Analysis of the Impact of Urbanization Level on the Income Level of Provincial Cities: A Case Study of Provincial Cities in China

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Abstract: With the rapid urbanization process in China, understanding the impact of urbanization on socio-economic indicators has become important. This study first identified the possible relationship between urbanization and income inequality through literature review. Then, using data from the entire country and the eastern, central, and western regions, empirical analysis was conducted using random effects models. Using panel data and the regression estimation approach, this study investigates how China's urbanization affects income levels. The research data cover 31 provinces in China across 5 years, 2018 to 2022. Regression analysis is performed in this article using the Gini coefficient as the dependent variable and the urbanization rate, per capita GDP, percentage of tertiary industry, and education level as the independent variables. Hausman's test was used to identify the best model, and robustness tests were carried out to guarantee the accuracy of the findings. According to this study, the rate of urbanization has no discernible effect on income disparity across the country; but, in the central region, the rate of urbanization significantly increases the Gini coefficient, suggesting that the procedure of urbanization may make income inequality worse there. Policy makers might find significant value in the research findings as a reference, and it is advised that they take into account the various impacts of urbanization when developing regional economic policies in order to achieve more equitable socioeconomic development

Keywords: Urbanization Rate, Income inequality, Gini coefficient.

1.   Introduction

With the rapid advancement of globalization and industrialization, urbanization has become a crucial factor of economic development in many countries. In China, the speed and scale of urbanization are unprecedented. According to data from the National Bureau of Statistics, China's urbanization rate has increased from less than 20% since the revive and opening up to over 60% today. Urbanization not only promotes economic benefits and social develop but also changes population structure, resource allocation, and industrial layout. However, income issues have also become prominent during the urbanization process, affecting social stability and sustainable development.

Investigating how China's urbanization trend affects income is the main goal of this study. Especially, it aims to find out the mathematical connection between urbanization rates and income.

By understanding the mechanisms through which urbanization affects income distribution, this study tries to figure out the direct and indirect ways that lead to changes in income. This exploration is crucial for identifying the main drivers of inequality in rapidly urbanizing societies and providing a detailed understanding of how economic and social policies can alleviate or exacerbate these impacts.

Urbanization does not occur uniformly across different regions, and its impact on income may depending on local economic conditions, policy, and social structures. This study aims to compare how urbanization affects income in different regions of China, particularly focusing on the Eastern, Central, and Western regions. By identifying these differences, the study will discuss the factors that lead to these situations.

This study will add to the body of knowledge by presenting fresh empirical data on the connection between urbanization and income disparity in developing nations. Our understanding of how statements evolve in provinces with varying rates of urbanization will be improved by the research's testing and possible extension of current models, such as the Kuznets inverted U-curve theory.

The practical implications of this research are diverse. Nowadays urbanization was seen as a key driver of economic growth, understanding its impact on income is vital for ensuring that this growth is sustainable. The study's findings will provide valuable enlightenment for policymakers at both the national and regional levels, helping them to design and implement policies that promote more equitable economic development.

Beyond the academic and policy aspect, this research will have significant implications for social equity and stabilization. Income level is a major concern in many societies, as it can lead to social unrest, decreased social mobility, and a general decline quality of life. This study will contribute to promoting social equity, especially in countries like China with significant income disparities, where economic development benefits the people rather than a privileged few.

In order to examine how urbanization affects income, this study will employ panel data from Chinese provinces and an empirical analysis methodology. Regression analysis will be performed in the study utilizing either a random effects model or a fixed effects model to account for heterogeneity and temporal effects amongst provinces.

The article will give a thorough explanation of the study process in the content that follows, covering data sources, variable selection, and model setting. Subsequently, the paper will showcase the outcomes of its regression analysis and apply heterogeneity analysis to examine regional variations. This paper will conclude by outlining the research findings' practical implications and offering suggested policies. The research findings and potential future research directions will be compiled in the conclusion section.

2. Literature Review

2.1. Explanation of Urbanization Level in Chinese Cities

Urbanization refers to the process of population migration from rural areas to cities, expansion of urban scale, and transformation of socio-economic structure towards urbanization. The urbanization process in China has significantly accelerated since the reform and opening, and the urbanization process in different regions has also shown significant differences. This difference generally divides China into central, eastern, and western regions.

The eastern region has a superior geographical location, close to the ocean, convenient transportation, and is conducive to opening to the outside and economic development. Since the reform and opening, it has taken the lead in developing the industrial and service industries, providing strong support for urbanization. Due to its economic status, it has received significant policy support and resource allocation. The central and western regions are located inland, especially in the western region where the terrain is complex, population density is lower, and urbanization development is

limited by natural conditions. In recent years, the central region has benefited from the "Rise of the Central Region" policy, and the urbanization process has accelerated. The western region relies on the promotion of policies such as the Western Development Plan.

