

Article

Global Value Chain Participation, Employment Structure, and Urban–Rural Income Gap in the Context of Sustainable Development

Shuguang Liu ^{1,2}, Xiaowen Tang ¹ and Yubin Zhao ^{1,*}

¹ School of Economics, Ocean University of China, Qingdao 266100, China; 2000046@ouc.edu.cn (S.L.); tangxiaowen@stu.ouc.edu.cn (X.T.)

² Institute of Marine Development, Ocean University of China, Qingdao 266100, China

* Correspondence: zhaoyubin@stu.ouc.edu.cn

Abstract: Currently, the trend of globalization is evident, and global value chain participation has had a significant impact on the urban–rural income gap in China. This article takes sustainable development as the background and constructs a theoretical mechanism for the impact of global value chain participation on the urban–rural income gap and uses a two-way fixed effects model to empirically test data from 30 provinces in China from 2005 to 2014. Research finds that global value chain participation significantly widens the urban–rural income gap. Compared to the central and western regions, the participation of the eastern region in the global value chain has a more significant effect on widening the urban–rural income gap. Further research has found that employment structure plays a partial mediating role in the process of global value chain participation in widening the urban–rural income gap. The factor endowment structure and industrial structure upgrading can significantly strengthen the mechanism of global value chain participation in optimizing the employment structure. This article’s research findings have significant practical implications for reducing the income gap between urban and rural areas and fostering sustainable development in both.

Keywords: global value chain participation; urban–rural income gap; employment structure; factor endowment structure; industrial structure upgrading



Citation: Liu, S.; Tang, X.; Zhao, Y. Global Value Chain Participation, Employment Structure, and Urban–Rural Income Gap in the Context of Sustainable Development. *Sustainability* **2024**, *16*, 1931. <https://doi.org/10.3390/su16051931>

Academic Editors: Ketil Lelo, Salvatore Monni and Federico Tomassi

Received: 15 January 2024

Revised: 20 February 2024

Accepted: 22 February 2024

Published: 27 February 2024



Copyright: © 2024 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

The 2030 Agenda for Sustainable Development issued by the United Nations sets out the goals of building sustainable cities and reducing inequality, and the document prominently states the need to eradicate poverty and integrate resources for the development of rural areas. Narrowing the urban–rural income gap (URIG) and promoting sustainable urban and rural development have received extensive attention from governments. With the continuous progress of urbanization, there are sustainable development imbalances between urban and rural areas in China [1]. At present, scholars have been exploring the factors that can narrow the urban–rural gap from the perspective of sustainable development, believing that urban–rural migration [2], urban–rural community planning [3], central village construction [4], and entrepreneurial urban–rural connections are important ways to promote sustainable urban–rural development [5]. The Chinese Bureau of Statistics announced that the rate of increase in rural residents’ incomes has surpassed that of urban residents in recent times, and that the ratio of urban to rural incomes has decreased from 3.22 in 2005 to 2.45 in 2022. These data indicate a narrowing of the income gap in China and a notable advancement in the sustainable development of both urban and rural areas. However, the fact is that from an international perspective, the problem of unsustainable urban–rural development is still prominent in China, and the URIG is greater than the international average [6]. The Chinese government has indicated that it wants to explore

various channels for increasing the factor income of middle- and low-income people, as well as multiple channels for increasing the property income of urban and rural residents, so as to promote the sustainable development of China's urban and rural incomes. Therefore, narrowing the URIG and cracking down on the urban–rural divide are of great practical significance in promoting the sustainable development of urban and rural areas in China.

Scholars have performed substantial research in an attempt to explain the elements that affect the URIG [7,8]. In recent years, the world economy has become gradually more integrated as countries' participation in the global value chain (GVC) continues to increase [9]. The GVC Development Report 2023 states that foreign inputs accounted for 28% of merchandise exports in 2022, a record high. As a core part of globalization, the economic and social effects of the GVC have received extensive attention from academics, and they play a crucial part in increasing productivity [10], promoting economic growth, and raising the employment level of the workforce. However, scholars have overlooked the impact of the distribution of international trade benefits on China's URIG following China's greater participation in international trade. In fact, participation in international trade has created new requirements for workers' skills, labor mobility, and work regions. These requirements have affected the income gap to some extent. In today's era of economic globalization, the promotion of sustainable development in China's urban and rural areas should be based on exploring internal factors while paying attention to changes in the external environment and exploring new paths for sustainable development in urban and rural areas from the perspective of globalization.

The existing literature on the GVC and income disparity falls into two main categories. Some scholars believe that GVC participation widens the income gap [11]. Pahl et al. indicate that the productivity of firms participating in GVC production is higher than that of non-participating firms, and, therefore, workers' wages are higher in firms participating in GVC production [12]. Meanwhile, Han et al. argue that regions more affected by globalization have experienced greater changes in wage inequality than regions less affected by globalization [13]. Aguiar de Medeiros and Trebat similarly conclude that GVC participation increases income disparities between countries [14]. Bo Chen et al. also note that since trade liberalization, there has been a notable rise in wage disparity in China's manufacturing sector between skilled and unskilled workers [15]. Crinò believes that the offshore outsourcing of services affects the composition of labor demand, increasing the relative demand for medium- to high-skilled workers [16]. Foster-Megregor et al. find that middle-skilled workers were the most affected in terms of shrinking labor demand [17]. Ndubuisi and Owusu's research find that high-income individuals benefit more from participating in the GVC [18]. Rural labor has weaker profit opportunities in participating in the GVC than urban labor due to a lack of corresponding skills [19]. Wang et al. also point out that an increase in a firm's GVC position as well as upgrading to an upstream sector exacerbates inequality in skilled wage opportunities [20]. In addition, there are other scholarly studies that take the opposite view. Gonzalez et al. point out that low-technology-intensive outsourcing is associated with narrowing the income gap, while high-technology-intensive outsourcing is associated with widening the income gap, but GVC participation narrows the income gap because low-technology-intensive outsourcing is overall more frequent [21,22]. Cai et al. argue that the effect of GVC participation in reducing income disparity by increasing the share of labor is stronger than the effect of heterogeneous labor in widening the wage gap, thus exhibiting a negative impact on domestic income inequality [23]. Lin and Rong find that countries' participation in the GVC reduces domestic income disparities and that this relationship is independent of the types of products exported as well as the level of development of the exporting country [24]. Zheng and Wang also believe that trade attracts foreign investment to promote economic development and narrow income gaps [25]. Cerdeiro and Komaromi's research suggests that trade improves people's living standards in the long run and benefits those at the lower end of the income distribution more due to trade integration [26]. Wang et al. also

pointed out that when trade increases the per capita income of urban and rural areas, its impact on rural areas is more pronounced, thereby narrowing the URIG [27].

Based on the above literature, it is found that there are few existing studies on the relationship between the GVC and the URIG, and more research is focused on the relationship between the GVC and the income gap. This article aims to address some of the issues in existing research. First, existing literature explores the causal relationship between the GVC and the income gap from an economic perspective. However, there is insufficient discussion on sustainable development between urban and rural areas, and there is little literature support. This article attempts to provide a reference for existing research fields from the perspective of sustainable development between urban and rural areas. Second, existing articles have inconsistent conclusions on GVC and URIG, mainly due to different research samples and regions. In addition, due to different scholars using different econometric methods for the same problem, there are also differences in regression results. Third, the existing literature has not explored the impact of GVC on URIG from the perspective of employment structure. New moderating variables can help address this issue from the perspective of labor employment structure. Therefore, based on China's current development, we mainly address the following issues: Will China's participation in the GVC expand or shrink the URIG? What is the mechanism by which GVC participation affects the URIG? Is there a regional difference in the impact of GVC participation on the URIG? Accurately answering these questions has theoretical and practical significance for reducing China's URIG and achieving sustainable development goals in the context of globalization.

In terms of research methodology, this article adopts a two-way fixed effects model and empirically tests the impact of GVC participation on China's URIG using provincial data from 2005 to 2014. The two-way fixed effects model is a form of a fixed effects model that is used for the linear regression of panel data. The appearance of this model somewhat makes up for ordinary least squares models' disregard of potential individual or temporal differences [28]. Within the fixed effects model are three types of models: individual, temporal, and two-way fixed effects. The individual fixed effects model, by incorporating individual fixed effects, can control individual characteristics that do not change over time, alleviate the problem of missing variables that vary with individuals, and aid in the accurate assessment of causal links. Likewise, temporal fixed effects are included in the temporal fixed effects model, which aids in controlling temporal trends and can address the issue of missing variables that change over time but not with individuals. Based on this, the two-way fixed effects model takes into account both temporal and individual fixed effects. It is frequently employed to handle conditions where there are individual- and time-specific influences in panel data [29,30], and researchers can make more accurate results by using this model. For example, Li's research, Shi and Jiang's research, and others all used a two-way fixed effects model to study the impact of globalization on income inequality [31,32].

