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Can New-Type Urbanization Construction Narrow the Urban–Rural Income Gap? Evidence from China

Jiamin Liu [1,2], Xiaoyu Ma [1,2,*], Wenli Jia [3] and Sisi Zhang [1,2]

[1] Xinjiang Innovation Management Research Center, Xinjiang University, Urumqi 830002, China
[2] School of Economics and Management, Xinjiang University, Urumqi 830002, China
[3] School of Public Finance and Taxation, Xinjiang University of Finance & Economics, Urumqi 830012, China
* Correspondence: maxiaoyu@xju.edu.cn (X.M.)

Abstract: To promote economic development, an imbalance in urban–rural development has been caused by a policy of favoring urban areas in every county. Recently, breaking the "urban–rural dual structure" and emphasizing urban–rural "integration" have become the ideal models for most countries to realize sustainable urbanization development. In China, the main goals of new-type urbanization construction (NTUC) are to optimize the urban–rural structure and improve the living standards of rural residents, help narrow the urban–rural income gap (URIG), and realize urban–rural sustainable development. This paper mainly studied the effect of NTUC on the URIG, analyzing the dynamic impact and regional heterogeneity. The moderating effect of NTUC on the URIG was also tested. A difference-in-difference model and mediating effect model were used to investigate the impact of the NTUC on the URIG. We found that, firstly, NTUC can significantly reduce the URIG. After a series of robustness tests was implemented, the results still held. Secondly, the effect of NTUC on the URIG was −0.1684 in the short term and −0.1710 in the long term. NTUC can significantly reduce the URIG in the central and western regions, but the negative impact is insignificant in the eastern region. Thirdly, industrial structure upgrades and financial and digital development are all important ways that NTUC narrows the URIG. Finally, based on our research conclusions, we put forward corresponding countermeasures and suggestions related to the policy implementation of NTUC, regional differences, industrial structure upgrading, and financial and digital development.

Keywords: new-type urbanization construction; urban–rural income gap; difference-in-difference model; heterogeneity; moderating effect; China

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1. Introduction

In order to provide better living conditions for people, governments across countries have long sought to encourage rapid economic development. Without exception, achieving shared prosperity is one of the main goals sought by the Chinese government, and it is the shared aspiration of the people. In a broad sense, common prosperity connotes affluence and sharing, which includes income, property, public services, etc. It also reflects the overall standards and qualities of resident life. In a narrow sense, the urban–rural income gap (URIG) can reflect the living disparity between residents from an economic perspective, and it is an intuitive embodiment of shared prosperity. How to achieve shared prosperity by narrowing the URIG has become the focus of scholars [1–3]. Sicular et al. (2010) argued that the URIG accounts for 34% to 47% of total income disparity in China, and this has shown an upward trend [4]. If the URIG continues to widen, it is not only detrimental to high-quality and sustainable economic development [5], but may also trigger conflicts between urban and rural residents and affect social stability [6]. In fact, the main reason for the widening of the URIG is the uneven development of urban and rural areas. Therefore, in 2014, to promote citizenship in the transferred agricultural

populations, optimize urban–rural structures, and improve the sustainable development capacity of town and country, the Chinese government formally proposed the National New-Type Urbanization Plan: 2014–2020 [7]. Meanwhile, the government announced Jiangsu Province, Anhui Province, and 62 prefecture-level cities (county-level cities and towns) as pilot areas of new-type urbanization construction (NTUC). NTUC outperforms the previous urbanization model with one-way urban–rural flow, and seeks to transition to the urbanization development model with dual urban–rural flow [8]. This means that China's previous urbanization model of population or land expansion has become history. NTUC, in line with new development concepts and trends, has been evolving the current blueprint of urban development [8–10]. The change in urban development pattern was and is a necessary objective in meeting the peoples' growing requirements for a better life and achieving high-quality economic development. The sustainable urban–rural integration model is the key to narrowing the gap between urban and rural development.

Since the NTUC development model is a product of the current era, it must consider the experiences of urbanization evolution in history. The early "urban–rural dual structure" model of focusing on urban and industrial development led to a lag in rural progress. Therefore, the Jorgenson model, the Todaro migration model, and the theoretical model of urban–rural spatial polarization development are derived from the "urban–rural dual structure" [11]. This theory of unbalanced urban–rural development became the mainstream view of the time [12]. As the negative impact of rural development lag on social and economic advancement became obvious, some geographers began to question this model of urban–rural division [13]. An "integrated" urban–rural development model, with agricultural activities and non-agricultural activities being closely linked, was then produced [12]. Bayulken and Huisingh (2015) explored the shortcomings of sustainable development and ecological modernization, based on the research results and changes in urban patterns in the 19th and 20th centuries. They developed a new theory of sustainable urbanization [14]. Furthermore, in order to achieve urban–rural sustainable development, the Chinese government introduced targeted poverty alleviation and other policies to support rural development in various aspects, such as the employment of the agricultural population, medical security, and poverty alleviation relocation. Nevertheless, the absolute advantages of urban areas in terms of education, transportation, public services, etc., can attract agricultural labor to urban areas. This not only leads to the decline of agricultural area development, but also causes a large number of people to gather in urban areas [15,16]. Under the restrictions of China's household registration system, the agricultural population flowing into urban areas cannot enjoy the same welfare as the urban population, resulting in a widening URIG [17,18]. In addition, to achieve the sustainable development of urban and rural areas, the environment, and resources, etc., scholars have also proposed "low-carbon urbanization" [19,20], "Smart Urbanization" [21,22], "Resilient urbanization" [23], and other sustainable urbanization development models. What is important is that China's government is pursuing a new-type urbanization model that puts people first. This model takes into account the comprehensive aspects of population, economy, medical care, education, transportation, communication, technology, infrastructure, resources, environment, climate, and so on; it has become a better development model and has provided the impetus for narrowing the urban–rural development gap.

Although the urban bias policy has a negative impact on the URIG, its contribution to China's rapid economic growth is obvious. For example, the income levels of urban–rural residents have been improved by sharing the dividends of economic development in China. Obviously, the URIG is still very high. For example, as is shown in Figure 1, from 1985 to 2020, a rise in per capita income of urban and rural residents can be seen. Meanwhile, the urban–rural income ratio showed an upward and then a downward trend, reaching its maximum in 2009. The urban–rural income ratios in 1985, 2009, and 2020 were 1.548, 3.353 and 2.559, respectively. Obviously, during this transition period, in which urban–rural residents are pursuing a high quality of life, the current URIG is still significant. In addition, using Chinese survey data, Xie and Zhou (2014) found that

China's Gini coefficient was 0.53 in 2010, and decreased slightly in 2012 [24]. Using the same data, Kanbur et al. (2021) found that the Gini coefficient dropped below 0.5 in 2014 [25]. It was 0.465 and 0.468 in 2016 and 2020, respectively. This suggests that the income gap among residents is still high. Therefore, how to effectively reduce URIG and quickly realize shared prosperity are vitally important considerations.

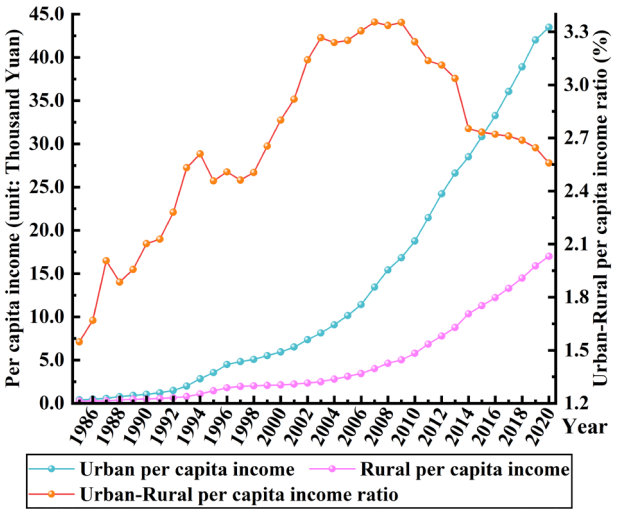

Figure 1. Urban (rural) per capita income and urban–rural per capita income ratio: 1985–2020. Data from the China Statistical Yearbook. To eliminate the influence of price factors, we took 1978 as the base period to make the reduction treatment.

