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The Driving Effect of Industrial Upgrading on new-type Urbanization in Zhejiang Province

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Abstract: ***The process of urbanization is supported by the economic foundation and accompanied by the upgrading of industrial structure. At present, the new-type urbanization of Zhejiang is in the stage of rapid development, and the upgrading of industrial structure is continuously and stably advanced and rational. Urban and rural development and urban construction are gradually moving towards a higher level. Therefore, it is of great significance to explore the driving effect of industrial upgrading on the new-type urbanization in Zhejiang Province for studying how to further promote the new-type urbanization process in China. Based on the analysis of industrial structure upgrading and urbanization in Zhejiang Province, this paper adopts the entropy weighting method to comprehensively evaluate the new-type urbanization level of each city in Zhejiang Province. Using panel data from 2009 to 2018, empirical analysis is made on the influencing factors of new-type urbanization level score of each city in Zhejiang Province. The influence of industrial structure upgrading index and other factors on the new-type urbanization level in Zhejiang province is obtained, which provides reference for Zhejiang and other regions to guide the industrial upgrading and improve the new-type urbanization development level.***

Keywords: Upgrading of industrial structure; Urbanization; Zhejiang.

1. INTRODUCTION

Since the reform and opening-up, urbanization in China has been advancing rapidly, with the urbanization rate increasing from less than 20% in 1978 to 64.72% in 2021 (Pang and Shi, 2023). On the one hand, urbanization has enabled a large number of agricultural populations to enter the secondary and tertiary industries, optimizing the allocation of urban and rural resources and driving long-term high economic growth in China. Urbanization has also promoted the improvement of urban infrastructure and public services, with healthcare, education, culture, and sports thriving. However, on the other hand, population urbanization lags behind land urbanization, resulting in a large number of rural populations unable to enjoy the benefits of urbanization and bearing the exacerbated income disparity between urban and rural residents. The mismatch between industrial layout and population resources has further exacerbated regional development imbalances (He et al., 2016). In response to this issue, a new concept of urbanization, distinct from traditional urbanization that only considers the population urbanization rate, has been proposed in Chinese government reports, emphasizing "the pattern of urban agglomerations as the main body, with coordinated development of large, medium, and small cities and small towns." This concept includes content such as coordinated urban-rural development, the benign interaction between industry and urbanization, and the creation of ecologically livable cities, providing correct theoretical guidance for urbanization construction in the new era.

In the practice of new-type urbanization, the industrial structure plays a crucial role. The rational adjustment of the industrial structure can coordinate urban and rural development, promote the optimal allocation of urban and rural resources, and narrow the urban-rural income gap. The upgrading of the industrial structure will also promote the transformation of extensive growth-oriented township enterprises into technology-oriented ones, saving resources, reducing pollution, and driving progress in population quality due to the demand for high-tech talents. Whether in new-type urbanization or industrial structure, Zhejiang is at an advanced level nationwide, highly representative, and of reference value. By taking Zhejiang as a research object and exploring the driving effect of industrial upgrading on new-type urbanization, we can provide assistance and suggestions for future new-type urbanization in Zhejiang and even the whole country (Gu and Wang, 2019).

2. ZHEJIANG'S INDUSTRIAL STRUCTURE UPGRADE AND URBANIZATION

2.1 Zhejiang industrial structure upgrade

2.1.1 Zhejiang Provincial Analysis

From 1978 to 2020, the gross production value of the primary, secondary, and tertiary industries in Zhejiang Province increased from 4.7 billion yuan, 5.4 billion yuan, and 2.3 billion yuan to 2169 billion yuan, 26412 billion yuan, and 36031 billion yuan, respectively. The structure of the three industries changed from 38:43:19 to 3:41:56. This paper divides the process of industrial structure upgrading in Zhejiang from 1978 to 2020 into the following three stages: 1978-1992, 1993-2002, and 2003-2020. The data intuitively reflects the rapid growth and structural optimization of the three major industries in Zhejiang Province (Shi, 2012).The first stage of the industrial structure upgrading in Zhejiang was from 1978 to 1992. During this period, the proportion of the primary industry decreased, surpassed by the tertiary industry, forming a pattern of "secondary industry > tertiary industry > primary industry". The second stage was from 1993 to 2002, during which the proportion of the primary industry continued to decrease, while the proportions of the secondary and tertiary industries continued to increase, and the gap between them remained unchanged. The third stage was from 2003 to 2020, during which the gap between the proportions of the secondary and tertiary industries gradually narrowed to equality, and ultimately, the proportion of the tertiary industry surpassed that of the secondary industry, forming a new pattern of "tertiary industry > secondary industry > primary industry".

