Frontiers in Economics and Management Volume 6 Issue 3, 2025
ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

How to Achieve Balance and Synergy between "New Infrastructure" and Traditional Infrastructure?

-- Empirical Evidence from China's Manufacturing Sector

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Abstract

With the rapid global development of the digital economy, "new infrastructure", as a critical engine for driving high-quality economic development, is gradually becoming a key driver for the transformation and upgrading of China's manufacturing sector. Meanwhile, the foundational role of traditional infrastructure in supporting manufacturing remains irreplaceable. How to achieve balance and synergy between the two has emerged as a pivotal issue in policymaking and academic research. Based on provincial panel data, this study employs the Generalized Method of Moments (GMM) model to empirically examine the heterogeneous effects of traditional infrastructure and "new infrastructure" information infrastructure on output growth across multiple industries in China. The results reveal significant differences in the roles of traditional infrastructure and "new infrastructure" across industries: In high-tech manufacturing industries, both substitution and synergistic effects coexist; in mid-tech manufacturing industries, both generally exhibit significant positive impacts on output growth; whereas in low-tech manufacturing and heavy industries, traditional infrastructure plays a more dominant role, while "new infrastructure" demonstrates polarized or even negative effects. Accordingly, this paper proposes that regions should formulate differentiated policy frameworks tailored to local conditions to achieve coordinated development between "new infrastructure" and traditional infrastructure. The findings provide theoretical foundations and policy insights for optimizing infrastructure resource allocation and advancing high-quality economic development in China.

Keywords

New Infrastructure; Traditional Infrastructure; Manufacturing Sector; Coordinated Development; Generalized Method of Moments (GMM).

1. Introduction

In recent years, the digital economy has emerged as a pivotal force driving economic growth and societal transformation, with its share in GDP continuously on the rise. Against this backdrop, "new infrastructure" construction has been endowed with unprecedented strategic significance as a crucial cornerstone for the development of the digital economy. The Guiding Opinions on Accelerating the Construction of New Infrastructure, issued in 2020, explicitly advocates for accelerating the deployment in areas such as 5G networks, industrial internet, and big data centers within the scope of "new infrastructure" to facilitate economic structural optimization and industrial upgrading. As a vital pillar of the national economy, the digital transformation of the manufacturing sector is particularly crucial. "New infrastructure" is reshaping the production models and value chains of the manufacturing sector through the

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

application of intelligent and digital technologies. Meanwhile, the role of traditional infrastructure as the foundational support for the development of the manufacturing sector remains non-negligible. However, the question of how to achieve optimal resource allocation and coordinated development between "new infrastructure" and traditional infrastructure to promote high-quality development in the manufacturing sector has become a focal point of attention for current policymakers and academics.

From a theoretical perspective, "new infrastructure" and traditional infrastructure exhibit notable differences in functional orientation, technical characteristics, and economic effects. With digitization and intelligence at its core, "new infrastructure" aims to drive industrial upgrading and economic transformation through technological innovation. Conversely, traditional infrastructure, grounded in physical networks, primarily serves resource allocation and the flow of production factors. Their roles in promoting economic growth may be complementary or may involve competitive relationships. Therefore, exploring the balancing mechanism between "new infrastructure" and traditional infrastructure not only contributes to optimizing resource allocation but also provides theoretical support and policy grounds for the coordinated development of multiple industries.

Based on this, this paper takes multiple industries in China as the research subject and empirically analyzes the heterogeneous impact of "new infrastructure" and traditional infrastructure on the output value growth of different types of manufacturing industries through the construction of a dynamic panel model. The research findings will provide empirical evidence for achieving coordinated development between "new infrastructure" and traditional infrastructure and offer references for relevant policymaking. The contributions of this paper lie in: first, revealing the differences in economic effects between "new infrastructure" and traditional infrastructure from a multi-industry perspective; and second, proposing policy recommendations for achieving a balance between the two, thereby providing new insights for promoting high-quality economic development in China.

