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The Unintended Consequences of Urban Community Infrastructure Investment for Consumption in China

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Abstract: Background: At a critical stage of the shift of economic growth, this work studied urban community infrastructure's driving role in consumption, discusses the causes and action mechanisms of infrastructure in promoting residents' consumption. Methods: Based on micro-household survey data, applying probit regression. Result: We found that community infrastructure, divided according to either its engineering or its service nature, has a great positive externality, significantly increasing the proportion of residents' consumption, and that the driving force behind consumption in urban central areas, transportation, and environmental protection infrastructure is more obvious. Good urban community infrastructure facilitates residents' production and promotes the efficient circulation of information, resources, and factors; improves residents' subjective expectations; and brings more consumption opportunities so that community infrastructure significantly improves residents' probability of consumption. Conclusion: In the context of economic transformation to a high-quality economy, we should pay attention to the key role of community infrastructure investment in structural transformation and choose urban central areas, capital-intensive industries, and transportation and environmental protection infrastructure as the investment focus so as to improve the consumption returns brought by infrastructure and achieve the transformation of the economy from an investment-driven one to an innovation-driven one.

Keywords: urban infrastructure; consumption; economic growth drivers

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1. Introduction

At a critical stage of the transformation of economic growth drivers, there has been major directional anxiety over whether investment can be used as the main force of growth. Xu and Lin et al. and Li et al. have argued that investment-driven growth is the root of China's economic problems [1–3]. At present, the industrial overcapacity, the deterioration of ecological environment, and the low efficiency of land and resource use are all brought about by the strong stimulation of investment [1,4,5]. Therefore, some economists advocate that, under the condition that the original model of growth is unsustainable, investment should be reduced on a large scale and transferred to a consumption-driven model. Liu Shijin believes that, due to the changes in China's population, labor structure, and the affordability of resources and environment reaching the critical point [5], the potential growth rate will face huge pressure. A steady monetary policy and investment stimuli cannot change this potential growth rate. Investment stimuli may be unfavorable for economic growth and may even become a driver of a long-term, sustained economic decline. Therefore, how to objectively view the role of investment in the economy and society, and whether the investment stimulus method can be used to stabilize the growth in the next step, has become a major problem in the current macro-policy [6].

Wan Haiyuan holds that the excessive use of strong investment stimuli will indeed lead to economic structure imbalance, but we cannot deny the role of investment and ignore its positive externalities [6]. Supply-side reform cannot easily fundamentally reverse the downward trend of the Chinese economy in a short period, and demand-side export

factors cannot easily become the main driving force behind China's current economic growth [6–8], therefore investment, especially infrastructure investment, will remain the main driving force of the current economic growth [9]. Combined with China's investment structure or direction, past investment has mainly been between cities, such as high-speed rail, highways, and airports, but the internal infrastructure investment of the city has obviously lagged behind, such as underground railways, environmental protection, and urban inland transportation. Thus, in the background of new urbanization, urban infrastructure construction should become the main channel of investment [6].

At present, China is in a period of transformation from an investment-driven to an innovation-driven development [6]. Infrastructure investment can not only bring about direct economic growth, but also bring about consumption to a large extent. Against the backdrop of the new coronavirus epidemic and sluggish world economic growth, how to dialectically view the important role of infrastructure investment in economic growth, how to further enhance the consumption-pulling role of investment, and how to further amplify the creative power in the economy are very critical. To understand these problems, it is necessary to have a deep understanding of the innovative impact of infrastructure investment [6] and to identify the investment efficiency and driving role of consumption of different types, different regions, and different levels of infrastructure.

At present, the impact of infrastructure investment on consumption is almost concentrated on the overall macro-level, combined with China's investment structure or investment direction. Previous studies have focused on expressways between cities, airports between cities, and high-speed railways between cities, but there has been little research conducted on urban community infrastructure investment. In particular, there is a relative lack of research on the micro-individual level of the urban community infrastructure, and the micro-transmission mechanism of the macroeconomic problems is even less clear. Therefore, it is impossible to have a comprehensive and objective understanding of the important role of infrastructure. It is also difficult to provide new ideas on major issues such as the transformation of investment structure and the transformation of the driving force of economic growth [6]. Starting from consumers' micro-decision making, this paper studies how urban community infrastructure affects residents' consumption behavior so as to effectively explain why community infrastructure investment has become a key variable in the transformation of economic structure and to help understand how it has become the fundamental driving force for the transformation of the economy from being investment driven to innovation driven.