Domestic and foreign scholars have conducted in-depth research on narrowing the URIG. Nilsson and Delmelle (2020) studied the impacts of rail transit access on income gap in metropolitan areas of the United States and found that new or expanded rail transit lines have no significant impact on income gap [26]. Le and Chung (2020) found that improving employment education and vocational training opportunities of the formal sector is an important channel for narrowing the URIG in Vietnam [27]. Based on the literature on the URIG in developing countries, Lagakos (2020) found that migration can help reduce URIG. To reduce the friction that hinders the flow of people between urban and rural areas, he put forward corresponding policy suggestions derived from the information on financial and land markets [28]. From the perspective of Romania, BăNcescu (2021) found that the rural structural income effect contributes only 0.63% to the reduction in the URIG [29]. Likewise, based on the context of China's development status, Chinese scholars also conducted many studies from the perspective of transportation infrastructure [3], labor mobility [30], digital inclusive finance [31], and urbanization [32,33], providing a feasible theoretical basis for narrowing the URIG. Meanwhile, some studies showed that urban-biased development policy has a close relationship with URIG, and causes an increase in URIG [34–36]. In addition, Meng et al. (2022) used the provincial panel data of China from 2007 to 2019, and found that the intellectualization of the circulation industry has an inverse "U" nonlinear impact on the URIG [37]. Intelligent mobile industries can also reduce the URIG through innovative investment. Ma et al. (2022) used the SDM model and a mediating effect model to explore the relationship between environmental regulation, urban–rural income gap and agricultural green total factor productivity. They found an inverted "U"-shaped relationship between environmental regulation and the URIG, and that the URIG is the mediate factor of environmental regulation affecting agricultural green total factor productivity [38].

Two comprehensive conclusions are derived from these studies. On the one hand, studies at home and abroad show that the URIG varies due to different factors, including urban expansion, information and digitization, and urban–rural structure, amongst others. On the other hand, if we are inclined to narrow the URIG, the government should

avoid adopting a biased strategy aiming at promoting the rapid progress of industrialization and urbanization [39]. Existing studies have used qualitative and quantitative methods to conduct in-depth research on spatial spillovers, nonlinearity and mediating effects, and provide a theoretical basis and practical path for each region or country to reduce the URIG. Can the policy of NTUC implemented in China shrink the URIG? How does the NTUC affect the URIG? Studies have not provided detailed answers from both theoretical and empirical points of view. As a result, to better resolve this issue, we used the difference-in-difference model to explore whether the NTUC can help to narrow the URIG. Simultaneously, there are significant differences in economic development level, environmental quality, transportation convenience, and local systems and policies among different regions in China. Is there apparent regional heterogeneity in the NTUC's impacts on the URIG? In addition, can the NTUC reduce the URIG by driving industrial structure upgrading, financial development, and digital development? Answering these questions will not only help to test whether the rural-oriented new-type urbanization has effectively reduced the URIG, but also provide a path to promote balanced and sustainable regional development.

We proceeded via the four following aspects. Firstly, we analyzed the mechanism of the effect of the NTUC on the URIG, which was verified by the difference-in-difference model and time-varying difference-in-difference. Secondly, dynamic effect and regional heterogeneity tests were performed. Thirdly, the mediating effect model was used to explore the impact path of the NTUC on the URIG. Eventually, we were able to provide a new perspective on how China can better implement the policy of NTUC and reduce the URIG, offering a lesson for other developing countries similar to China.

The remainder of this study is organized as follows. The second part analyzes the theoretical mechanism by combining the correlational studies and the goals of NTUC. The third part constructs an empirical model and explains the relevant variables. The fourth part conducts the benchmark empirical analysis, robustness tests and heterogeneity discussions. The fifth part presents the research findings and discusses relevant policy implications.

2. Theoretical Mechanism

2.1. Effect of the NTUC on URIG

There is no denying that urban expansion can promote the income level of urban and rural residents [40]. However, some developing countries have implemented policies that have always favored urban over rural areas to achieve high economic growth [36,41], which causes the enlargement of URIG. For example, non-urban residents benefit less from pensions, health insurance, and housing subsidies [17]. Even formal or informal sectors, such as local state-owned enterprises, the Civil Affairs Department and the public service sector, select workers based on whether they have urban status [18]. The negative impacts of China's unique household registration system on the social identity of rural residents can also lead to the widening of the URIG [42]. In addition, Cochrane (1958) used the theory of the "agricultural technology treadmill" to shed light on the impact of agricultural technological progress on competition and benefit distribution among agricultural producers [43]. They found that while agricultural technology progress can optimize production efficiency, it contributes to a reduction in agricultural product prices and a downswing in producer surplus. Moreover, farmers who adopt new technologies can maintain the same returns as in the past, but those who do not use the latest technology face the dilemma of declining income. Thus, the low penetration of agricultural technology may widen the URIG.

Instead, the NTUC can gradually narrow the gap between urban and rural residents and promote the coordinated development of urban–rural areas. It is conducive to build a new countryside by following specific guidelines, such as industry nurturing agriculture, and towns supporting rural areas and giving more, taking less, and loosening

control. To realize the synergistic development of urban–rural regions, it is also of significance to prompt the development of urban–rural integration and enhance the vitality of the rural economy. Specifically, on the one hand, the main plans of the NTUC are to accelerate the implementation of the system of equal employment and equal paying for urban–rural workforces. The other goals are to improve the incentive and benefit-sharing mechanism, which encourages agricultural science and technology personnel to enter the countryside, upgrades the transformation of agricultural science and technology achievements, and promotes advanced agrarian technologies. Meanwhile, certain methods, such as prompting the innovation of agricultural insurance products and business organization forms and encouraging social capital to invest in rural areas, are development goals of the NTUC. Thus, the NTUC helps to increase the income level of rural residents and reduce the URIG. On the other hand, the NTUC is conducive to constructing agricultural retail markets and cultivating modern circulation methods and patterns. Through flexible forms of linkage between production and marketing, such as docking between farmers and supermarkets and farmers and wholesalers, the income channels of farmers have been widened, meaning that the URIG decreased. In addition, NTUC also strengthens the construction of rural infrastructure, rural landscape, and regional cultural characteristics, helping to enhance tourism income and benefits to rural residents.

The NTUC promoted the move of rural residents out of the countryside into towns, which means that the household registration system that solidifies the urban–rural dual structure has been optimized gradually [17,44]. The relaxation of the household registration system has attracted a large inflow of rural labor into towns. The mobility of registered agricultural labor, mainly college students, improves personal income level by driving the flow of information and technology [45,46]. Self-employment activities among the transient population, as an initial form and an essential source of entrepreneurship, have been studied by domestic and foreign scholars [47,48]. Paulson and Townsend (2004) found that the talents of self-employed migrants can be fully exploited due to the reform of the household registration system [49]. The main factor is self-employed individuals who expand their businesses by obtaining financing, thus gaining higher incomes. Parents with entrepreneurial behavior are more effective in motivating later generations to engage in entrepreneurial activities [48]. Furthermore, with the gradual relocation of the rural population to town areas, the per capita resource possession of the rural population is increased, which helps to facilitate the scale and mechanization of agricultural production and improve the level of agricultural modernization and farmers' living standards [7]. Rural residents with the transfer rights of collective construction land have increased incomes, thus helping to reduce the URIG [50]. In other words, the reform of the household registration system under the goals of NTUC has led the mobile population to engage in entrepreneurial activities or to obtain permanent and stable jobs. To sum up, these can further increase the income levels of rural residents and reduce the URIG. Therefore, Hypothesis 1 is proposed:

Hypothesis 1. *With the policy favoring rural areas, the NTUC can help to narrow the URIG.*

2.2. Moderating Effect

2.2.1. Industrial Structure Upgrading

The NTUC is an important starting point in optimizing the industrial layout and promoting industrial structure upgrades. In particular, the service industries with the highest numbers of employed people have become the main focus of industrial structure optimization [7]. On the one hand, the NTUC has promoted the linkage development among the primary, secondary, and tertiary industries, which is conducive to optimizing the allocation of production factors, driving the concentration of innovation factors and the diffusion of knowledge, thus leading to economic agglomeration [7]. Adamson et al. (2004) argued that cities and towns offer opportunites for laborers to earn higher wages through the positive externalities of economic agglomeration [51]. Thus, the NTUC propelled the

transfer of rural labor with the same skill levels to cities and towns, allowing them to enjoy wage premiums. On the other hand, with the advancement of the NTUC, industries enhanced in the service sector can provide more jobs, which increases the degree of matching between various types of skilled labor and employment, and decreases the costs and time required by a job search. The laborers can also gain higher wages by entering the most productive positions [52]. Hebsaker et al. (2021) also argued that individuals with better abilities are more likely to find jobs that match their knowledge and abilities, obtain higher wages, and thus narrow the URIG [53].

