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ASSESSING ECONOMIC GROWTH QUALITY

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ABSTRACT

Purpose: The aim of this study is to examine the quality of economic growth according to the stages of its generation and manifestation.

Theoretical framework: The use of quantitative estimation when exploring economic growth can lead to misinterpretation or inaccurate judgments, since the economic reality implies not only quantitative, but also qualitative components. The goal of economic growth, its planning and statement are not an end in themselves, they are aimed to improve the welfare of society. Its implementation implies an improvement in the qualitative facet of economic growth. To date, attempts to assess the quality of economic growth are mostly based on its social outcomes. With such an approach, we miss the formation process of economic growth, focusing only on its effects.

Design/methodology/approach: There are developed special indices for both economic growth generation quality and economic growth effects quality, based on macroeconomic and social indicators that play a significant role in the relevant process. These together, as subindices, form an economic growth quality index. The latter is calculated for 76 countries during 2005-2020. The following techniques and indicators are used in the process of the index calculation - normalization, percentiling, optimal lag length selection informational criteria, cointegration tests.

Findings: The research empirically confirms that the economic growth quality in the world manifests itself more steadily than it is being formed. Between the leaders and the countries in the last positions in index rankings, the drastic difference mainly lies in their productivity, expenditures on education and lending to the private sector through domestic credit.

Research, Practical & Social implications: The nature of the proposed economic growth assessment can serve as a baseline for further research studies in this context. On the other hand, the findings of this study can be used to analize the drivers and barriers to growth in each of the observed country.

Originality/value: The approach according to which the economic growth quality index is constructed gives an opportunity to observe economic growth not as a static indicator but as a breathing organism, describing the development process with detailed growth causes and consequences.

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AVALIAÇÃO DA QUALIDADE DO CRESCIMENTO ECONÔMICO

RESUMO

Objetivo: O objetivo deste estudo é examinar a qualidade do crescimento econômico de acordo com os estágios de sua geração e manifestação.

Estrutura teórica: O uso de estimativas quantitativas ao explorar o crescimento econômico pode levar a interpretações equivocadas ou julgamentos imprecisos, uma vez que a realidade econômica implica não apenas componentes quantitativos, mas também qualitativos. A meta de crescimento econômico, seu planejamento e sua declaração não são um fim em si mesmos, mas visam a melhorar o bem-estar da sociedade. Sua implementação implica uma melhoria na faceta qualitativa do crescimento econômico. Até o momento, as tentativas de avaliar a qualidade do crescimento econômico baseiam-se principalmente em seus resultados sociais. Com essa abordagem, perdemos o processo de formação do crescimento econômico, concentrando-nos apenas em seus efeitos.

Projeto/metodologia/abordagem: Foram desenvolvidos índices especiais tanto para a qualidade da geração do crescimento econômico quanto para a qualidade dos efeitos do crescimento econômico, com base em indicadores macroeconômicos e sociais que desempenham um papel significativo no processo relevante. Esses índices juntos, como subíndices, formam um índice de qualidade do crescimento econômico. Esse último é calculado para 76 países no período de 2005 a 2020. As técnicas e os indicadores a seguir são usados no processo de cálculo do índice: normalização, percentilização, critérios informativos de seleção de comprimento de defasagem ideal, testes de cointegração.

Conclusões: A pesquisa confirma empiricamente que a qualidade do crescimento econômico no mundo se manifesta de forma mais constante do que está sendo formada. Entre os líderes e os países nas últimas posições nas classificações do índice, a diferença drástica está principalmente em sua produtividade, gastos com educação e empréstimos ao setor privado por meio de crédito doméstico.

Implicações sociais, práticas e de pesquisa: A natureza da avaliação de crescimento econômico proposta pode servir de base para outras pesquisas nesse contexto. Por outro lado, as constatações deste estudo podem ser usadas para analisar os impulsionadores e as barreiras ao crescimento em cada um dos países observados.

Originalidade/valor: A abordagem segundo a qual o índice de qualidade do crescimento econômico é construído oferece uma oportunidade de observar o crescimento econômico não como um indicador estático, mas como um organismo que respira, descrevendo o processo de desenvolvimento com causas e consequências detalhadas do crescimento.

Palavras-chave: Qualidade do Crescimento Econômico, Geração de Crescimento, Efeitos do Crescimento, Índice de Crescimento.

EVALUACIÓN DE LA CALIDAD DEL CRECIMIENTO ECONÓMICO

RESUMEN

Objetivo: El objetivo de este estudio es examinar la calidad del crecimiento económico según las etapas de su generación y manifestación.

Marco teórico: El uso de estimaciones cuantitativas al explorar el crecimiento económico puede conducir a interpretaciones erróneas o juicios inexactos, ya que la realidad económica implica no sólo componentes cuantitativos sino también cualitativos. El objetivo del crecimiento económico, su planificación y declaración no son un fin en sí mismos, sino que persiguen mejorar el bienestar de la sociedad. Su puesta en práctica implica una mejora de la faceta cualitativa del crecimiento económico. Hasta ahora, los intentos de evaluar la calidad del crecimiento económico se basan principalmente en sus resultados sociales. Con este enfoque, pasamos por alto el proceso de formación del crecimiento económico, centrándonos únicamente en sus efectos.

Diseño/metodología/enfoque: Se han desarrollado índices especiales tanto para la calidad de la generación del crecimiento económico como para la calidad de sus efectos, basados en indicadores macroeconómicos y sociales que desempeñan un papel significativo en el proceso en cuestión. Estos índices juntos, como subíndices, forman un índice de calidad del crecimiento económico. Este último se calcula para 76 países para el periodo 2005 a 2020. En el proceso de cálculo del índice se utilizan las siguientes técnicas e indicadores: normalización, percentilización, criterios informativos de selección de la longitud de retardo óptima, pruebas de cointegración.

Conclusiones: La investigación confirma empíricamente que la calidad del crecimiento económico en el mundo se manifiesta más constantemente de lo que se está formando. Entre los líderes y los países que ocupan las últimas posiciones en la clasificación del índice, la diferencia drástica se da principalmente en su productividad, gasto en educación y préstamos al sector privado a través del crédito interno.

Implicaciones sociales, prácticas y de investigación: La naturaleza de la evaluación propuesta del crecimiento económico puede servir de base para nuevas investigaciones en este contexto. Además, las conclusiones de este

estudio pueden utilizarse para analizar los factores que impulsan y obstaculizan el crecimiento en cada uno de los países observados.
Originalidad/valor: El enfoque según el cual se construye el índice de calidad del crecimiento económico ofrece la oportunidad de observar el crecimiento económico no como un indicador estático, sino como un organismo que respira, describiendo el proceso de desarrollo con causas y consecuencias detalladas del crecimiento.

Palabras clave: Calidad del Crecimiento Económico, Generación de Crecimiento, Efectos del Crecimiento, Índice de Crecimiento.