2. Literature Review

It has been widely acknowledged that Infrastructure serves as a fundamental condition for urban development and expansion, playing a pivotal role in economic development (Graham,2000). Yu et al. (2013) empirically demonstrate that infrastructure not only directly enhances economic output as a production factor but also indirectly boosts total factor productivity through spillover effects. Zhang et al. (2017) further extended that infrastructure, as a special capital stock, can directly promote economic growth and also indirectly facilitate it by increasing investment and labor force, as well as enhancing the marginal productivity of existing capital and labor. In terms of the impact of infrastructure on the manufacturing sector, Mitra et al. (2016) point out that infrastructure has a significant positive effect on the overall productivity and technical efficiency of manufacturing. Industries more exposed to international competition, such as transportation equipment, textiles, and chemicals, exhibit higher sensitivity to improvements in infrastructure. Nair et al. (2020) argue that in the long run, with the increase in infrastructure capital stock, the expansion of product market size will enhance the capital return on firms' R&D investments, thereby motivating firms to increase R&D expenditures. In summary, infrastructure construction not only directly affects production efficiency and output levels but also indirectly drives economic growth and manufacturing upgrading through pathways such as promoting technological innovation, industrial integration, and human capital enhancement. Therefore, governments have always hoped that infrastructure investment can effectively promote the long-term development of the economy and industries.

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

Compared with traditional infrastructure, "new infrastructure" is characterized by technological iteration, synergistic integration, and digital drive (Du, 2022), possessing immense potential to promote high-quality economic development in China. According to the official interpretation of the scope of new infrastructure issued by the National Development and Reform Commission on April 20, 2020, "new infrastructure" encompasses information infrastructure, integrated infrastructure, and innovation infrastructure. Taking information infrastructure as an example, numerous scholars at home and abroad have conducted research on the relationship between the development of the telecommunications industry and economic development, yielding substantial research results. Hardy (1993) empirically prove that the development of the telecommunications industry can promote economic growth. This promotional effect includes not only the incremental demand generated during the production of telecommunications infrastructure but also the positive impact of the network spillover effects of telecommunications infrastructure on other industries (Roller and Waverman, 2001). Some scholars also point out that the construction of information infrastructure not only promotes enterprises to achieve intelligent manufacturing by facilitating technological innovation and reducing production costs but also exhibits a more pronounced driving effect on intelligent manufacturing as the level of marketization increases (Tang et al., 2021).

Recently, there has been a surge of research pertaining to “new infrastructure”. Scholars point out that "new infrastructure" can facilitate total factor productivity growth, market integration, and enhance innovation efficiency; and it can also promote industrial integration and development (Tang et al., 2023). In addition, "new infrastructure" as a fixed asset investment can also exert a strong influence on economic growth (Meng et al., 2023), they also find that China's new infrastructure can significantly improve regional productivity and promote regional technological progress. Beyond direct positive impacts, new infrastructure construction can also indirectly promote the upgrading of the manufacturing value chain by driving the marketization of factors (Ji and Wang, 2024). In particular, it has a significant promotional effect on the modernization of high-tech manufacturing chains, and this impact exhibits a spatial spillover effect (Song et al., 2024).

Although the existing literature generally believes that "new infrastructure" can promote the development of the manufacturing sector, there is still controversy within academia. On the one hand, studies show that the promotional effect of "new infrastructure" on the manufacturing sector exhibits regional heterogeneity, with more significant effects in eastern regions and areas with better digital foundations, while the promotional effect in western regions is weaker (Gong et al., 2023). However, in economically underdeveloped regions, "new infrastructure" has a more pronounced effect on productivity enhancement, mainly because these regions have poorer resource endowments, and "new infrastructure" can optimize resource allocation and compensate for the deficiencies of traditional infrastructure (Meng et al., 2023). On the other hand, some scholars question the actual effectiveness of "new infrastructure." For example, Tang and Zhao (2023) point out that the development level of China's "new infrastructure" is relatively low, and its coupling state with strategic emerging industries has not yet reached an ideal level, which may limit its promotional effect on the manufacturing sector.