In addition, the NTUC promoted industrial structure upgrades. It is conducive to making employment more flexible, switching from offline to online, from fixed to flexible, and from single to diverse, thus meeting the job demands of low-skilled labor. The gig economy is a typical example. The gig economy improves job matching and productivity, creating more new jobs [54]. Hall and Krueger (2018) found that the ages, skill levels, and education levels of drivers more closely resembled those of general industries, using survey data from Uber drivers [55]. The NTUC provides an advantageous situation for the development of the gig economy. The development of the gig economy, represented by "Meituan" takeaway, "Baidu" takeaway, and online taxi drivers, provides opportunities for low-skilled agricultural laborers entering cities and towns. Job flexibility brought by the development of the gig economy can improve the life satisfaction of unemployed or underemployed workers [56,57]. In short, the NTUC upgrades the rural laborers' income level through diversified jobs, and reduces the URIG. Therefore, Hypothesis 2 is proposed:

Hypothesis 2. *The NTUC can narrow the URIG by promoting industrial structure upgrading.*

2.2.2. Financial and Digital Development

The NTUC strengthens the rapid development of financial inclusion, thus reducing rural poverty by providing more comprehensive agricultural financial services. For example, local governments encourage and support the development of new financial institutions, such as village banks, loan companies and mutual funds. The local government can also build a new urbanization fund support system with multiple levels and wide coverage to optimize the financial market and broaden financial channels. Meanwhile, rural areas actively innovate market-oriented patterns of investment and finance, and developed the guiding and leveraging functions of fiscal funds to improve financial support. This further promotes the construction of public–private partnership (PPP) platforms, improving the level of rural financialization (https://www.ndrc.gov.cn/xxgk/zcfb/tz/201610/t20161014_963224.html?code=&state=123 (accessed on 30 October 2022)). Financial development alleviates poverty mainly through the indirect means of promoting economic growth and the direct means of providing financial services [58,59]. The volatility and inadequate function of traditional financial systems reduces the poverty reduction effect of financial development [60]. However, currently, financial institutions provide loan services to poor households and low-income groups. With microfinance services to help the poor, the income level of rural residents is improved, and is an essential method of financial poverty reduction [61]. In particular, Ghosh (2013) pointed out that financial inclusion policies have become a more effective strategy of poverty reduction [62]. Ji et al. (2021) and Yu et al. (2021) conducted research from the perspective of entrepreneurs and urban–rural income structure, respectively, and both found that digital financial inclusion can help reduce the URIG [31,63,64]. Therefore, Hypothesis 3 is proposed:

Hypothesis 3. *The NTUC can reduce the urban–rural income gap by improving the level of financial development.*

The NTUC promotes public service coverage to rural areas, shaping a sustainable public service system of government-led urban–rural integration [7]. The extension of public service construction to rural areas accelerates internet development. Furthermore, rural information technology helps the diversification of employment in the rural labor force, and can effectively improve income levels [65]. E-commerce, as a manifestation of the digital economy, has a direct impact on the income levels of farm households [66,67]. E-commerce provides employment opportunities for off-farm labor, which in turn contributes to rising wages [65,68]. For example, China's rural e-tailing reached CNY 2.05 trillion in 2021, with a year-on-year growth of 11.3%. In addition, digital development can alleviate rural "information poverty" and reduce the cost of access to information related to agricultural technology. Digital development also improves agricultural production efficiency and optimizes resource allocation, which makes rural labor's income level increase and narrows the URIG. Furthermore, rural areas can rely on internet information technology to improve the level of human capital, increase employment opportunities and reduce the URIG. Thus, Hypothesis 4 is proposed:

Hypothesis 4. *The NTUC can reduce the URIG by enhancing the digitalization level.*

In summary, under the process of the NTUC in China, the government gradually optimizes the household registration management system and promotes a policy that is preferential toward rural areas. Meanwhile, the NTUC facilitates industrial structure upgrading and financial and digital development, which narrows the URIG. The combined effect of these two aspects helps to achieve a decline in the URIG. The mechanism by which the NTUC affects the income gap in URIG is shown in Figure 2.

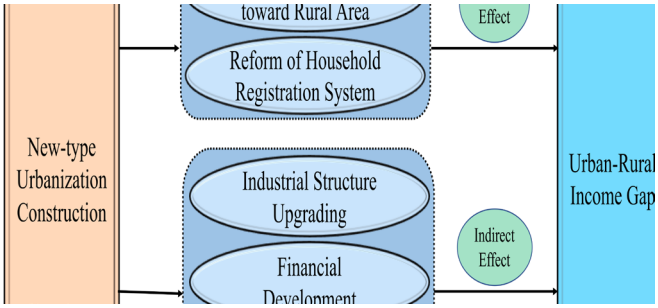

Figure 2. Mechanism diagram.

3. Study Design

3.1. Model Specification

To test the effect of the NTUC on the URIG, we used the difference-in-difference model. Firstly, we constructed the following two dummy variables: ① experimental group (Treated) and control group dummy variable (Untreated). We used the pilot prefecture-level cities of the NTUC announced in 2014 as the experimental group, taking the value of 1. The value was 0 for the remaining areas. The pilot areas implemented in 2014 include Jiangsu and Anhui provinces, and 62 cities (counties). Because the Jiangsu and Anhui provinces were included in the pilot areas, we used 29 prefecture-level cities under the jurisdiction of the two provinces as pilot areas. In addition, based on data availability, 30 prefecture-level cities in the other 62 cities (counties) were selected as pilot areas in this study. In total, 204 prefecture-level cities were used as the control group. ② Policy time dummy variable (Time). We set the values of 0 for the years before 2014 and 1 for the remaining years. We finally established the following difference-in-difference model:

$$URIG_{\mathrm{it}} = \alpha_1 + \alpha_2 Treated_{it} \times Time_{it} + \alpha_m \sum_{m=1} X_{it} + \mu_{\mathrm{it}} + \varepsilon_{it} \quad (1)$$

where i and t denote time and region, respectively; *URIG* denotes urban–rural income gap; *Treated* × *Time* denotes the interaction term between *Treated* and *Time;* X denotes a series of control variables; μ and ε denote individual effects and random error terms; α_i is the marginal contribution of each variable to the *URIG*.

Furthermore, after announcing Jiangsu Province, Anhui Province, and 62 cities (counties) as the first batch of pilot areas in May 2014, the Chinese government announced 59 cities (counties) as the second batch of pilot areas in November 2015. In total, 111 cities (counties) were announced as the third batch of pilot areas in December 2016. Based on the data availability, we selected 7 regions and 18 regions from the second and third pilot areas as the experimental group, respectively. Meanwhile, since the implementation time of the second batch of pilot areas and the implementation time of the third batch of pilot areas were at the end of the year, we set the implementation time of the second batch policy to 2016 and the implementation time of the third batch policy to 2017. We referred to the method used by Beck et al. (2007) to set the following time-varying difference-in-difference model [58]:

$$URIG_{\mathrm{it}} = \alpha_1 + \alpha_2 Treated_{it,n} \times Post_{it,n} + \alpha_m \sum_{m=1} X_{it} + \mu_{\mathrm{it}} + \varepsilon_{it} \quad (2)$$

where *Treaed* × *Post* denotes the binary dummy variables of the NTUC pilot areas. If the area is a pilot area, the value is 1; otherwise, the value is 0. $n = 1,2,3$ denotes the first batch pilot areas, the second batch pilot areas, and the third batch pilot areas, respectively. The other variables are explained in the same way as in Equation (1).

In order to test the indirect effect of the *NTUC* on the *URIG*, we constructed a mediating effect model to explore the transmission mechanism of the *NTUC* on the *URIG* by referring to the method used by Wu et al. (2021) [69]:

$$MED_{\mathrm{it}} = \beta_1 + \beta_2 Treated_{it} \times Time_{it} + \beta_m \sum_{m=1} X_{it} + \mu_{\mathrm{it}} + \varepsilon_{it} \quad (3)$$

$$URIG_{\mathrm{it}} = \gamma_1 + \gamma_2 Treated_{it} \times Time_{it} + \gamma_3 MED_{it} + \gamma_m \sum_{m=1} X_{it} + \mu_{\mathrm{it}} + \varepsilon_{it} \quad (4)$$

where i denotes the region; t denotes the time; *MED* denotes the mediating variable. Other variables have the same meaning as in Equation (1).

3.2. Description of Variables

3.2.1. Explanatory Variables

Urban–rural income gap (URIG). We referred to the method used in existing studies and divided the per capita income of urban residents by the per capita income of rural residents [6]. The specific calculation formula was as follows:

$$URIG_{it} = {}^{URB_{it}}\!\Big/\!_{RUR_{\mathrm{it}}} \quad (5)$$

where *URB* denotes the per capita income of urban residents and *RUR* denotes the per capita income of rural residents. The data used in this study were obtained from China's economic and social big data research platform to derive the actual per capita income of urban and rural residents, deflated with 2005 as the base period.

3.2.2. Core Explanatory Variables (Treated × Time)

To identify the impact of the NTUC on the URIG, we constructed a difference-in-difference model in two dimensions: prefecture-level cities and Time. Specifically, the term Treated denotes the pilot area. The value was 1 if referring to a pilot area, and 0 otherwise; Time indicates pilot time. The value was 1 if referring to a pilot year, and 0 otherwise.

