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Exploring China's Transition from Old to New Driving Forces

--From the Perspective of New Productive Forces

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Abstract: This paper explores China's transition from traditional growth drivers, such as manufacturing and investment, to new quality productive forces that emphasize innovation, technological advancement, and sustainability. Against the backdrop of diminishing returns from resource-intensive industries and rising global competition, China has strategically pivoted toward innovation-driven growth as a necessary path for long-term economic resilience. The research focuses on analyzing the role of new quality productive forces in driving this transition, with a particular emphasis on their impact on productivity, industrial upgrading, and sustainable development. Using a combination of qualitative analysis and case studies, this paper examines the technological innovations and policy initiatives that are reshaping China's economic landscape. The study includes an analysis of sectors such as renewable energy, telecommunications, and electric vehicles to illustrate how these new forces are transforming industries and creating new opportunities. The findings reveal that while the transition presents significant challenges, such as the need for large-scale workforce reskilling and managing technological disruptions, it also offers substantial opportunities for economic growth and global leadership. The study concludes that fostering new quality productive forces is essential for China to maintain its competitive edge in the digital economy and achieve sustainable, long-term growth.

Keywords: New quality productive forces, energy transition, renewable energy, green growth.

1. Introduction

China's traditional growth drivers, such as manufacturing and investment, are increasingly unsustainable due to rising costs, environmental concerns, and global competition. As the country seeks to reduce its reliance on exports and elevate its international standing, there is a pressing need for industrial transformation towards high-tech and specialized sectors. In response, China has strategically shifted towards new driving forces focused on innovation and technology to ensure long-term economic resilience and maintain its global competitiveness. This paper examines China's transition from old to new driving forces, emphasizing the role of new quality productive forces in this process.

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The paper begins by analyzing China's economic shift from old to new driving forces, focusing on the factors driving this transition. It introduces the concept of new quality productive forces and their role in fostering innovation-driven growth. The paper then explores the impact of these forces on productivity, industrial upgrading, and sustainability, and examines the structural transformation of the economy as it moves from resource-intensive to advanced sectors. Additionally, it discusses the challenges and opportunities of this transition, such as workforce reskilling and technological disruption, and highlights the critical role of new quality productive forces in shaping China's economic future.

2. Literature Review

The concept of "new productive forces", introduced by President Xi Jinping, is central to China's modern economic strategy. This concept emphasizes the role of innovation and technological advancement as key drivers of economic growth, particularly as China transitions from traditional, resource-intensive industries to high-tech, sustainable sectors. The literature explores how these forces are transforming China's economic landscape, promoting quality and sustainability as integral components of development.

Rui Chen and Maohua Fan argues that for new productive forces to effectively translate technological innovations into economic gains, a robust focus on quality is essential [1]. They highlight that these forces are closely tied to improvements in production quality, which are necessary for achieving stability and consistency in output. By integrating new technologies into existing industries, these forces create a high-quality, sustainable production environment. Their analysis also illustrates how regions like Anhui have successfully implemented quality-driven strategies to support the growth of new productive forces, demonstrating the importance of strong quality infrastructure in regional economic development.

Dong Liu contributes to the understanding of new productive forces from a Marxist perspective, emphasizing the need for a systemic integration of technology and industry [2]. Liu suggests that these forces represent an evolution of Marxist production theory, where industrial development must balance the growth of both new and traditional sectors. This balance is crucial for ensuring that technological advancements lead to meaningful industrial upgrades. Liu advocates for "systemic, dialectical, and innovative thinking" to merge technology with industry, driving productivity and sustainability in a way that aligns with China's national strategies.

Hualun Zhong provides a broader view of new productive forces within China's socio-economic context, aligning them with the goals of Chinese-style modernization [3]. Zhong underscores the importance of sustainability and technological self-reliance in this framework, arguing that new productive forces are pivotal in reshaping industries and production processes to achieve these goals. He identifies ongoing innovations in AI, robotics, and green technologies as central to this transformation, positioning new productive forces as the foundation for China's future competitiveness on the global stage. Zhong's work emphasizes that these forces are not only crucial for economic development but are also strategic in achieving long-term national objectives, including environmental sustainability and social well-being.

