

Analysis and Decision-making of Regional Economic Vitality and its Influencing Factors

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Abstract

Regional economic vitality is an effective manifestation of regional economic adaptability and competitiveness. Different regions with different natural resources and human capital will lead to regional economic imbalances. This article selects Jilin Province as a sample for analyzing regional economic vitality, and takes the revitalization of Northeast old industrial bases as the background. Combined with the actual situation, we explored the problem from different levels and aspects, and provided theoretical basis and strategic opinions for the development of regional economic vitality in Jilin Province. For Question 1, Jilin Province's urban population, population aging, natural growth rate, and population migration were selected as explained variables, and regional GDP was used as the explanatory variable. Using Eviws software to perform multiple linear regression analysis, it can be seen that the model has a strong explanatory power. Then test the above results through the unit root test and E-G cointegration test. In terms of enterprise vitality, we used nine SPSS variables to analyze the relationship between the number of enterprises and economic vitality, and found that there was a corresponding relationship between the number of enterprises in Jilin Province and economic vitality. For Question 2, in the context of the transformation policy of increasing the development of the tertiary industry economy in the Northeast, the analysis was made from the perspective of the development level of the tertiary industry at different levels and the level of regional economic development. It can be concluded from the regression results that increasing the development ratio of the tertiary industry can indeed bring regional economic growth in the short term, but long-term planning is still needed. For Question 3, use the grey correlation to obtain the grey correlation between the number of registered companies, registered capital and the city's permanent population. Through the solution of the first problem, it was found that there is a significant link between the urban resident population and the regional economic vitality, and then a relevant evaluation system was established. Then corroborate the conclusion through correlation analysis and rank the cities. For Question 4, based on the conclusions of the previous three questions, through the proposal of using export trade to increase employment opportunities, accelerating the pace of urbanization, strengthening the organic combination of talents and enterprises, adjusting industrial structure and developing and innovating technology so as to make Jilin more regionally competitive.

Keywords

Population Quantity and Quality; Index Evaluation; Grey Correlation Analysis; Regional Economic Vitality.

1. Questions Analysis

1.1. Analysis of Demographic Factors to the Change of Regional Economic Vitality

While China is fully developing its economic and cultural construction and completing its social transformation, it is also facing many severe challenges, such as population issues. Some provinces and autonomous regions have experienced imbalanced population development, low birth rate, aging population, and uneven distribution of talents. Starting from the basic characteristics of population development, effectively grasping the new population development trends of the country or region and combining with the actual situation, all of these have a time-effective help for China's national economic, cultural and social development.

1.1.1. Development Characteristics of Urban Population Density

There is a certain degree of correlation between population size and economic development. A moderate population size represents a suitable labor force quality and employment rate, and provides a good foundation for urban development. People can stimulate the goods consumption and promote the production of scientific and technological innovation. Therefore, the number of a city's population indirectly indicates the degree of city's activity and its development potential.

According to the Statistical Communique of Jilin Province on National Economic and Social Development 2018 provided by the National Bureau of Statistics, as of the end of 2018, the total population of the province was 27,046,000. Among them, the urban resident population is about 15,556,000, accounting for 57.53% of the total population. Compared with the previous year at the end of 2017, the total resident population in Jilin Province was 27,174,000. The total number of resident population in 2018 decreased by 137,700, a year-on-year decrease of 0.49 percentage points. The number of resident population continued to decline.

In the process of scientific research, allometric growth models can be used to describe the relationship between urban population and urban area, and the distribution of urban-rural evolution.

$$\frac{1}{M} \frac{dM}{dt} = b \frac{1}{N} \frac{dN}{dt} \quad (1)$$

Equation (1) can be equivalently expressed as $\ln M = \ln a + b \ln N$, and the logarithmic equation can be simplified by the power operation to obtain $M = aN^b$. Among them, a is the proportionality coefficient, b is the allometric growth coefficient, N is the total urban population, and M is the urban area.

The basis for judging allometric growth is the value of b , which is determined by the urban population and the dimensions of the urban area. According to studies by Chinese scholars, the dimension of urban land in China is generally around 1.7, and the dimension of urban population is generally 2, so $b=0.85$ can be obtained. When b is greater than 0.85, the growth rate of urban land is greater than the growth rate of urban population, otherwise the reverse is true. This indicator can be used to measure whether the urban population and urban area are developing in harmony.

In the curve relationship in the figure above, the urban population density and the urban area showed a slow growth trend from 2008 to 2010, but the two showed an inflection point in 2010. During 2010-2013, the urban population density gradually increased to 3135 (persons per square kilometer), while at the same time, the urban area dropped from 7,377 square kilometers to 3596 square kilometers. From 2013 to 2015, the urban population density and

urban area were relatively stable. However, from 2015 to 2016, the urban population density showed a significant downward trend, falling to 2231 (persons per square kilometer), showing a negative growth state. The urban area increased by 5,112 square kilometers in 2016. The data stabilized in 2016-2017, but compared with the previous five years, the downward trend is obvious. On the whole, in the ten years from 2008 to 2017, data on urban population density and urban area have changed significantly.