2. Review of the Literature

Mainstream economists have argued that government expenditures will also have a crowding-out effect on the residents' consumption in the long run [10]. However, subsequent studies have found that public expenditure does not necessarily crowd out private consumption [11]. In other words, the relationship between public expenditure and private consumption is complementary, rather than a relationship of substitution [10,12]. In order to explain the phenomenon in which government expenditure promotes personal consumption, scholars have revised the theoretical model in different directions. For instance, consumer heterogeneity, including "Ricardian schematic residents" and "non-Ricardian schematic residents", has been discussed [10,13].

China scholars have also conducted a lot of research on the relationship between investment and consumption [14,15]; however, from the research paradigm, it is basically within the framework of the dichotomy. For example, Jin Tao et al. found that the relationship between government expenditure and residents' consumption varies from region to region [16]. The expansion of local government expenditure in the eastern and central regions hinders residents' consumption, while the western region, to the contrary, promotes consumption [16]. Wang Wenfu et al. argued that local government investment leads to the national income being more inclined to the management side rather than the labor side, which leads to a decline in the residents' consumption rates [17]. Another kind of research

focuses on the relationship between classified government expenditure and household consumption. Guan Yongbin et al. found that government investment expenditure has a "crowding-in effect" in the long term [18], while Zhang Zhijue et al. found that government investment expenditure has a "crowding-out effect" on the consumption of urban and rural residents [19]. Liu and Turnovsky found that the productivity of government spending could increase household consumption, which falls first and then rises [20]. Liang Yu et al. studied the macro-economic effect of military spending on government spending and found that it was positively related with household consumption [21].

However, more scholars seem inclined to embrace neoclassical views. Li Daokui et al. believed that overheated investment deviates from the path of optimal welfare optimization, suppresses consumption, and causes significant welfare losses [22]. Lu Binyang et al. pointed out that only by weakening the intensity of expansionary fiscal policy and reducing the dependence on fiscal investment can the investment–consumption ratio be reduced [23]. Yi Jian et al. found that we can increase the consumption rate by optimizing the structure of government expenditure and increasing the proportion of social security expenditure [24]. In addition to the wealth effect, financial investment also indirectly affects consumption by changing residents' expected behavior. Hu et al. found that an expected response that is too large or too small would squeeze household consumption [25].

Generally speaking, current research on the impact of infrastructure investment on consumption has focused on the enterprise or macro-aggregate level, ignoring the role of the individual or family level. Community infrastructure will affect residents' consumption behavior, but there is still a lack of direct micro-evidence, and the understanding of the consumption externality of community infrastructure needs to be improved. The innovation of this paper includes the following points: At present, the discussion on infrastructure mainly focuses on urban and rural areas or between cities, ignoring the investment layout within cities, which is precisely an important direction of future investment under the background of declining economic growth. Second, at present, the policies supporting consumption behavior are basically concentrated on the enterprise side or the production side. This paper proves that policy-based support or infrastructure construction of the residents' services can also have a significant effect on promoting residents' consumption from the perspective of the residents, therefore it should be a key direction of future policies. Third, at present, almost all the research on infrastructure uses the aggregated data of countries or provinces, but there is little research from the perspective of communities and families, which cannot describe the micro-impact and action mechanism brought by infrastructure. This paper focuses on the two themes of infrastructure investment and innovation transformation, makes links to the consumption decision making of micro-individuals, and analyzes the micro-basis of macro-investment. Fourth, relying on the information on the balance of duty and housing, the subjective and objective evaluation of infrastructure in the data and the existing endogenous problems can be separated from different perspectives, and the influence of consumption on infrastructure can be obtained. Fifth, this paper distinguishes consumption's driving role in enterprise production, resident services, and public service infrastructure, and compares the consumption returns of different regional locations so as to provide policy guidance to optimize the type, object, regional distribution, and investment focus of community infrastructure construction.

