



# Industrial Structure Upgrading, County Economic Growth, and Resident Income - Data from Counties in Anhui Province

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**Abstract:** Industrial restructuring is an important part of China's supply-side reform, which is related to sustainable economic prosperity, however, can industrial restructuring really promote regional economic development and regional residents' income increase? The main research purpose of this paper is the degree of influence of industrial structure upgrading on regional economic growth and regional residents' income. Taking all counties in Anhui Province as an example, panel data of 61 counties in Anhui from 2012-2019 are selected and regression analysis is used to explore the relationship between industrial structure upgrading, county economic growth and residents' income. The following conclusions are drawn: industrial structure upgrading contributes to economic growth and urban and rural residents' income growth in Anhui counties, and industrial structure upgrading contributes to the increase of urban and rural residents' income gap in Anhui counties; the share of primary industry in urban and rural residents' income growth in Anhui counties is insignificant, the share of secondary industry contributes less to urban and rural residents' income growth, while the share of tertiary industry has a greater contribution to urban and rural residents' income growth and is the main driving force of income growth of urban and rural residents. Finally, according to the content of the study, specific suggestions are proposed.

**Keywords:** Industrial Structure Upgrading, County Economic Growth, Income of Urban, Rural Residents

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## 1. Introduction

The county economy occupies an increasingly important position in the national economy, especially in today's economic slowdown and the impact of the new crown epidemic, which plays an important role in promoting the consumption demand of the domestic market and building a well-off society in an all-around way. As early as the Sixteenth National Congress, it was proposed to "develop and strengthen the county economy." At the 19th National Congress of the Communist Party of China, the strategy of rural revitalization was further proposed. County economic growth is an important driving force for China's further economic growth. Industrial structure adjustment is an important part of promoting supply-side reform under the new normal of the economy, and it is also the focus of academic attention, in the 2018

government work report pointed out that with supply-side reform as the main line of economic development, it is necessary to accelerate the transformation and upgrading of industrial structure and further promote "three districts, one reduction, and one supplement". This will be the key to cracking the economic imbalances during the 13th Five-Year Plan period. This paper takes all counties in Anhui from 2012 to 2019 as a sample to explore the relationship between industrial structure, county economy and residents' income.

## 2. Literature Review

Industrial structure refers to the proportion of each industry composition and the connection between various industries, and industrial structure upgrading refers to the increase in the proportion of output value of non-agricultural industries, that is,

the evolution of the industry from a low-level form to a high-level form. China's current industrial structure is still dominated by industrialization [1], for China's county economy, it is agricultural industrialization is the leading [2], but with the development of the economy, industrialization-led industrial structure upgrading has become unsustainable, single industrial products, extensive development methods, and other issues, and then scholars proposed that to maintain structural dividends to promote economic development, the industrial structure should be further upgraded to the tertiary industry dominated by the service industry. The important role of national economic growth in the upgrading of industrial structure, many scholars at home and abroad have proved through empirical cases, but some scholars believe that there are differences in the promotion of economic development, Chen Zhaoming and other [3] people proposed that the advanced industrial structure has a threshold effect on economic growth, that is, for counties with a high degree of urbanization, the industrial structure is advanced to effectively promote economic growth. Zhang Zhidong [4], Wang Zhenhua [5] and others proposed that the interaction between urbanization development and industrial structure upgrading should jointly promote county economic growth through statistical analysis of Anhui and Liaoning counties, respectively. Regarding the industrial structure and residents' income, Jing Shouwu et al. [6] proposed that the upgrading of the industrial structure can promote the income of residents and reduce the gap between urban and rural areas; However, Dong Honghai [7] proposed that the upgrading of the industrial structure in northeast China cannot reduce the gap between urban and rural areas; Zhang Yuchang [8] further research found that the upgrading of industrial structure can reduce the income gap between urban and rural areas, while the rationalization of industry the will widen the income gap between urban and rural areas. There are obvious regional heterogeneities between the industrial structure and the income of urban and rural residents, and the upgrading of the industrial structure is affected by many aspects, and the impact on the income of residents is also different.

