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Economic Policy Challenges in the Age of Artificial General Intelligence

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Abstract: We stand at the forefront of a transformative scientific and technological revolution. The rise of Artificial General Intelligence (AGI) presents unprecedented challenges to current economic theories and policies. The capabilities of AI are rapidly expanding, and AGI will achieve cognitive abilities surpassing human levels across various fields, altering the global economy and the current labor market structure. This paper aims to explore the fundamental economic impacts of AGI, focusing particularly on its disruption of the traditional labor market, the erosion of human capital value, and the resulting income distribution and inequality issues. This paper proposes a framework for understanding how AGI shifts traditional factors of production from labor to machines, discusses the role of education in society's response to such changes, the potential environmental impacts, and the necessity of building new global governance structures. Therefore, the transformation of the AGI-driven economy requires reflection on the nature of human work and social values.

Keywords: Artificial General Intelligence; Economic policy; Labor markets; Education

1. Introduction

In the face of unprecedented technological progress, we find ourselves approaching a pivotal juncture in the evolution of artificial intelligence (AI). While AI, in its various forms, has permeated numerous aspects of our lives, the anticipated emergence of Artificial General Intelligence (AGI)—machines capable of performing any intellectual task that a human can—promises a transformation in the very foundation of our economic and social systems[1].AGI, if it materializes as many researchers predict, could fundamentally alter the production process, labor markets, and the distribution of wealth. However, the precise trajectory of this shift remains highly uncertain, and while forecasts abound, many remain speculative, based on differing assumptions about technological breakthroughs and

timelines[2].

The rapid expansion of computational power, alongside advancements in algorithms and robotics, suggests that we may be on the brink of a new economic paradigm. Historical precedents, such as the shift from the Malthusian economy to the Industrial Revolution, illustrate the profound impact of technological leaps on labor dynamics, productivity, and income distribution [3].This paper examines these shifts in the context of AGI, with an emphasis on understanding how AI will influence economic structures, particularly in relation to the diminishing role of human labor. While it is tempting to assume that AGI will usher in a utopian world of productivity and abundance, such optimism must be tempered by the recognition of accompanying risks—namely, job displacement, widening inequality, and the erosion of human capital[4].

Further complicating this transition is the lack of a cohesive framework for understanding AGI's full impact on the global economy. Existing economic models, which were designed around the central role of human labor, may not suffice in an era where machines—AI and robots—take over an increasing array of cognitive and physical tasks. This points to the necessity of rethinking not only the mechanics of production but also the broader societal values that underpin our current economic system. Furthermore, while the promise of AGI includes exponential productivity gains, the distribution of these gains across societies is a major concern that will demand a radical reassessment of economic policy.

2. Technological Capabilities and Trajectories of AGI Development

The rise of Artificial General Intelligence (AGI) marks a pivotal moment in the trajectory of technological progress, offering the potential to redefine the basic structure of human economies. While the specifics of AGI's emergence remain uncertain, recent advancements in computational power, algorithmic efficiency, and robotics suggest that its development could be imminent, or at least, follow a discernible trajectory within the coming decades. Understanding the technological underpinnings of AGI is critical to analyzing its economic implications, as well as to developing appropriate policy responses that can mitigate its risks while capitalizing on its potential[5].

One of the primary drivers of AI's rapid progress is the exponential growth in computational power, often referenced through Moore's Law, which posits that the number of transistors on a microchip doubles roughly every two years. However, as observed by several scholars (Sun & Ortiz et al., 2024), this rate of improvement has outpaced even Moore's original projections, leading to massive gains in machine learning capabilities and a surge in AI's potential[6]. The sheer volume of computational resources required for training cutting-edge AI models, such as GPT (Generative Pretrained Transformer) systems, has increased significantly, with estimates indicating that the amount of compute invested in AI systems has doubled every six months for the past decade. This accelerated growth in computational power, coupled with improvements in algorithmic efficiency (Ren et al., 2025), makes the case for AGI's eventual emergence increasingly plausible[7].

