The Allocation of Educational Resources in the Face of Socioeconomic Factors in China

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Abstract:

China's rapid economic development has led to significant improvements in its education system, contributing to a reduction in educational inequalities. However, this progress has been unevenly distributed, with a disproportionate focus on urban metropolitan areas, leaving rural regions underfunded and underserved. Despite efforts to universalize nine-year compulsory education, those disadvantaged students coming from rural areas or remote regions of China continue to face substantial challenges in comparison to their urban counterparts. Through time series analysis with Theil index model, it can be used to analyze and study the change of urban and rural income and its potential impact on education distribution. This paper highlights that the problems in allocation of educational resources between urban-rural area still exist. To address these disparities, several strategies could be implemented, including financial investment, developing aid-programs, and expanding educational facilities in rural areas. This research contributes to the broader literature on educational inequality in China, offering guidance for future investment strategies to address these persistent disparities.

Keywords: Educational inequality; the Theil index; income differences; China; educational distribution.

1. Introduction

Education has long been a cornerstone of societal development and a key driver of human progress, influencing not only individual growth but also broader political and economic outcomes. Education which has been generally assumed as a driving force to promote economy and social development could be effectual to reduce poverty and yield opportunities for promoting prosperity [1]. In China, the roots of formal education date back over a thousand years, with the introduction of the imperial examination system (*keju zhidu*) during the Sui and Tang dynasties. This system, which emphasized meritocratic selection for government positions based on knowledge of Confucian texts, played a pivotal role in shaping China's political structure and contributed to the formation of a highly centralized bureaucracy. The imperial examination system not only facilitated upward social mobility for the educated but also promoted cultural continuity and intellectual development. Its long-lasting influence established education as a central component of China's governance and social order. In modern times, education in China has evolved significantly, with the establishment of a 9-year compulsory education system in 1986, ensuring access to basic education for all citizens. This system has been instrumental in enhancing literacy rates, narrowing ur-ban-rural educational gaps, and contributing to China's rapid economic development as well as social welfare [2]. By equipping citizens with essential knowledge and skills, education has elevated the standard of living across the country and improved overall social welfare. The transition from the imperial examination system to modern compulsory education underscores the enduring importance of education in shaping not only individual success but also national prosperity and social stability [3]. Consequently, education remains a critical pillar in China's ongoing development, illustrating its far-reaching impact on both the historical and contemporary trajectories of the nation. Along with the enhanced economy, education system has been reformed and improved. China has invested in national education including qualified teachers, constructing new schools, 9-year compulsory education policy. Before the 9-year compulsory education policy goes into effect, the national education level Expansion of higher education increases the number of educational opportunities for students in China, allowing students from disadvantaged backgrounds could have access to higher education institutions than the past [4].

In 2018, rural primary schools enrolled 11.5379 million pupils, up 1.5% compared to 2017. And Rural junior high schools enrolled 10.2103 million students up 2.4% from

2017, which is higher than enrollments of junior high schools 5.8156 million from urban area, corresponding to the declining urban-rural gap at education level [5,6]. Nevertheless, compared to those students coming from rural areas, students living in urban areas often have a comparative advantage for a higher educational attainment. The average value of equipment per student in urban primary schools was RMB 1,5558, while the average value of equipment per student in rural primary schools was 75.8% of that in urban primary schools [7]. The average value of equipment per student in junior high schools reached RMB 2,453, reflecting an increase of RMB 188, or 8.3%, compared to the previous year. However, in rural junior high schools, this figure represented only 76% of that in urban junior high schools, despite a modest improvement of 0.8 percentage points over 2017 [7].

This disparity underscores the persistent inequality in resource allocation between rural and urban schools, where rural students continue to have significantly less access to equipment than their urban counterparts. According to the overview of educational achievement in China in 2018 from Ministry of Education of the People's Republic of China, "in rural areas, the proportion of teachers with such a degree was 75.3%, 12.0 percentage points lower than that in urban areas, reflecting still a sizable gap [8]." This paper highlights that the problems in allocation of educational resources between urban-rural area still exist.

