

Article

Can New Infrastructure Become a New Driving Force for High-Quality Industrial Development in the Yellow River Basin?

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Abstract: Ecological protection and high-quality development in the Yellow River Basin have become a major national strategy in China. This paper explores the impact and mechanisms of new infrastructure on high-quality industrial development in the Yellow River Basin, considering the current context of vigorous development of new infrastructure and the industrial development status of the region. This study finds that new infrastructure promotes high-quality industrial development in the Yellow River Basin, and the enhancement of digital literacy strengthens this positive impact. New infrastructure facilitates high-quality industrial development in the Yellow River Basin by driving labor transfer from the supply side and consumption upgrading from the demand side. This positive influence is particularly pronounced in the upstream cities, central cities, and urbanized areas of the Yellow River Basin. Further research indicates that there is a “pain period” in promoting the construction of new infrastructure, and only when the level of high-quality industrial development exceeds a certain threshold can its efficiency be further improved. The conclusions of this paper provide theoretical references and policy inspiration for the coordinated promotion of new infrastructure construction to empower high-quality industrial development in the Yellow River Basin.

Keywords: new infrastructure; high-quality industrial development; labor transfer; consumption upgrading; Yellow River Basin



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1. Introduction

As a crucial ecological barrier and economic region, the Yellow River Basin holds a significant strategic position in China's economic development and modernization efforts. However, due to constraints such as geographical location, resource endowment, and natural conditions, the regions along the Yellow River face prominent issues of low-quality and inefficient industries, primarily dominated by agriculture, animal husbandry, energy chemicals, smelting, and building materials. The critical issue in achieving long-term sustainable development in the Yellow River Basin is overcoming the paradox between resource endowment and economic development to establish a dynamic system for high-quality industrial growth. What then serves as a vehicle for promoting high-quality industrial development? Notably, new infrastructure formed through the organic integration of next-generation information technologies—such as 5G, artificial intelligence, industrial Internet, the Internet of Things, and data centers—is spearheading a new round of industrial revolution and transformation, providing a crucial cornerstone for the digital, networked, and intelligent transformation of traditional industries. Within the strategic context of ecological protection and high-quality development in the Yellow River Basin, can this new infrastructure become a key driving force for high-quality industrial development? If so, by what internal mechanism is this effect transmitted? Does this impact exhibit heterogeneity among different cities within the basin? Furthermore, as the industrial development stage changes, what kind of structural evolution exists in the marginal impact effects of new infrastructure?

The existing literature lacks systematic research addressing these questions, offering an opportunity for this paper to contribute marginally to the field.

For a long time, economic theories explaining high-quality industrial development have focused on factors such as changes in relative product prices [1–3] and income growth [4–7]. In recent years, both domestic and international scholars have concentrated on exploring the impact of factors like international trade [8,9], technological innovation [10,11], population aging [12,13], and financial development [14,15] on high-quality industrial development. Among the few studies conducted from the perspective of new infrastructure, Guo et al. (2020) constructed a multi-sector dynamic general equilibrium model to theoretically analyze the economic mechanisms through which new infrastructure drives high-quality industrial development by affecting specific production technologies and industrial sources [16]. Chao et al. (2021), starting from the entire industrial chain of manufacturing, proposed that new infrastructure can achieve a positive impact on high-quality development in manufacturing through two channels: upgrading production and manufacturing and improving market matching [17]. Pan and Gu (2022) focused on the development of the service industry and found that new infrastructure can drive the transformation and upgrading of the service industry through labor efficiency improvement and technological innovation [18]. However, these studies either remain at the theoretical analysis level without empirical data support or focus on transformation and upgrading within a specific industry, lacking a comprehensive analysis from the perspective of high-quality industrial development.

The studies most closely related to this paper investigate the impact of new infrastructure on high-quality economic development. Representative literature includes that of Guo et al. (2020) [19], Pradhan et al. (2021) [20], Tang et al. (2022) [21], and Wang et al. (2023) [22]. These studies largely confirm that new infrastructure has a significant positive impact on high-quality economic development, primarily through internal mechanisms such as technological progress, resource allocation, and industrial integration. From an analytical perspective, existing studies predominantly concentrate on the impact of new infrastructure on high-quality economic development at the macroeconomic level, with fewer studies addressing the meso-industrial level. Regarding the mechanism of influence, most existing literature revolves around channels such as technological progress, overlooking the critical roles of labor transfer and consumption upgrading in enhancing economic quality and efficiency. Content-wise, current studies have yet to explore the moderating role of digital literacy in the process by which new infrastructure supports high-quality industrial development. Regarding research objects, the study of high-quality industrial development is still in its infancy. To date, no literature has examined the relationship between new infrastructure and high-quality industrial development, and empirical research based on large sample data from the Yellow River Basin is particularly scarce. Existing research provides a solid theoretical foundation for this paper while also offering valuable insights and inspiration.

Compared with the existing literature, the marginal contributions of this paper are mainly reflected in the following three aspects: First, this paper clarifies the internal logic of high-quality industrial development in the Yellow River Basin under the new development concept. It systematically analyzes the mechanisms by which new infrastructure influences high-quality industrial development from the perspectives of labor transfer from the supply side and consumption upgrading from the demand side, thus enriching and expanding the research dimension in this field. Second, it comprehensively examines the moderating role of digital literacy, deepening the understanding of the inherent laws between new infrastructure and high-quality industrial development. Third, based on the economic characteristics of the basin, this paper constructs a comprehensive indicator system for high-quality industrial development. It explores the heterogeneous impact of new infrastructure on high-quality industrial development in the Yellow River Basin from the dimensions of upstream, midstream, and downstream, city hierarchy, and main functional areas. Additionally, it expansively analyzes the structural changes in the marginal impact effects

between the two, providing forward-looking theoretical inspiration and empirical evidence for the coordinated promotion of new infrastructure construction across various regions along the Yellow River in the next step.

2. Theoretical Analysis and Research Hypotheses

2.1. The Direct Impact of New Infrastructure

The high-quality industrial development of the Yellow River Basin is a typical example of high-quality development in large basins. However, it has certain unique characteristics due to significant differences from the Yangtze River Basin in terms of geographic location, navigability, basin area, population size, natural conditions, and resource endowment. This is specifically manifested in considerable disparities in economic development levels within the basin, fragile ecological environment, and concentration of impoverished populations [23]. Consequently, these factors impose serious limitations on the high-quality industrial development process in the Yellow River Basin. Therefore, high-quality industrial development in the Yellow River Basin needs to be guided by the new development concept. This includes enhancing the intrinsic motivation and sustainability of basin industrial development through innovation and green development, promoting a reasonable division and layout of industrial development through coordinated development, and maximizing the social welfare of shared industrial achievements through open and shared development. The new infrastructure, composed of information infrastructure, integrated infrastructure, and innovative infrastructure, is characterized by strong scientific and technological attributes and a wide range of potential application scenarios. It can drive high-quality industrial development in the Yellow River Basin by providing services such as digital transformation, intelligent upgrading, and integrated innovation.