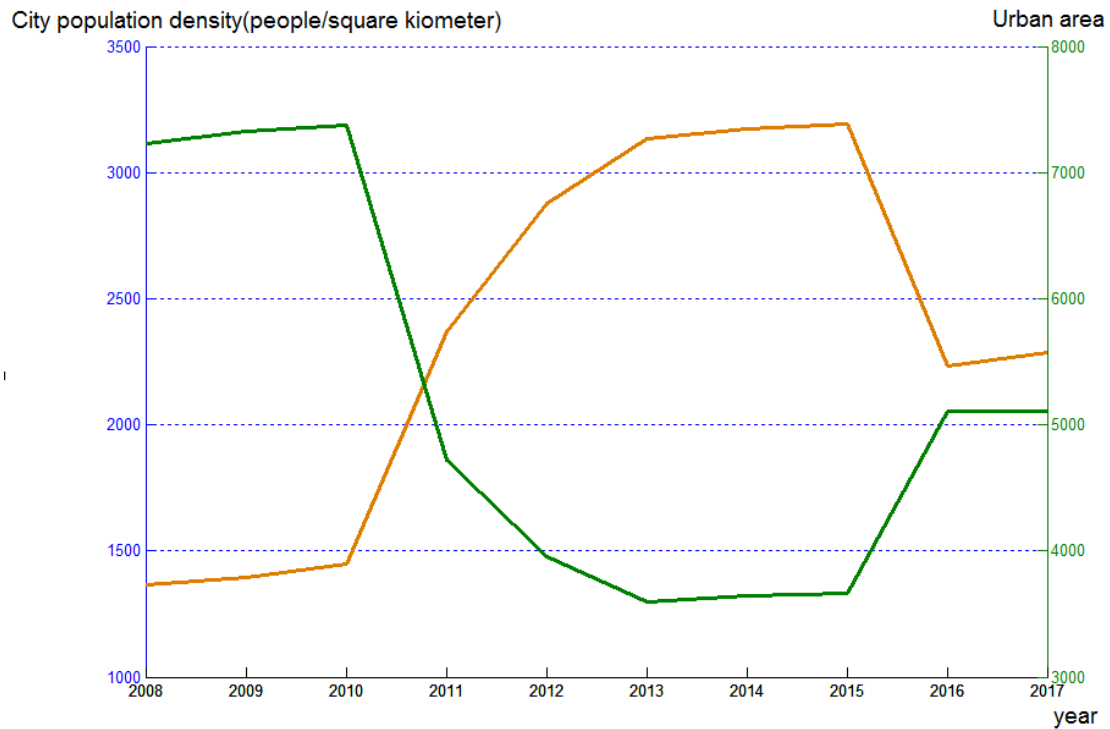


Figure 1. Trend of Urban Area and Urban Population Density

Here, we introduce the concept of imbalance index, the expression is as follows:

$$E = \sqrt{\frac{\sum_i^n [\frac{\sqrt{2}}{2}(x_i - y_i)]^2}{n}} \tag{2}$$

x_i represents the proportion of GDP in Region i , and y_i represents the proportion of population in Region i . The size of the imbalance index reflects the degree of coupling between population and economic space. The greater the degree of imbalance, the lower the degree of coupling between the regional population and the economy.

As can be seen from the table above, the imbalance coefficient reached the highest value in 2015 after a slow orientation, indicating that the regional population and economic space utilization rate is gradually developing from an imbalance to a balanced state. However, the imbalance coefficient is generally greater than the national average, so the problem of population and economic space utilization needs to be further solved.

At the same time, according to the National Statistical Bulletin, in 2017, the proportion of urban population in the country was 58.52%, while the proportion of urban population in Jilin Province was 56.64%, which was lower than the national urban population level.

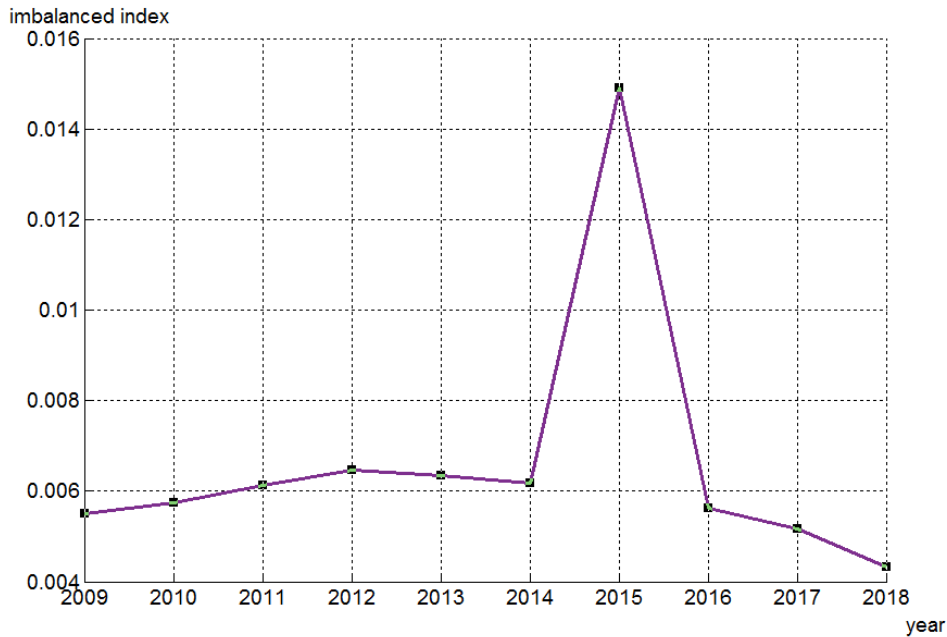


Figure 2. Trend of Unbalance Coefficient in Jilin Province

1.1.2. Increasing Number of Aging Population and the Aging Social Population

Up to now, with the development of the world economy, the aging of the population has become a common problem in the social development of developed countries and some developing countries. Similarly, the aging of the population is also one of the current development status of China. Internationally, the standard for population aging is generally set as follows: people over 60 years old account for 10% of the total population of a country or region, or people over 65 years old account for 7% of the total population of a country or region.

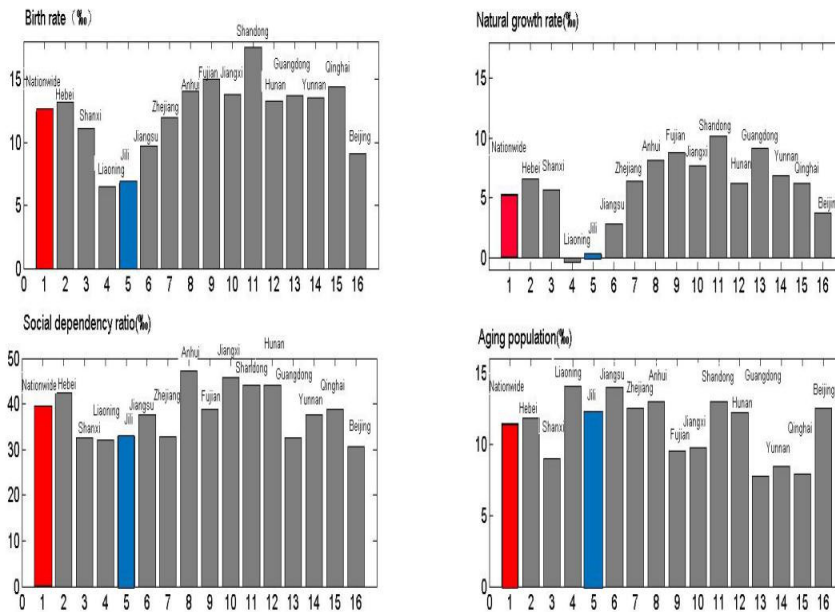


Figure 3. Figures of birth rate, natural growth rate, social dependency ratio, and proportion of elderly population

The aging social phenomenon is a direct consequence of changes in birth and death rates. An aging population will lead to a decline in productivity, which will lead to a slow development of

national or regional economic vitality. The prominent effect of population aging is on the age structure of the labor force. The higher the degree of population aging, the greater the resistance to economic growth. In other words, the aging of the population will lead to a decline in the proportion of the working population and insufficient supply, which will lead to a low supply of labor and affect the economy.