In summary, the impact of industrial structure upgrading on county economic growth and urban and rural residents' income, affected by regional factors, needs specific analysis, there are few empirical studies on the upgrading of industrial structure and urban and rural income in Anhui County, so it is of certain significance to study the upgrading of industrial structure, county economic growth and urban and rural residents' income through empirical research, and can also provide a reference foAnhuiui regional development.

### 3. The Selection of Variables and Data Sources

#### 3.1. Model Design

According to the Cobb-Douglas production function, economic growth is influenced by fundamental factors of production: capital, labor, technological progress, and other factors. To build an econometric model to analyze the impact

of industrial structure on the county economy, the following extended model was established:

$$y_{it}=f(K_{it}, L_{it}, \text{Structure}_{it}, X_{it})$$

where  $i$  represent the counties of Anhui and  $t$  represents time. In the process of economic development in Anhui County, it is affected by various factors and based on capital, labor, and technological progress factors, urbanization, government intervention, and government investment in science and technology are added as control variables. Taking the per capita GDP (PerGDP) as the county economic growth level, taking the logarithm of the extended Cobb-Douglas production function, the following economic growth regression model is obtained:

$$\text{LnPerGDP}_{it}=C_0+\beta_1\text{LnStructure}_{it}+\beta_2X_{it}+\eta_i+\eta_t+\varepsilon$$

Where  $C_0$  represents the intercept term,  $X$  represents the control variables: labor, capital, urbanization, government intervention, government investment in science and technology,  $\eta_i$ ,  $\eta_t$  represent the county fixed effect, time fixed effect, respectively, and  $\varepsilon$  represents random interference items.

The model is further expanded, the industrial structure upgrading affects the economic growth of the county, and the economic growth affects the income of urban and rural residents, and the expansion regression model is set.

$$\text{C-income}_{it}=C_0+\alpha_1\text{Structure}_{it}+\alpha_2\text{PerGDP}_{it}+X_{it}+\eta_i+\eta_t+\varepsilon$$

$$\text{T-income}_{it}=C_0+\gamma_1\text{Structure}_{it}+\gamma_2\text{PerGDP}_{it}+X_{it}+\eta_i+\eta_t+\varepsilon$$

C-income represents the per capita disposable income of rural residents, and T-income represents the per capita disposable income of urban residents.

#### 3.2. Variable Selection Instructions

##### 3.2.1. The Explanatory Variable

County economic growth: The per capita GDP was selected as a variable index to reflect the economic growth of the county.

Resident income: Resident income is divided into rural resident income and urban resident income, using rural residents' disposable income and urban residents' per capita disposable income as variable indicators.

##### 3.2.2. Explanatory Variables

Industrial structure: For the selection of indicators of industrial structure, there are different calculation methods, most scholars use the secondary and tertiary industry output value to account for the proportion of regional GDP to indicate the industrial structure, but to better measure, the level of regional industrial structure upgrading, here draws on Shi Enyi [9] and other practices, the use of industrial structure upgrade coefficient as a measure of industrial structure upgrading indicators:

$$\text{Structure}=\sum_{i=1}^3(y_i \times i) \times 1+y_2 \times 2+y_3 \times 3$$

Among them,  $y_i$  indicates the proportion of the added value of the I industry, the industrial structure upgrading coefficient is taken at 1-3, the larger the value, the higher the industrial level, and the lower the value indicates the lower the industrial level.

At the same time, the added value of the primary, secondary and tertiary industries were selected as the proportion of GDP as the subdivision industrial structure, and the relationship with the income of urban and rural residents was further explored.

**Capital:** We use the amount of fixed asset investment in each county as the capital investment of each county, and the government's fixed asset investment has always been an important driving force for economic growth and is still the most effective driving force [10]. Therefore, the county fixed asset investment is selected as an indicator of capital investment. Labor is measured by the proportion of social employees in the resident population.