3.2.3. Control Variables

Environment regulation (ENR). Under the influence of environmental regulation, the agricultural sector will continuously increase technological input to provide green products. Green products with high added value help agricultural producers obtain higher profits, enticing them to expand production scale and increase agricultural income, thereby reducing the URIG [70]. Ma et al. (2022) also found that there is a nonlinear relationship between environmental regulation and URIG [38]. Considering that the primary goal of environmental regulation is to reduce pollutants, we used the entropy weight method to calculate the comprehensive indicators of wastewater, waste residue and waste gas as the proxy variables of environmental regulation.

Human capital (HUC). The NTUC can optimize the education system and strengthen education services' quality. Han and Zhang (2022) found that a rise in education level can effectively reduce the URIG [5]. Thus, we used college and undergraduate students as a proxy variable for human capital (unit: people).

Government intervention (*GOI*). Chen et al. (2020) found that government actions are closely related to the *URIG*. Specifically, the government can regulate the income distribution between urban and rural residents through taxation, relocation payments, and public infrastructure construction [71]. We used the ratio obtained by dividing budgetary expenditure by government fiscal revenue as a proxy variable. The specific calculation formula was as follows:

$$GOI_{\mathrm{it}} = GFS_{\mathrm{it}} \Big/ GOR_{it} \tag{6}$$

where *i* and *t* denote prefecture and time; *GOI* denotes government intervention; *GFS* denotes government fiscal expenditure; *GOR* denotes government budgetary revenue.

Population agglomeration (*POA*). Batabyal and Beladi (2019) found that the spatial distribution of the population reflects the income level of a region to some extent [72]. Areas with high population concentration have higher wage premiums, which promotes the impact of agricultural population movement on the *URIG*. Meanwhile, regions with high population concentration are more likely to display exchange among laborers and rapidly upgrade skills, which further enables the rural population to reach higher incomes and reduces the *URIG*. We used population spatial agglomeration as a proxy variable. The specific calculation formula was as follows:

$$POA_{it} = POR_{\mathrm{it}} \Big/ AREA_{it} \tag{7}$$

where *i* and t denote prefecture-level cities and time; *POA* denotes population concentration (unit: ten thousand people/square kilometer); *POR* denotes population size; *AREA* denotes the area of prefecture-level cities.

Expanding opening-up (OPE). OPE is conducive to the introduction of advanced management experience and technology. Meanwhile, the inflow of foreign capital can not only create more employment opportunities, but can also promote economic development, further reducing the URIG [73]. We used total imports and exports divided by GDP as a proxy variable. The total value of imports and exports is converted into yuan using the current exchange rate.

3.2.4. Mediating Variables

Industrial structure upgrading (*ISU*). Theoretical mechanism analysis shows that the NTUC can promote industrial structure upgrading, generate more jobs, and then improve labor efficiency and job matching, which produces a higher wage premium and causes the URIG to decrease. We use the ratio of the sum of the secondary and tertiary industries to GDP as a proxy variable.

Financial development (*FDL*). Building a diversified and sustainable investment and financing mechanism is one of the crucial goals of the *NTUC*. Improving the financial system and mechanism shows that finance alleviates poverty. Li et al. (2022) found that digital financial inclusion is an important lever in reducing the *URIG* [11]. Therefore, we use the ratio of the balance of various loans and deposits of the financial institutions to *GDP* as a proxy variable. The calculation formula is as follows:

$$FDL_{it} = {}^{FLD_{\mathrm{it}}}\!\!\diagup\!\!_{GDP_{it}} \quad (8)$$

where *i* and *t* represent time and region, respectively; *FDL* is the level of financial development; *FLD* represents the balance of various deposits and loans of financial institution (unit: CNY 10,000); *GDP* represents the gross domestic product (unit: CNY 10,000).

Digital development (DGE). The level of digital development is an important variable that affects the relationship between the NTUC and the URIG. We used the entropy weight method to calculate the comprehensive indicators of the number of internet broadband users per 100 people, the total number per 100 telecom servicers, and the number per 100 mobile phone users as proxy variables.

Based on data availability, we selected a sample of 263 prefecture-level cities in China from 2007 to 2020 (data from Tibet, Taiwan Province, Macao Special Administrative Region, and Hong Kong Special Administrative Region are unavailable, and were not included in the sample). The values of each variable were obtained from the China City Statistical Yearbook, the China Economic and Social Big Data Research Platform, and the National Economic and Social Development Statistics Bulletin of prefecture-level cities. For individual missing values, we used linear interpolation to fill them in. The statistical descriptions of each variable are shown in Table 1.

To ensure the accuracy of the empirical regression results, we referred to the Fisher-ADF method used by Choi (2001) for the unit root testing of the panel data [74]. As can be seen from Table 1, all variables used reject the original hypothesis at the 1% significance level, indicating that all variables are smooth. Furthermore, we used the variance inflation factor (VIF) to test multicollinearity. The results of the test are shown in Table 1. The inflation factor (VIF) of all variables was lower than 10, indicating that there was no severe multicollinearity among the variables, and the regression could be performed.

Table 1. Statistical description of variables.

Variable Name	Symbols	Unit	Mean	S.D	Fisher-ADF	VIF
Urban–rural income gap	URIG	—	2.4386	0.9748	2213.3702 ***	—
Interaction items	Treated×Time	—	0.1122	0.3156	239.4726 **	1.09
Environment regulation	ENR	—	0.7810	0.1839	1654.9991 ***	1.18
Human capital	HUC	people	10.4634	1.6040	1058.3783 ***	1.32
Government intervention	GOI	—	2.7218	1.7174	1001.2759 ***	1.29
Population agglomeration	POA	ten thousand people/square kilometer	0.0456	0.0364	823.3438 ***	1.33
Expanding opening-up	OPE	—	0.2047	0.3802	1342.9752 ***	1.11
Upgrading industrial structure	ISU	—	0.8783	0.0817	1283.8845 ***	—
Digital development	DGE	—	0.0900	0.0804	1367.4502 ***	—
Financial development	FDL	—	2.5878	1.9875	1084.7465 ***	—

Notes: ** $p < 0.05$, *** $p < 0.01$; the observed value of each variable is 3682. HUC and WPR are logarithmically treated separately. The following table uses the same process.

4. Analysis of the Impact of NTUC on the URIG

4.1. Time Trend Graph of URIG

To visualize the impact of NTUC on the URIG, we used Equation (2) to measure the URIG in 263 regions before the empirical analysis. By plotting the time trend of the URIG between the experimental group (pilot areas of China's NTUC) and the control group (non-pilot regions of China's NTUC), the differences in the changes in the NTUC between the experimental and control groups can be visually revealed. The results are shown in Figure 3.

Figure 3 shows that before the implementation of the NTUC policy, the URIG between the experimental group and the control group presented the same change trend overall. After introducing the policy, the URIG between the experimental and control groups shows an obvious turning point. The URIG of the experimental group was lower than that of the control group, indicating that the pilot policies of NTUC may have influenced the URIG.

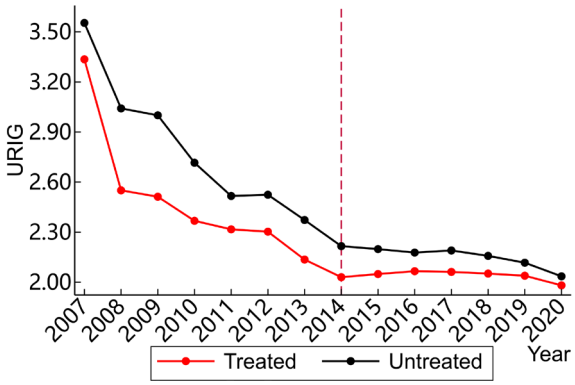

Figure 3. Time trend of URIG in the experimental and control groups.

4.2. Baseline Regression Results

4.2.1. Effect of the NTUC on the URIG

Before and after the implementation of the NTUC policy in 2014, the URIG between the experimental and control groups showed significant differences (Figure 3). In order to more clearly identify the marginal contribution of the NTUC in the URIG, we used fixed-effect OLS to conduct an empirical estimation. The results are shown in Model (1) and Model (2). To ensure the robustness of the fixed-effect OLS regression results, we also used a time-varying difference-in-difference model to verify the benchmark regression. The results are shown in Model (3) and Model (4).

According to Table 2, the NTUC could effectively reduce the URIG by about 0.2449% in Model (2). The regression coefficients of Model (3) and Model (4) in Table 2 show that the results in Model (1) and Model (2) are robust. Hypothesis 1 is confirmed. The main reason is that the NTUC promotes rural economic development by supporting farmers with science and technology, expanding sales channels of agricultural products, strengthening rural infrastructure construction, etc. [7]. In addition, the citizenization of the agricultural population is one of the critical goals of the NTUC, which means that the NTUC makes some of the agricultural population migrate to urban areas. The per capita resource share of the non-migrated agricultural population rises, and the URIG falls.