2.1.2 Analysis at the municipal level in Zhejiang

To assess whether there is significant differentiation in the industrial structure among various cities in Zhejiang, this paper selects data from the year 2018 and conducts a quantitative analysis of the industrial structure in each city using the Industrial Structure Upgrading Index. The calculation method is set as follows: Industrial Structure Upgrading Index = Added Value of the Tertiary Industry / Added Value of the Secondary Industry.

Table 1: Current status of industrial upgrading in cities in Zhejiang Province in 2018

	Added value of secondary industry (100 million yuan)	Added value of tertiary industry (100 million yuan)	Industrial structure upgrading index
Hangzhou	209.45	701.91	3.35
Ningbo	388.08	515.17	1.33
Wenzhou	229.62	367.54	1.60
Jiaxing	306.57	205.41	0.67
Huzhou	101.88	142.49	1.40
Shaoxing	139.30	210.65	1.51
Jinhua	118.84	142.53	1.20
Quzhou	74.66	71.13	0.95
Zhoushan	25.52	69.26	2.71
Taizhou	244.23	246.20	1.01
Lishui	70.29	78.74	1.12
Zhejiang average	/	/	1.34
National average	/	/	1.31

According to Table 1, it is evident that six cities in Zhejiang are above the national average level, namely Hangzhou, Ningbo, Wenzhou, Huzhou, Shaoxing, and Zhoushan, with Hangzhou being the highest at an index of 3.35. The remaining five cities have Industrial Structure Upgrading Indices lower than the national average, with indices around 1, indicating proximity to the average level. This is partly due to the fact that these areas still have considerable room for development in the secondary industry. Additionally, it reflects the hierarchical nature of industrial structure upgrading within the province (Xu and Jiao, 2021).

Overall, the average Industrial Structure Upgrading Index in Zhejiang is slightly higher than the national average. Zhejiang's overall industrial structure level ranks among the top in the country. Maintaining such an industrial upgrading index reflects Zhejiang's abundant driving force for industrial upgrading.

2.2 Zhejiang New Urbanization

2.2.1 A review of evidence at the provincial level in Zhejiang

Zhejiang, as a pioneer in the reform and opening-up era, led the exploration of economic system reforms. In the 1980s and 1990s, with the rapid rise of township enterprises and the accelerated pace of rural industrialization, the fast-developing small towns became a major breakthrough in urbanization in Zhejiang. By the late 1990s, Zhejiang was the first to propose an urbanization strategy, initiating a rapid urbanization process. After 2003, Zhejiang Province put forward strategies for integrated urban-rural development and new-type urbanization (Huang, Jiang, and Chen, 2023). The urbanization process in Zhejiang since the reform and opening-up can be roughly divided into the following four stages.

The first stage: 1978-1997. In 1978, the reform and opening-up greatly promoted industrialization in Zhejiang, characterized by the predominant development of township industries, laying a solid foundation for urbanization (W. Xu and Tan, 2002). Urbanization in Zhejiang during this stage occurred against the backdrop of the early initiation of industrialization and marketization in coastal areas, with the rapid rise and development of small towns as the main sign, while large, medium, and small cities were generally in the initial stage of endogenous evolutionary development.

The second stage: 1998-2002. In 1998, the urbanization level in Zhejiang reached 36.7%, but compared with the global average and that of developed countries and regions (approximately 45% in 1998), urbanization was still at a relatively low level (Wang, 2015). In 1999, Zhejiang Province pioneered the formulation and implementation of the first round of provincial urban system planning in the country, becoming the first to be approved for implementation. After 2000, Zhejiang continued to increase its efforts to promote urbanization in a planned and step-by-step manner. During this period, the urbanization rate in Zhejiang increased rapidly, reaching 51% in 2002.