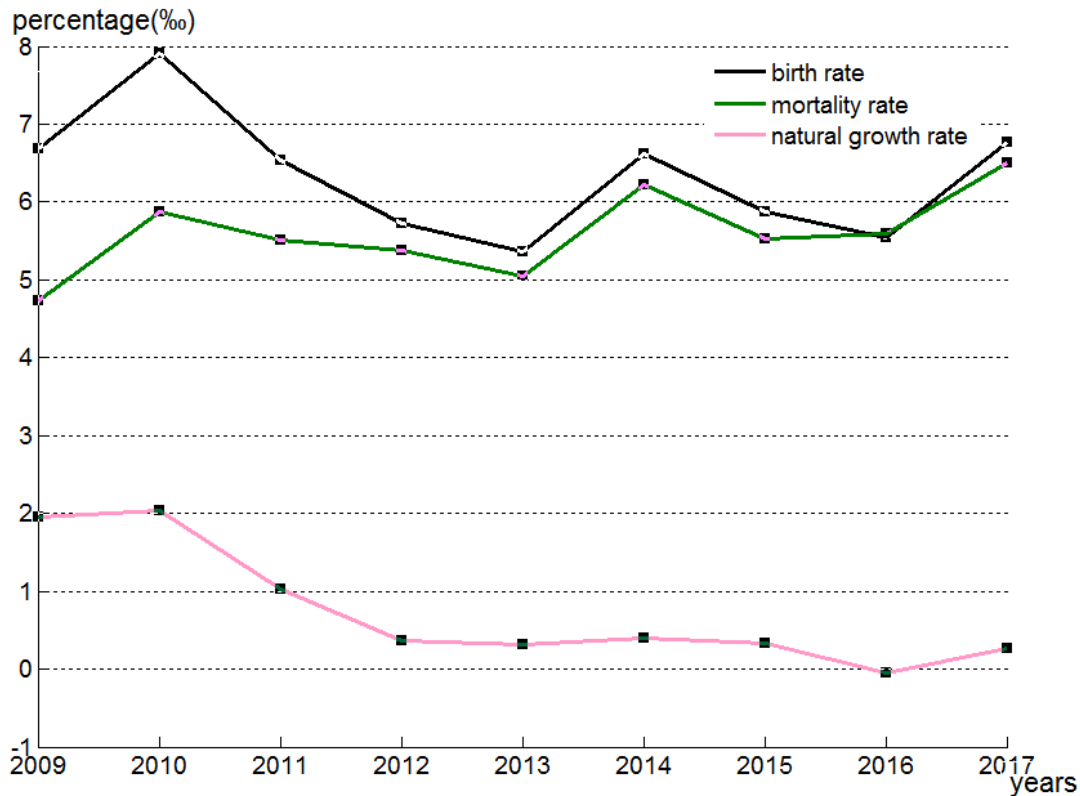


Figure 4. Curve of Annual Natural Population Growth Rate in Jilin Province From 2009 to 2017

As can be seen from the data line chart above, from 2009 to 2017, the birth rate of Jilin Province has been less than 10%. As of 2017, the birth rate of Jilin Province was 6.76%. Due to the continued low birth rate, the natural population growth rate of Jilin Province has been -0.05% in 2016. From 2009 to 2017, the overall population birth rate of Jilin Province has shown a downward trend, resulting in an increase in the proportion of the elderly population and a negative growth rate of the natural growth rate. And even negative numbers appeared. It can be concluded from this that Jilin Province is a typical aging population area and the situation is severe.

1.1.3. Impact of Population Migration on Changes in Regional Economic Vitality

To a certain extent, population migration is an economic investment. People often consider various economic factors while migration, such as cost and economic benefits after migration. Whether the decision maker chooses to relocate depends on whether the comprehensive benefits obtained from the relocated area can be greater than the comprehensive benefits from the area of origin. Therefore, the migration volume can reflect the dynamic situation of regional economic development from the side. And the migration of population will definitely lead to the migration of talents. The following figure is a hierarchy of talent pyramid.



Figure 5. Hierarchy of Talent Pyramid

According to the “Migration Population Dynamics Survey Data”, Jilin Province’s annual net outflow population continues to increase. For the sake of comparison, this article selects Beijing in the eastern region, Guangdong province in the coastal region, Jiangxi province in the central region, and Jilin province in the northeast. As shown in the following table (positive numbers in the table below are net inflows and negative numbers are net outflows).

Table 1. Net Outflow and Inflow of Urban Population in Year

Year	Beijing	Guangdong	Jiangxi	Jilin
2011	13804	42482	9816	– 933
2012	20862	59111	12402	–1268
2013	24302	59977	11017	–1794
2014	23737	67838	10104	–1900
2015	22321	73417	16839	– 2093
2016	18557	58022	14012	–1620

According to the above table, compared with developed areas in the east, Jilin Province, one of the old industrial bases in Northeast China, lagged behind in the development of coastal developed areas and areas with better development in the central region in recent years. From 2011 to 2016, the population of Jilin Province was in a state of outflow, which made Jilin a typical outflow province.

The relationship between population migration and regional economy is shown in the figure below.

