DOI: 10.5281/zenodo.15269816 Volume 1, Issue 2, 2025

Statistical Measurement and Effect Analysis of the New Kinetic Energy for Realizing High-Quality Economic Development

Jing Li[1], Jiaojiao Shen[2]*

[1]School of Public Finance and Taxation, Nanjing University of Finance & Economics,
No. 3 Wenyuan Road, Xianlin University Town, Nanjing, Jiangsu, China
252115080@qq.com

[2]School of Public Finance and Taxation, Nanjing University of Finance & Economics,
No. 3 Wenyuan Road, Xianlin University Town, Nanjing, Jiangsu, China
sjj1230422@163.com

*Corresponding author, School of Public Finance and Taxation, Nanjing University of Finance & Economics,
sjj1230422@163.com

Abstract: ***Against global economic pattern adjustment and domestic economic structure optimization, cultivating new economic dynamics has become the key to promoting China's high-quality economic development. This paper constructs a measurement index system covering six dimensions: economic vitality, innovation power, digital capacity, green development, openness level, and public service, selects data from 30 provinces (cities and districts) in China from 2012 to 2022, measures the level of the new kinetic energy of economic using the entropy method, and analyzes its interaction with economic growth and industrial structure with the help of the Panel Vector Autoregressive (PVAR) model. The study finds that (1) the national index of the new kinetic energy continues to rise from 2012 to 2022, but the regional development is unbalanced, with the east leading, the central region growing the fastest, and the western and northeastern regions lagging relatively. (2) Economic vitality, innovation-driven, and digital economy contribute significantly to the improvement of new kinetic energy, there are fluctuations in green development, public service inputs are increasing, and the level of openness is steadily increasing but the pulling effect is weak. (3) In the short term, each variable is mainly affected by its inertia, and the long-term dynamic correlation is gradually increasing, the new economic dynamics have a positive role in promoting economic growth and industrial upgrading, but the economic growth is overly dependent on the traditional industries will inhibit the development of new dynamics. This paper provides a quantitative basis for an in-depth understanding of China's economic new momentum development and also provides empirical evidence for the government to formulate policies to promote the development of economic new momentum.***

Keywords: new economy; new kinetic energy; high-quality development; statistical measurement.

1. Introduction

With the adjustment of the global economic pattern and the optimization of the domestic economic structure, the high-quality development of China's economy has become the core proposition of the times. Since the reform and opening-up, China has realized rapid economic growth through the high-intensity input of resource factors, but the traditional development model has brought about the tightening of resource and environmental constraints, imbalance in the industrial structure, and the erosion of the demographic dividend, which have led to the weakening of the traditional comparative advantages. At the same time, changes in the external environment, such as the weakening of the momentum of global economic growth, the rise of anti-globalization thinking, and the intensification of geopolitical risks, have led to a significant increase in the uncertainty of China's economic development environment, which further highlights the urgency of transforming the mode of development. Against this backdrop, it has become an inevitable choice for China's economic development to promote high-quality economic development and realize a shift from "quantitative expansion" to "qualitative improvement".

The core of high-quality economic development is to realize profound changes in the mode of development, economic structure, and growth momentum, emphasizing the enhancement of quality and efficiency rather than mere quantity and speed growth, and paying more attention to the quality and sustainability of economic development, and the key to achieving this lies in the cultivation of new economic dynamics represented by new technologies, industries, industries and modes of growth. General Secretary Xi Jinping, in the report of the 18th CPC National Congress, held under his presidency, clearly put forward that China's economy is currently in a period of transformation of the development mode, optimization of economic structure, and transformation of the growth momentum, and has shifted from the stage of high-speed growth to the stage of development with quality. This assertion points out the direction for China's development and lays a theoretical foundation for the cultivation of new kinetic energy.

Our Government has always attached great importance to the cultivation of new kinetic energy. Since the concept of the conversion of old and new kinetic energy was put forward in 2015, China has issued the "Opinions on Innovative Management and Optimization of Services to Cultivate and Grow New Kinetic Energy for Economic Development and Accelerate the Conversion of Old and New Kinetic Energy", the "14th Five-Year Plan for the Development of the Digital Economy", and other policy documents, which emphasize the need to adhere to the innovation-led development and create new advantages in the digital economy. The government has been systematically promoting the conversion of old and new kinetic energy. General Secretary Xi Jinping pointed out in the report of the 20th Party Congress that it is necessary to comprehensively promote the innovation-driven development strategy, open up new fields and new tracks, and continue to cultivate new kinetic energy and new advantages. In this context, it is of great practical value to carry out the measurement and analysis of the development trend and economic effect of new kinetic energy in China.