Based on the studies outlined above, this paper may have the following contributions: First, in terms of research perspective, compared with the existing literature that focuses on income inequality in the international and inter-provincial context, this study investigates how GVC participation affects the URIG. The analysis from an urban–rural perspective expands, to a certain extent, the methodology for promoting sustainable development in urban and rural areas. Second, in terms of research mechanism, this study analyzes the mediating effect of employment structure on the relationship between GVC participation and the URIG and further explores the moderating effects of factor endowment structure and industrial structure upgrading, which helps to enrich the research on the influence of the GVC in the URIG. Third, in terms of research indicators, this paper utilizes the 2005–2014 China Customs Database to measure the GVC participation of Chinese provinces and further investigates the differential impact of GVC participation on the URIG in different regions, which is a useful supplement to existing research.

The structure of this study is as follows. Section 2 introduces the theoretical mechanisms of the GVC, employment structure, and the URIG and proposes hypotheses. Section 3 introduces the main variables and the data used, as well as the empirical model. Section 4 summarizes the results from regression analysis, including benchmark regression, robustness test, heterogeneity test, and mechanism test, and discusses the regression results. Section 5 draws conclusions and suggestions.

2. Theoretical Background and Hypothesis Development

In the context of sustainable development, many studies have shown that with the deepening of economic globalization, trade patterns have changed, and urban and rural development has also been affected accordingly. The influence of GVC participation on URIG can be broadly classified into the following categories. First, the participation of enterprises in the GVC increases productivity, enabling more value to be created per unit of input, leading to enterprise scale-up and urban sector economic growth [33]. Basic economic theory suggests that workers should typically receive compensation based on their marginal products. As a result, increasing enterprise productivity can result in higher demand and market share, and the corresponding rise in enterprise profits can create jobs, raise worker welfare, and raise income levels for both urban and rural populations [34,35]. However, the increased income from participation in the GVC cannot be equally distributed among the labor force, thus creating an impact on income inequality. There are considerable distinctions in the participation of urban and rural labor forces in GVC production, as well as differences in income levels, and globalization poses challenges to the equal sustainable development of urban and rural areas [36]. Second, the increase in employment opportunities brought about by GVC participation causes rural labor to move to cities and increases their non-farm income [37]. The complete free movement of labor between regions can narrow the URIG and enhance urban–rural sustainability. In fact, China’s urban–rural dual economic structure is prominent, and the degree of regional integration is not high, so when the rural labor force flows to the cities, there are structural contradictions, and the effect of rural income growth is not good [38,39]. Meanwhile, the rural labor force mainly flows to the industrial and service sectors with lower technology level, and this flow sacrifices the modernization process of rural areas, which further widens the URIG [40]. In addition, due to the insufficient education and skill level of rural labor, agricultural transfer labor has become the main component of low-skilled labor and is generally at a disadvantage in the job market, with its income growth rate lower than that of urban labor [41]. Enterprises participating in the GVC often reduce costs by using advanced technology to replace low-skilled labor and lowering wage levels in response to market competition. Due to the relatively low skill level and strong substitutability of rural labor, they may face the risk of unemployment and wage decline, which will have adverse effects on the sustainable development of urban and rural areas.

China actively integrates into the GVC and promotes significant growth in employment scale. Furthermore, it has been found that the increase in GVC participation has also had a significant impact on employment structure [42], mainly including the following two paths: First, the factor endowment structure. On one hand, there are differences in factor endowments when countries take part in the division of labor in the GVC. Developed countries move labor-intensive industries to developing countries in accordance with their comparative advantages in order to obtain labor cost advantages. Due to a certain gap in technological level between developing countries and developed countries, the portion of the value chain that they undertake still belongs to high-tech production links, which increases the relative demand for high-skilled labor in developing countries and affects the employment structure [43]. On the other hand, the optimization of the factor endowment structure enhances the competitive advantage of enterprises in participating in the GVC, which leads to a more efficient allocation of resources among enterprises and encourages them to transform into capital-intensive enterprises [44,45]. In this process, the reallocation of capital leads to labor mobility, with higher-skilled labor flowing to capital-intensive

enterprises, which increases the demand for high-skilled labor and changes the employment structure [46]. The second is the upgrading of industrial structure. On one hand, the participation of enterprises in the GVC leads to more intense market competition. In order to occupy a favorable position in international competition, it is necessary to continuously upgrade product quality and production technology and improve enterprise productivity [47]. As there is a correlation between the productivity of enterprises participating in the GVC and the size of the highly skilled workforce, there is an employment substitution effect, leading to an increase in the proportion of highly skilled labor in enterprises [48]. In addition, the division of labor and cooperation among countries in the GVC is beneficial for reducing production costs, expanding market size, and improving profitability [49]. With the expansion of production scale and further upgrading of industrial structure, the demand for high-skilled labor by enterprises participating in the GVC will also further expand. On the other hand, the production and processing activities in the GVC contain a large amount of knowledge and skill combinations. Utilizing the “learning by doing” effect to learn advanced technologies from developed countries can optimize industrial structure and generate technological progress effects [50]. Due to the superior ability of high-skilled labor to match technological progress compared to low-skilled labor [51], the demand for high-skilled labor by enterprises has increased, thereby optimizing the domestic employment structure [52].

While GVC participation affects the structure of employment, it also leads to changes in the corresponding wage shares. According to the Heckscher–Ohlin model and the Stolper–Samuelson theorem, the price of a factor of production grows if it is used intensively in the production of a product; thus, GVC participation may increase the skill premium across the entire economy [53]. Since urban residents tend to have higher skill levels than rural residents, they are able to earn higher incomes in enterprises participating in the GVC [54], whereas rural laborers may suffer from unstable employment and slow wage growth, leading to a widening of the URIG [55].

Based on the analysis in the previous text, this article proposes the following hypotheses:

Hypothesis 1: *GVC participation widens the URIG.*

Hypothesis 2: *Employment structure plays a mediating role in the impact of GVC participation on the URIG.*

Hypothesis 3: *Factor endowment structure and industrial structure upgrading can strengthen the optimizing effect of GVC participation on employment structure.*

In Figure 1, the theoretical framework is displayed.

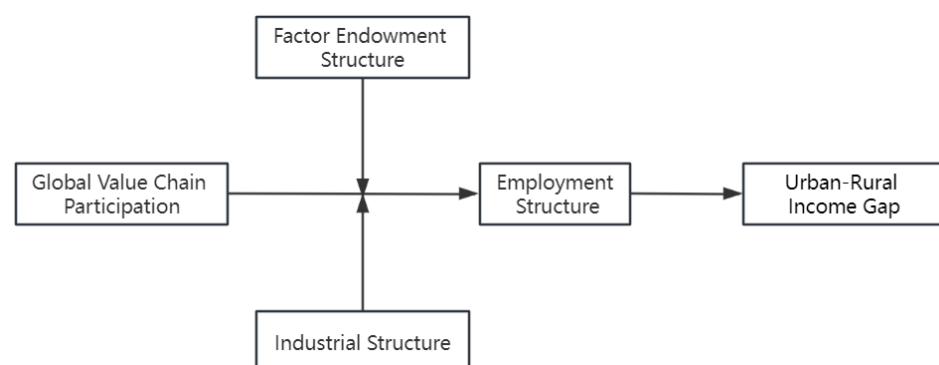


Figure 1. Theoretical analysis framework.

3. Data and Methods

3.1. Variable Selection and Data Sources

3.1.1. Dependent Variable

A reasonable URIG is the key to promoting sustainable urban–rural development [56]. The methods of measuring the URIG in the existing literature mainly include the urban–rural residents’ income ratio, the Gini coefficient, and the Theil index. The urban–rural residents’ income ratio measures the disparity in the per capita disposable income between urban and rural areas. Nevertheless, this method does not account for the influence of the urban–rural population structure [57]. The Gini coefficient responds more to changes in middle-class income, whereas the URIG in China mostly reflects the two extremes. The Theil index, which Hermann Theil developed in 1967, is a commonly used metric to assess the degree of inequality in the distribution of wealth or income [58]. The Theil index divides the URIG into the intra-group income gap and inter-group income gap, taking into account the factors of population fluctuations. In addition, the Theil index more accurately reflects the changes in income distribution between high-income and low-income groups, which is more in line with the actual situation in China. Therefore, due to the advantages of the Theil index compared to the first two methods, this article chooses the Theil index to measure the URIG, with the following formula.

$$TL_{it} = \sum_{j=1}^2 \left(\frac{P_{ij,t}}{P_{i,t}} \right) \ln \left[\left(\frac{P_{ij,t}}{P_{i,t}} \right) / \left(\frac{Z_{ij,t}}{Z_{i,t}} \right) \right] \quad (1)$$

where $j = 1$ denotes urban areas and $j = 2$ denotes rural areas. TL_{it} is the Theil index, which refers to the URIG. $P_{i,t}$ is the total income of each province, and $P_{ij,t}$ denotes the income of urban or rural residents. $Z_{i,t}$ refers to the total population of each province, and $Z_{ij,t}$ represents the number of urban or rural populations. The closer the indicator value is to 0, the smaller the URIG, and conversely, the farther the indicator value is from 0, the larger the URIG.