3. Variables' Definitions and Statistical Description

3.1. Data Sources

We obtained data from 89,631 individual samples, spanning from January 2017 to December 2019. The data include samples of urban, rural, and floating populations. In addition to investigating individual- and family-level issues, the data also included village and community surveys.

3.2. Variables' Description

The infrastructure required for consumption includes the convenience required by the location of the enterprise and the necessary infrastructure required by the community residence. One of the biggest advantages of the data is that, although they come from household surveys, they also ask about metrics related to businesses or community, especially about community infrastructure at both the household and community levels [6]. They include both the infrastructure variables related to resident services and indicators related to enterprise production or community public services. (1) Urban community infrastructure has two divisions: the engineering and service categories. According to the nature of the project, infrastructure can be divided into energy infrastructure, water supply infrastructure, transportation infrastructure, post and telecommunications infrastructure, and environmental protection infrastructure (defense and disaster prevention), while, according to the nature of the services, these can be divided into production service infrastructure (necessary roads for community work and convenience of public transportation, etc.), residents' service infrastructure (whether the community has electricity or fitness equipment, etc.), and public service infrastructure (whether the community has health stations or primary schools and kindergartens, etc.).

The study investigates these infrastructure variables in detail both at the community level and regarding their installation and use at the home level. At both the community and family level, infrastructure can be divided into two-dimensional dummy variables: 1 as present or good and 0 as non-existing or poor. "Comprehensive 1" refers to the definition of 1 when five types of infrastructure such as energy, water supply, transportation, post and telecommunications, and environmental protection exist at the same time; otherwise, it is 0. "Comprehensive 2" refers to the definition of 1 when production services, resident services, and public services exist at the same time; otherwise, it is 0. The main urban areas, urban and rural combination areas, and town centers and town combination areas within the city can also be further divided, so as to identify differences in the consumption role of different locations and infrastructure. Control variables have four aspects. The individual characteristics include gender, age, education, health, and marital status. The family characteristics include family social network, parents entrepreneurial background, family income/consumption ratio, family property/consumption ratio, and family support pressure. The urban level includes urban employment rate, state-owned enterprise employees, enterprises' average profit margin, per capita salary, per capita GDP, and permanent population size.

4. The Entrepreneurial Driving Role of Urban Community Infrastructure in Consumption

4.1. Based Regression

By dividing the engineering type and service nature, we applied STATA 14.0 and used the infrastructure variable to carry out a probit regression on the improvement of residents' consumption and clustered the data at the community level. Table 1 shows that consumption's driving role in all community infrastructure is very obvious. According to the nature of the project, the regression coefficients of transportation, energy, post and telecommunications, and environmental protection infrastructure are significant at the level of 1%. Compared with the absence of these infrastructure facilities, the community has better road transportation and a convenient energy supply, which can increase the probability of residents' consumption by 8%. The garbage in the community can be treated in a centralized manner; greening the landscape design and better air quality can increase the probability of residents' consumption by 7.1%, and having all the engineering infrastructure can increase the probability of residents' consumption by about 9.3%.

Table 1. The driving role of urban community infrastructure in consumption.

	1	2	3	4	5	6	7	8	9	10
	Energy	Water	Traffic	Telecom-munications	Environmental Protection	Synthesize 1	Production	Residents	Public Class	Synthesize 2
Whether to promote consumption	0.081 *** (0.013)	0.046 *** (0.012)	0.08 *** (0.018)	0.061 *** (0.011)	0.071 *** (0.012)	0.093 *** (0.012)	0.09 *** (0.008)	0.071 *** (0.011)	0.07 *** (0.011)	0.09 *** (0.010)
Sample	73,956	73,956	73,956	73,956	73,956	73,956	73,956	73,956	73,956	73,956

Based on all the labor samples and using the probit method. Loss of individual variables resulted in a reduced sample size. The dependent variable is whether residents' consumption increased. The independent variable is the infrastructure. Each coefficient represents a regression. To save space, the control variable results are not presented. The coefficients in the table are all marginal effects. *** $p < 0.01$.

