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Research Article

Does Infrastructure Improve Residents' Consumption? Evidence from China's New-Generation Infrastructure

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The new infrastructure is becoming the key support and important material guarantee for a new round of scientific and industrial changes in China. In recent years, the further upgrading of the scale and structure of resident consumption has faced resistance from both the supply and demand sides. By enhancing the consuming environment, enhancing transaction efficiency, and lowering spatial barriers, among other benefits, new infrastructure could encourage improvements in resident consumption level and the optimization of consumption structure. This research empirically investigates the consumption implications of new infrastructure under two standards using panel data from 30 Chinese provinces from 2003 to 2020. The findings demonstrate that new infrastructure significantly affects the expansion and upgrading of consumption. Its influence is quite heterogeneous. Additionally, it is discovered during the mechanism of influence test that improving the industrial structure might have a considerable impact on the consumption effect of new infrastructure. In the context of China's economic transition to high quality, this paper aims to quicken the upgrading of industrial structure and optimize the layout of new infrastructure investment in order to increase consumer returns from infrastructure and support consumption upgrading.

1. Introduction

Currently, at the critical stage of the transformation of economic growth drivers, there is a major directional anxiety regarding the question of whether investment can still be the main force of growth. In recent years, problems arising from the strong stimulus of investment have gradually emerged, such as industrial overcapacity, ecological degradation, and inefficient use of land and resources. As a result, some economists advocate a massive reduction in investment and a shift to a consumption-driven model when the original growth model is unsustainable. Since 2003, consumption has contributed to economic growth at a steadily increasing rate as one of the three factors driving China's long-term economic growth. Final consumption spending made up 65.4% of the economy up until 2021. Consumption has steadily evolved into the primary engine powering the nation's economy's robust recovery as demand for goods and services keeps rising, domestic demand expands, and consumption policies are supported. After the epidemic's effects, China's consumption scale, consumption structure, and consumer model innovation will not change, even though some elements are still impeding consumer recovery. Among them, the upgrade of consumer structure refers to the structural upgrading and level of consumer expenditure in total consumption expenditure. As a result of a new development pattern, it is also one of the crucial routes to achieve internal circulation. Additionally, it can promote high-quality economic growth by boosting private consumption and maximizing the effects of the consumption structure, by optimizing the consumption structure [1, 2].

The principal forces behind the recovery of economy will be private consumption and infrastructure spending. The social and economic growth of developing nations is directly impacted by their information infrastructure [3]. In the age of the pandemic, many nations have made boosting

investments in digital infrastructure and speeding up the digitalization of conventional industries as an essential agenda item [4]. Investment in infrastructure may boost economic growth, and well-designed infrastructure can boost consumption by enhancing the environment for spending, easing restrictions on consumption, and enhancing consumption habits. The majority of prior domestic and foreign studies have concentrated on how infrastructure affects economic growth and factor configuration. However, infrastructure's impact on consumption is disregarded [5]. The development of new infrastructures that use massive data centers, 5G networks, and artificial intelligence as their foundation is accelerating. New infrastructure, in contrast to conventional infrastructure, has extensively used new technologies, which can greatly fulfill the new demands of economic development and new demand for a better life. As a vehicle to unlock the potential of the domestic market, new infrastructure is progressively emerging as a crucial engine and a significant driver of high-quality growth in the new era. Consumption can aid in the promotion of the national economy [6]. Stimulating resident consumption potential and promoting consumption upgrading has become the key to China's way of changing economic growth and improving the quality of economic development [7].

The development of the digital economy is served by the new infrastructure, which can offer a strong foundation for it. The share of the digital economy has grown steadily in recent years. The new infrastructure differs from the traditional infrastructure in terms of industrial structure optimization in that it primarily strengthens development of the tertiary sector, particularly the service sector. The tertiary industry has the largest rates of digital economy penetration in China. It follows that the new infrastructure indirectly contributes to the development of the digital economy by improving the industrial structure. New infrastructure has an impact on the industrial structure directly. The new infrastructure in the transportation sector promotes industrial upgrading through the flow of production factors and the reallocation of resources. Information infrastructure dives the upgrading of the industrial structure by reducing information asymmetry, improving transaction efficiency, raising the level of technological innovation, and optimizing the efficiency of resource allocation. According to the perspective of the overall industrial structure change of the national economy, the upgrading of the industrial structure includes shifting the national economy's center of gravity from the primary industry to the secondary industry and finally to the tertiary industry, such as the service industry.

Developed nations' experiences indicate that "economic structural service" is a key characteristic of improving industrial structure. The new infrastructure in the field of information and transportation could promote the upgrading of the industrial structure from the perspective of promoting the development of the service industry. The supply side has improved. At the same time, the demand side has been satisfied. From the standpoint of technological innovation, it supports the enhancement of the residents' consumption quality and quantity.

It is important to select the appropriate viewpoint when researching population consumption. The traditional "absolute income hypothesis," "relative income hypothesis," "life cycle hypothesis," "persistent income hypothesis," "random wandering hypothesis," "precautionary savings theory," and other western consumption theories all center on the impact of income on consumption demand [8]. The dampening impact of home ownership and spending expectation on retirement, education, and health care on present consumption has been more specifically studied by domestic scholars [9–11]. Thus, it is clear that the majority of current research focus on the demand side, studying from perspective of consumer budgetary limitations. Comparatively, the key question becomes whether it is possible to develop a structural match between production and consumption when analyzing consumption from the supply side perspective [12, 13]. In actuality, "supply" should comprise a number of circumstances required to sustain the resident consumption activities and cannot just be defined as the production of goods. In the literature that already exists on infrastructure and consumption, the majority of researchers have concentrated on how a particular kind of infrastructure, primarily the Internet and transportation network, affect consumer behavior [14–16]. In the current wave of technical and industrial revolutions, digital platform has extended consumption channels and improved consumer convenience, which are new driving forces for unleashing consumption potential [17]. Nowadays, the economy is under more downward pressure with traditional infrastructure becoming saturated. New infrastructure, as a product of the current society moving toward digitalization and intelligence in the era of digital economy, will promote the formation of new products and services, new production systems, and new business models. Therefore, exploring the relationship between new infrastructure and resident consumption can provide a more comprehensive understanding of the impact of new infrastructure on the economy as a whole. In general, the majority of the material that is currently available examines how new infrastructure and regional economic ties affect local communities [18–20]. Besides, it has also looked at how new infrastructure affects employment [21] and the ways in which it promotes factor mobility in the production chain [22]. Research connecting new infrastructure to domestic consumption is lacking. The impact of new infrastructure on economic growth cannot be disregarded in the context of underconsumption. It makes the most of its ability to drive consumption by enhancing the environment for consuming, lowering consumption restrictions, and raising the tendency to consume. It is important to explore the role of new infrastructure in effectively promoting social demand from the consumer side. As a result, this paper empirically investigates how new infrastructure affects consumption under both standards. In terms of heterogeneity tests, the statistics in Figure 1 show that the development of new infrastructure in China is uneven between provinces. As a result, we investigate the regional differences between the eastern, central, and western regions as well as the variation in consumption caused by income. The mechanism of action of new infrastructure investment on the expansion and upgrading of resident consumption is finally studied. New infrastructure

