

# *Analysis of the Role of Digital Economy in Hebei Province's Economic Transformation*

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**Abstract:** Hebei Province, located in northern China, is a key player in the Beijing-Tianjin-Hebei coordinated development strategy. Despite steady economic growth, Hebei faces significant challenges in achieving sustainable, high-quality development due to its reliance on traditional heavy industries like steel, chemicals, and building materials. The digital economy offers a transformative opportunity to address these challenges by enhancing industrial transformation, promoting green production practices, and fostering technological innovation. This paper examines the current economic structure of Hebei, the progress of digital economic development, and its integration with traditional industries. It also explores the potential for digital technologies to optimize industrial efficiency, improve resource allocation, and support Hebei's transition from a resource-dependent to an innovation-driven economy. The study identifies the gaps in technological innovation and industrial capabilities and proposes strategic recommendations to strengthen Hebei's position within the Beijing-Tianjin-Hebei coordinated development framework. Future research should focus on regional differences, workforce education, environmental impacts, and policy effects on industrial and digital innovation.

**Keywords:** Hebei Province, Digital Economy, Industrial Transformation, Technological Innovation, Sustainable Development

## 1. Introduction

The province's economic structure has long been dominated by secondary industries, with heavy industry—particularly steel, chemicals, and building materials—playing a central role. This reliance is closely tied to Hebei's abundant mineral resources, which have supported its traditional industries[1]. Notably, Hebei's steel production ranks among the highest nationwide. However, this industrial foundation comes with challenges, including high resource consumption and significant pollution emissions, highlighting the urgent need for sustainable, high-quality development through industrial transformation and upgrading [2]. In this context, the digital economy presents a transformative opportunity for Hebei. As a technology-driven economic paradigm, the digital economy can accelerate the digitalization and intelligent transformation of traditional industries, optimize resource allocation, and enhance production efficiency. Hebei should actively foster the integration of digital technologies with manufacturing, boosting the competitiveness of its steel, chemical, and other traditional sectors through intelligent manufacturing, green production practices, and supply chain modernization. Additionally, the digital economy has the potential to spawn

emerging industries and innovative business models, providing new momentum for economic growth and supporting Hebei's transition from a resource-dependent to an innovation-driven economy [3]. Despite progress in promoting industrial restructuring and bolstering the service and high-tech sectors in certain areas like Shijiazhuang and Qinhuangdao, the overall impact of industrial upgrading remains uneven across the province. Hebei continues to face pressures related to transformation and quality enhancement while pursuing economic growth. Striking a balance between scaling up its economy and achieving structural optimization has become Hebei's central challenge.

This paper will examine the current state of Hebei's economic development, focusing on the impact of the digital economy, particularly in optimizing industrial structure and transforming traditional industries. Through an analysis of Hebei's economic structure, the progress of digital economic development, and its integration with traditional industries, the study aims to demonstrate how the digital economy can enhance production efficiency, optimize resource allocation, promote green production, and foster technological innovation. This will help Hebei transition from a resource-dependent economy to one driven by innovation. Furthermore, the study will address the challenges Hebei faces in its industrial upgrading process, such as limited technological innovation capabilities and incomplete industrial chains, and propose relevant policy recommendations to strengthen Hebei's economic position within the Beijing-Tianjin-Hebei coordinated development strategy.

## **2. Analysis of the Advantages of Hebei Province's Economic Development**

### **2.1. Geographical Location and Transportation Advantages**

Hebei Province is located in northern China, close to Beijing and Tianjin, and is located in the core area of the Beijing-Tianjin-Hebei Economic Circle, with unique geographical advantages. This locational condition enables Hebei Province to enjoy the radiation effect of the capital economic circle, effectively attract resources and industrial spillovers from the capital region, and drive regional economic development. The coastal areas of Hebei Province include Qinhuangdao, Tangshan and Cangzhou, with a coastline of 487.3 kilometers, becoming an important hub connecting Northeast China, North China and East China, forming a transportation network that reaches the whole country. In addition, Hebei Province has relatively complete transportation infrastructure, with complete railway, highway and port facilities. Many important railway lines such as Beijing-Guangzhou, Beijing-Shanghai and Beijing-Harbin pass through the province, and the mileage of expressways is more than 1,000 kilometers. The road network density and access depth are higher than the national average [4]. The three major ports - Qinhuangdao Port, Tangshan Port and Huanghua Port, have an annual throughput capacity of more than 500 million tons, providing an important port collection and distribution platform for logistics exchanges between Hebei Province and North China, Northeast China and Northwest China. The efficient transportation system enhances material circulation, reduces enterprise logistics costs, and creates a strong foundation for Hebei Province to attract foreign investment, develop modern logistics and port-related industries, and drive rapid economic growth.

### **2.2. Resource advantages**

Hebei Province is rich in mineral, land, and marine resources. It has significant iron ore reserves of 5.96 billion tons, making it a key player in China's steel industry, with output among the highest in the country. The province also has abundant coal, limestone, and other resources, supporting industries like cement and building materials. Hebei's coastal areas offer over 5 million mu of developable land, including tidal flats and saline-alkali land, which can support agriculture and industrial parks. Additionally, the province boasts a 80.7-kilometer deep-water coastline with oil, natural gas, and raw salt reserves, forming a unique coastal economic belt. These resources provide

a solid foundation for Hebei's industries and offer potential for resource processing and industrial upgrades, helping the province transition to a resource-efficient economy [4].