Subdividing the infrastructure according to different service properties, it was found that having better enterprise service infrastructure can increase the probability of resident consumption by 8%. Better residential service infrastructure can increase the consumption probability by 6%. Public service infrastructure can increase the probability of consumption by about 5%. Combined with all the results in Table 1, whether divided by the total items or sub-items, the project type, or service nature, community infrastructure has an obvious driving effect on consumption, which significantly increases the consumption probability of residents, and the consumption externality of community infrastructure is very stable.

4.2. Endogeneity

Although urban community infrastructure and household consumption decision making are not the same level indicators, and despite the problem that the latter may not affect the former, there is a possibility that families move to communities with better infrastructure in order to facilitate consumption. Referring to Wan Haiyuan's study, we selected the exogenous topographic slope as the instrumental variable for the infrastructure. Because the engineering construction of transportation, postal services, water supplies, and other infrastructure is often obviously affected by topographic factors, the terrain slope may affect the infrastructure investment. At the same time, the terrain slope, as an exogenous factor, cannot easily directly affect the consumption decision of residents. Therefore, this index meets the basic requirements of the tool variables.

After testing the instrumental variables, it was found that the Chi-squared (1) *p*-value was zero, which means rejecting the alternative assumption that infrastructure is exogenous; moreover, the *p*-value of the instrumental variable C statistics was very large, so it was impossible to reject the assumption that instrumental variables are exogenous. The Kleibergen–Paaprk rk LM statistic *p*-value was small, which means rejecting alternative assumptions of insufficient identification. Meanwhile, the Cragg–Donald Wald F statistic was large, and the rejection of the tool variables' weak correlation with the infrastructure assumed that there was no weak identification problem in the tool variables; thus, this is reasonable to set the regression model comprehensively. In Table 2, the regression coefficients all remained significantly positive after adding the instrumental variable method for the topographic slope, once again verifying the robust consumption impact of the infrastructure. The coefficients and standard errors estimated in line 1 of Table 2 were significantly higher than in the OLS method, although the regression coefficient was still significantly positive, indicating that urban infrastructure does improve the consumption probability of residents, and that the significance results themselves are very stable.

Table 2. Consideration of the impact of consumption on endogenous community infrastructure.

	1	2	3	4	5	6	7	8	9	10
	Energy	Water	Traffic	Telecom-munications	Environmental protection	Synthesize 1	Production	Residents	Public Class	Synthesize 2
IV + Full sample	3.12 *** (0.060)	2.34 *** (0.041)	3.41 *** (0.070)	3.10 *** (0.041)	2.38 *** (0.029)	2.61 *** (0.081)	2.19 *** (0.045)	2.18 *** (0.030)	2.38 *** (0.019)	2.10 *** (0.041)
IV + Full sample + More control variables	3.12 *** (0.062)	2.34 *** (0.045)	3.43 *** (0.072)	3.10 *** (0.044)	2.38 *** (0.030)	2.61 *** (0.086)	2.22 *** (0.048)	2.18 *** (0.033)	2.39 *** (0.020)	2.12 *** (0.045)
IV + Sub-sample + families were consistent with the community facilities	3.07 *** (0.062)	2.28 *** (0.071)	3.21 *** (0.080)	2.97 *** (0.071)	2.25 *** (0.049)	2.76 *** (0.089)	1.99 *** (0.065)	2.09 *** (0.048)	2.29 *** (0.039)	1.87 *** (0.081)

Note: Using the IV probit method, the dependent variable is whether residents' consumption increased, and the explanatory variable is infrastructure. We used the terrain slope as the tool variable. Each coefficient in the table represents a regression equation. In order to save space, the results of control variables are not presented. *** $p < 0.01$.

