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THE IMPACT OF ARTIFICIAL INTELLIGENCE ON ECONOMIC GROWTH: THEORETICAL MODELS AND NEW TRENDS

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Abstract. This article examines the impact of artificial intelligence on economic growth through the lens of theoretical economic models and emerging development trends. The study analyzes the role of artificial intelligence within the framework of endogenous growth theory, technological progress models, and the digital economy paradigm. Particular attention is paid to how artificial intelligence contributes to productivity growth, production efficiency, and innovation dynamics, thereby influencing long-term economic growth rates. The article also provides a theoretical assessment of the effects of AI-driven automation on labor markets, human capital formation, and capital structure. The findings suggest that the widespread adoption of artificial intelligence has the potential to initiate a new qualitative stage of economic growth; however, it simultaneously raises challenges related to institutional adaptation, workforce reskilling, and inequality.

Keywords: artificial intelligence, economic growth, theoretical models, endogenous growth, digital economy, innovation, productivity, future trends

Introduction. In recent decades, artificial intelligence (AI) has emerged as one of the most transformative technologies shaping modern economic systems. Rapid advancements in machine learning, big data analytics, and computational power have enabled AI to penetrate almost all sectors of the economy, including manufacturing, finance, healthcare, transportation, and public administration. As a result, artificial intelligence is no longer viewed solely as a technological innovation, but rather as a key driver of structural economic change and long-term growth. From a theoretical perspective, economic growth has traditionally been explained through factors such as capital accumulation, labor input, and technological progress. Classical and neoclassical growth models treated technological advancement as an exogenous factor, while more recent endogenous growth theories emphasize the role of innovation, knowledge, and human capital in sustaining economic expansion. Within this framework, artificial intelligence represents a new form of general-purpose technology capable of enhancing productivity, accelerating innovation processes, and reshaping production functions. Its ability to automate cognitive tasks, optimize decision-making, and improve resource allocation positions AI as a critical determinant of future economic performance.

At the same time, the diffusion of artificial intelligence introduces complex challenges and uncertainties. While AI-driven automation can significantly increase efficiency and reduce

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production costs, it also raises concerns regarding labor displacement, skill mismatches, and income inequality. These issues necessitate a deeper theoretical understanding of how artificial intelligence interacts with labor markets, capital structures, and institutional frameworks. Consequently, analyzing AI within established economic growth models becomes essential for assessing both its opportunities and potential risks. The relevance of this topic is further reinforced by global digitalization trends and the increasing role of data-driven technologies in economic policymaking. Governments and international organizations are actively integrating artificial intelligence into development strategies, viewing it as a tool for enhancing competitiveness and achieving sustainable growth. However, the long-term impact of AI on economic growth depends largely on the effectiveness of regulatory frameworks, education systems, and innovation policies.

Against this background, the present article aims to explore the impact of artificial intelligence on economic growth by examining relevant theoretical models and identifying future development trends. By synthesizing economic theory with contemporary technological dynamics, the study seeks to contribute to the ongoing academic debate on how artificial intelligence may redefine the foundations of economic growth in the digital era.

Main body. Artificial intelligence has increasingly become a central element in contemporary discussions on economic growth, not merely as a technological tool but as a structural force reshaping production, innovation, and value creation. Unlike previous waves of automation that primarily affected manual labor, artificial intelligence extends automation into cognitive and analytical domains, fundamentally altering the traditional relationship between labor, capital, and technology. From an economic theory perspective, this shift necessitates a re-evaluation of established growth models and their assumptions.

Within endogenous growth theory, technological progress is driven by intentional investment in knowledge, innovation, and human capital. Artificial intelligence fits naturally into this framework, as it both depends on and reinforces knowledge accumulation. Romer emphasizes that ideas differ from traditional goods because they are non-rival and generate increasing returns to scale[1]. In the context of AI, algorithms and data-driven models exemplify this characteristic: once developed, they can be replicated at near-zero marginal cost and applied across multiple sectors simultaneously. This amplifying effect allows artificial intelligence to enhance productivity beyond firm-level improvements, contributing to economy-wide growth. Moreover, artificial intelligence functions as a general-purpose technology, comparable to electricity or the internet, due to its broad applicability and capacity to stimulate complementary innovations. Aghion et al. argue that technological breakthroughs influence growth primarily through their interaction with institutional and competitive structures[2]. AI-driven innovation intensifies competition by lowering entry barriers for data-oriented firms while simultaneously enabling dominant firms to consolidate market power through superior algorithms and data access. This dual effect has significant implications for long-term growth trajectories, as it influences both innovation incentives and market efficiency.

One of the most debated aspects of artificial intelligence concerns its impact on labor markets and productivity. From a theoretical standpoint, AI augments labor rather than merely substituting it, particularly when combined with high levels of human capital. Acemoglu and Restrepo highlight that automation technologies can generate new tasks and occupations,

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offsetting displacement effects under appropriate institutional conditions[3]. The economic significance of this argument lies in the distinction between short-term adjustment costs and long-term productivity gains. While AI may disrupt existing employment structures, its capacity to create new forms of value-added work supports sustained economic growth when labor markets are flexible and education systems are adaptive. At the same time, artificial intelligence alters the capital structure of economies. Traditional growth models treat capital accumulation as a function of savings and investment, yet AI introduces intangible capital—such as data, software, and algorithms—into the growth equation. These forms of capital challenge conventional measurement frameworks and complicate productivity analysis. According to Brynjolfsson and McAfee, the digital economy increasingly rewards intangible assets that are not fully captured in standard national accounts[4]. The underestimation of AI-driven productivity may partly explain the so-called "productivity paradox," where technological progress appears rapid, yet aggregate productivity growth remains modest.

From a macroeconomic perspective, artificial intelligence enhances allocative efficiency by improving decision-making processes across firms and governments. Predictive analytics, real-time optimization, and automated policy tools reduce informational asymmetries and transaction costs, thereby improving overall economic coordination. In theoretical terms, this aligns with models emphasizing information as a key constraint on growth. When AI reduces uncertainty and enhances forecasting accuracy, it effectively expands the feasible set of economic decisions, leading to more efficient resource allocation and higher growth potential. However, the growth-enhancing effects of artificial intelligence are not automatic. Institutional quality plays a decisive role in determining outcomes. Weak regulatory frameworks, inadequate data governance, and insufficient competition policies may allow AI-driven growth to become highly concentrated, exacerbating inequality and undermining social cohesion. Stiglitz notes that technological progress does not inherently lead to inclusive growth; its distributional effects depend on policy choices and institutional design[5]. This insight is particularly relevant for AI, as its benefits tend to accrue disproportionately to highly skilled workers and capital owners unless corrective measures are implemented.

Looking ahead, future growth models are likely to incorporate artificial intelligence as an endogenous factor influencing both technological change and economic structure. The interaction between AI and sustainability also represents an emerging research frontier. By optimizing energy use, reducing waste, and enabling smart infrastructure, artificial intelligence may support environmentally sustainable growth paths. Yet, the increasing energy consumption associated with large-scale data centers and computational processes presents new challenges that require careful policy coordination.

In conclusion, artificial intelligence represents a transformative force within economic growth theory, extending beyond productivity enhancement to reshape labor markets, capital formation, and institutional dynamics. Its integration into theoretical models reveals both opportunities for accelerated growth and risks associated with inequality and market concentration. As such, understanding the economic impact of artificial intelligence requires not only technological analysis but also a comprehensive theoretical and institutional perspective. When aligned with effective policies, artificial intelligence has the potential to redefine the foundations of economic growth in the twenty-first century.

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