Overall, the literature highlights the critical role of new productive forces in China's shift from resource-intensive growth to an innovation-driven economy. These forces, characterized by their reliance on advanced technologies, a focus on quality, and a commitment to sustainability, are essential for China's continued modernization and global competitiveness. As China navigates the challenges of this transition, the development of new productive forces will remain a strategic priority, driving the nation towards high-quality, sustainable economic growth.

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3. Basic Analysis of the Facts

3.1. The Transition from Old to New Driving Forces in China

Figure 1 visualizes the change of China's GDP and GDP growth rate over the past two decades, from year 2004 to year 2023 [4]. Although the GDP value has consistently increased over the past two decades, the GDP growth rate has exhibited a declining trend year by year, with the notable exception of a significant increase in 2021, following the economic recovery post-pandemic.

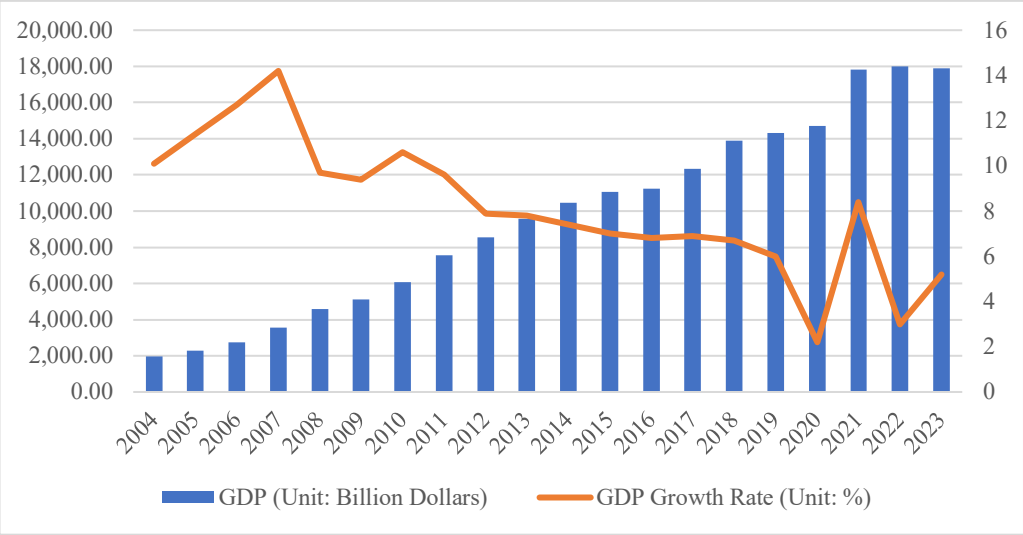

Figure 1: GDP and GDP Growth Rate in China from 2004 to 2023

China's economic growth, historically driven by a combination of traditional manufacturing, extensive investment, and low-cost labor, has entered a phase where these old driving forces are no longer sustainable or sufficient for continued growth. The diminishing returns from this growth model, coupled with rising wages, environmental concerns, and global competition, have necessitated a shift towards new driving forces that can ensure sustainable economic development.

According to Xunlei Li's research, 42% of China's GDP growth over the past 15 years was driven by investment and capital formation, a rate nearly double the global average; however, the rapid rise in debt has made this capital-intensive growth model unsustainable [5].

This indicates that China's future economic growth will increasingly rely on innovation-driven growth instead of "Ricardian growth", a growth model steming from demographic dividend, urban migration, and reduced barriers on trading [6].