Another kind of problem comes from missing variables. For example, the higher the income level of the residents, the higher the probability of purchasing houses with better community infrastructure. At the same time, the higher the income, the greater the possibility of consumption. Therefore, the income level may affect the level of consumption and infrastructure at the same time. Thus, on the basis of the above tool variables' estimation, the in-laws' family background, per capita urban income, and urban industrial structure were further added as control variables so as to minimize the influence of the third party. On the basis of the whole sample, the estimation results of the instrumental variables are shown in line 2 of Table 2. After adding more control variables, the standard error generally increased to a certain extent, but the significance of the regression coefficient did not change, and the consumption-driving effect of infrastructure remained significant.

One of the advantages of the data is that they investigate the same infrastructure variables from the perspectives of family and community. For example, with regard to greening facilities, the family questionnaire asked about the greening of residential areas, while the community questionnaire asked about the greening status of entrances into the community and whether there are parks in the community. All the infrastructure types have indicators at both the family and community levels, and the two levels can verify each other. Therefore, the samples were divided into four quadrants according to whether the family level improves consumption and whether the family level has better infrastructure; the samples with actual high consumption and families with better infrastructure were excluded so as to reduce the endogeneity caused by individual selective migration to houses with better infrastructure. In the reserved sub-samples, the community-level infrastructure was used to regress whether the consumption was increased at the individual level so as to obtain a cleaner impact. According to row 3 of Table 2, it was found that, after excluding the possible endogenous samples, the entrepreneurial driving effect of infrastructure was basically the same as that in row 1, indicating that the problem caused by selectivity between consumption and infrastructure was not too serious.

5. Urban Community Infrastructure Layout and Consumption Structure

Investment Structure and Location Layout of Infrastructure

Since urban community infrastructure can bring consumption externalities, in addition to encouraging increased infrastructure investment, it is important to find more efficient investment types so as to optimize the investment layout and investment focus of infrastructure. Thus, we tested whether there is a so-called regional agglomeration effect of infrastructure, and whether the return on infrastructure investment and consumption in economically developed areas is greater. Infrastructure was divided into two categories according to the geographical area in the questionnaire, namely, the main urban area (urban center or main urban area) and the non-main urban areas (urban–rural combined areas,

town and township combined areas, and other special areas), and the geographical location was integrated with the infrastructure variables. We go on applying STATA 14.0 to perform the analysis. Panel A of Table 3 shows that the return on consumption of infrastructure in non-main urban areas was significantly positive. The comparison coefficient of the main urban area was also positive, which shows that the return on the consumption of infrastructure in the main urban area was significantly higher than that in the non-main urban area. This confirms the existence of a resource agglomeration effect, that is, the consumption rate of return of infrastructure in the center of the city is higher than in other areas, and the closer to the city center, the greater the consumption return.

Table 3. Regional differences in the driving role of urban community infrastructure in consumption.

	1	2	3	4	5	6	7	8	9	10
Panel A	**Energy**	**Water**	**Traffic**	**Telecom-munications**	**Environmental Protection**	**Synthesize 1**	**Production**	**Residents**	**Public Class**	**Synthesize 2**
Infrastructure (non-main area)	0.081 *** (0.013)	0.046 *** (0.012)	0.08 *** (0.018)	0.061 *** (0.011)	0.071 *** (0.012)	0.093 *** (0.012)	0.09 *** (0.008)	0.071 *** (0.011)	0.07 *** (0.011)	0.09 *** (0.010)
Main urban area × Infras-tructure	0.051 *** (0.0048)	0.090 *** (0.015)	0.092 *** (0.020)	0.092 *** (0.020)	0.061 *** (0.015)	0.04 *** (0.0043)	0.05 *** (0.023)	0.06 *** (0.015)	0.06 *** (0.014)	0.05 *** (0.012)
Panel B	**Energy**	**Water**	**Traffic**	**Telecom-munications**	**Environmental protection**	**Synthesize 1**	**Production**	**Residents**	**Public Class**	**Synthesize 2**
Community infrastructure	0.081 *** (0.017)	0.06 *** (0.015)	0.09 *** (0.019)	0.07 *** (0.017)	0.08 *** (0.015)	0.12 *** (0.021)	0.010 *** (0.018)	0.08 *** (0.016)	0.07 *** (0.013)	0.10 *** (0.013)
Urban con-sumption × In-frastructure	−0.04 *** (0.008)	−0.02 (0.015)	−0.02 (0.016)	−0.02 (0.015)	−0.01 (0.015)	−0.03 *** (0.007)	−0.03 (0.014)	−0.01 (0.014)	−0.01 (0.014)	−0.03 (0.014)
In-street con-sumption × in-frastructure	−0.02 (0.008)	0.05 *** (0.016)	0.05 ** (0.016)	0.06 *** (0.016)	0.05 *** (0.014)	0.02 *** (0.007)	0.001 (0.014)	0.05 *** (0.014)	0.05 *** (0.014)	0.02 (0.014)
In-community consump-tion × infras-tructure	−0.01 (0.008)	0.06 *** (0.016)	0.05 *** (0.016)	0.07 *** (0.016)	0.06 *** (0.015)	0.00 (0.007)	0.02 (0.014)	0.06 *** (0.014)	0.06 *** (0.014)	0.02 (0.014)