2.2. Existing Theoretical Framework

Data strongly concurs with the hypothesis that urbanization speeds up economic expansion, and in the early stages of development, income and economic growth are balanced, at least geographically.

Since many qualified employees are located in metropolitan districts that have greater industrial incomes, inequality is an unavoidable outcome of urbanization, according to the traditional dual economic model analyzing structural alterations [1-3]. By allowing the economy to benefit from growing profits and the economics of urbanization, structural changes to the economy encourage economic growth [4].

3. Research Method

3.1. Data and applications

Reputable resources such the China Economic Database, the China Statistical Yearbook, and the National Bureau of Statistics of China provided the data for this study. This study collected panel data from 31 provinces over a five-year period, taking into account the recentness of the data. There are 155 observations overall (5 years × 31 provinces).

3.2. Variable Setting

3.2.1. Dependent Variable

Measures of income inequality in the literature are based on three primary metrics: the Gini coefficient, the Theil index, and the ratio of urban per capita disposable income to rural per capita net income. While the Gini coefficient is more sensitive to shifts in middle class income, the Theil index is more sensitive to shifts in extreme of the income spectrum. Because it does not take into consideration the proportion of the population that lives in both urban and rural areas, the first measurement method is unable to accurately determine the level of disparity [5]. The levels of wealth in this study is represented by the Gini coefficient. The computation technique made use of Hu Zuguang (2004). [4]

3.2.2. Independent Variable

The urbanization rate can be roughly expressed as the proportion of urban population:

$$\text{Urbanization} = \frac{\text{PU}}{\text{PU+PR}} \tag{1}$$

3.2.3. Control Variable

Control variables include GDP, years of education, and the proportion of the tertiary industry.

Setting and Interpretation of Research Models

In terms of time span, this study selected data from 2018 to 2022, which includes the transition from rapid urbanization to slowdown during these five years, and there are gaps in the analysis of these years among existing articles [6, 7].

Based on a hypothesis connecting to urbanism and income disparity, this study proposes a quantitative model analyzing the impact of urbanization on income inequality as follows:

$$\text{Gini}_{it} = \alpha + \beta 1 \text{Urbanization}_{it} + \beta 2 \text{GDP}_{it} + \beta 3 \text{EDU}_{it} + \beta 4 \text{Industry}_{it} + \mu_{it} + v_{it} + \varepsilon_{it} \qquad (2)$$

Among them, Gini_{it} is a measure of income inequality (such as the Gini coefficient), Urbanization_{it} is the urbanization rate, GDP_{it} is per capita GDP, $\beta 3 \text{EDU}_{it}$ is the number of years of education, $\beta 4 \text{Industry}_{it}$ is the proportion of the tertiary industry, μ_{it} it is the province fixed effect, v_{it} it is the time fixed effect, and ε_{it} it is the error term.

4. Research Result

4.1. Model Validation

Table 1 compiles the descriptive statistics for every variable in the model. The Gini coefficient has a minimum of 0.348, a maximum of 0.508, a mean of 0.424, and a standard deviation of 0.046.Therefore, there is little variation in the income inequality index among the sample. In terms of urbanization, what are the minimum, maximum, and standard deviations—0.339, 0.110, and 0.635, respectively. This demonstrates a notable variation in the degree of urbanization among the provinces across the time frame. Like GDP industry, education, likewise have substantial differences among provinces.

Table 1: Descriptive Statistics.

VarName	Obs	Mean	SD	Min	Median	Max
urbanization	155	0.635	0.110	0.339	0.618	0.893
gini	155	0.424	0.046	0.348	0.424	0.508
gdp_per_capita	155	33824.732	27561.687	1548.400	25793.200	129513.6
industry	155	48.613	9.362	30.600	46.828	83.100
education	155	9.476	1.064	5.721	9.473	12.782

4.1.1. Correlation Testing

The combinations of independent variables in Table 2 have a notable correlation, according to the findings of the association study between the variables.

Table 2: Correlation matrix.

	urbani~n	gini	gdp pe~a	industry	educat~n
urbanization	1				
gini	-0.00700	1			
gdp per ca~a	0.340***	0.0310	1		
industry	0.749***	0.0310	0.0320	1	
education	0.890***	-0.0260	0.236***	0.736***	1

4.1.2. Robust Testing

Table 3: Hausman Testing.

	-1	-2	-3	-4
VARIABLES	Gini	gini	gini	gini
urbanization	-4.1515	-9.1597	-4.1515	-0.0038
	(-1.54)	(-1.26)	(-1.54)	(-0.04)
gdp_per_capita	0	0	0	0

Table 3: (continued).