It is evident that there are still controversies and research gaps in the current research on "new infrastructure" and traditional infrastructure. Firstly, regarding whether "new infrastructure" can promote the development of the manufacturing sector, the results derived from the literature are heterogeneous, and some studies have even reached opposite conclusions. Secondly, in terms of the impact of infrastructure on industries, most of the literature focuses on exploring the impact of "new infrastructure" on the manufacturing sector, neglecting the interaction between traditional infrastructure and "new infrastructure." This paper empirically studies both within a unified framework, addressing the important issue of whether "new infrastructure" and traditional infrastructure can promote the development of the

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

manufacturing sector, and deeply explores the interaction between them, providing theoretical and practical guidance for various regions in China to balance the development of "new infrastructure" and traditional infrastructure according to local conditions.

3. Model and Data

In this paper, we construct an empirical model using the Generalized Method of Moments (GMM) within the framework of the dynamic panel model. This approach allows for an in-depth analysis of the impact of traditional infrastructure and "new infrastructure" on the output value of different industries. The dependent variable Y_it represents the output value of various low-, medium-, and high-end industries across different provinces. The primary explanatory variables include traditional infrastructure, new infrastructure, and a series of control variables. The specific model is outlined below. To address potential endogeneity issues, we incorporate a one-period lagged dependent variable in the model.

$$Y_{it} = f(Y_{i(t-1)}, \gamma highway_{it}, \delta telecom_{it}, \theta highway_{it} * telecom_{it}, \mu gdp_{it}, \rho pop_{it}, \sigma imem_{it}, \tau edu_{it}) \quad (1)$$

In this study, we utilize highway mileage (highway_it) as a key indicator to measure the level of traditional infrastructure development. Highways, as a crucial component of traditional infrastructure, not only directly reflect the development of the transportation network but also serve as a significant marker for assessing a country or region's economic development and modernization process. Their prominent roles in facilitating regional economic integration, enhancing logistics efficiency, attracting investment, and driving industrial upgrading intuitively demonstrate the capabilities of traditional infrastructure in promoting efficient resource allocation, accelerating factor mobility, and enhancing economic resilience. On the other hand, the development level of "new infrastructure" is measured by total telecommunications business (telecom_it), as this indicator encompasses a wide range of areas including fixed-line telephones, mobile phones, and Internet access services, directly reflecting the depth and breadth of digital infrastructure construction and application. Given the potential interaction between traditional infrastructure and "new infrastructure," we include their interaction term (highway_it*telecom_it) in the model.

Table 1. Classification of Manufacturing Industries

Classification	Industries
High-tech Manufacturing Industries	General equipment manufacturing; Specialized equipment manufacturing; Transportation equipment manufacturing; Communications equipment, computers, and other electronic equipment manufacturing; Instrumentation and cultural and office machinery manufacturing; Arts and crafts and other manufacturing; Waste resource and scrap material recycling
Mid-tech Manufacturing Industries	Non-ferrous metal smelting and rolling processing; Pharmaceutical manufacturing; Rubber and plastics products manufacturing; Petroleum processing, coking, and nuclear fuel processing; Metal products; Chemical raw materials and chemical products; Ferrous metal smelting and rolling processing
Low-tech Manufacturing Industries	Textile, apparel, footwear, and headwear manufacturing; Textiles; Furniture manufacturing; Agricultural and sideline food processing; Tobacco manufacturing; Printing and reproduction of recorded media; Wood processing and the manufacture of wood, bamboo, rattan, palm, and straw products; Leather, fur, feather (down); Food manufacturing; Cultural, educational, and sporting goods manufacturing; Beverage manufacturing; Paper and paper products manufacturing