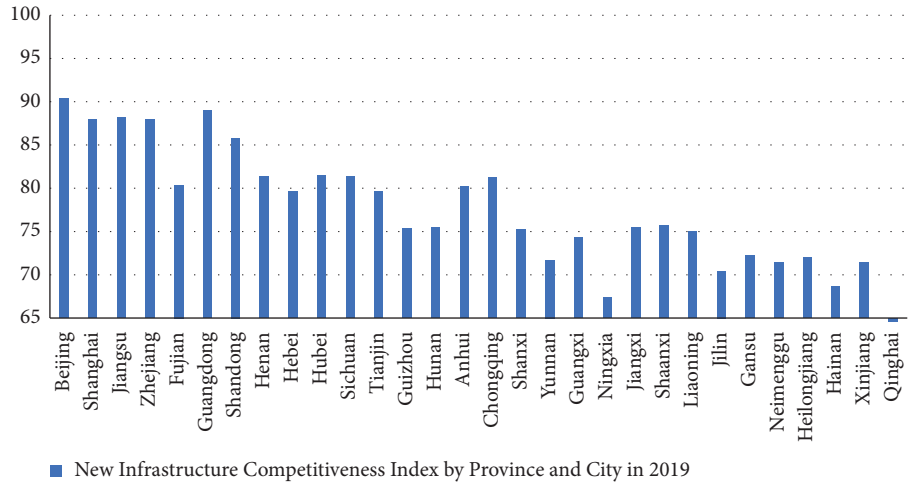

Figure 1: New infrastructure competitiveness index of 30 provinces of China in 2022.

has a dual supply and demand driving effect, i.e., promoting technological innovation and consumption upgrading and driving the domestic value chain cycle. Studying how new infrastructure drives consumption upgrade has important traction value for new infrastructure planning and construction.

Therefore, this paper uses panel data of 30 Chinese provinces from 2003 to 2020. It empirically explores the impact of new infrastructure on expanding the scale of resident consumption and optimizing the consumption structure and its mechanism of action. It aims to shed light on how new infrastructure has influenced the expansion and upgrading of resident consumption. The marginal contributions of this paper lie in the following three points. First, the research perspective is innovative. The new infrastructure was proposed later, and relevant empirical studies have more focused on new infrastructure and high-quality economic development or employment, ignoring the relationship between new infrastructure and resident consumption. Therefore, this paper will study the impact of two standards of new infrastructure on the level and structure of resident consumption. Second, the variables are selected innovatively. There is no consensus in the academic community to explore the question of whether infrastructure investment is crowding out or crowding in consumption. Among them, most scholars choose to link infrastructure to consumption levels while ignoring the impact on consumption structure. In the context of China's double-cycle pattern, it is particularly important to study the optimization of the consumption structure. Therefore, this paper examines the impact of infrastructure on consumption level and also explores the relationship between infrastructure and consumption structure of residents so that such research is enriched. Third, the mechanism is innovative. New infrastructure helps to expand the tertiary industry and promote the transformation of industrial structure to advanced direction. Intuitively, the penetration rate of the digital economy as a new infrastructure service in the tertiary industry climbs from 29.6% in 2016 to 40.7% in 2020. The way that industries are organized is drastically altering as a result of the current fresh round of technical and industrial revolutions, which are also fostering the growth of new industries and optimizing the industrial structure. The upgrading of industrial structure has led to a more refined division of labor between and within industries and a higher degree of specialization and collaboration, which has improved the efficiency of the supply side. In addition, improving production efficiency and optimizing resource allocation are also met for the consumer demand. Therefore, this paper explores whether industrial structure upgrading can act as a mediating variable for new infrastructure to promote residential consumption.

2. Literature Review and Effect Mechanisms

2.1. The Consumption Effect of New Infrastructure. It is still debatable in the literature that is now available on the subject of infrastructure and consumption as to whether infrastructure is crowding in or crowding out consumption. Three categories of thought can be widely distinguished in the literature. The first category is based on the Keynesian system, represented by the demand-side school, which believes that demand determines supply and thus promotes a dynamic cycle in the production chain. In addition, government spending has a multiplier effect, which will drive economic growth and increase national income, which in turn will drive consumption [23]. The second category is based on neoclassicism. According to theory, more government spending will result in residents paying higher projected tax rates, which will in turn lower consumption due to the wealth effect [24]. The third category is based on the substitutability hypothesis. According to Karras, higher government spending will raise the marginal utility of resident consumption, which will stimulate resident consumption [25]. In addition, according to French and others, government spending has an impact on resident consumption through the consumer tilt and resource withdrawal channels [26]. However, the investment strategy for new infrastructure is very different from that of conventional infrastructure. Instead of only relying on government

funding, the new infrastructure is built on market investment, which gives private capital more opportunities. Therefore, the study from the perspective of government spending is not applicable to new infrastructure. Some scholars have studied the impact of a specific type of infrastructure on residential consumption. For example, Wu discovered the phenomenon of gradually becoming a lot of family tourism, indicating that transportation infrastructure affects production behavior and resident consumption behavior [27]. Ran looked further into the mechanism of infrastructure capital expansion to support resident consumption. The empirical findings demonstrated that better infrastructure encouraged both urban and rural residents' propensities to consume [28]. Then, according to the empirical findings of Li and others' micro-views, infrastructure investment has raised urban resident consumption levels, but it has a different impact on the structure of that consumption [29]. However, the new infrastructure is different from the division of traditional. The new infrastructure serves as a material engineering facility to provide basic and public services in digital transformation, intelligent upgrading, and convergence and innovation. Its seven main areas include 5G base station construction, extra-high voltage, intercity high-speed rail, urban rail transit, big data center, artificial intelligence, and industrial Internet. Therefore, from the perspective of measuring the development level of new infrastructure, the division of traditional infrastructure is no longer applicable.

Information infrastructure is not only a strategic, pioneering, and critical infrastructure for the country, but also a core element of the new infrastructure in the new era. Through the demand and supply sides, online and offline, respectively, the information infrastructure promotes resident consumption in four areas: communication capability, information service level, Internet industry, and information industry application [30]. By reducing the information imbalance between buyers and sellers during market transactions, information infrastructure creates a better environment for consumers. At the same time, the quick development of information network has helped to accelerate the gradual transition from mass-produced consumption models to customized and individualized ones, which has improved resident consumption patterns as well as driving consumption. The new generation of information infrastructure is not only limited to the field of communication but also empowering traditional industries to improve transaction efficiency and reduce transaction costs. By removing spatial restrictions, enhancing resident consumption environments, enhancing consumption efficiency, enhancing consumer behavior, providing high-quality service industries, and gradually developing consumer personalized and customized consumption models, it is possible to drive the upgrading of the resident consumption structure. Reducing space restrictions, enhancing supply and demand, and successfully fostering domestic demand are all benefits of improved transportation infrastructure that increase accessibility and circulation of supply and demand [31]. According to New Economic Geography, the establishment and ongoing growth of cities as well as the development of regions are fundamentally influenced by spatial agglomeration. The degree of regional integration of economic activity and wealth in spatial allocation depends on the relative scale of capital externalities, labor mobility, and transportation costs [32]. As a fusion of new materials and technologies, intercity railway and subway in urban area are of great importance to city clusters. It not only can promote the flow of resources of various elements but also is more efficient than other transportation methods. The growth of intercity rail is advantageous for fostering the free flow of labor, capital, and technological factors. Additionally, it hastens the development of the network structure between core cities, small and medium-sized cities, and different types of cities in urban clusters. Then, it encourages the concentration of urban production components and industrial agglomeration by removing the spatial barrier between supply and demand, expanding circulation and accessibility. In addition to overcoming the spatial limitations on resident demand, the development of transportation infrastructure also improves the environment for everyday life and production. In order to increase resident consumption, it also gathers the employment potential and income of urban and rural residents through various production factors and industries [33]. The new infrastructure in transportation sector, such as the intercity railway and the subway in metropolitan areas, removes the geographical restriction and lessens consumption restrictions brought on by the time-space fragmentation factor. It can also optimize the consumption environment from both the supply side and the demand side together, saving transaction costs and simplifying the consumption process. Although some developing countries grow rapidly, the lack of power supply may restrict consumption. The construction of energy infrastructure in China has seriously hindered the consumption of residents. The energy crisis of lack of power supply has gradually reflected the weakness of energy infrastructure construction [34]. The new infrastructure in energy sector represented by the ultra-high voltage has the basic function of optimizing the allocation of energy resources on a large scale, large capacity, and high efficiency. It significantly increases power transportation capacity, increases economic transmission distance, and reduces losses. Then, it breaks the insufficient power supply, promotes the consumption behavior of residents, and improves consumption tendencies. Thus, we propose the following hypothesis.