Regarding the effects of the control variables on the URIG, the estimated coefficients of ENR, HUC, GOI and POA are significant and negative in general. Principally, environmental regulation can promote the green transformation of agricultural production, which benefits the agricultural population, enabling them to get higher added value from green products and reducing the URIG [70]. Human capital accumulation promotes knowledge spillover and improves the production efficiency [65,75], thus reducing the URIG. As an intermediate force regulating balanced regional development, the

government raises the income level of the rural population. It restrains the expansion of the URIG through financial subsidies supporting agricultural development, income redistribution, and the equalization of public services [71]. Population agglomeration produces scale effects and knowledge spillover effects, and enhances regional innovation potential and production efficiency [72], which promotes economic development and reduces the URIG. Expanding opening-up has a negative impact on the URIG. The probable reason is that, compared with urban areas, there is a delay before the dividends of expanding opening-up can be enjoyed.

Table 2. Regression results of NTUC affecting the URIG.

Variables	Benchmark Regression		Time-Varying Difference-in-Difference	
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**
Treated × Time	−0.4633 ***	−0.2449 ***	−0.4643 ***	−0.2885 ***
	(0.0578)	(0.0565)		(0.0552)
ENR		−1.3550 ***		−1.3495 ***
		(0.0947)		(0.2051)
HUC		−0.1707 ***		−0.1653 ***
		(0.0187)		(0.0201)
GOI		−0.1139 ***		−0.1129 ***
		(0.0149)		(0.0209)
POPA		−2.2513 *		−1.9359 *
		(1.3284)		(1.1330)
OPE		−0.0921		−0.0922
		(0.0601)		(0.0629)
Constant	2.4906 ***	5.7422 ***	2.5042 ***	5.6769 ***
	(0.0151)	(0.2100)	(0.0079)	(0.2890)
With-R^2	0.0185	0.1250	0.0252	0.1293
Observations	3682	3682	3682	3682

Notes: * $p < 0.1$, *** $p < 0.01$; robust standard errors in parentheses; fixed-effect OLS is used in the following tables.

4.2.2. Robustness Tests

(1) Placebo Test

The regression results in Table 2 indicate that NTUC helps to reduce the URIG. Furthermore, to ensure the robustness of the estimated results, we referred to the method used by La Ferrara et al. (2012) [76] and used the nonparametric substitution test for the placebo test. Specifically, 59 regions were randomly selected as experimental groups and set as the interaction terms between "pseudo" treatment groups and the corresponding "pseudo" policy. Figure 4 shows the kernel density distribution of the "pseudo" estimated coefficients based on 1000 random samples. As can be seen from Figure 4, the estimation results of the random group concentrate around 0, indicating that there is no serious problem of omitted variables in the model. It can be seen that the mitigation effect of NTUC on the URIG is not affected by other, potentially costly, observed random factors.

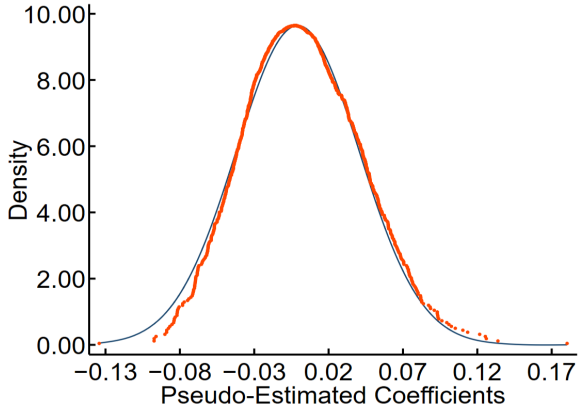

Figure 4. Placebo test results.

(2) Sample Tailing Treatment

We considered the possibility of extreme values of the URIG variable, which would lead to biased results. This study subjected the URIG to 1% tailoring and then used Equation (1) to reevaluate the results. Model (1) in Table 3 shows the estimated results after 1% tailoring. The estimated coefficient of Treated×Time is −0.2704, and is significant at the 1% level. This corroborates the robustness of the benchmark regression results.

Table 3. Robustness test (fixed-effect OLS).

Variables	1% Tailing Treatment	PSM-DID Test	Delete 2014 Observation	Deleted Sample Size	Time-Varying Difference-in-Difference	
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Treated × Time	−0.2704 ***	−0.2202 ***	−0.2278 ***	−0.3612 ***	−0.2884 ***	−0.3787 ***
	(0.0252)	(0.0717)	(0.0723)	(0.1368)	(0.0559)	(0.0798)
ENR	−0.8689 ***	−1.3359 ***	−1.3295 ***	−1.3923 ***	−1.3177 ***	−1.3976 ***
	(0.0503)	(0.2129)	(0.2044)	(0.2193)	(0.2020)	(0.2171)
HUC	−0.1598 ***	−0.2350 ***	−0.1703 ***	−0.1680 ***	−0.1642 ***	−0.1619 ***
	(0.0097)	(0.0255)	(0.0205)	(0.0208)	(0.0195)	(0.0197)
GOI	−0.0785 ***	−0.1258 ***	−0.1259 ***	−0.1181 ***	−0.1250 ***	−0.1170 ***
	(0.0079)	(0.0250)	(0.0235)	(0.0224)	(0.0231)	(0.0218)
POA	−1.7780 **	−3.3948 **	−2.3586 **	−3.3668 *	−1.9670 *	−3.0750 *
	(0.6890	(1.4277)	(1.1907)	(1.8032)	(1.1292)	(1.6966)
OPE	−0.0182	−0.0927	−0.0944	−0.0958	−0.0953	−0.0927
	(0.0315)	(0.0649)	(0.0633)	(0.0681)	(0.0641)	(0.0673)
Constant	5.0875 ***	6.4902 ***	5.7676 ***	5.7987 ***	5.6902 ***	5.7381 ***
	(0.0314)	(0.3414)	(0.2905)	(0.3051)	(0.2828)	(0.2966)
With-R^2	0.2409	0.1244	0.1252	0.1240	0.1300	0.1288
Observations	3609	3636	3419	3220	3419	3220

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors in parentheses.

(3) Robustness Test of PSM-DID Method.

To better select the control group, this study used the PSM-DID method to test further. We constructed logit models controlling environmental regulation, human capital, government intervention, population agglomeration, and expanding opening-up. We also used 1:3 nearest neighbor matching. We plotted the kernel density after obtaining the propensity matching scores to ensure the matching quality of the sample data (Figure 5). Figure 5 shows that the post-matching samples have a larger range of overlap compared to the pre-matching samples, and most of the observations are within the common range of

values. In addition, the maximum loss of samples under nearest neighbor matching is shown in Table 4. The experimental and control groups retained 3636 matched samples even after the loss of 46 samples, indicating a good matching effect. Furthermore, to obtain the impact of the NTUC on the URIG after sample matching, we implemented regression using Equation (1), and the results are shown in Model (2) of Table 3. The estimated coefficient of Treated × Time is 0.2202 and significantly negative, indicating that the benchmark regression results are robust.

Table 4. PSM matching results.

	Unmatched Samples	Matching Samples	Total
Control group	44	2812	2856
Experimental group	2	824	826
Total	46	3636	3682

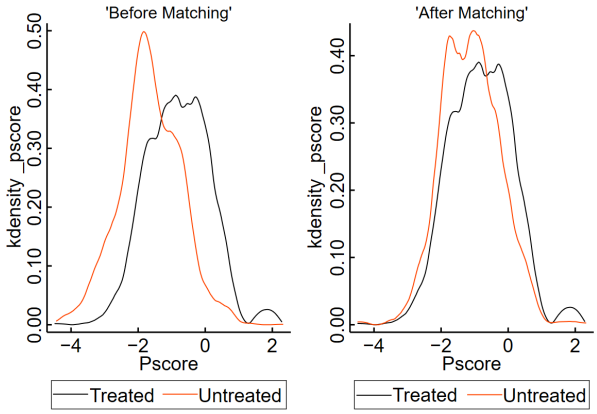

Figure 5. Comparison results of nuclear density before and after matching.

(4) Delete the Observation Value in the Year (2014) of Policy Implementation

After the Chinese government announced the pilot policy of NTUC in May 2014, there was a delay in the implementation of the NTUC documents issued by the central government in each pilot area. The NTUC could not take effect in 2014. Considering this, we removed the observations from 2014 and then used Equation (1) to regress. Model (3) in Table 3 presents the regression results after removing the 2014 observations. The estimated coefficient of Treated×Time was 0.2278, which is still significantly negative.

(5) Robustness Test of the Removal Some Pilot Areas

When we constructed the "Treated" variable, all prefecture-level cities under the jurisdiction of Anhui and Jiangsu Provinces were included in the pilot areas according to the first batch of pilot areas announced by the Chinese government. However, including all prefecture-level cities in the Jiangsu and Anhui Provinces in the pilot areas may lead to biased results. The main reason is that local governments cannot carry out the policy of the NTUC equally in all prefecture-level cities of the Jiangsu and Anhui Provinces. In short, there is bias in the policy implemented by government departments, resulting in the faster implementation of NTUC in some areas and a slower implementation in others. The biased policy implementation leads to inaccurate estimation results. In addition, the sample also included Beijing, Tianjin, Shanghai, and Chongqing as pilot areas. However, when the Chinese government introduced the pilot areas, it did not include all jurisdictions governed by the four municipalities. Instead, the government only used one of the jurisdictions governed by the four municipalities as a pilot area. Therefore, the direct inclusion of the four municipalities as a whole in the Treated group may lead to low results. Consequently, we removed all prefecture-level cities governed by Jiangsu Province and Anhui Province, and deleted the samples from Beijing, Tianjin, Shanghai, and Chongqing.