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

The remaining variables serve as controls, including GDP, population, openness to the outside world, and education level. Specifically, gdp_it reflects the scale of overall economic activities; total population (pop_it) is directly related to the supply of the labor market, the unleashing of consumption potential, and the structure of market demand; openness to the outside world is measured by total import and export volume (imem_it), given the significant impact of international trade activities on resource allocation, technology introduction, and market expansion; education level (edu_it) is measured by the number of college enrollments, which is a crucial indicator of human capital investment and education level, reflecting not only the quality and skill structure of the future labor force but is also an indicator of the potential for technological innovation and industrial upgrading. In this paper, all data are transformed using the natural logarithm before conducting regression analysis. Following Zhu et al. (2019), industries are classified into three categories, with specific classifications detailed in Table 1.

4. Results

This paper empirically tests the impact of traditional infrastructure and "new infrastructure" information infrastructure on the output value of different industries using provincial panel data and the Generalized Method of Moments (GMM) model. Tables 2 to 5 present the regression results. It can be observed that the coefficients of the lagged terms are significant, indicating that the output value from the previous period has a significant impact on the current output value. The use of the dynamic panel model effectively captures the path dependence and inertia effects of output value.

Table 2. Regression Results of High-tech Manufacturing Industries

	General equipment	Specialized equipment	Transportation equipment	Communications equipment, computers, and other electronic equipment	Instrumentation and cultural and office machinery	Arts and crafts and other	Waste resource and scrap material recycling
L.Yit	0.513***	0.224***	0.705***	-0.0543***	0.332***	0.163***	0.606***
	(0.0309)	(0.0283)	(0.0247)	(0.0200)	(0.0124)	(0.0128)	(0.0557)
loghighway	0.0518	1.520***	-1.419***	-5.548***	2.082***	11.26***	5.165***
	(0.446)	(0.493)	(0.188)	(0.405)	(0.511)	(2.243)	(1.100)
log_highway_telecom	-0.120***	-0.191***	0.0261**	0.288***	-0.00786	-0.537***	-0.180**
	(0.0285)	(0.0122)	(0.0118)	(0.0342)	(0.0357)	(0.193)	(0.0905)
logtelecom	0.218***	0.273***	-0.117***	-0.887***	-0.121	1.376**	0.411*
	(0.0790)	(0.0295)	(0.0302)	(0.0883)	(0.0883)	(0.559)	(0.247)
loggdp	-0.0577	0.556**	0.374**	2.336***	0.252	-2.437***	-1.114***
	(0.139)	(0.242)	(0.170)	(0.200)	(0.245)	(0.362)	(0.392)
logpop	2.201	-1.406	0.576	-5.738***	-2.644*	-3.143**	-0.249
	(1.745)	(3.133)	(2.168)	(1.268)	(1.542)	(1.275)	(4.754)
logimem	0.259***	0.0474	0.0247	-0.159***	-0.170***	0.664***	0.243**
	(0.0354)	(0.0396)	(0.0250)	(0.0602)	(0.0479)	(0.0953)	(0.124)
logedu	0.230**	0.670***	0.0510	1.525***	0.165	1.160**	2.063***
	(0.0998)	(0.110)	(0.0641)	(0.197)	(0.178)	(0.453)	(0.460)
Constant	-19.43	5.534	-3.019	43.83***	20.29*	9.356	-9.371
	(13.25)	(23.75)	(16.56)	(10.13)	(12.00)	(11.12)	(34.45)
N	355	353	353	351	348	335	346

The regression results in Table 2 reveal that, within the high-tech manufacturing industry, traditional infrastructure significantly promotes the output value of specialized equipment

