УДК. 330.342:004.8

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МҮМКҮНЧҮЛҮКТӨРДҮ ЖАҢЫЛОО: ЖАСАЛМА ИНТЕЛЛЕКТ ЭКОНОМИКАНЫН ТАТААЛДЫГЫН КАНТИП КАЛЫПТАНДЫРАТ

Аннотация. Бул макалада экономикалык өнүгүүдөгү диверсификациянын ролу, жана көпчүлүк өлкөлөр басып өткөн моделдер изилденет. Экономикалык татаалдык методологиясы өлкөнүн жашыруун артыкчылыктары менен аялуу жактарын аныктоо аркылуу анын потенциалын так ачууга жардам берет. Жасалма интеллект адам капиталы, илимий-изилдөө жана тажрыйбалык-конструктордук иштеп чыгуулар (ИИТКИ), институттук сапат сыяктуу негизги жөндөмдөрдү өзгөртө ала тургандыгы көрсөтүлгөн. Жасалма интеллект изилдөөлөрдү тездетүүчү, патенттердин санын көбөйтүүчү жана көндүмдөрдүн жаңы айкалыштарын түзүүчү жаңы жөндөмгө айланууда. Жасалма интеллектти өз процесстерине интеграциялаган экономикалар жогорку экономикалык татаалдыкка жетишип, узак мөөнөттүү өсүштү камсыз кыла алышат.

Негизги сөздөр: экономиканы диверсификациялоо, жасалма интеллект, эки баскычтуу диверсификация, экономикалык татаалдык, жөндөмдүүлүк теориясы, адамдык капитал.

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ПЕРЕОСМЫСЛЕНИЕ ВОЗМОЖНОСТЕЙ: КАК ИСКУССТВЕННЫЙ ИНТЕЛЛЕКТ ФОРМИРУЕТ СЛОЖНОСТЬ ЭКОНОМИКИ

Аннотация. Данная статья исследует роль диверсификации в экономическом развитии и модели, через которые проходят большинство стран. Методология экономической сложности помогает точнее выявлять потенциал страны, раскрывая скрытые преимущества и уязвимости. Показано, что искусственный интеллект (ИИ) трансформирует ключевые способности, такие как человеческий капитал, НИОКР, институциональное качество. ИИ становится новой способностью, ускоряющей исследования, повышающей количество патентов и создающей новые комбинации навыков. Экономики интегрирующие ИИ в процессы могут достигать высокую экономическую сложность и поддерживать долгосрочный рост.

Ключевые слова: экономическая диверсификация, искусственный интеллект, двухэтапная диверсификация, экономическая сложность, теория способностей, человеческий капитал.

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REINVENTING CAPABILITIES: HOW ARTIFICIAL INTELLIGENCE SHAPES ECONOMIC COMPLEXITY

Abstract. The article examines the role of diversification in economic development and the patterns most countries follow. Economic Complexity provides a clearer view of a country's potential by revealing hidden advantages and vulnerabilities. The paper shows that traditional capabilities such as human capital, research capacity and institutional quality remain central but are being reshaped by Artificial Intelligence. AI emerges as a new capability that accelerates research, increases patenting and enables new combinations of skills, leading to more advanced and less common products. Economies integrating AI are more likely to sustain long-term growth and reach higher economic complexity.

Keywords: economic diversification, artificial intelligence, two-stage diversification, economic complexity, theory of capabilities, human capital.

In the realm of rapid changes in today's world, with increasing risks of geopolitical crises, environmental challenges, and the 21st-century technological revolution, the question of diversification becomes essential for every country that aims to minimize external and internal risks. The more a nation relies on a single sector, the more difficult it becomes when confronting shocks, whereas a diverse economic profile helps to decrease the sensitivity to potential shocks. For example, with a price drop in the commodity market, an economy can balance out through stronger growth in other sectors like the IT industry, machinery, or the service sector. Diversification can soften the consequences of imposed sanctions on a country, changes in the world market, and technological revolutions. Another positive implication of a well-diversified economy is that it enhances social sustainability. The development of various areas of activity results in the creation of diverse positions in the job market for people with different levels of education and skills, ranging from production and service to high-technology engineering and scientific research. In turn, this broader economic and skill base makes a country more conducive to attracting foreign direct investment, as such a multifaceted economy is considered not only less risky but also more opportunity-rich.

One can argue that diversification is a natural, structural process, and the empirical evidence from the work of Jean Imbs and Romain Wacziarg proves that most countries undergo a similar process, consisting of two stages, on their path to economic development. In the first stage of diversifying the economy, almost every nation attempts to develop new sectors and increase its production power, enlarging the portfolio of its export basket. This expansion helps create more jobs, reduce dependency on a single sector, and become more stable toward external shocks. Once a country reaches an upper-middle-income level, it is more likely to shift to the production and development of more specialized products with higher value and technological advancement, which allows it to build a stronger comparative advantage in international markets. This second stage reflects a movement from broad diversification toward strategic specialization, with a focus on high-technology industries and knowledge-intensive operations [3, p.64].