The third stage: 2003-2011. In 2004, Zhejiang Province proposed the idea of coordinating urban and rural development and promoting integrated urban-rural development, initiating the process of overall spatial planning, construction, and governance of urban and rural areas in the province, actively exploring and preparing for the transformation and development of the next stage of urbanization. In 2009, the Zhejiang provincial government proposed to build Zhejiang into a national demonstration zone for the practice of new-type urbanization through joint construction between central and provincial governments. In 2011, Zhejiang became the first province to implement the new round of urban system planning. During this period, the urbanization rate in Zhejiang stabilized and improved, reaching 62% in 2011.

The fourth stage: Since 2012. Since 2012, Zhejiang has continued to advance deepening transformation along the new-type urbanization strategy, proposing a series of targeted measures such as "joint governance of five waters," "three reforms and one demolition," "four sides and three improvements," "four replacements and three promotions," and "air pollution control," further improving the institutional mechanisms for integrated urban-rural development. By the end of 2019, the urbanization rate of Zhejiang's permanent resident population reached 70% (Xiong et al., 2021).

Table 2: Population urbanization in cities in Zhejiang Province in 2009 and 2018

Index / city	Population urbanization in 2009(%)	Population urbanization rate in 2018(%)	growth rate(%)
Hangzhou	69.5	77.4	11.37
Ningbo	63.7	72.9	14.44
Wenzhou	60.7	70	15.32
Jiaixng	51.2	66	28.91
Huzhou	50.7	63.5	25.25
Shaoxing	57.7	66.6	15.42
Jinhua	58.4	67.7	15.92
Quzhou	41.1	58	41.12
Zhoushan	62.4	68.1	9.13
Taizhou	51.7	63	21.86
Lishui	41.8	61.5	47.13
Zhejiang	57.9	68.9	19.00

Between 2009 and 2018, the urbanization rate of the population in Zhejiang Province increased by over 10% over the span of a decade, with an average annual growth rate of approximately 1 percentage point, showing an overall trend of stable growth. According to Table 2.2, the urbanization rates of the population in various cities of Zhejiang Province in 2009 and 2018 indicate a stable growth trend over the decade. In 2009, the top three cities in terms of urbanization rates were Hangzhou, Ningbo, and Zhoushan, whereas in 2018, they were Hangzhou, Ningbo, and Wenzhou. Conversely, in 2009, the bottom three cities were Huzhou, Lishui, and Quzhou, and in 2018, they were Taizhou, Lishui, and Quzhou. In 2009, only four cities exceeded the provincial average, and in 2018, there were only three, indicating significant regional disparities in urbanization levels within Zhejiang Province, suggesting uneven development. It is noteworthy that cities with lower urbanization rates demonstrated higher growth rates, with Lishui and Quzhou experiencing growth rates of 47.13% and 41.12%, respectively, far surpassing the average of 19%. This indicates a trend of narrowing regional disparities in urbanization levels within Zhejiang Province, suggesting a benign and coordinated evolutionary state.

2.2.2 Comprehensive evaluation of new urbanization in various cities

Relying solely on the urbanization rate of the population as an evaluation criterion for regional new-type urbanization is inevitably one-sided. Therefore, to more comprehensively reflect the true development level of new-type urbanization in each city, a comprehensive evaluation of new-type urbanization in various cities of Zhejiang Province from 2009 to 2018 was conducted.

(I)Evaluation indicators and evaluation methods

1.Evaluation indicators

(1) Economic Level: The most direct reflection of urbanization level is economic level, specifically including residents' income level, industrial development level, enterprise management level, government financial level, etc. Generally, more developed urban areas have stronger secondary and tertiary industries, which lead to higher per capita income for local residents, more robust government financial resources from tax revenue, and more funding to support local enterprises and industries.

(2) Population Development: The development of new-type urbanization is not only comprehensive urban development but also comprehensive human development, including comprehensive development of urban population. Population quality and per capita wealth can be reflected from both cultural and material perspectives.