## 2. Overview of the Development of Education in China

2.1 The Educational Level of Each Region in China

Over the past 20 years, China has seen substantial progress in its education system, particularly in the realm of higher education and average schooling years. In Figure 1, the proportion of people attaining higher education has risen sharply across most regions. Beijing leads with nearly 40% of its population in higher education by 2025, compared to around 10% in 2000. Similarly, Shanghai and Jiangsu show considerable growth, reaching approximately 25% by 2025, while they started closer to 5% in 2000 [9]. Figure 2 highlights a consistent increase in per capita years of schooling, with regions like Beijing and Shanghai moving from around 10 years of schooling in 2000 to over 12.5 years by 2025 [9]. Guangdong and Jiangsu show similar upward trends, increasing from around 8 years of schooling to over 11 years during the same period. This progress reflects the successful implementation of policies to enhance educational opportunities nationwide.

Despite the overall progress, both figures expose notable disparities between different regions. In Figure 1, regions such as Gansu, Qinghai, and Xizang lag significantly behind in higher education participation. Gansu, for instance, only reaches about 15% of its population in higher education by 2025, compared to Beijing's 40% [9]. This gap reflects an almost 25-percentage-point difference, which demonstrates the vast educational inequality. Similarly, in Figure 2, the per capita years of schooling in less developed regions like Xizang and Guizhou are significantly lower than in developed regions. By 2025, Xizang only reaches around 8 years of schooling, compared to Beijing's 12.5 years, illustrating a gap of 4.5 years. Even though both regions improved since 2000, the rate of improvement is noticeably slower in these less developed regions [9]. These figures highlight the stark contrast in educational development between urbanized, economically advanced areas and rural, less developed regions.

The regional disparities in education, as shown in Figures 1 and 2, have profound implications for China's broader socioeconomic goals. The stark differences in higher education participation (a 25-point gap between Beijing and Gansu) and schooling years (a 4.5-year difference between Beijing and Xizang) highlight the uneven distribution of educational resources and opportunities. This imbalance risks perpetuating existing socioeconomic inequalities, as regions with less access to education may struggle to improve their economic outcomes. The disparities suggest that more strategic allocation of educational resources is required, with a focus on improving access in underdeveloped areas to bridge the gap between regions. Without addressing these imbalances, China may face challenges in achieving its goals of balanced regional development and reducing poverty, as the lack of educational opportunities in certain areas will likely continue to limit the social and economic mobility of their populations.
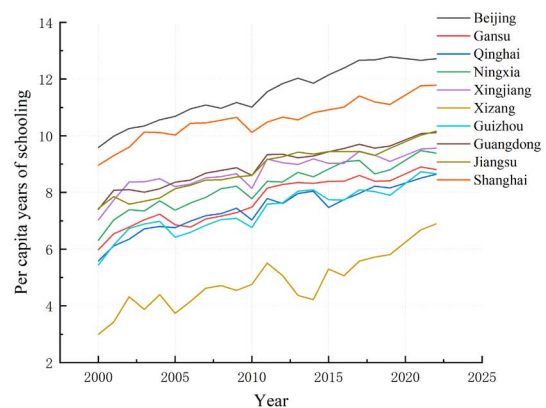
Fig. 1 Per capita years of schooling, 2000-2022 Source in different regions: National Bureau of Statistics, China Population and Employment Statistical Yearbook
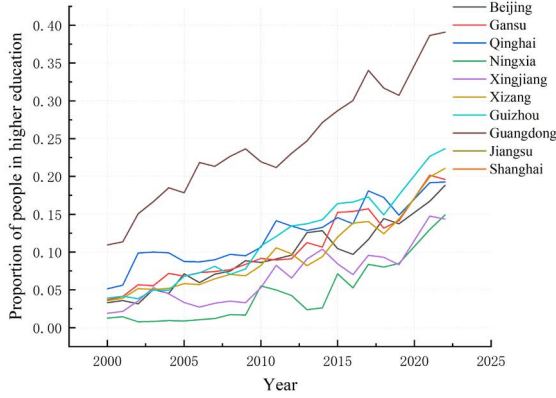
Fig. 2 Proportion of people in higher education in different regions, 2000-2020 Source: National Bureau of Statistics, China Population and Employment Statistical Yearbook

