Economics, Law and Policy
ISSN 2576-2060 (Print) ISSN 2576-2052 (Online)
Vol. 7, No. 1, 2024
www.scholink.org/ojs/index.php/elp

Original Paper

Regional Disparities: A Longitudinal Analysis of Economic Growth Factors across Rural China

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Received: May 20, 2024 Accepted: June 10, 2024 Online Published: June 20, 2024

doi:10.22158/elp.v7n1p206 URL: http://dx.doi.org/10.22158/elp.v7n1p206

Abstract

This paper presents a longitudinal analysis of economic growth factors in rural and underdeveloped regions of China using a mixed effects model, with regions treated as a random effect to account for inherent variability. The study focuses on several key factors of economic growth, including education, healthcare, agricultural performance, industrialization, population flow, government expenditure, and their effects on the overall economic performance. The analysis reveals a significant disparity among the regions. This span indicates the varied levels of existing development and highlights the need for targeted policy interventions. By exploring these discrepancies, the study aims to provide a clearer understanding of the factors that drive or hinder economic growth in China's less-developed rural areas, offering insights that could inform future strategies to foster balanced regional development. The implications of these findings are discussed in terms of policymaking, resource allocation, and the potential development of these communities.

Keyword

Regional disparities, economic growth, rural China, socioeconomic factors, poverty alleviation, regional development, economic policy

1. Introduction

1.1 Background

China has witnessed rapid economic development over the past few decades, starting from President Deng Xiaoping's economic reform and opening-up strategies around 1980. This growth has predominantly been driven by rapid urbanization and extensive international trade. Now, as the second-largest economy in the world, China successfully escaped absolute poverty in 2020 but is still a developing country that heavily relies on agriculture. However, rural areas are significantly falling behind the urban regions, with a household annual per capita nominal income of 20,133 yuan, which is

far lower than the national average of 36,883 yuan. Rural areas have long been the focus of the Chinese government to reduce regional inequalities. Despite various policies being implemented throughout the years, those regions still face issues of poverty, mainly due to limited resources and opportunities.

1.2 Policies

Several policies primarily target the impoverished population in rural areas. Having the same general goal of alleviating poverty and developing rural economies, those policies or programs are different in terms of level, focus, and methods.

The Common Prosperity Policy, holding the goal of evenly distributing the benefits of economic growth in the entire country, is particularly relevant but not limited to rural areas, where economies are less developed. There is a wide range of economic issues targeted, and the policy manages income distribution through several initiatives at the national level, such as modernizing agriculture, developing infrastructures, providing safety net, and encouraging enterprises.

The Rural Revitalization Strategy is a more specific program targeting rural China, focusing on improving local living standards and solving population loss, which aims to address the unique challenges in rural areas, based on regional differences. Those strategies include education, healthcare, financial assistance, environmental protection, etc. Moreover, this policy focuses on urbanizing and modernizing rural areas by improving the industrial system, creating -more job opportunities outside the agriculture sector.

1.3 Importance of Rural Areas

There was a steady decline in the proportion of the rural population, from 80% in the 1980s to approximately 35% in 2023. While the Chinese economy has become more diversified, the rural population of China still surpassed 500 million, which is high compared to developed countries. Also, as an agricultural-based economy, China has the world's largest primary sector, composing 22.4% of the labor force, meaning that rural areas remain crucial to the economy. The development of China's rural areas will contribute to rising living standards for a great proportion of the Chinese population.

1.4 Research Question

With multiple policies in effect and continuous efforts made by the Chinese government, rural areas remain an issue, even after the official eradication of absolute poverty, because the majority of relative poverty still happens in rural regions. It is then important to find out what are the major economic growth factors in rural areas of China so that policies can be made to target those aspects.

2. Literature Review

Studies underscore significant inequalities in educational access between urban and rural regions in China that have impacted the income disparities between those regions. There is a disparity in infrastructure between rural and urban areas that contributes to an educational gap, creating a gap that hinders social mobility. This deficiency in the educational system perpetuates poverty across generations and traps rural communities in a continuous cycle of limited educational and economic

opportunities. There is thus a need to invest in rural education to foster economic growth.

The uneven distribution of medical resources has also exacerbated rural-urban disparities. With more than half of the rural population impoverished by illnesses, poor health has significantly reduced income for people in rural areas by limiting economic opportunities, and the development of healthcare infrastructure in urban areas was “far ahead of that in rural China”.

There has been significant rural-urban migration, as illustrated by a decrease in rural population from 972 million to 551 million from 2007 to 2020. This is increasingly weakening the rural economy and thus causing rural decline. Even though there are improvements in individual income for rural migrants, it results in rural demographic imbalances in the rural population that “widens the urban-rural divide”. Therefore, it is necessary for policymakers to “retain the outflowing populations” and enhance rural economic conditions.

3. Theoretical Framework

The fundamental theoretical framework behind rural economic growth is that the standard of living can be enhanced through the expansion of economic activities; in this way, the economy is diversified, providing more opportunities to local people. The process of income generation should come from sectors different from traditional agriculture. A variety of strategies can be employed based on this theory to improve the overall income level and economic efficiency.