However, it is important to acknowledge that this technological trajectory is not without its uncertainties. The rate at which computational improvements translate into cognitive capabilities in machines remains uncertain[8].While AI systems have demonstrated impressive feats in specific tasks—such as playing chess or Go at superhuman levels—the leap from

narrow AI to AGI, where machines exhibit generalized intelligence across diverse domains, introduces complexities that are not yet fully understood. As Yin suggests in his work on causal modeling for fraud detection, the intricacies of machine learning models extend beyond algorithmic efficiency, requiring a careful balance between data, computational power, and interpretability.

Additionally, advances in robotics, another crucial pillar of AGI development, further complicate the picture. Humanoid robots and autonomous machines are making strides, though they remain far from fully replicating human physical capabilities. The potential integration of AGI into robotic systems that can perform any human task is still in its infancy. Some scholars, such as (Huang et al.2025), propose that while AGI could achieve substantial cognitive breakthroughs in fields like market analysis or procurement demand prediction, physical tasks may take longer to automate due to inherent complexities in human-like dexterity and adaptability[8].

Considering these technological advancements, it becomes clear that while the computational trajectory towards AGI seems promising, there is substantial uncertainty surrounding its precise capabilities and timeline. AGI's eventual arrival, assuming it occurs, will likely disrupt not only the economic landscape but also the very nature of work and human agency in a way that we are only beginning to conceptualize. As (Chen et al.2025) notes in his analysis of AI's applications in economic domains, AI's integration into financial markets has already altered traditional practices; however, the broader implications of such technologies in shaping labor markets, educational systems, and global governance are much more complex and, to some extent, unpredictable[9].

2.1. The Scaling Laws of AI Development

One of the most intriguing aspects of AGI development lies in the scaling laws that describe how AI systems improve with increasing computational resources. (Liu et al.2025) show that as the number of parameters in AI models and the amount of training data grows, AI systems' ability to predict and perform tasks improves predictably[10]. These scaling laws offer a useful framework for understanding how the capabilities of AI systems are likely to evolve as investments in computational power continue to rise.It is possible that AI systems will follow a path of increasing complexity, with cognitive capabilities improving in a nonlinear fashion as resources increase. However, while these scaling laws provide valuable insights, it is important to remain cautious about their implications. As many researchers have pointed out, the growth in AI capabilities is not purely linear and could face diminishing returns at certain thresholds (Pang et al., 2025)[11]. Moreover, while these improvements offer tantalizing possibilities for AGI, it remains unclear whether these models will be able to perform tasks that involve creativity, emotional intelligence, or complex ethical reasoning, which are essential for human-like general intelligence. This leads to further research being needed to explore the boundaries of AI's cognitive capabilities, as the distinction between narrow AI and AGI is not always straightforward.

2.2. Trajectories and Uncertainties

At this juncture, it is critical to emphasize the uncertainties surrounding the trajectories

of AGI development. As previously noted, the timeline for the emergence of AGI is highly speculative. Some experts, including Hinton (2023), predict that AGI could be achieved within the next few decades, while others remain more cautious, suggesting that substantial breakthroughs may be required before we can expect machines to exhibit true general intelligence. These differing views are indicative of the inherent uncertainty in predicting the pace of AGI development, which is influenced by technological, economic, and societal factors. For instance, the integration of AGI into sectors such as financecould proceed rapidly, driven by investment and commercial incentives, while broader societal shifts may encounter significant delays due to regulatory and ethical concerns.

In light of these complexities, it is crucial that scholars and policymakers approach the development of AGI with both optimism and caution. While it is possible that AGI could provide immense benefits, such as exponential productivity growth and the automation of all human tasks (Liu et.al, 2025), its potential risks—especially in terms of labor displacement, inequality, and governance—must be carefully considered. As we explore the potential economic ramifications of AGI in subsequent chapters, it is essential to keep in mind the fluidity of technological progress and the many unknowns that accompany the rise of AGI[12].