This two-stage process leads us to an important question: how can we measure the progress of a country on its way to a diversified economy, and where it stands in the production of more specialized products? Traditional indicators such as GDP per capita or trade volumes cannot help us grasp a detailed picture of the productive capabilities that a country holds for creating more advanced goods. Moreover, when it comes to predicting future economic growth, these indicators cannot be solely relied

on, as GDP presents current outcomes but is not necessarily able to show the unique capabilities of a country that would drive an economy toward transformative growth. Here, the Economic Complexity Index becomes an essential tool for measuring not only how many products a country can produce and export but also how sophisticated those products are. This indicator was developed by Ricardo Hausmann and César Hidalgo, and it gives us a lens through which we can evaluate the capabilities of a country. As capabilities, Hausmann suggests considering skills, know-how, quality of institutions and infrastructure, and investments in research and design, as the combination of these factors creates an environment for a country to produce more technologically advanced products with high comparative advantage. The more unique products a country exports, the higher the Economic Complexity Index it earns [1, p.10570-10575; 2, p.309-342].

The predictive power of ECI gives us a more accurate picture of where a country is headed. Empirical research shows that economic complexity is highly correlated with future economic trajectories. In one of the recent works, Hidalgo and Stojkoski demonstrated that a model relying solely on GDP per capita had a predictive value of $R^2 = 0.09$, whereas including ECI in the model more than doubled the accuracy of prediction, raising R^2 to 0.19 [4, p.15]. Therefore, the Economic Complexity Index can be thought of as a navigator for economic development. It helps us see not only the structure of produced goods today but also the sectors into which a country could potentially move. By measuring ECI, we can uncover a deeper layer of analysis, identifying hidden strengths or vulnerabilities within an economy's production landscape, which sets the trajectory for future development.

In scientific literature, a broad set of factors demonstrates high correlation with the Economic Complexity Index. Ricardo Hausmann presents these factors as capabilities essential for the production of highly technological products. The more diverse and developed this set of capabilities a country possesses, the more likely it is to produce unique and sophisticated goods. Traditionally, such capabilities included human capital, developed infrastructure, a strong research base, high institutional quality, participation in global value chains, and financial and trade openness. However, within the last couple of years, a new element, Artificial Intelligence, has started to change the structure of economic complexity, not only by helping to automate processes but also by changing the technological form of production capabilities, directly influencing the structure of innovation and creating new niches for export and becoming a capability itself.

One of the clearest mechanisms through which AI influences economic complexity is its acceleration of research and development (R&D). AI decreases the cost of research, helps analyze huge amounts of unstructured data, and uses machine learning to uncover hidden patterns. This effect is well demonstrated in the work of Toner-Rodgers, who conducted an experiment on 1,018 scientists in one of the biggest R&D companies in the USA. The scientists who were allowed to use Artificial Intelligence were able to discover 44% more potential materials for research than those who had to work on their own. The additionally uncovered materials resulted in a 39% increase in applying for patents, and this in turn led to a 17% increase in product innovations [5, p.17]. This example clearly demonstrates how Artificial Intelligence speeds up the process of scientific discovery and opens new, non-ordinary perspectives for analysis, multiplying the effect of research on economic complexity and allowing countries to develop less ubiquitous products.

This multiplying effect can also be observed in human capital. In traditional models of economic development, there is a direct link between investments in STEM education, engineering specializations, and analytics, and the gradual increase in the complexity of produced goods [12, p.32; 14, p.29]. The more people in a country acquire knowledge and skills in these fields, the more sophisticated the products a nation is able to produce. With Artificial Intelligence, productivity can increase significantly, as one person can potentially accomplish the work of an entire team; an engineer can design a more advanced construction; and a scientist can process data and literature in a much more accelerated way. Artificial Intelligence helps enhance expertise, which leads to the

development of more unique products.

Another important channel through which Artificial Intelligence may influence Economic Complexity is by lowering the barriers to entry for engaging in advanced scientific and technological activities. With knowledge of AI, even mid-level engineering specialists can build prototypes, run simulations, or start developing products. This allows previously excluded groups to be included in the development and production of more sophisticated goods. As people with heterogeneous sets of skills begin to cooperate, it results in the emergence of new capability combinations, which in turn creates opportunities for a country to build less standard products and enhance its comparative advantage in the world market.

Economic Complexity grows when a country develops new capabilities and finds novel ways to combine existing ones. Artificial Intelligence presents new possibilities not only by accelerating existing skills, making problem-solving faster and the design of new products more accessible, but also by creating opportunities for more creative combinations of capabilities that help a country develop more unique products and sustain long-term growth.

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