Figure 2 illustrates the trend of the URIG in China from 2005 to 2014. From a national perspective, the URIG appeared to follow a downward trend during the observation period, from 0.132 in 2005 to 0.092 in 2014, with a decrease of 30.3% and an average annual decrease of 3.93%. While there is a sizable disparity between the areas, the URIG in the eastern, central, and western regions coincides with the national trend. Of them, the eastern area has the lowest URIG, followed by the central region; both have lower income gaps than the national average over the same time period. The western region has the largest URIG, and this difference is substantial when compared to the national average level. The reason for this is that the eastern region has a significant advantage in terms of resource factors, and the cities and villages are developing at a fast pace and at a high level of integration. With the help of national strategies like Precision Poverty Alleviation and Western Development, the central and western regions have accelerated the flow of factors between urban and rural areas and improved transportation accessibility, but there is still a significant development gap in the eastern regions and low integration between urban and rural areas.

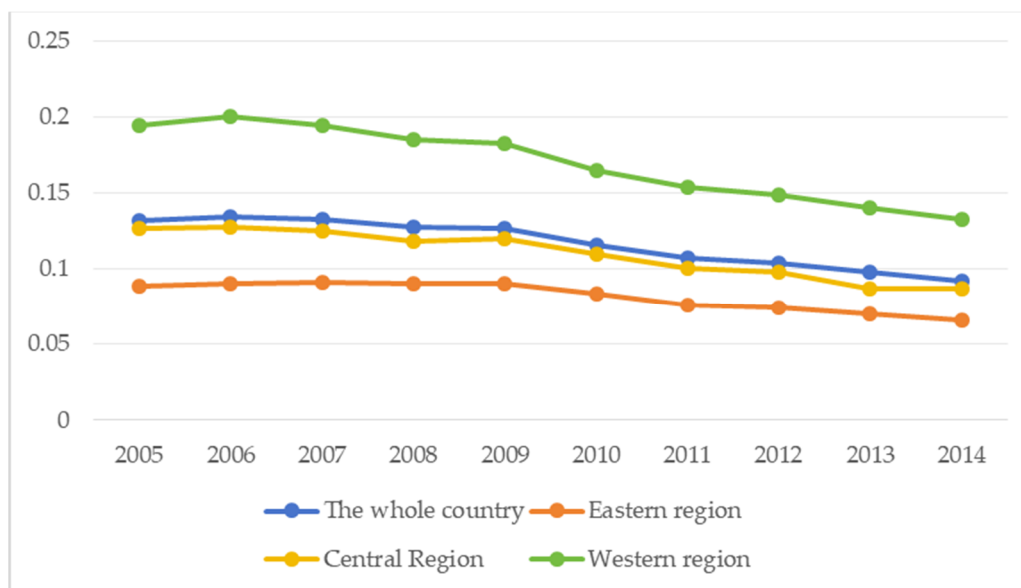


Figure 2. Trends in China's urban–rural income gap, 2005–2014.

3.1.2. Independent Variable

GVC participation is the degree of a country's participation in the division of labor in the global value chain. Hummels et al. [59] proposed vertical specialization, which measures GVC participation by using the proportion of imported intermediate products in total exports. Koopman et al. [60] used the World Input–Output Tables to manage the bias in the results due to duplicated statistics by using the value-added trade accounting method. Zhang et al. [61] and Shao and Su [62] further comprehensively considered the issues of different trade methods, trade agents, indirect imports of intermediate goods, and imports of capital goods and proposed a method of measuring GVC participation at the micro level. Referring to the above studies, this paper defines regional GVC participation as follows:

$$GVC_{it} = \frac{M_{it}^P + M_{it}^O \left[\frac{X_{it}^O}{Y_{it} - X_{it}^P} \right]}{X_{it}^P + X_{it}^O} \quad (2)$$

where M_{it}^P is the actual total imports of intermediate products of processing trade, M_{it}^O is the actual total imports of intermediate products of general trade, X_{it}^P is the actual total exports of processing trade, X_{it}^O is the actual total exports of general trade, and Y_{it} is the total output. The larger the GVC participation index, the deeper the province's participation in the division of labor in GVC. In contrast, when the GVC participation index is smaller, it means that the province is less involved in the division of labor in GVC and has a lower level of openness to the outside world.

The time span of GVC participation measured in this paper is 2005–2014. Overall, China's GVC participation has increased quickly throughout this time. In order to visualize the spatial characteristics of China's participation in GVC, this paper used ArcGIS 10.8 software and the natural breakpoint classification method to draw spatial distribution maps of GVC participation in 2005 and 2014, as shown in Figure 3. In terms of time, China's overall participation in GVC is showing an upward trend. In 2005, the participation level in GVC of various provinces in China was not high and did not exceed 0.5. Among them, Jiangsu, Guangdong, and Shanghai had a leading level of participation in the GVC nationwide. In 2014, China's overall participation in GVC increased, with some cities exceeding 0.5. Among them, Heilongjiang, Jilin, Shanxi, and Hainan had the highest growth rates. In terms of space, there are spatial imbalances in GVC participation. The eastern region has a significant advantage in participating in the GVC, with a higher degree of participation than the central and western regions.

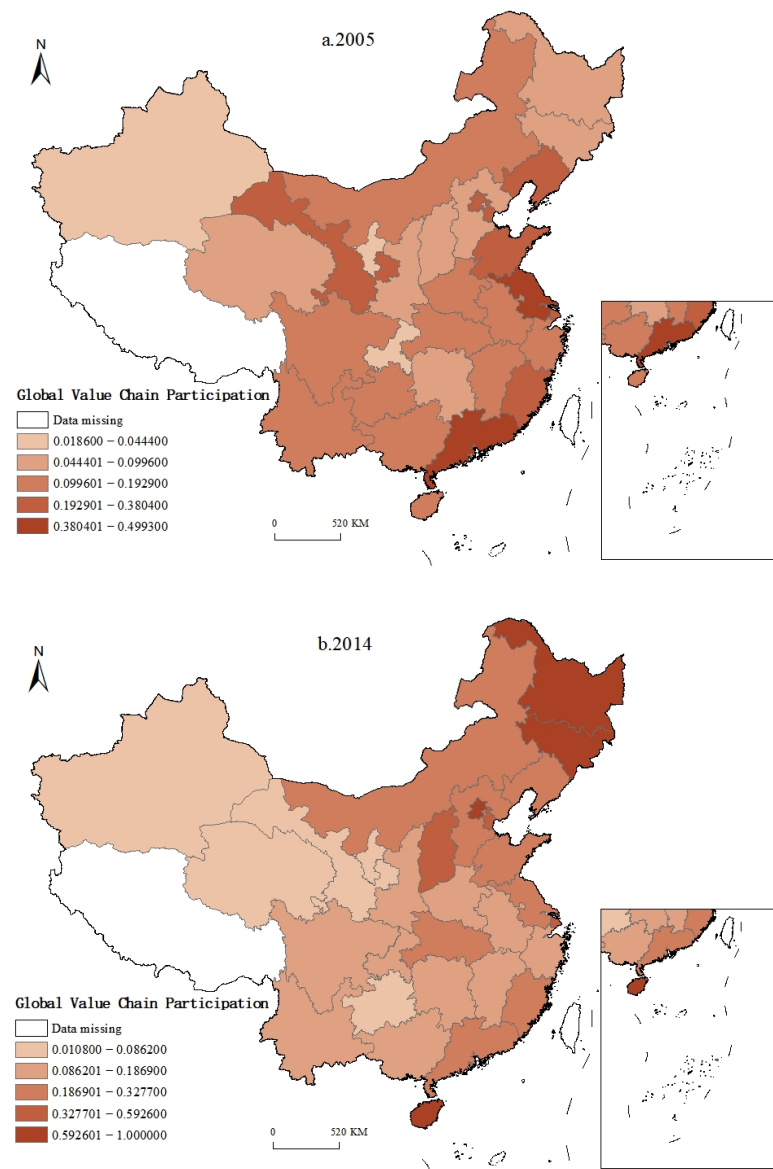


Figure 3. Spatial distribution of China's GVC participation, 2005 (a) and 2014 (b).

3.1.3. Mediation Variable

The mediating variable in this paper is employment structure (ES). Referring to the study by Tang [63], the employment structure is represented by the ratio of high-skilled labor force to low-skilled labor force among all employees. Those with a college degree or more comprise the high-skilled labor force, whereas the remaining workers are considered part of the low-skilled labor force. The specific formula is as follows:

$$ES = N_H / N_L \quad (3)$$

ES is the employment structure, N_H is the high skilled labor force, and N_L is the low skilled labor force. The larger the ES value, the higher the level of employment structure.