### 3.2.3. Control Variables

According to Yang Bing [11] and others on the construction of the county economic development system, the level of urbanization, government intervention, and government investment in science and technology are selected as control variables. Among them, according to the research of Lin Yifu and other [12] people, the proportion of the urban population and household registration population is selected as the indicator of urbanization level. The degree of government intervention refers to the government's contribution and investment to the economy in the process of county economic development, and we use the proportion of fiscal expenditure

in each county to GDP to measure. The important supporting role of scientific and technological investment in economic development [13] is to use financial investment in science and technology as an indicator of scientific and technological investment.

### 3.3. Data Sources

The panel data of 61 counties in Anhui from 2012 to 2019 were selected to conduct an empirical analysis on the relationship between industrial structure upgrading and county economic growth, further subdivide the industrial structure into secondary and tertiary industries, and conduct regression analysis respectively. The data are mainly from the wind database, the Anhui Statistical Yearbook 2013-2020, and the Anhui Municipal Statistical Yearbook 2013-2020.

## 4. Empirical Analysis

### 4.1. Descriptive Statistics

Descriptive statistics are carried out using the data before the dimensionlessness to more intuitively present the changing trend of each variable index, as shown in Table 2 below. Statistics can see that the maximum per capita GDP is 102461, the minimum value is 5074, the minimum capital value is 88319, the maximum value is 9776123, the minimum value of science and technology investment is 119, and the maximum value is 60134. The input varies greatly among the counties in Anhui.

*Table 1. Variable selection and definition.*

Level 1 indicators	Secondary indicators	Variable definitions
County economic growth	GDP per capita	GDP per capita
Income of residents	Per capita disposable income of rural residents Per capita disposable income of urban residents	
Industrial structure	Industrial structure upgrading coefficient The proportion of primary industry The proportion of secondary industry The proportion of tertiary industry	Primary industry output value/output value Secondary industry output value/ total output value Tertiary industry output value / gross output value
capital	Investment in fixed assets	Total investment in fixed assets in the region
labor	T of social employees	Social practitioners/resident population
Urbanization	The urban population accounts for the registered population	Urban population/household registration population
Degree of government intervention	Proportion of fiscal expenditure	Fiscal expenditure/GDP
Investment in science and technology	Financial investment in science and technology	Fiscal investment in science and technology

*Table 2. Descriptive statistics for each variable.*

variable	Sample size	average value	standard deviation	minimum	maximum
GDP per capita (yuan/person).	427	27221.43	16119.71	5074	102461
Rural per capita disposable income (RMB)	427	11412.99	3485.546	6060.833	24050
Urban per capita disposable income (RMB)	427	23521.47	6291.808	12121.67	48100
Industrial upgrading coefficient	427	2.132514	0.01082273	1.798241	2.472929
The proportion of primary industry	427	0.191585	0.0832867	0.033517	0.4976253
The proportion of secondary industry	427	0.4839478	0.1159352	0.2065084	0.7604075
The proportion of tertiary industry	427	0.3243445	0.0748964	0.1812469	0.5690664
Capital investment (10,000 yuan).	427	1905334	1416558	88319	9776123
Labor input	427	0.5801605	0.0727141	0.2833939	0.751185
Urbanization	427	0.1889878	0.0735737	0.0657822	0.4137618
Degree of government intervention	427	0.2339222	0.0766323	0.0951732	0.5004188
Investment in science and technology (10,000 yuan).	427	6788.244	7869.105	119	60134

#### 4.2. Sample Regression Results and Analysis

To test the relationship between industrial structure, county economic growth, and residents' income, the regression analysis of county economic growth and urban and rural residents' income from industrial upgrading is carried out. According to the Hausmann test, it was found that it did not meet the conditions of the random effects model and met the fixed effects model, so the fixed effect model was selected to return to 61 counties in Anhui Province, and the following table 3 was obtained.

From the results of return 1, it can be seen that the industrial structure has a strong linear relationship with the county economic growth, of which the industrial upgrading coefficient is positively correlated with the county economic growth, that is, for Anhui county, the industrial structure upgrade is conducive to the county economic growth. This shows that increasing the proportion of the tertiary industry and continuously promoting the upgrading of the industry plays an important role in promoting the economic growth of Anhui County.