Note: Using the probit method, the dependent variable is the consumption decision; the explanatory variable is the infrastructure and its interaction term; and each column represents a regression equation. To save space, the results of control variables are not presented. The consumption return is shown in Panel A, and the first behavioral base group infrastructure is shown in Panel B; the other rows are compared with the base group coefficients. Cluster levels and significance levels are identical to those in Table 2. *** $p < 0.01$, ** $p < 0.05$.

Another issue closely related to urban location is the balance between employment and housing. In particular, many residents in large cities do not live in the same place as that of their employment. Therefore, we questioned whether the community infrastructure in the residential area affects the consumption process, or whether the infrastructure in the residential area extends its impact beyond the community. In reality, there is an imbalance between the place of work and place of residence. Does the infrastructure construction of one's place of residence also contribute to consumption outside the community? In the questionnaire, there was a survey regarding the location of individual consumption and residence, which can be distinguished according to whether the two places are consistent. Compared with living in the community, consumption occurs in the community, in the street outside the community, in the urban area outside the street, and in the city outside the urban area. We used this variable to make an interactive term and regression for infrastructure. Panel B in Table 3 shows that, the closer the place of consumption is to the place of residence, the greater the effect of consumption promotion of residential infrastructure. Conversely, the farther the place of consumption is from the place of residence, the smaller the effect of consumption promotion of residential infrastructure. This shows that better community infrastructure not only provides convenience for the residents, but also provides convenience regarding geographical distance to residents' consumption, which successfully promoted residents' consumption; this also further verified the driving role of urban community infrastructure in consumption.

6. How Urban Community Infrastructure Affects the Residents' Consumption Decisions

To understand how infrastructure induces the economy to move towards a consumption orientation, we further analyzed how community infrastructure can stimulate consumption and through which channels residents' consumption can be improved.

6.1. Infrastructure Affects the Consumption Process of Residents

Consumption willingness is an important prerequisite for residents' consumption. In reality, consumption can not only obtain high psychological utility, but can also improve people's happiness. Next, consumption willingness was defined as a binary dummy variable: 1 means there is a clear consumption willingness, and 0 means there is no clear consumption willingness or other; the infrastructure variable was regressed to the consumption intention. We applied STATA 14.0 to perform regression analysis, and the first row of Table 4 shows that most types of infrastructure have a significant impact on consumption intention, which shows that community infrastructure investment does improve residents' consumption willingness.

Table 4. How urban community infrastructure affects consumption.

	1	2	3	4	5	6	7	8	9	10
	Energy	Water	Traffic	Telecom-munications	Environmental Protection	Synthesize 1	Production	Residents	Public Class	Synthesize 2
Consumption willingness	3.12 *** (0.060)	2.34 *** (0.041)	3.41 *** (0.070)	3.10 *** (0.041)	2.38 *** (0.029)	2.61 *** (0.081)	2.19 *** (0.045)	2.18 *** (0.030)	2.38 *** (0.019)	2.10 *** (0.041)
Consumption opportunity	3.12 *** (0.062)	2.34 *** (0.045)	3.43 *** (0.072)	3.10 *** (0.044)	2.38 *** (0.030)	2.61 *** (0.086)	2.22 *** (0.048)	2.18 *** (0.033)	2.39 *** (0.020)	2.12 *** (0.045)
Consumption environment	3.07 *** (0.062)	2.28 *** (0.071)	3.21 *** (0.080)	2.97 *** (0.071)	2.25 *** (0.049)	2.76 *** (0.089)	1.99 *** (0.065)	2.09 *** (0.048)	2.29 *** (0.039)	1.87 *** (0.081)