3.1.4. Moderator Variable

The moderating variables in this paper are factor endowment structure (FE) and industrial structure upgrading (IS). Referring to the study by Wang and Shen [64], the factor endowment structure is measured by the capital–labor ratio with logarithmic treatment. The industrial structure hierarchy coefficient is presented to show the degree of industrial

structure upgrading in each province, with reference to the research by Xu and Jiang [65]. The upgrading status of the three industries is mostly reflected in this index, and the precise calculation is as follows:

$$IS = \sum_{m=1}^3 m\alpha_m = \alpha_1 + 2\alpha_2 + 3\alpha_3 \quad (4)$$

where IS represents industrial structure upgrading, α_m represents the proportion of output value of the m industry, and $m = 1, 2, 3$. The higher the IS value, the greater the coefficient of industrial structure hierarchy and the higher the level of industrial structure.

3.1.5. Control Variables

The control variables in this article include the following. The degree of openness to the outside world (Open) is indicated by the ratio of total import and export to GDP [66]. Research investment intensity (RI) is indicated by the proportion of R&D expenditure to GDP; the greater the research investment intensity, the stronger the regional emphasis on science and technology, and the more it can promote technological progress and affect the URIG [67]. Infrastructure level (Infra) is measured by the ratio of the number of road mileage owned by each province to the area of each province and region, and the increase in the level of transportation infrastructure is conducive to the mobility of labor factors, thus affecting the URIG [68]. Fiscal support for agriculture (FSA) is expressed as the ratio of fiscal expenditure on agriculture, forestry, and water affairs to GDP in each province [69]. The greater the local financial support for agriculture, the more favorable it is for its development, which may lead to a corresponding increase in the level of farmers' income. Foreign direct investment (FDI) is expressed as the proportion of FDI to GDP converted in Chinese yuan. Foreign direct investment is beneficial for rural residents to improve their employment and human capital levels, which in turn affects the URIG [70]. Financial development efficiency (Fin) is expressed as the ratio of the balance of loans to the balance of deposits from banking financial institutions in each province [71]. An increase in financial development efficiency results in more deposits being converted into loan outflows, which energizes regional productive activities and, thus, affects the URIG.

Table 1 displays the main variables used in this article.

Table 1. Variable selection.

| Variable Type | Variable Name | Variable Symbols | Application Equation |
|----------------------|---|------------------|----------------------|
| Dependent Variable | Urban–rural income gap | TL | (5), (7) |
| Independent Variable | Global value chain participation | GVC | (5)–(9) |
| Mediation Variable | Employment structure | ES | (6)–(9) |
| Moderator Variable | Factor endowment structure | FE | (8) |
| | Industrial structure upgrading | IS | (9) |
| | The degree of openness to the outside world | Open | (5)–(9) |
| | Research investment intensity | RI | (5)–(9) |
| | Infrastructure level | Infra | (5)–(9) |
| Control Variables | Fiscal support for agriculture | FSA | (5)–(9) |
| | Foreign direct investment | FDI | (5)–(9) |
| | Financial development efficiency | Fin | (5)–(9) |

3.1.6. Data Resources

Currently, China's GVC participation is measured using the China Customs Import and Export Microdatabase. This database publishes detailed information on product transactions. However, due to the confidentiality of the data, the Chinese government has only publicized the database information from 2000 to 2014, so most of the currently available articles contain GVC measurements from the time span of 2000–2014 [72,73]. Other data variables come from the China Statistical Yearbook, China Population and Employment Statistical Yearbook, China Rural Statistical Yearbook, China Labor Statistical

Yearbook, China Financial Statistical Yearbook, Statistical Yearbook of each province, and National Bureau of Statistics. By combining the above data, this article finalizes the relevant data for 30 provinces in China from 2005 to 2014. The variables' descriptive statistics are displayed in Table 2.

Table 2. Descriptive statistics of variables.

| Variable | Sample Size | Mean | Standard Deviation | Min | Max |
|----------|-------------|-------|--------------------|-------|-------|
| TL | 300 | 0.117 | 0.051 | 0.021 | 0.248 |
| GVC | 300 | 0.333 | 0.215 | 0.021 | 1.000 |
| ES | 300 | 0.149 | 0.149 | 0.035 | 1.036 |
| FE | 300 | 2.404 | 0.721 | 1.155 | 4.882 |
| IS | 300 | 2.317 | 0.122 | 2.132 | 2.779 |
| Open | 300 | 0.350 | 0.409 | 0.045 | 1.639 |
| RI | 300 | 1.345 | 1.023 | 0.215 | 5.885 |
| Infra | 300 | 0.781 | 0.452 | 0.067 | 1.941 |
| FSA | 300 | 0.021 | 0.015 | 0.002 | 0.067 |
| FDI | 300 | 0.027 | 0.023 | 0.001 | 0.106 |
| Fin | 300 | 0.715 | 0.103 | 0.508 | 0.969 |

3.2. Model Setting

First, using VIF for multicollinearity diagnosis, the results showed that the model did not have multicollinearity issues. Subsequently, based on the Hausman test results, this research employed a two-way fixed effects model to investigate the effect of GVC participation on the URIG. The two-way fixed effects model takes into account correlations between different times and individuals, which can improve estimation accuracy. The specific model is as follows.

$$TL_{it} = \alpha_0 + \beta_1 GVC_{it} + \delta x_{it} + \gamma_i + \lambda_t + \varepsilon_{it} \quad (5)$$

where i refers to different provinces, t refers to years, TL_{it} is the Theil index which refers to the URIG, and GVC_{it} represents global value chain participation. x_{it} is the other control variable affecting the URIG. α_0 is the intercept and β_1 is the regression coefficient estimated by the model. γ_i is a variable that does not vary over time but varies with individuals, and λ_t is a variable that does not vary with individuals but varies over time. ε_{it} represents a random disturbance term.

4. Results and Discussion

4.1. Benchmark Regression Results

This paper uses a two-way fixed effects model to study the impact of GVC participation on the URIG. This article winsorized the data by 1% to lessen the impact of outliers. Table 3 reports the regression results of GVC participation and the URIG. According to the results in Table 3, each model's goodness of fit progressively gets better, and the estimation results of the models are relatively good. The first column only considers the core explanatory variable of the GVC, and the result shows that its estimated coefficient is considerably positive, suggesting that GVC participation can widen the URIG. The second to seventh columns include various control variables, and the results show that the coefficient of GVC participation is still greatly positive. This indicates that after controlling for numerous factors, GVC participation still has an important effect on widening the URIG.

The regression results in Table 3 (7) show that GVC participation has a positive impact on the URIG at the 1% significance level, with a coefficient of 0.0071, indicating that for every 1-unit change in GVC participation, the URIG widens by 0.0071 units, which is consistent with Hypothesis 1. As GVC participation is unbalanced between urban and rural areas, rural participation in the GVC is lower, resulting in agricultural productivity improvement and industrial structures upgrading slower than that in cities, which is not conducive to the integrated development of urban and rural economies, and the URIG

widens [74]. With the deepening of participation in GVC, industrial transformation and upgrading and product quality improvement have increased the demand for skilled labor, resulting in a skill premium. The skill level of rural laborers is generally lower than that of urban laborers, and rural laborers are mostly engaged in low and medium-skilled positions, so the benefits of the skill premium are mostly seen in cities, resulting in the further widening of the URIG [75].

Table 3. Benchmark regression results.

| Variables | (1) TL | (2) TL | (3) TL | (4) TL | (5) TL | (6) TL | (7) TL |
|-------------------|------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| GVC | 0.0062 ** (0.0029) | 0.0070 *** (0.0026) | 0.0079 *** (0.0025) | 0.0076 *** (0.0025) | 0.0072 *** (0.0025) | 0.0071 *** (0.0025) | 0.0071 *** (0.0025) |
| Open | | −0.0395 *** (0.0056) | −0.0227 *** (0.0060) | −0.0217 *** (0.0060) | −0.0182 *** (0.0061) | −0.0182 *** (0.0061) | −0.0186 *** (0.0064) |
| RI | | | 0.0187 *** (0.0032) | 0.0204 *** (0.0033) | 0.0190 *** (0.0034) | 0.0184 *** (0.0035) | 0.0183 *** (0.0035) |
| Infra | | | | −0.0087 * (0.0052) | −0.0129 ** (0.0054) | −0.0128 ** (0.0054) | −0.0128 ** (0.0054) |
| FSA | | | | | −0.2603 ** (0.1128) | −0.2721 ** (0.1142) | −0.2708 ** (0.1145) |
| FDI | | | | | | −0.0439 (0.0635) | −0.0440 (0.0636) |
| Fin | | | | | | | −0.0036 (0.0137) |
| _cons | 0.1308 *** (0.0017) | 0.1463 *** (0.0027) | 0.1187 *** (0.0053) | 0.1202 *** (0.0054) | 0.1249 *** (0.0057) | 0.1269 *** (0.0064) | 0.1298 *** (0.0129) |
| Fixed individuals | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Fixed time | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 300 | 300 | 300 | 300 | 300 | 300 | 300 |
| R ² | 0.7727 | 0.8098 | 0.8321 | 0.8339 | 0.8373 | 0.8376 | 0.8377 |

Note: *, **, *** mean significant at the 10%, 5%, and 1% levels, and the values in parentheses represent standard errors.