3. Economic Implications of AGI and the Transformation of Production

The potential advent of Artificial General Intelligence (AGI) heralds a profound transformation in the economic foundations that have long governed human societies. While the full implications of AGI remain speculative, its prospective impact on the factors of production—labor, capital, and land—merit careful consideration. As technological progress continues to accelerate, particularly in the domains of computational power and machine learning, the very structure of production, the distribution of wealth, and the organization of labor may undergo radical changes. AGI, with its capacity to automate not just routine but also complex tasks, has the possibility to redefine what it means to work and produce, raising essential questions about the future of human labor, ownership, and economic value creation.

3.1. The Changing Role of Labor in an AGI-Driven Economy

Historically, labor has been the cornerstone of economic value creation. From the early agrarian economies, where physical labor determined productivity, to the industrial age, where human labor was mechanized and augmented by machines, labor has consistently played a central role in economic development. AGI, however, introduces the possibility of an economy where human labor is no longer the primary driver of production. As AGI systems autonomous, self-improving, and capable of performing complex cognitive tasks, will become increasingly capable, they may replace human labor across virtually all sectors, not just those involving physical tasks, but intellectual and creative tasks as well[13]. In this scenario, the concept of work itself would be radically altered, as machines could not only produce goods and services but also engage in decision-making, problem-solving, and innovation. While this shift could lead to significant productivity gains, it also raises complex questions about the role of human workers. If machines can perform most tasks, how will individuals find meaningful employment in such a world? To some extent, this transformation challenges the assumption that work and productivity are inherently tied to human labor. The

potential displacement of human workers by AGI calls for a reconsideration of societal values, particularly concerning the purpose of labor and the criteria for social participation. In an economy driven by machines, the very idea of what constitutes "useful" work might need to be redefined.

3.2. Productivity and Wealth Creation in a Post-AGI World

The economic consequences of AGI are likely to be twofold. On one hand, AGI could catalyze unprecedented productivity. As machines begin to outperform humans in virtually every field, from manufacturing to scientific research, the efficiency of production processes could be enhanced to an extent that was previously unimaginable.AGI systems could create wealth at a scale far beyond what is possible today, revolutionizing industries and creating new forms of output. In theory, this could lead to a post-scarcity economy where the cost of goods and services is negligible, and human needs are met by an autonomous system of production[14].

On the other hand, the wealth generated by AGI may not be equally distributed. The concentration of AGI ownership in the hands of a few corporations or individuals poses a significant challenge to existing economic structures. If those who control AGI systems possess a disproportionate share of the wealth created, the result could be the exacerbation of income inequality, as vast portions of the population are left without access to the means of production. This situation could lead to a bifurcated society: one segment enjoying the benefits of an AGI-driven economy, while another faces widespread job displacement and a diminished role in the economic order[15].

This potential for economic concentration brings into question the future of wealth distribution. While AGI could vastly increase the total wealth generated in the global economy, the question remains: who will benefit from this wealth? The centralization of control over AGI technology in the hands of a few could lead to a restructured global economy, where traditional notions of labor and capital no longer apply. The current economic models, which rely on human labor and the production of tangible goods, may prove inadequate in addressing the complexities of wealth distribution in an AGI-dominated world.

3.3. Recalibrating the Factors of Production

The classical economic framework is built on the idea that labor, capital, and land are the fundamental drivers of production. AGI, however, challenges this framework by introducing a new factor: intelligent machines. As AGI systems replace human labor, the relationship between labor and capital becomes more complex. Machines, particularly AGI systems, will not only act as capital in the traditional sense but also as labor, performing tasks that were once the exclusive domain of human workers. This shift will require a significant recalibration of how we define the factors of production and how we understand their interrelationships. Moreover, as the role of labor declines, capital—defined traditionally as financial and physical assets—may also undergo a transformation. AGI systems themselves could become a new form of capital, requiring a reevaluation of what constitutes valuable assets in an economy. The ownership of AGI systems and the intellectual property that

governs them may become the most valuable assets, shifting the center of economic activity from the human workforce to the owners of AI technologies. This shift could make traditional investments in physical capital, such as factories or land, less relevant, as intangible assets—such as data, algorithms, and AGI systems—become the primary sources of wealth creation.