Note: Based on all the labor samples, the OLS method was used; each coefficient represents a regression equation where only the influence coefficient of infrastructure on the consumption process is retained, and the table is the direct coefficient effect without control variable results. *** $p < 0.01$.

Urban community infrastructure construction may bring new consumption opportunities, such as urban subways or road extensions to the suburbs, thus prompting urban residents to experience the consumption pleasure of rural life. Considering that the regional economy is dynamic or shows rapid growth, there may be more consumption opportunities. We took the speed of regional economic development as the proxy variable of consumption opportunities. Table 4, line 2 shows that the impact of consumption opportunities for all types of infrastructure was significantly positive, and that good infrastructure is indeed accompanied by significantly higher consumption opportunities. In addition, the overall institutional environment cannot be ignored. In order to promote sustainable economic growth, China is actively promoting spiritual and cultural consumption, green consumption, tourism consumption, holiday consumption, and education consumption, and providing corresponding supporting policies to promote the development of consumption. Therefore, we used "new consumption items" as the proxy variable. In the third row of Table 4, the coefficients are significant.

6.2. Micro-Mechanism of Infrastructure's Consumption Effect

In the following, we continued to explore how urban community infrastructure affects the consumption process. This paper provides three possibilities. First of all, traffic and communication facilities can facilitate the daily passage and communication of residents, and the flow frequency and exchange level of the elements, resources, or information can increase. We used the proportion of the transportation and communication expenditure in the total consumption expenditure to represent the circulation efficiency of the information, resources, or factors. Secondly, good infrastructure may affect individual consumption cognition through subjective or objective changes so as to improve individual consumption cognition. We defined the individual experiencing new consumption items as 1, otherwise it was 0. Again, the questionnaire had a subjective evaluation of future employment prospects,

including future family income, whether one believes one's employment prospects or living standards to be higher than average, or whether one believes their future family economic situation is able to cope with various accidents. The subjective expected variable was defined as 1, otherwise 0.

Three possible explanations for the relationship between infrastructure and household consumption, namely, information circulation efficiency, consumption cognition, and subjective expectations, are provided above. After controlling for other factors, Table 5 shows that good infrastructure is positively associated and statistically significant with information circulation efficiency. At the same time, good infrastructure is accompanied by high consumption cognition, and this positive correlation is statistically significant. Infrastructure also improved the optimistic judgment of residents' consumption outlook, and the subjective expectation of the overall economic situation was also significantly better.

Table 5. Urban community infrastructure affects the micro-characteristics of residents.

	1	2	3	4	5	6	7	8	9	10
	Energy	Water	Traffic	Telecom munications	Environmental	Synthesize 1	Produc-tion	Residents	Public Class	Synthesize 2
Information circulation	0.05 (0.017)	0.05 (0.013)	0.06 *** (0.020)	0.03 (0.015)	0.05 *** (0.013)	0.04 (0.020)	0.04 *** (0.013)	0.05 *** (0.013)	0.04 *** (0.013)	0.04 *** (0.013)
Consumer cognition	0.02 ** (0.016)	0.02 ** (0.012)	0.03 *** (0.018)	0.01 *** (0.014)	0.01 *** (0.012)	0.01 (0.018)	0.02 (0.012)	0.02 (0.012)	0.02 (0.013)	0.01 (0.012)
Subjective expectations	0.02 ** (0.016)	0.02 ** (0.012)	0.03 *** (0.018)	0.01 *** (0.014)	0.01 *** (0.012)	0.01 (0.018)	0.02 (0.012)	0.02 (0.012)	0.02 (0.013)	0.01 (0.012)

Note: Based on all the labor samples and using the probit method, the dependent variables are individual characteristics, and the explanatory variables are infrastructure. Cluster levels and significance levels are the same as those in Table 1. *** $p < 0.01$, ** $p < 0.05$.