Regarding the control variables, the degree of openness to the outside world has a significantly negative coefficient, meaning that opening up to the outside world increases the employment opportunities available to rural laborers, hence narrowing the URIG [32]. The coefficient of the intensity of scientific research investment is significantly positive, suggesting that an increase in this intensity will widen the URIG due to the uneven distribution of funding. Infrastructure level has a significantly negative effect on the URIG, meaning that as infrastructure level advances, the URIG will get smaller. This could be because improved infrastructure encourages the flow of factors between rural and urban areas, which in turn encourages the movement of excess labor from rural to urban areas, raising the income of those living in rural areas [76]. The degree of financial support for agriculture has a significantly negative coefficient, meaning that as the level of financial support for agriculture rises, the URIG falls. This is mostly due to increased financial support for agriculture, which promotes modern agriculture's development and increases the degree of agricultural mechanization, raising rural populations' income levels [77]. The financial development efficiency and foreign direct investment regression coefficients are negative; however, they fail the significance test. The explanation for this could be that the impact of foreign direct investment and financial development efficiency on the URIG has a certain time lag, so it does not show a significant effect in the short term [78].

4.2. Robustness Test

To test the robustness of the model, this research utilizes the following methods. First, the dependent variable is replaced. Referring to the approach of Cheng and Zhang [79],

the urban–rural income ratio is used instead of the Theil index as an indicator to measure the URIG. The ratio of urban inhabitants’ per capita disposable income to that of rural residents’ per capita disposable income is known as the urban–rural income ratio. Second, the regression model is replaced and the Tobit model is used for testing [80]. Third, new control variables are added. Kuznets [81] found that increasing the education level of workers can promote income equality, so the logarithm of per capita education years was added to the model. Fourth, the sample is winsorized. This article performs a 5% tail reduction on the sample data and then regresses again. Fifth, this paper adds the URIG lagged first-order term and performs a systematic GMM regression. Table 4’s findings demonstrate that the five robustness tests used in this paper are largely in line with the findings of the benchmark regression. The coefficient of GVC participation is prominently positive, indicating that it does have a certain amplification effect on the URIG, and the model is more robust.

Table 4. Robustness test results.

| | Robustness Test 1 | Robustness Test 2 | Robustness Test 3 | Robustness Test 4 | Robustness Test 5 |
|-------------------|--|--|---------------------------------|-----------------------|------------------------|
| | Substitution of Dependent Variable | Replacement of Regression Models | Addition of Control Variable | Winsorize | GMM |
| Variables | Urban–Rural Income Ratio | TL | TL | TL | TL |
| L.TL | | | | | 0.8845 *** (0.0570) |
| GVC | 0.1086 *** (0.0392) | 0.0101 *** (0.0034) | 0.0060 ** (0.0024) | 0.0070 ** (0.0029) | 0.0064 *** (0.0016) |
| lnEdu | | | −0.0989 *** (0.0254) | | |
| Control variable | Yes | Yes | Yes | Yes | Yes |
| Fixed individuals | Yes | Yes | Yes | Yes | Yes |
| Fixed time | Yes | Yes | Yes | Yes | Yes |
| AR (1) | | | | | 0.078 |
| AR (2) | | | | | 0.522 |
| Sargan Test | | | | | 0.472 |
| N | 300 | 300 | 300 | 300 | 270 |
| R ² | 0.7205 | | 0.8469 | 0.8079 | |

Note: **, *** mean significant at the 5% and 1% levels, and the values in parentheses represent standard errors.

4.3. Heterogeneity Test

Given that different regions of China have varying degrees of participation in GVC, this article separates China’s 30 provinces into eastern and central western regions for regression analysis, with the findings displayed in Table 5.

Table 5. Results of the regional heterogeneity test.

| Variables | Eastern Region TL | Central and Western Region TL |
|-------------------|------------------------|----------------------------------|
| GVC | 0.0103 *** (0.0032) | 0.0069 ** (0.0031) |
| Control variable | Yes | Yes |
| Fixed individuals | Yes | Yes |
| Fixed time | Yes | Yes |
| N | 120 | 180 |
| R ² | 0.8134 | 0.8970 |

Note: **, *** mean significant at the 5% and 1% levels, and the values in parentheses represent standard errors.

The model's regression results reveal that the coefficients of the impact of GVC participation on the URIG are positive in both the eastern region and the central and western region, showing that increasing GVC participation widens the URIG, which is in accordance with the overall regression results. Regarding the extent of influence, the eastern region is significant at the 1% significance level, and for every unit increase in GVC participation in the eastern region, its URIG increases by 0.0103 units; the central and western regions are significant at the 5% significance level, and for every unit increase in GVC participation in the central and western regions, its URIG increases by 0.0069 units. As can be observed, there is significant geographical variation in the influence of GVC participation on URIG, and the function of GVC participation in expanding the URIG in the eastern region of China is evidently stronger than that of the central and western regions. This is mostly because of the eastern region's great geographic location and high degree of economic development, which draw a lot of foreign direct investment and cause the industry to scale up and create a lot of jobs [82]. With the increased participation in GVC, the eastern region has taken the lead in changing the trade pattern and pursuing higher value-added products, which has widened the wage gap between laborers with different skills, and in turn widened the URIG. The central and western regions are unattractive to the inflow of talents, and highly skilled labor is often transferred to the eastern region. At the same time, driven by the eastern region, the central and western regions have undertaken part of the industrial transfer from the eastern region [83], resulting in the widening of the URIG, but the widening effect is smaller than that of the eastern region.

4.4. Mediation Effect Analysis

To investigate the mediating effect of employment structure on the process of GVC participation affecting URIG, this article relates to the mediating effect model presented by Wen and Ye [84], which is set as follows:

$$ES_{it} = \alpha_1 + \beta_2 GVC_{it} + \delta x_{it} + \gamma_i + \lambda_t + \varepsilon_{it} \quad (6)$$

$$TL_{it} = \alpha_2 + \beta_3 GVC_{it} + \beta_4 ES_{it} + \delta x_{it} + \gamma_i + \lambda_t + \varepsilon_{it} \quad (7)$$

Among them, ES_{it} represents employment structure and x_{it} is the control variable, which is consistent with the control variable in the seventh column of the benchmark regression.

It is clear from the results shown in Table 6 (1) that GVC participation has a pronouncedly beneficial impact on employment structure, suggesting that greater GVC participation encourages improvements to employment structure. Table 6 (2) shows that GVC participation and employment structure have a significant impact on the URIG, and the direction is the same as Table 6 (1). This indicates that GVC participation can directly widen the URIG, as well as indirectly widen the URIG through employment structure. There is a partial mediating effect of employment structure between GVC participation and the URIG. Hypothesis 2 was tested.

Table 6. Results of the mediation effect test.

| Variables | (1) ES | (2) TL |
|-------------------|------------------------|-----------------------|
| GVC | 0.0684 *** (0.0142) | 0.0052 ** (0.0026) |
| ES | | 0.0280 ** (0.0108) |
| Control variable | Yes | Yes |
| Fixed individuals | Yes | Yes |
| Fixed time | Yes | Yes |
| N | 300 | 300 |
| R ² | 0.6744 | 0.8473 |

Note: **, *** mean significant at the 5% and 1% levels, and the values in parentheses represent standard errors.

4.5. Moderating Effect Analysis

Theoretical analysis shows that factor endowment structure and industrial structure upgrading are mechanisms for GVC participation to accelerate employment structure optimization. In order to test the moderating role of factor endowment structure and industrial structure upgrading, this paper further adds the interaction term between factor endowment structure and GVC participation and the interaction term between industrial structure upgrading and GVC participation and constructs models (8) and (9), with the specific formulas as follows:

$$ES_{it} = \alpha_0 + \beta_1 GVC_{it} + \beta_2 FE_{it} + \beta_3 GVC_{it} \times FE_{it} + \delta x_{it} + \gamma_i + \lambda_t + \varepsilon_{it} \quad (8)$$

$$ES_{it} = \alpha_1 + \beta_4 GVC_{it} + \beta_5 IS_{it} + \beta_6 GVC_{it} \times IS_{it} + \delta x_{it} + \gamma_i + \lambda_t + \varepsilon_{it} \quad (9)$$

where FE_{it} is the factor endowment structure, IS_{it} is the industrial structure upgrading indicator, $GVC_{it} \times FE_{it}$ is the interaction term between GVC participation and factor endowment structure, and $GVC_{it} \times IS_{it}$ is the interaction term between GVC participation and industrial structure upgrading.