The regression was then performed using Equaiton (1). The estimated results are shown in Model (4) of Table 3. The estimated coefficient of Treated×Time is −0.3612 and is significant at the 1% level, indicating that the benchmark regression results are robust.

(6) Time-Varying Difference-in-Difference Test

We used the time-varying difference-in-difference model to conduct further verification according to robustness in Method 4 and Method 5. Firstly, the regression results derived using Equation (2) are shown in Model (5) in Table 3, which involved deleting the observation value in 2014. The estimated coefficient of Treated×Time indicates that the NTUC still significantly suppresses the widening of the URIG. In addition, we followed the robustness test of Method (5) by removing all prefecture-level cities under the jurisdiction of Jiangsu and Anhui Provinces, and removing samples from Beijing, Tianjin, Shanghai, and Chongqing. The results obtained from the regression using Equation (2) are shown in Model (6) of Table 3. The estimated coefficient of Treated×Time is −0.3787 and significant at the 1% level. This corroborates the robustness of the benchmark regression results.

4.3. Heterogeneity Analysis

4.3.1. Dynamic Effect of NTUC on the URIG

Given the adaptation period during which local governments implement the policy of the NTUC, there are some deficiencies during the initial implementation of new-type urbanization, and the effect of the NTUC on the URIG is also low. For example, the local governments only implement the new-type urbanization according to the documents issued by the central government. Still, one cannot thoroughly combine the development status of the region with the policy of the NTUC, resulting in a significant reduction in the effectiveness of the NTUC. With the implementation of new-type urbanization, the governments of the pilot areas improved existing shortcomings in the early stage, and later became more skilled in implementing new-type urbanization combined with local characteristics, which improves the effects of the NTUC on the URIG. Therefore, we infer that the inhibitory effect of the NTUC on the URIG may gradually increase with the promotion of NTUC. A dynamic test that includes short-term and long-term considerations was implemented. To test the short-term and long-term effects of the NTUC on the URIG, we defined the "short" impact variable as short term and the "long" impact variable as long term. Specifically, in the first two years (2015, 2016) after the implementation of the new-type urbanization policy, the "short" value was 1. For the experimental group in other periods and all periods of the control group, the "short" value was 0. For the long term, in the last five years (2015, 2016, 2017, 2018, 2019) after the implementation of the new-type urbanization construction policy, the "long" value was 1. For the experimental group in other periods and all periods of the control group, the "long" value was 0. Finally, the interaction term between "short" and "Treated" and the interaction term between "long" and "Treated" were sequentially generated. The results are shown in Model (1) and Model (2) in Table 5.

The estimated coefficients of NTUC on URIG are −0.1684 and −0.1710 in the short term and long term, respectively. In the short term and long term of the implementation of NTUC, the NTUC has a significant inhibitory effect on the URIG, and the long-term impact is more significant than the short-term effect. Meanwhile, the results also indicate that the government should consider the actual situation of local development in order to narrow the URIG while implementing the policy of the NTUC.

Table 5. Estimation results of dynamic effects.

Variables	Short Term	Long Term
	Model (1)	**Model (2)**
Treated × Time	−0.1684 ***	−0.1710 ***
	(0.0423)	(0.0543)
ENR	−1.4034 ***	−1.3843 ***
	(0.2046)	(0.2059)
HUC	−0.1761 ***	−0.1741 ***
	(0.0222)	(0.0217)
GOI	−0.1170 ***	−0.1553 ***
	(0.0214)	(0.0213)
POA	−3.1990 ***	−2.9551 **
	(1.2094)	(1.1675)
OPE	−0.0864	−0.0817
	(0.0587)	(0.0607)
Constant	5.8648 ***	5.8206 ***
	(0.3012)	(0.2984)
With−R^2	0.1214	0.1225
Observations	3682	3682

Notes: ** $p < 0.05$, *** $p < 0.01$; robust standard errors shown in parentheses.

4.3.2. Regional Heterogeneity Analysis

In terms of the quality of the natural environment and resource reserves, or the level of economic development and the speed of urbanization, there are significant differences between eastern, central, and western China. Therefore, the effects of NTUC on URIG may be different in these regions. To explore the regional effect discrepancy of the NTUC on the URIG, we divided the sample into eastern, central, and western, and then regressed using Equations (1) and (2). The estimation results are shown in Table 6.

In the east, the estimation results of Treated×Time in Model (1) of Table 6 show that the effect of the NTUC on the URIG is negative but not significant. The probable reason is that the eastern regions are all located in the coastal areas of China, and are economic agglomeration areas. The development of industrialization and urbanization here started earlier and developed faster. The current stage of urbanization has reached a very high level here. The NTUC is more concerned with giving residents equitable access to higher-level public services, such as infrastructure construction, education, and health care. However, the role of the NTUC in narrowing the URIG is weakened. Instead, the human capital level and government intervention have become the main factors affecting the URIG. For example, from the estimated coefficients in the control variables, it is clear that if human capital increases by 1%, the URIG is significantly reduced by 1.2632%, which is the largest among the eastern, central, and western regions. Government intervention has the same effect. The results also mean that the advanced stage of the NTUC is more concerned with providing equitable public services, such that urban–rural areas share equally the fruits of urbanization.

In the central area, from the estimation results of Model (2) in Table 6, we can see that the NTUC can effectively reduce the URIG by 0.3806%. The main reason is that the NTUC optimizes industrial structure and provides diversified jobs for rural labor with various skills. On the one hand, the labor force enters jobs with matching skill levels, improving the productivity of enterprises and enabling a higher wage premium [41]. On the other hand, with the accumulation of work experience, agricultural laborers can gain higher incomes, decreasing the URIG.

Table 6. Regional heterogeneity regression results.

Variables	Difference-in-Difference			Time-Varying Difference-in-Difference		
	Eastern China	Central China	Western China	Eastern China	Central China	Western China
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
Treated × Time	−0.0148	−0.3806 ***	−0.4904 ***	−0.0824	−0.3754 ***	−0.4324 ***
	(0.0895)	(0.0951)	(0.1174)	(0.0807)	(0.0994)	(0.0862)
ENR	−1.2632 ***	−1.2500 ***	−1.4222 ***	−1.2610 ***	−1.2524 ***	−1.4378 ***
	(0.2160_	(0.1525)	(0.1148)	(0.2153)	(0.3167)	(0.2062)
HUC	−0.5721 ***	−0.1978 ***	−0.1336 ***	−0.5556 ***	−0.1915 **	−0.1283 ***
	(0.0961)	(0.0426)	(0.0151)	(0.0962)	(0.0745)	(0.0156)
GOI	−0.1657 ***	−0.1055 ***	−0.0872 ***	−0.1647 ***	−0.1029 ***	−0.0912 ***
	(0.0406)	(0.0300)	(0.0139)	(0.0405)	(0.0358)	(0.0280)
POA	−1.5132	1.5183	−8.6739 **	−1.3553	1.4955	−6.2190
	(1.6021)	(3.4851)	(4.1086)	(1.6016)	(2.3633)	(4.0977)
OPE	−0.0686	−0.6550 ***	−0.0341	−0.0721	−0.6202 ***	−0.0345
	(0.0765)	(0.2374)	(0.0826)	(0.0763)	(0.2271)	(0.0437)
Constant	9.9821 ***	5.7646 ***	5.7846 ***	9.8001 ***	5.6936 ***	5.6967 ***
	(1.0019)	(0.4629)	(0.2201)	(1.0021)	(0.8385)	(0.2871)
With-R^2	0.1060	0.1093	0.322	0.1067	0.1124	0.3321
Observations	1344	1470	868	1344	1470	868

Notes: ** $p < 0.05$, *** $p < 0.01$; robust standard errors in parentheses; eastern China (Beijing, Tianjin, Hebei Province, Liaoning Province, Shanghai, Jiangsu Province, Zhejiang Province, Fujian Province, Shandong Province, Guangdong Province, Hainan Province); central China (Shanxi Province"山西省", Inner Mongolia Autonomous Region, Jilin Province, Heilongjiang Province, Anhui Province, Jiangxi Province, Henan Province, Hubei Province, Hunan Province); western China (Sichuan Province, Chongqing Municipality, Guizhou Province, Yunnan Province, Shanxi Province"陕西省", Gansu Province, Qinghai Province, Ningxia Hui Autonomous Region, Xinjiang Uygur Autonomous Region, Guangxi Zhuang Autonomous Region).