(3) Infrastructure: Healthcare, transportation, communication, etc., are essential public services closely related to the quality of life of urban residents during the urbanization process. The development of infrastructure can attract more rural residents to move to urban areas, directly impacting the urbanization rate.

(4) Urban-Rural Coordination: Improving the level of urban-rural coordination is essential for implementing rural revitalization. The ability to coordinate urban and rural areas is a necessary component of new-type urbanization.

(5) Ecological Resources: Ecological construction is the implementation of the concept of harmonious development between humans and nature, aiming at the widespread and rational utilization of ecological resources to improve people's living conditions.

For the above five primary evaluation indicators, secondary indicators are selected as shown in Table 3.

Table 3: Comprehensive evaluation index system for new urbanization in cities in Zhejiang Province

Target	Overall indicator	Detailed indicators	Indicator correlation
Comprehensive evaluation of new urbanization in various cities	economic level	GDP per capita (yuan)	Positive correlation
		Industrial structure upgrade (dimensionless)	Positive correlation
		Fixed asset investment per capita (yuan)	Positive correlation
		Per capita fiscal expenditure (yuan)	Positive correlation
	population development	Number of students enrolled in ordinary colleges and universities per 10,000 people (person)	Positive correlation
		Per capita social deposits at the end of	Positive correlation

		the year (10,000 yuan)	
	infrastructure	Number of mobile phones per 10,000 people (units)	Positive correlation
		Highway mileage per 10,000 people (km)	Positive correlation
		Number of hospital and health center beds per 10,000 people (number of beds)	Positive correlation
	Urban-rural coordination	Urbanization rate of permanent population (%)	Positive correlation
		Ratio of disposable income of urban and rural residents (dimensionless)	Negative correlation
	ecological resources	Liquefied petroleum gas supply per 10,000 people (tons)	Positive correlation
		Sewage treatment rate (%)	Positive correlation
		Green coverage rate of built-up areas (%)	Positive correlation

2.Evaluation methods

The entropy method avoids the random subjective weighting of the analytic hierarchy process, effectively addressing the issue of overlapping information in multiple indicator variables. It is both comprehensive and objective, without the need for prior knowledge of results. Moreover, compared to the Delphi method and the analytic hierarchy process, it offers higher reliability and credibility. Therefore, this paper chooses to adopt the entropy method for evaluation (Vidal, Marle, and Bocquet 2011). The calculation steps are as follows:

(1)Data normalization:

positive indicator:

$$X_{\mathrm{ij}}=\frac{X_{\mathrm{ij}}-\min\left\{X_{ij}\right\}}{\max\left\{X_{ij}\right\}-\min\left\{X_{ij}\right\}}\left(i=1,2,3..m;j=1,2,3..n\right) \tag{2.1}$$

negative indicator:

$$X_{\mathrm{ij}}=\frac{\max\left\{X_{\mathrm{ij}}\right\}-X_{ij}}{\max\left\{X_{ij}\right\}-\min\left\{X_{ij}\right\}}\left(i=1,2,3..m;j=1,2,3..n\right) \tag{2.2}$$

(2)Calculate the proportion Yij of the j-th indicator value in the i-th year:

$$Y_{ij}=\frac{X_{ij}}{\sum_{i=1}^{m}X_{ij}} \tag{2.3}$$

(3)Calculate the entropy value ej of the jth indicator:

$$e_j=-k\sum_{i=1}^{m}\left(Y_{ij}\times\ln Y_{ij}\right),e_j\in\left[0,1\right] \tag{2.4}$$

(4)Calculate the difference coefficient dj of the jth indicator:

$$d_j=1-e_j \tag{2.5}$$

(5)Calculate the weight Wi of the jth indicator:

$$W_i=d_j\Big/\sum_{j=1}^{n}d_j \tag{2.6}$$

(6)Calculate the comprehensive score of each indicator Hi:

$$W_i=\frac{d_j}{\sum_{j=1}^{n}d_j} \tag{2.7}$$

The single indicator of population urbanization rate is insufficient to comprehensively assess the level of new-type urbanization in a region. Over the years, scholars both domestically and internationally have innovated evaluation methods by constructing comprehensive evaluation indicator systems with multiple levels, dimensions, and indicators. This approach aims to derive more reasonable and accurate results.

