

Analysis of the Economic Effect of Zhengzhou Metropolitan Circle

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Abstract: Metropolitan area, as functional region in China, is of critical role in economic development. Most studies focus on metropolitan development zones from a macroeconomic perspective, but there is a lack of specific research linking factors such as environment and industrial upgrading in the Central Plains Economic Zone. Therefore, this paper conducts an in-depth analysis of the relevant factors that affect the development of the Zhengzhou Metropolitan Circle in the process of economic growth, as well as the environmental pollution and industrial upgrading issues it faces. This article takes Wuhan as a comparative case and analyzes the differences in multiple aspects, such as environment, transportation strength, and regional development coordination, between the two metropolitan circles. It points out that promoting sustainable development is urgent. At the same time, this study proposes that the core area of the Zhengzhou Metropolitan Circle should carry out economic reforms based on the concepts of green development and regional coordinated development, aiming to provide theoretical support for a deeper understanding of regional economic development mechanisms and the formulation of targeted strategies.

Keywords: core metropolitan area, economic benefits, green development, regional coordinated development

1. Introduction

As the aftermath of the pandemic has not yet dissipated and the global economy has not yet shown a strong growing trend, China started to shown steady recovery, and urbanization has become one of the most important drivers of economic development in China and the world. A metropolitan area is a functional geographical concept that refers to a range that includes a core city and surrounding areas, connected by multiple transportation channels. Tokyo, New York, London and other famous cities around the globe are undoubtedly important metropolitan circles with strong economic development. As the financial centers of the country, they lead their respective regions to achieve the radiation effect of surrounding industries and regional economic transformation.

Many of such examples are shown in China's regional economic development. In recent years, many scholars have conducted research on regional economy, with China's five major economic regions being the focus of their studies. Reviewing relevant research, the study of core economic benefits focuses on the aggregation of key economic factors in the region and their radiation effects on the surrounding areas. As for the Zhengzhou Metropolitan Circle, it is centered around Zhengzhou and promotes the formation of a functionally complementary economic region among surrounding cities. The economic development trend is good, but it also faces problems such as environmental

pollution and urgent industrial upgrading [1-3]. However, there is still a lack of analysis in existing literature on these related issues. Most studies tend to examine the Central Plains Economic Zone from a macro perspective and analyze its advantages, while in-depth analysis of the economic benefits of the core areas of the Central Plains Economic Zone is relatively scarce [4, 5].

This study aims to fill this research gap, focusing on exploring the economic benefits and negative effects of the core area of the Zhengzhou Metropolitan Circle on the surrounding urban areas under the background of economic growth. This not only helps with deepening the understanding of the internal mechanism of economic development in the region, but also provides theoretical basis for formulating targeted development strategies, assisting the core area of Zhengzhou Metropolitan Circle to achieve green development and regional coordinated development, and making unique contributions in the field of regional economic development research. This study first elaborates on the research background and main achievements of the Zhengzhou, further analyzes relevant factors and problems, and finally proposes suggestions for promoting economic reform and development in the Zhengzhou Metropolitan Circle.

2. Development of Zhengzhou metropolitan circle

2.1. Overview

Zhengzhou is an ancient city with a long history and is also the birthplace of Chinese civilization. Since ancient times, it is known as the “commercial capital.” At the same time, there have been sites on the territory of Zhengzhou since the Neolithic Age, indicating its long history of development. In the 21st century, the development of Zhengzhou has reached a new level. By 2023, the urbanization rate of Zhengzhou has reached 80%. The country is actively promoting Zhengzhou to become the central city of China. In 2024, the Gross Domestic Product (GDP) of Zhengzhou reached a historical high of 1,453.21 billion yuan, indicating its strong economic development. At the same time, Zhengzhou has also made significant investments in transportation development. The establishment of Zhengzhou Airport Zone has provided Zhengzhou with a solid logistics foundation and also improved its economy.

2.2. Positive effects

Zhengzhou Metropolitan Circle located in the Central Plains Economic Zone, has shown an overall upward trend in development over the past 15 years. Research on the level and strategy of the Central Plains Economic Zone has indicated that, although the economy of the Central Plains Economic Zone declined in 2014 and 2015, it generally continued to rise in subsequent years [6]. This suggests that the Central Plains Economic Zone has had a positive economic impact on surrounding cities.

In terms of the balance of enterprise development, for Zhengzhou Metropolitan Circle, the industrial structure upgrading has driven the optimization and adjustment of surrounding areas. Due to the rising cost of land and labor and the surplus of labor force, some labor-intensive industries have transferred to surrounding second- and third-tier cities.

