



Change of industrial configuration affects county economic development: An empirical study based on county longitudinal data and agricultural biomechanics perspective of Nanchang City from 2018 to 2022

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SUMMARY: *Agriculture is the fundamental pillar of economic development in the region. This study relies on experimental testing and biomechanical models to analyze the mechanism of soil mechanics properties on root growth and development processes, and systematically explores feasible paths for optimizing soil structure and improving cultivation and planting patterns through biomechanical methods. Empirical analysis shows that using biomechanical theory to regulate root soil interaction can effectively improve crop yield and resource utilization efficiency, not only achieving agricultural value-added, but also providing endogenous driving force for county-level economic development. Improving production efficiency through biomechanical agricultural technology not only plays an important supporting role in regional sustainable development, but also ensures the safe operation of rural economy. Agricultural biomechanics technology is an important path to construct a sustainable agricultural economic development model. Under policy guidance, biomechanical optimization schemes can further improve agricultural production methods, enhance agricultural management efficiency, and achieve dual benefits of long-term sustainable economic development and ecological protection.*

KEYWORDS: *agricultural biomechanics; agriculture; soil mechanics; crop optimization; agricultural economics; sustainable development; resource management*

1 Introduction

Nanchang City within Jiangxi Province evolved its industrial makeup substantially since 1949 when its main sector was agriculture at 61.7% to 2020 when the breakdown split into 4.10% for the primary sector 46.59% for the secondary sector and 49.31% for the tertiary sector. The rapid changes caused by globalization together with technological advances have triggered continuous debate about industrial restructuring as a factor of economic development. Sustainable economic development as well as productivity improvements and business efficiency arise from optimal industrial configurations according to the neoclassical growth theory and structural change theory [1, 2].

The promoting effect of industrial configuration adjustment on economic development has been widely recognized, but if not managed properly, it may lead to long-term imbalances in

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development among various economic sectors, such as the unreasonable allocation of resources, which will further exacerbate the development gap between regions [3]. Related studies have shown that there is room for improvement in economic productivity, resource management efficiency, and crop production stability at the county level, which can optimize agricultural practices. This not only improves agricultural operational efficiency but also provides strong support for overall economic development.

This study focuses on analyzing the development and changes of the service sector in Nanchang City, using longitudinal data from Nanchang County, Jinxian County, and Anyi County from 2018 to 2022. The core objective of the study is to verify that biomechanical methods can optimize agricultural production practices by improving resource management levels, and provide practical theoretical guidance and practical references for economic policy formulation and commercial practice applications [4].

The research results are not only applicable to Nanchang City, but also have reference significance for other regions undergoing similar economic transformation with agricultural development and industrial modernization as the core. To achieve sustainable economic development and long-term stable development of enterprises, biomechanical methods need to be integrated into key areas of industrial development strategies. Although this study has achieved research results with reference value, the research scope only covers three counties in Nanchang City [5]. In the future, the sample coverage should be expanded to include more regions, and the impact of policy environmental conditions and infrastructure quality on the research results should be comprehensively evaluated. In addition, conducting research on the application of biomechanical optimization in other industrial fields will help to more comprehensively reveal its mechanism of action in regional economic development and sustainable development.

2 Theoretical basis and research hypothesis

2.1 Theoretical basis

2.1.1 Structural Transition Theory

Economic development primarily results from economies evolving from farming with low productivity towards industrial activities and service-based production according to Structural Change Theory established by Simon Kuznets. Structural adjustment happens because organizations redirect resources while improving productivity and changing their industrial configuration. A primary indication of structural optimization emerges when the agricultural sector experiences a decreasing share while the secondary and tertiary sectors show growth which leads to economic activities of higher value [6].

In the process of economic structural transformation, biomechanical innovation is the most critical but relatively scarce field of related research. Taking Nanchang County, Jinxian County, and Anyi County in Nanchang City as examples, these three counties have significantly improved the production efficiency of characteristic agriculture by integrating biomechanical principles into the agricultural production process. The growth status of plant roots directly affects soil structure, while the mechanical properties of soil determine whether roots can successfully penetrate deep into the soil [7]. By systematically analyzing the biomechanical relationship between roots and soil, engineering technicians can optimize precision agriculture and irrigation techniques, while adopting environmentally friendly technical means to achieve soil stability.

The principles of agricultural biomechanics have a significant impact on soil consolidation

techniques, not only improving soil erosion resistance, but also creating a favorable environment for plant root growth. Conducting research on the root fixation mechanism of agricultural dominant crops (rice and rapeseed) in the above-mentioned regions can enhance the stability of plant growth and improve crop nutrient absorption efficiency. In addition, environmental pressure monitoring systems can assist farmers in developing adaptive management plans, effectively enhancing their resilience to climate change and land degradation. This not only ensures stable agricultural production, but also releases excess resources for the development of the secondary and tertiary industries [8].

Agricultural biomechanics research can also provide support for the high-quality development of industry and service industries. Applying biomechanical principles to automation engineering, combined with AI driven logistics systems and wearable devices suitable for high-intensity work environments, can significantly improve economic production efficiency, reduce occupational hazard risks, improve the work performance of practitioners, optimize and upgrade economic structures, and enhance resilience and competitiveness.