There are two major economic growth models suitable for rural areas. The Human Capital Theory emphasizes investments in education, healthcare, and skill development, which contribute significantly to economic growth and an improved standard of living. In the context of rural areas in China, this theory suggests that increasing access to education and healthcare services, reducing illiteracy rates, and enhancing educational attainment are vital steps toward economic development. A well-educated and healthy rural population is more likely to engage in productive economic activities, leading to higher incomes and an improved quality of life.

The Neoclassical Growth Theory is widely used to explain economic growth by emphasizing capital accumulation and labor force (physical capital and human capital). In rural areas, agricultural tools, infrastructure, and technology are essential to the local economy, which are physical capital and technology that are promoters of economic growth. Considering the labor force, the theory suggests that improving the skills and increasing the number of workers contributes to economic growth. However, now rural areas face population losses due to the migration of young workers to cities. migration to cities of younger workers. To counteract the migration to urban areas, the government needs to provide employment opportunities in rural areas.

4. Hypothesis

Building on the theoretical framework provided by the Human Capital Theory and the Neoclassical Growth Theory, as well as previous studies on rural economies, this study posits that several key factors are crucial in driving economic growth in China's rural regions. These factors emphasize the enhancement of human capital, including the number, skill, and condition or quality of the workforce, as well as the government's support in improving economic outcomes.

Accordingly, the following hypotheses are proposed:

- Education: Higher levels of education in rural areas are positively associated with economic growth
- Healthcare: Greater accessibility to healthcare in rural regions is positively correlated with improvements in economic growth
- Population flow: Rural regions with a larger net inflow of population will exhibit higher economic growth
- Agriculture: A higher agricultural output in rural areas is negatively correlated with economic growth
- Government expenditure: Higher government spending in rural regions is positively related to economic growth
- Industry and enterprises: A larger number of industries or enterprises in rural regions is positively associated with economic growth

5. Data and Methodology

5.1 Data Source and Description

We extracted our data from the China Statistical Yearbooks, the most authoritative statistical database in China, covering census and non-census data published by the Chinese government.

The administrative divisions of China are generally categorized into three levels: the provincial, county, and township levels. There are also more divisions in practice, which can be divided into five levels of administration: the central (national level), provincial, prefectural, county, and township. We specifically chose the statistical summaries at the county level, which fits best with our consideration of underdeveloped rural regions. The official classification of counties in China often covers areas that could be considered less urban, rural, or semi-rural. They typically encompass rural regions such as small townships and villages. Moreover, this is the lowest level where reliable data are available. At administrative divisions lower than the county level, such as townships and villages, there is often a lack of complete census on demographics and socioeconomics data, either lacking an official collection of certain types of data or there are too many missing values.

For the classification of being both "rural" and "underdeveloped", several different methods are performed. It is determined that focusing on the 832 poverty-stricken counties would best represent the rural and underdeveloped regions because there are significant disparities between counties. Some

counties are economically advantaged and are thus inappropriate for our analysis. By focusing on those counties with low incomes, we can identify the most important factors that drive their growth.

Our data spans from 2000 to 2021 and across the entire country, which provides variations in both time and space and, thus, a comprehensive analysis of economic trends in the past two decades.

5.2 Data Calculation

5.2.1 Data Filling

Multiple imputation was performed to handle missing data in the dataset using Multivariate Imputation by Chained Equations (MICE). This process aims to improve the reliability and validity of the analysis by creating complete datasets to address the issue of missing data.

Specifically, we applied multiple imputations to the raw dataset using Predictive Mean Matching, which imputes missing values by matching predicted values to observed values, thereby preserving the original distribution characteristics of the data.

5.2.2 Dependent and Independent Variables

Dependent variable

Regional GDP per capita (Y): County-level GDP/population Figure 1:

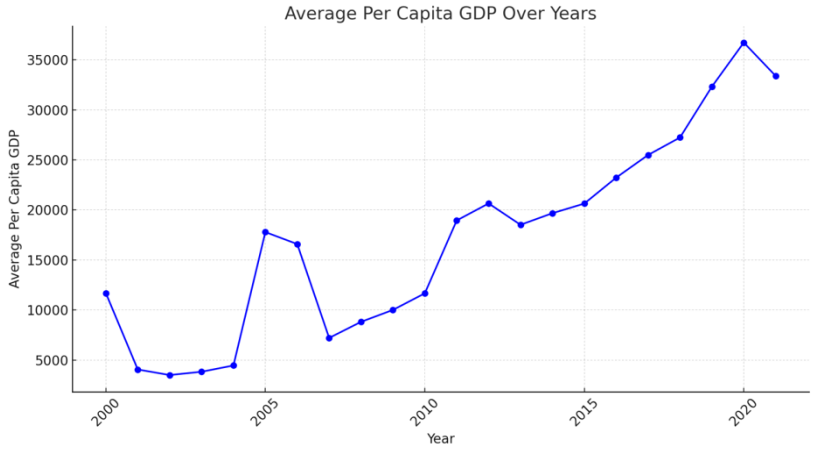

Figure 1. County-level GDP/Population

Independent variables

- Schools per 1000 (education): (# of primary schools + # of middle school)/(total population/1000)
- Hospital beds per 1000 (healthcare): # of beds/(total population/1000)
- Population inflow (population flow): total population-registered permanent resident
- Agricultural output ratio (agriculture): total output value of agriculture, forestry, husbandry, and fishery/county GDP
- Government spending per capita (government expenditure): Local fiscal budget expenditure/total population