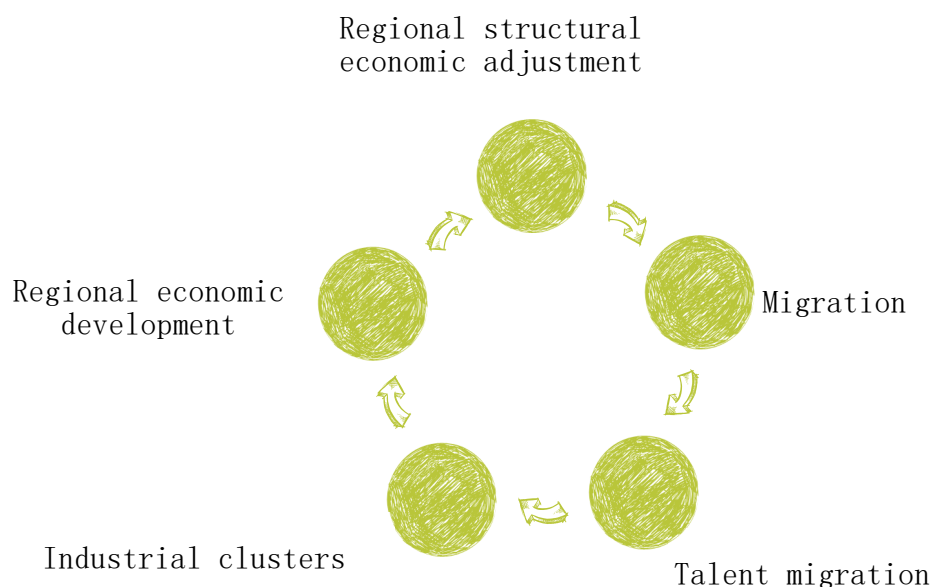


Figure 6. Mind Mapping of Population Migration and Regional Economic

1.2. Analysis of Changes in Corporate Vitality Characteristics

Table 2. National and Northeast China Enterprise Loss

Year	National enterprises			Northeast Enterprises		
	Number of Business Units	Increase or Decrease in Loss-Making Companies(%)	Cumulative Growth Rate of Total Losses(%)	Number of Business Units	Increase or Decrease in Loss-Making Companies(%)	Cumulative Growth Rate of Total Losses(%)
2019.10	369794	7.7	14.9	3818	42	16.4
2019.8	367678	6.7	11.6	3810	29.2	5.5
2019.6	366187	5.7	10.4	3806	23.6	8.2
2019.4	365232	4.3	15.6	3798	22.1	-0.3
2019.2	364977	5.4	23.9	3794	16.9	12.8
2018.12	378440	8.4	8.5	5963	6.5	-35.8
2018.10	376236	6.9	7.4	5962	9.7	-32.5
2018.8	374552	6.2	5.4	5960	8.6	-37.2

The development of a country or region also complements the development of enterprises. A good environment brings a good talent resource base for enterprises and a good enterprise brings economic benefits to the region. As an old industrial base, Northeast China has an excellent geographical location and excellent industrial development conditions. However, in recent years, with the continuous changes and adjustments of the regional economic structure, the problems of physical fitness and corporate structure in the Northeast have become increasingly prominent. According to the data of the National Bureau of Statistics, the analysis shows that the industrial and economic aggregate growth of the three northeastern provinces

has been slow, and has clearly fallen behind the national average and several other typical industrial cities. It is urgent to take measures to deal with the decline of corporate vitality.

The data shown above are from the National Bureau of Statistics. Through comparative analysis, it is found that from a national perspective, the growth rate of loss-making companies in Northeast China from 2018.8 to 2019.10 is much higher than the national level.

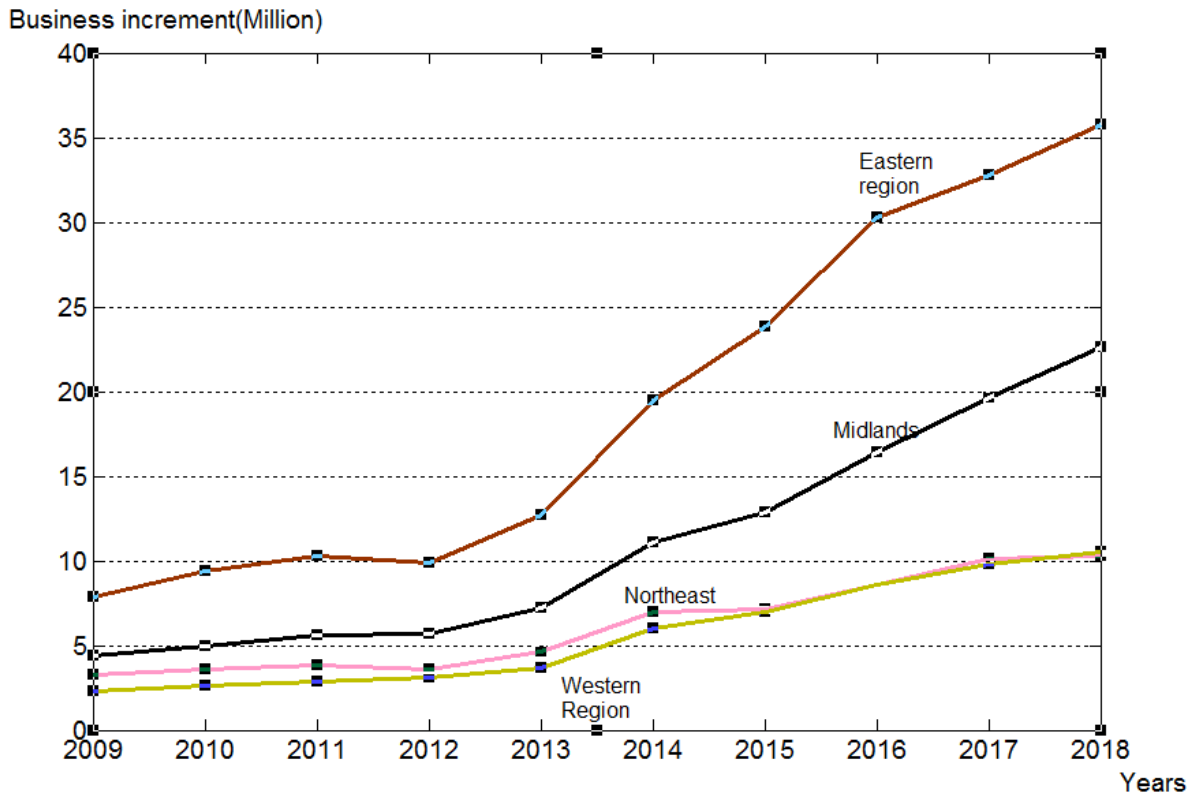


Figure 7. Incremental Changes in the Four Economic Zones

According to the incremental changes in the four economic zone companies provided in Annex II, we converted the data into line charts. It can be intuitively seen that the four economic zones have generally maintained an upward trend, and the number of new enterprises each year is basically higher than the above year. However, the number of new enterprises between economic zones varies greatly. The number of newly-added enterprises in the eastern region has maintained a leading level among the remaining economic zones, and has a great advantage, followed by the central region. Due to the reform of the economic system, the northeast region has changed from a net migration inflow of population to a net migration outflow of population. Especially in recent years, the economic growth of the Northeast region has slowed down and even declined. Therefore, the vitality of enterprises is relatively weak, and the number of new enterprises in the Western region may exceed that of the Northeast.