Hypothesis 1. New infrastructure can positively boost resident consumption.

2.2. New Infrastructure, Industrial Structure Upgrading, and Resident Consumption. Infrastructure investment, as a current capital of society, has obvious investment multiplier. For a long time, infrastructure has been an important means for governments to drive employment and stimulate economic growth. The secondary industry is positively impacted by traditional infrastructure, which leads to a progressive shift in the income structure from citizens'

income to industrial firm profit margins and ultimately lowers consumption rates. However, the difference between new and traditional infrastructure is that it, as the cornerstone of the development of the digital economy, has greatly improved the economic contribution rate of the tertiary industry in recent years. The new infrastructure promotes the development of the tertiary industry, mainly the service, as well as the traditional industry toward the new generation of information technology industry and cultural tourism. Moreover, it is able to reallocate factor resources among different industrial sectors, which leads to the upgrading of resident consumption.

It is a common aspect of economic growth that as per capita income rises, so do the GDP and employment shares of services [35]. The new infrastructure is based on an information network to provide services such as digital transformation, smart upgrading, and convergence and innovation. Its investment requires more R&D and innovation in new-generation general-purpose technologies such as 5G as well as financial and business services that are closely related to them. Therefore, the proportion of service inputs in the production sources is relatively high [36]. Modern service sectors, such as software and information technology services, have a wider opportunity for development and play a crucial role in fostering high-quality economic development as a result of the faster penetration of new-generation information technology into economic and social life. In optimizing resource allocation, information infrastructure curbs the unbalanced development brought about by industrial structure by reducing information asymmetry and improving operational efficiency, thus realizing the rationalization of industrial structure [37]. Information infrastructure provides industrial structure upgrading through technological innovation effects. Technology innovation effects on information infrastructure leads to improvements in industrial structure. With the aid of technological spillover effects, it also offers fresh concepts for innovation in other disciplines, raising the general level and application of innovation in society [38]. Information infrastructure can also significantly advance other fields, including transportation. It generates emerging consumption driven from new industries and new models and effectively meets the demand side of consumption. The basic rule of economic structural transformation is that the share of added value of primary industry in GDP is decreasing, and the share of added value of secondary and tertiary industries, especially the service, is increasing. The new infrastructure in transportation sector is represented by urban rail transit and intercity high-speed rail. By encouraging the perspective of factor movement and resource reallocation, it breaks the spatial limitation, improves transaction convenience, drives the optimization of industrial structure, and promotes industrial agglomeration. According to the gradient development theory, two tendencies in the distribution of production are inevitable to emerge with the economic development of every nation or region: the polarization trend of production concentrated in particular places and the expansion trend of production dispersed to wide areas. In order to effectively prevent structural aging in the economy, cities in high gradient areas must continuously innovate, establish new industries and businesses, develop new products, and maintain their technological leadership, whereas low gradient regions should initially concentrate on the growth of primary industries and labor-intensive businesses that have a higher competitive edge, pick up the industries lost to or spilled over from high gradient regions as quickly as feasible, and build the regional economy. The development of intercity railway and subway in urban areas can promote the transaction efficiency of core cities and surrounding small and medium-sized cities for better advantageous division of labor. Additionally, by lowering the cost of labor and information transportation between cities, this type of promotion of information exchange and knowledge spillover can successfully encourage the redistribution of industries among cities as well as the adjustment of cities' industrial structures and accelerate the synergistic and cooperative development of city clusters [39]. Although intercity railway and urban rail transit in metropolitan regions eliminate the time and location restrictions of exchanges and increase the flow of human, capital, and other variables, productive service sectors still require more human exchanges. Additionally, this flow increases passenger traffic, which aids in the growth of the service industry. Empowering the traditional power grid with digital technology will realize the transformation from electric energy ubiquitous to information data ubiquitous, from electric interconnection to the interconnection of everything. Thus, it will constitute an energy Internet with interconnected network and free form conversion. The construction and improvement of the power grid and the stable operation and reliability of the power system provide sufficient electric energy security for the rapid development of China's economy. Ultra-high voltage which is one of the seven areas of the new infrastructure plays a pivotal role in the whole new infrastructure. For example, the power consumption of a 5G base station is more than ten times that of a 4G base station. For such a high demand for electricity, energy consumption and power supply become tricky issues. Thanks to the development of ultra-high-voltage transmission, energy consumption and electricity demand are effectively balanced. At the same time, the deep integration of the photovoltaic industry and ultra-high-voltage technology will promote industrial structure upgrading and energy transformation and upgrading.

New infrastructure, in the event of the free flow of factors, not only considerably increases the share of the high-end service sector but also has an impact on the upgrading of the service industry by enhancing labor efficiency and encouraging technological innovation [40]. Additionally, according to the Petty–Clark theorem, when economic growth and the level of national income per capita rise, the work force transitions from primary to secondary to tertiary industries. In the article studying industrial economics, Dong found that industrial upgrading has a large positive impact on economic growth by examining the existence of a long-term equilibrium relationship between industrial structure upgrading, economic growth, and carbon emissions [41]. Tarlok's study examined the long-run equilibrium and short-run dynamics between

services and GDP and between services and non-services in India [42]. Viktor looked at how the service industry affected the country's industrial structure and found that both developing and developed nations can benefit from the variety and complexity of the service industry [43]. It is clear that improving the industrial structure will promote economic growth and have a catalytic impact on population consumption levels. Information infrastructure and the new infrastructure in transportation sector can directly promote the development of the service industry, and the ultra-high voltage can be used as the power reliance to guarantee the information infrastructure and new infrastructure in transportation sector. Based on this background, the upgrading of the industrial structure is beneficial to economic growth and will promote the level of consumption of residents. The upgrading of the industrial structure will be carried out from both the supply and demand sides, and the resulting supply of high-quality products and services will create and lead to new consumer demands. Therefore, industrial structure upgrading can promote the upgrading of consumption structure and improvement of lifestyle by developing and growing new industries, optimizing the supply of products and services, and helping demand transformation. By creating and expanding new industries, enhancing the supply of goods and services, and assisting in the transformation of demand, it encourages the upgrading of the consumption structure and the enhancement of lifestyle [44]. The technological innovation brought by the information infrastructure can promote independent innovation and technological innovation in the industry. This will improve the supply side of consumption so that resident consumption is satisfied on the demand side, which in turn stimulates resident consumption to enhance the structure of resident consumption. Based on the above analysis, in the context of combining digital technology with traditional industries, the development of new infrastructure can have a direct or indirect positive impact on resident consumption. The influencing figure is shown in Figure 2. Therefore, we propose the following hypothesis.