For other variable factors, we can see that capital investment and scientific and technological investment have a role in promoting economic growth, fixed asset investment is still the primary driving force for economic development at this stage, and scientific and technological investment is conducive to promoting industrial upgrading and promoting high-quality economic development. Judging from the results of the return, the contribution of urbanization to the county economy is unstable and needs further study. For the degree of government intervention, it can be seen that the economic growth of the county is inversely correlated, that is, too much government intervention in the economy is not conducive to economic development, and the law of economic development should be fully respected and market-oriented competition should be carried out.

From the results of the return to 2 and 3, it can be seen that the upgrading of the industrial structure and the income of urban and rural residents are positively correlated, and the 0.01 level test, shows that the upgrading of the industrial structure can promote the income growth of urban and rural residents, and the upgrading of the industrial structure can promote regional economic growth, which in turn promotes the income of residents. The specific mechanism of action may be that the upgrading of the industrial structure promotes the continuous improvement of industrial added value, promotes the wage level of employees, and then promotes the increase in the income of urban residents, while for rural residents, industrial prosperity prompts rural residents to work in the city, and the urban consumer market increases, which also increases the income level of rural employees. From the perspective of the regression coefficient, the upgrading of the industrial structure will benefit the income of urban residents more, higher than the income of rural residents and it can be seen that the advanced industrial structure of Anhui County will promote the widening of the income gap between urban and rural areas.

In terms of the impact of other factors on urban and rural income, it can be seen that fixed asset investment can promote the increase of urban and rural income, while labor input and government economic intervention have not contributed to the income of urban and rural residents. The impact of urbanization and scientific and technological investment on urban and rural income has not been reflected, and the possible reason is that the boundary between urban and rural areas is becoming more and more blurred, and the level of urban-rural integration is constantly improving, and the role of urbanization in promoting urban and rural income is no longer obvious. The investment in science and technology is mainly the government's subsidy investment in science and technology, mainly for enterprises, and the impact on individuals is not obvious.

Table 3. Full sample regression results.

variable	Regression 1 GDP per capita	Regression 2 Per capita disposable income in rural areas	Regression 3 Per capita disposable income in cities and towns
Industrial structure upgrading coefficient	0.5978669*** (8.38)	0.7827296*** (9.11)	0.8109718*** (9.86)
Capital investment	0.3735573*** (26.32)	0.3483558*** (20.39)	0.360909*** (22.05)
Labor input	-0.5908289*** (-5.59)	-0.6847715*** (-5.39)	-0.5889747*** (-4.84)
Urbanization	0.0411393 (0.59)	0.1446327* (1.75)	0.1208423 (1.51)
Degree of government intervention	-1.288472***	-0.5281904*** (-2.97)	-0.5292813*** (-3.11)
Investment in science and technology	0.0220145*** (4.24)	0.0133718* (2.14)	0.0056749 (0.95)
Regional effects	YES	YES	YES
Time effect	YES	YES	YES
Sample size	427	427	427
R-sq	0.9365	0.6642	0.6617

#### 4.3. Further Research

From the above, it can be seen that the upgrading of the industrial structure can promote the economic development of Anhui County, and then promote the income of residents. The impact of specific industries on the income of rural and urban

residents needs to be further explored. Through the proportion of primary, secondary, and tertiary industries, that is, the degree of industrial contribution, the income of rural and urban residents is analyzed, and the specific regression results are as follows in Table 4.

Table 4. Results of industrial contribution to residents' income.