In terms of transportation network development, Zhengzhou is a provincial capital city with a focus on high-speed rail and expressway construction. In recent years, the state has strongly supported the urban transportation development of Zhengzhou, creating an extremely efficient land transport system. Reports indicate that, by 2025, the Zhengzhou municipal government plans to invest over 12.5 billion yuan to enhance the efficiency of the urban rail transit system. This reduces corporate transportation costs and promotes economic growth as well as increased business cooperation among enterprises [7]. At the same time, it also facilitates population mobility and the expansion of the labor market.

In terms of talent attraction, Zhengzhou boasts numerous universities such as Zhengzhou University, Henan University, and Henan University of Technology. These institutions can provide a large number of talents to work in local enterprises. Therefore, Zhengzhou can create a promising economic market to attract both talents and businesses. These technological innovation resources can spread to surrounding areas, providing significant support for their economic development. By enhancing and collaborating on technology, it can help the continuous advancement of science and technology in neighboring cities. At the same time, ongoing cooperation and improvement will also increase the competitiveness among industries, bringing benefits to Zhengzhou Metropolitan Circle.

2.3. Negative effects

On the premise of economic growth in Zhengzhou Metropolitan Circle, its problems cannot be underestimated. Among them, environmental pollution and industrial upgrading are more significant. Regarding environmental pollution, research on pollution relationships has shown that the impact of economic growth in Henan Province on the environment is primarily manifested as exhaust emissions [1]. Relevant data also indicates that the Particulate Matter 2.5 (PM2.5) concentration in the Central Plains Economic Zone of Henan Province is very high. Some scholars speculate that this is resulted from increased traffic frequency caused by economic growth, and the unique climate conditions of the region also facilitate the dispersion of pollutants [2].

In terms of the need for industrial upgrading, many scholars believe that the manufacturing industry in Henan Province has significant problems. The reason is that many local factors are contradictory to the direction of industrial upgrading, such as the high proportion of heavy industry and the high dependence on resources and energy [3]. Many scholars have studied these issues, but the root cause has never been resolved.

The indirect negative impacts of the Zhengzhou Metropolitan Circle cannot be overlooked. In terms of available land, population growth driven by economic development and the reduction in land availability have led to rising housing prices and supply-demand imbalances in education and healthcare resources. It is reported that Zhengzhou's housing prices rose from 11,000 yuan per square meter in 2019 to 13,000 yuan per square meter in 2023, and continue to rise steadily. However, few scholars have analyzed this phenomenon. The increase in housing prices is actually due to the massive influx of people driven by economic growth, which creates substantial demand for real estate. The supply-demand imbalance in education and healthcare resources stems from the concentration of these resources, leading to regional development disparities. The primary reason for these imbalances is that the core area of the Zhengzhou Metropolitan Circle attracts a large amount of resources, while surrounding cities lag behind in high-tech industries and investment attraction, thus causing the aforementioned phenomena.

3. Comparative analysis: Wuhan versus Zhengzhou

3.1. Overview of metropolitan development

Wuhan has been a strategic location for military contention from ancient times to the present. Due to the convergence of multiple rivers in Wuhan, it has long been known as the "River City." The unique geographical position of Wuhan provides a solid foundation for logistics and transportation. In recent years, the economic benefits of Wuhan have been particularly prominent. In 2023, the GDP of the Wuhan Metropolitan Circle reached 3.36 trillion yuan, with Wuhan alone accounting for about 1.91 trillion yuan, or over 57%, indicating a high degree of economic primacy and development heavily reliant on the core city of Wuhan. In contrast, the Zhengzhou Metropolitan Circle had an economic output of 3.57 trillion yuan in 2023, with a larger and more balanced development after expansion,

covering multiple cities. Apart from Zhengzhou's GDP exceeding 1.39 trillion yuan, cities like Luoyang and Xuchang also have significant development scales, with minimal economic disparities.

In summary, the Wuhan Metropolitan Circle brings numerous advantages to Wuhan, with regional development being uncoordinated and failing to exert the radiating effect that a metropolitan circle should have; in contrast, the Zhengzhou Metropolitan Circle relies on the clarity of its "one core, one sub-center, two axes, and multiple points" structure, where cities leverage their own advantages to attract industries, thus avoiding excessive concentration of industries in the core city.