Hypothesis 2. New infrastructure can promote consumption by upgrading industrial structure.

3. Research Design

3.1. Sample and Data Collection. The sample data for this article are compiled below in order to empirically analyze the consumption impact of China's new infrastructure. There has been a severe lack of statistics in Tibet ever since the National Statistical Yearbook began tracking fixed asset investment in the information transmission sector in 2003. Therefore, this article sorted out and calculated the investment inventory of new infrastructure investment in 30 provinces (cities and autonomous regions) from 2003 to 2020 as the core explanatory variables. Resident consumption is an explanatory variable, which is measured by the consumption structure and level. The data processing used STATA15. The control variables and intermediary variables in the study were collected from the National Statistical Yearbook and CSMAR from 2003 to 2020. Missing values are filled by interpolation.

3.2. Variable Definition

3.2.1. Dependent Variable. Resident consumption in urban regions is chosen as the dependent variable in this article. This is due to the fact that new infrastructure can contribute more to the efficient synergy and high-quality development of city clusters, which can provide a broader market space for the application of new infrastructure. Two levels of consumption are measured: the "quantity" of consumption is represented by residents' consumption level, while the "quality" of consumption is represented by residents' consumption structure. The "quantity" of consumption is determined by the average amount consumed of the city dwellers, while the "quality" of consumption is determined by the proportions of health care, transportation, and communication, as well as education and culture. In addition, housing consumption is subtracted from the overall consumption of urban dwellers due to the relatively significant rise in housing costs between 2003 and 2020.

3.2.2. Independent Variable. In this paper, the capital stock of new infrastructure is used as the independent variable. Since it is difficult to define which of the two standards is a more accurate representation, this paper explores the impact of new infrastructure on resident consumption from the narrow and broad statistical standards. Among them, the new infrastructure in the narrow sense is distinguished from the traditional infrastructure by the unknown nature of new technology. Therefore, ultra-high voltage and intercity rail are not part of new technology and do not belong to new infrastructure in the narrow sense. On the other hand, the widely accepted new infrastructure in the broad sense includes not only the infrastructure serving the digital economy but also the intelligent transformation of traditional infrastructure to adapt to the digital economy. For the sake of empirical study, new infrastructure is defined in two ways: first, information infrastructure as the core of new infrastructure solely, and second, the new infrastructure as a whole. Among them, the former is the new infrastructure represented by information infrastructure, and the latter is composed of information infrastructure, new infrastructure in transportation and energy fields together. The perpetual inventory system is used to estimate the capital stock of new infrastructure. Referring to the data selection of Jin [45], new fixed asset investment (except for the base year) is chosen as the investment flow to measure the capital stock of new infrastructure by the perpetual inventory system, whose formula is

$$K_{it} = K_{it-1}\left(1 - \delta_{it}\right) + I_{it}, \tag{1}$$

where t represents the year and i represents the province. K_{it-1} represents the new infrastructure stock in the year preceding year t. δ_{it} represents the depreciation rate, which is assumed to be 9.6% without changing over time. I_{it} represents the investment flow in the year.

In the data collection process, the stock of new infrastructure in 2003 was selected as the base stock. Considering the calculating value of I, we choose the fixed asset index in 2003 as the base period to calculate that each year. In the narrow sense, the NIC consists of new fixed assets in

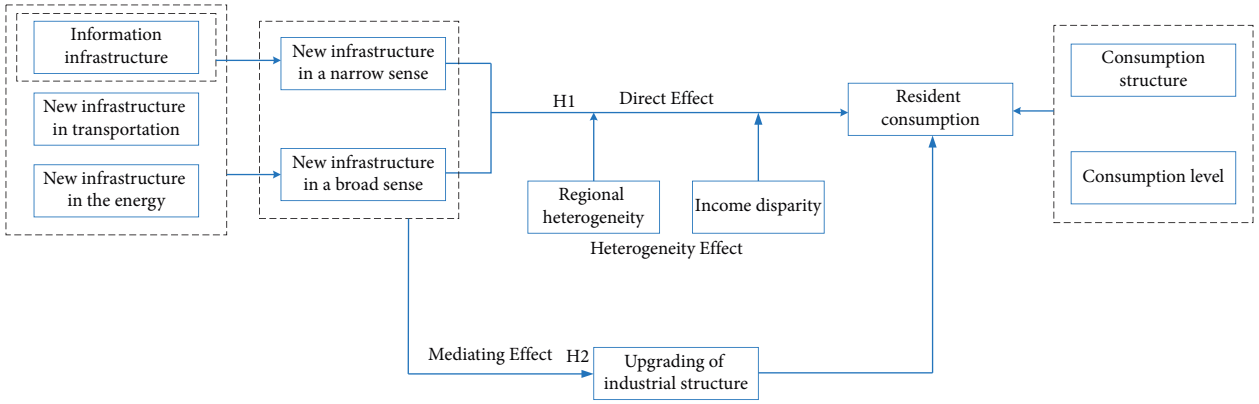

Figure 2: The transmission mechanism of direct and indirect effects of new infrastructure on resident consumption.

the information transmission, software, and information technology service industries. Since the National Bureau of Statistics changed the statistical standard of the information transmission industry in 2012, there are no complete statistical data for each subindustry of each industry in each province. According to the availability of data, this paper selects the statistical data which belong to information transmission, computer service, and software industry of the National Bureau of Statistics from 2003 to 2011 and the information transmission, software, and information technology service industry of the National Statistical Yearbook from 2012 to 2020. In the broad sense, the new infrastructure stock is the sum of new fixed asset investments in the information transmission, electricity supply, and railway transportation industries [46]. The base-year data for each province are derived from the share of the industry in the national new fixed asset investment multiplied by the national stock in 2003.

3.2.3. Mediating Variable. In order to study the indirect effect of industrial structure upgrading on new infrastructure to promote consumption, this study introduces the industrial structure hierarchy coefficient to measure the level of industrial structure upgrading (Industry_{it}). The specific calculation formula is

$$\text{Industry}_{it} = \sum_{i=1}^{3} q_i \times i = q_1 \times 1 + q_2 \times 2 + q_3 \times 3, \quad (2)$$

where q_i is the share of the output value of industry i.

3.2.4. Control Variable. The upgrading of urban resident consumption is influenced by a variety of causes. The control variables of resident consumption level are chosen from five aspects to exclude the impact of other factors: (1) urbanization rate (URB_{it})—the proportion of urban population in the total population of the province (%); (2) economic development level (PGDP_{it})—per capita GDP of each province (ten thousand yuan/person); (3) level of foreign investment (FDI_{it})—amount of FDI in each province; (4) market degree (Market_{it})—fixed asset investment of the whole society in each province; and (5) degree of government intervention (GOV_{it})—the amount of general budget expenditure of provincial governments. All economic indicators related to monetary values are based on the year 2003 to eliminate the effect of changes in price levels. Meanwhile, in order to avoid spurious regression, the amount of FDI, fixed asset investment in the whole society, and the general government budget expenditure are normalized.