(II)Analysis of new urbanization evaluation results

Under the comprehensive evaluation indicator system mentioned earlier, the results obtained through the entropy weighting method applied to the data of relevant indicators from 2009 to 2018 are shown in Table 4.

Table 4: Comprehensive evaluation scores of new urbanization in cities in Zhejiang Province from 2009 to 2018

	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	Average
Hangzhou	0.710	0.724	0.767	0.768	0.788	0.549	0.794	0.538	0.665	0.661	0.696
Ningbo	0.687	0.674	0.612	0.646	0.538	0.371	0.582	0.510	0.432	0.418	0.547
Jiaixng	0.312	0.343	0.339	0.340	0.285	0.229	0.361	0.363	0.291	0.187	0.305
Huzhou	0.211	0.203	0.216	0.230	0.160	0.134	0.251	0.277	0.219	0.182	0.208
Shaoxing	0.255	0.271	0.244	0.265	0.253	0.199	0.332	0.373	0.346	0.433	0.297
Zhoushan	0.593	0.587	0.635	0.607	0.562	0.500	0.640	0.593	0.579	0.503	0.580
Wenzhou	0.173	0.168	0.182	0.235	0.184	0.381	0.100	0.102	0.206	0.232	0.196
Jinhua	0.206	0.207	0.215	0.262	0.234	0.189	0.250	0.213	0.145	0.292	0.221
Quzhou	0.088	0.079	0.074	0.165	0.067	0.327	0.139	0.241	0.231	0.230	0.164
Taizhou	0.172	0.159	0.162	0.137	0.152	0.130	0.192	0.252	0.251	0.258	0.186
Lishui	0.154	0.148	0.189	0.198	0.148	0.194	0.181	0.400	0.337	0.342	0.229
Zhejiang	0.324	0.324	0.331	0.350	0.307	0.291	0.348	0.351	0.337	0.340	0.330

From the comprehensive evaluation scores of new-type urbanization in Zhejiang Province, it can be observed that the overall trend of new-type urbanization in Zhejiang shows a fluctuating upward trend. Only Hangzhou, Ningbo, and Zhoushan have average evaluation scores higher than the provincial average, indicating significant internal differences in the level of new-type urbanization in Zhejiang. Some prefecture-level cities have a much higher level of new-type urbanization than the overall provincial level.

3. EMPIRICAL ANALYSIS

3.1 Panel data description

The empirical analysis in this paper utilizes panel data. To eliminate strong interference from the outbreak of the COVID-19 pandemic on various socio-economic data, the longitudinal time dimension is chosen to span from 2009 to 2018, totaling a period of 10 years. Additionally, the cross-sectional geographical selection includes the eleven prefecture-level cities in Zhejiang Province. The data sources include the "Statistical Yearbook of Zhejiang Province," the "China City Statistical Yearbook," and the comprehensive evaluation scores mentioned earlier (Yan and Reschovsky, 2021).

3.2 Model construction and variable definition

Based on the study results of Wang, Han, and Du (2021), which measured the level of new urbanization in 285 prefecture-level cities in China from 2003 to 2012, it was concluded that the quality of labor force, level of investment, economic development, government capacity, infrastructure, and industrial structure all have a positive promoting effect on new urbanization. The paper introduced five control variables, namely the quality of labor force, level of investment, economic development, government capacity, and infrastructure. Following the principles of representativeness, accessibility, and operability, specific data representing the control variables were selected, including the number of university students per ten thousand people, per capita fixed asset investment, per capita GDP, per capita fiscal expenditure, and road mileage per ten thousand people. The comprehensive evaluation score of new urbanization, number of university students per ten thousand people, per capita fixed asset investment, per capita GDP, per capita fiscal expenditure, and road mileage per ten thousand people were respectively logged, and the following econometric model was set up.

$$\ln Y_{it}=\alpha_{it}+\beta_1 h_{it}+\beta_2 \ln L_{it}+\beta_3 \ln K_{it}+\beta_4 \ln E_{it}+\beta_5 \ln G_{it}+\beta_6 \ln F_{it}+\varepsilon_{it} \quad (3.1)$$

Among them, lnk_{it} is the new level of urbanization.$h_{it}$is the upgrading of industrial structure.lnL_{it} is the quality of the workforce.$lnK_{it}$is the investment level.lnE_{it} is the level of economic development.lnG_{it} is government capacity.lnF_{it} is infrastructure.α is a constant term.α_{it}, β_1, β_2, β_3, β_4, β_5, β_6 is the coefficient.ε_{it} is the error disturbance term.i is the region and t is the time.