Firstly, the digital transformation services provided by the new infrastructure can drive industrial openness and green sustainable development. Information infrastructure, evolving from next-generation information technology, can optimize cross-border communication and deepen global collaboration through digital transformation services. This not only facilitates the expansion of export volumes but also improves export structures, thereby promoting industrial openness [24–27]. Additionally, the organic integration of digital technologies, such as big data, cloud computing, and data centers, with physical industries fosters the construction of digital production, operation, and management systems along the industrial chain. This effectively enhances the comprehensive utilization efficiency of production resources, reduces energy consumption, lowers pollutant emissions, and promotes green and low-carbon industrial development [21,28,29].

Secondly, the intelligent upgrade services provided by the new infrastructure can promote the sharing of industrial achievements. The deep application of technologies, such as blockchain and artificial intelligence, supports the transformation and upgrading of traditional infrastructure, forming an integrated infrastructure. This aims to enhance the intelligence level of industries, improve social efficiency, and promote the sharing of industrial achievements through the exploration and expansion of potential application scenarios [30]. Currently, the related applications of 5G, the Internet of Things, industrial Internet, and intelligent computing centers in downstream industries are in an exploratory and explosive phase. An increasing number of rich industrial application scenarios, such as smart grids, intelligent transportation, smart logistics, telemedicine, and smart education, are gradually being explored [19], effectively promoting the sharing of industrial achievements at both societal production and resident living levels.

Finally, the integrated innovative services provided by the new infrastructure can drive industrial and technological progress and coordinated upgrading. Traditional industries in the Yellow River Basin are mostly labor-intensive and resource-processing industries, which have gradually lost their competitiveness due to the lack of innovative technological support. Innovation infrastructure, aimed at supporting scientific research, technology development, and product innovation, offers opportunities for the integration of new technologies with traditional industries, reinforcing the technological foundation for high-

quality industrial development [31,32]. The integrated innovative services provided by new infrastructure closely link new technologies with downstream industrial applications. While promoting the technological transformation of traditional industries, they also provide solid data, human capital, and technological support for the development of emerging industries [33], thereby aiding the coordinated upgrading of industries in the Yellow River Basin. Based on this, the following hypothesis is proposed for testing:

Hypothesis (H1). *New infrastructure promotes high-quality industrial development in the Yellow River Basin.*

2.2. Labor Transfer Mechanism and Consumption Upgrading Mechanism

The relationship between labor transfer, consumption upgrading, and high-quality industrial development has been a long-standing research topic. According to Lewis' dual economic theory, the flow of labor from the agricultural sector with low productivity to the non-agricultural sector with high productivity is a crucial mechanism for industrial structural transformation [34]. The Engel effect and Baumol effect of consumption upgrading are considered major factors influencing high-quality industrial development [4,5,35]. While supporting the development of the digital economy, new infrastructure also contributes to high-quality industrial development in the Yellow River Basin through mechanisms of labor transfer and consumption upgrading.

On the one hand, from the supply side, new infrastructure affects high-quality industrial development in the Yellow River Basin by driving labor transfer. The prominent issues of ecosystem vulnerability and water scarcity in the Yellow River Basin hinder its ability to support the current scale of the rural population's production activities. As a result, a large number of overloaded populations in agriculture and animal husbandry have not been effectively transferred to non-agricultural sectors, becoming a major constraint on high-quality industrial development. The latest research in the field of structural transformation indicates that labor market frictions caused by traditional agricultural production methods, specific human capital, and institutional constraints increase the costs of labor transfer and hinder the free migration of labor [36–38]. The application of new infrastructure helps enhance the digitalization, automation, and intelligence of agricultural production, reducing reliance on agricultural labor and thereby substituting part of the agricultural labor. In this process, the deep integration of new infrastructure with labor factors and urban governance will result in a higher-quality labor supply and greater carrying capacity of public services. Therefore, improving the level of new infrastructure construction, as an important means to enhance the allocation efficiency of production factors and reduce transfer costs [39,40], is likely to reduce labor market frictions that hinder labor transfer by deepening labor division, optimizing labor supply, and improving labor welfare. Consequently, this will foster the development of both industrial and service sectors, further triggering a positive feedback mechanism along the industrial chain and propelling high-quality industrial development in the Yellow River Basin.

On the other hand, from the demand side, new infrastructure affects high-quality industrial development in the Yellow River Basin by promoting consumption upgrading. The "demand traction" effect generated by the expansion of the consumption scale and the upgrading of consumption structure can significantly increase the proportion of manufacturing and service industries as well as their total factor productivity, thereby profoundly impacting high-quality industrial development [1,3,41]. In recent years, with the continuous upgrading of consumption among residents of the Yellow River Basin, consumption has become the primary driving force for economic growth in various regions along the Yellow River. However, compared to other regions, such as the Yangtze River Basin, the Yellow River Basin still faces prominent issues of insufficient consumption scale and unreasonable consumption structure, which limit the consumption-driven effect on high-quality industrial development. Traditional infrastructure investments are driven by demand, whereas new infrastructure investments drive demand. A substantial investment

in the construction of new infrastructure can tap into the vast consumer market, serving as a crucial engine for promoting a new round of consumption upgrading. Intelligent service systems such as smart cities, smart healthcare, smart transportation, and smart homes, formed by new infrastructure, can deeply empower various fields, including healthcare, transportation, and entertainment, fostering more new consumption trends [42]. Simultaneously, changes in demand-side consumption preferences induced by new infrastructure are compelling transformations in the production domain. This not only promotes overall industrial structure upgrading but also facilitates the optimization of internal structures within the manufacturing and service sectors, thereby propelling high-quality industrial development in the Yellow River Basin. Based on this, the following hypothesis is proposed for testing:

Hypothesis (H2). *New infrastructure facilitates high-quality industrial development in the Yellow River Basin by driving labor transfer from the supply side and consumption upgrading from the demand side.*

2.3. The Moderating Effect of Digital Literacy

Digital literacy refers to individuals' ability to utilize digital technologies and tools to acquire, evaluate, organize, create, and communicate information in a digital environment. It covers a variety of survival skills and knowledge assets, such as the proficient use of digital tools, understanding and analysis of information, awareness of digital security and privacy, and effective communication and collaboration in a digital environment [42,43]. Cultivating digital literacy among the general population is an important foundation for enhancing the inclusiveness and accessibility of new infrastructure and providing solid human capital support for high-quality industrial development in the Yellow River Basin. The moderating effect of digital literacy is mainly reflected in the following two aspects.

