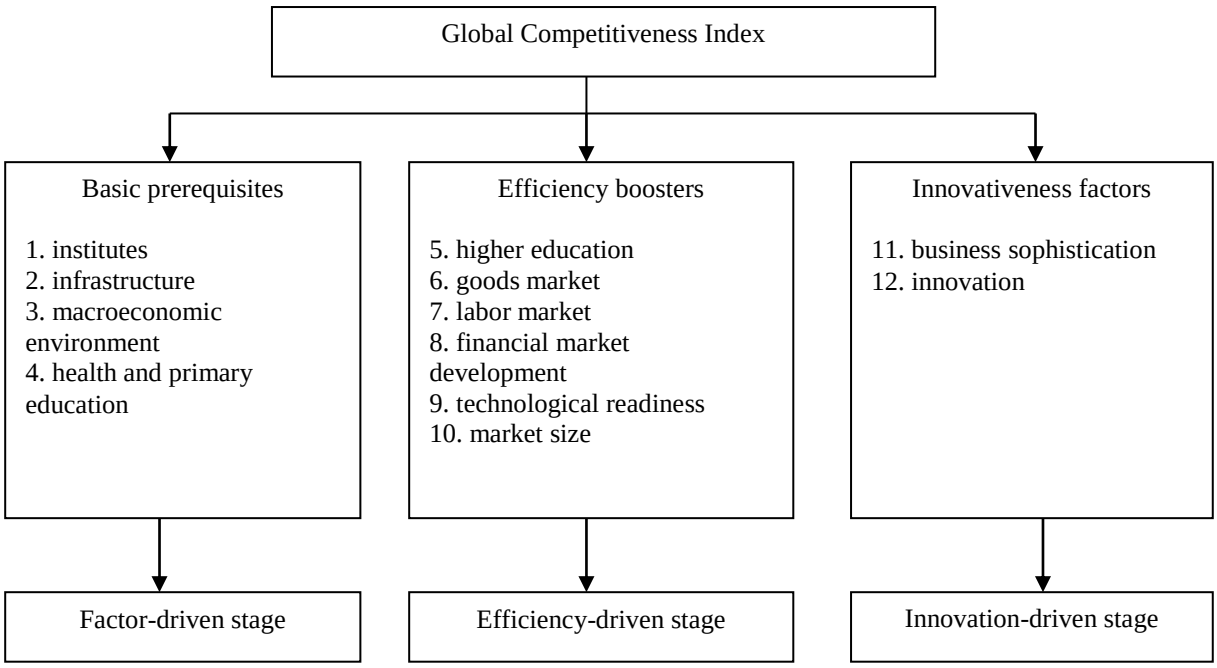
$$F\left[N-1, NT-N-K\right] = \frac{\left(R_U^2 - R_R^2\right)/\left(N-1\right)}{\left(1-R_U^2\right)/\left(NT-N-K\right)}, \quad (5)$$

where *N* is the number of nations; *T* is the number of observation years; *K* is the number of factors for limiting the model; R_U^2 is the coefficient of determination of a model without restrictions on parameters (in the case under study, it is the coefficient of determination of a model with fixed effects); R_R^2 is the coefficient of determination of a model with restrictions on parameters (i.e. a model with one common constant term). The limitation consists in the fact that all the fixed effects are equal among each other and equal to a certain constant.

To check the null hypothesis, the computed value of the F statistic is compared with a critical value found across tables of critical values of the Fisher distribution with the degrees of freedom (N — 1) and (NT — N — K) for the given level of significance. If the computed value of the F statistic is above the critical value, the null hypothesis is rejected. This means that it is more advisable to assess a panel data model with fixed effects than a regular regression model with a common limitation on a panel data set.

The authors also see relevance in exploring the methodology for calculating the Global Competitiveness Index, which determines the role and place of a country as an economic entity within an interrelated system and treats competitiveness as a collection of institutions, policies, and factors that determine the level of production in a country, an indicator directly associated with well-being, development, and progress (Figure 1).

Figure-1. Structure of the Global Competitiveness Index.



A nation's ability to respond to challenges arising in the world is determined by a number of interrelated factors, for the economy cannot be competitive without efficient democracy, which, in turn, is impossible if the nation's population is not well-consolidated socially. A methodology for computing the integrated indicator of a nation's

competitiveness can be based on the synthesis within the ambit of one indicator of a broad spectrum of economic characteristics of various nations and their hierarchical juxtaposition.