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

manufacturing, instrumentation and cultural and office machinery manufacturing, arts and crafts and other manufacturing, as well as waste resource and scrap material recycling and processing industries. Meanwhile, "new infrastructure" information infrastructure significantly enhances the output value of general equipment manufacturing, specialized equipment manufacturing, arts and crafts and other manufacturing, and waste resource and scrap material recycling and processing industries. The interaction terms between traditional infrastructure and "new infrastructure" information infrastructure are mostly negative, suggesting the existence of a substitution effect. When the level of traditional infrastructure is high, the marginal contribution of "new infrastructure" to industrial output value may diminish, and vice versa. However, for the transportation equipment manufacturing and communications equipment, computers, and other electronic equipment manufacturing industries, the coefficients of the interaction terms are positive and significant, indicating a synergistic effect between traditional infrastructure and "new infrastructure" in promoting the output value of these two industries. That is, when the level of "new infrastructure" is high, the marginal contribution of traditional infrastructure to output value will further increase.

Table 3. Regression Results of Mid-tech Manufacturing Industries

	Non-ferrous metal smelting and rolling processing	Pharmaceutical manufacturing	Rubber and plastics products manufacturing	Petroleum processing, coking, and nuclear fuel processing	Metal products	Chemical raw materials and chemical products	Ferrous metal smelting and rolling processing
L.Yit	0.133***	0.141***	0.647***	0.100***	0.343***	0.346***	0.325***
	(0.0439)	(0.0480)	(0.0353)	(0.0211)	(0.0507)	(0.0261)	(0.0276)
loghighway	0.696	1.715***	1.997***	-0.105	0.207	0.834**	0.276
	(0.447)	(0.491)	(0.571)	(0.554)	(0.596)	(0.362)	(0.571)
log_highway* telecom	-0.0294**	-0.103***	-0.185***	-0.0904***	-0.0450**	-0.0963***	0.0791*
	(0.0146)	(0.0137)	(0.0195)	(0.0176)	(0.0184)	(0.0127)	(0.0409)
logtelecom	-0.0712**	0.115***	0.344***	0.171***	-0.00613	0.0855***	-0.338***
	(0.0333)	(0.0340)	(0.0484)	(0.0443)	(0.0415)	(0.0290)	(0.121)
loggdp	0.405***	0.785***	0.0308	0.477***	0.488***	0.296**	0.0779
	(0.0976)	(0.0847)	(0.149)	(0.104)	(0.179)	(0.115)	(0.162)
logpop	1.006	-0.374	-0.351	0.0270	0.632	-0.196	0.666
	(2.115)	(0.762)	(1.238)	(0.966)	(1.304)	(0.772)	(1.840)
logimem	0.233***	0.0148	-0.0424	0.303***	0.155***	0.152***	-0.232***
	(0.0318)	(0.0200)	(0.0264)	(0.0283)	(0.0217)	(0.0220)	(0.0316)
logedu	-0.000195	0.177*	0.418**	0.246	0.404***	0.538***	0.564***
	(0.157)	(0.107)	(0.190)	(0.162)	(0.131)	(0.0779)	(0.191)
Constant	-11.43	-3.436	0.0511	-4.327	-9.603	-1.839	-1.675
	(16.25)	(5.900)	(9.574)	(7.393)	(10.27)	(6.187)	(13.89)
N	355	355	352	355	355	355	328

For the majority of mid-tech manufacturing industries, both traditional infrastructure and "new infrastructure" information infrastructure have significant positive effects on their output value. However, in the case of two typical heavy industries, namely non-ferrous metal smelting and rolling processing, and ferrous metal smelting and rolling processing, "new infrastructure" exhibits a negative impact on their output value growth, while traditional infrastructure has no

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

significant influence. This suggests that "new infrastructure" may struggle to directly enhance production efficiency in heavy industries, and simultaneously, traditional infrastructure in most provinces and municipalities dominated by heavy industries may already be approaching saturation, with limited marginal contribution from further investment to output value. In contrast, for industries such as pharmaceutical manufacturing, rubber and plastics products manufacturing, petroleum processing, coking, and nuclear fuel processing, as well as the manufacture of chemical raw materials and chemical products, "new infrastructure" has a significant positive impact on their output value. This indicates that these industries currently possess high technological intensity and innovation demands, which are highly compatible with the digitalization and informatization technologies encompassed by "new infrastructure," exerting a positive influence on their production process optimization and quality control.