## 2.2 The Theil Index Model for Analyzing Urban-Rural Income Gap

Across all regions, the Theil index exhibits a general decline, particularly post-2010. This indicates that overall inequality between the regions in terms of educational outcomes or opportunities has been reducing over time. For most regions, the Theil index peaked around 2005, signaling a period where disparities were at their highest, followed by a noticeable drop. This reflects increased efforts to mitigate inequalities in education across China through various reforms, policies, and investments.

$$Theil_t = \sum_{i=1}^{2}\left(\frac{I_{it}}{I_t}\right)ln\frac{I_{it}/P_{it}}{I_t/P_t} = \left(\frac{I_{rt}}{I_t}\right)ln\frac{I_{rt}/P_r}{I_t/P_t} + \left(\frac{I_{ut}}{I_t}\right)ln\frac{I_{ut}/P_U}{I_t/P_t}$$

Based on the method of Long Haiming, this paper uses the Theil index to measure the urban-rural income gap, with the calculation formula as shown in Equation [9]. In the equation, $Theil_t$ represents the Theil index measuring the urban-rural income gap. I_{rt} and I_{ut} represent the total income of rural and urban residents at time t (total population multiplied by the average income level). I_t represents the total income at time t. And P_r and P_U represent the rural and urban population respectively at time t. P_t represents the total population at time t.

In Figure 3 below, Xizang (Tibet) and Gansu, these two regions show the highest Theil index values, especially between 2000 and 2010, indicating significant disparities in educational access or quality relative to other regions [10]. While their index values have declined, they remain higher than more developed regions like Beijing or Shanghai, which have had consistently low Theil index values, suggesting that the level of educational inequality

within these regions has been relatively minimal throughout the measured period. The small fluctuations suggest steady management of education resources. Provinces like Gansu, Qinghai, and Ningxia, located in western China, show significantly higher values compared to eastern provinces such as Guangdong and Jiangsu. This highlights the persistent regional disparities between the western, less economically developed areas and the eastern, more developed regions, though the gap is narrowing.
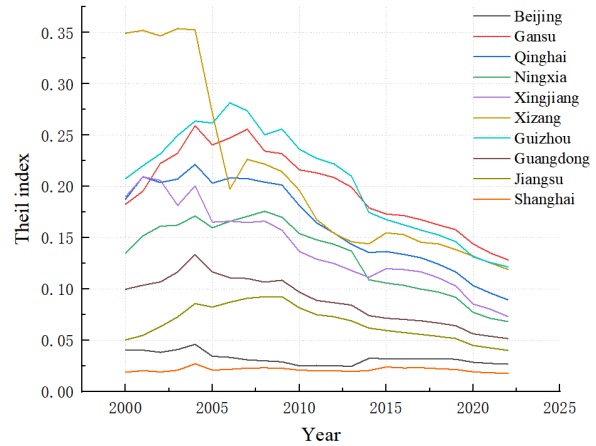
Fig. 3 Theil index of different regions in China, 2000-2022 Source: National Bureau of Statistics

2.3 The Income Gap among Areas in China

The Theil index model serves as an approach for understanding the income gap in urban-rural area. Figure 3 illustrates the trends in urban and rural income across various Chinese regions from 2000 to 2022, highlighting both persistent regional disparities and the impact of significant events, such as the COVID-19 pandemic. Regions such as Beijing, Shanghai, and Jiangsu consistently exhibit higher income levels, reflecting their more robust economic structures, while provinces like Guizhou, Gansu, and Qinghai remain at lower income levels, emphasizing enduring economic inequalities. A notable sharp decline is observed in Xizang (Tibet) around the mid-2000s, suggesting the influence of specific regional policies or economic shifts, though income levels stabilize after this period. Income trends across many regions peak between 2010 and 2015, coinciding with China's rapid economic growth and increased urbanization.