1.3. Research and Analysis on the Status Quo of Regional Economic Vitality Development

Regional economic vitality is the ability of a region to compete economically, adapt to the environment, and attract private and public enterprises. Regional economic vitality is more specifically manifested in economic growth, the attraction of foreign capital and various productivity factors. Regional economic vitality reflects the current status of regional development and future development prospects from an economic perspective. This article

selects two economic indicators, namely the number of registered enterprises and the amount of registered capital, as indicators of regional economic vitality.

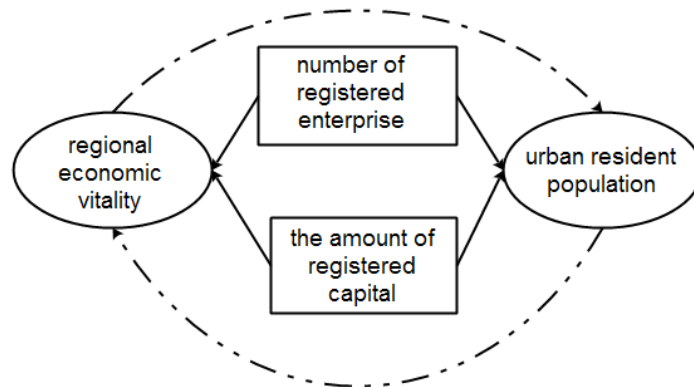


Figure 8. The Impact of Enterprises on Regional Economic Vitality and Urban Population

The number of registered enterprises and registered funds in the region is closely related to the city's economic vitality and population size. The contribution of enterprises to the economy is not just the tax and output value expressed intuitively. It has also played a significant role in the region's economic vitality, capital and talent attraction. Better economic vitality means better infrastructure and public service systems. It also means more investment in capital and talent, which increases employment opportunities. Therefore, the number of regional business registrations and registered funds have a significant direct impact on the urban population.

In this article, we will measure the economic vitality of a city through the amount of business registration and the amount of registered capital, thereby exploring the regional economic vitality, and analyzing the impact of the number of business registrations and registered funds on the resident population through grey correlations. According to the established indicator system, the economic vitality of each city provided in Annex III is ranked.

2. Models Establishment and Solution

2.1. Models Establishment and Solution in Question

2.1.1. The Establishment of Indicators

When discussing the impact of population size and quantity on regional economic vitality, we take the total population, the natural population growth rate, the aging ratio, and the number of migrants as typical indicators that can represent its system. At the same time, we use regional GDP as the economic vitality and the characteristic factors are detailed in the table below.

Table 3. Index System of Population Quality and Economic Development

Indicator Type	Index
Population Quality (a_i)	Total Population a_1 (10,000 People)
	Natural Population Growth a_2 (%)
	Percentage of Population over 65 a_3 (%)
	Outflow of Population a_4 (Person)
Economic Vitality (b_i)	GDP of Jilin Province b_1 (10,000 Yuan)

2.1.2. Establishment and Solution of Multiple Linear Regression Model

In order to establish the relationship between population factors and regional economy in Jilin Province, this paper selects four variables that can represent population factors, and discusses the linear relationship between them and regional GDP. First, the establishment of a multiple linear regression equation between the explanatory variable GDP and the explanatory variable X is determined. The model is built as follows:

$$b = \beta_0 + \beta_1 a_1 + \dots + \beta_p a_p + e \tag{3}$$

Using *Eviews* to perform multiple linear regression analysis on the data from 2011 to 2017, the following results were obtained:

$$b = 13775.64 - 0.287492a_1 + 2.629618a_2 - 2293.184a_3 + 0.60605a_4$$

It can be seen from the final analysis results that the judgment coefficient is $R^2 = 0.987$ and the adjusted judgment coefficient is 0.961. The goodness of fit is relatively good, indicating that the model is convincing (for detailed results and program codes, see the annex). This shows that the total population of Jilin Province, the natural population growth rate and the quality of the population brought about by the aging population, the migration of talents and the accumulation of industries brought about by the migration have a significant impact on regional economic growth.

2.1.3. ADF Unit Root Test and E-G Two-Step Co-Integration Test

A unit root test was performed on the selected explanatory variables to further determine its stability, and the *Eviews* software was used to test the results. The results are shown in the Table 4.

Table 4. ADF Test Results

Variable	ADF Value	1% Critical Value	5% Critical Value	10% Critical Value	Conclusion
X_1	-3.5227	-5.6046	-3.6948	-2.9828	Stable
X_2	-4.1256	-2.4236	-3.9849	-3.1206	Stable

From the test results obtained in the above table, the original sequence was stabilized by first-order differences, indicating that there is a stable relationship between the dependent variable and the independent variable, which satisfies the conditions for co-integration testing. After the stationarity test, the E-G two-step method was used for the test, and the results are shown in Table 5.

Table 5. Residual Unit Root Test

Variable	ADF Value	1% Critical Value	5% Critical Value	10% Critical Value	Conclusion
Resid	-2.8642	-2.6324	-1.9421	-1.5247	Stable

2.1.4. Perspective of Enterprise Vitality Trend

The vitality of an enterprise is the inherent strength in the development of its production and operation activities, and the foundation of the development of the national economy. This paper analyzes the relationship between the number of enterprises and economic vitality by selecting

nine variables from the 2017 statistical yearbook of Jilin Province. X_1 is agriculture, forestry, animal husbandry and fishery, X_2 is mining industry, X_3 is manufacturing industry, X_4 is construction industry, X_5 is science and technology information industry, X_6 is wholesale and retail industry, X_7 is financial industry, X_8 is service industry and X_9 is education industry. This nine types of industries perform data factor analysis.

Use SPSS to analyze and process related data, and perform correlation analysis between variables before doing factor analysis between variables. The coefficient matrix finds that the coefficients between variables are basically above 0.5, and factor analysis can be done. According to the standard that the cumulative variance contribution rate of the factor is above 85% and the eigenvalues are all greater than 1, the eigenvalues, variance contribution rates, and cumulative variance contribution rates of the three common factors are shown in Table 6.