	(-0.06)	-0.42	(-0.06)	-0.55
industry	0.0080*	0.0074*	0.0080*	0.0008
	-1.86	-1.75	-1.86	-0.91
education	0.0186	0.1628	0.0186	-0.0073
	-0.28	-1.24	-0.28	(-0.73)
Constant	2.248	3.8635	2.248	0.4545***
	-1.42	-0.88	-1.42	-9.37
Observations	60	30	60	155
R-squared	0.484	0.507	0.484	
id	YES	YES	YES	YES
year	YES	YES	YES	YES
Number of id				31

After Hausman's test, the null hypothesis is not rejected, and a random effects model is used (Table 3).

4.2. Results Display and Preliminary Comments

Table 4: Regression Result.

	(1)
VARIABLES	gini
urbanization	-0.0038
	(-0.04)
gdp_per_capita	0.0000
	(0.55)
industry	0.0008
	(0.91)
education	-0.0073
	(-0.73)
Constant	0.4545***
	(9.37)
Observations	155
Number of id	31
z-statistics in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$	

The impact of urbanization rate on Gini coefficient is not significant in the overall sample (-0.0038, $t=-0.57$), indicating that changes in urbanization rate do not directly lead to significant changes in income inequality. However, the effects of other variables such as industrialization and education level on the overall sample were also not significant, suggesting that there may be heterogeneity in the relationships between variables in different regions (Table 4).

To further explore the impact of regional differences, we conducted heterogeneity analyses on the eastern, central, and western regions.

Table 5: Heterogeneity Result.

	(1)	(2)	(3)
VARIABLES	gini	gini	gini
urbanization	-0.1014	1.0460***	0.1576
	(-0.57)	(2.80)	(0.68)
gdp_per_capita	0.0000	0.0000	-0.0000
	(0.40)	(0.66)	(-0.17)
industry	0.0004	0.0030	-0.0001
	(0.27)	(0.84)	(-0.05)
education	0.0051	-0.1001***	-0.0242
	(0.26)	(-2.64)	(-1.15)
Constant	0.4169***	0.6064***	0.5463***
	(3.95)	(3.02)	(5.14)
Observations	65	30	60
Number of id	13	6	12
z-statistics in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$			

In the eastern region, the urbanization rate has a negative impact on the Gini coefficient (-0.1014), indicating that the urbanization process contributes to income equality in the eastern region. The reason is that the developed economy and social security system in the eastern region have effectively alleviated the negative impact of urbanization on income distribution (Table 5).

In contrast, the Gini coefficient in the central region is positively and significantly impacted by the rate of urbanization (1.0450, t=2.80, $p<0.01$). This suggests that urbanization may make income inequality in the center region worse.

In the western region, the impact of urbanization rate on Gini coefficient is positive but not significant (0.1576, t=0.68), indicating that the impact of urbanization on income inequality in the western region is more complex. Due to harsh geographical conditions and weak economic level, the urbanization process in the western region has significant regional differences and imbalances, resulting in insignificant impact on income distribution.

5. Research Discussion

The findings of the regression analysis show that the rate of urbanization, particularly in the central region, has an effect on the Gini coefficient (Table 5). In particular, the central region's pace of urbanization has a notable positive influence on the Gini coefficient, suggesting that as the region's urbanization has accelerated, income inequality has grown. Furthermore, there is no discernible correlation between the Gini coefficient and the rate of urbanization in the eastern and western areas.

Industrialization has a negative, albeit not statistically significant, effect on the Gini coefficient for other independent variables in both the central and western regions. This demonstrates how industrialization in these areas has no effect in reducing income inequality. The central region's education level has an adverse and substantial effect on the Gini coefficient, suggesting that raising

educational attainment can effectively lower income inequality in the area. Nonetheless, the effect of education level on the Gini coefficient is negligible in the eastern and western areas.

Furthermore, not all regions see a substantial correlation between per capita GDP and the Gini index, indicating that increases in per capita GDP do not directly impact income inequality.

6.　Conclusion

Using empirical research, this paper investigates how the pace of urbanization, industrialization, and educational attainment affect income disparity in various Chinese regions. The findings show that, in the central region, urbanization significantly reduces income inequality, whereas in the eastern and western regions, this effect is negligible. This finding implies that when encouraging urbanization, policymakers should take the center region's income inequality into consideration. Increasing education expenditure is crucial for improving the income distribution in the central region since raising educational standards also has a major impact on lowering income disparity in the area.

The limitation of this study is that the data coverage time is relatively short, and future research can consider data with longer time spans. In addition, more control variables such as government policies, social security, etc. can further enrich the research conclusions.

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