INTRODUCTION

When discussing economic growth, the use of its quantitative assessment can lead to misunderstanding or misinterpretation, as its nature implies not only quantitative but also qualitative changes. That is why it has already become an imperative in the modern economy to focus on quality of growth. The economic growth recorded in the country does not mean that the quality of life of the population has improved, and in the absence of the latter, the statement of the fact of economic growth becomes an end in itself. Paraphrasing this thought, we can say that the growth is endowed with high quality when it improves life.

On the other hand, qualitative indicators are highly regarded by modern economists. Adding to this the fact that in recent decades the issue of assessing growth has shifted from national income accounting to human-oriented measurements, we can clearly state that the quality of economic growth is one of the major issues in 21st century economics. Thus, the evaluation of this phenomenon and the factor analysis of its generation and manifestation have been defined as the main goals of the current study.

Over the past decade, various attempts have been conducted to measure the growth quality of countries, which in most cases are composite and multidimensional indicators. Central to this agenda of bringing together the aspects of material wealth, harmonious society, and environmental civilization is the issue of how to define and measure inclusive green growth, and how to identify the parameters that best capture the quality of growth. Efforts to improve the quality, rather than quantity, of growth are continuing (Jha, 2018). Therefore, in this context, scientific efforts are aimed at assessing and revealing the mechanisms to improve economic growth quality (EGQ).

THEORETICAL FRAMEWORK

The quality of economic growth, and in general the quality of various economic phenomena that make up the production process and are manifested from it, have been the object of various debates, discussions and scientific works since the second half of the previous

century. Many of them, based on data of different countries and regions, identified a number of typical characteristics of the problem. According to finding of Hanushek and Kimko (2000), international test scores in math and science are strongly linked to growth. Jamison et al. (2007) noted that the quality of education affects the economic outcome by changing the pace of technological progress, in particular, an increase in the amount of one standard deviation of scores on the international student performance test in mathematics causes an annual increase in per capita income by 0.5-0.9%.

Since the beginning of the 21st century, the previously noted tendencies expanded, namely, they were directed towards the general production process and the quality of economic growth. Back In the last decade, Easterlin and Angelescu (2007), referring to subjective criteria for assessing well-being, rather than objective ones, as a result of the analysis conclude that the gap between economic growth and quality of life is even deeper. Although per capita income tends to increase in rich and poor countries, this does not improve the level of happiness and life satisfaction.

In this context, we believe that an important effort makes the Legatum Institute, which has been calculating the aggregate prosperity indicator for more than 160 countries since 2007 (Legatum Institute, 2021c). Over time, the methodology of calculating the index has been developed, and the range of indicators that generate it has expanded. In the latest report published in 2021, the calculation of the index is based on 12 pillars, one of which is economic quality. It measures how well a country's economy is equipped to generate wealth sustainably and with the full engagement of its workforce. The value of this pillar is expressed through 5 main elements: fiscal sustainability, macroeconomic stability, productivity and competitiveness, dynamism, labor force engagement. Each of them, in turn, is formed on the basis of relevant indicators. 19 of the 300 indicators included in the prosperity index relate to the level of economic quality.

One interesting trend was noted during the research of the current study. Especially in the works of recent years, within the framework of the EGQ, the authors put forward new ideas and terms, for example, the "synthetic efficiency indicator for economic growth", through which Kokocińska et al. (2020) described the efficiency of transforming economic growth expenditures into sustainable development outcomes. The authors provided a ranking list of countries based on the efficiency of economic growth towards sustainable growth criterion. They showed that the smaller EU member states are characterized by significantly higher

efficiency of converging expenditures exemplifying economic growth into results pertaining to sustainable development in the researched area.

The complex nature of the growth quality implies the calculation of composite indicators for its evaluation. In particular, from year to year, more and more importance is attached to the environmental problems and the issues related to natural resources in that process. Within this framework, the Global green growth institute has a major contribution. For 2005-2019, the institution calculated the green growth index based on materials of more than 240 countries and regions. It is framed on a green growth economic development model, which aims to deliver equal opportunities from economic prosperity while protecting the environment; it integrates Sustainable Development Goals (SDG) indicators and targets related to green growth dimensions that support the quality of life (i.e., efficient and sustainable resource use, natural capital protection, green economic opportunities, and social inclusion) and it benchmarks indicators against sustainability targets including the SDGs, the Paris Climate Agreement, and the Aichi Biodiversity Targets to measure national-level green growth performance (Acosta et al., 2020).

Aghajanyan et al. (2014) developed an index of the quality of economic growth based on 31 indicators, which are grouped into 10 subsystems, then evaluated it based on the materials of the Republic of Armenia for 2002-2012. As a result, the unfavorable dynamics recorded by the country in terms of the acquisition of information technologies and scientific and educational activities is obvious.

The origin of the underlying idea of the current study comes from the growth quality index proposed by the International Monetary Fund (IMF) in 2011 based on materials of developing countries (Mlachila et al., 2016). Building on the quality of growth index, the authors also investigate the main drivers of the quality of growth. Thus, the quality of growth index is designed as a composite index of subindices capturing the growth nature and the desirable social outcomes. Empirical investigations of the authors point to the fact that main factors of the quality of growth are political stability, public pro-poor spending, macroeconomic stability, financial development, institutional quality and external factors such as FDI.

Thus, at the theoretical level, economic literature has been referring to the quality of growth since the last century, and there are some attempts to transfer it to the quantitative plane. Based on the studied literature, we evaluated the economic growth quality index (EGQI). It is fundamentally different from the assessments presented so far, except for the IMF proposal. In particular, referring to the quality of economic growth, the assessments developed so far mainly

or exclusively focus on its social aspect, which is already quite comprehensively described by international and widespread substantiate indicators, e.g., prosperity, happiness, Gini indices, etc. Of course, the most important consequence of economic growth is precisely social welfare, but the approach will be complete if the preconditions and causes of economic growth and the formation of its quality are also taken into account. This study aims to include these characteristics of the quality of growth. Thus, it will be possible to take into account the presumption that the transition of the economy to a more efficient production and creating preconditions of the high level of potential will lead to an improvement in social outcomes.

METHODOLOGY

The new principle underlying the proposed index is the evolution of the EGQ, in particular, its formation and manifestations. The observation of the EGQ will be incomplete only in the context of indicators of a social outcome nature and from the both interpretation and methodology points of view, since, confining ourselves only to the study of EGQ effects, we cannot understand the factors and possibilities of their improvement. The index consists of two subindices: EGQ generation index (EGQGI) and EGQ effect index (EGQEI). In the first stage of the index building process, sixteen indicators of a macroeconomic and social nature were selected (Table 1). The criteria for their selection are typical characteristics of their relevant subindex nature and reflect the structural features of other assessments provided so far by professional literature. The calculated index should characterize inclusive, environmentally friendly, stable, and efficient economic growth that improves the well-being of society and the competitiveness of the country, ensures technological progress. The listed characteristics form a complex system characterize high-quality growth, which covers both generation and manifestation processes.