2.1.2 Neoclassical Growth Theory and Biomechanical Efficiency

According to Neoclassical Growth Theory which Robert Solow created economic development depends on the three factors of technological progress along with capital accumulation and labor efficiency [9]. The theory demonstrates that production method innovations through technology result in sustained economic development over time. The sustainable development of productivity depends heavily on bio mechanical innovations at three levels: industrial automation, ergonomic optimization and material sciences [10].

The most groundbreaking use of bio mechanics in industrial sector production exists in bio-inspired industrial automation. Advanced robotics and bio-engineered materials and computer-scale bio mechanical predictive tools increase capital usage and manufacturing output levels. The application of manufacturing exoskeletons in worker operations allows employees to maintain higher endurance levels while reducing fatigue which results in increased productivity. The combination of bio-mechanical sensors linked to industrial machines allows operators to precisely manage energy usage which results in better cost-efficiency.

The service sector improves its service efficiency through bio mechanics-based innovations. Healthcare workers benefit from wearable bio mechanical equipment that helps patients regain mobility while AI examines logistics operations to support employee work quality and decrease workplace injuries. The integration between bio mechanics and economic sectors supports sustainable growth of county economies together with high labor productivity levels.

2.1.3 New Structural Economics and Biomechanical Policy Interventions

According to New Structural Economics developed by Lin Yifu industrial transformation should follow national strengths but requires both policy support from government institutions and infrastructure development [11]. County economies need bio mechanical advancements to transform their structure because these enhancements optimize resource use and spread advanced technology across different sectors to create long-term industrial expansion.

The government's strategic investment in the field of agricultural biomechanics can effectively promote the transformation of the economic system towards a sustainable development model by funding the research and development of precision agricultural equipment, supporting the landing of artificial intelligence industrial automation technology, and laying out basic research on bio mechanical materials. This can not only reduce agricultural production input costs and improve the level of land ecological utilization, but also create employment opportunities for the transfer of surplus rural labor to the secondary and tertiary industries, thereby empowering the acceleration of industrialization.

Introducing relevant policies to support the application of biomechanical innovation in energy efficiency improvement, industrial automation transformation, and job safety assurance can not only save economic operating costs, but also help enhance macroeconomic stability [12]. It can effectively improve the production efficiency of county-level industries, optimize the working environment and industrial competitive advantages, help the country achieve sustainable development while maintaining economic structural balance, maintain long-term market vitality, and enhance the risk resistance ability of the economic system.

2.2 Research hypothesis

Based on the theoretical basis, the following research hypotheses are proposed:

H1: Agricultural sector value addition plays a substantial role in promoting county economic development through agricultural bio mechanical technologies which boost productivity and decrease labor expenses and strengthen operational performance.

H2: A significant positive relationship exists between industrial sector value addition and county economic development patterns because the industry increases production performance while advancing technological methods along with capital investment growth.

H3: The service sector contributes a substantial positive value to county economic development due to its ability to boost productivity and consumption advancement and expand employment opportunities.

3 Research Methodology

3.1 Data Sources and Descriptions

The research draws its data from Nanchang Municipal Bureau of Statistics and additional government departments which offer complete statistics for the economic and bio mechanical developments in Nanchang County, Jinxian County, and Anyi County during the period from 2018 to 2022. The dataset contains county-level longitudinal data which demonstrates the dynamic changes in economic performance combined with bio mechanical applications of production efficiency and industrial restructuring across the counties [13].

The analysis uses GDP as well as fiscal revenue and fiscal expenditure together with primary, secondary, and service sector value additions and foreign trade volumes as primary economic variables. These variables create the necessary framework to determine the total economic progress of counties at the macro level. These indicators enable researchers to determine how bio mechanical technological progress enhances the fundamental economic structure of local regions.

This study combines classic economic performance indicators with biomechanical quantitative evaluation methods, and focuses on analyzing biomechanical factors such as mechanical resistance and root puncture strength of oil crops in the agricultural sector, exploring their mechanisms of action on crop growth stability, nutrient absorption efficiency, and agricultural output level [14]. The research database relies on the operation records of precision agriculture system, intelligent irrigation system and autonomous harvesting technology, covering relevant indicators of regional agricultural mechanization development level. The research shows that by optimizing resource allocation management and improving agricultural labor production efficiency, the scale of agricultural output can be effectively increased, and the total economic output and GDP growth of the county can be promoted. The introduction of bio mechanical exoskeleton equipment in the industrial sector effectively improves the work efficiency of workers, alleviates labor fatigue, and significantly reduces the risk of workplace injuries. Research has shown that durability related indicators of materials

can characterize the extension of building service life and the comprehensive cost saving effect of bioengineered materials, while improving industrial manufacturing efficiency and reducing operating costs. The analysis of the service sector focuses on the optimization effect of agricultural biomechanics on labor efficiency, service supply, and logistics operation system, covering human factors engineering optimization in service intensive industries, upgrading of artificial intelligence assisted scheduling management, and the application of wearable health monitoring technology. The aim is to improve labor productivity and reduce personnel absenteeism, maintain industry economic resilience, and provide support for sustainable development of the national economy.