3.3. Model Settings

3.3.1. Baseline Regression Model. The following model is created to examine the effect of new infrastructure on urban resident upgrading of consumption:

$$\text{Consume}_{it} = \alpha_0 + \alpha_1 \text{Infrastructure}_{it} + \alpha_2 \text{Control}_{it} + \eta_i + \gamma_i + \varepsilon_{it}. \quad (3)$$

Among them, Consume_{it} is the urban resident consumption upgrading, divided into Expenditure_{it} for urban resident consumption level and Upgrade_{it} for urban resident consumption structure. $\text{Infrastructure}_{it}$ is the stock of new infrastructure, divided into Narrow_{it} for new infrastructure in the narrow sense and Broad_{it} for new infrastructure in the broad sense. Control_{it} represents the five control variables. η_i represents individual fixed effects, γ_i represents time – fixed effects, and ε_{it} represents a random disturbance term. The subscript i is the province, and t is the year. From 2003 to 2020, annual data for the 30 provinces were gathered from the CSMAR database and the National Statistical Yearbook. After the Hausman test, the benchmark regression uses the two-way fixed effects model.

3.3.2. Mediation Model. In order to analyze the relationship between new infrastructure, industrial structure, and resident consumption, this paper refers to the mediation effect test method proposed by Wen et al. [47] and establishes the following model:

Table 1: Descriptive statistics.

Variable	N	Mean	SD	Min	Max
Expenditure	540	9.5355	0.5080	8.5001	10.7367
Upgrade	540	0.3823	0.0435	0.2907	0.4933
Narrow	540	5.2821	1.0476	1.2304	7.5996
Broad	540	7.6497	1.1542	3.6945	10.0188
Industry	540	2.3070	0.1526	1.8207	2.8357
URB	540	53.4753	14.3338	24.77	89.6
PGDP	540	4.0767	2.8455	0.3603	16.4889
FDI	540	0.0503	0.0988	0	1
Market	540	0.2054	0.2107	0	1
GOV	540	0.0995	0.0710	0	1

Table 2: Benchmark regression.

	Model 1 Expenditure	Model 2 Expenditure	Model 3 Upgrade	Model 4 Upgrade
Narrow	0.0362*** (4.16)		0.0078*** (2.69)	
Broad		0.0186** (2.25)		0.0065** (2.39)
URB	0.0017 (1.28)	0.0015 (1.12)	0.0019*** (4.45)	0.0019*** (4.42)
PGDP	0.0048 (1.62)	0.0062** (2.12)	−0.0041*** (−4.21)	−0.0038*** (−3.95)
FDI	−0.0277 (−0.65)	−0.0121 (−0.28)	−0.0608*** (−4.30)	−0.0555*** (−3.87)
Market	−0.0584** (−2.05)	−0.08400*** (−2.74)	−0.0344*** (−3.62)	−0.0430*** (−4.27)
GOV	0.1350** (2.36)	0.1491** (2.57)	0.0236 (1.24)	0.0280 (1.47)
CONS	8.4274*** (140.86)	8.4780*** (127.78)	0.2346*** (11.78)	0.2314*** (10.59)
Individual/time effect	Yes	Yes	Yes	Yes
R^2	0.8981	0.8978	0.7951	0.7945
N	540	540	540	540

Note. T-statistics are shown in parentheses. ***, **, * indicate 1%, 5%, 10% respectively.

$$\begin{aligned} \text{Consume}_{it} &= \alpha_{11}\text{Infrastructure}_{it} + \alpha_{12}\text{Control}_{it} + \varepsilon, \\ \text{Industry}_{it} &= \beta_{21}\text{Infrastructure}_{it} + \beta_{22}\text{Control}_{it} + \varepsilon, \\ \text{Consume}_{it} &= \gamma_{31}\text{Infrastructure}_{it} + \gamma_{32}\text{Industry}_{it} + \gamma_{33}\text{Control}_{it} + \varepsilon. \end{aligned} \tag{4}$$

The test steps are as follows. (i) Firstly, the coefficient α_{11} is tested. If α_{11} is significant, the second step is carried out. (ii) Then, test β_{21} and γ_{32}. The upgrading of the industrial structure will have a mediating influence on the upgrading of new infrastructure and resident consumption, if the aforementioned two coefficients are all statistically significant.

4. Results

4.1. Descriptive Statistics. The outcomes of descriptive statistics for the variable are displayed in Table 1. The data in the table illustrate that the maximum value of urban resident consumption structure is 49.33%, the minimum value is 29.07%, and the average value is 4.35%. This shows that there are significant differences in the consumption structure of residents in each province, and there is still much space for improvement. The maximum value of new infrastructure stock in the narrow sense is 7.5996, the minimum value is 1.2304, and the average value is 5.2821, while the minimum value of new infrastructure in the broad sense is 3.69. The maximum value is 10.0188, and the average value is 7.6497. Based on the aforementioned information, this research concludes that there is a significant resource gap and uneven development of new infrastructure in the two standards across the provinces. The study of the moderate layout of new infrastructure regionally and the multiplier effect can provide strong support for the reasonable layout of new infrastructure at this stage.

4.2. Benchmark Regression. The benchmark regression test is performed on formula (3). After the Hausman test, the regression of the new infrastructure to resident consumption should adopt a fixed effects model. The data are obtained by the combination of the STATA time effect. This regression requires controlling the time effect. Therefore, this article uses two-way FE for the benchmark regression.

The findings in Table 2 represent the impact of new infrastructure on resident consumption. Models 1 and 3 are the results of regressing new infrastructure against resident consumption level and structure. The impact of new infrastructure on resident consumption pattern and structure can be seen in models 2 and 4. The results show that new infrastructure in the narrow and broad sense play a significant consumption effect, and it is significantly reflected in the consumption level and structure. The contribution of

Table 3: Regional heterogeneity.

