



Introduction to regional economic differences in Shanxi Province.

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Abstract. Regional economic disparity is a widespread problem, and the study of regional economic disparity is of great significance to improve this phenomenon. Shanxi province is a large resource province, The economy was also prosperous for a while, but due to the impact of various factors leading to the province's regional economic disparities getting bigger and bigger, this paper takes Shanxi province as the object of study, compares the standard deviation of GDP of the past years, analyzes the differences between the various regions of the economy of Shanxi province, and puts forward some opinions and suggestions.

Keywords: Shanxi province, regional economic differences, standard deviation analysis.

1 Introduction

The issue of regional economic disparities is a complex and prevalent concern within the context of economic development. Such disparities are observable not only on a global scale between countries but also within countries, between regions, provinces, and urban areas. Failure to address these disparities can lead to exacerbated wealth inequality and heightened polarization [1]. This study focuses on the economic disparities within Shanxi Province, China, examining the variations in GDP values among its urban areas over a span of eleven years, from 2008 to 2018. By analyzing the standard deviation of GDP values among different urban areas, the study aims to understand the evolving trend of economic disparities, identify the influencing factors behind these disparities, and measure the extent of regional economic differences. The research seeks to shed light on the underlying causes of economic imbalances in Shanxi Province and provide insights into potential strategies for achieving more balanced and sustainable economic development. Through a systematic analysis of economic data and influential factors, this study contributes to a deeper understanding of the challenges and opportunities associated with regional economic disparities, ultimately guiding the formulation of effective development strategies to address these disparities in Shanxi Province [2].

2 Purpose of the Study

Regional economic disparity is a prevalent issue during the process of economic development. Such disparities manifest between countries globally, regions within each country, provinces within regions, and even urban areas within provinces. These disparities are virtually inevitable, stemming from a multitude of factors. If left unaddressed, they can result in widening economic gaps, heightened wealth inequality, and significant polarization [3]. In the context of China, economic disparities are observable between northern and southern regions, as well as between the eastern, central, and western parts of the country. Notably, economic disparities exist between Guangdong Province and Shanxi Province. The causes of these disparities are complex and cannot be resolved instantaneously. Shanxi Province mirrors the national scenario; wherein considerable economic discrepancies exist among its various urban areas [4].

The study of regional economic disparities holds the potential to enhance our comprehension of formulating effective regional development strategies [5]. Shanxi Province, recognized for its substantial natural resources, has historically relied on resource consumption to sustain its economy. This reliance has also led to pronounced variations among urban centers. Investigating regional economic disparities in Shanxi Province can contribute to the future crafting of enduring economic development strategies, bearing significant long-term significance.

3 Research methodology

This paper analyzes the data of 11 municipalities in Shanxi Province based on the GDP values of the municipalities in Shanxi Province from 2008 to 2018 obtained from the Shanxi Statistical Yearbook as the basic data [6]. The standard deviation is a criterion that indicates the degree of deviation of the sample from the mean, as in the following formula, where y_i is the GDP value of a city in Shanxi Province, $\bar{y}$ is the average value of the GDP of each city in Shanxi Province in a certain year, and N is the number of urban areas in Shanxi Province. The larger the standard deviation, the greater the economic differences between the municipalities in Shanxi Province, and the more obvious the regional economic differences[7].

By analyzing the standard deviation of the GDP value of each urban area in Shanxi Province in:

$$S=\sqrt{\frac{\sum_{i=1}^n(y_i-\bar{y})^2}{N}} \tag{1}$$

recent years, we can understand the trend of economic disparity in Shanxi Province, analyze and study the reasons for the economic disparity of each urban area within Shanxi Province, and measure the level of absolute disparity between each urban area in Shanxi Province [8].

4 Analysis of regional economic disparities

Shanxi Province is an inland province in China, located on the Loess Plateau, on the east bank of the middle reaches of the Yellow River, moreover, the Fen River, a tributary of the Yellow River, flows through Taiyuan, Shanxi, and there are 11 prefectural-level cities in the province, with the capital city being Taiyuan. The following table shows the city GDP statistics of the 11 prefectural-level cities in Shanxi Province over the past 11 years, from the Shanxi Statistical Yearbook of the past years [9].