### **2.3. Policy advantages**

Hebei Province benefits from national policies supporting regional development, particularly in the digital economy. As part of the Beijing-Tianjin-Hebei coordinated development strategy, Hebei has leveraged policies on industrial transfer, ecological protection, and infrastructure construction to optimize its economic structure [5]. With the decentralization of non-capital functions from Beijing, Hebei has become a key area for industrial spillover, accelerating the growth of digital economy and high-tech industries. The government has also boosted ecological governance, focusing on pollution prevention and environmental improvement. Additionally, policies promoting local enterprise innovation, investment in digital economy, and industrial upgrading have enhanced Hebei's business environment, competitiveness, and laid the foundation for sustainable development.

## **3. Insufficient economic development in Hebei Province**

### **3.1. Economic development quality issues**

Hebei Province has achieved significant economic development in the past but faces challenges in enhancing quality and sustainability. Its growth model remains reliant on traditional heavy industries such as steel, chemicals, and building materials, characterized by high resource consumption and pollution, which hinder sustainable progress. While these sectors contribute substantially to the overall economy, they offer low added value, with limited production efficiency and labor productivity. The development of high-tech industries and modern services lags behind, with innovation-driven sectors comprising a small portion of the economy. The province lacks core technologies and leading enterprises essential for driving economic upgrades [2]. Despite recent efforts to optimize industrial structures and foster emerging industries, the quality of economic development has seen little improvement. Limited technological innovation keeps Hebei at the lower end of the industrial chain, making high-quality growth challenging.

### **3.2. Unbalanced regional development**

There is a significant imbalance in the regional economic development of Hebei Province. As part of the coordinated development strategy of Beijing, Tianjin and Hebei, the coastal areas of Hebei, such as Qinhuangdao, Tangshan and Cangzhou, rely on superior location and resource conditions, with relatively high economic development levels and relatively complete infrastructure, attracting a large number of industries and investments, and the total economic growth is relatively fast. However, the central and western regions of Hebei, such as Xingtai and Handan, are relatively remote in geographical location, with relatively poor economic development conditions, a single industrial structure and relatively lagging economic growth rate. The uneven development within Hebei Province has resulted in significant income gaps between regions, with the disparity between urban and rural areas growing more pronounced. Imbalances in resource allocation and policy support, particularly between coastal and inland areas, have further exacerbated these regional inequalities. Additionally, the infrastructure gap between cities within the province is evident, alongside stark differences in the quality of public services available in rural versus urban areas.

### **3.3. Environmental and resource issues**

As a heavy industrial province, Hebei Province has long faced severe environmental and resource problems. Due to the dominance of resource-intensive industries such as steel, coal, and

petrochemicals, Hebei Province ranks among the top in the country in terms of resource consumption and pollution emissions, and the environmental pressure is huge. In particular, in terms of air pollution, the PM2.5 concentration in many cities in Hebei Province has been at a high level for a long time, which has an adverse impact on the quality of life and health of residents. Water shortage is also a major problem facing Hebei. There is a large demand for industrial and agricultural water, but the water supply is insufficient, resulting in over-exploitation of water resources in some areas and a fragile ecological environment. In addition, Hebei Province is rich in mineral resources, but the way of resource development is relatively extensive, resulting in resource waste and environmental damage [6]. Although Hebei Province has taken a series of measures in environmental governance and resource protection in recent years, including promoting clean production, strengthening environmental law enforcement, and optimizing energy structure, the results still need to be improved.

#### **4. The Digital Economy Drives Economic Growth in Hebei Amid Challenges**

The rapid development of the Bohai Rim Economic Zone offers Hebei Province opportunities to accelerate economic transformation and growth. By strengthening regional integration with Beijing and Tianjin, Hebei can attract industrial transfers, particularly in advanced manufacturing and modern service industries, to support industrial upgrading and structural adjustment. Moreover, the construction of the Bohai Rim Economic Zone enhances infrastructure development, such as expanding ports, railways, and road networks. These improvements enable Hebei to build a modern transportation and logistics network, improving material circulation efficiency and reducing enterprise transportation costs. Such progress creates a strong foundation for boosting Hebei's economic competitiveness. A key driver of Hebei's future growth is the digital economy. The Bohai Rim Economic Zone attracts both domestic and foreign investment, facilitating technological innovation and talent recruitment. These factors contribute to the expansion of Hebei's digital economy and high-tech industries, enabling the province to achieve sustainable, high-quality economic growth. By leveraging digital technologies, Hebei can modernize traditional industries, enhance productivity, and explore new economic sectors, creating a more innovation-driven industrial ecosystem [7].