Table 4. Regression Results of Low-tech Manufacturing Industries

	Textile, apparel, footwear, and headwear manufacturing	Textiles	Furniture manufacturing	Agricultural and sideline food processing	Tobacco manufacturing	Printing and reproduction of recorded media
L.Yit	0.931***	0.915***	0.350***	0.557***	0.280***	0.495***
	(0.0109)	(0.0569)	(0.0344)	(0.0202)	(0.00421)	(0.0373)
loghighway	-0.898***	1.217**	3.854***	1.266***	1.975***	1.596**
	(0.292)	(0.561)	(0.632)	(0.372)	(0.127)	(0.737)
log_highway_telecom	-0.0681***	-0.148***	-0.292***	-0.103***	-0.0972***	-0.120***
	(0.0192)	(0.0175)	(0.0271)	(0.0141)	(0.00947)	(0.0211)
logtelecom	0.109**	0.233***	0.484***	0.0590*	0.239***	0.187***
	(0.0482)	(0.0463)	(0.0796)	(0.0336)	(0.0204)	(0.0411)
loggdp	0.440***	-0.495***	0.362***	-0.146*	-0.468***	0.366**
	(0.109)	(0.131)	(0.126)	(0.0841)	(0.0909)	(0.144)
logpop	-1.120*	-0.211	-1.876*	-0.750	4.205***	-0.913
	(0.598)	(1.331)	(1.139)	(0.781)	(0.932)	(2.161)
logimem	0.111***	0.240***	0.0272	0.194***	0.501***	0.0862***
	(0.0390)	(0.0428)	(0.0188)	(0.0191)	(0.0295)	(0.0292)
logedu	-1.125***	0.510***	0.617*	0.981***	0.154	-0.295
	(0.201)	(0.174)	(0.337)	(0.132)	(0.0968)	(0.200)
Constant	9.243**	-0.838	4.529	2.487	-40.55***	2.338
	(4.661)	(9.743)	(8.682)	(6.201)	(7.091)	(16.21)
N	351	355	349	355	346	352

In low-tech manufacturing industries, traditional infrastructure generally has a significant positive impact on output value growth. However, the role of "new infrastructure" information infrastructure demonstrates polarization. For six industries, namely textile, apparel, footwear, and headwear manufacturing, textiles, furniture manufacturing, agricultural and sideline food processing, tobacco manufacturing, and printing and reproduction of recorded media, "new infrastructure" can significantly increase their output value. This suggests that although these industries are traditionally considered labor-intensive or resource-intensive, with technological advancements and shifts in market demand, their need for digitalization and informatization technologies is gradually increasing. By providing technologies such as intelligent manufacturing, industrial internet, and big data analytics, "new infrastructure" significantly enhances production efficiency and market responsiveness in these industries.

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

For other low-tech manufacturing industries including wood processing and the manufacture of wood, bamboo, rattan, palm, and straw products, leather, fur, feather (down), and related products, food manufacturing, cultural, educational, and sporting goods manufacturing, beverage manufacturing, and paper and paper products manufacturing, "new infrastructure" has no positive effect on their output value growth. In contrast, the coefficient for traditional infrastructure is positive, indicating that the production processes of these industries are primarily physical processing with low dependence on "new infrastructure." Traditional infrastructure, such as transportation networks, ensures rapid transportation of raw materials and products for these industries, reduces logistics costs, enhances market responsiveness, and has a more significant positive impact on their output value growth.