Table 6. Common factor eigenvalue, variance contribution rate and cumulative variance contribution rate

Common Factor	Eigenvalues	Variance Contribution Rate (%)	Cumulative Variance Contribution Rate (%)
F_1	8.554	95.050	95.050
F_2	1.393	4.364	99.413
F_3	1.053	0.587	99.992

In order to understand the common factor to establish a mathematical model, the factor load matrix structure after a simple rotation is selected by an orthogonal matrix and multiplied to the right. In this paper, the maximum variance rotary valve is used to rotate the factor load. Calculate the factor score of each common factor and get the following formula: $F_{\text{综合}} = 78.011F_1 + 11.454F_2 + 11.302F_3$. After analysis, the number of regional enterprises and the regional economic growth show a certain degree of positive correlation. It shows that the number of enterprises can promote regional economic growth.

2.2. Establishment and Solution of Models in Question Two

2.2.1. Identification of Indicators and Establishment of Models

With the continuous improvement of China's economic level, the transformation of economic policies has caused a certain change in the industrial structure. Guided by the theory of three industrial upgrades, the development of the tertiary industry has become an important factor in measuring the level of regional economic development. And Jilin Provincial Government has issued related tertiary industry support policies to improve the development level of the tertiary industry in Jilin Province.

This question is analyzed from the perspective of the correlation between the development level of the tertiary industry at different levels and the level of regional economic development. We mainly selected the development level of the tertiary industry as the explained variable, and the income level, the development level of the secondary industry, the level of labor supply, and the level of opening to the outside world as explanatory variables to set up multiple regression equations.

(1) Tertiary industry development level (D): Measured by the increase in the proportion of the tertiary industry

(2) Income level (Z_1): Measured by per capita income of residents.

(3) Development level of the secondary industry (Z_2): Measured by the increase in the proportion of the secondary industry

(4) Labor supply level (Z_3): Since we use the development level of the tertiary industry as the explained variable, we use the proportion of employees in the tertiary industry to measure the labor supply level

(5) Level of opening to the outside world (Z_4): The level of opening up is measured by the total amount of imports and exports.

The multiple regression model is established as follows:

$$D = \delta + \beta_1 Z_1 + \beta_2 Z_2 + \beta_3 Z_3 + \beta_4 Z_4 + \mu \tag{4}$$

Among them, δ represents a constant term, μ represents random interference, and $\beta_1, \beta_2, \beta_3$ is the coefficient of each influencing factor.

2.2.2. Analysis of Results

Table 7. Regression analysis results of influencing factors of the proportion of tertiary industry value added in Jilin Province

Province	C	Z_2	Z_1^2	Z_3	Z_4	$adj - R^2$	F	$D - W$
Jilin	-78.2737***	4.4063***	-0.048802***	0.35064	0.825756	0.806	12.819***	1.37725

From the regression results in the table above, it can be seen that the significance passed the 1% F test, indicating that the overall regression was significant, and each explanatory variable also passed the test.

Table 8. Increased proportion and index of three industries in Jilin Province in 2015 (unit:% last year=100)

Region	Primary Industry		Secondary Industry		Tertiary Industry	
	Proportion	Index	Proportion	index	Proportion	index
Jilin Province	11.0	104.8	48.5	105.2	40.4	108.4
Changchun	6.2	103.5	50.1	98.5	43.7	110.0
Jilin	10.6	102.1	45.4	97.3	44.0	103.8
Matsubara	17.4	107.7	44.1	98.4	38.5	105.5

The increase of the tertiary industry in Jilin Province is mainly affected by the development level of the secondary industry and the labor force level. As can be seen from the following table, the proportion of the secondary industry has dropped to about 50% in recent years. Since Jilin Province is one of the old industrial bases in Northeast China, as the proportion of the secondary industry continues to decline, the development of the tertiary industry will also be affected to some extent. Therefore, the increase in the proportion of the secondary industry will promote the development of the tertiary industry.

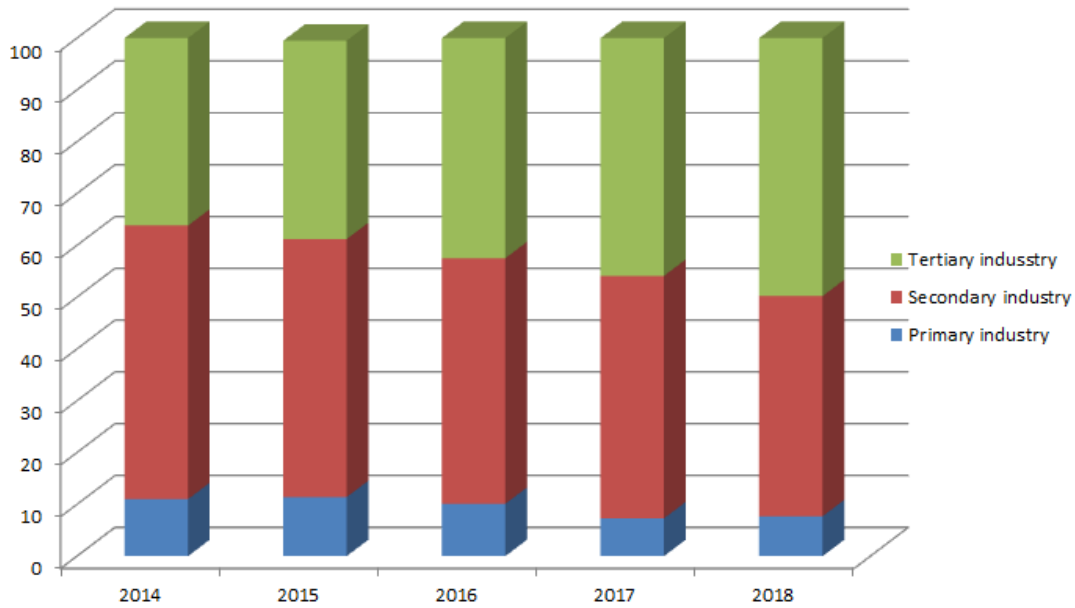


Figure 9. Proportion of the value added of the three industries to the regional GDP in 2014-2018

In recent years, with the government's call for "rejuvenating the Northeast" policy, the proportion of the secondary industry, especially industry, will definitely increase further, thereby driving the growth of the tertiary industry. From a short-term perspective, it is conducive to regional economic development and enhances regional economic vitality. But from a long-term perspective, the emerging development of the secondary and tertiary industries will inevitably lead to a reduction in the proportion of the primary industry. This requires the government to continuously optimize the proportion of the industrial structure in the process of economic development, so that the types of regional economy can develop in a coordinated manner and benefit each other.