On the one hand, it coordinates and promotes the collaborative development of new infrastructure construction within the basin. There are significant regional disparities in the level of new infrastructure construction within the Yellow River Basin, with downstream areas, especially Shandong Province, exhibiting significantly higher levels compared to midstream and upstream areas. The essence of regional disparities in the basin lies in the differences in human capital and digital talent. Enhancing digital literacy and skills among the entire population and society can help accelerate the bridging of the "digital divide" between regions, promote the construction and renovation of new infrastructure in the midstream and upstream areas of the Yellow River Basin, and facilitate the collaborative development of new infrastructure construction within the basin.

On the other hand, it effectively improves the utilization efficiency of new infrastructure in the process of high-quality industrial development in the Yellow River Basin. The value of new infrastructure lies not only in its "construction", but also in its "utilization". Through the publicity and popularization of digital technology usage, enhancing the skills of accessing and utilizing information resources among the general population contributes to solidifying the social foundation for the application of new infrastructure. This, in turn, enhances the capacity of new infrastructure to serve labor transfer and drive consumption upgrading, thereby reinforcing its positive impact on high-quality industrial development in the Yellow River Basin. Based on this, the following hypothesis is proposed for testing:

Hypothesis (H3). *The enhancement of digital literacy can strengthen the positive impact of new infrastructure on high-quality industrial development in the Yellow River Basin.*

3. Research Design

3.1. Model Setting

In order to test the impact of new infrastructure on high-quality industrial development in the Yellow River Basin, this paper constructs a benchmark econometric model as follows:

$$HDI_{it} = \theta_0 + \theta_1 NDI_{it} + \theta_2 X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (1)$$

where i represents the prefecture-level city in the Yellow River Basin and t represents the year of observation, HDI_{it} and NDI_{it} represent high-quality industrial development level and new infrastructure construction level of city i in year t , respectively, X_{it} represents other control variables that affect high-quality industrial development. μ_i represent city fixed effects, γ_t represents time fixed effects, ε_{it} is the random error term. This paper mainly focuses on the estimation coefficient of new infrastructure θ_1 , and the expected sign is significantly positive.

To further examine the moderating effect of digital literacy, this paper adopts the interaction term method commonly used in existing research. Specifically, we incorporate the digital literacy variable and its interaction term with the new infrastructure variable into the benchmark model (1). The specific econometric model is as follows:

$$HDI_{it} = \beta_0 + \beta_1 NDI_{it} + \beta_2 NDI_{it} \times DL_{it} + \beta_3 DL_{it} + \beta_4 X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (2)$$

where DL_{it} represents digital literacy. β_2 is the estimated coefficient for the interaction term between the new infrastructure variable and the digital literacy variable. If β_2 is significantly positive, it indicates that an increase in digital literacy can enhance the positive impact of new infrastructure on high-quality industrial development in the Yellow River Basin.

3.2. Variable Selection

3.2.1. The Explained Variable

High-quality industrial development (HDI). Although the increase in the proportion of the tertiary industry is widely recognized as an important indicator of industrial upgrading, this increase does not necessarily signify high-quality industrial development. This is due to the variations in labor productivity within the tertiary industry and the limitations of a singular measurement dimension. Especially for the Yellow River Basin, which attaches equal importance to ecological protection and economic development, it is necessary to evaluate high-quality industrial development from a long-term and comprehensive perspective. To address this, this paper constructs a comprehensive index system for high-quality industrial development based on the new development concept of “innovation, coordination, green, openness, and sharing”. This system includes five primary indicators: industrial technological progress, industrial coordination and upgrading, industrial green sustainability, industrial openness, and industrial achievement sharing, along with 12 secondary indicators (see Table 1). On this basis, the global principal component analysis method is used to condense and synthesize the original indicators, and a comprehensive evaluation is conducted on the level of high-quality industrial development in 78 prefecture-level cities in the Yellow River Basin from 2004 to 2020.

3.2.2. The Core Explanatory Variable

New infrastructure (NDI). The development of new-generation information technology is crucial for the construction and improvement of new infrastructure. New infrastructure primarily involves the industrial application of new-generation information technology, directly serving enterprises in vertical industries, such as electronic equipment manufacturing and information technology services. According to the Classification of Strategic Emerging Industries (2018) issued by the National Bureau of Statistics, new infrastructure encompasses the new-generation information network industry, emerging software and new information technology services, internet and cloud computing, big data services, artificial intelligence, and other electronic equipment manufacturing indus-

tries under the new-generation information technology industry. Accordingly, this paper draws on the approach of Chao et al. (2020) [44], measuring the level of new infrastructure construction by the output value of listed companies in related industries.

Table 1. Comprehensive indicator system for high-quality industrial development.

Primary Indicators	Secondary Indicators	Measurement Methods	Unit	Indicator Attribute
Industrial and technological progress	Proportion of science and technology expenditure	Science and technology expenditure/local general public budget expenditure	%	Positive
	Proportion of employees in science and technology	Number of employees in science and technology/total employment	%	Positive
Industrial coordination and upgrading	Upgrading of industrial structure	Coefficient of industrial structure hierarchy	--	Positive
	Rationalization of industrial structure	Theil index	--	Negative
	Development of producer services	Number of employees in producer services/number of employees in urban units	%	Positive
Industrial green sustainability	Sewage treatment rate	Sewage treatment volume/sewage discharge volume	%	Positive
	Comprehensive utilization rate of industrial solid waste	Comprehensive utilization of industrial solid waste/industrial solid waste output	%	Positive
	Energy consumption per unit GDP	Total energy consumption/GDP	Tons of standard coal/10,000 yuan	Negative
Industrial openness	Proportion of foreign capital used	Actual utilization amount of foreign investment/GDP	%	Positive
	Proportion of total export-import volume	Total export-import volume/GDP	%	Positive
Industry achievement sharing	Urban maintenance and construction expenditure	Urban maintenance and construction fund expenditure	10 mn yuan	Positive
	Per capita basic public service expenditure	Basic public service expenditure/total resident population	Yuan/person	Positive

3.2.3. The Moderator Variable

Digital literacy (DL). This indicator measures the range of qualities and abilities that digital society citizens possess in learning, working, and living, including digital access, creation, use, evaluation, interaction, sharing, innovation, security, and ethics. Considering that increasing educational investment in various regions helps enhance the human capital accumulation and expand the demographic dividend, thereby fostering digital literacy among the population [42,43], this paper uses the proportion of education expenditure in government fiscal spending to measure digital literacy.