variable	Regression 4		Regression 5		Regression 6	
	C-income	T-income	C-income	T-income	C-income	T-income
The proportion of primary industry	-0.2107 (-1.25)	-0.2467 (-1.50)				
The proportion of secondary industry			-1.0145*** (-8.13)	-1.0394*** (-8.65)		
The proportion of tertiary industry					1.2299*** (10.43)	1.2726*** (11.32)
Capital investment	0.4376*** (24.40)	0.4515*** (25.90)	0.4528*** (34.65)	0.4691*** (37.26)	0.3719*** (25.48)	0.3854*** (27.68)
Labor input	-0.9276*** (-6.74)	-0.8387*** (-6.26)	-0.7779*** (-6.08)	-0.6874*** (-5.57)	-0.6474*** (-5.23)	-0.5507*** (-4.66)
Urbanization	0.4849*** (5.86)	0.4728*** (5.88)	0.1537* (1.78)	0.1342 (1.61)	0.0301 (0.35)	0.0028 (0.03)
Degree of government intervention	-0.5088** (-2.58)	-0.5089*** (-2.66)	-0.5480*** (-3.02)	-0.5494*** (-3.14)	-0.5464*** (-3.16)	-0.5482*** (-3.32)
Investment in science and technology	0.0134* (1.94)	0.0057 (0.84)	0.0158* (2.49)	0.0082 (1.34)	0.0139* (2.29)	0.0062 (1.07)
Regional effects	YES	YES	YES	YES	YES	YES
Time effect	YES	YES	YES	YES	YES	YES
Sample size	427	427	427	427	427	427
R-sq	0.5755	0.5540	0.4619	0.4500	0.5985	0.5988

From the results of the return to 4, it can be seen that the estimation coefficient of the contribution of the primary industry to the income of urban and rural residents is not significant, indicating that the contribution of the primary industry is for Anhui County. The income contribution of urban and rural residents is not obvious, which is determined by the agricultural economy and other agriculture itself, as well as urbanization: (1). It can be seen from the proportion of primary industry in various counties in Anhui that the proportion of primary industry in most counties is decreasing year by year, but the relative agricultural development is relatively slow, the construction of agricultural infrastructure, the production efficiency of agricultural labor is low, the development of modern agriculture is slow, and it has failed to play a leading role, which prevents the contribution of the primary industry to economic growth, so the contribution to the income of urban residents is also low; (2) The level of urbanization in Anhui has reached 63%, most rural residents go to the city to work, the hollowing out of the countryside is more serious, and there are fewer employees specializing in agriculture, so the impact of the agricultural industry on the income of rural residents is also relatively small.

From the results of the return to 5, the impact of the contribution of the secondary industry on the income of urban and rural residents, it can be seen from the statistical results that the contribution of the secondary industry to the income of urban and rural residents is not obvious enough, or even negative. According to the comprehensive research of other literature [14], the empirical analysis of other provinces shows that the proportion of the secondary industry is generally conducive to the economic growth of the county, but the Anhui county is the opposite, and the possible reason is that the quality of the secondary industry in Anhui county is relatively low, and the industrial products are relatively single. And the development is relatively slow, and the lack of advanced industrial products and industrialization development is slow, thereby delaying the income of urban and rural residents in the county.

From the results of the return to 6, the proportion of the tertiary industry has a strong positive and significant correlation relationship with the economic growth of the county, indicating that the growth of the tertiary industry is the

main contribution point to the income of urban and rural residents in Anhui County, that is, the upgrading of the industrial structure has promoted the economic growth of the county and also contributed to the growth of the income of urban and rural residents. The tertiary industry gradually has a leading position in economic development, especially in the eastern region, the development of the tertiary industry fully promotes the growth of consumption and investment, and can fully release the rural labor force, drive the development of urbanization, and promote the growth of urban and rural residents' income.

#### 4.4. Robustness Testing

The previous empirical results have confirmed that the research logic of this paper has certain rationality, and to ensure the robustness of the empirical results, the robustness test is carried out. The way of robustness testing is mainly through two aspects, one is to replace the interpreted variables by replacing the variables; The second is to look for instrumental variables. In this paper, the GDP indicator per capita is replaced by the GDP indicator by substitution variables; Replace the disposable income of urban and rural residents with the total consumption of urban and rural residents. Regression analysis (limited to space, results are not listed) and the regression results are found to be consistent with the previous results, indicating that the results are stable.