Table 5: Model variable definition

Variable name	Symbol	Definition
New urbanization	lnY	The logarithm of the calculation results of comprehensive economic, social, population, urban and rural coordination, ecological and other indicators
Industrial structure upgrading index	h	The added value of the tertiary industry/the added value of the secondary industry
Labor force quality	lnL	Logarithm of the number of college students per 10,000 people
Investment level	lnK	Logarithm of fixed asset investment per capita
The level of economic development	lnE	Logarithm of GDP per capita
Government capacity	lnG	Logarithm of fiscal expenditure per capita
Infrastructure	lnF	Logarithm of highway miles per 10,000 people

3.3 Empirical analysis

3.3.1 Correlation coefficient test, KMO test and Bartlett test

Table 6: Correlation coefficient test

	h	lnL	lnK	lnE	lnG	lnF
h	1	.078	.048	.092	.011	.018
lnL	.078	1	.445**	.657**	.478**	-.177
lnK	.048	.445**	1	.834**	.801**	-.198*
lnE	.092	.657**	.834**	1	.770**	-.323**
lnG	.011	.478**	.801**	.770**	1	.022
lnF	.018	-.177	-.198*	-.323**	.022	1

*. Significantly related at the 0.05 level (two-sided)
**. Significantly correlated at the 0.01 level (two-sided).

Table 7: KMO and Bartlett's test

Kaiser-Meyer-Olkin metric of sampling sufficiency.		.692
Bartlett's test of sphericity	Approximate chi-square	352.594
	df	15
	Sig.	.000

Firstly, a correlation coefficient test was conducted on the variables. The majority of the correlation coefficients between variables were greater than 0.5. The Kaiser-Meyer-Olkin (KMO) measure and Bartlett's test were performed as shown in Table 3.2. The KMO value was 0.692, and Bartlett's test yielded an approximate chi-square value of 352.594 with 15 degrees of freedom and a significance level of 0.000. Thus, it can be inferred that factor analysis is appropriate.

3.2 Extract principal components

Principal component analysis (PCA) was conducted using SPSS on the six explanatory variables. As indicated in Table 3.4, factors 1, 2, and 3 collectively contributed 85.152% to the variance of the new urbanization, effectively reflecting the majority of the information. Therefore, the first three factors were labeled as principal components, denoted as F1, F2, and F3, respectively.

Table 8: Total variance explained

Ingredients	Initial eigenvalue			Extract sum of squares and load		
	total	% variance	ofCumulative %	total	% variance	ofCumulative %
1	3.080	51.331	51.331	3.080	51.331	51.331
2	1.032	17.195	68.526	1.032	17.195	68.526
3	.998	16.627	85.152	.998	16.627	85.152
4	.613	10.212	95.364			
5	.166	2.774	98.138			
6	.112	1.862	100.000			

Extraction method: principal component analysis.

Table 9: rotated component matrix

	Ingredients		
	1	2	3
h	.040	.018	.994
lnL	.689	-.205	.118
lnK	.904	-.070	-.013
lnE	.925	-.245	.063
lnG	.917	.183	-.052
lnF	-.110	.977	.021

Extraction method: main ingredients.
Rotation method: Orthogonal rotation method with Kaiser normalization.
a. Rotation converges after 4 iterations.