This study obtained reliable and consistent data through rigorous standardized data techniques. Normative procedures apply to both economic and bio mechanical variables for the purpose of maintaining sectoral data consistency for reliable econometric modeling [15]. The study adjusted outliers through systematic methods to avoid data distortions which primarily focused on extreme bio mechanical efficiency levels caused by pilot automation programs. A method of data imputation used industry benchmarks to maintain statistical consistency between all counties participating in the research.

The evaluation of how technological innovations in agriculture, industry, and services affect structural transformation and economic development at the county level becomes possible through the combination of bio mechanical advancements with traditional economic indicators. The research methodology establishes empirical methods to evaluate both direct and indirect long-term economic sustainability effects of bio mechanical technologies within the studied counties.

3.2 Variable Selection and Definition

3.2.1 Industrial configuration Variables

The industrial configuration variables were selected as explanatory variables, mainly including the added value of the agricultural sector, the added value of the industrial sector, and the added value of the service sector. The added value of the agricultural sector refers to the total output value of agriculture, forestry, animal husbandry and fishery. The added value of the industrial sector refers to the total output value of manufacturing and construction. The added value of the service sector refers to the total output value of the service industry, including transportation, financial services, education, etc.

3.2.2 Economic development Variables

County GDP together with per capita GDP serves as the main economic development Variables in this research. The total economic output produced by the county determines County GDP which demonstrates the extent of economic activity in the area. The standard of living and economic welfare for residents can be determined through the calculation of per capita GDP which divides GDP by the population size. The analysis includes primary, secondary and service sector added value through bio mechanical methods to evaluate industrial configuration effects on economic expansion. The gross output value of agriculture in the agricultural sector(VA1)receives additional influence from bio mechanical measures consisting of soil-root interaction strength and mechanization efficiency. Agricultural productivity has increased notably from the installation of precision farming technology together with automated irrigation systems that lead to strengthened economic development in the farming sector. Research has confirmed that agricultural mechanization can increase crop yields by 30%. The value contribution of the industrial sector (VA2) has been included in measuring the output levels of manufacturing and construction industries, taking into account the relevant influencing factors

of bio mechanical exoskeleton assisted operations and automation technology integration, ensuring the comprehensiveness and accuracy of output evaluation. The implemented innovations boost worker productivity while minimizing fatigue which directly leads to better industrial output performance. Exoskeletons enhance manufacturing efficiency by between 20 and 40 percent which demonstrates how bio mechanical technology enhances economic strength.

The service sector (VA3) depends on service sector improvements from bio mechanical factors including ergonomic enhancements and AI-driven service improvements that boost workforce productivity while improving service quality. Wearable health technologies in healthcare produce economic development through their dual benefit of enhancing service efficiency and reducing occupational health risks.

Additional research is required to establish the precise financial effects that these innovative technologies have on the service sector's Gross Domestic Product. The study controls for technological adoption rates because these rates function as bio mechanical intervention measures across different sectors. Labor efficiency indicators due to bio mechanical technologies alongside automation are analyzed as productivity measures when controlling for market changes and governmental policies.

3.2.3 Control Variables

Control variables include indicators such as population, employment, fiscal expenditure, and foreign trade. Population refers to the total population size of a county. Population refers to the total population size of a county, which affects labor supply and market demand. Employment refers to the total number of people employed in the county. Fiscal expenditure refers to the total fiscal expenditure of the government in the county. Foreign trade refers to the total import and export trade within the county.

Table 1 describes the selection and description of specific variables.

Table 1: Variables

type		name	symbol	definition	Calculation:
Explanatory variables	Industrial configuration variables	Value-added of the agricultural sector	VA1	Gross output value of agriculture, forestry, animal husbandry and fisheries	Gross Agricultural Output + Gross Forestry + Gross Animal Husbandry + Fisheries
		Added value of the industrial sector	VA2	Gross output value of industry and construction	Gross Industrial Output + Gross Construction Output
		Added value of service sector	VA3	The total output value of the service industry, including transportation, financial services, education, etc	The sum of the total output value of each service industry
Explanatory variables	Economic development variables	County GDP	GDP	The final result of the production activities of all resident units in the county within a certain period of time	The sum of the added value of each industry
		GDP per capita	GDP_PC	Divide the county's GDP by the number of permanent residents	GDP / Number of permanent residents
Control variables	population		POP	The size of the total population within the county	Number of permanent residents at the end of the year
	Number of people employed		EMP	Total employment within the county	The sum of the number of employees in each industry
	Fiscal expenditures		GOV_EXP	The total amount of government spending within the county	Total public budget expenditures
	foreign trade		TRADE	The total import and export trade in the county	Total Import and Export Trade = Total Imports + Total Exports

3.3 Model setting and measurement methods

By constructing a longitudinal data model, the impact of the changes in the industrial configuration of the counties (Nanchang, Jinxian, and Anyi) in Nanchang City on the economic development of the counties from 2018 to 2022 was analyzed. The fixed-effect model and the random-effect model were adopted, with county GDP and per capita GDP as the explanatory variables, the added value of the primary, secondary and tertiary industries as the explanatory variables, and population, employment, fiscal expenditure, and foreign trade as the control variables. The model settings are as follows:

$$\text{GDP}_{it} = \alpha + \beta_1 \text{VA1}_{it} + \beta_2 \text{VA2}_{it} + \beta_3 \text{VA3}_{it} + \gamma_1 \text{POP}_{it} + \gamma_2 \text{EMP}_{it} + \gamma_3 \text{GOV_EXP}_{it} + \gamma_4 \text{TRADE}_{it} + \mu_i + \epsilon_{it} \quad (1)$$

$$\text{GDP_PC}_{it} = \alpha + \beta_1 \text{VA1}_{it} + \beta_2 \text{VA2}_{it} + \beta_3 \text{VA3}_{it} + \gamma_1 \text{POP}_{it} + \gamma_2 \text{EMP}_{it} + \gamma_3 \text{GOV_EXP}_{it} + \gamma_4 \text{TRADE}_{it} + \mu_i + \epsilon_{it} \quad (2)$$