However, from 2019 to 2022, a marked decline in income is evident across all regions, likely attributable to the global economic disruptions caused by the COVID-19 pandemic. The pandemic led to supply chain disruptions, reduced economic activity, and lockdown measures,

which disproportionately affected rural areas and less economically developed regions. These observations underscore the ongoing challenges in reducing regional income disparities and emphasize the need for policies that foster more equitable economic recovery and growth across China.

Figure 3 further illustrates the urban-rural income gap across various regions in China from 2000 to 2025, showing significant disparities that can directly impact educational outcomes. Regions like Xizang (Tibet), Gansu, and Qinghai exhibit the largest income gaps, correlating with the higher Theil index seen in educational disparity. This urban-rural income gap suggests that wealthier urban areas can allocate more resources toward education, while rural areas, with lower income levels, struggle to maintain quality education, contributing to unequal educational opportunities. Over time, the narrowing of these income gaps reflects gradual improvements in educational equity, though some regions still face significant challenges. This gap highlights the importance of economic balance in reducing educational inequality between urban and rural populations.

3. Analysis of GDP Per Capita as a Contributing Factor to Educational Disparities

GDP per capita generally correlates with resource allocation, including education. Wealthier regions like Beijing and Shanghai typically have higher GDP per capita and, consequently, more resources to invest in education infrastructure, quality of teachers, and other educational services. This can lead to lower Theil index values, indicating less inequality within these regions. As shown in Figure 3 above, Beijing and Shanghai exhibit consistently low Theil index values. This aligns with their relatively high GDP per capita, as shown in the GDP data.

The availability of funding and resources in these regions allows for more equitable access to quality education across different demographic groups. On the other hand, Regions like Gansu and Qinghai, which have higher Theil index values, typically have lower GDP per capita. These regions are less developed and thus may struggle to provide the same level of educational services as wealthier regions. The disparities in funding, educational infrastructure, and teacher quality in lower GDP regions contribute to higher inequality. The GDP per capita data shows a significant gap between western provinces (like Xinjiang, Xizang, and Ningxia) and eastern provinces (like Jiangsu and Guangdong). This economic disparity directly influences educational outcomes, leading to the observed higher Theil index in western provinces and lower Theil index in eastern provinces.

4. Conclusion

The data analyzed from various regions in China reveal persistent educational disparities, despite significant improvements over time. Key factors contributing to these disparities include the urban-rural income gap, GDP per capita differences, and unequal access to higher education. Regions with higher income levels and better economic development, such as Beijing, Shanghai, and Guangdong, tend to have higher average years of schooling and a larger proportion of the population attending higher education. Conversely, less developed regions, like Gansu, Qinghai, and Xizang, exhibit lower educational outcomes, as reflected by higher Theil index values and larger urban-rural income gaps.

To address these disparities, several strategies could be implemented. First, targeted investments in educational infrastructure and resources for underdeveloped regions are essential. Government policies that allocate funding specifically to rural and economically disadvantaged areas can help reduce the resource gap. Additionally, promoting economic growth in these regions through balanced regional development initiatives could enhance income levels and support better educational outcomes. Moreover, fostering access to higher education in rural areas, such as through scholarships, financial aid programs, and expanding educational facilities, can help bridge the gap between urban and rural populations. Thus, a multi-faceted approach that combines economic development with educational reform is crucial to alleviating educational disparities and ensuring equal opportunities for all students across China.

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