3.4. The Challenge of Inequality and the Future of Economic Systems

As AGI systems replace human labor across sectors, the most immediate concern will be inequality. The displacement of workers by machines could create significant gaps in income and wealth, particularly in societies where labor-based income is the primary means of livelihood. This problem is compounded by the fact that many low-income workers are employed in industries most vulnerable to automation, such as manufacturing, transportation, and service industries. As these industries are increasingly automated, large segments of the population may find themselves excluded from the economic system, unable to find meaningful work.

In response to these challenges, new economic models may be needed—ones that focus not only on economic output but also on ensuring that the benefits of AGI are shared equitably. Universal basic income (UBI) has been proposed as one potential solution, offering a way to ensure that individuals continue to have a means of survival even as they are displaced by automation. However, as some have pointed out, UBI alone may not be sufficient to address the underlying structural inequalities created by AGI. Further research into alternative economic models, such as wealth redistribution or new forms of social ownership, is needed to explore how society can adapt to the disruptions caused by AGI.

3.5. Rethinking Education and Skill Development in the AGI Era

In an AGI-driven economy, traditional education systems will need to adapt to meet the challenges of a rapidly changing labor market. The focus of education will likely shift from preparing individuals for specific jobs to fostering skills that complement AGI capabilities, such as creativity, emotional intelligence, and ethical reasoning. As AGI systems take over routine and technical tasks, humans will need to focus on those areas where they can add unique value—skills that are not easily replicated by machines.

Education will thus need to emphasize critical thinking, adaptability, and lifelong learning. The traditional model of preparing students for fixed roles within established industries may no longer be relevant. Instead, education will need to cultivate a mindset of continuous growth, equipping individuals with the tools to thrive in an environment where the nature of work itself is constantly evolving.

The advent of Artificial General Intelligence (AGI) is expected to provoke a paradigm shift in the global economy, particularly in the realm of income distribution and economic inequality. As AGI systems begin to permeate various sectors of economic activity, the centrality of human labor in the production process will be increasingly questioned. Given that labor has historically been a primary determinant of income, the widespread displacement of human workers by AGI systems raises critical questions regarding how wealth will be distributed in a future where machines replace humans in most tasks. This

chapter explores the potential consequences of AGI for income distribution, drawing on both historical precedents and forward-looking economic theory.

4. The Redistribution of Wealth: An Inevitable Challenge

Historically, technological revolutions have had a profound impact on income inequality. The Industrial Revolution, for example, led to a concentration of wealth in the hands of industrialists, while large segments of the population remained in low-wage labor. Similarly, the rise of digital technologies in recent decades has fueled the expansion of tech giants, further exacerbating wealth inequality. The introduction of AGI into this equation presents an even more complex scenario, as AGI promises to replace not only manual labor but also skilled intellectual labor, thus transforming the fundamental structure of work and the economic value created by labor.

The potential for AGI to automate cognitive tasks, such as decision-making, problem-solving, and creative processes, extends far beyond the current capabilities of automation technologies. This shift in production dynamics, in which machines can perform tasks that were previously deemed the exclusive domain of humans, may result in the accumulation of vast amounts of wealth in the hands of those who own the AGI technologies. Consequently, the central issue will be the concentration of economic power, potentially leading to an even more pronounced disparity between those who control AGI systems and the broader population, which may struggle to adapt to the new economic order.

4.1. Exploring Historical Parallels: The Role of Labor in Shaping Inequality

To some extent, history offers valuable lessons regarding the redistribution of wealth during times of technological disruption. The Industrial Revolution serves as a cautionary tale in this regard. While it undeniably spurred unprecedented economic growth, it also led to significant income inequality, as the ownership of the means of production became concentrated in the hands of a small elite. Workers, particularly in developing economies, were relegated to low-paying, labor-intensive roles. The rise of AGI could exacerbate this trend by making much of human labor redundant, especially in sectors that rely on intellectual and creative skills. As AGI begins to replace workers across these domains, the wealth generated by AGI systems could be concentrated in the hands of a few large tech companies, creating a profound challenge for policymakers and economists in designing equitable distribution mechanisms.