Variable	East				Midlands				West			
	Expenditure	Upgrade	Expenditure	Upgrade	Expenditure	Upgrade	Expenditure	Upgrade	Expenditure	Upgrade	Expenditure	Upgrade
Narrow	0.0373*** (3.45)	0.0047 (1.34)			0.0073 (0.61)	0.0065 (1.47)			0.0846*** (4.68)	−0.0015 (−0.24)		
Broad			0.0343*** (3.86)	0.0060** (2.08)			0.0220 (1.14)	0.0217*** (3.12)			0.0448*** (3.01)	0.0037 (0.74)
URB	0.0028 (1.56)	0.0006 (0.95)	0.0039** (2.12)	0.008 (1.29)	0.0002 (0.11)	−0.0006 (−0.80)	0.0007 (0.37)	−0.0001 (−0.11)	−0.0030 (−0.72)	0.0008 (0.58)	0.0004 (0.09)	0.0011 (0.73)
PGDP	0.0171** (2.30)	0.0011 (0.48)	0.0212*** (2.95)	0.0016 (0.67)	0.0348*** (4.57)	−0.0039 (−1.38)	0.0336*** (4.44)	−0.0052* (−1.89)	0.0058 (0.44)	0.101** (2.20)	0.0199 (1.38)	0.0110** (2.32)
FDI	−0.5579 (−1.42)	−0.1676 (−1.32)	−0.5657 (−1.45)	−0.1726 (−1.37)	−0.1744 (−0.43)	0.0009 (0.01)	−0.2086 (−0.52)	−0.0341 (−0.23)	−0.6504 (−0.81)	−0.0226 (−0.08)	0.1257 (0.15)	−0.0223 (−0.08)
Market	−0.0310 (−0.64)	−0.0354** (−2.27)	−0.1004** (−2.02)	−0.0466*** (−2.90)	0.0321 (0.64)	−0.0031 (−0.17)	0.0207 (0.42)	−0.0139 (−0.78)	−0.0951 (−0.87)	−0.1078*** (−2.82)	−0.4020*** (−3.29)	−0.1178*** (−2.92)
GOV	1.6042*** (5.14)	−0.02439 (−0.24)	1.5437*** (5.00)	−0.02734 (−0.27)	0.5308* (1.71)	0.0280 (0.25)	0.5688* (1.83)	0.0675 (0.60)	4.3998*** (5.62)	−0.3585 (−1.32)	3.7029*** (4.53)	−0.3654 (−1.35)
CONS	8.4163*** (109.24)	0.2960*** (11.89)	8.3373*** (95.96)	0.2746*** (9.78)	8.5596*** (108.35)	0.3227*** (11.06)	8.4633*** (67.36)	0.2254*** (4.96)	8.2467*** (59.55)	0.3384*** (7.03)	8.1284*** (44.54)	0.3031*** (5.03)
Individual/ time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.9203	0.8774	0.9104	0.8785	0.9238	0.8869	0.9139	0.8923	0.9223	0.8995	0.9115	0.8999
N	324	324	324	324	180	180	180	180	144	144	144	144

Note. T-statistics are shown in parentheses. ***, **, * indicate 1%, 5%, 10% respectively.

Table 4: Income heterogeneity.

Variables	High-income areas				Low-income areas			
	Expenditure	Upgrade	Expenditure	Upgrade	Expenditure	Upgrade	Expenditure	Upgrade
$\ln G_x$	0.0524*** (4.21)	0.0102** (2.36)			0.0389*** (3.78)	0.0050 (1.33)		
$\ln G_g$			0.0514** (2.41)	0.0046 (0.64)			0.02197** (2.56)	0.0074** (2.40)
URB	−0.0004 (−0.20)	0.0014** (1.97)	−0.0025 (−1.19)	0.0011 (1.51)	0.0032* (1.91)	0.0005 (0.88)	0.0037** (2.12)	0.0009 (1.37)
GDP	0.0064* (1.79)	−0.0026** (−2.12)	0.0080** (2.20)	−0.0023* (−1.83)	−0.0098 (−1.20)	0.0038 (1.26)	−0.0041 (−0.50)	0.0046 (1.58)
FDI	−0.1365** (−2.05)	−0.0848*** (−3.68)	−0.1119 (−1.60)	−0.0840* (−3.51)	0.1633*** (3.27)	−0.0527*** (−2.88)	0.1642*** (3.24)	−0.0518*** (−2.85)
FV	0.0068 (0.16)	0.0001 (0.01)	0.0105 (0.23)	0.0019 (0.12)	−0.1260*** (−3.50)	−0.0484*** (−3.66)	−0.1958*** (−4.82)	−0.0673*** (−4.61)
GES	0.1038* (1.78)	0.0229 (1.14)	0.1265** (2.10)	0.0254 (1.24)	4.3372*** (10.03)	−0.2204 (−1.39)	4.1967*** (9.62)	−0.2309 (−1.47)
CONS	8.4288*** (96.59)	0.2390*** (7.91)	8.4531*** (77.44)	0.2646*** (7.10)	8.2070*** (128.52)	0.3195*** (13.62)	8.1767*** (96.83)	0.2808*** (9.26)
Individual/time effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.8990	0.7017	0.8985	0.6945	0.8724	0.8751	0.8722	0.8771
N	252	252	252	252	288	288	288	288

Note. T-statistics are shown in parentheses. ***, **, * indicate 1%, 5%, 10% respectively.

Table 5: Robustness test.

	Model 1 Expenditure	Model 2 Upgrade
Flow	0.0307*** (5.79)	0.0060*** (3.38)
URB	0.0005 (0.37)	0.0017*** (3.90)
PGDP	0.0051* (1.77)	−0.0040*** (−4.16)
FDI	0.0029 (0.07)	−0.0548*** (−3.86)
Market	−0.0877*** (−3.08)	−0.0402*** (−4.20)
GOV	0.1356** (2.41)	0.0238 (1.26)
CONS	8.4925* (174.58)	0.2503*** (15.28)
Individual/time effect	Yes	Yes
R^2	0.9885	0.7968
N	540	540

Note. T-statistics are shown in parentheses. ***, **, * indicate 1%, 5%, 10% respectively.

new infrastructure in the narrow sense on the level and structure of resident consumption is significantly at the 1% level, and the contribution of new infrastructure in the broad sense to the level and structure of resident consumption is significant at the 5% level. This study contends that while new infrastructures both in the broad and narrow sense can have a prominent impact on resident consumption, new infrastructure in the narrow sense has a more noticeable impact. In the era of quick Internet development, the ongoing development of the information infrastructure means that urban development is becoming more and more informationized, and people's lives are becoming more intelligent and convenient. On the one hand, information infrastructure promotes the dual integration of online and offline consumption and enriches the resident consumption. On the other hand, it reduces production, transportation, and marketing costs by providing convenient sales channels and reduces the transfer of production costs from producers to consumers. It can also assist producers in identifying target consumers and instantly matching consumer demand with enterprise production.

4.3. Tests for Heterogeneity

4.3.1. Regional Heterogeneity. This research hypothesizes that the consumption effects of new infrastructure are geographically heterogeneous based on the disparities in economic development, resource endowment, and geographic position among provinces (cities and autonomous areas). The results are shown in Table 3 after the study separates 30 Chinese provinces (municipalities and autonomous regions) into eastern, central, and western regions. The results in the table show that all of the eastern regions are significantly at the 1% or 5% level, except for the new infrastructure in the narrow sense, which has no effect on the consumption structure of the resident. Only new infrastructure in the broad sense has a great effect on the resident consumption structure at the 1% level in the central area. In the western region, new infrastructures both in the narrow and broad sense only contribute to the consumption level and both contribute significantly at the 1% level. This paper argues that the eastern area, due to its quick economic growth and comprehensive infrastructural development, has the best impact on boosting urban resident upgrading of their spending habits. The western area needs to encourage urban dwellers' consumption levels. There is a lack of sound infrastructure due to the low degree of economic development. However, only the infrastructure in the broad sense has been significantly promoted in the central region. This paper argues that this phenomenon is because new infrastructure in the broad sense plays a better role in promoting regional economic development in the central region than the infrastructure in the narrow sense. The infrastructure has a practical "quality" impact on the consumption upgrade of resident due to the higher economic level. We conclude that the eastern area of China performs more significantly in the expansion and upgrading of consumer spending because it has a strong foundation in terms of economic development, innovation, information technology, and the beginning level of infrastructure construction. For example, the Beijing-Tianjin economic belt, the Yangtze Delta, and the Pearl River Delta are a few examples of high development potential in the central region. Recent years have seen an acceleration in the local growth of the central region, due to the strategic location of Wuhan City in Hubei Province (which plays a key role in the national main functional area plan) and the Changzhutan integrated construction. Although it has not yet reached the optimization of the consumption structure, the new infrastructure for the western region can greatly boost the population's consumption level. Due to the absence of reliable infrastructure and the lower level of economic development, there is still opportunity for improving the resident consumption patterns with the new infrastructure.