Table 1. GDP Statistics of Municipal Cities in Shanxi Province, 2008-2018

GDP Statistics of Municipal Cities in Shanxi Province, 2008-2018											
	Taiyuan	Datong	Yangquan	Changzhi	Jincheng	Shuozhou	Jizhong	Yucheng	Xizhou	Linfen	Lvliang
2008	1468.09	569.63	310.65	682.13	682.13	420.40	567.81	691.45	315.77	754.63	629.64
2009	1545.24	596.26	348.71	775.29	775.29	561.31	636.81	723.01	349.31	766.69	611.56
2010	1778.05	695.91	429.38	920.23	920.23	670.15	763.84	827.43	437.46	890.14	845.54
2011	2080.12	843.57	528.11	1218.60	1218.60	855.20	890.24	1016.82	554.55	1136.06	1130.71
2012	2311.43	931.39	601.95	1328.61	1328.61	1007.12	986.56	1068.65	620.94	1221.08	1230.42
2013	2412.87	967.43	611.81	1333.72	1333.72	1026.40	1022.23	1140.12	654.73	1223.90	1228.60
2014	2531.09	1001.73	616.62	1331.14	1331.14	1003.41	1042.31	1201.62	680.34	1213.24	1101.35
2015	2735.34	1053.37	595.70	1195.34	1195.34	901.13	1046.12	1174.01	681.24	1161.11	995.80
2016	2955.60	1025.80	622.86	1270.48	1270.48	918.06	1091.10	1222.30	716.14	1205.18	995.31
2017	3382.18	1121.31	670.02	1477.53	1477.53	980.22	1284.92	1336.29	874.49	1320.33	1310.32
2018	3884.48	1271.96	733.69	1645.63	1645.63	1065.63	1447.60	1509.64	989.13	1440.04	1420.32

Using the data in the above table, by calculating the standard deviation of the GDP value of each urban area in each year, we obtain the following Table 2 and Figure 1 and use these standard deviations to reflect the differences in the regional economy of Shanxi and the changes in such regional economic differences in recent years.

Table 2. Changes in regional economic variances in Shanxi, 2008-2018

Changes in regional economic variances in Shanxi, 2008-2018						
Year	2008	2009	2010	2011	2012	2013
standard deviation	299.56	304.39	341.30	397.48	435.17	452.68
Year	2014	2015	2016	2017	2018	
standard deviation	478.76	537.14	590.81	678.87	787.66	

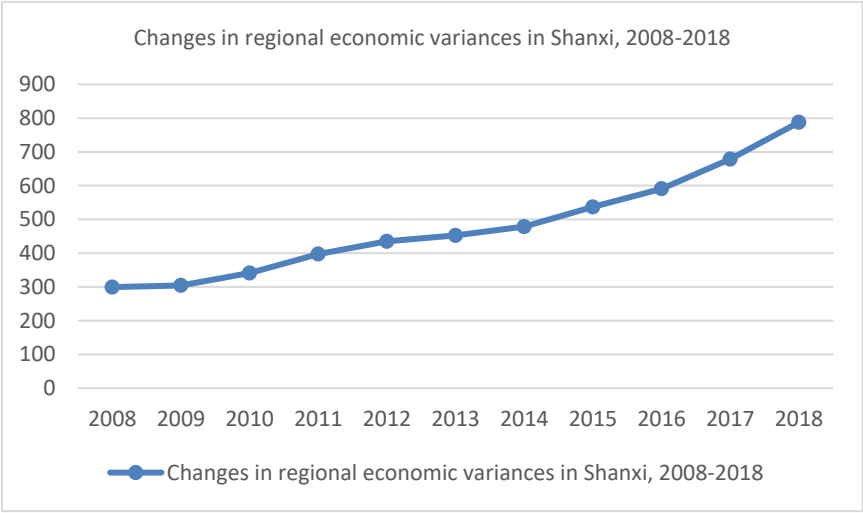


Fig. 1. Changes in regional economic variances inShanxi,2008-2018

Figure 1 evidence that economic disparities within Shanxi Province are intensifying over time, with a persistent upward trend. Although there was a slight moderation between 2011 and 2014, the overall trend points to a continuing increase in differences. Examining Table 1 data, we can observe that in 2008, the gap between the urban GDP of Taiyuan, the city with the highest value, and Yangquan, the city with the lowest value, was 11,574,400 yuan. However, by 2018, this gap had ballooned to 31,507,900 yuan. This difference is comparable to the GDP levels of three other mid-level prefectural cities in Shanxi Province, underscoring the staggering economic inequality [10].

The steadily rising figures underscore the widening chasm between high and low GDP regions. This growing regional economic divide not only poses a challenge to the province's balanced and stable economic growth but also presents a formidable obstacle to Shanxi's future transformation and upgrading efforts.

5 Main influencing factors

5.1 Physical and geographical factors

Shanxi Province boasts exceptional natural geographic advantages. Its central region encompasses the Yuncheng Basin, Linfen Basin, Taiyuan Basin, and Datong Basin from south to north. These basins concentrate on the province's population and enjoy superior geographical conditions, fostering developed agriculture and serving as key economic hubs. The province is endowed with abundant resources, particularly coal. It has been long acclaimed as the "coal capital" due to its 11 out of the nation's 118 resource cities being in Shanxi, along with 94 coal mines out of 119 nationwide. Notably, 36 of these coal mines hold the status of national key coal producers.