In the western region, the estimation results in Model (3) show that the NTUC can also effectively reduce the URIG. Specifically, the NTUC reduces the URIG by 0.4904%. The main reason is that the urbanization and economic development are relatively low in the west, enabling the new-type urbanization policy to produce more significant effects. In addition, the NTUC provides more jobs for the labor force to earn a higher wage premium [52]. As some rural residents migrate to urban areas, the per capita resources of the remaining labor force increase, and the income increases [7].

To ensure that the difference-in-difference regression results are accurate, we used a time-varying difference-in-difference model for robustness testing. The estimation results of the time-varying difference-in-difference model are presented in Model (4), Model (5), and Model (6), respectively. The estimation results of the time-varying difference-in-difference model are consistent with Model (1), Model (2), and Model (3). Therefore, the benchmark regression results are robust.

To sum up, the results indicate that the negative effect of the NTUC on the URIG gradually increases over time, as shown in Table 5. The results show that the negative effect of NTUC on the URIG is not significant in the east, and is significant in the central and western regions (Table 6). In actuality, the NTUC advances the quality of urbanization to a higher stage as practice progresses. For example, the eastern region has the highest level of economy and urbanization, followed by the central region, and the western region has the smallest. From the empirical results, the effect of the NTUC on the URIG shows an upward trend over time. However, the impact of the NTUC on the URIG is not significant in the eastern region, with a higher urbanization level, and is significant in the central and western areas with a lower urbanization level. Thus, we recognize that the effect of the NTUC on the URIG is gradually strengthened in the early and middle stages of the

NTUC's implementation by local government. The effect of the NTUC on the URIG can be replaced by other factors, such as human capital and government intervention, in the advanced stage of the NTUC. We will perform further verifications in the follow-up study.

4.4. Mediating Effect Test

4.4.1. Estimated Results of Hypothesis 2

According to the theoretical mechanism analysis, the NTUC can indirectly affect the URIG through industrial structure upgrading. Therefore, we empirically tested the mediating effect of industrial structure upgrading. The mediating effect model test is divided into three steps: The first step is to test the total effect of the NTUC on the URIG (Equation (1)). The second step is to test the effect of the NTUC on mediating variables (Equation (3)). The third step is to test the direct impact of the NTUC on the NTUC, and the indirect impact of the NTUC on the NTUC through a mediating variable (Equation (4)). Model (2) in Table 2 has already listed the total effects of the NTUC on the URIG. Therefore, they are not listed in Table 7. A mediating effect exists on the premise that the estimated coefficients of the core explanatory variables in Equations (1), (3) and (4) are all significant, and the direct effect of the NTUC on the URIG is smaller than the total effect. The regression results are shown in Model (2) in Table 2 and Model (1) and Model (2) in Table 7. Meanwhile, to ensure the robustness of the empirical results, we also used the time-varying difference-in-difference model to estimate, and the results are shown in Model (4) in Table 2 and Model (3) and Model (4) in Table 7. It can be seen from the results that the regression of each model meets the standards of the mediating effect. The time-varying difference-in-difference model verifies the robustness of the regression results.

Table 7. Mediating effect test of industrial structure upgrading.

Variables	Difference-in-Difference		Time-Varying Difference-in-Difference	
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**
Explanatory variables	ISU	URIG	ISU	URIG
Treated×Time	0.0234 ***	−0.1554 ***	0.0263 ***	−0.1912 ***
	(0.0024)	(0.0566)	(0.0020)	(0.0489)
ISU		−3.8297 ***		−3.6613 ***
		(0.4058)		(0.4097)
ENR	0.0536 ***	−1.1497***	0.0534 ***	−1.5141 ***
	(0.0039)	(0.0960)	(0.0039)	(0.0956)
HUC	0.0077 ***	−0.1412 ***	0.0072 ***	−0.1388 ***
	(0.0008)	(0.0187)	(0.0008)	(0.0187)
GOI	−0.0020 ***	−0.1217 ***	−0.0021 ***	−0.1201 ***
	(0.0006)	(0.0147)	(0.0006)	(0.0147)
POA	−0.0005	−2.2531 *	−0.0251	−2.0277
	(0.0553)	(1.3116)	(0.0547)	(1.3090)
OPE	0.0191 ***	−0.0190	0.0190 ***	−0.0225
	(0.0025)	(0.0599)	(0.0025)	(0.0598)
Constant	0.7548 ***	8.6330 ***	0.7602 ***	8.4603 ***
	(0.0087)	(0.3699)	(0.0087)	(0.3742)
With-R^2	0.1404	0.1473	0.1584	0.1493
Observations	3682	3682	3682	3682

Notes: * $p < 0.1$, *** $p < 0.01$; robust standard errors in parentheses.

Model (2) in Table 2 shows that the total effect of the NTUC on the URIG is −0.2449 and significant, indicating that the NTUC can effectively narrow the URIG. Model (1) in Table 7 shows that the NTUC promotes industrial structure upgrading, and the regression coefficient is 0.0234. Model (2) in Table 7 shows that the effect of the industrial structure

upgrading on the URIG is −3.8297 and significant. According to the mediating effect model mechanism, the direct effect of the NTUC on the URIG is −0.1554. The indirect impact of the NTUC on the URIG is −0.0896, enacted through industrial structure upgrading, accounting for 36.5925% of the total effect. Hypothesis 2 is verified. On the one hand, the policy of the NTUC favors rural areas and promotes industrial structure, which causes some agricultural populations to shift to non-agricultural jobs, such as rural tourism, farmhouse entertainment, e-commerce, and other service industries. This has helped raise the incomes of non-farm workers. Agricultural laborers also enjoyed wage premium dividends due to the industrial structure upgrading, thus narrowing the URIG. On the other hand, under the influence of the NTUC, the industrial structure upgrading in urban areas generated more employment opportunities and led urban areas to absorb more of the agricultural population, which increased the income level of the agricultural labor force and narrowed the URIG.

4.4.2. Results Estimated of Hypothesis 2

The mechanism analysis shows that the NTUC can narrow the URIG by improving the financial level. We also used the mediating effect model to test the indirect effect. Because Section 4.4. has thoroughly discussed the test steps of the mediating model and the standards of the mediating effect, we will not elaborate this further. The estimated coefficients of the core explanatory variables of Model (2) in Table 2 and Model (1) and Model (2) in Table 8 are significant, and the direct effect of the NTUC on the URIG is smaller than the total effect, which meets the standards of the mediating model. To ensure the robustness of the empirical results, we also list the estimation results of the time-varying difference-in-difference model. The estimated coefficients of the core explanatory variables of Model (4) in Table 2 and Model 3 and Model (4) in Table 8 are negative and significant, which shows that the benchmark regression results are robust.

Table 8. Mediating effect test of financial development.

Variables	Difference-in-Difference		Time-Varying Difference-in-Difference	
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**
Explanatory variables	FDL	URIG	FDL	URIG
Treated×Time	0.6897 ***	−0.2196 ***	0.8509 ***	−0.2599 ***
	(0.1204)	(0.0566)	(0.1025)	(0.0486)
FDL		−0.0366 ***		−0.0336 ***
		(0.0080)		(0.0080)
ENR	0.9967 ***	−1.3185 ***	0.9725 ***	−1.3168 ***
	(0.2018)	(0.0948)	(0.1999)	(0.0942)
HUC	0.2395 ***	−0.1620 ***	0.2226 ***	−0.1578 ***
	(0.0398)	(0.0187)	(0.0397)	(0.0187)
GOI	0.3200 ***	−0.1022 ***	0.3165 ***	−0.1022 ***
	(0.0318)	(0.0151)	(0.0316)	(0.0151)
POA	5.4616 *	−2.0512	4.4053	−1.7878
	(2.8304)	(1.3253)	(2.8131)	(1.3212)
OPE	1.6067 ***	−0.0332	1.6090 ***	−0.0381
	(0.1281)	(0.0613)	(0.1273)	(0.0612)
Constant	−2.2230 ***	5.6607 ***	−2.0130 ***	5.6093 ***
	(0.4474)	(0.2101)	(0.4458)	(0.2099)
With-R^2	0.1076	0.1304	0.1168	0.1338
Observations	3682	3682	3682	3682

Notes: * $p < 0.1$, *** $p < 0.01$; robust standard errors shown in parentheses.

Model (2) in Table 2 shows that the effect of the NTUC on the URIG is −0.2449 and significant, indicating that the NTUC can reduce the URIG. Model (1) in Table 8 shows that the NTUC can promote financial development, and the effect coefficient is 0.6897. Model (2) in Table 8 shows that the effect of financial development on the URIG is −0.0366 and significant. According to the mediating effect model's mechanism, the direct effect of the URIG on the URIG is −0.2196. The indirect impact of the NTUC on the URIG is −0.0252, through financial development, accounting for 10.3075% of the total effect. Hypothesis 3 is verified. The NTUC accelerated the reform of investment and financing mechanisms, broadened financing channels and innovative market-oriented financing models, which promoted the development of rural finance. Financial development increased financial services and reduced the dependence of agricultural populations on informal finance through peer-to-peer assistance, improving production efficiency and narrowing the URIG. In addition, the URIG can effectively revitalize the stock of rural assets, improving agricultural profits and reducing the URIG.