Setting a factor loading greater than 0.9 to indicate significant contributions to variables, Table 4.5 reveals that factor 1 (F1) has substantial loadings on lnK, lnE, and lnG, indicating that per capita fixed asset investment, per capita GDP, and per capita fiscal expenditure contribute significantly to F1. Similarly, per capita road mileage contributes significantly to F2, and the industrial structure upgrading index contributes significantly to F3. Therefore, F1 is named as the economic level factor, F2 as the infrastructure factor, and F3 as the industrial upgrading factor.Then calculate the score coefficient of each factor and get the following results:

Table 10: Component score coefficient matrix

	Ingredients		
	1	2	3
h	-.023	.017	.987
lnL	.212	-.115	.091
lnK	.308	.039	-.048
lnE	.292	-.125	.027
lnG	.344	.283	-.089
lnF	.075	.918	.021

Extraction method: main ingredients.
Rotation method: Orthogonal rotation method with Kaiser normalization.

The scores of F1, F2 and F3 can be expressed as:

$$F1=-0.23h+0.212\ln L+0.308\ln K+0.292\ln E+0.344\ln G+0.075\ln F \quad (3.1)$$

$$F2=0.017h-0.115\ln L+0.039\ln K-0.125\ln E+0.283\ln G+0.918\ln F \quad (3.2)$$

$$F3=0.987h+0.091\ln L-0.048\ln K-0.027\ln E-0.089\ln G+0.021\ln F \quad (3.3)$$

3.3.3 Stationary sequence test

To avoid spurious regression, an Augmented Dickey-Fuller (ADF) test was conducted on F1. The result of the t-test is -2.786303, which exceeds the critical value of -2.771129 at the 10% significance level. This indicates that F1 exhibits a unit root and is non-stationary, necessitating first-order differencing.

Table 11: ADF test results of F1 sequence

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.746303	0.1036
Test critical values:	1% level	-4.420595	
	5% level	-3.259808	
	10% level	-2.771129	

After taking the first-order difference of F1 and conducting another ADF test, the result of the t-test is -8.451304, which is lower than the critical value of -4.803492 at the 1% significance level. This indicates that at the 1% significance level, F1 is a first-order integrated series.

Table 12: ADF test results of F1 first-order difference sequence

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-8.451304	0.0004
Test critical values:	1% level	-4.803492	
	5% level	-3.403313	
	10% level	-2.841819	

Using the same method of testing, it was found that lnY, F2, and F3 are also first-order integrated series.

3.3.4 Linear regression and cointegration tests

To test for the existence of cointegration among F1, F2, F3, and lnY, the values of F1, F2, and F3 were calculated using formulas 4.1, 4.2, and 4.3, respectively. Subsequently, a regression model was constructed by regressing these calculated values against lnY.

$$\ln Y = -9.341753 + 0.847570F1 - 0.249698F2 + 0.220785F3 \quad (4.4)$$

Table 13: Model regression results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-9.341753	0.793005	-11.78020	0.0000
F1	0.847570	0.068228	12.42262	0.0000
F2	0.249698	0.078574	-3.177859	0.0019
F3	0.220785	0.016522	13.36312	0.0000
R-squared	0.634262	Mean dependent var		-1.301938
Adjusted R-squared	0.623911	S.D. dependent var		0.600051
S.E. of regression	0.367988	Akaike info criterion		0.874152
Sum squared resid	14.35398	Schwarz criterion		0.972351
Log likelihood	-44.07833	Hannan-Quinn criter.		0.913982
F-statistic	61.27508	Durbin-Watson stat		1.089570
Prob(F-statistic)	0.000000			

Furthermore, an Augmented Dickey-Fuller (ADF) test was conducted on the residuals. The result of the t-test is -6.569324, which is below the critical value of -3.491345 at the 1% significance level. This suggests that the residual sequence is stationary, indicating the absence of a unit root. Thus, there exists a cointegrating relationship between lnY and F1, F2, and F3.