3.2.4. Control Variables

In addition to new infrastructure, drawing on relevant studies of Yuan and Zhu (2018) [45], Zhao et al. (2020) [46], and Wang and Wang (2021) [14], this paper mainly considers the impact of the following factors on high-quality industrial development, including (1) economic development level (*Pergdp*), represented by per capita GDP. (2) financial development level (*Fin*), measured by the ratio of the year-end deposit and loan balances of financial institutions to GDP. (3) marketization level (*Mar*), calculated as the

reciprocal of the proportion of government fiscal expenditure to GDP. (4) human capital level (*Hum*), measured by the ratio of the number of students enrolled in regular higher education institutions to the total resident population. (5) traditional infrastructure level (*TI*), reflected by the per capita urban road area. (6) informatization level (*Inf*), represented by the ratio of total postal and telecommunications business volume to GDP.

3.3. Data Sources and Description

According to the delineation by the Yellow River Conservancy Commission of the Ministry of Water Resources, the natural Yellow River Basin includes nine provinces (autonomous regions), including Qinghai, Sichuan, Gansu, Ningxia, Inner Mongolia, Shaanxi, Shanxi, Henan, and Shandong (see Figure 1). However, based on the Yangtze River Economic Belt Development Plan and the 13th Five-Year Plan for the Revitalization of Northeast China, Sichuan Province and the eastern four leagues of Inner Mongolia have been incorporated into the Yangtze River Economic Belt and the Northeast region, respectively. Therefore, these areas are not included in the scope of the Yellow River Basin for this study. Considering data availability, this paper ultimately selects 78 prefecture-level cities in the Yellow River Basin from 2004 to 2020 as the research sample. The original data used in this study are sourced from the Wind database, the China Statistical Yearbook, the China City Statistical Yearbook, the provincial statistical yearbooks of the provinces involved, and the statistical bulletins on the national economic and social development of the relevant prefecture-level es. Missing and abnormal data were filled in using interpolations. The descriptive statistics of the main variables are shown in Table 2.

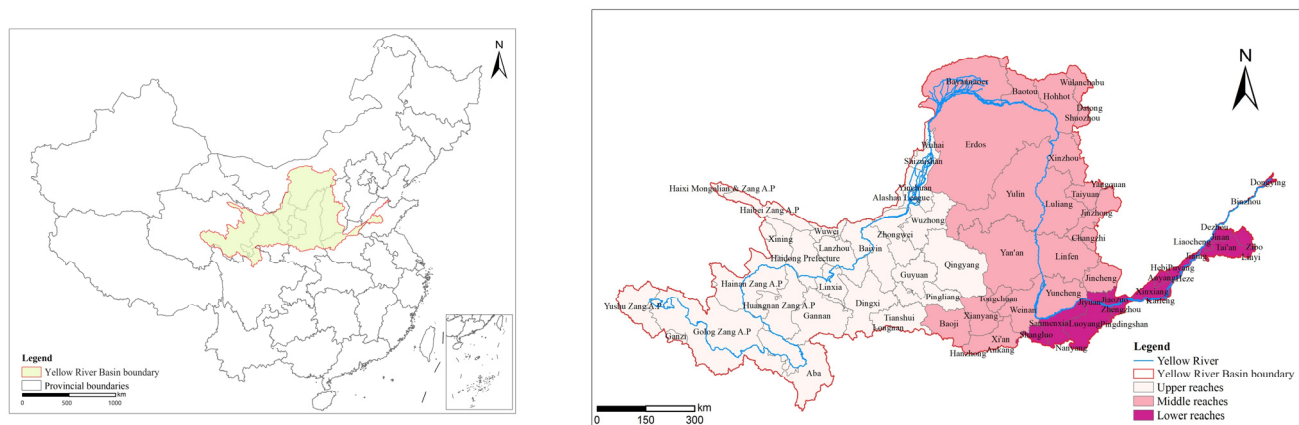


Figure 1. Spatial distribution of the Yellow River Basin. Note: This figure is based on the standard map with approval number GS (2023) 2763 from the standard map service website of the Ministry of Natural Resources.

Table 2. Descriptive statistics of variables.

Variables	Obs	Mean	Std. Dev.	Min	Max
<i>HDI</i>	1326	−0.0620	0.2508	−0.9904	1.2920
<i>NDI</i>	1326	4.0965	8.3102	0.0000	24.9660
<i>DL</i>	1326	18.7666	4.1890	2.0152	34.1689
<i>Mar</i>	1326	7.2759	3.5351	1.4197	17.3954
<i>Pergdp</i>	1326	10.2968	0.8148	7.6620	12.2807
<i>Hum</i>	1326	0.0166	0.0238	0.0000	0.1310
<i>Fin</i>	1326	2.1914	1.1530	0.5080	8.7770
<i>TI</i>	1326	4.2984	4.1572	0.2540	21.2260
<i>Inf</i>	1326	0.0264	0.0214	0.0040	0.1890

4. Empirical Results and Analysis

4.1. Benchmark Regression Results

The benchmark regression results in columns (1) and (2) of Table 3 show that the regression coefficient of new infrastructure (*NDI*) is significantly positive, indicating that new infrastructure promotes high-quality industrial development in the Yellow River Basin, which effectively verifies Hypothesis (H1).

Table 3. Results of benchmark regression.

Variables	(1)	(2)	(3)	(4)
<i>NDI</i>	0.0058 ** (0.0023)	0.0059 *** (0.0021)	0.0037 (0.0035)	0.0037 (0.0031)
<i>NDI</i> × <i>DL</i>			0.0008 *** (0.0003)	0.0008 *** (0.0003)
<i>DL</i>			0.0028 (0.0023)	0.0044 * (0.0024)
<i>Mar</i>		0.0022 (0.0049)		0.0042 (0.0048)
<i>Pergdp</i>		0.0873 ** (0.0387)		0.0930 ** (0.0431)
<i>Hum</i>		0.2900 (0.7665)		0.1353 (0.6407)
<i>Fin</i>		0.0185 * (0.0106)		0.0228 ** (0.0111)
<i>TI</i>		0.0033 (0.0054)		0.0028 (0.0053)
<i>Inf</i>		−0.2118 (0.2969)		−0.3217 (0.2706)
Year FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
Observations	1326	1326	1326	1326
Adj_R ²	0.8804	0.8834	0.8854	0.8896

Note: ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. Robust standard errors of the estimated coefficients are in parentheses.