2.3. Research on Regional Economic Vitality based on Grey Relational Analysis

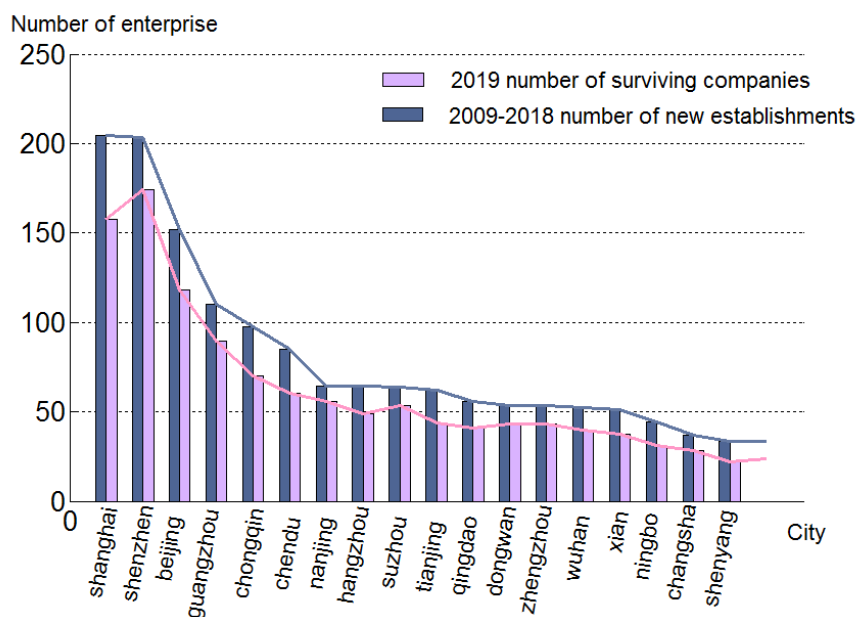


Figure 10. The number of new urban enterprises and the number of enterprises surviving

Due to differences in politics, economy, culture, and humanities, the economic vitality of each country and region is different, and capital investment has a great promotion effect on economic growth. According to the data, after the reform and development, the contribution rate of capital investment to China's economic growth has reached above 50%. This paper selects six cities, including Beijing, Guangzhou, Shenzhen, and some second-tier cities, as samples for analysis. The grey correlation degree was used to verify the correlation between the registered amount and registered capital of the company and the urban resident population. First, determine the sequence of the reference and comparison sequences; second, process the data dimensionlessly; third, correlate the coefficients based on the grey correlation formula; and fourth, finally determine the degree of correlation.

In order to study the correlation between the number and size of urban population and the number of registered enterprises and registered funds in cities, a reference sequence $Y = \{Y(i) | i = 1, 2, 3, \dots, m\}$ was determined, and the comparison sequence X was respectively the registered amount of enterprises X_1 and the registered fund of enterprises X_2 . Among them $X_j = \{X_{j(i)} | j = 1, 2, \dots, n; i = 1, 2, \dots, m\}$, the amount of business registration, the business registration fund, and the city's resident population include the data provided in Annex III.

Dimensionless data processing, the calculation formula is:

$$X'_i = \frac{X_i}{\max X_i} \tag{5}$$

Calculate the processed data according to the above formula, and then obtain the gray coefficient and gray correlation respectively, as shown in Table 9 and Table 10.

Table 9. Data Correlation Coefficient Table

Year	2012	2013	2014	2015	2016	2017
X_1	1	0.9685	0.9756	0.9507	0.9432	0.9769
X_2	1	0.7521	0.7124	0.4126	0.3367	0.5231

Table 10. The grey correlation between the number of business registrations and the business registration funds for the urban resident population

Index	Business Registrations	Business Registration Fund
Correlation	0.9645	0.6321

Analysis of the results: Through calculation, the correlations between the number of registered enterprises, the amount of corporate funds and the number of urban residents are $R_1 = 0.9645$ and $R_2 = 0.6321$ respectively. That is, the impact of the number of urban business registrations on the urban resident population is greater than the impact of the business registration fund on the resident population. Because the increase in the number of registered companies can provide more jobs and employment opportunities for society and individuals, R_1 is as high as 0.9645. The development of enterprises is inseparable from the introduction of talents and the formation of talent attractiveness. The registration volume of urban enterprises will greatly affect the economic vitality of cities. Better economic vitality means better living standards and

service levels, which can attract more permanent residents. The impact of corporate registration funds on the city's economic level is obvious, and it attracts the resident population by affecting the vitality of the city. The calculation shows that the number of registered companies and the registered capital of the company will affect the city's permanent population, and then affect the economic vitality of the city.

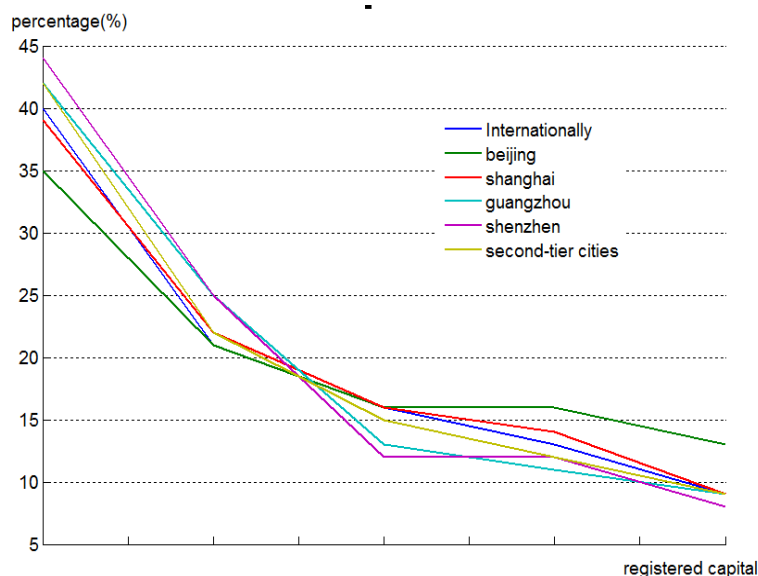


Figure 11. Distribution of Registered Capital Data of Enterprises

Registered corporate capital can be used as an indicator to measure the size of the enterprise. Based on the data provided in Annex IV, we convert it into a line chart for intuitive analysis. It is not difficult to find that in terms of enterprise size distribution, the differences between Beijing, Shanghai, Guangzhou and Shenzhen and second-tier cities are not so great.