The indicators included in the EGQGI, which are grouped in the checkpoints listed below, describe the main driving forces of the economy and the factors that help to discover new opportunities for further growth.

- *Growth structure*. High-quality economic growth is the growth with an efficient structure. It is the key factor that differentiates successful countries from unsuccessful ones and is of vital importance for economic growth. Foreign scientists most commonly define economic sector performance targeted at a country's economic growth as structural changes (Lankauskienė and Tvaronavičienė, 2013). Within an identical macroeconomic setting, they show considerable strength in some industries and

weaknesses in others (European Commission, 2009). Thus, we preferred the decomposed form of the economic growth.

- *Efficiency*. With the improvement of the level of economic development, people pay more attention to total factor productivity (TFP) and regard the improvement of TFP as an important symbol of high-quality economic development (Zeng et al., 2022). Total factor productivity (TFP) is the portion of output not explained by the amount of inputs used in production. As such, its level is determined by how efficiently and intensely the inputs are utilized in production (Comin, 2010). We decomposed TFP as well, because TFP includes output productivity, level of human capital, entrepreneurial climate, level of competitiveness, technological development and innovation capabilities and corporate efficiency, which all are already included in set of selected indicators except of factors' productivity. Their increase would enable higher levels of output in the economy, and their structural charachteristics as well. Sirait et al. (2023) stated that it is crucial for governments to prioritize the development of technology infrastructure for SMEs to provide easy access to this technology. This can increase real per capita income, which can ultimately affect the level of public health. In macroeconomics, empirical observations of GDP production are usually conducted in the context of a production function. It is essentially a metaphorical framework (Lewin, 1995), a mathematical imitation of the input-output process. In this context, the classic production function represents a certain law according to which output depends on labor force and capital. Labor and capital productivity can be considered as productivity indicators (Korkmaz and Korkmaz, 2017), as we appended to our system of indicators, in particular, labor productivity and energy efficiency. The latter has recently been promoted as an industrial policy to boost economic competitiveness. When firms become more productive by using less energy per unit of output, they could become more cost-competitive in export markets. The ensuing investment could bring new jobs and growth, government could allow greater spending in other priority areas that would benefit growth in the long run, such as health and education, policies could create new demand and new markets for energy efficient technologies and products (Rajbhandari et al., 2017). The capital factor indicator is also taken into account, but we find it is more relevant for the following section.
- *Investments*. The impact of investment on economic growth has been studied by many authors around the world with different times and research methods Blomstrom

and Persson, 1983; Tiwari and Mutascu, 2011; Nguyen and Nguyen, 2021). It is one of the most frequently used economic development incentives. Its most common components also are selected for the EGQGI calculation to make the system comprehensive. Domestic investment or gross fixed capital formation has both in terms of theory (Keller and Yeaple, 2009) and empirically (Neanywa and Makhenyane, 2016) recognized as an essential component to facilitate economic growth. The professional literature has repeatedly stated both theoretically and empirically that research and development (R&D) expenditures have significant impact on TFP, both in short and long terms, moreover by various approaches and estimation techniques: Autoregressive distributed lag (Saifuzzaman et al., 2014), data envelopment analysis and one-step and two-step stochastic frontier analysis (Apokin and Ipatova, 2016), pooled mean group (Aydin et al., 2018), non-linear (Kijek and Kijek, 2020), dynamic fixed effect (Abidin and Shaari, 2021), etc. We used share of R&D expenditures in GDP to neutralize the differences among scales of countries during the index calculation process. Foreign investment, particularly foreign direct investment (FDI), has often been seen as a major source of foreign exchange, which helps in easing the balance of payment constraint on economic growth. Moreover, it also supplements domestic investment resources required to thrust economic growth (Chaudhury et al., 2020). It boosts the productivity of local producers as it is assumed that working practices, advanced production technology and managerial knowledge will be transferred from foreign investors to local firms. Countries invest in education to elevate their human resources as well, which will increase growth. Human capital investment is being promoted to corporate innovation performance. Human capital stock is being promoted to innovative performance, and human capital training is being promoted to innovative performance. Improving the value level of human capital is a strategic choice to promote the efficient allocation of resources, increase innovation output and obtain the core competitiveness of enterprises (Lu and Wu, 2023). A number of studies are devoted to evaluate its impact on growth. Many economists and sociologist state that public expenditure in education is the leading sector for economic growth. Although many countries made a long-term investment in education, it is also a priority as a development program through education (Suwandaru, 2021). Investing in education means creating a skilled labor force that will influence the creation of innovations, increase productivity and wages, reduce the demands on the state to finance various social programs, and increase the

state budget by accumulating taxes, and all this is expected to have a positive impact on the economic growth of the country (Ziberi, 2022). Again, its ratio to GDP is taken as EGQGI component.

The EGQEI describe the effects of the growth on society and country's competitiveness. Experts have already proposed certain approaches and evaluation methods, based on which they publish calculated indicators for years describing the social outcomes of growth and the competitiveness level it generates.

- *Happiness*. We started our search for EGQEI from subjective indicators. In this context, we find happiness the most appropriate. Purpose of many modern studies is to analyze the relationship between economic growth and life satisfaction, and these trends have spread and expanded so much that a new direction has emerged in economics. Happiness economics is a very contemporary research field, attracting economists, sociologists, psychologists and other scientists to investigate it, yet there are many rooms for exploration. The researchers are divided in two parties: the ones who are arguing that economic growth and happiness go hand in hand and the ones who say that there is no relationship between these two concepts and because of this fact the constant aspiration for economic growth lost its meaning, and does more harm than benefit (Rus and Blajan, 2021). In any case, the presence of this phenomenon is necessary to indicate the qualitative aspect of growth.
- *Prosperity*. In the 21st century, we should turn our attention to prosperity rather than to development per se (Moore, 2015). The broad brush of prosperity must be about the relationship between individual lives – their quality, aspiration, and purpose – and the larger systems and constraints within which they are embedded (Moore and Mintchev, 2021). After all, in practice, the ultimate goal of governments is to improve welfare.
- *Competitiveness*. Many economic phenomena are described as competitive or non-competitive issues. Berger identifies four main theoretical constructs for national competitiveness: ability of a nation to sell its goods to another nation, to earn, to adjust to changes in the external environment to attract scarce mobile resources (Berger, 2008). From the other side, competitiveness can be defined as the ability of a country (region, location) to deliver the beyond-GDP goals for its citizens. With this definition, competitiveness has arrived at the country level, and the term is now closely connected to welfare assessments in the tradition of the beyond-GDP literature (Aiginger et al.,

2015). That is, competitiveness also has a complex nature and multidimensional indicator is needed for its inclusion in the EGQEI.