4.3.2. Income Heterogeneity. Previous theories on consumption contend that income is a key factor in consumption, particularly in terms of consumption structure, and that there would be a significant difference between inhabitants with different income levels in terms of their consumption. Table 4 shows how new infrastructure affects resident consumption at various income levels. The income ranges are divided into groups based on the average net income per capita of the sample for each year. According to the findings in the table, in the high-income areas, new infrastructure in the narrow sense has a greater impact on

Table 6: Mediation test (NIC in narrow sense).

Variable	Expenditure (1)	Industry (2)	Expenditure (3)	Upgrade (4)	Industry (5)	Upgrade (6)
Narrow	0.1365*** (10.32)	0.0283*** (5.14)	0.1242*** (9.31)	0.0075*** (3.50)	0.0283*** (5.14)	0.0051** (2.39)
Industry			0.4355*** (4.25)			0.0840*** (5.10)
URB	0.0049*** (3.93)	0.0024*** (4.64)	0.0038*** (3.07)	0.0010*** (4.95)	0.0024*** (4.64)	0.0008*** (3.96)
PGDP	0.0979*** (12.91)	0.0316*** (10.01)	0.0842*** (10.34)	0.0021* (1.68)	0.0316*** (10.01)	−0.0006 (−0.45)
FDI	−0.5955*** (−5.06)	−0.0022 (−0.05)	−0.5946*** (−5.13)	−0.0691*** (−3.63)	−0.0022 (−0.05)	−0.0689*** (−3.70)
Market	0.1875*** (2.86)	−0.0985*** (−3.61)	0.2304*** (3.53)	0.01524 (1.44)	−0.0985*** (−3.61)	0.0235** (2.24)
GOV	0.7984*** (4.89)	−0.1026 (−1.51)	0.8431*** (5.24)	0.1094*** (4.14)	−0.1026 (−1.51)	0.1180*** (4.56)
CONS	8.0678*** (106.87)	1.9317*** (61.49)	7.2267*** (34.18)	0.2707*** (22.14)	1.9317*** (61.49)	0.1085*** (3.19)
Individual/time effect	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.8303	0.6742	0.8359	0.3929	0.6742	0.4212
N	540	540	540	540	540	540

Note. T-statistics are shown in parentheses. ***, **, * indicate 1%, 5%, 10% respectively.

Table 7: Mediation test (NIC in broad sense).

Variable	Expenditure (1)	Industry (2)	Expenditure (3)	Upgrade (4)	Industry (5)	Upgrade (6)
Broad	0.2142*** (18.76)	0.0338*** (6.11)	0.2060*** (17.54)	0.0127*** (5.96)	0.0338*** (6.11)	0.0102*** (4.73)
Industry			0.2445*** (2.75)			0.0727*** (4.44)
URB	0.0080*** (7.51)	0.0029*** (5.59)	0.0073*** (6.70)	0.0012*** (5.93)	0.0029*** (5.59)	0.0010*** (4.82)
PGDP	0.0756*** (11.39)	0.029*** (8.98)	0.0685*** (9.68)	0.0007 (0.53)	0.0289*** (8.98)	−0.0014 (−1.10)
FDI	−0.1950* (−1.92)	0.0629 (1.27)	−0.2104** (−2.08)	−0.0455** (−2.40)	0.0629 (1.27)	−0.0501*** (−2.68)
Market	−0.1693*** (−2.79)	−0.1369*** (−4.65)	−0.1358** (−2.21)	−0.0075 (−0.66)	−0.1369*** (−4.65)	0.0024 (0.21)
GOV	0.4274*** (3.06)	−0.1639** (−2.42)	0.4675*** (3.35)	0.0876*** (3.36)	−0.1639** (−2.42)	0.0995*** (3.86)
CONS	7.1628*** (79.55)	1.8177*** (41.65)	6.7184*** (36.40)	0.2145*** (12.77)	1.8177*** (41.65)	0.0823** (2.42)
Individual/time effect	Yes	Yes	Yes	Yes	Yes	
R^2	0.8774	0.6804	0.8791	0.4178	0.6804	0.4386
N	540	540	540	540	540	540

Note. T-statistics are shown in parentheses. ***, **, * indicate 1%, 5%, 10% respectively.

the expansion and improvement of resident consumption than low-income areas do. Consumption effect of new infrastructure in the broad sense is more significant in low-income areas. This indicates that for the expansion and upgrading of resident consumption, information infrastructure works comparatively better in high-income locations. However, the new infrastructure, which consists of seven primary categories, only completely contributes to the increase in quality of consumption and volume in low-income locations. The use of the Internet by groups in high-income areas will help to improve the consumption structure and help to upgrade consumption, according to this paper's argument. The Internet offers a wide variety of personalized services and goods targeted at the high-income areas.

4.4. Robustness Test. We use the method that replaces the independent variable to test the robustness of result. To assess the reliability of the findings, we use the method that replaces the independent variable. The main variables that are replaced are the flows of new infrastructure investment. Information infrastructure is a main component of new infrastructure stocks in both narrow and broad sense, which is why investment flows in information infrastructure were chosen to replace the independent variable. Table 5 displays the results of the regression. Its model 1 and model 2 demonstrate that investment flows in information infrastructure have a prominent impact on resident consumption level and consumption structure. The conclusions are solid since the significance and sign of the control variables also largely agree with the benchmark regression.

4.5. Mediation Test. The indirect impact of new infrastructure on the expansion and upgrading of consumption is tested in this section using the mediating effect model. The results are significant at the 1% level, indicating that the hypothesis is correct. Tables 6 and 7 demonstrate how new infrastructure can increase resident consumption level and optimize the consumption structure by upgrading of industrial structure improvement. As a result, upgrading of industrial structures is an indirect route for new infrastructure to encourage resident consumption. The new infrastructure promotes the upgrading of manufacturing industry and the development of service industry, which in turn leads to the development of service industry, technological innovation, and changes in both the supply and demand sides to promote the consumption of resident. It can widen the production boundary, provide future supply capacity, and promote the optimization of industrial structure. On the one hand, industrial structure upgrading improves the supply capacity of products and services through new technologies, new products, and new services. On the other hand, it improves the marginal compensation of factors through optimizing the efficiency of resource allocation, which in turn improves the income of factor providers of labor, knowledge, and technology, thus promoting the upgrading of resident consumption. Industrial structure upgrading can serve as the mechanism of action for new infrastructure to promote consumption expansion and upgrading and promote high-quality economic development. The new infrastructure mechanism of action for promoting increased and upgraded consumption as well as high-quality economic development can be the modernization of the industrial structure. The competitiveness of the tertiary industry is continuously increasing with the aid of new infrastructure that relies on digital technology, and the supply side is able to optimize business models, enhance service quality, and extend service scope. With the help of digital technology, technological level of the tertiary industry is constantly rising. Market transaction costs are decreasing, efficiency is increasing, transactions are generally more convenient, supply and demand adaptation is becoming better, and even personalized goods and services can be improved. Because of this, the new infrastructure has developed into a technical force for the growth of the tertiary industry, enabling it to actively contribute to demand.