3.2. Comparative analysis

In terms of transportation conditions, the Zhengzhou Metropolitan Circle boasts unparalleled traffic conditions in China. Its crisscrossing network of roads and railways brings about incomparable transport capabilities. Meanwhile, studies have pointed out that the transportation methods in the Zhengzhou Metropolitan Circle are highly diverse, including air travel, trains, trucks, and water transport, all of which contribute significantly to logistic benefits. For instance, Zhengzhou North Station is one of the largest railway freight marshalling stations in the country, providing substantial transport capacity. In contrast, the Wuhan Metropolitan Circle has relatively weaker freight capabilities, thus its economic benefits are not as significant as those of the former [4].

In terms of labor resources, Henan is a region with abundant human capital nationwide. As its provincial capital, Zhengzhou has been one of the cities with the largest population growth in China over the past decade, thus boasting ample labor resources. However, despite having numerous universities, it still falls slightly short of Henan Province in total labor force numbers. Therefore, Zhengzhou Metropolitan Circle can secure more labor and generate greater economic benefits.

In terms of urban coordination, Zhengzhou Metropolitan Circle includes the central city of Zhengzhou and surrounding cities such as Luoyang, Kaifeng, and Xinxiang. These cities have not only a solid foundation in the development of secondary and tertiary industries, but also strong capabilities in primary industry. The regional development is relatively balanced, with little disparity between urban and rural areas; in contrast, the Wuhan Metropolitan Circle has significant regional development differences due to its failure to implement Zhengzhou's model of integrated urban-rural development. In fact, some scholars have already conducted comparative analyses on this issue, with one study noting that Zhengzhou's balanced regional development is indeed prominent among major metropolitan circles and has been very effective [5].

In terms of the environment, based on the environmental issues in Zhengzhou Metropolitan Circle mentioned earlier, comparative analysis through relevant data on China's Air Quality Online Monitoring Platform shows that the average PM_{2.5} concentration in the Wuhan Metropolitan Circle was 30 micrograms per cubic meter in 2024, while that in Zhengzhou Metropolitan Circle was nearly 40 micrograms per cubic meter. Therefore, the Wuhan Metropolitan Circle has made more effective progress in environmental protection. Comparative analysis also reveals that the environment in Wuhan Metropolitan Circle was very poor before 2019 (inclusive), with severe pollution almost every month. In response to this situation, Wuhan has taken many measures to improve air quality, such as increased road watering to suppress dust and partial suspension of diesel buses.

In addition to the above aspects, there is a difference in the siphon effect between the regional development of Wuhan and Zhengzhou with their own respective surrounding cities. In economics, the siphon effect refers to the movement of productive factors from economically underdeveloped areas to economically developed areas. Both cities share a common feature, that they lack a relatively large surrounding city to counterbalance them, which leads to the central city dominating the development and thus triggering the siphon effect.

If the siphon effect really exists, there may be a significant amplitude fluctuation in population data. According to the data, Wuhan's permanent population was 13.74 million in 2024, while

Zhengzhou's was 12.74 million. Therefore, Wuhan has seen a significant increase in population. Through a series of policies, such as the "Million University Students Retention Program," Wuhan has strong appeal for high-quality talents, which is not limited to those within the province. In contrast, Zhengzhou has a strong ability to attract labor from other regions in the province, but is relatively weak in attracting talents from outside the province.

In recent years, a common phenomenon in similar cities is the imbalance in regional development. The reason for such phenomenon may be the siphon effect reflected in the real estate market. Before the implementation of policies in Zhengzhou, the central urban area experienced a severe siphon effect. The imbalance in its real estate market development was due to different levels of infrastructure construction capabilities between the central urban area and suburban areas. As a result, housing prices in the central urban area rose with increasing demand. At that time, the siphon effect in Zhengzhou was further exacerbated by the imbalance in regional development, making the city's high-quality resources even more attractive, which in turn continuously amplified the siphon effect. However, in recent years, the government has strengthened infrastructure construction in Zhengzhou and activated the market with multiple policies, addressing this issue.

Wuhan is quite different, that it has transformed the siphon effect into a powerful tool for driving the development of surrounding cities through various means. For instance, by fostering industrial synergy, the real estate market in Wuhan has attracted numerous enterprises. Although this inevitable siphon effect leads to increased costs, it also provides opportunities for outward relocation, thereby boosting the local economy.