Table 14: ADF test results of residual sequence

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.569324	0.0000
Test critical values:	1% level	-3.491345	
	5% level	-2.888157	
	10% level	-2.581041	

Finally, incorporating F1, F2, and F3 into the aforementioned results, the regression coefficients and the econometric model are derived as follows:

$$\ln Y_{it}=-9.34+0.409h_{it}+0.228\ln L_{it}+0.241\ln K_{it}+0.273\ln E_{it}+0.201\ln G_{it}+0.161\ln F_{it}+\varepsilon_{it} \quad (4.5)$$

3.3.5 Analysis of empirical results

The econometric model derived from the multiple linear regression results reveals that the industrial upgrading index, representing the explanatory variable, exhibits an elasticity coefficient of 0.409. This coefficient is significantly higher than those of the other five control variables. Following closely is the level of economic development among the control variables, with an elasticity coefficient of 0.273, slightly below the industrial upgrading index but higher than labor quality, investment level, and government capability. Labor quality, investment level, and government capability have elasticity coefficients ranging from 0.2 to 0.25, indicating comparable effects. Lastly, infrastructure has an elasticity coefficient of 0.161, notably lower than the other variables.

From these findings, it can be concluded that in terms of the driving effect on new urbanization, industrial structural upgrading stands as the primary factor, followed by the level of economic development. Meanwhile, other factors such as investment level and government capability also contribute positively to the advancement of new urbanization to varying degrees.

4. SUGGESTIONS

Zhejiang should enhance government support and strengthen policy innovation to expand financial subsidies for high-tech industries, guiding the trend of new economic development towards optimizing structural changes from the previous emphasis on "quantity-oriented" growth to "quality-oriented" development. In the conception and innovation of industrial structural policies, emphasis should be placed on the role of upgrading industrial structures towards higher levels of advancement and rationalization (Liu and Bai, 2021). Simultaneously, allowing and supporting regional differentiation and individualized industrial policies, tailored to the specific industrial structure levels of various districts and counties, will facilitate precise promotion of balanced urban construction and industrial investment. It is essential to maintain the parallel focus on the efficiency and quality of urban development, fostering a virtuous interaction and coordinated progress between industrial transformation and upgrading and new urbanization.

Furthermore, robust employment policies should be implemented alongside industrial policies to promote the concentration of population and industry towards urban areas. Continuously introducing new policies to effectively support the growth of modern agriculture, industry, and services, guiding improvements in their internal structures, will create a core driving force for the development of new urbanization.

Zhejiang should continue to adopt policies to stimulate private enterprises to expand investment, reasonably relax the scope of capital access, and safeguard the legitimate rights and interests of enterprises (Gregory, Tenev, and Wagle, 2000). As per current laws and regulations, there are no explicitly prohibited industries and sectors for entry, such as public utilities, affordable housing construction, and infrastructure development. Opening up private investment can not only drive industrial development and optimize industrial structures by promoting the rational allocation of capital among industries but also further promote economic development, increase employment opportunities, and enhance gross domestic product, injecting momentum into the improvement of the level of new urbanization.

Moreover, Zhejiang should continue to stabilize policies and expand the utilization of foreign capital, appropriately easing conditions for market access for foreign capital and encouraging foreign investment in industries such as digital economy, new materials, life sciences, aerospace, etc. Strengthening the protection of factors for foreign-funded enterprises, optimizing the investment environment for foreign investors, and focusing on protecting the intellectual property rights of foreign companies are crucial. Accelerating the construction of high-level open platforms and promoting the innovative development of development zones, leveraging foreign investment to advance the high-level upgrading of industrial structures, stimulating economic vitality under the dual circulation pattern of domestic and foreign economies, will create favorable external factors for the improvement of the level of new urbanization.

Zhejiang should strengthen support for scarce talents and become a base for cultivating talent for industrial innovation. Precise talent introduction should be focused on key pillar industries such as new energy, electronic information, high-end equipment manufacturing, and environmental protection tourism. Additionally, efforts should be made to build an excellent talent team for entrepreneurs, promote the return of Zhejiang business talents, and enhance the cultivation of management talents for state-owned enterprises. Relying on talents to continuously promote the rationalization and high-level upgrading of industrial structures, driving the modernization and high-end development of township enterprises, will lead to a new pattern and new heights in the level of new urbanization (Zhu, Iles, and Shutt, 2011). Besides, Zhejiang should introduce new measures to focus on improving the quality of manufacturing labor, encourage enterprises and social organizations to provide more training opportunities for employees to upgrade their skills, and vigorously develop vocational education in fields such as artificial intelligence to meet the realistic demands of manufacturing industry upgrading under the trend of automation production.

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