Table 11. Ranking of economic vitality in urban areas

City	Total Ranking	City	Total Ranking
Qingdao	1	Zhengzhou	11
Beijing	2	Nanjing	12
Tianjin	3	Suzhou	13
Shanghai	4	Hangzhou	14
Dongguan	5	Chengdu	15
Wuhan	6	Xi'an	16
Guangzhou	7	Kunming	17
Shenzhen	8	Changsha	18
Chongqing	9	Shenyang	19
Ningbo	10		

This article uses Eviews to do pearson correlation analysis to verify the above results. It is obtained that the GDP correlation between pearson and industrial added value is 0.821, so its correlation is high, and the pearson correlation coefficient between GDP and fixed asset investment is 0.629, its correlation coefficient and its significance are also smaller than the former. (See the appendix for details) The analysis of the above results can be verified exactly. By improving their ability to self-value up funds and accumulate funds, companies can moderately adjust their internal structure to meet market requirements and bring benefits. At the same time, it has also won a demographic dividend for its region and obtained sufficient human resources, which has increased the number of urban permanent residents. Population mobility brings circulation to the regional economy, thereby accelerating regional economic development.

Through the ranking of the above-mentioned cities' economic vitality, we find that in the future, the distribution of floating population will have a three-layer structure: the first layer is the Bohai Rim urban belt and the southeast coastal city belt centered on the Beijing-Tianjin-Hebei, Yangtze River Delta, and Pearl River Delta metropolitan areas; the second floor is the central and western industrial undertaking belts of the Wuhan City Circle and the Chengdu City Group; the third floor is the central and western central cities such as Xi'an, Wulongmuqi, and Hohhot.

2.4. Development Recommendations

Regional economy is the study of the optimal allocation and combination of production resources in a certain area, and has a guiding role in regional development. Regional economic growth can be understood unilaterally as the growth of regional GDP. From various perspectives, regional economic growth actually includes control of population size, increase in per capita disposable income, corporate income and capital investment.

In the early period of the founding of the People's Republic of China, the Northeast region, by virtue of its geographical advantages near the former Soviet Union, the development of resource conditions and good infrastructure for the heavy chemical industry has become a national key construction area. Data show that during the first five-year period, among the key national construction projects, the proportion of investment in Northeast China was as high as 38.7%. During this period, the population moved to the Northeast on a large scale and evenly distributed in the three regions of the Northeast. However, with the adjustment of regional economic structure, the focus of national construction has shifted to other regions, and the number of people moving out has gradually increased.

Based on the actual development of Jilin Province in Northeast China, decisions and suggestions are made on the vitality of its regional economy:

2.4.1. Improve the Employment Creation Effect of Regional Export Trade

The formation and treatment of population aggregation will improve the level of labor force growth and enrich the diversity of labor supply. Economic development needs to quickly meet the needs of new enterprises for the environment and labor. Even if the distribution of people with different education levels is uneven, population concentration will also increase due to population expansion caused by population migration. In other words, the higher concentration of the population is due to the relatively good level of regional development. So local governments should attract more workers by creating more jobs, thereby increasing the level of employment. Facts show that population concentration significantly affects the output of the secondary and tertiary industries, but the secondary industry suffers a greater impact. The talent gathering can significantly affect the ability of regional innovation and bear the responsibility of driving the entire regional economy.

2.4.2. Promote the Flow of Population between Urban and Rural Areas and to Accelerate the Pace of Population Urbanization

Population urbanization is an important part of the regional population settlement process. According to the analysis of Question 1, it is not difficult to see that Jilin Province has a high level of urbanization, but its growth rate is slow. Considering that Northeast China is a large agricultural province, the labor supply in agricultural development tends to be excessive. Therefore, it can be considered from two aspects. On the one hand, we promote industrialization of agriculture in Jilin and guide the transfer of surplus labor to other industries through the labor supply market adjustment mechanism. On the other hand, giving policy and economic support to improve the quality of labor force, so that Jilin Province has more job options and benefit from the process of urbanization.

2.4.3. Effective Combination of Industrial Development and Population Aggregation

Based on the previous analysis, Jilin Province has a high population migration rate, a low natural growth rate, and a slow urban population growth rate, which are huge obstacles to the development of Jilin Province's regional economic vitality. For example, a low natural growth rate will lead to an increase in the average life expectancy of a person, which will affect the population structure. In addition to delaying the retirement age and reducing the social dependency ratio, different markets can be developed and created for the elderly's material and spiritual needs, with strong development potential. Government agencies should encourage the development of related service industries.

2.4.4. Introduce High-Tech Equipment to Drive Industrial Transformation

The modernization of the tertiary industry plays an important role in promoting the primary and secondary industries.

There is significant impact between GDP and the three industries Jilin Province has a large space for the further development of the tertiary industry. We should speed up the development of the tertiary industry and promote the development of the trade of tertiary industry exports in order to achieve the goal of optimizing the industrial structure and vigorously developing regional economic vitality.

3. Evaluation of Models

3.1. Advantages of the Models

(1) From the perspective of economics, this article first makes an overall framework for the issues discussed, and analyzes and evaluates the impact of demographic factors on the regional economic vitality from three aspects: urban population, aging population, and migration.

(2) From a business perspective, the article grasps the effects at different levels, including the effects of direct and indirect effects on the urban resident population and regional economic vitality. Finally, we perform test analysis on the data results to ensure the reliability and accuracy of the experimental results.

(3) This article focuses on the use of quantitative modeling methods, applying mathematical formulas, to clarify the research essence of the problem, and to quantify the impact of regional economic vitality.

3.2. Disadvantages of the Models

(1) In researching the number and quality of the population, although every indicator of the population size was selected as much as possible, it failed to cover all categories. Because the models themselves may have flaws, they need to be further improved.

(2) During the creation of the thesis, a large amount of data was found as the basis for analysis. There are some materials that cannot be collected completely and there is room for further improvement.

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