## 5. Conclusions and Recommendations

Through the 61 counties in Anhui, the impact of industrial structure upgrading on county economic growth and urban and rural residents' income is analyzed by using the panel data from 2012 to 2019, and the impact of the proportion of industry on the income of urban and rural residents in the county is further subdivided. The following conclusions are drawn: (1) The upgrading of the industrial structure is conducive to the economic growth of Anhui County and the growth of the income of urban and rural residents, and the upgrading of the industrial structure has promoted the increase in the income gap between urban and rural residents in Anhui County; (2) The proportion of the primary industry

in Anhui County is not obvious to the income growth of urban and rural residents, and the proportion of the secondary industry to the income growth of urban and rural residents is low; (3) The proportion of the tertiary industry has a greater contribution to the income growth of urban and rural residents and is also the main driving force for the income growth of urban and rural residents. Given the above conclusions, combined with the fact that the proportion of the tertiary industry in Anhui County is relatively low compared with that of developed provinces in the east, there is still a lot of room for improvement. Based on the above empirical analysis results, the following suggestions are put forward for the economic growth of Anhui County and the income growth of urban and rural residents at the county level:

### ***5.1. Optimize the Industrial Structure and Pay Attention to Adjusting the Income Gap Between Urban and Rural Areas***

From the above empirical results, it can be seen that the upgrading of the industrial structure is conducive to economic growth and the growth of urban and rural residents' income, and the optimization and upgrading of the industrial structure means that the proportion of the primary industry is getting lower and lower, the proportion of the secondary and tertiary industries is getting higher and higher, and the industrialization of most counties in Anhui is insufficient, the development of modern service industry is lagging, and the evolution to the tertiary industry is weak. It is necessary to strengthen infrastructure construction, undertake industrial transfer in the Yangtze River Delta, increase the proportion of service industry, increase support for technology investment, adhere to independent innovation and research and development, and improve the overall industrial technology level; We should pay attention to the development of private enterprises, especially small and micro enterprises, we should use the guiding role of the government to solve the problems of lagging development and imperfection of the main body of the service industry, give full play to the role of the marketization of the service industry, the upgrading of the industrial structure has expanded the income gap between urban and rural residents, local governments should pay attention to adjusting the income gap between urban and rural areas, and can reduce the income gap between urban and rural residents through administrative means such as subsidies for rural residents.

### ***5.2. Undertake Industrial Transfer and Promote the Integrated Development of the Yangtze River Delta***

From the results of the return, it can be seen that the secondary industry has not played a role in promoting the income of urban and rural residents in Anhui County, and the reason is that the industrialization development of Anhui County is slow, the added value of products is low, and the industrial technology is backward. Anhui county should take advantage of the integrated development of the Yangtze River

Delta, actively undertake industrial transfer, form an industrial chain with the developed areas of the Yangtze River Delta, especially the proposal of "new infrastructure", and should actively coordinate with the Yangtze River Delta region to provide supporting industries. Coordinated industrial development is an important path for the integrated development of the Yangtze River Delta, Anhui integrates the integration of the Yangtze River Delta and provides supporting synergy, which not only helps to upgrade the industrial structure but also promotes the income of urban and rural residents and reduces the income gap between residents in the Yangtze River Delta region.

### ***5.3. Promote the Internal Circulation of the Economy and Increase the Income of Residents***

Insufficient market demand is one of the main reasons affecting economic development, affected by the new crown epidemic and the decline in foreign demand, the Party Central Committee proposed a double cycle strategy to promote the internal circulation of the economy, supplemented by the external circulation of the economy. The internal circulation of the economy can also effectively stimulate market demand and promote the growth of residents' income, and there are mainly the following suggestions for promoting the internal circulation: 1. 2020 is a key year for targeted poverty alleviation, and increasing poverty alleviation will help expand market demand; The relocation of poverty alleviation migrants will also be conducive to investment needs; 2. Rural population into the city and the construction of the metropolitan area is also an important way to expand domestic demand, the government should provide the same public services and social benefits as the citizens to the peasants in the city, promote the coordinated development of the metropolitan area so that the surrounding small cities can obtain development opportunities; 3. Increase the proportion of the tertiary industry, enhance the county consumer market, demand to promote industrial development, should adhere to market-oriented adjustment, to avoid excessive government intervention, from the return results can know that the degree of government intervention on the county economic growth and resident income plays a reverse role.

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