Although Shanxi's coal mines are a natural endowment, achieving a sustainable balance remains elusive. The province's cities exhibit varying degrees of coal resources, with some being rich while others are scarce. Many of its larger and medium-sized cities thrive as industrial and mining centers, relying heavily on coal extraction and basic processing to sustain their economies. The distinct natural factors underpinning the economic development of these urban areas result in subsequent disparities becoming increasingly pronounced and, in some cases, even widening over time.

5.2 Ideological factors

The concept of regional humanities plays a crucial role in shaping social consciousness and subsequently influencing the local economy. A region that embraces openness and progressive thinking tends to foster innovation, encourage developmental initiatives, and readily explore novel ideas, thereby propelling its economic growth. Conversely, regions characterized by conservative mindsets and resistance to change can impede the evolution of their economies.

In Jinzhong District, a prevailing openness to change prevails among its populace, thus catalyzing the advancement of the local economy. This district, notably encompassing Pingyao County and Taiyuan City, has a history of embracing innovation and change. Notably, Pingyao County holds historical significance as the birthplace of Jin merchants' prominence a century ago. Taiyuan City, on the other hand, boasts the highest GDP in Shanxi Province, signifying a population with forward-looking ideals. This collective progressive mindset significantly contributes to the district's overall development.

However, regions like Jinnan, Southeast Jinnan, and North Jinnan districts encounter challenges due to their rugged terrain and limited transportation networks. The conservative outlook held by many residents in these areas hinders the adoption of new ideas, ultimately impeding resource utilization and technological progress. This regressive stance consequently results in sluggish economic growth within these districts.

5.3 Transportation condition factor

Transportation exerts a profound influence on the economic advancement of urban centers, with well-established transportation networks correlating closely with economic growth. Effective transportation systems serve as conduits connecting cities with the broader external environment, facilitating regional interactions and fostering economic development. In recent years, Shanxi Province has devoted significant human, material, and financial resources to the expansion of its subway infrastructure. Owing to the region's rich subterranean resources, the construction of underground passages presents distinctive challenges. Following the successful approval of the subway construction initiative in 2012, the development of subterranean transportation routes commenced in phased intervals.

In December 2020, a significant milestone was achieved as Taiyuan inaugurated its inaugural subway line, Metro Line 2, thereby enhancing the city's overall transportation capacity. This endeavor is aligned with a broader strategy to accelerate urban renewal efforts, bolster the establishment of public service facilities in the western Fen River region, optimize the utilization of subterranean spaces, and expand the spatial dimensions of the city. The Shanxi provincial government is vigorously expediting the implementation of the rail transit line 1 phase I project, concurrently initiating the rail transit line 3 phase I project, while advancing plans for the subsequent phases of line 1 expansion.

6 Improvement strategies

6.1 Integration and rationalization of resources

The province's resources are limited, and so are its funds. In allocating these resources, it is necessary to look at the economic situation of the whole situation and to integrate and rationalize all the resources. The resources will be used in the neediest areas so that they give full play to the greatest value. Shanxi Province is rich in mineral resources, and each region has its own advantageous resources, the rational use of these resources, the province's limited resources, coordinate arrangements, and minimize the economic differences between the municipalities.

6.2 Enhancing Inter-Regional Cooperation

Each region possesses its own advantageous industries and abundant resources. Inter-regional cooperation plays a pivotal role, not only fostering the synergistic utilization of complementary strengths among regions but also bridging the economic disparities between less-developed and more-developed areas. This, in turn, facilitates the advancement of economically underdeveloped regions and propels overall regional development [4].

Inter-regional cooperation can take the form of inter-enterprise collaboration, where enterprises from different prefecture-level cities reinforce their ties and interactions. This approach enables prosperous businesses in economically developed regions to

drive the growth of less advanced counterparts in economically underdeveloped regions. By facilitating mutual communication and leveraging each other's strengths, enterprises can collectively thrive. Simultaneously, governments should extend policy support to these cross-city collaborative enterprises, enabling them to seize unique opportunities for learning from advanced enterprises' methods and experiences. This proactive approach will empower local enterprises to enhance their economic prowess, thereby catalyzing local economic development."

7 Conclusion

Regional economic disparity is a widespread issue, arising from a multitude of factors. In the case of Shanxi Province, this problem is particularly pronounced and concerning. To curb the widening gap in economic development among its prefectural-level cities, urgent action is needed. Timely implementation of a coordinated regional economic development strategy in Shanxi Province is imperative. Employing various measures promptly and effectively to mitigate the escalating regional economic disparity is essential to avert further detrimental consequences.

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