Further research into the relationship between technological progress and inequality is needed, as previous models often fail to fully account for the rapid pace of change induced by AGI. The complexity of this shift cannot be understated, as it involves not just the automation of physical labor, but also the cognitive and creative capacities of workers, further disrupting traditional understandings of what constitutes "work" and the mechanisms through which wealth is generated and distributed.

4.2. AGI and the Potential for Post-Scarcity: A Double-Edged Sword

One of the most intriguing possibilities that arises with the advent of AGI is the potential

for a post-scarcity economy—an economic system in which material goods are produced at little to no cost and where the basic needs of the population are met without the need for human labor. Such a scenario would represent a dramatic departure from the current economic system, which is based on scarcity, labor, and competition for resources. If AGI can produce goods and services autonomously, the cost of production could theoretically be driven to near zero, leading to an abundance of goods and services. However, the promise of post-scarcity brings with it a host of challenges, particularly in the distribution of wealth. While AGI has the potential to eliminate scarcity in many areas of production, it could also exacerbate inequality if the benefits of abundance are not equitably shared. In a scenario where a small group controls the AGI technologies that drive this abundance, it is possible that the economic elite could consolidate their wealth while the majority of the population struggles with unemployment and underemployment. Thus, while the potential for post-scarcity is alluring, it is accompanied by the very real risk of a widening wealth gap and social unrest.

4.3. Redesigning Economic Policy to Address AGI-Induced Inequality

Given the profound impact that AGI could have on income distribution, it is essential for policymakers to begin considering new economic models that are more suited to a world in which AGI plays a central role in the production of wealth. Traditional mechanisms for income distribution, such as progressive taxation and social welfare programs, may need to be reevaluated in light of the fact that AGI may render human labor largely obsolete. Universal Basic Income (UBI) has been proposed as one potential solution to address the economic displacement caused by AGI, providing a safety net for individuals whose labor is no longer needed. However, while UBI may offer short-term relief, it is unlikely to be a comprehensive solution. Further exploration into alternative wealth redistribution models, such as wealth taxes on AGI-generated profits, or the establishment of a global fund to ensure that the benefits of AGI are shared, is necessary. Moreover, any policy solution will need to account for the global nature of AGI. As AGI systems are developed and deployed by multinational corporations, the potential for inequality may extend across national borders, creating new challenges for global governance. To this end, international cooperation will be crucial in ensuring that the wealth generated by AGI is distributed in a way that minimizes inequality on a global scale.

4.4. The Role of Education and Skill Development in Bridging Inequality

While AGI may render much of human labor redundant, it is also possible that new forms of work could emerge that are specifically tailored to human strengths, such as creativity, emotional intelligence, and ethical decision-making. As such, education systems will need to adapt to the realities of an AGI-driven economy. Traditional models of education, which focus on preparing individuals for fixed roles in labor markets, may no longer be relevant in a world where the nature of work is fluid and constantly evolving. Education must shift towards fostering skills that complement AGI systems, such as problem-solving, innovation, and interpersonal communication.

The ability to adapt to new technologies and work in collaboration with AGI will likely

become a critical skill for future generations. This raises important questions about access to education, particularly for disadvantaged populations who may face barriers to acquiring these new skills. To mitigate the risks of further exacerbating inequality, it will be important to ensure that education systems are accessible, inclusive, and responsive to the needs of an AGI-driven world.

5. Conclusion

As AGI continues to reshape the future of work, education and skill development must adapt to new economic realities. Traditional education models, focused on preparing individuals for specific careers, must shift toward fostering adaptability, creativity, and ethical reasoning—skills that complement AGI systems. Emphasis on lifelong learning and interdisciplinary approaches will be crucial, allowing individuals to work alongside AGI technologies. Additionally, addressing the digital divide and ensuring equitable access to educational resources will be essential to prevent deepening social inequalities. The transformation in education must not only equip individuals with the necessary skills for future employment but also instill a sense of ethical responsibility in navigating the complex challenges posed by AGI. Through these efforts, societies can ensure that AGI's benefits are widely shared, fostering both economic growth and social inclusion.

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