The development guidelines put forward by the Chinese government at multiple national conferences also illustrate the importance and necessity of China's pursuit of innovation-dependent growth. According to Ni Kang, China's 18th National Congress in 2012 introduced the strategy of innovation-driven development, positioning innovation as the primary goal and driving force for national progress; Central Economic Work Conference in 2023 further emphasized the role of technological innovation in building a modern industrial system, highlighting that cutting-edge technologies are key to fostering new industries, business models, and economic momentum, and to developing new productive forces [7].

With a long-term commitment to a strategy of technological self-reliance, China will vigorously develop new quality productive forces. This strategy is crucial for seizing opportunities amidst crises and for creating new prospects in the face of changing circumstances.

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3.2. New Quality Productive Forces

The concept of New Quality Productive Forces was first introduced by President Xi Jinping during a symposium on promoting the comprehensive revitalization of Northeast China, held in Heilongjiang on September 7, 2023. According to the National Development and Reform Commission of China, new quality productive forces are defined as "driving forces propelled by the deepening application of new technologies, characterized by the rapid emergence of new industries, new formats, and new models, thereby establishing new social production relations and a new social system." These forces are distinguished by five main characteristics: 1) with new digital, networked and intelligent technologies as support, 2) with data as the key production factor, 3) with scientific and technological innovation as the core driving force, 4) with deepening the application of high-tech as the main feature, 5) with extensive and revolutionary impacts on economics and society [8].

The development of new quality productive forces emphasizes the growth of multiple emerging and future industries, such as biotechnology, new energy vehicles, artificial intelligence, deep-sea exploration, space development, gene research, etc. This development is an inevitable step for China to adapt to the ongoing technological revolution and industrial transformation. Moreover, it represents a strategic decision for China to build new competitive advantages and secure a proactive position in global development.

4. The Impact of New Quality Productive Forces on Economic Development

The rise of new quality productive forces has had a profound impact on China's economic development, reshaping the country’s economic structure and driving sustainable growth. These forces contribute to economic development through various mechanisms, including enhancing productivity, fostering innovation, enabling industrial upgrading, and promoting sustainability.

4.1. Productivity Enhancement

New quality productive forces significantly enhance productivity across different sectors. The integration of advanced technologies such as AI, robotics, and automation into traditional industries has transformed production processes.In manufacturing, the adoption of industry technologies has led to the development of smart factories where operations are highly automated and data-driven. This transformation has resulted in higher efficiency, reduced labor costs, and minimized errors, leading to greater output with fewer inputs.

A case in point is China’s electric vehicle industry, where the adoption of automation and robotics has revolutionized production. Companies like BYD and NIO have integrated AI and robotics into their manufacturing lines, allowing for more precise assembly and quality control. For example, NIO's production facilities utilize AI-powered robotic arms for intricate assembly tasks that require high precision, reducing human error and increasing the speed of production. This has not only improved productivity but also enhanced the quality of vehicles, enabling these companies to compete on a global scale. Furthermore, the application of digital twin technology in these factories allows for real-time simulation and monitoring, which helps in predicting potential issues before they occur, thereby reducing downtime and increasing overall productivity.

BYD provides a concrete example of how these new quality productive forces have been leveraged to achieve significant operational efficiencies. At the 2017 ACT Expo in Long Beach, California, BYD showcased a range of advanced zero-emission, all-electric transportation solutions, highlighting the company's commitment to innovation. For instance, the BYD 8Y battery-electric terminal tractor can operate continuously for 15 hours and save over $27,000 annually in operational costs, assuming it runs 16 hours a day, seven days a week; similarly, the BYD 8R battery-electric refuse truck, with

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a payload capacity of 10 tons and a range of 76 miles, can save fleet managers over $13,000 annually in operational costs based on a service route of 60 miles per day, five days a week [9].

4.2. Innovation and Industrial Upgrading

Innovation is at the core of new quality productive forces, driving the development of new products, services, and business models. This continuous innovation is essential for industrial upgrading, allowing China to move up the value chain from low-cost manufacturing to high-value-added production.