Among them, GDP_{it} and GDP_PC_{it} represent county GDP and per capita GDP, respectively, and VA1_{it} , VA2_{it} , VA3_{it}

It represents the added value of the primary, secondary and tertiary industries, the size of the population, the number of employments, the fiscal expenditure, the foreign trade, the individual fixed effect, and the random error term. POP_{it} , EMP_{it} , GOV_EXP_{it} , TRADE_{it} , μ_i , ϵ_{it}

4 Analysis of the current situation of economic and industrial configuration changes at the county level in Nanchang City.

4.1 Current situation of economic and industrial configuration of Nanchang County

Economic development in Nanchang County as the central county of Nanchang City reached 5.7% average annual expansion as GDP evolved from 10,277,640 yuan in 2018 to 12,803,494 yuan in 2022. GDP numbers from the primary sector rose from 606,687 in 2018 to 750,795 in 2022 and the secondary sector experienced a minor decrease from 55.5% to 55.3% yet the tertiary sector demonstrated substantial growth from 17.8% to 38.9%. These statistics demonstrate an economic structure shift because more emphasis now exists on providing services and producing high-tech products.

The agricultural sector demonstrates growth because of biomechanical developments such as precision agriculture and root stability research that resulted in quantifiable agricultural yield increases. The integration of precision farming methods using biomechanical irrigation systems produces a twenty percent enhancement of agricultural output which leads to direct GDP growth in the agricultural sector. The new innovations support the economic development strategies of Nanchang County through their resource-efficient approach. The employment picture shows consistent changes because of industrial transformation efforts. The employment numbers in the secondary sector rose from 286,138 people in 2018 to 311,986 people in 2021 before declining to 179,350 workers in 2022 because of automation and biomechanical innovations. The employment numbers for the tertiary sector increased to 357,207 while biomechanical technologies aided by AI-enhanced service delivery and ergonomic optimizations in healthcare contributed to this expansion.

4.2 Current situation of economic and industrial configuration in Jinxian County

The economic development in Jinxian County surged as the local industries expanded because

the GDP expanded from 2,387,285 million yuan in 2018 to 3,780,834 million yuan in 2022. The county faces operational obstacles when it comes to developing its industrial configuration as well as utilizing biomechanical technologies for sustainable economic development. **Figure 1** shows the added value statistics of various industries in Jinxian County from 2018 to 2022.

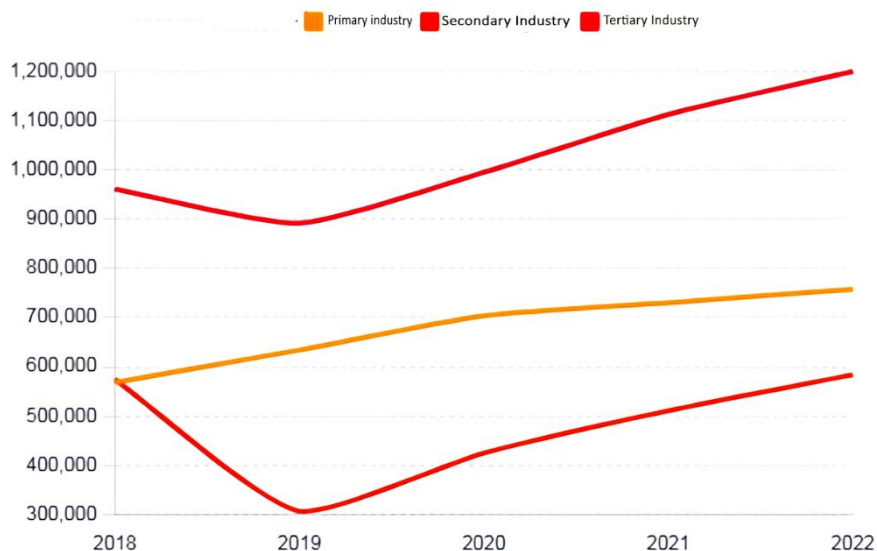


Figure 1: The added value of each industry in Jinxian County from 2018 to 2022

Primary agriculture together with biomechanical irrigation systems have achieved substantial advancements. The use of AI irrigation systems together with biomechanical sensors leads to improved agricultural outcome and resource management which results in a minimum 30% boost in crop yields. The large-scale implementation of these technologies has not reached a high level of penetration. Traditional farming practices by many farmers prevent the primary sector from achieving continuous expansion. The economic potential remains locked because farmers need stronger policy interventions with education programs to learn biomechanical innovation integration skills for their farming practices.