Based on the theory of competitive advantage, the integrated indicator of competitiveness divides nations' economic development into three major stages: the factor-driven stage (which basic premises are effectiveness of institutional mechanisms, infrastructure, macroeconomic environment, and high quality of healthcare and primary education), the efficiency-driven stage (which is formed by higher education, goods market efficiency, labor market efficiency, financial market development, technological readiness, and market size), and the innovation-driven stage (determined by business sophistication and innovation) (Table 1).

Table-1. Subindex Shares and GDP Threshold Values across the Stages in Nations' Economic Development

Indicators	Factor-driven stage (Stage 1)	Transition from Stage 1 to Stage 2	Efficiency-driven stage (Stage 2)	Transition from Stage 2 to Stage 3	Innovation-driven stage (Stage 3)
GDP per capita, threshold values, $	< 2,000	2,000–2,999	3,000–8,999	9,000–17,000	> 17,000
Share of the Basic Prerequisites subindex, %	60	40–60	40	20–40	20
Share of the Efficiency Boosters subindex, %	35	35–50	50	50	50
Share of the Innovativeness Factors subindex, %	5	5–10	10	10–30	30

In terms of the GDP per capita indicator, as the key criterion for determining the stage of economic development, a nation is in the factor-driven stage if its GDP per capita is less than $2,000, in the efficiency stage if its GDP per capita is $3,000–9,000, and in the innovation-driven stage if this indicator is above $17,000.

Nations whose economic development is between any two of these three stages are regarded as nations with the transitional economy. In the course of development, their indicators slowly change, which is a testimony to a gradual transition from one stage of development to another – accordingly, their significance in the structure of the nation's competitiveness changes as well.

4. Discussion

The reliability of the proposed techniques for assessing the unevenness of economic development in the world is substantiated by the fact that the computation of the integrated indicator of competitiveness is based on the consistent aggregation of points, starting with the level of variables, i.e. the most detailed level, and ending with the general score for the integrated indicator of competitiveness (Fedulin *et al.*, 2017; Loseva *et al.*, 2017; Seredina *et al.*, 2017). If nothing else is specified, the values of variables within one category can be aggregated using the arithmetic mean method.

To aggregate top-category indicators, it is possible to employ the above-mentioned percentage share. It is a category's share within the main group of indicators. For instance, a score received by a country on a 9-point scale constitutes 17% of the score received on the "boosters of effectiveness" subindex for that country regardless of its current degree of development. As opposed to the lower levels of aggregation, the share of each of the three subindexes is not constant and depends on the stage of development of each country individually.

To aggregate statistical indicators, it is possible to normalize them to values from 1 to 7 in order to comply with the rules for consistency of distribution of points received by a country and relative distance between them. The maximum and minimum points in the sample are the maximum and minimum points in the sample of countries that are on the roster of nations analyzed using the integrated indicator of competitiveness.

Sometimes it is possible to make adjustments taking into account extreme values. For statistical data for which large values mean a worsening of the result (e.g., diseases and national debt), it is necessary to employ a normalization technique whereby the values 1 and 7 will match the lowest and the best results. To prevent duplication, in each case the variables are provided with values equal to half of their share.

5. Conclusion

To conclude, competition, which is a major component of the efficiency of the goods market, is the weighted average of such component parts as internal competition and external competition. Variables that are part of these two component parts define the degree of distortion of competition. A relative value of these distortions depends on the ratio of the dimensions of the internal and external markets.

Research attests that, based on the integrated indicator of competitiveness, the level of technogenic development of countries coincides with the level of their overall development. In today's conditions of internationalization and globalization of production and capital, this kind of methodology for assessing indicators of national economic development, and, accordingly, the country's place in the international arena, has proved to be quite effective, with the integrated indicator of competitiveness taking account of various approaches and factors.

At the same time, the integrated indicator of competitiveness divides nations' economic development into three major stages: the factor-driven stage (which basic premises are effectiveness of institutional mechanisms, infrastructure, macroeconomic environment, and high quality of healthcare and primary education), the efficiency-driven stage (Seredina et al., 2017) (which is formed by higher education, goods market efficiency, labor market efficiency, financial market development, technological readiness, and market size), and the innovation-driven stage (determined by business sophistication and innovation).

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