It can be seen in Table 6 that the higher the efficiency of information circulation, the higher the consumption probability, and the regression coefficient is significant. Therefore, it can be confirmed that infrastructure affects consumption through this mechanism, that is, good infrastructure can accelerate the circulation speed of information, resources, or factors, and can be conducive to residents' consumption. Table 6 also shows that residents' optimistic expectations are accompanied by significantly higher consumption ratios. Combined with Table 5, infrastructure can increase the optimistic judgment of consumption or the overall situation, and then induce a higher probability of consumption.

Based on Tables 5 and 6, the micro-mechanism of the impact of community infrastructure on consumption is as follows: It does objectively accelerate the circulation efficiency of information, resources, or factors, and subjectively improves residents' optimistic expectations. Coupled with more consumption opportunities, it finally leads to a higher consumption ratio. Further, from Table 6, it was found that the more capital-intensive the industries and the greater the educational level of the residents, the more obvious the channels for infrastructure to lead to consumption through information flow efficiency and subjective expectations. That is to say, to improve the consumption externality of infrastructure, and to allow it to play a role in promoting the transformation and upgrading of the economic structure, it is necessary to clarify and adjust the future investment direction. Investment should be focused on urban community infrastructure in urban central areas and on capital-intensive industries such as energy, transportation, and environmental protection, and attention should be paid to the guidance of consumption policies for residents with higher education.

Table 6. Micro-characteristics and consumption decisions of urban residents.

	1	2	3	4	5	6	7
Information Circulation	0.061 *** (0.0073)			0.06 *** (0.008)	0.068 *** (0.008)		
Consumer Cognition		0.04 *** (0.0075)					
Subjective Expectations			0.065 *** (0.015)			0.093 *** (0.014)	0.081 *** (0.015)
X × High School Degree				0.04 *** (0.0063)		0.07 *** (0.010)	
X × College Degree or Above				0.15 ***		0.21 *** (0.014)	
X × High-Capital-Intensive Industries					0.05 ** (0.008)		0.036 *** (0.011)

Note: Based on all the labor samples and using the probit method. The dependent variable is whether individual consumption increased. Each column represents a regression equation. To save space, the control variable results are not presented. X in Models 4 and 5 is the information flow efficiency. The X corresponding to Models 6 and 7 is the subjective expectation. The interaction term coefficient is the benchmark group with low capital density relative to middle school and below. According to Wan Haiyuan (2021), mining, manufacturing, power and gas production and supply, transportation and postal storage, information transmission and computer services, real estate, water conservancy, environment, and public facilities management are high-capital-intensive industries. The rest are low-capital-intensive industries. The cluster levels and significance levels are the same as those in Table 1. *** $p < 0.01$, ** $p < 0.05$.

7. Conclusions

This paper focuses on the two main themes of infrastructure and innovation transformation, makes links to the decision making of micro-individuals, focuses on the positive externality of urban community infrastructure on consumption, and emphasizes the important role of infrastructure in the process of economies moving from investment-driven models to innovation-driven models. This also leads to a major directional judgment on the layout of infrastructure investment and the transformation of the driving force of economic growth.

Overall, the consumption externality of urban community infrastructure is very stable, and consumption return is more obvious in urban central areas, capital-intensive industries, transportation, and environmental protection infrastructure. From the perspective of impact channels, good infrastructure increases residents' consumption opportunities and consumption willingness, and significantly improves residents' consumption probability. In terms of the micro-foundation of the macro-economy, infrastructure objectively improves the circulation efficiency of information, resources, and factors and leads to residents' optimistic expectations regarding consumption, thus increasing the proportion of residents' consumption.

Our research has some limitations: We have emphasized investment-driven consumption, but is consumption always beneficial to society? We do not take into account the effects of personal consumption on the natural environment, therefore future research can continue to discuss whether investment-driven consumption has a negative impact on society and the environment. Second, our survey data need to be further improved, and future studies can use more mediation variables to study individual consumption mechanisms.

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