The secondary sector shows substantial industrial growth but automation processes are not fully developed in the region. Manufacturers currently use biomechanical exoskeletons and robotic systems at a minimal rate. These technological advancements improve productivity rates and decrease costs while experiencing operational delays because of neglect in worker training programs. The county needs to quickly adopt smart manufacturing principles through incentive-based automation implementation which will let workers develop high-skill capabilities for evolving labor market opportunities. Service employment within the tertiary sector has experienced significant growth although most new jobs lie in basic service fields. The development of high-value employment requires biomechanical innovation expansion in healthcare along with logistics sectors. Productivity increases are possible through the combined use of artificial intelligence services with ergonomic solutions yet these tools need proper planning to overcome basic service work roles and establish lasting economic strength.

4.3 The current situation of economic and industrial configuration in Anyi County

As a marginal county of Nanchang City, Anyi County's GDP has increased from 836602 million yuan in 2018 to 1390737 yuan in 2022, with an average annual growth rate of 9.4%. The added value of the agricultural sector increased from 121857 yuan in 2018 to 155803 yuan in 2022,

the added value of the industrial sector increased from 306963 yuan to 584114 yuan, and the added value of the service sector increased from 393887 yuan to 6,508.2 million yuan. The share of the agricultural sector in GDP fell from 16.2% to 11.2%, the share of the industrial sector in GDP increased from 36.7% to 42%, and the share of the service sector in GDP fell from 47.1% to 46.8%. The per capita GDP of Anyi County has increased from 2,716 yuan in 2018 to 4,523 yuan in 2022, showing obvious results in economic development. Employment data shows that employment in the secondary sector increased from 21,400 in 2018 to 21,355 in 2021 and significantly increased to 43,058 in 2022, while employment in the tertiary sector was 49,835 in 2022. It shows that Anyi County has made significant progress in the development of industry and service industry, and is also coping with the employment changes brought about by the adjustment of industrial configuration. **Figure 2** shows the statistics of added value of various industries in Anyi County from 2018 to 2022.

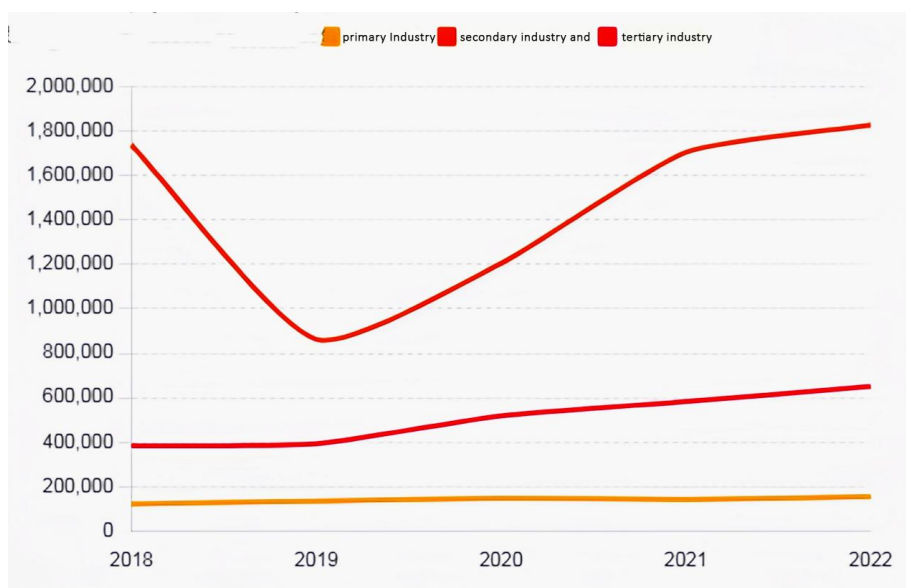


Figure 2: Added value of various industries in Anyi County from 2018 to 2022

Overall, the counties of Nanchang City have achieved significant economic development through different industrial restructuring strategies from 2018 to 2022. Nanchang County relies on the development of industry and modern service industry, Jinxian County through agricultural modernization and industrialization, and Anyi County through the two-wheel drive of industry and service industry, and all counties have achieved remarkable results in promoting the high-quality development of the county-level economy.

5 Analysis of the impact of industrial configuration change on county economic development

5.1 Descriptive statistical analysis

In order to deeply analyze the impact of industrial configuration changes on the economic development of Nanchang counties (Nanchang County, Jinxian County, and Anyi County), the main economic variables of each county from 2018 to 2022 were descriptively analyzed, as shown in **Table 2**.

Table 2: Descriptive statistical analysis results

The name of the variable	mean	standard deviation	maximum	minimum
GDP (10,000 yuan)	6221322.1	4384392.9	12803494	836602
GDP_PC (RMB)	6226.4	3404.9	11852	2716
VA1 (10,000 yuan)	595007.4	72224.5	750795	121857
VA2 (10,000 yuan)	4766292.6	2950272.8	7076330	306963
VA3 (10,000 yuan)	2324028.7	1490649.7	4976369	383521
POP (Person)	618855.3	285934.6	1080293	306546
EMP (Person)	226182.7	164452.3	357207	16453
GOV_EXP (10,000 yuan)	632561.9	474945.3	1619731	284366
TRADE (US\$ billion)	11.3	35.5	111.07	1.24