4. Coping strategies

In response to the aforementioned issues, this study proposes appropriate adjustments to the planning direction of the core area of the Zhengzhou Metropolitan Circle. It should focus on high-quality development in the future, promoting industrial upgrading, especially in intelligent manufacturing, digital economy, and high-tech fields. Green development will be a priority, with enhanced environmental protection measures to promote clean energy and low-carbon transportation. Transportation infrastructure will continue to expand, enhancing Zhengzhou's status as a central transportation hub and promoting regional integration. At the same time, coordinated development between the city and surrounding areas will be strengthened, narrowing the urban-rural gap. In the future, the Zhengzhou Metropolitan Circle will develop towards innovation-driven growth, green sustainability, and optimized social services, becoming an economic and technological center in Central China.

Regarding the environmental pollution, especially the pollution caused by developed transportation, Zhengzhou should use more environmentally friendly modes of transport. Although Zhengzhou has several large airports, such transportation methods are costly. The development of Zhengzhou's extensive railway network dates back to 1904 when it became the intersection point of the Beijing-Hankou Railway and the Longhai Railway, serving as a convergence point for the transportation network. Zhengzhou's railway network is relatively well-developed, making rail transport an excellent choice.

Regarding the industrial upgrading, a more reasonable approach for the government is to increase investment in scientific research and financing related to research, especially in key areas of technology. For instance, if the government increases investment in the sustainable development of high-tech industries, more high-tech companies will also move into Zhengzhou, optimizing the local industrial structure. In fact, scholars have already paid attention to these issues and indicated that improvements are being made [8].

Regarding available land, the shortage of actual usable land has not gone unnoticed by scholars, who point out that it is due to the rapid economic development in the core area of the Zhengzhou

Metropolitan Circle [9]. There are generally two solutions to this issue: optimizing the use of existing developed land and increasing land supply. Optimization is the most feasible solution. Taking Zhengzhou as an example, some scholars have noted that there are many old urban areas within the city. These areas can be redeveloped through demolition and renovation, transforming them into residential or office buildings with higher occupancy rates or greater efficiency, which not only increases occupancy and economic benefits but also contributes to performance [10]. Increasing land supply is another excellent option. The government can develop underground land resources. For instance, building large shopping malls beneath office buildings can help the government achieve strong economic returns while also satisfying the public's appetite needs.

In view of the relatively successful development of Zhengzhou Metropolitan Circle compared with Wuhan Metropolitan Circle, there are several points that worth noting, in terms of the use of production factors and means of production, as well as actual economic benefits. In terms of the utilization of production factors, Zhengzhou Metropolitan Circle has effectively leveraged its geographical location to create a complex transportation network, thereby enhancing logistics efficiency and generating more economic benefits, which is well worth learning from. The shortcomings in this aspect of the Wuhan Metropolitan Circle reflect that they have not fully utilized their geographical advantages. However, there has been some improvement in recent years, and there is still considerable room for further progress.

In terms of policy implementation, the Zhengzhou Metropolitan Circle has effectively adopted an integrated urban-rural development model; thus, the regional disparities are not severe, laying a solid foundation for future development. In this regard, the Wuhan Metropolitan Circle can serve as a relatively negative example, as its regional development is indeed uneven. In terms of preventing the siphon effect, Zhengzhou Metropolitan Circle was once lacked centralized and unified leadership and management. As a result, surrounding cities, that should have received radiating effects from Zhengzhou, had not developed in good coordination, but instead struggled with their own battles. This phenomenon is worth reflecting on. For this special type of urban cluster, the goal for large metropolitan circle should be very clear; it is to promote common development, with the central city driving the surrounding economy.

5. Conclusion

In summary, this article provides a detailed analysis of the basic situation and strengths and weaknesses of Zhengzhou Metropolitan Circle. By comparing it with the Wuhan Metropolitan Circle, specific solutions are proposed to address its shortcomings. As the core of the Central Plains Economic Zone, the positive economic impact of the Zhengzhou Metropolitan Circle is undeniable, but the negative economic effects that come with Zhengzhou's development cannot be overlooked. In fact, there is a wealth of experience in the core area of the Zhengzhou Metropolitan Circle that is worth learning from, whether it be decisions already made or remedial measures taken. Regional economic development should draw inspiration from the development experience of the Zhengzhou Metropolitan Circle. Regions that have already implemented policies should refer to its strengths for improvement; meanwhile, the government can also consider its negative effects and potential issues when selecting and planning the structure of regional economic development, thus making necessary adjustments.

However, this paper does not provide detailed quantitative analysis to support its conclusions. Moreover, comparing with only the Wuhan Metropolitan Circle is less than sufficient; thus, more comprehensive comparative analyses with a large number of metropolitan areas are needed to support policy recommendations and could serve as future research directions.

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