However, significant challenges remain. Hebei's industrial structure is still heavily reliant on traditional manufacturing and resource-based industries, which lack the technological sophistication and innovation necessary to compete effectively within the Bohai Rim Economic Zone. Additionally, regional disparities within the province are stark, with coastal areas far outpacing central and western regions in economic development, infrastructure, and industrial capabilities. These imbalances threaten to hinder Hebei's coordinated development. To overcome these challenges, Hebei must further integrate the digital economy into its industrial transformation strategy. This includes fostering high-tech innovation, increasing the technological content and value-added potential of its industries, and bridging the digital divide between urban and rural areas. Strengthening regional coordination and guiding infrastructure and industrial upgrades in the central and western regions are also critical. By addressing these issues, Hebei can maximize the transformative potential of the digital economy, achieving balanced and sustainable development within the Bohai Rim Economic Zone.

#### **5. Digital economy promotes rapid economic development in Hebei**

##### **5.1. Promote optimization and upgrading of industrial structure**

As a new economic form based on information technology, digital economy is an important engine for promoting optimization and upgrading of Hebei's industrial structure. Hebei Province's economic structure is dominated by heavy industry, and traditional industries account for a high proportion. It is urgent to promote the transformation and upgrading of the manufacturing industry through

digitalization and intelligent means. By accelerating technological transformation and introducing high-tech and intelligent equipment, traditional manufacturing can effectively improve production efficiency, reduce costs, reduce resource consumption and environmental pollution. In addition, the development of the digital economy has also spawned new business models and industrial chains, injected vitality into traditional industries, and improved product added value and competitiveness in the process of industrial transformation and upgrading. Although Hebei's digital economy and manufacturing industries are developing positively, challenges remain. These include unbalanced growth, limited integration between the digital economy and manufacturing, weak technological innovation capabilities, and minimal progress in industrial structure transformation. To address these issues, Hebei must accelerate the deep integration of the digital economy with the manufacturing sector, leveraging technological advancements to drive high-quality economic growth.

## **5.2. Promote regional coordinated development**

The digital economy provides a new idea for solving the imbalance of regional development in Hebei. At present, there is a large gap between the coastal areas and inland areas of Hebei in terms of economic foundation, industrial structure and infrastructure. The development of the digital economy can bridge these differences. By accelerating the construction of digital infrastructure, especially in the central and western regions and rural areas, Hebei can achieve a coordinated improvement in the digitalization level of urban and rural areas. At the same time, the digital economy can also promote regional economic connectivity through smart logistics, e-commerce and other means, and strengthen the efficient allocation of industries and resources between urban and rural areas [8]. In addition, Hebei needs to use the digital economy platform to strengthen cooperation with the Beijing-Tianjin region, undertake the industrial transfer and technology spillover from Beijing and Tianjin, promote the optimization of the industrial chain by digital means, fully activate the regional economic vitality, and achieve regional coordinated development.

## **5.3. Strengthen Scientific and Technological Innovation and Talent Attraction**

The growth of the digital economy relies heavily on scientific and technological innovation and the availability of high-quality talent. Hebei should leverage the digital economy as a catalyst to increase investment in research and development (R&D) in key high-tech areas such as intelligent manufacturing, new materials, and new energy. This approach can encourage enterprises to boost their core competitiveness through independent innovation. To foster a robust innovation ecosystem, Hebei should establish digital economy demonstration zones and scientific and technological innovation incubation bases. Strengthening collaboration with universities and research institutions is also vital to supporting innovation and entrepreneurship. In terms of talent attraction, Hebei needs to optimize its policy environment to draw high-end professionals and technical teams. The development of the digital economy provides an opportunity to implement measures such as creating dedicated talent recruitment platforms, offering housing and educational benefits, and enhancing the commercialization of scientific and technological achievements. By attracting top-tier domestic and international talent, Hebei can build a strong foundation for comprehensive development driven by the digital economy.

## **6. Conclusion**

In conclusion, Hebei Province, as a key player in northern China's economic landscape, faces both significant opportunities and challenges in its development journey. While the province has made notable strides in economic growth and industrial modernization, it continues to grapple with structural imbalances, regional disparities, and environmental pressures. The province's reliance on

traditional heavy industries, particularly steel and chemicals, has provided a solid economic base but also highlights the need for transformation toward more sustainable and high-value-added sectors. Integrating digital technologies into traditional industries, such as intelligent manufacturing and green production, can enhance Hebei's global competitiveness while supporting the transition from a resource-dependent economy to one driven by innovation. Furthermore, digital infrastructure can help bridge the development gap between Hebei's coastal and inland regions, ensuring more balanced economic growth.

Despite the promising potential, the province must address the existing gaps in technological innovation, industrial capabilities, and regional coordination to fully leverage the benefits of the digital economy. By adopting strategic policies that focus on industrial restructuring, technological integration, and regional integration, Hebei can build a more sustainable and innovation-driven economy, positioning itself as a vital hub within the Beijing-Tianjin-Hebei coordinated development framework. The province's success will depend on its ability to harness digitalization while ensuring equitable growth across its diverse regions. However, this study may overlook localized issues, and by its limited exploration of workforce education and reskilling. Future research should address these gaps by examining regional differences, investigating the role of human capital in digital integration, assessing environmental impacts, documenting successful case studies, and analyzing the effects of policies on industrial and digital innovation.

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