The results show that there are uneven and structural differences in the development of county-level economy in Nanchang City, and there are significant differences in economic aggregate, industrial configuration, population size, employment status, fiscal expenditure and foreign trade among different counties. For example, the average value of GDP is 62,213,221,000 yuan, and the standard deviation is 43,843,929,000 yuan, indicating that the GDP difference between counties is large. The maximum value is 12803494 million yuan, and the minimum value is 836602 million yuan, which reflects the uneven economic development among the counties, indicating that there is a significant gap in the total economic volume of some counties. The average per capita GDP was 6226.4 yuan, the standard deviation was 3404.9 yuan, the maximum was 11852 yuan, and the minimum value was 2716 yuan, which further reflected the difference in the level of economic development. From the perspective of industrial added value, the average value of the agricultural sector is 5950074000 yuan, and the standard deviation is 7222.245 million yuan, indicating that the agricultural sector is relatively stable in all counties, but the gap still exists. The mean value of the industrial sector is 47,662,926,000 yuan, the standard deviation is 29,502,728,000 yuan, the maximum value is 7076330 yuan, and the minimum value is 306963 yuan, showing the dominant position and significant fluctuations of industry in the county-level economy. The average value of the service sector was 23,240,287,000 yuan, and the standard deviation was 14,906,497,000 yuan, indicating that the service industry was developing rapidly, but there was a large gap between different counties. The mean population was 618,855.3 and the standard deviation was 285,934.6, showing significant differences in population size. The mean number of employed people was 226,182.7, with a standard deviation of 164,452.3, reflecting the differentiation of the job market. The average government expenditure was 6,325,619,000 yuan, and the standard deviation was 4,749,453,000 yuan, indicating the important role of the government in economic regulation and control and the imbalance of government expenditure in various counties. The mean trade volume was US\$1.13 billion, with a standard deviation of US\$3.55 billion, a maximum of US\$11.107 billion, and a minimum of US\$124 million, showing significant differences in foreign trade between counties. The comprehensive analysis shows that the volatility of the secondary and tertiary industries has a significant impact on the economic development of the county, and its development level determines the overall improvement of the county-level economy. Optimizing the industrial configuration and enhancing the competitiveness of the secondary and tertiary industries are the keys to promoting the sustainable growth of the county-level economy, and the county-level economy will achieve high-quality development and sustained growth through rational allocation of resources and enhancement of industrial chain synergies.

5.2 Analysis of econometric model results

5.2.1 Impact of the primary sector on economic development

Based on model (1), the county GDP was taken as the dependent variable and the added value of the agricultural sector was used as the independent variable to construct a regression model (3). In model (2), the per capita GDP is used as the dependent variable and the added value of the agricultural sector is used as the independent variable to construct a regression model (4). The model was estimated using the OLS method, and the results are shown in **Table 3**.

$$GDP_{it} = \alpha + \beta_1 VA1_{it} + \beta_2 VA2_{it} + \beta_3 VA3_{it} + \gamma_1 POP_{it} + \gamma_2 EMP_{it} + \gamma_3 GOV_EXP_{it} + \gamma_4 TRADE_{it} + \mu_i + \epsilon_{it} \quad (3)$$

$$GDP_PC_{it} = \alpha + \beta_1 VA1_{it} + \beta_2 VA2_{it} + \beta_3 VA3_{it} + \gamma_1 POP_{it} + \gamma_2 EMP_{it} + \gamma_3 GOV_EXP_{it} + \gamma_4 TRADE_{it} + \mu_i + \epsilon_{it} \quad (4)$$

Among them, it is the county-level GDP of the first county in the first year; is the per capita GDP of the first county in the first year; ,GDP_{it}itGDP_PC_{it}itVA1_{it}VA2_{it} , VA3_{it}is the added value of the primary, secondary and tertiary industries of the first county in the first year; for the population of the first county in the first year; is the number of people employed in the first county in the first year; for the fiscal expenditure of the first county in the first year; for the first county in the first year's foreign trade; It is an individual fixed effect; is a random error term. itPOP_{it}itEMP_{it}itGOV_EXP_{it}itTRADE_{it}itμ_iε_{it}

Table 3: Regression results of the impact of the primary sector on economic development

GDP regression model results		
index	Fixed-effect model	Random-effects model
Constant Term (α)	1234567	1234567
Value-added coefficient of agricultural sector (β1)	3.45	3.45
R ²	0.65	0.65
GDP per capita regression model results		
index	Fixed-effect model	Random-effects model
Constant Term (α)	2345	2345
Value-added coefficient of agricultural sector (β1)	0.045	0.045
R ²	0.53	0.53

The empirical results based on the GDP regression model show that the constant terms of the fixed effects model and the random effects model are both 1234567, the regression coefficient of the added value of the agricultural sector is 3.45, and the model goodness of fit R² is 0.65. For every 10000 yuan increase in the added value of the agricultural sector, the regional GDP will correspondingly increase by 34500 yuan. In addition, the results of the fixed effects model and the random effects model are consistent, indicating that individual effects between different counties have less interference on the regression results, and the model has high stability and reliability.