From an economic perspective, the standard deviation of new infrastructure within the sample is 8.31, and the standard deviation of high-quality industrial development is 0.25. This means that for each standard deviation increase in new infrastructure, high-quality industrial development increases by an average of approximately 4.90%, accounting for 19.61% of the standard deviation in high-quality industrial development. It can be seen that the impact of new infrastructure on high-quality industrial development in the Yellow River Basin cannot be ignored.

Furthermore, this paper examines the role of digital literacy in the process of new infrastructure promoting high-quality industrial development. Columns (3) and (4) of Table 3 report the estimated results for the moderating effect of digital literacy. It can be seen that the regression coefficients of the interaction term (*NDI* × *DL*) between new infrastructure and digital literacy are significantly positive at the 1% level. This indicates that digital literacy moderates the effect of new infrastructure in promoting high-quality industrial development in the Yellow River Basin. Specifically, the enhancement of digital literacy can strengthen the positive impact of new infrastructure on high-quality industrial development in the Yellow River Basin. These results verify Hypothesis (H3).

4.2. Robustness Check

4.2.1. Replacing the Core Explanatory Variable

For the measurement indicators of new infrastructure, there is no unified standard in the existing research. In addition to the benchmark measurement indicator, this paper selects eight basic indicators (see Table 4) and applies the entropy weight TOPSIS method to synthesize a comprehensive index of new infrastructure for robustness testing. The regression results in columns (1) and (2) of Table 5 show that, after replacing the proxy indicator of the core explanatory variable, the regression coefficient of new infrastructure (*NDI*) remains significantly positive. This indicates that the research conclusion is robust.

Table 4. New infrastructure indicator system.

Sub-Indicators	Unit	Indicator Attribute
Proportion of employees in information transmission, computer services, and software industries	%	Positive
Total volume of telecommunications services	10 mn yuan	Positive
Number of mobile phone users	10,000 households	Positive
Number of computers used per hundred people	Units	Positive
Software business revenue	100 mn yuan	Positive
Number of Internet broadband access users	10 mn households	Positive
Proportion of fixed asset investment in information transmission, software, and information technology services	%	Positive
Main business income of the electronic information manufacturing industry above the designated size	100 mn yuan	Positive

Table 5. Results of the robustness test.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>NDI</i>	0.1246 * (0.0698)	0.1989 *** (0.0738)	0.0021 * (0.0012)	0.0021 * (0.0011)	0.0084 *** (0.0029)	0.0083 *** (0.0027)	0.0052 ** (0.0024)	0.0054 ** (0.0022)
Controls	No	Yes	No	Yes	No	Yes	No	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year Trend Item	No	No	No	No	No	No	Yes	Yes
Observations	1326	1326	1326	1326	1054	1054	1326	1326
Adj_R ²	0.8784	0.8827	0.8303	0.8320	0.8802	0.8836	0.8843	0.8901

Note: ***, **, and * indicate 1%, 5%, and 10% significance levels, respectively. Robust standard errors of the estimated coefficients are in parentheses.

4.2.2. Replacing the Explained Variable

To avoid the potential impact of varying measurement methods on estimation results, this paper uses entropy weight TOPSIS in addition to the global principal component analysis method to re-evaluate the level of high-quality industrial development. The regression results in columns (3) and (4) of Table 5 show that the estimation results using this measurement method are consistent with the previous ones, indicating the robustness of the conclusions drawn in this paper.

4.2.3. Excluding Economically Developed Regions

The issue of unbalanced and inadequate development within the Yellow River Basin is prominent. In 2020, Shandong Province's per capita GDP was twice that of Gansu Province and significantly higher than the average level in other provinces (autonomous regions) in the Yellow River Basin. Considering that data from economically developed regions could potentially interfere with the overall results, this paper excludes the relevant data of 16 prefecture-level cities in Shandong Province, which has the highest per capita

GDP among the provinces (autonomous regions) in the Yellow River Basin. The regression results in columns (5) and (6) of Table 5 show that after excluding the influence of economically developed regions, new infrastructure continues to significantly promote high-quality industrial development in the Yellow River Basin, reaffirming the robustness of the research conclusions.

4.2.4. Incorporating Multi-Dimensional Interactive Fixed Effects

Considering the diverse developmental trends in new infrastructure across different cities in the Yellow River Basin, this paper extends the original model by introducing a region-year-trend item. This addition helps control for unobservable factors at the provincial level that may change over time, aiming to identify cleaner estimation results. The regression results in columns (7) and (8) of Table 5 show that there are no significant differences in the sign and significance of the regression coefficient of new infrastructure (*NDI*) compared to the benchmark model regression results, further reinforcing the findings of this paper.

4.3. Endogeneity Treatment

To further address potential endogeneity issues arising from reverse causality or omitted variables, this paper employs the instrumental variable (IV) method to identify the net effect of new infrastructure on high-quality industrial development in the Yellow River Basin. Considering that the historical usage of traditional telecommunication tools is closely related to the popularization and development of the Internet in subsequent stages [47], information technology represented by the Internet is an important support for new infrastructure. Therefore, the number of telephones in history has a strong correlation with the current new infrastructure, but does not directly affect the current high-quality industrial development. Based on this, this paper uses the number of telephones per 10,000 people in 1992 as the instrumental variable of new infrastructure. Additionally, by interacting this variable with the number of internet broadband subscribers from the previous year, it is extended into a panel instrumental variable. Table 6 presents the regression results obtained using the IV 2SLS method. The validity of the instrumental variable is confirmed, as there are no issues of insufficient identification or weak instrumental variables, satisfying the relevant assumptions. The regression coefficient of new infrastructure (*NDI*) remains significantly positive at the 1% level, consistent with the benchmark regression results, thereby validating the robustness of the earlier research findings.

Table 6. Results of the endogeneity test.