Columns (1) and (2) of Table 7 show the regression results of the tests of the moderating effects of factor endowment structure and industrial structure upgrading, respectively. The findings in column (1) demonstrate that factor endowment structure's coefficient of interaction term is prominently positive, suggesting that factor endowment structure amplifies the favorable impact of GVC participation on employment structure. The data shown in Column (2) indicates that the interaction term of industry structure upgrading has a prominently positive coefficient. This suggests that the positive influence of GVC participation on employment structure is further amplified by industrial structure upgrading. The above results verify the mechanism by which factor endowment structure and industrial structure upgrading accelerate the role of GVC participation in optimizing employment structure. This is consistent with hypothesis 3.

Table 7. Test results of the moderating effect of factor endowment structure and industrial structure upgrading.

| Variables | (1) ES | (2) ES |
|-------------------|-------------------------|------------------------|
| GVC | 0.0486 *** (0.0120) | 0.0578 *** (0.0140) |
| FE | −0.1468 *** (0.0264) | |
| GVC·FE | 0.0393 *** (0.0150) | |
| IS | | −0.0416 (0.1091) |
| GVC·IS | | 0.7439 *** (0.0695) |
| Control variable | Yes | Yes |
| Fixed individuals | Yes | Yes |
| Fixed time | Yes | Yes |
| N | 300 | 300 |
| R ² | 0.7764 | 0.7164 |

Note: *** mean significant at the 1% levels, and the values in parentheses represent standard errors.

4.6. Discussion

This article uses provincial-level panel data from 2005 to 2014 in China and applies a two-way fixed effects model to study the impact of GVC participation on the URIG from the perspective of sustainable development. We believe that the participation of GVC has widened the URIG in China. Aguiar de Medeiros and Trebat's findings are similar to those of this paper, arguing that GVC participation increases inequality in the

international division of labor, making income disparities wider across countries [14]. Similarly, Ndubuisi and Owusu studied both developed and developing countries and argued that GVC participation causes income inequality by making high-income earners more profitable [18]. Some previous studies have reached consistent conclusions with this paper on the relationship between GVC participation and income disparity, but the difference is that this paper further focuses on income disparity from an urban–rural perspective, and by analyzing urban–rural differences, it expects to make a contribution to the promotion of sustainable development in urban and rural areas. Second, this study also points out that employment structure plays a partial mediating role in the process of GVC participation affecting the URIG. Similarly, Crinò points out that the offshoring of services increases the relative demand for high- and medium-skilled workers, affecting employment structure [16]. Bo Chen et al. also believe that participating in GVC tends to have a higher demand for skilled workers, leading to skill premiums and widening the income gap [15]. This article considers this from the perspective of urban and rural areas, and rural populations frequently cannot access high-paying employment opportunities due to the lack of necessary skills and capital that match their jobs [19]. When there is an increase in the number of workers entering low-threshold occupations, wages in these occupations tend to decrease, contributing to income inequality. Furthermore, this article also investigates the moderating effects of factor endowment structure and industrial structure upgrading on this basis. The research results of this article are helpful in exploring methods to narrow the URIG in the context of globalization and promoting the process of sustainable development in urban and rural areas. However, there are still some scholars whose research results differ from ours. For example, Cerdeiro and Komaromi argue that in the long term, low-income groups benefit more from trade integration, thus reducing income inequality [26]. Cai et al. argue that GVC participation has a negative impact on domestic income inequality by increasing the share of labor [23]. The reason for the inconsistent research results may be that different scholars have different research periods and regions, and there are also differences in the measurement methods of core explanatory variables.

There are still some limitations to this article. This article's research period spans from 2005 to 2014. Due to the lack of the latest data, the research period did not include more time. The sample period can be extended as much as feasible in subsequent studies. Furthermore, extending the research region from provincial to prefecture level and cities would help to more accurately characterize how GVC participation affects the URIG.

5. Conclusions and Implications of this Study

This research aims to investigate the relationship between GVC participation and the URIG in China, with the goal of increasing GVC participation, reducing the URIG, and advancing sustainable urban–rural development. Through theoretical analysis, we find that higher levels of GVC participation lead to an increase in overall income, but in order to improve international competitiveness, problems such as skill premiums and the substitution of unskilled labor tend to occur, thus widening the URIG. Then, this paper utilizes panel data from 30 provinces in China from 2005 to 2014 to explore the impact of GVC participation on China's URIG. This paper found the following conclusions: (1) The increase in GVC participation widens the URIG. The widening effect remains robust after robustness tests. (2) The contribution of GVC to the expansion of the URIG varies by location. In the eastern region, GVC participation has a more dramatic effect on the URIG than it does in the central and western regions. (3) The employment structure plays a partial mediating role in the process of GVC participation in widening the URIG. Factor endowment structure and industrial structure upgrading have a prominent positive moderating effect on the role of GVC participation in optimizing the employment structure, which can widen the URIG even further. The findings of this article can theoretically enrich research on the relationship between GVC participation and the URIG, as well as have significant practical implications for reducing China's URIG, optimizing employment

structure, and achieving sustainable development goals in the context of globalization. Based on the above findings, the government should attach great importance to the income distribution effect of GVC participation, and some insights and recommendations are presented here.

First, actively participate in the GVC and coordinate rational development both domestically and internationally. The government should establish a good business environment and industrial base, utilize production factors in which it has a relative advantage, undertake the transfer of industries from developed regions and even from abroad, attract a large number of surplus rural laborers, and raise the income level of farmers. At the same time, it should strengthen the in-depth processing of agricultural products, develop modern agriculture, promote trade in agricultural products, and push specialty agricultural products to the world market. It should deepen the participation of rural residents in the GVC, optimize income distribution patterns, and better promote the sustainable development of urban and rural areas in the context of globalization. Governments can also encourage trade liberalization by implementing policies aimed at lowering tariff and non-tariff trade barriers. This would enable businesses to participate more actively in international competition, integrate into the GVC, lower transaction costs, and boost productivity. This allows for the attraction of greater foreign direct investment, which boosts firm profitability and contributes to increased labor income levels.

Second, encourage the transformation and upgrading of urban and rural industries, and optimize the employment structure. Businesses should consistently raise their R&D expenditures, strengthen their capacity for autonomous innovation, concentrate on assimilating cutting-edge technologies from other countries in the GVC, improve trade conditions, increase the added value of export goods, and continuously enhance China's position in the GVC. In addition, it is necessary to enhance the level of social human capital, foster the development of education, improve the education level and conditions in rural areas, enable rural labor to participate more in high-paying employment, optimize employment structure, and effectively narrow the URIG.

Third, improve the level of opening up in the central and western regions, and leverage regional advantages. There are differences in the level of participation in the GVC among different regions, and it is necessary to deepen the regional division of labor and cooperation to achieve rational allocation of resource elements. At the same time, we should orderly promote the transfer of industries to the central and western regions, deepen their participation in value chain production, actively engage in international trade, explore trade models suitable for the development of the central and western regions, increase employment opportunities, and promote sustainable development.

Author Contributions: Conceptualization, S.L. and X.T.; Methodology, X.T.; Data curation, X.T. and Y.Z.; Writing—original draft, X.T.; Writing—review & editing, S.L., X.T. and Y.Z. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by the Key Research Program of the National Social Science Fund of China [grant number 18VSJ06].

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The data that were used are confidential.

Conflicts of Interest: The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the research reported in this study.