The success of the telecommunications sector, particularly with companies like Huawei, exemplifies this point. These companies have evolved from producing low-cost equipment to becoming global leaders in 5G technology. Huawei's substantial investment in R&D—amounting to 164.7 billion Yuan in 2023—has been pivotal in the development of cutting-edge technologies that now set global standards.

A prime example of Huawei's role in innovation and industrial upgrading is its digital transformation initiative, known as the "Integrated Supply Chain +" (ISC+). Launched in 2015 under the leadership of Lening Xiong, President of Huawei's Supply Chain Management Department, this project aimed to enhance operational efficiency and customer experience across the global industry. Through the implementation of an intelligent two-tier supply chain system, service-oriented processes, IT integration, and scenario-based algorithm modeling, Huawei has successfully transformed its operation and management models. As a result, the digitalization of Huawei's supply chain have led to significant improvements in customer service levels. Specifically, delivery times, end-to-end inventory turnover, and supply cost rates have each improved by 50% [10-11].

This transformation highlights how innovation-driven digital strategies can lead to substantial industrial upgrading. By leveraging advanced technologies, Huawei has not only optimized its operations but also positioned itself as a leader in the global telecommunications market, demonstrating how new quality productive forces can drive both efficiency and competitiveness on a global scale.

4.3. Sustainability and Green Growth

Sustainability is a key aspect of new quality productive forces, aligning with global trends towards green growth. China’s leadership in renewable energy is a testament to how new quality productive forces can drive sustainable economic development. The massive investments in solar and wind energy, coupled with advances in energy storage and smart grid technologies, are helping China transition to a low-carbon economy.

A significant example of this commitment is the launch of the Shaanxi Super Grid Project in August 2024. This project, set to be the largest and longest power transmission line in history, represents a monumental investment aimed at accelerating the low-carbon transformation of Shaanxi's power system. Once completed, the transmission capacity from northern Shaanxi to the Guanzhong region will increase from the current 6.1 million kilowatts to over 10 million kilowatts. This enhancement will allow for an additional 17 billion kilowatt-hours of electricity to be delivered annually to the Guanzhong and southern Shaanxi regions. Furthermore, this project is expected to replace the consumption of 7 million tons of coal each year, resulting in a reduction of 14 million tons of carbon dioxide emissions annually [12].

These initiatives showcase how new quality productive forces are not only advancing China’s economic growth but also driving significant environmental benefits, contributing to the broader global effort to combat climate change.

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4.4. Job Creation and Social Transformation

The rise of new quality productive forces has also led to the creation of new types of jobs and a transformation of the labor market. While there are concerns about job displacement due to automation and the integration of artificial intelligence (AI) and big data, the overall effect has been positive, as new industries emerge and create employment opportunities. AI and big data, while often seen as threats to traditional jobs, have also been powerful engines of job creation, particularly in sectors requiring specialized skills.

For instance, the digital economy has given rise to new professions such as data scientists, AI specialists, and e-commerce managers. The tech sector alone has generated millions of jobs, particularly in urban centers like Beijing, Shanghai, and Shenzhen. Additionally, the gig economy, facilitated by platforms like Didi and Meituan, has created flexible job opportunities for millions of people, ranging from delivery workers to taxi drivers, contributing to income growth and social mobility.

However, the academic community remains divided on the long-term impact of AI and big data on employment. Some scholars argue that automation and AI could lead to significant job displacement, particularly in sectors involving routine and manual tasks. This concern is based on the potential for AI to perform tasks more efficiently and at a lower cost, reducing the need for human labor in certain roles.

5. Correlation analysis

The relationship between new quality productive forces and the transition from old to new driving forces is complex and dynamic, characterized by a symbiotic interaction where each influences and reinforces the other.

5.1. Catalyst for Transition

New quality productive forces serve as a catalyst for the transition from old to new driving forces by providing the technological and innovative foundation necessary for new economic sectors to emerge. As traditional industries reach their growth limits, new quality productive forces offer alternative pathways for economic expansion through innovation, efficiency gains, and the creation of high-value-added industries.