Variables	IV-2SLS (1st Stage)		IV-2SLS (2nd Stage)	
	(1)	(2)	(3)	(4)
<i>IV_NDI</i>	2.1283 *** (0.1223)	2.2864 *** (0.1773)	—	—
<i>NDI</i>	—	—	0.0337 *** (0.0021)	0.0118 *** (0.0020)
Controls	No	Yes	No	Yes
Observations	1326	1326	1326	1326
Kleibergen-Paap rk LM statistic	191.869 [0.000]	135.060 [0.000]	191.869 [0.000]	135.060 [0.000]
Cragg-Donald Wald F statistic	347.822 {16.38}	179.041 {16.38}	347.822 {16.38}	179.041 {16.38}
Kleibergen-Paap rk Wald F statistic	302.764 {16.38}	166.353 {16.38}	302.764 {16.38}	166.353 {16.38}

Note: *** indicates 1% significance level. Robust standard errors of the estimated coefficients are in parentheses. The values within [] represent *p*-values, and the values within { } represent the critical values at the 10% level for the Stock-Yogo weak ID test.

5. Mechanism Test and Heterogeneity Analysis

5.1. Mechanism Test

The theoretical analysis concludes that new infrastructure not only directly promotes high-quality industrial development in the Yellow River Basin but also indirectly affects it by driving labor transfer from the supply side and consumption upgrading from the demand side. To verify the existence of this mechanism, the following models are constructed based on Equation (1):

$$Med_{it} = \gamma_0 + \gamma_1 NDI_{it} + \gamma_2 X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (3)$$

$$HDI_{it} = \lambda_0 + \lambda_1 NDI_{it} + \lambda_2 Med_{it} + \lambda_3 X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (4)$$

where Equation (3) is used to examine the relationship between new infrastructure and the mediating variables. *Med* represents the mediating variables, which include labor transfer (*LT*) and consumption upgrading (*CDU*). Specifically, labor transfer (*LT*) is measured by the proportion of non-agricultural employment; a higher proportion indicates sufficient labor transfer. Consumption upgrading (*CDU*) is measured by the Engel coefficient, an internationally recognized indicator for measuring the living standards of residents, which effectively reflects the shifts in residents' consumption focus once basic food demand is met. A lower Engel coefficient signifies more evident consumption upgrading. Equation (4) is used to test the impact of the core explanatory variable and the mediating variables on high-quality industrial development. The selection of the control variables is consistent with the benchmark regression model.

The specific testing approach is as follows: first, perform a regression on Equation (1). If θ_1 is not significant, it indicates that new infrastructure is not related to high-quality industrial development, and further testing is halted. Otherwise, proceed to the next step of testing. Test γ_1 and λ_2 sequentially. If both are significant, then test λ_1 . If λ_1 is significant, it indicates the existence of partial mediation effect. Otherwise, it indicates the existence of a complete mediation effect. If at least one of γ_1 and λ_2 is not significant, the Sobel test is used to determine the existence of the mediation effect.

The results of the mechanism test are shown in Table 7. The regression results in column (1) are completely consistent with the benchmark regression. From the regression results in column (2), it is evident that new infrastructure significantly drives labor transfer, encouraging more agricultural labor in the Yellow River Basin cities to move to non-agricultural sectors. In column (3), the impact of labor transfer on high-quality industrial development is significantly positive at the 1% level. Additionally, the regression coefficient of new infrastructure (*NDI*) decreases from 0.0059 in column (1) to 0.0051 in column (3), and the significance level also drops from 1% to 5%. These results indicate a notable partial mediation effect of labor transfer, initially validating Hypothesis (H2). From the regression results in column (5), it is evident that new infrastructure significantly reduces the Engel coefficient, indicating that it effectively promotes consumption upgrading in the cities of the Yellow River Basin. In column (6), the regression coefficient of consumption upgrade (*CDU*) is -0.3843 and is significant at the 1% level. As consumption upgrade is a negative indicator, this signifies that consumption upgrading has a significant positive impact on high-quality industrial development.

These results indicate that the construction and improvement of new infrastructure leads to consumption upgrading, which steadily expands the consumption scale and optimizes the consumption structure in cities along the Yellow River Basin. This shift guides industries to move up the value chain, promoting the high-value transformation of traditional industries and ultimately achieving high-quality industrial development in these cities. In summary, the construction and improvement of new infrastructure simultaneously drives labor transfer from the supply side and consumption upgrading from the demand side, thereby indirectly facilitating high-quality industrial development in the Yellow River Basin. These findings validate Hypothesis (H2).

Table 7. Results of the mechanism test.

Variables	Labor Transfer			Consumption Upgrading		
	(1)	(2)	(3)	(4)	(5)	(6)
	HDI	LT	HDI	HDI	CDU	HDI
NDI	0.0059 *** (0.0021)	0.0302 ** (0.0132)	0.0051 ** (0.0021)	0.0059 *** (0.0021)	−0.0009 ** (0.0004)	0.0055 *** (0.0020)
LT			0.0251 *** (0.0044)			
CDU						−0.3843 *** (0.1431)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1326	1326	1326	1326	1326	1326
Adj_R ²	0.8834	0.7023	0.9042	0.8834	0.7073	0.8854
Sobel Z		1.755			2.201	

Note: *** and ** indicate 1% and 5% significance levels, respectively. Robust standard errors of the estimated coefficients are in parentheses.

5.2. Heterogeneity Analysis

Considering the significant differences among cities in the Yellow River Basin in terms of resource endowments, city types, and development content, this section focuses on exploring the heterogeneous impacts of new infrastructure from three dimensions: upstream, midstream, and downstream: city hierarchy and main functional areas. This analysis aims to deepen the understanding of the inherent laws by which new infrastructure influences high-quality industrial development in the Yellow River Basin.

5.2.1. Heterogeneity of Upstream, Midstream and Downstream

As a complex organic whole with a large area, diverse resource endowments, and development conditions in various regions, the Yellow River Basin requires careful consideration of the unique characteristics of its different sections when promoting high-quality industrial development. Accordingly, this paper refers to the Yellow River Yearbook and uses Hekou Town in Inner Mongolia and Taohuayu in Henan Province as dividing points to divide the research samples into upstream, midstream, and downstream.

The regression results in columns (1) to (3) of Table 8 show that the regression coefficient of new infrastructure (NDI) is significantly positive only in the upstream and midstream cities, with the upstream cities exhibiting a larger coefficient than the midstream cities. This suggests that new infrastructure has a more substantial positive impact on high-quality industrial development in the upstream regions of the Yellow River Basin. Analyzing the data structure reveals that, compared to upstream cities, midstream and downstream cities have a better foundation for high-quality industrial development. As the level of high-quality industrial development continues to rise, midstream and downstream cities have gradually moved past the initial “dividend period” of new infrastructure construction, leading to a diminishing impact of new infrastructure on high-quality industrial development.