References

1. Du, B.; Wang, Y.; He, J.; Li, W.; Chen, X. Spatio-Temporal Characteristics and Obstacle Factors of the Urban-Rural Integration of China's Shrinking Cities in the Context of Sustainable Development. *Sustainability* **2021**, *13*, 4203. [\[CrossRef\]](#)
2. Ye, C.; Ma, X.; Gao, Y.; Johnson, L. The lost countryside: Spatial production of rural culture in Tangwan village in Shanghai. *Habitat Int.* **2020**, *98*, 102137. [\[CrossRef\]](#)

3. Yan, J.; Chen, H.; Xia, F. Toward improved land elements for urban–rural integration: A cell concept of an urban–rural mixed community. *Habitat Int.* **2018**, *77*, 110–120. [\[CrossRef\]](#)
4. Allawi, A.H.; Al-Jazaeri, H.M.J. A new approach towards the sustainability of urban-rural integration: The development strategy for central villages in the Abbasiya District of Iraq using GIS techniques. *Reg. Sustain.* **2023**, *4*, 28–43. [\[CrossRef\]](#)
5. Mayer, H.; Habersetzer, A.; Meili, R. Rural–Urban Linkages and Sustainable Regional Development: The Role of Entrepreneurs in Linking Peripheries and Centers. *Sustainability* **2016**, *8*, 745. [\[CrossRef\]](#)
6. Yuan, Y.; Wang, M.; Zhu, Y.; Huang, X.; Xiong, X. Urbanization’s effects on the urban-rural income gap in China: A meta-regression analysis. *Land Use Policy* **2020**, *99*, 104995. [\[CrossRef\]](#)
7. Zhou, Q.; Li, Z. The impact of industrial structure upgrades on the urban–rural income gap: An empirical study based on China’s provincial panel data. *Growth Chang.* **2021**, *52*, 1761–1782. [\[CrossRef\]](#)
8. Boffy-Ramirez, E.; Moon, S. The role of China’s household registration system in the urban-rural income differential. *China Econ. J.* **2018**, *11*, 108–125. [\[CrossRef\]](#)
9. Carpa, N.; Martínez-Zarzoso, I. The impact of global value chain participation on income inequality. *Int. Econ.* **2022**, *169*, 269–290. [\[CrossRef\]](#)
10. Chiarvesio, M.; Di Maria, E.; Micelli, S. Global value chains and open networks: The case of Italian industrial districts. *Eur. Plan. Stud.* **2010**, *18*, 333–350. [\[CrossRef\]](#)
11. Meschi, E.; Vivarelli, M. Trade and income inequality in developing countries. *World Dev.* **2009**, *37*, 287–302. [\[CrossRef\]](#)
12. Pahl, S.; Timmer, M.P.; Gouma, R.; Woltjer, P.J. Jobs and Productivity Growth in Global Value Chains: New Evidence for Twenty-five Low- and Middle-Income Countries. *World Bank Econ. Rev.* **2022**, *36*, 670–686. [\[CrossRef\]](#)
13. Han, J.; Liu, R.; Zhang, J. Globalization and wage inequality: Evidence from urban China. *J. Int. Econ.* **2012**, *87*, 288–297. [\[CrossRef\]](#)
14. Aguiar de Medeiros, C.; Trebat, N. Inequality and Income Distribution in Global Value Chains. *J. Econ. Issues* **2017**, *51*, 401–408. [\[CrossRef\]](#)
15. Chen, B.; Yu, M.; Yu, Z. Measured skill premia and input trade liberalization: Evidence from Chinese firms. *J. Int. Econ.* **2017**, *109*, 31–42. [\[CrossRef\]](#)
16. Crinò, R. Service offshoring and the skill composition of labour demand. *Oxf. Bull. Econ. Stat.* **2012**, *74*, 20–57. [\[CrossRef\]](#)
17. Foster-McGregor, N.; Stehrer, R.; de Vries, G.J. Offshoring and the skill structure of labour demand. *Rev. World Econ.* **2013**, *149*, 631–662. [\[CrossRef\]](#)
18. Ndubuisi, G.; Owusu, S. Wage effects of global value chains participation and position: An industry-level analysis1. *J. Int. Trade Econ. Dev.* **2022**, *31*, 1086–1107. [\[CrossRef\]](#)
19. Liu, X.; Li, J. FDI, Industrial Structure and Urban-rural Income Inequality: Analysis of Spatial Durbin Model Based on 11 Provinces(Cities) in the Yangtze River Economic Belt. *J. Yunnan Agric. Univ. (Soc. Sci.)* **2023**, *17*, 56–65. (In Chinese)
20. Wang, W.; Thangavelu, S.; Lin, F. Global value chains, firms, and wage inequality: Evidence from China. *China Econ. Rev.* **2021**, *66*, 101585. [\[CrossRef\]](#)
21. Grossman, G.M.; Rossi-Hansberg, E. Trading tasks: A simple theory of offshoring. *Am. Econ. Rev.* **2008**, *98*, 1978–1997. [\[CrossRef\]](#)
22. Gonzalez, J.L.; Kowalski, P.; Achard, P. *Trade, Global Value Chains and Wage-Income Inequality*; OECD iLibrary: Berlin, Germany, 2015.
23. Cai, L.; Zhang, Y.B.; Wang, Z.G.; Liu, Z.J. Does the rise of global value chain position increase or reduce domestic income inequality? *Appl. Econ.* **2023**, *55*, 5833–5845. [\[CrossRef\]](#)
24. Lin, L.; Rong, J. Will GVC’s Participation Widen Income Gap—From the Perspective of Backward Participation. *J. Int. Trade* **2016**, 65–75. (In Chinese) [\[CrossRef\]](#)
25. Zheng, L.; Wang, X. Does FDI Enlarge Income Gap between Urban and Rural within Provinces in China? An Empirical Analysis Based on Spatial Econometric Model. *Macroeconomics* **2018**, 62–80. (In Chinese)
26. Cerdeiro, D.A.; Komaromi, A. Trade and income in the long run: Are there really gains, and are they widely shared? *Rev. Int. Econ.* **2021**, *29*, 703–731. [\[CrossRef\]](#)
27. Wang, X.; Yan, H.; E, L.; Huang, X.; Wen, H.; Chen, Y. The Impact of Foreign Trade and Urbanization on Poverty Reduction: Empirical Evidence from China. *Sustainability* **2022**, *14*, 1464. [\[CrossRef\]](#)
28. Das, P. *Econometrics in Theory and Practice*; Springer: Singapore, 2019; pp. 51–58.
29. Zhang, Z.; Lin, L.; Cao, S.; Zhou, Y. When is the Fixed Effect Estimator Credible under DiD Design? Some Useful Suggestions. *J. Manag. World* **2024**, *40*, 196–222. (In Chinese)
30. Dehaan, E. Using and Interpreting Fixed Effects Models. Available at SSRN 3699777 2021. Available online: <https://ssrn.com/abstract=3699777> (accessed on 24 March 2023).
31. Li, X. Global market and income gaps between industries: Evidence from finance industry and manufacturing industry. *J. Chin. Sociol.* **2019**, *6*, 10. [\[CrossRef\]](#)
32. Shi, X.; Jiang, Z. Opening to the Outside World and Income Gap between Urban and Rural Areas Based on Panel Data of 30 Provinces and Cities. *Front. Bus. Econ. Manag.* **2022**, *5*, 161–166. [\[CrossRef\]](#)
33. Jiang, Y.; Cheng, D. Global Value Chains Embedding, Domestic Market Integration and Interprovincial Income Gap. *J. China Univ. Geosci. (Soc. Sci. Ed.)* **2024**, *24*, 128–142. (In Chinese)