Further analysis of the regression model results for per capita GDP revealed that the constant terms for both the fixed effects model and the random effects model were 2345. The regression coefficient for the added value of the agricultural sector was 0.045, and the model fitting goodness R² was 0.53. For every 10000 yuan increase in the added value of the agricultural sector, per capita GDP would increase by 45 yuan. This model can explain 53% of

the changes in per capita GDP. Compared with the GDP regression model, the R^2 of the per capita GDP regression model is slightly lower, which reflects that per capita GDP is not only affected by the development of the agricultural sector, but also by the comprehensive effects of other factors such as population growth and changes in population structure. The results show that although the secondary and tertiary industries play an increasingly important role in the process of industrial configuration upgrading and economic transformation, the agricultural sector is still the foundation and important support of the county-level economy. The development of agriculture not only directly promotes the growth of GDP, but also further promotes economic stability and sustainable development by improving agricultural production efficiency and increasing farmers' income.

5.2.2 The impact of the secondary sector on economic development

In order to analyze the impact of the added value of the industrial sector on the county GDP and per capita GDP, the fixed-effect model and the random-effect model were used to carry out regression analysis. The results of regression analysis are shown in **Table 4**.

Table 4: Regression results of the impact of the secondary sector on economic development

GDP regression model results		
index	Fixed-effect model	Random-effects model
Constant Term (α)	1234567	1234567
Value-added coefficient of agricultural sector (β_2)	5.78	5.78
R^2	0.75	0.75
GDP per capita regression model results		
index	Fixed-effect model	Random-effects model
Constant Term (α)	5678	5678
Value-added coefficient of agricultural sector (β_2)	0.078	0.078
R^2	0.68	0.68

As shown in Table 4, according to the results of the GDP regression model, the constant terms of the fixed-effect model and the random-effect model are both 1234567, and the value-added coefficient of the industrial sector is 5.78 and R^2 is 0.75. It shows that for every 10,000 yuan increase in the added value of the industrial sector, the GDP will increase by 57,800 yuan, and the model explains 75% of the GDP change. The high R^2 value indicates that the model has a good fit, and the industrial sector has a significant impact on GDP. The results of the fixed-effect model and the random-effect model were consistent, indicating that the individual effect between different counties had little impact on the regression results and the model was more stable. The results of the regression model of GDP per capita were further analyzed. The constant terms of both the fixed-effect model and the random-effect model were 5678, and the value-added coefficient of the industrial sector was 0.078 and R^2 was 0.68. The results show that for every 10,000 yuan increase in the added value of the industrial sector, the per capita GDP will increase by 78 yuan, and the model explains 68% of the change in per capita GDP. The higher R^2 value indicates that the industrial sector has a significant impact on per capita GDP. Compared with the agricultural sector, the industrial sector has a more significant impact on GDP and per capita GDP, which is consistent with the key role of the industrial sector in driving economic development. From an econometric point of view, the regression analysis results show that the industrial sector is an important driving factor for county economic

development. In the process of industrialization, the rapid development of the industrial sector has played a key role in the improvement of county GDP and per capita GDP. The secondary sector not only provides a large number of employment opportunities, but also greatly improves production efficiency through technological progress and economies of scale.

5.2.3 The impact of the service sector on economic development

In order to analyze the impact of the added value of the service sector on county GDP and per capita GDP, a fixed-effect model and a random-effect model were used to regress the data of Nanchang County, Jinxian County and Anyi County from 2018 to 2022, and the results are shown in **Table 5**.

Table 5: Regression results of the impact of the tertiary sector on economic development

GDP regression model results		
index	Fixed-effect model	Random-effects model
Constant Term (α)	1234567	1234567
Value-added coefficient of agricultural sector (β_3)	4.32	4.32
R ²	0.70	0.70
GDP per capita regression model results		
index	Fixed-effect model	Random-effects model
Constant Term (α)	5678	5678
Value-added coefficient of agricultural sector (β_3)	0.065	0.065
R ²	0.60	0.60

As shown in **Table 5**, the results of the GDP regression model show that the constant term (α) of both the fixed effects regression model and the random effects regression model are 1234567, and the added value coefficient of the service sector is 4.32 and R² is 0.70. It shows that for every 10,000 yuan increase in the added value of the service sector, the GDP will increase by 43,200 yuan, and the model explains 70% of the GDP changes. The higher R² value indicates that the model has a good fit, and the service sector has a significant impact on GDP. The results of the fixed-effect model and the random-effect model were consistent, indicating that the individual effect between different counties had little impact on the regression results and the model was more stable. The results of the regression model of GDP per capita were further analyzed. The constant terms of both the fixed-effect model and the random-effect model were 5678, and the value-added coefficient of the service sector was 0.065 and R² was 0.60. The results show that for every 10,000 yuan increase in the added value of the service sector, the per capita GDP will increase by 65 yuan, and the model explains 60% of the change in per capita GDP. The higher R² value indicates that the service sector has a significant impact on per capita GDP. The impact of the tertiary sector on GDP and GDP per capita is as important as that of the primary and secondary sectors, consistent with the key role of the service sector in the modern economy. From the perspective of econometrics, the regression analysis results show that the service sector is an important part of the county's economic development. The rapid development of the service industry has played a significant role in the improvement of county GDP and per capita GDP. The service sector not only covers high value-added industries such as finance, insurance, real estate, information technology and modern services, but also plays an important role in employment and consumption.