Table 5. Regression Results of Low-tech Manufacturing Industries (Continued)

	Wood processing and the manufacture of wood, bamboo, rattan, palm, and straw products	Leather, fur, feather (down)	Food manufacturing	Cultural, educational, and sporting goods manufacturing	Beverage manufacturing	Paper and paper products manufacturing
L.Yit	0.115***	0.375***	0.586***	0.545***	0.626***	-0.258***
	(0.0102)	(0.0300)	(0.0351)	(0.0338)	(0.0277)	(0.00993)
loghighway	3.526***	-1.130	0.254	4.482***	0.877*	1.914***
	(0.653)	(0.704)	(0.373)	(1.626)	(0.498)	(0.713)
log_highway_telecom	-0.0489	-0.0663	-0.00113	-0.289***	-0.0314***	-0.150***
	(0.0378)	(0.0499)	(0.0247)	(0.0789)	(0.0116)	(0.0315)
logtelecom	-0.322***	-0.168	-0.138**	0.229	-0.0713**	0.0713
	(0.0922)	(0.130)	(0.0675)	(0.191)	(0.0299)	(0.0898)
loggdp	0.235	0.744***	0.0839	0.166	0.0260	1.012***
	(0.231)	(0.200)	(0.0934)	(0.433)	(0.0552)	(0.101)
logpop	-0.457	-1.045	0.973	-9.225***	-1.869**	-4.274***
	(1.998)	(1.525)	(0.968)	(3.476)	(0.882)	(1.138)
logimem	-0.310***	-0.0168	0.0777***	0.921***	0.0956***	-0.0656*
	(0.0800)	(0.0885)	(0.0237)	(0.109)	(0.0180)	(0.0379)
logedu	1.337***	1.356***	0.439***	1.770***	0.410***	1.294***
	(0.223)	(0.277)	(0.0839)	(0.544)	(0.0658)	(0.222)
Constant	1.185	5.042	-8.623	46.89*	13.12**	26.00***
	(16.16)	(11.09)	(7.142)	(26.55)	(6.506)	(7.990)
N	348	348	355	351	355	355

5. Conclusion and Policy Implications

Achieving a balance between "new infrastructure" and traditional infrastructure is a crucial issue for promoting high-quality economic development in China. Based on provincial panel data and the Generalized Method of Moments (GMM) model, this paper empirically tests the impact of traditional infrastructure and "new infrastructure" information infrastructure on the output value of different industries. The research results indicate that there are significant differences in the roles of traditional infrastructure and "new infrastructure" across different industries, with both substitution and synergistic effects existing between them. Specifically, both traditional infrastructure and "new infrastructure" generally have significant positive

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

effects on the output value growth of high-tech and mid-tech manufacturing industries. However, in some heavy industries and low-tech manufacturing industries, the role of "new infrastructure" is limited, while the role of traditional infrastructure is more pronounced.

Therefore, to achieve synergistic development between "new infrastructure" and traditional infrastructure, regions should formulate differentiated policy frameworks according to their local industrial structure characteristics and economic development stages. In more economically developed regions, it is essential to fully leverage the synergistic effects of "new infrastructure" and traditional infrastructure, with a focus on promoting the intelligence and digital transformation of high-tech and mid-tech manufacturing industries. For example, through the deep integration of 5G networks and intelligent transportation systems, logistics efficiency and supply chain management levels can be optimized. In economically underdeveloped regions, priority should be given to improving traditional infrastructure to reduce logistics costs and enhance market responsiveness, while gradually introducing "new infrastructure" technologies to lay the foundation for future industrial upgrading. Additionally, in regions with a high proportion of heavy industries, it is necessary to explore "new infrastructure" application scenarios suitable for their production characteristics, such as energy internets and intelligent monitoring systems, to promote their transformation towards greenness and intelligence. Through policy design tailored to local conditions, regions can maximize the role of infrastructure in promoting economic growth and achieve coordinated development between "new infrastructure" and traditional infrastructure.

Acknowledgments

This paper is funded by Guangzhou Basic and Applied Basic Research Fund - General Program (Project No. 2023A04J0327); the Innovation Training Project of Guangdong University of Foreign Studies (Project No. S202411846031); Guangdong Provincial Education Science Planning Project (Higher Education Special Project) (Project No. 2022GXJK086); Guangzhou Philosophy and Social Sciences Development "14th Five-Year Plan" Project (Project No. 2023GZGJ34).