- *Market Concentration*. A country with trade (export or import) that is concentrated in a very few markets does not bring an inclusive growth. Similarly, a diversified trade portfolio is more stable and creates more opportunities for further growth.
- *Income inequality*. In the context of social outcomes of growth, income distribution and its relation to economic activity perhaps is the most discussed phenomenon and the most important problem that professional studies face with. Since the 1960s, economists have widely accepted the Lorenz curve as the tool for deriving measures of income inequality in society, among them the Gini coefficient (Kristensen, 2022), which is widely used in socio-economic assessments.

The second step was to collect and consolidate annual data on selected indicators for 2005-2020 for 76 countries. The problem of data imperfection is solved and the normalization of them as well is done in accordance with the priorities and approaches specified in the methodology of the prosperity index (Legatum Institute, 2021b).

Table 1 – Components of the EGQI, their data sources and notations

EGQGI components		
Indicator name	**source**	**notation**
Industry (including construction), value added (annual % growth)	World Bank national accounts data, and OECD National Accounts data files	gi_1
Services, value added (annual % growth)	World Bank national accounts data, and OECD National Accounts data files	gi_2
Agriculture, forestry, and fishing, value added (annual % growth)	World Bank national accounts data, and OECD National Accounts data files	gi_3
Manufacturing, value added (annual % growth)	World Bank national accounts data, and OECD National Accounts data files	gi_4
GDP per person employed (constant 2017 PPP $)	ILOSTAT database	gi_5
Foreign direct investment, net inflows (% of GDP)	International Monetary Fund, International Financial Statistics and Balance of Payments databases, World Bank, International Debt Statistics, and World Bank and OECD GDP estimates	gi_6
Gross fixed capital formation per labor force unit (constant 2015 US$)	World Bank national accounts data, and OECD National Accounts data files	gi_7
GDP per unit of energy use (constant 2017 PPP $ per kg of oil equivalent)	IEA Statistics	gi_8
Domestic credit to private sector (% of GDP)	International Monetary Fund, International Financial Statistics and data files, and World Bank and OECD GDP estimates	gi_9
Government expenditure on education, total (% of GDP)	UNESCO Institute for Statistics	gi_{10}

EGQGI components		
Indicator name	**source**	**notation**
Research and development expenditure (% of GDP)	UNESCO Institute for Statistics	gi_{11}
EGQEI components		
Life Ladder (Happiness index)	Gallup World Poll	ei_1
Prosperity index	Legatum Prosperity Index Dataset	ei_2
Global Competitiveness Index	World Economic Forum	ei_3
HH Market concentration index	WBG - WITS	ei_4
Gini index	World Bank, Development Research Group	ei_5

Note: notations are defined for the following tables.
Source: Prepared by the authors (2022).

The indicators in the Index are based on different units of measurement. In order to merge indicators based on different units of measurement, they were normalized. A distance-to-frontier method is applied for this process, when every indicator is scaled in 0-1 range. This method compares a country's performance in an indicator with the values of the assumed best-case and the worst-case for the indicator.

To perform the first step when normalizing data, we define the frontiers, which are the best and worst cases for each indicator. This scenario applies to components of EGQEI. In particular, best and worst cases were detected based on the data collected since 2005. Then we decided whether there are outliers that should be excluded when selecting the critical cases. This is done primarily because selecting frontiers to include outliers would result in very little differentiation between the majority of the other countries. We are typically guided by the 4th and 96th percentiles for observed values in excluding outliers, that is we detect the boundaries for every component of EGQGI by excluding 50 critical observations (from 1216) both for the worst and best cases. The normalized value formula is given by the following equation:

$$X'_{ij} = \frac{X_{ij} - X_{min}}{X_{max} - X_{min}},$$

Where,

X_{ij} is the unprocessed value of the country i for the j variable. The notations I and j are the country and indicator indices, respectively. Xmin and Xmax stand for the minimum (min) and the maximum (max) values of the current indicator during the observed period, respectively. Where greater values indicate worse outcomes, the distance-to-frontier is inverted, such that higher scores always indicate better performance.

Next, the two subindices are calculated independently. Each indicator receives an equal weight: 1/11 for the factors included in EGQGI, and 1/5 for the EGQGI indicators.

Understandably, each choice made in the construction process of a composite index appears to be very responsible. The developer is compelled to make compromises in each stage, valiantly bearing their drawbacks at the end. The main rationale for this weighting option, which is used in other well-known indices, lies in its simplicity and transparency (Mlachila et al., 2016). Some alternative aggregation options exist, but they cause several inconveniences. The most widely used approach is to use a linear combination of the component indices, where the combination weights are determined by optimizing an objective function. To maximize the overall variation of the resulting composite index, the combination weights can be obtained through principal component analysis (Chen et al., 2021), but it is difficult to apply when it comes to aggregating more than three variables (Mlachila et al., 2016). On the other hand, we do not deal with time series, but with panel data, in which the assessment of the importance of each indicator by weight would be absolutely subjective, since they are quite diverse and differ by trends and degrees of influence across the countries. In case of panel data and missing observations, econometrics is often powerless in determining coefficients process. In the weighting stage, developers encounter a wide variety of approaches along a subjective to objective spectrum. Approaches falling at the former end could assign a more meaningful set of weights, according to a theoretical framework or an expert's opinion. However, with the norm being the lack of a theoretical framework and the existence of 'biasedness' in each developer's opinion, they may result in inconsistencies and broad criticism (Greco et al., 2018).

Table 2 – Informational criteria for choosing the optimal lag of the EGQGI impact on EGQEI

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-35037.86	NA	5.02e+16	83.86091	83.95141	83.89560
1	-18397.83	32603.32	0.476500	44.66466	46.20316*	45.25445
2	-17822.80	1104.660	0.222251	43.90143	46.88793	45.04632*
3	-17520.42	569.3137	0.199208	43.79047	48.22498	45.49046
4	-17137.03	707.1516	0.147301	43.48573	49.36823	45.74081
5	-16860.77	498.9976*	0.140994*	43.43724*	50.76775	46.24743

Note: the table presents the optimal lag length criteria determined for the restricted vector autoregressive model fitted to panel data of EGQEI and EGQGI components. The notation * indicates the optimal lag length according to current criteria.
Source: Prepared by the authors (2022).

If the formation of the EGQ generation is mainly due to the values of the corresponding indicators of the current year, the qualitative effects cannot be immediately noticeable. The next task is to choose the optimal lag for the manifestation of economic growth. For this purpose, the vector autoregressive optimal lag length criteria have been calculated (Table 2). According to them, the optimal lags among proposed ones (1 to 5) are 2, 3 and 5. In order to select the

most appropriate lag from them, which will help to establish a consistent long-term relationship between the two groups of indicators, cointegration tests were conducted between them (Table 3).