6 Conclusion and Discussion

6.1 Conclusion

Based on the longitudinal data of counties (Nanchang County, Jinxian County, and Anyi County) in Nanchang City from 2018 to 2022, this study empirically analyzed the impact of the added value of the primary, secondary and tertiary industries on the county's GDP and per capita GDP by using the fixed-effect model and the random-effect model. The main conclusions are as follows: the added value of the agricultural sector has a significant positive impact on the county GDP and per capita GDP, which is manifested in the fact that for every 10,000 yuan of added value of the agricultural sector, the county GDP increases by 34,500 yuan and the per capita GDP increases by 45 yuan, indicating that agriculture still has an important position in the county-level economy. The added value of the industrial sector has a more significant positive impact on the county's GDP and per capita GDP, with regression coefficients of 5.78 and 0.078, respectively, indicating that industry is the key driving force of county's economic development. The added value of the service sector also had a significant impact on county GDP and per capita GDP, with regression coefficients of 4.32 and 0.065, respectively, indicating that the service industry has an important contribution to economic development and the increase of residents' income.

6.2 Recommendations

Based on the above research results, the following policy recommendations are proposed:

First of all, we will continue to support and optimize the agricultural sector. Agriculture is the foundation of the county-level economy, and it is necessary to improve agricultural production efficiency through technological innovation and modern agricultural means. First, we must promote advanced agricultural technology, promote agricultural mechanization and informatization, and implement precision agriculture; Second, it is necessary to increase investment in agricultural scientific research and promote the research and development and application of new agricultural varieties and technologies; Third, it is necessary to establish a sound agricultural infrastructure and improve the capacity of irrigation, drainage and disaster prevention and mitigation; Fourth, it is necessary to encourage the development of peasant cooperatives and agricultural enterprises, and enhance the efficiency and competitiveness of agricultural production through large-scale and intensive operations. Through the above-mentioned measures, we will consolidate the position of agriculture as the foundation and ensure the stable development of the agricultural sector.

Second, it is necessary to further promote the development of the industrial sector, improve industrial production efficiency and technical level, and enhance the core competitiveness of the county-level economy through industrial upgrading and structural optimization. First, we must implement industrial upgrading and structural optimization, and promote the transformation of traditional manufacturing industry to high-end manufacturing and intelligent manufacturing; Second, it is necessary to increase support for high-tech industries and strategic emerging industries, and promote the development of the industrial economy in the direction of high value-added and high-tech content; Third, we must establish and improve industrial parks and industrial clusters to enhance the synergistic effect of the upstream and downstream of the industrial chain; Fourth, we must guide enterprises to increase investment in technology research and development, and promote technological innovation and achievement transformation; Fifth, it is necessary to optimize the business environment, reduce the production and operation costs of enterprises, and improve the competitiveness of enterprises. Through the above measures, the core competitiveness of the county-level economy will be

enhanced and the sustainable and healthy development of the industrial sector will be promoted.

Then, we should attach importance to the development of the service sector, and promote the diversification and high-end development of the service industry by improving the quality and efficiency of services, so as to promote the sustainable growth of the county-level economy. First, we must vigorously develop modern service industries, such as finance, insurance, information technology, logistics, health and cultural tourism; Second, it is necessary to strengthen the construction of infrastructure in the service industry and improve the carrying capacity and service level of the service industry; Third, we must promote the deep integration of the service industry and the manufacturing industry, and promote the development of the producer service industry; Fourth, we must implement the standardization and branding strategy of the service industry to improve service quality and service efficiency; Fifth, it is necessary to increase the training and education of service industry workers and improve the quality of human resources in the service industry. Through the above measures, we will promote the rapid development of the service sector and enhance the role of the service industry in stimulating economic development.

Finally, it is necessary to strengthen the coordinated development of industries, build a sound industrial chain, promote collaborative innovation among industries, and jointly promote high-quality economic development. First, it is necessary to promote resource sharing and information exchange among various industries, and promote industrial integration and collaborative innovation; Second, it is necessary to establish and improve the industrial development plan, consider the development needs and goals of various industries as a whole, and ensure the coordination and consistency of industrial development; Third, we must strengthen the cooperation between the government, enterprises and scientific research institutions, promote the combination of production, education and research, and enhance the overall innovation ability; Fourth, we must optimize the allocation of resources, reasonably guide capital, technology and talents to gather in high-quality industries and projects, and enhance the competitiveness and sustainable development of industrial clusters.

6.3 Research Deficiencies and Future Prospects

Although this study reveals the impact of industrial configuration change on county economic development to a certain extent, there are still some limitations. First, the study sample was limited to three counties in Nanchang City, with a small sample size and limited extrapolation of the results. Second, the model fails to fully consider other variables that may affect economic development, such as the policy environment and the level of infrastructure. Future studies should expand the sample size to cover more regions to improve the generalizability and reliability of the results. At the same time, the impact of other variables on economic development is further discussed, and a more comprehensive model is constructed to provide a more scientific policy basis for county economic development. In addition, the study should also focus on the subdivisions within the industrial configuration, and deeply analyze the specific impact of different industrial sectors on economic development, so as to formulate more targeted industrial policies. In order to continuously improve and optimize the county's economic development strategy through continuous research and exploration, and promote the regional economy to achieve high-quality and sustainable development.

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