A possible explanation for this phenomenon is that the marginal impact effects of new infrastructure may vary structurally across the different stages of high-quality industrial development. When the level of high-quality industrial development is relatively low, the positive effects of new infrastructure are more pronounced. However, as the development level rises, these effects gradually diminish, and cities may enter a “pain period” of new infrastructure construction. In other words, there may be a threshold for high-quality industrial development beyond which the initial advantages of high-quality industrial development can be revealed, allowing the efficiency of new infrastructure in promoting

industrial development to be further enhanced. Given this potential characteristic of marginal impact effects, further discussion will be presented in Section 6.

Table 8. Results of the heterogeneity test.

Variables	Upstream, Midstream, and Downstream			City Hierarchy		Main Functional Areas		
	Upstream	Midstream	Downstream	Central Cities	Peripheral Cities	Urbanized Areas	Main Agricultural Production Areas	Key Ecological Functional Areas
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<i>NDI</i>	0.0692 *** (0.0185)	0.0095 *** (0.0034)	0.0013 (0.0013)	0.0130 ** (0.0051)	0.0035 ** (0.0014)	0.0108 *** (0.0038)	0.0015 (0.0020)	0.0020 (0.0012)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	357	459	510	153	1173	680	459	187
Adj_R ²	0.9045	0.9030	0.8538	0.8628	0.7806	0.9261	0.6494	0.6760

Note: *** and ** indicate 1% and 5% significance levels, respectively. Robust standard errors of the estimated coefficients are in parentheses.

5.2.2. Heterogeneity of City Hierarchy

Considering the significant differences in policy support that cities in different hierarchies can receive in the construction of new infrastructure, this may subsequently lead to heterogeneous impacts on high-quality industrial development. This paper draws on the approach of Zhao et al. [46] and divides municipalities, sub-provincial cities, and provincial capital cities into central cities and other prefecture-level cities into peripheral cities.

The regression results in columns (4) and (5) of Table 8 show that new infrastructure has a significantly positive impact on high-quality industrial development across cities of different hierarchies in the Yellow River Basin, with a relatively greater positive impact on central cities. A possible explanation for these findings is that the new-generation information technology industry, which is involved in new infrastructure as an emerging industry in the modern industrial system, is still in the initial stage of development and construction [18]. Characteristics such as a huge initial investment scale and a long investment return cycle necessitate significant governmental involvement. At this stage, the government plays a crucial role in providing supportive policies, leveraging investments to stimulate growth, encouraging the development of application scenarios, and facilitating a rapid transition from construction to application. Compared to peripheral cities, central cities receive more powerful guidance and support from the government in terms of policies, funds, technology, and supervision related to new infrastructure construction. Therefore, central cities can leverage the advantages of the new infrastructure to facilitate high-quality industrial development.

5.2.3. Heterogeneity of Main Functional Areas

Due to significant differences in natural ecological conditions, resource, and environmental carrying capacity, existing development intensity, and population concentration among regions along the Yellow River, it is impossible to form a unified model for high-quality industrial development in the Yellow River Basin. Instead, it is essential to adhere to the idea of constructing the main functional areas. Referring to the National Main Functional Area Plan and the main functional area plans of each province, this paper divides the prefecture-level cities in the basin into the following three main functional areas according to the development content: urbanized areas, main agricultural production areas, and key ecological functional areas.

The regression results in columns (6) to (8) of Table 8 show that the impact of new infrastructure on high-quality industrial development varies significantly among the differ-

ent main functional areas within the Yellow River Basin. Specifically, it has a significant positive effect in urbanized areas but does not have a significant impact on the main agricultural production areas and key ecological function areas. The main reason for this phenomenon is that, compared to the main agricultural production areas and key ecological functional areas, urbanized areas have a higher concentration of high-quality talent and a more complete industrial system for the new-generation information technology industry that supports new infrastructure construction. Additionally, the functional positioning of urbanized areas focuses on the development of industrial and service products. Therefore, urbanized areas can drive high-quality industrial development more efficiently through channels such as labor transfer and consumption upgrades.

6. Evolutionary Analysis of Marginal Impact Effects

To comprehensively depict the overall distribution of conditions for the impact of new infrastructure on the high-quality development of industries in the Yellow River Basin, this paper employs the panel quantile regression model to further explore the evolution trajectory of the marginal impact effects of new infrastructure across different levels of high-quality industrial development. The econometric model is set as follows:

$$Q_{\tau}(HDI_{it}|NDI_{it}) = \omega_{\tau 0} + \omega_{\tau 1}NDI_{it} + \omega_{\tau 2}X_{it} + \varepsilon_{it} \quad (5)$$

where $Q_{\tau}(HDI_{it}|NDI_{it})$ is the value of high-quality industrial development at the τ quantile under the given new infrastructure conditions, and $\omega_{\tau 1}$ is the regression coefficient vector of new infrastructure at the τ quantile. Drawing on the practice of existing studies, this paper selects the five most representative quantiles ($\tau = 0.1, 0.25, 0.5, 0.75, 0.9$) for testing.

Table 9 reports the results of the panel quantile regression, from which it can be seen that the regression coefficients of new infrastructure (NDI) are significantly positive at each quantile, indicating that the improvement of new infrastructure can significantly promote high-quality industrial development in the Yellow River Basin at different quantile levels of the explained variable (HDI).

Table 9. Results of the panel quantile model test.

Variables	(1)	(2)	(3)	(4)	(5)
	$\tau=0.1$	$\tau=0.25$	$\tau=0.5$	$\tau=0.75$	$\tau=0.9$
NDI	0.0042 *** (0.0007)	0.0045 *** (0.0006)	0.0037 *** (0.0007)	0.0067 *** (0.0008)	0.0071 *** (0.0011)
Controls	Yes	Yes	Yes	Yes	Yes
Observations	1326	1326	1326	1326	1326
R^2	0.3565	0.2805	0.2872	0.3869	0.4898

Note: *** indicates 1% significance level. Robust standard errors of the estimated coefficients are in parentheses.