The results indicate that there is a long-term relationship between the EGQEI and the EGQGI components, in particular, the third lag is the optimal one. Having supplemented this circumstance with the fact that the summary of the optimal lag length criteria is the lowest in the case of the third lag, we decide to choose it for the next step of the calculation underlying the index.

Table 3 – Resulsts of the long-run relationship tests of between EGQGI components and EGQEI

Kao test for cointegration			
Ho: No cointegration	Number of panels	76	
Ha: All panels are cointegrated	Number of periods	14	
Cointegrating vector: Same			
Panel means: Included	Kernel:	Bartlett	
Time trend: Not included	Lags:	1.41 (Newey-West)	
AR parameter: Same	Augmented lags:	2 / 3 / 5	
		p-values	
	Lag 2	Lag 3	Lag 5
Modified Dickey-Fuller t	0.0487	0.0487	0.0487
Dickey-Fuller t	0.0005	0.0005	0.0005
Augmented Dickey-Fuller t	0.2334	0.1711	0.2334
Unadjusted modified Dickey-Fuller t	0.0001	0.0001	0.0001
Unadjusted Dickey-Fuller t	0.0000	0.0000	0.0000

Note: results of cointegration existence between EGQGI components and EGQEI for the second, third, and fifth lags. The test compares the null hypothesis of cointegration absence against the alternative of cointegration. The output reports the values of all test statistics with their respective p-values at significance level of 5%).
Source: Prepared by the authors (2022).

Thus, the influence of indicators generating the growth quality on their manifestations is expressed over three periods, that is, the current EGQEI is determined according to its average effect during the following three years. For example, the EGQEI in 2007 is the average EGQEI of 2008-2010. For the calculation of this indicator for 2018-2020, the values for 2021-2023 are predicted along a linear trend by using retrieved data. Through such an approach, from the point of view of the methodology and index interpretation, the phenomena of the generation and effects of the EGQ are clearly separated by their influence periods.

Thus, after selecting indicators, collecting data, normalizing them and determining the relevant weights, two subindices were calculated by weighted average. Their arithmetic mean introduces the EGQI.

RESULTS AND DISCUSSION

The EGQ allows forming a more holistic view of the country's economic growth, and the numbers, characterizing its quantitative rate, can provide a multifaceted picture of reality, as well as give an opportunity to identify the problems that prevent growth or cause its incomplete manifestation and make a certain economic diagnosis.

In Table 4 the studied countries in descending order of EGQI are represented. European countries lead, the top ten is closed by the USA. The last positions occupy the Asian and African countries. The lineups of the leaders according to the subindices look similar, but in the case of the lowest indicators they differ. The drastic between the EGQGIs of the best and worst performing countries is sharper than in case of EGQEI. Switzerland's average EGQGI over 15 years studied is higher, more than twice, than that of Pakistan. In case of EGQEI the performance disparity between Switzerland and Mongolia equals to 58%.

Table 4 – EGQI, EGQGI, EGQEI and EGEMS average values in 2005-2020 for the studied countries

Country	EGQGI	EGQEI	EGQI	EGEMS	Country	EGQGI	EGQEI	EGQI	EGEMS
Switzerland	0.65	0.82	0.73	B+B+	Peru	0.33	0.68	0.50	AB
Denmark	0.61	0.80	0.71	B+B+	Argentina	0.32	0.68	0.50	AB
Sweden	0.55	0.81	0.68	BB+	Morocco	0.37	0.63	0.50	AA+
Ireland	0.61	0.75	0.68	B+B+	Romania	0.33	0.66	0.49	AA+
Luxembourg	0.57	0.77	0.67	B+B+	Moldova	0.33	0.65	0.49	AA+
Norway	0.57	0.77	0.67	B+B+	Ghana	0.36	0.62	0.49	AA+
Netherlands	0.53	0.78	0.66	BB+	Georgia	0.33	0.65	0.49	AA+
Finland	0.50	0.80	0.65	BB+	Indonesia	0.30	0.68	0.49	AB
United Kingdom	0.48	0.79	0.64	BB+	Colombia	0.35	0.63	0.49	AA+
United States	0.51	0.76	0.64	BB+	Kazakhstan	0.31	0.66	0.49	AA+
Israel	0.52	0.74	0.63	BB	Serbia	0.31	0.66	0.48	AA+
Germany	0.47	0.77	0.62	BB+	India	0.33	0.64	0.48	AA+
Iceland	0.51	0.73	0.62	BB	Russia	0.31	0.65	0.48	AA+
France	0.46	0.75	0.61	BB+	Ecuador	0.31	0.65	0.48	AA+
Cyprus	0.49	0.72	0.60	BB	Armenia	0.32	0.64	0.48	AA+
Panama	0.45	0.72	0.58	A+B	Philippines	0.31	0.65	0.48	AA+
Spain	0.44	0.72	0.58	A+B	Ethiopia	0.37	0.59	0.48	AA
Estonia	0.42	0.72	0.57	A+B	Sri Lanka	0.34	0.62	0.48	AA+
China	0.47	0.67	0.57	BA+	Botswana	0.40	0.55	0.48	A+A
Canada	0.44	0.69	0.57	A+B	Albania	0.34	0.61	0.48	AA+
Italy	0.42	0.70	0.56	A+B	Kenya	0.32	0.62	0.47	AA+
Czech Republic	0.39	0.72	0.56	A+B	Azerbaijan	0.33	0.60	0.47	AA
Slovenia	0.41	0.70	0.55	A+B	Gabon	0.31	0.62	0.47	AA+
Malaysia	0.40	0.70	0.55	A+B	Ukraine	0.30	0.63	0.46	AA+
Costa Rica	0.40	0.68	0.54	A+B	Senegal	0.31	0.62	0.46	AA+
Portugal	0.42	0.66	0.54	A+A+	Egypt	0.33	0.59	0.46	AA
Latvia	0.37	0.71	0.54	A+B	Algeria	0.30	0.62	0.46	AA+

Country	EGQGI	EGQEI	EGQI	EGEMS	Country	EGQGI	EGQEI	EGQI	EGEMS
Poland	0.37	0.71	0.54	A+B	Mexico	0.32	0.60	0.46	AA
Chile	0.39	0.69	0.54	A+B	Kyrgyzstan	0.30	0.60	0.45	AA
Lithuania	0.38	0.69	0.53	A+B	Iran	0.29	0.61	0.45	AA+
Hungary	0.39	0.68	0.53	A+B	Mongolia	0.38	0.52	0.45	A+A
Slovak Republic	0.37	0.70	0.53	AB	Guatemala	0.27	0.62	0.45	AA+
Turkey	0.40	0.66	0.53	A+A+	Tanzania	0.29	0.60	0.44	AA
Brazil	0.35	0.69	0.52	AB	Myanmar	0.32	0.57	0.44	AA
Jordan	0.37	0.66	0.52	AA+	Nicaragua	0.29	0.58	0.44	AA
Uruguay	0.35	0.68	0.51	AB	Pakistan	0.26	0.59	0.42	AA
Croatia	0.34	0.68	0.51	AB	Zambia	0.27	0.54	0.41	AA
Greece	0.35	0.67	0.51	AA+	Nepal	0.28	0.53	0.41	AA

Note: in EGEMS column the notation “A” corresponds to the values between 0 and 0.25, “A+”—between 0.25 and 0.5, “B”—to values in range 0.5-0.75, “B+” to 0.75-1 interval. The countries are sorted in ascending order of EGQI.