The rapid technological innovation of the digital age has brought about disruptive technologies across industries, leading to the innovative reconfiguration of production factors and digital integration. This has also fostered cross-disciplinary collaboration in science and technology, resulting in new knowledge, methods, and tools that pave the way for new quality productive forces. These forces, rooted in digital advancements, are essential for driving industrial restructuring, improving supply chains, and promoting industry convergence, ultimately securing a competitive edge in the digital economy.

5.2. Structural Transformation

The development of new quality productive forces leads to structural transformation within the economy, where outdated and inefficient industries are gradually replaced by more advanced and sustainable sectors. This transformation is crucial for China's long-term economic resilience, as it reduces dependence on resource-intensive industries and promotes a more diversified economic structure.

The shift from coal to renewable energy is a clear example of this structural transformation. China's aggressive push towards solar and wind energy has not only reduced its carbon footprint but

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also created a thriving industry that generates significant economic value. As of 2022, China's clean energy manufacturing sector employs around 3 million people, accounting for 80% of the global workforce in solar photovoltaic panel and electric vehicle battery production. The global solar PV manufacturing capacity saw an almost 40% increase in 2022, with China leading this expansion [13].

Moreover, China's structural transformation extends beyond domestic advancements. With a 5.2% economic growth in 2023, China contributed 32% to global growth; notably, exports of these "three new" products—which includes innovations like electric vehicles, lithium batteries, and photovoltaic products—grew by nearly 30%, with China's share of global new energy vehicle production exceeding 60% [14]. This not only underscores China's domestic transformation but also its pivotal role in shaping the global economic landscape by promoting sustainable technologies and innovation.

5.3. Policy Support and Implementation

The Chinese government's policy initiatives play a crucial role in facilitating the growth of new quality productive forces and supporting the transition from old to new driving forces. Policies that promote innovation, investment in R&D, and the development of a skilled workforce are essential for this transition.

The government's "Dual Circulation" strategy, which emphasizes both domestic consumption and global trade, is designed to create a balanced and resilient economy. By fostering domestic innovation and reducing reliance on foreign technology, China aims to build a robust internal market while continuing to engage in global trade. This strategy supports the growth of new quality productive forces and ensures that they are integrated into the broader economy.

5.4. Challenges and Opportunities

While the transition to new driving forces offers significant opportunities, it also presents challenges that must be addressed. These include the large-scale reskilling of the workforce, managing social impacts, and mitigating the risks of technological disruption. As new quality productive forces, which represent new technologies, industries, and economic drivers, place higher demands on the workforce, China faces particular challenges. These include a declining proportion of the labor force, significant pressure to improve labor productivity, and a shortage of talent in strategic emerging industries [15].

The rise of automation and AI, for example, could lead to job displacement in certain sectors. However, with the right policies and strategic investments, these challenges can be mitigated. It is essential to develop a robust incentive system to attract and retain talent in technological innovation, ensuring that skilled workers are motivated to contribute to new industries. Simultaneously, accelerating labor market reforms to optimize the allocation of human capital is crucial. By focusing on these areas, the government aims to equip workers with the skills necessary for the new economy, allowing them to benefit from the opportunities created by new quality productive forces while minimizing the social and economic disruptions that may arise during this transition.

6. Conclusion

In conclusion, the transition from old to new driving forces in China, propelled by the development of new productive forces, represents a fundamental shift in the country's economic strategy. This transition supports structural transformation and sustainability, enhancing productivity across various sectors and fostering innovation and industrial upgrading. Furthermore, as discussed, the rise of new productive forces also creates opportunities for job creation and social transformation, although it poses challenges that require careful management, such as workforce reskilling and addressing technological disruptions. Looking forward, the ongoing focus on innovation and technological self-reliance will be crucial in ensuring that China not only navigates these challenges but also secures its

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place as a global leader in the digital economy. As these forces continue to evolve, they will shape the future of China's economic growth, driving the nation towards high-quality, sustainable development.

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