34. Lipsey, R.E.; Sjöholm, F. Foreign direct investment, education and wages in Indonesian manufacturing. *J. Dev. Econ.* **2004**, *73*, 415–422. [\[CrossRef\]](#)
35. Wu, D. Research on employment effect of induced technological progress in China's manufacturing industry. *Stud. Sci. Sci.* **2023**, 1–15. (In Chinese) [\[CrossRef\]](#)
36. Zeng, C.; Deng, X.Z.; Dong, J.N.; Hu, P.Y. Urbanization and Sustainability: Comparison of the Processes in "BIC" Countries. *Sustainability* **2016**, *8*, 400. [\[CrossRef\]](#)
37. Zhai, F.; Wang, Z. WTO accession, rural labour migration and urban unemployment in China. *Urban Stud.* **2002**, *39*, 2199–2217. [\[CrossRef\]](#)
38. Fan, J.; Wang, L.; Shen, L. Industrial Concentration and the Trans—Regional Flow of Rural Labor Forces. *J. Manag. World* **2004**, 22–29+155. (In Chinese) [\[CrossRef\]](#)
39. Acemoglu, D.; Restrepo, P. The wrong kind of AI? Artificial intelligence and the future of labour demand. *Camb. J. Reg. Econ. Soc.* **2020**, *13*, 25–35. [\[CrossRef\]](#)
40. Yuan, D.; Wei, H.; Yang, H. Trade Openness, Improvement of Trade Commodity Composition and Urban-rural Income Inequality: An Empirical Study Based on Provincial Panel Data in China. *China Soft Sci.* **2011**, 47–56. (In Chinese) [\[CrossRef\]](#)
41. Cao, G.; Feng, C.; Tao, R. Local "land finance" in China's urban expansion: Challenges and solutions. *China World Econ.* **2008**, *16*, 19–30. [\[CrossRef\]](#)
42. Erten, B.; Leight, J. Exporting Out of Agriculture: The Impact of WTO Accession on Structural Transformation in China. *Rev. Econ. Stat.* **2021**, *103*, 364–380. [\[CrossRef\]](#)
43. Feenstra, R.C.; Hanson, G.H. Globalization, outsourcing, and wage inequality. *Am. Econ. Rev.* **1996**, *86*, 240–245.
44. Brambilla, I.; Porto, G.G. High-income export destinations, quality and wages. *J. Int. Econ.* **2016**, *98*, 21–35. [\[CrossRef\]](#)
45. Dai, X.; Xu, L.; Ren, Z. Research on the Influence Mechanism of Global Value Chain Participation on the Quality of Economic Growth. *Int. Bus.* **2020**, 20–34. (In Chinese) [\[CrossRef\]](#)
46. Xiao, W.; Wang, J.; Zhao, X. Industrial Structure, Employment Structure and Urban-rural Income Disparity. *Macroeconomics* **2022**, 78–86+96. (In Chinese) [\[CrossRef\]](#)
47. Pavcnik, N. Globalization and within-country income inequality. In *Making Globalization Socially Sustainable*; WTO iLibrary: Geneva, Switzerland, 2011; pp. 233–259.
48. Bernard, A.B.; Jensen, J.B. Exporters, skill upgrading, and the wage gap. *J. Int. Econ.* **1997**, *42*, 3–31. [\[CrossRef\]](#)
49. Zhao, J. Trade and Employment: Literature Review of International Studies on the Latest Progress and Policy Orientation—On the Policy Choice of Resolving the Impact of Sino-US Trade Conflicts on China's Employment. *Financ. Trade Econ.* **2019**, *40*, 5–18. (In Chinese)
50. Sharma, C.; Mishra, R.K. International trade and performance of firms: Unraveling export, import and productivity puzzle. *Q. Rev. Econ. Financ.* **2015**, *57*, 61–74. [\[CrossRef\]](#)
51. Tang, D. The Impact of Globalization on China's Employment Structure. *J. World Econ.* **2011**, *34*, 95–117. (In Chinese)
52. Perry, G.; Olarreaga, M. Trade liberalization, inequality, and poverty reduction in Latin America. In *Annual World Bank Conference on Development Economics, Regional. Beyond Transition*; The World Bank Group: Washington, DC, USA, 2007; pp. 103–139.
53. Xu, B.; Li, W. Trade, technology, and China's rising skill demand1. *Econ. Transit.* **2008**, *16*, 59–84. [\[CrossRef\]](#)
54. Chen, D.; Ma, Y. Effect of industrial structure on urban-rural income inequality in China. *China Agric. Econ. Rev.* **2022**, *14*, 547–566. [\[CrossRef\]](#)
55. Su, B.; Heshmati, A. Analysis of the determinants of income and income gap between urban and rural China. *China Econ. Policy Rev.* **2013**, *2*, 1350002. [\[CrossRef\]](#)
56. Wang, X.; Zhang, H. The role of narrowing the urban-rural income gap in sustainable socio-economic development. *Chin. J. Popul. Sci.* **2005**, 211–215. (In Chinese)
57. Wang, S.; Ouyang, Z. The Rural-urban Income Disparity and Its Effects to Economic Growth in the Case of China. *Econ. Res. J.* **2007**, *42*, 44–55. (In Chinese)
58. Theil, H. *Economics and Information Theory*; North-Holland Publishing Company: Amsterdam, The Netherlands, 1967.
59. Hummels, D.; Ishii, J.; Yi, K.-M. The nature and growth of vertical specialization in world trade. *J. Int. Econ.* **2001**, *54*, 75–96. [\[CrossRef\]](#)
60. Koopman, R.; Wang, Z.; Wei, S.-J. Estimating domestic content in exports when processing trade is pervasive. *J. Dev. Econ.* **2012**, *99*, 178–189. [\[CrossRef\]](#)
61. Zhang, J.; Chen, Z.; Liu, Y. Measuring the Domestic Value Added in China's Exports and the Mechanism of Change. *Econ. Res. J.* **2013**, *48*, 124–137. (In Chinese)
62. Shao, C.; Su, D. The Spatial Spillover Effect of Global Value Chain on Productivity. *China Ind. Econ.* **2017**, 94–114. (In Chinese) [\[CrossRef\]](#)
63. Tang, D. How Vertical Specialization Trade Influences China's Employment Structure? *Econ. Res. J.* **2012**, *47*, 118–131. (In Chinese)
64. Wang, Y.; Shen, Z. Endowment Structures, Income Inequality and Industrial Upgrading. *China Econ. Q.* **2018**, *17*, 801–824. (In Chinese)
65. Xu, M.; Jiang, Y. Can the China's Industrial Structure Upgrading Narrow the Gap between Urban and Rural Consumption? *J. Quant. Technol. Econ.* **2015**, *32*, 3–21. (In Chinese)

66. Cheng, X.; Zhang, M.; Xu, J.; Xu, J.; Tang, D. Research on the Impact of Sustainable Urbanization on Urban Rural Income Disparity in China. *Sustainability* **2023**, *15*, 5274. [\[CrossRef\]](#)
67. Cheng, Y.; Zheng, D. Does the Digital Economy Promote Coordinated Urban–Rural Development? Evidence from China. *Sustainability* **2023**, *15*, 5460.
68. Chanieabate, M.; He, H.; Guo, C.; Abrahamgeremew, B.; Huang, Y. Examining the Relationship between Transportation Infrastructure, Urbanization Level and Rural-Urban Income Gap in China. *Sustainability* **2023**, *15*, 8410. [\[CrossRef\]](#)
69. Liu, J.; Puah, C.-H.; Arip, M.A.; Jong, M.-C. Impacts of Digital Financial Inclusion on Urban–Rural Income Disparity: A Comparative Research of the Eastern and Western Regions in China. *Economies* **2023**, *11*, 282.
70. Song, Y.; Zhang, Y.; Wang, Y.; Zhang, B.; Su, J. The influence of foreign direct investment on the urban–rural income gap: Evidence from China. *Kybernetes* **2021**, *51*, 466–484. [\[CrossRef\]](#)
71. Deng, X.; Guo, M.; Liu, Y. Digital economy development and the urban-rural income gap: Evidence from Chinese cities. *PLoS ONE* **2023**, *18*, e0280225. [\[CrossRef\]](#)
72. Wang, S.; Wang, H. Can Global Value Chain Participation Drive Green Upgrade in China's Manufacturing Industry? *Int. J. Environ. Res. Public Health* **2022**, *19*, 12013. [\[CrossRef\]](#)
73. Liu, Y.; Yu, J.; Yang, J. Urban Agglomeration and the GVC Status of Chinese Manufacturing Enterprises. *Econ. Rev.* **2023**, 3–16. (In Chinese) [\[CrossRef\]](#)
74. Hartmann, D.; Guevara, M.R.; Jara-Figueroa, C.; Aristarán, M.; Hidalgo, C.A. Linking Economic Complexity, Institutions, and Income Inequality. *World Dev.* **2017**, *93*, 75–93. [\[CrossRef\]](#)
75. Zhang, J.; Peck, J. Variegated Capitalism, Chinese Style: Regional Models, Multi-scalar Constructions. *Reg. Stud.* **2016**, *50*, 52–78. [\[CrossRef\]](#)
76. Lu, H.; Zhao, P.; Hu, H.; Zeng, L.; Wu, K.S.; Lv, D. Transport infrastructure and urban-rural income disparity: A municipal-level analysis in China. *J. Transp. Geogr.* **2022**, *99*, 103292. [\[CrossRef\]](#)
77. Wang, W. Human Capital Accumulation and Relative Poverty Alleviation Driven by Financial Support for Agriculture: Theoretical Analysis and Empirical Evidence. *Inq. Into Econ. Issues* **2023**, *44*, 115–134. (In Chinese)
78. Yang, Z.; Jiang, Y. Foreign Direct Investment, Industrial Characteristics and Economic Growth: Statistical Analysis and Industrial Comparison. *Econ. Probl.* **2014**, 23–28. (In Chinese) [\[CrossRef\]](#)
79. Cheng, M.; Zhang, J. Internet Popularization and Urban-rural Income Gap: A Theoretical and Empirical Analysis. *Chin. Rural. Econ.* **2019**, 19–41. (In Chinese)
80. Zhang, B.; Dong, W.; Yao, J.; Cheng, X. Digital Economy, Factor Allocation Efficiency of Dual-Economy and Urban-Rural Income Gap. *Sustainability* **2023**, *15*, 13514. [\[CrossRef\]](#)
81. Kuznets, S. Economic growth and income inequality. *Am. Econ. Rev.* **1995**, *45*, 25–37.
82. Meng, S.; Yan, H.; Yu, J. Global Value Chain Participation and Green Innovation: Evidence from Chinese Listed Firms. *Int. J. Environ. Res. Public Health* **2022**, *19*, 8403. [\[CrossRef\]](#)
83. Zhu, S.; Yu, C.; He, C. Export structures, income inequality and urban-rural divide in China. *Appl. Geogr.* **2020**, *115*, 102150. [\[CrossRef\]](#)
84. Wen, Z.; Ye, B. Analyses of Mediating Effects: The Development of Methods and Models. *Adv. Psychol. Sci.* **2014**, *22*, 731–745. (In Chinese) [\[CrossRef\]](#)

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.