Source: Prepared by the authors (2022).

In a separate column, there are introduced the economic growth effective manifestation statuses (EGEMS) of each country (Table 4). It represents the country’s relative level of transition from economic growth generation to its manifestation. To obtain the latter, at first, the subindices were normalized. Then certain notations were given to the obtained values. Their combined purpose is precisely the EGEMS (in “formation/effect” order). This classification by status clearly shows the effectiveness of economic growth qualitative manifestation of each country. It illuminates the country’s effectiveness of improving the quality of life of people and the competitiveness of the country through the outcome obtained from growth.

If, under conditions of a certain level of growth in economic sectors, productivity, government expenditures and other macro fundamental improve, in subsequent periods the prosperity of the population boosts, the market concentration and inequality in income distribution softens, as well as other effects of growth are positive, then we can affirm that the economic growth of the current country is effectively manifested. The mentioned scenario is noticed for Slovakia, Brazil, Uruguay, Croatia, Peru, Argentina, and Indonesia. The “AB” status registered by them indicates that the countries, being in relatively low positions (A) among the countries under consideration with a certain result of registered EGQGI, occupy two levels higher positions by EGQEI. That is, with the current level of economic activity quality, they demonstrate a higher level of manifestation than others. In case of these countries, the problem of improving the EGQ is mainly in the factors that shape growth. The EGQI leaders have this indicator relatively neutral, since they have high indicators for both subindices. Here the driving forces of the economy function well, and through appropriate economic and legal mechanisms they effectively transform them to high-quality effects.

There are few countries that recorded a negative EGEMS - China, Botswana, and Mongolia. Within the framework of the countries under consideration, they occupy relatively higher positions in EGQGI rankings than in EGQEI. This means that in these countries, unlike others, there are problems in the process of transition from EGQ formation to its manifestation. For example, in China, the growth of economic sectors is relatively high, but high concentration of the market and Gini coefficient, as well as a relatively low prosperity index distort the high-quality formation of growth. The country ratings also indicate this difference: according to the EGQGI rating, the country ranks 16th, while according to the EGQEI it is only 39th out of 76 countries.

After calculating the index and the classification of the countries' transition from growth to quality, we have tried to understand the driving forces of the leaders, detect the common problems that the countries in the last positions face and the factors preventing improvement of the growth quality. In Table 5 the best and worst ten countries according to their EGQ performance are selected, conditionally highlighted values below 0.2 (as a barrier to improving EGQ) and above 0.8 (factors promoting EGQ) as well. Even among outsiders, there are no countries that scored less than 0.2 EGQEI. Foremost, the reason is in the composition of the countries included in our monitoring, which is not complete. On the other hand, the outliers' definition by percentiles could also cause this. Despite these circumstances, it can be stated that from the point of view of the manifestation of the EGQ, the problems of outsiders are not critical. The leaders have a more noticeable high level of prosperity, as well as a less level of market concentration. The picture is more differentiated in the depth of EGQGI. Let's highlight the core differences between the two groups of countries, and also present some of their main characteristics. The recorded growth of economic sectors and the foreign direct investment differ little between the two groups and do not lead to a decisive difference in the final formation of the economic quality growth quality. Productivity, as well as domestic credit to private sector and government expenditure on education, are more noticeable in EGQGI components of top ten countries. In the last ten, all other indicators are prominent in a negative way (except for the growth of economic sectors), especially GDP per employed, gross fixed capital formation per labor force unit, R&D expenditure as well.

Table 5 – Values of EGQI components of top and bottom ten countries in EGQI rankin

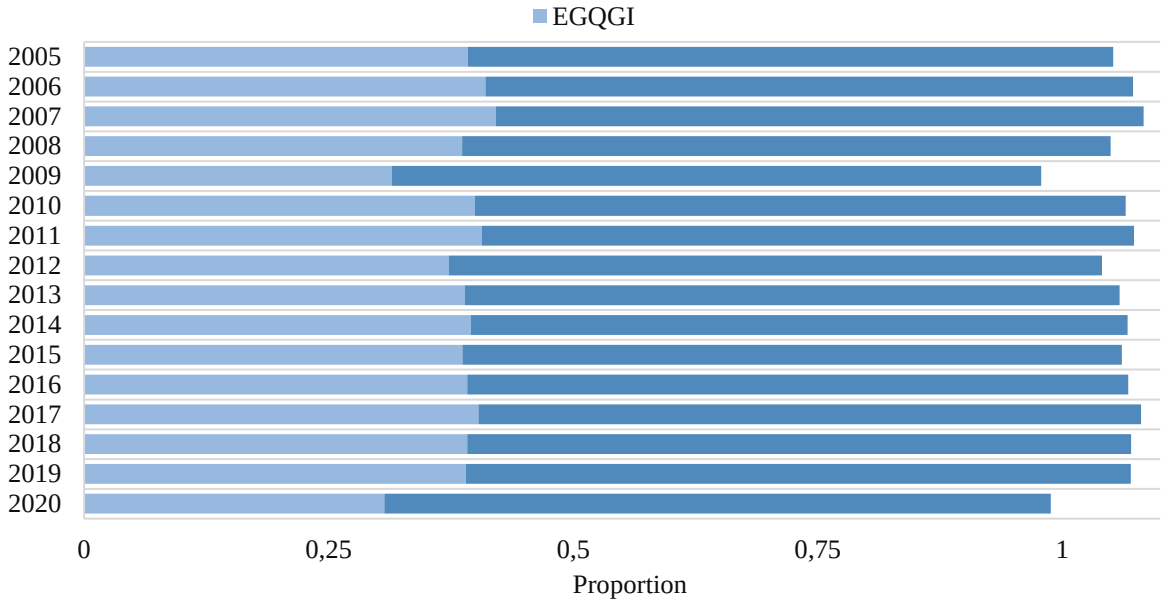
Country	**gi_1**	**gi_2**	**gi_3**	**gi_4**	**gi_5**	**gi_6**	**gi_7**	**gi_8**	**gi_9**	**gi_{10}**	**gi_{11}**	**ei_1**	**ei_2**	**ei_3**	**ei_4**	**ei_5**
Top 10																
Switzerland	0.45	0.4	0.48	0.48	**0.93**	0.29	**0.97**	**0.89**	0.48	0.76	**1**	0.76	**0.82**	**0.81**	**0.93**	0.75
Denmark	0.5	0.37	0.47	0.43	**0.98**	*0.09*	**0.86**	0.67	**0.96**	0.72	0.61	0.77	**0.83**	0.77	**0.94**	0.73