5. Conclusions

China is fostering a new development paradigm with domestic circulation as the mainstay, domestic and international circulations reinforcing each other. The mainstay of domestic demand among them is the quickly rising consumption demand. This paper finds through empirical research that new infrastructure promotes resident consumption and behaves differently. At the same time, there is also an indirect path of industrial structure upgrading as a mediating variable. The impact of new infrastructure on resident consumption is shown not only in an increase in level of consumption but also in the optimization of resident consumption structure. This research's results fully prove that the consumption effect of new infrastructure is in line with the domestic demand of China's new development paradigm.

The findings of the benchmark regression demonstrate how optimized and expanded consumption can be enabled by new infrastructure. The impact of new infrastructure in the narrow sense on resident consumption is more significant. This result roughly agrees with Yuan [48]. Consumer behavior is now influenced by a variety of factors, including big data and algorithmic recommendations based on digital technology, as well as other consumer purchasing behaviors. As a result, new demand may be generated and the scale of consumption increases, which helps that information infrastructure plays a more significant role in releasing the consumption potential of residents [49]. In heterogeneity, this paper is divided by regional geographic location and income level. The results show that the consumption stimulation effect is best in the eastern region, which is consistent with the findings of Mao. The central region has the greatest potential, and the western region has more space for development. The consumption effect performs best in high-income regions, and this paper argues that this reason is due to the consistent tendency of capital factors and traditional production factors to pursue profit maximization [50]. Therefore, the increase in income can promote the upgrading of resident consumption through production

restructuring, which is consistent with the findings of Yu et al. [51, 52]. Second, this paper finds that industrial structure upgrading can serve as an indirect path for new infrastructure to promote resident consumption. The digital economy based on digital technology is an important force for high-quality economic growth and industrial transformation [53]. New infrastructure transforms traditional industries with the help of emerging science and technology, which in turn promotes their transformation and upgrading [54]. In addition, the new infrastructure itself has advantages, such as high added value and technology, which can effectively expand the industrial synergy and agglomeration effect brought by capital as well as labor and other production factors, further expanding the advantages of market to a certain extent, thus driving industrial transfer. With the help of mobile Internet, big data, and other digital new technologies to enhance the degree of digital support, promote the new infrastructure to reduce transaction costs, optimize resource allocation, and promote industrial structure upgrading [55], the new infrastructure comprehensively promotes the linkage development of digital technology and real economy, promotes the digital transformation of key industries, empowers traditional digitalization, creates a new mode of high-quality economic development, and promotes the expansion of consumption scale and the upgrading of consumption structure.

With traditional infrastructure becoming saturated, new infrastructure will be another important grasp to stabilize growth, promote employment, and expand domestic demand. Information infrastructure can promote a steady increase in consumption by improving consumption behavior, transforming consumption patterns, and optimizing the consumption environment. New infrastructure in transportation and energy sectors breaks down the barriers that restrict consumption, promotes the flow and concentration of various resource factors, and drives resident consumption in order to promote the high-quality development of China's economy.

Then, this study provides the following recommendations for policies related to new infrastructure. First, in the process of new infrastructure investment, attention should be paid to matching the regional economic layout, reducing unnecessary investment, and increasing effective supply. Based on the fact, new infrastructure shows different strengths of consumption effects among regions. This paper suggests to focus on the regional arrangement differences of new infrastructure in the investment process and formulate development policies for each region in response to the economic as well as resource endowment disparities among regions. Second, new infrastructure can improve the consumption environment, relax consumption constraints, increase consumption propensity, and stimulate consumption desire and potential by improving the consumption environment. It improves the consumption behavior of residents in the region by accelerating the allocation and regulation of the economy between regions and by making rational use of the advantages of neighboring regions. Information infrastructure provides more network and platform effects for new consumption, giving rise to a large number of new models and new types of business. The development of intercity railway and subway in urban areas promotes the rationalization of resources in urban clusters and stimulates the consumption of new services, for example, tourism and entertainment. The construction of information infrastructure should be accelerated to lay a solid base for the digital transformation and intelligent enhancement of infrastructure in other fields. Third, activate domestic demand with the help of new infrastructure, make full use of new infrastructure to accelerate the transformation of traditional industries, guide new types of consumption, and enhance the consumption structure. At the same time, deepen the reform of the income distribution system, improve the factor distribution mechanism, raise the proportion of labor distribution, and explore new jobs to increase the income channels of residents as a way to increase their consumption vitality. At the same time, we will strengthen new technologies embedded in consumption and promote consumption upgrading in a concerted manner in terms of shaping new consumption scenarios, upgrading consumption levels, transforming consumption patterns, optimizing consumption structures, and innovating the supply of goods and services. Finally, it effectively drives new infrastructure from production sources to directly drive demand for services. The new infrastructure can promote employment and new labor supply transferred out of the manufacturing industry into the productive service industry which is complementary to the manufacturing industry. It plays a good agglomeration effect of industrial structure upgrading. At the same time, it is rational to treat industrial structure upgrading, formulate industrial policies in line with the stage of regional economic development, and promote the benign interaction between secondary and tertiary industries. New infrastructure is the infrastructure for new economy and business. Complete new infrastructure can stimulate a large number of innovation and employment opportunities in a short period. Promoting information infrastructure, such as big data centers and industrial Internet construction, accelerates digital upgrading on the supply side and quickens product turnover to drive demand. In addition, promoting the development of intercity railway and subway in urban areas will facilitate the satisfaction of the demand side from the perspective of production factor flow and resource reallocation. Ultimately, the new infrastructure will promote the upgrading of the industrial structure, which in turn will jointly promote consumption from the supply-side improvement and demand-side satisfaction.

With the advent of the digital age, the role of digital technology in transforming and empowering traditional infrastructure has deepened. Infrastructure has also shifted from traditional infrastructure to new infrastructure which is safer, more efficient, and sustainable. This paper examines the ability of new infrastructure in promoting resident consumption in the sample of 30 Chinese provinces. In the end, the study of the consumption effect of new infrastructure is to better link it to the high-quality development of our economy. Therefore, this paper provides a new research direction for future scholars to continue to

study in depth the relationship between new infrastructure, resident consumption, and high-quality economic development. Subsequent studies can delve into whether consumption can serve as an indirect path for the new infrastructure to promote high-quality development of China's economy. It will enrich the research related to the high-quality development of the Chinese economy.

The limitation of this paper is the selection of data. Due to the serious lack of official statistics on the new infrastructure investment indicators at the prefecture level, this paper was only able to obtain provincial panel data. Therefore, this leads to a controlled sample size. Alternative ways to quantify the investment in new infrastructure could be developed in future research to make up for this shortcoming. In addition, in future studies, based on the research in this paper, it can be explored whether the employment structure and income distribution gap can be used as the mechanism of action for the consumption effect of new infrastructure empowerment.

Data Availability

The data presented in this study are available on request from the corresponding author.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

AS and RW were responsible for conceptualization, methodology, validation, and investigation. RW was responsible for software, formal analysis, data curation, original draft preparation, and visualization. AS was responsible for project administration, resources, and review and editing. AS and XY were responsible for supervision. XY and BK were responsible for funding acquisition. All authors have read and agreed to the published version of the manuscript.

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