- Industrial scale enterprises ratio (industrial & enterprises): # of large-scale industrial enterprises/total population

We eliminate the population factor in most of our variables to account for the regional differences in size. The use of per 1000 population for schools and beds is for convenience due to the fact that the data would be more intuitive than per capita as the number would otherwise be too small. Moreover, there is also an official use of bed/1000 in the data published by the government. For population inflow, we keep the population factor, as the absolute number of flows does matter because of the role population density plays in an economy.

5.3 Model Setup

5.3.1 Description of Longitudinal Analysis

Model setting: We used a mixed effects model to analyze the data, considering the region to be a random effect. The response variable y is estimated to be 1 in the model, indicating the main trend or average we observed among different regions.

Span: The analysis results show that the span between regions is very large, indicating that there are significant differences between regions in the indicators studied. This span may reflect the differences in the development levels of different regions in terms of education, healthcare, agriculture, industry, population flow, and government spending.

5.3.2 Model 1: Random Intercept

Formula: Per Capita GDP~region name

Random effects:

- Variance for intercept: 129,574,529 (σ: 11,383)
- Residual variance: 870,343,500 (σ: 29,502)

Fixed effects:

- Intercept: 17,096.4 (Std. Error: 461.2, t-value: 37.07, p<2e-16)

Interpretation:

- The random intercept model shows significant variability in Per Capita GDP across different regions.

The residual variance is the variability in Per Capita GDP within regions that is not explained by the model. The value of 870,343,500 with a standard deviation of 29,502 shows there is still considerable unexplained variation within each region.

- The intercept suggests that the expected value of Per Capita GDP for a typical region is around 17,096.4 units.

5.4 Model Evaluation

The Intraclass Correlation Coefficient (ICC) from the null model stood at 0.13, which suggests that 13.0% of the variability can be attributed to the regional level. This ICC value is indicative of a non-negligible between-region variance in GDP, signifying that the region does indeed play a role in shaping individuals' GDP in others, although most of the variation is still at the individual level.

The ANOVA test was used to compare two models, and significant improvements in model fit were

observed. The full model demonstrated a lower Akaike Information Criterion (AIC) and a significant chi-squared statistic of 5823.4 with 6 degrees of freedom ($p<2.2e-16$), affirming its superior fit over the null model. This substantiates that the inclusion of socio-demographic predictors notably enhances our model's capacity to explain the variability in GDP across individuals within regions.

6. Discussion and Implications

The analysis has revealed the factors influencing economic growth in rural and underdeveloped regions of China, in which each of the variables plays a unique role.

The positive coefficients of schools per 1000 and beds per 1000 indicate that local access to education and healthcare significantly contributes to economic growth by enhancing the productivity of the workforce, which in turn stimulates economic activities. The statistical significance suggests that investments in education and healthcare-related programs could yield substantial returns in economic growth.

The coefficient for population inflow is also positive and statistically significant, suggesting that regions experiencing a net inflow of population tend to see economic growth. This could be due to several factors, such as an increased labor force, higher demand for goods and services, and the diversification of skills. Policies aimed at attracting people to underdeveloped areas, such as through developing infrastructures, creating job opportunities, and improving living and working conditions, might potentially benefit the local economy.

The contrasting effects of agricultural and industrial development suggest that a movement toward industrialization might be beneficial for these regions. The negative coefficient for the agricultural output ratio suggests that a dependence on agriculture might be associated with lower levels of economic growth, which could be explained by the lower added value of the primary sector compared to other activities. By contrast, the positive coefficient for the industrial-scale enterprises reinforced the idea that industrialization acts as a promoter of economic growth. Supporting small and medium-sized enterprises could bring economic advancements.

The positive effect of government spending reflects the role of fiscal policy in economic growth. However, while it has demonstrated that increased government spending supported the economy, the finding suggests that the effectiveness of such spending heavily depends on the specific aspect it targets. Merely considering the amount of budget is not sufficient. It is crucial to allocate funds toward those programs that most effectively drive economic growth so that resources can be used to generate the maximum impact. Policymakers should focus more on enhancing the socioeconomic factors of underdeveloped regions to maximize the impact of government expenditure.

7. Conclusion

The eradication of absolute poverty in China is significant, yet the persistence of relative poverty in rural areas poses continued challenges. This study on the factors influencing economic growth in these regions provides a reference for policymakers to refine their strategies. Our research emphasizes education, healthcare, economic sectors, and effective governmental intervention in driving the economic growth of rural and underdeveloped areas in China. By focusing on these aspects, China can address the problems rooted in those areas and move toward sustained development.

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