Country	gi_1	gi_2	gi_3	gi_4	gi_5	gi_6	gi_7	gi_8	gi_9	gi_{10}	gi_{11}	ei_1	ei_2	ei_3	ei_4	ei_5
Sweden	0.49	0.42	0.43	0.44	0.71	*0.16*	0.8	0.28	**0.85**	**0.82**	0.65	0.74	**0.83**	0.79	**0.96**	0.74
Ireland	0.52	0.51	0.53	0.53	0.55	0.71	**0.98**	**0.83**	0.44	0.33	0.74	0.71	0.79	0.71	**0.9**	0.64
Luxembourg	0.45	0.45	0.45	0.45	0.51	0.7	**1**	0.59	0.33	0.35	**1**	0.7	0.8	0.72	**0.91**	0.7
Norway	0.52	0.41	0.42	0.4	0.75	*0.13*	**0.98**	0.34	**0.87**	0.44	**0.97**	0.76	**0.83**	0.75	**0.91**	0.57
Netherlands	0.49	0.38	0.44	0.43	0.64	0.71	**0.83**	0.4	0.55	0.47	0.5	0.75	**0.81**	0.78	**0.91**	0.64
Finland	0.53	0.35	0.44	0.44	0.49	*0.17*	0.8	*0.17*	0.74	0.8	0.58	0.76	**0.82**	0.78	**0.96**	0.68
United Kingdom	0.43	0.39	0.42	0.38	**0.87**	*0.19*	0.71	0.55	0.55	0.41	0.42	0.69	0.79	0.77	**0.95**	0.74
United States	0.52	0.41	0.45	0.45	**1**	*0.11*	**0.96**	0.21	*0.18*	0.68	0.65	0.71	0.77	**0.81**	**0.94**	0.58
Bottom 10																
Kyrgyzstan	0.51	0.57	0.45	0.53	*0.04*	0.26	*0.05*	*0.17*	0.67	*0.04*	*0.01*	0.51	0.52	0.51	0.77	0.66
Iran	0.58	0.45	0.52	0.44	0.28	*0.07*	0.35	0.03	0.27	*0.13*	*0.11*	0.49	0.47	0.59	**0.87**	0.63
Mongolia	0.66	0.76	0.58	0.62	0.22	0.53	*0.16*	0.08	0.47	*0.05*	*0.06*	0.5	0.54	0.53	0.38	0.64
Guatemala	0.54	0.51	0.49	0.5	*0.13*	*0.11*	*0.13*	0.32	0.18	*0.01*	*0.04*	0.62	0.53	0.57	0.79	0.57
Tanzania	0.58	0.65	0.64	0.74	*0.01*	*0.16*	*0*	*0.01*	0.29	*0.11*	*0.01*	0.37	0.47	0.51	**0.92**	0.72
Myanmar	0.57	0.67	**0.86**	**0.87**	*0.04*	*0.18*	*0.02*	0.26	0	*0.01*	*0.02*	0.44	0.41	0.47	0.78	0.7
Nicaragua	0.54	0.45	0.53	0.52	*0.14*	0.28	*0.06*	0.26	0.37	*0.02*	*0.02*	0.56	0.52	0.52	0.61	0.66
Pakistan	0.53	0.57	0.53	0.53	*0.06*	0.09	*0.07*	0.24	0.09	*0.09*	*0.01*	0.52	0.41	0.51	**0.94**	0.54
Zambia	0.47	0.68	0.55	0.63	*0.03*	0.23	0.03	0.05	0.26	*0.06*	*0.03*	0.46	0.48	0.51	**0.84**	0.44
Nepal	0.55	0.58	0.49	0.56	0.29	*0.05*	*0.01*	*0.17*	0.31	*0.06*	*0*	0.47	0.46	0.52	0.64	0.52

Note: The values are averaged for the observed 2005-2020 period. The notations' meanings of columns' headers are available in Table 1. The italic style indicates the values below 0.2, bold ones—above 0.8.
Source: Prepared by the authors (2022).

Touching upon the EGQ dynamics in the world , we can state that, in general, the EGQ is ensured mainly by the economic growth quality effects (see Figure 1), especially on the life of society and countries' competitiveness. On the other hand, the subindex dynamics is quite stable. Over the past sixteen years the increase in the EGQEI has not exceeded 0.4%, the standard deviation in absolute terms is negligible (0.0007). However, the fluctuations are quite evident in the EGQGI dynamics, in which the standard deviation of the subindex is higher more than 14 times than that of EGQEI. Dynamics also clearly describe the periods of economic crises and pandemics. The largest mean square deviations are observed in the series of "domestic credit to private sector" and "GDP per person employed" indicators. Thus, we can state that fluctuations in the EGQ predominantly depend on economic shocks, among which it can be difficult for countries to generate high-quality economic growth. But due to the efforts of governments, as well as the behavior of economic circles and stabilizers in the long term, in our case, during the following three years, the inconstancy is mitigated. Therefore, in the world there are problems related to the realization of economic potential, the formation of the quality of economic growth and its instability, which are the main hindering forces in improving economic growth.

Figure 1 – EGQGI and EGQEI proportions in EGQI in observed countries during 2005-2020



Source: Prepared by the authors (2022).