A further comparison of the regression coefficients of new infrastructure (NDI) at different quantiles reveals structural differences in its impact on high-quality industrial development. As the quantile level of high-quality industrial development gradually increases from 0.1 to 0.5, the regression coefficient of new infrastructure (NDI) shows a trend of first monotonically increasing and then monotonically decreasing. When $\tau = 0.5$, its coefficient reaches the minimum value, and the “pain period” characteristics of promoting the construction of new infrastructure are initially presented. However, when the quantile level of high-quality industrial development further exceeds 0.75, the positive impact of new infrastructure on high-quality industrial development becomes increasingly sensitive. In other words, once most cities in the Yellow River Basin overcome the “pain period” of promoting the construction of new infrastructure, the efficiency of new infrastructure in enhancing high-quality industrial development will be further improved.

7. Further Discussion

New infrastructure can simultaneously drive labor transfer from the supply side and consumption upgrades from the demand side, thereby injecting powerful momentum into high-quality industrial development in the Yellow River Basin. In the process of ecological protection and high-quality development in the Yellow River Basin, the industrial technology progress and industrial openness brought about by new infrastructure can stimulate economic growth in various regions along the Yellow River and improve the well-being of residents within the basin through the sharing of industrial achievements. Meanwhile, new infrastructure fosters industrial coordination and upgrading, as well as industrial green sustainability, thereby reducing the consumption of resource-based products within the basin and enhancing the ecological efficiency of industries, which benefits the ecological protection of the Yellow River Basin. Nevertheless, while new infrastructure brings about the coordinated development of industrial development, economic growth, and ecological environment in the Yellow River Basin, it also encounters a series of challenges. These include excess capacity, unbalanced investment subject structure, exacerbated digital divide, and the absence of a legal system environment. To address these challenges and fully harness the empowering potential of the new infrastructure, it is essential to effectively manage the following critical relationships:

First, balancing the relationship between “construction” and “utilization” to enhance the economic benefits of new infrastructure. New infrastructure has strong spillover effects. If local market demand is not considered, blind construction can easily lead to idle capacity and long-term financial losses, making it difficult for investors to achieve effective returns. Therefore, at the onset of new infrastructure construction in the Yellow River Basin, it is crucial to strengthen the coordination between construction and operational planning. The scale and density of the layout should match the local industrial demands to avoid over-investment. Furthermore, considering the rapid technological advancements in new infrastructure construction and the significant energy demands during later operations, it is important to address future usage and operational management issues while advancing infrastructure construction. This will help mitigate potential risks such as “easy construction, difficult management”.

Second, the roles of the government and the market must be balanced to build a diversified investment and financing system. Currently, the construction of new infrastructure in the Yellow River Basin is primarily government-funded due to the “quasi-public goods” nature of new infrastructure. However, given the financial constraints of local governments in the region, relying solely on government investment is not conducive to the sustainable and healthy development of new infrastructure. Therefore, it is urgent to build a mechanism of “government guidance, market dominance, and multi-party participation” for co-construction, co-investment, and co-sharing. By relaxing restrictions on private capital entry, offering tax incentives, providing financing benefits, and innovating public-private partnership (PPP) models, the enthusiasm of various economic entities can be mobilized, thereby expanding effective investment in new infrastructure.

Third, balancing “points” and “areas” to bridge the digital divide. In terms of regional distribution, the construction of new infrastructure should combine key points and overall areas, promoting coordinated development to prevent the exacerbation of the digital divide due to “information gaps” and “knowledge separations”. On the one hand, urban agglomerations and metropolitan areas should be the focus of new infrastructure construction in the Yellow River Basin, leading regional high-quality industrial development while also driving the growth of surrounding areas. On the other hand, the inclusivity of new infrastructure construction should further penetrate into less developed regions, promoting construction and upgrading in the mid-upper reaches of the Yellow River Basin to address coverage gaps in “long-tail” areas and narrow the digital divide in the basin.

Fourth, balancing development and governance to improve the legal and institutional environment. The construction of new infrastructure has the characteristics of a platform economy, which, while creating significant technological, capital, and data aggregation

effects and resource allocation efficiencies, can also lead to issues such as platform monopolies, algorithmic opacity, and information security concerns. Therefore, alongside accelerating the construction of new infrastructure, it is necessary to establish an appropriate legal and institutional environment to regulate the operation and usage of new infrastructure. This will ensure that the new infrastructure better supports high-quality industrial development in the Yellow River Basin.

8. Conclusions and Policy Implication

Against the backdrop of profound transformations in industrial development modes, accelerating the improvement of new infrastructure has become a critical breakthrough in creating a new engine for high-quality industrial development in the Yellow River Basin. This paper systematically sorts out the impact and mechanism of new infrastructure on high-quality industrial development, and 78 prefecture-level cities in the Yellow River Basin from 2004 to 2020 are used as research samples for empirical analysis. The main conclusions are as follows:

- (1) New infrastructure promotes high-quality industrial development in the Yellow River Basin, and the enhancement of digital literacy strengthens this positive impact.
- (2) New infrastructure can indirectly affect high-quality industrial development in the Yellow River Basin by driving labor transfer from the supply side and consumption upgrading from the demand side.
- (3) The positive influence of new infrastructure on high-quality industrial development is particularly pronounced in the upstream cities, central cities, and urbanized areas of the Yellow River Basin. There is a “pain period” in promoting the construction of new infrastructure, and only when the level of high-quality industrial development exceeds a certain threshold can its efficiency be further improved.

The research conclusions of this paper have the following policy implications:

- (1) Under the reality that the marginal effect of traditional infrastructure is diminishing and new infrastructure has become a new engine to promote high-quality industrial development, regions along the Yellow River should increase investment in new infrastructure-related fields and provide corresponding policy support to further release the dividend advantages of new infrastructure. Considering that digital literacy and new infrastructure can form a synergy to promote high-quality industrial development, there is a need to strengthen the publicity and popularization of digital technology usage and to cultivate digital literacy among the general population.
- (2) The mechanism by which new infrastructure drives labor transfer and consumption upgrades to provide endogenous momentum for high-quality industrial development suggests that greater emphasis should be placed on leveraging new infrastructure to facilitate the transfer of overloaded populations in agriculture and animal husbandry in the Yellow River Basin to non-agricultural sectors. Additionally, it is crucial to strengthen the integration of new infrastructure with downstream industries to tap into the vast consumer market and extensive application scenarios.
- (3) The heterogeneous and marginal impact effects of new infrastructure indicate that regions along the Yellow River should implement differentiated and dynamic new infrastructure strategies based on local resource endowments, ecological and economic functional positioning, and industrial development stages. This approach aims to sustainably harness the value of new infrastructure to enable high-quality industrial development.

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