4.4.3. Results Estimated of Hypothesis 3

The mechanism analysis shows that the NTUC can narrow the URIG by improving the level of digital development. We used the mediating effect model to test the indirect effect. The regression coefficients of the core explanatory variables of Model (2) in Table 2 and Model (1) in Table 9 are significant, and the direct effect of the NTUC on the URIG is smaller than the total effect, which meets the standards of the mediating model. To ensure the robustness of the regression results, we also used the time-varying difference-in-difference model to verify further. The results are shown in Model (4) in Table 2 and Model (2) in Table 9. The coefficients and significance of the core explanatory variables estimated by the time-varying difference-in-difference model indicate the robustness of the benchmark regression results.

Table 9. Mediating effect test of digital development.

Variables	Difference-in-Difference		Time-Varying Difference-in-Difference	
	Model (1)	**Model (2)**	**Model (3)**	**Model (4)**
Explanatory variables	DGE	URIG	DGE	URIG
Treated×Time	0.0267 ***	−0.1884 ***	0.0265 ***	−0.2356 ***
	(0.0029)	(0.0569)	(0.0025)	(0.0488)
DGE		−2.1096 ***		−1.9918 ***
		(0.3295)		(0.3303)
ENR	0.0271 ***	−1.2978 ***	0.0276 ***	−1.2944 ***
	(0.0049)	(0.0946)	(0.0049)	(0.0941)
HUC	0.0042 ***	−0.1620 ***	0.0038 ***	−0.1578 ***
	(0.0010)	(0.0186)	(0.0010)	(0.0186)
GOI	0.0009	−0.1121 ***	0.0009	−0.1111 ***
	(0.0008)	(0.0148)	(0.0008)	(0.0148)
POA	0.1813 ***	−1.7689	0.1686 **	−1.6000
	(0.0686)	(1.3221)	(0.0683)	(1.3183)
OPE	−0.0119 ***	−0.1173 **	−0.0122 ***	−0.1165 *
	(0.0031)	(0.0599)	(0.0031)	(0.0598)
Constant	0.0140	5.7718 ***	0.0177	5.7123 ***
	(0.0108)	(0.2088)	(0.0108)	(0.2088)
With-R^2	0.0602	0.1354	0.0683	0.1385
Observations	3682	3682	3682	3682

Notes: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$; robust standard errors shown in parentheses.

Model (2) in Table 2 shows that the NTUC can reduce the URIG. Model (1) in Table 9 indicates that the NTUC can promote digital development, and the effect coefficient is 0.0267. Model (2) in Table 8 shows that the effect of the financial development on the URIG is −0.1884. According to the mediating effect mechanism, the direct effect of the NTUC on the URIG is −0.2196. The indirect impact of the NTUC on the URIG is −0.0563, through digital development, accounting for 22.9997% of the total effect. Hypothesis 4 is verified. The NTUC promotes informatization, digitalization, and intelligent development, and improves communication infrastructure construction, strengthening the rural digitalization level. Digital development can reduce the cost of searching for information, and break the dispersion of urban–rural employment opportunities, which helps improve the income level of rural residents and reduces the URIG. At the same time, the integrated development of digitalization and industry can effectively improve production efficiency, causing the the agricultural population's income to increase and reducing the URIG.

5. Conclusions and Discussions

5.1. Conclusions

Abandoning the crude urbanization pattern of the past and building a new type of urbanization model has become essential. More importantly, the NTUC's role of reducing the URIG should be fully developed (Table 2). For example, the important goal of the NTUC is to relocate the agricultural population, allowing them to access a higher income. Therefore, the local government continuously strengthens the carrying capacity of urban public services according to the changing trends of the resident population. The government provides a more convenient exchange platform for the labor force so as to promote an increase in low-skilled laborers' abilities and offer them a higher income. Meanwhile, in the process of the NTUC, the local government should vigorously strengthen urban–rural integration development [64], so that rural residents can enjoy more urban "fruits".

In addition, the effect of the NTUC on the URIG shows an ascending trend (Table 5), and regional differences between the eastern, central, and western areas (Table 6). This indicates that the local government should improve the level of human capital and education. It also rationalizes the mechanism of taxes, relocations and public infrastructure at the mature stage of urbanization construction, and in economically developed regions (e.g., eastern China). Local governments should promote the NTUC and fully develop the role of the NTUC in narrowing the URIG, such as in the central and western regions, at the lower stage of NTUC, and in developing regions.

Finally, The NTUC reduces the URIG through industrial structure upgrading, financial development, and digital development. Thus, in terms of industrial structure upgrading, local governments should combine the advantages of local resources, industry and location, take advantage of the NTUC, and strive to promote the transformation of industrial structure towards mid–high industry. Simultaneously, local governments also need to cultivate new industries and improve their capacity to accommodate the migrant agricultural population. Rural areas rely on their own agricultural characteristics, developing modern agriculture and improving agricultural production efficiency. In terms of financial development, we need to encourage the development of rural finance, especially its breadth and depth of coverage, when promoting the NTUC. Regional differences have to be taken into account when the government formulates policies for financial kulaks. The pace and quality of financial development have been balanced. For digital development, local governments should take advantage of the policy of the NTUC to increase rural infrastructure construction, especially in terms of communications, transportation, and so on. The government should also encourage and support the development of agro-ecotourism and cultural exchanges based on digital technologies. In addition, digital technology should be used to link urban and rural markets, and develop the natural attributes and advantages of agriculture. Through the above strategies, the effect of the NTUC on the URIG will be fully released.

5.2. Discussions

Focusing on the policy of the NTUC proposed in 2014, we used the difference-in-difference model to explore the NTUC's impact on the URIG, using the panel data of 263 prefecture-level cities from 2007 to 2020. The specific research steps were as follows. Firstly, we summarized the current research results, and deduced the mechanism of the NTUC's effect on the URIG. Secondly, we used the difference-in-difference model to study the effect of NTUC on the URIG, and a series of robustness tests were conducted. We also explored the dynamic effects and regional heterogeneity. Finally, we used the mediating effect model to study the impact of the NTUC on the URIG through industrial structure upgrading, financial development, and digital development. A series of findings were obtained, as follows.

Firstly, the difference-in-difference regression results (Table 2) show that the NTUC reduces the URIG by 0.2449, showing that the NTUC is likely to increase the income of rural residents compared to urban areas. This conclusion was held through the placebo test, 1% shrinkage tail treatment, the PSM-DID method, the removal of observations from the 2014 sample, the removal of some pilot areas of NTUC, and time-varying difference-in-difference model verification (Figure 4; Table 4). Secondly, the effect of NTUC on URIG was shown to be −0.1684 in the short term and -0.1710 in the long term, with a significant upward trend (Table 5). Thirdly, the effect of the NTUC on the URIG was found to be −0.0148, but insignificant, in the east. The NTUC has a significant negative impact on the URIG in the central and western regions. The regression results of the time-varying difference-in-difference model indicate that the effects of the NTUC on the URIG are robust in the eastern, central, and western regions (Table 6). Finally, industrial structure upgrading, financial development and digital development are the intermediate variables by which the NTUC narrows the URIG. This result still holds through the testing of the time-varying difference-in-difference model.

Obviously, the research results show that the implementation of "people-oriented" new-type urbanization construction in China can not only effectively narrow the URIG, but can also significantly reduce the URIG by optimizing the industrial structure, and promoting financial and digital development. This conclusion holds true for most developing countries in Southeast Asia, Africa and Central Asia. The specific reasons are as follows: The NTUC is a new-type model of urban–rural development. This model not only takes into account the equalization of public services, the life fairness and employment equality of the agricultural population, and so on, in urban–rural areas, but also takes into account the issue of rural revitalization. Meanwhile, the regional heterogeneity analysis (Table 6) provides suggestions for the implementation of the new-type urbanization model in countries with development levels similar to those in eastern, central and western China. Industrial structure optimization, as well as financial and digital development, must be considered in the urban–rural development of each country.

5.3. Deficiencies and Prospects

Although this study not only provides a reference for other regions implementing the NTUC policy, but also provides a new means to narrow the URIG by leveraging the NTUC policy, it also has shortcomings related to data and study scope. Firstly, we used Chinese prefecture-level cities' panel data, and did not use county-level panel data, which can lead to a bias in the regression coefficients. Secondly, in order to keep the effect by which the NTUC narrows the URIG smoothly and finally achieves shared prosperity, improvements to the policy of NTUC are not explored. This will be the focus of our future research.

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