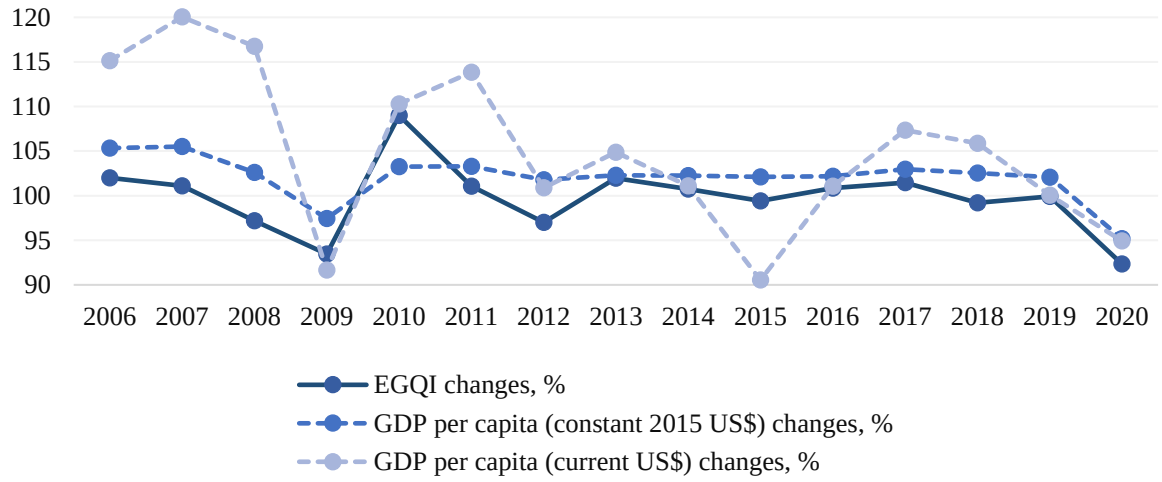
EGQI and GDP per Capita Comparison

In the next section of our study, we touch upon the gaps between the proposed index and the nominal-real GDP indicators, which confirm that the latters are substantively incomplete. The factor analysis resulting from this may make it possible to identify those areas where the effective application of policies, aimed at improving them, will allow endowing high economic growth with qualitative features. On the other hand, the reallocation of priorities will refine the contribution of the qualitative aspects of the growth process and focus the spotlight on what development truly means (Thomas et al., 2000). For this purpose, we used the indicators of GDP per capita at current and constant prices.

Before addressing the most pronounced ruptures and their causes, let us look at the developments taking place in the world during the observed 16 years (Figure 2). Note that although the trends of the EGQI and nominal GDP changes coincide, the nominal GDP changes are much sharper, which in the case of the index is mitigated by the latter's consideration of long-term provisions for growth. That is, the nominal GDP, encompassing price changes, and thereby affecting the behavior of consumers and entrepreneurs, as well as other economic entities and phenomena, describes the changes in economic reality. But on the other hand, the relationship between inflation and productivity growth is found to be negative in cross-country empirical studies (Abdychev et al., 2015), and incomes of the population are negatively affected by inflation as well (Leonidova, 2019), which leads to a violation of qualitative characteristics of growth in the processes of its formation and manifestation. Another study suggests that

before reaching some threshold level, inflation has a positive impact on growth (Malik et al., 2021). This leads to milder changes in the EGQI compared to nominal GDP. The trends and dynamics of real GDP are more similar to the EGQI picture, but in this case the aforementioned indirect effects of inflation on the quality of growth miss, which gives a smoother overview. Moreover, the deflators used to separate GDP into nominal GDP and real GDP may produce a biased measure of inflation. For new goods and services that are changing in quality, current methods may not capture consumer surplus well. A central issue here is how to separate changes in prices that reflect quality improvements from those that represent true inflation (Dynan and Louise, 2018). Thus, we can conclude that nominal GDP forces to overestimation of the qualitative side of economic reality, and in the case of real GDP—its underestimation.

Figure 2 – Growth dynamics of EGQI, real GDP per capita and nominal GDP per capita during 2006-2020



Source: Prepared by the authors (2022).

The lineups of the countries occupying the first and last places also differ according to the growth quality index and GDP indicators, e.g., despite the fact that Luxembourg is the leader in terms of GDP per capita, it is only 5th in terms of the quality of growth index. At the opposite pole of the ratings, the picture is much more differentiated: The GDP per capita in Ethiopia is the lowest among the countries under consideration, but the country ranks 55th out of 76 by EGQI.

Economic activity and its quality can differ both on the global scale and on the scale of individual countries. When considering the real GDP per capita as an indicator of the country's economic development, we can get into misconception about its performance: it can lead to underestimation or overestimation, inaccurate judgments, biased conclusions. The importance of the quantitative assessment of the quality of growth is most clearly represented by the

examples of the countries, which deviations in EGQI and real GDP per capita are large. For example, China ranks only 43rd on average during 2005-2020 by real GDP per capita (constant 2015 US$). However, during the same period, on average, the quality of the country's economy is relatively much higher—19th out of 76 countries. This difference is due to its high growth of economic sectors, especially in industry, R&D expenditures, as well as high competitiveness of the country and low degree of market concentration. However, there is a rather low level of happiness and prosperity in the country, a relatively high Gini coefficient. Changes in real GDP per capita in the country are much more stable than changes in EGQI. The crises and economic cataclysms in 2008, 2016 and 2020 are noticeable in changes in EGQ, which miss in the dynamics of GDP per capita. On the other hand, Mexico ranks much lower on the EGQI (66th) than on GDP per capita (37th). The country is in the last ten according to two subindices. The shares of domestic credit to private sector, net inflows of foreign direct investment, R&D expenditure in GDP, and gross fixed capital formation per labor force unit as well are quite low in the country. In manifestation stage, only the market concentration is unfavorable, according to which the country occupies the penultimate place. I.e., Mexico's problems are mainly expressed in the growth quality formation process. Although the trends of GDP per capita and EGQI in the country generally coincide until 2013, after that the former has an increasing character and the latter has a decreasing one. Thus, the real GDP appears to be misleading about the economic dynamics of the country.

CONCLUSION

In the conditions of diversity and uncertainty of the modern world, it is difficult to describe the quality of the country's development according to the available quantitative indicators. The real GDP appears to be misleading about the economic dynamics of the country, as it does not characterize the qualitative characteristics of growth. The index calculated within the framework of this study, which is based on data of selected 16 indicators for 76 countries in the period of 2005-2020, allows exploring the dynamics of the country's EGQ, identify the main obstacles in its development, and make a definite diagnosis. The evolutionary approach to the quality of economic growth laid down in the basis of the proposed EGQI, both in factorial and temporal terms, allows us to provide a comprehensive description for countries.

In the world as a whole, the EGQ is stable (except of the crisis and pandemic years), in particular, the economic growth quality manifests more steadily, than it is generated.

The subsystems concerning the formation and effects of the EGQ, as well as the classification of countries by the status of effective manifestation of economic growth, state that the economic growth quality transition from formation to its manifestation in the majority of countries is mainly effective. In developing countries, it is stable, but in absolute terms it is quite low. The transition in some countries is inefficient.

The drastic difference between the leaders and the countries in the last positions mainly lies in productivity, education expenditures and lending to the private sector through domestic credit.

Although the trends of the EGQI and nominal GDP changes coincide, the nominal GDP changes during the observed period are much sharper, which in the case of the index is mitigated by the latter's consideration of long-term provisions for growth. The trends and dynamics of real GDP are more similar to the EGQI picture, but effects of inflation on the economic activity and growth quality miss, which gives a smoother overview. Thus, in the growth quality context, nominal GDP represents the economic reality, where impact of prices is overestimated, and in the case of real GDP, it is underestimated.

The lineups of the countries in EGQI and GDP per capita rankings differ. In some cases, the depth of contrast can lead to inaccurate judgments and biased conclusions about the current country, eventually the research finding may appear to be suspicious or controversial.

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