References

[1] S. Graham: Constructing premium network spaces: reflections on infrastructure networks and contemporary urban development. International journal of urban and regional research, Vol. 24 (2000) No.1, p.183-200.

[2] N. Yu, M. De Jong, S. Storm and J. Mi: Spatial spillover effects of transport infrastructure: Evidence from Chinese regions. Journal of Transport Geography, Vol.28(2013), p.56-66.

[3] X. Zhang, G. Wan and X. Wang: Road infrastructure and the share of labor income: Evidence from China's manufacturing sector. Economic Systems, Vol.41(2017)No.4, p.513-523.

[4] A. Mitra, C. Sharma and M. A. V. Varoudakis: Infrastructure, Information & Communication Technology, and Firms' Productive Performance in Indian Manufacturing. Journal of Policy Modeling Vol. 38 (2016), p.353-371.

[5] M. Nair, R. P. Pradhan and M. B. Arvin: Endogenous dynamics between R&D, ICT and economic growth: Empirical evidence from the OECD countries. Technology in Society, Vol.62(2020), 101315.

[6] X. Du, H. Zhang and Y. Han: How does new infrastructure investment affect economic growth quality? Empirical evidence from China. Sustainability, Vol.14(2022) No.6, 3511.

[7] A. P. Hardy: The Role of Telephone in Economic Development. Telecommunications Policy Vol.4 (1993), p.278-286.

[8] L. H. Roller and L. Waverman: Telecommunications Infrastructure and Economic Development: A Simultaneous Approach. American Economic Review Vol.91(2001), p.909-923.

ISSN: 2692-7608 DOI: 10.6981/FEM.202503_6(3).0012

[9] C. Tang, Y. Xu, Y. Hao, H. Wu and Y. Xue: What is the role of telecommunications infrastructure construction in green technology innovation? A firm-level analysis for China. Energy Economics, Vol.103(2021), 105576.

[10] W. Wu, Z. Ji and H. Liang: The Impact of New infrastructure Construction on Optimization and Upgrading of Industrial Structure. Buildings, Vol.13(2023) No.10, 2580.

[11] J. Tang, X and Zhao: Does the new digital infrastructure improve total factor productivity? Bulletin of Economic Research, Vol.75(2023) No.4, p.895-916.

[12] J. Meng, Y. Zhu and Y. Han: Can 'new'infrastructure become an engine of growth for the Chinese economy?. Journal of Chinese Economic and Business Studies, Vol.21(2023) No.3, p.341-362.

[13] J. Ji and Y. Wang: The impact of digital infrastructure on the geographical supply chain layout of firms--Evidence from Chinese microdata. China Economic Review, Vol.87(2024), 102249.

[14] Y. Song, H. Huang, Y. Li and J. Xia: Towards inclusive green growth in China: Synergistic roles and mechanisms of new infrastructure construction. Journal of Environmental Management, Vol. (2024)353, 120281.

[15] M. Gong, Y. Zeng and F. Zhang: New infrastructure, optimization of resource allocation and upgrading of industrial structure. Finance Research Letters, Vol.54(2023), 103754.

[16] J. Tang and X. Zhao: Does the new digital infrastructure improve total factor productivity?. Bulletin of Economic Research, Vol.75(2023) No.4, p.895-916.

[17] X. Wu, X. Huang and P. Zhong: Measurement and Coupling Mechanism of the Coupling and Coordinated Development of New Infrastructure Construction and Strategic Emerging Industries. Geographical Science, Vol.41(2021) No.11, p.1969-1979.

[18] J. Zhu,, Y. Wang and C. Wang: A comparative study of the effects of different factors on firm technological innovation performance in different high-tech industries. Chinese Management Studies, Vol.13(2019) No.1, p.2-25.