This paper examines the development trend of new kinetic energy from multiple dimensions by constructing a new kinetic energy evaluation index system and reveals the development differences of new kinetic energy in different regions. This paper also analyzes the effect of new kinetic energy on economic growth and industrial upgrading, which provides a scientific basis for policy formulation and helps to provide experience for the cultivation and development of new kinetic energy for economic development.

2. Literature review

From the existing literature, the current research on new economic drivers focuses on the connotation characteristics, cultivation and optimization, statistical measurement, and economic effects of new economic drivers.

New dynamics originated in the new economy, and there is no international agreement on what the new economy entails. Business Week initially defined it as a special economic form of high economic growth, low inflation, and low unemployment driven by the revolution in information technology. Scott (2016) argues that the new economy is a systemic change based on the knowledge economy and that the new technological revolution will lead to changes in the mode of economic growth, structure, and rules of operation. Hayton (2010) emphasizes that knowledge-driven creative destruction is the source of competitiveness in the new economy. Galbi (2003) points out that institutional innovation is the key to upgrading in the new economy. The National Bureau of Statistics of China (NBS) summarizes new economic activities as "three new economies" (new industries, new business forms, and new business models), and later adds "new technologies" to form the "four new economies". Chai and Li (2021) further pointed out that the new economy is a new round of scientific-technological and industrial revolution driven by new production, exchange, consumption, and distribution activities, which is manifested in the new technology generated by various types of new industries, new business forms, and new modes, but also manifested in the fusion and development of traditional industries and new technologies. 2017, the State Council of China issued the "Opinions on Innovative Management and Optimization of Services for Cultivating and Growing New Dynamic Forces in Economic Development and Accelerating the Conversion of Old and New Dynamic Forces". Opinions on the Successive Conversion of Dynamic Energy", which makes it clear that new kinetic energy refers to the new kinetic energy of economic development that is led by technological innovation, centered on new technologies, new industries, new business forms, and new modes, and supported by new factors of production such as knowledge, technology, information, and data. There are three perspectives on the definition of new kinetic energy in academia: single-factor theory, two-factor theory, and multi-factor theory (Sheng, 2020). Single-factor theorists emphasize the central role of innovation (Shi and Zhang, 2018). The two-factor theory focuses on the synergy between supply-side structural reform and demand-side consumption upgrading (Zhang and Wang, 2018). Multi-factor theory, on the other hand, proposes a multidimensional framework that includes innovation mode and industrial upgrading (Wu, 2019). Yang and Jiao (2018) pointed out that the transformation of old and new kinetic energy is a systematic change process of microelement combination, mesoscale regional balance, and macroscopic quality improvement.

Scholars have proposed the cultivation path of new kinetic energy from different perspectives. Huang (2017) emphasizes the dual role of the new technological revolution and economic system reform. Li (2017) found that technological progress in the productive service industry is the key to cultivating new kinetic energy for economic growth. Pei and Ni (2020) suggest that the transformation of old and new kinetic energy requires the simultaneous optimization of the supply-side structure and new demand structure. Zhao et al. (2018) advocate strengthening links based on knowledge-based enterprises, research institutions, and universities to build a knowledge-based and ecological cluster relationship network. Chen et al. (2018) emphasize the synergistic promotion of basic research and the transformation of traditional industries and call for the breaking of the existing policy and institutional shackles, and the creation of a relaxed environment and conditions for the growth of new technologies and industries. Ren and Miao (2021) proposed that the cultivation of new drivers of high-quality development in China can be strengthened through the path of “cultivating innovative entities – strategic emerging industries – famous brand products – and building an innovation incentive mechanism”. Sui et al. (2021) found that green credit, bond innovation, and fund support can significantly promote the transformation of old and new kinetic energy, and Zhou (2024) pointed out that talent cultivation and international cooperation are important guarantees for realizing the transformation of old and new kinetic energy.

About the statistical measurement of new kinetic energy, there are two main categories: the first is to use total factor productivity (TFP) as the core indicator. Analyzing from the perspective of the power source of economic growth, capital, and labor can be categorized as traditional kinetic energy, while total factor productivity is treated as new kinetic energy. For example, Bai (2018) analyzes the basic dynamics of old and new kinetic energy conversion measuring total factor productivity. The second type is to construct a comprehensive evaluation system with multiple indicators, and the commonly used analytical methods include principal component analysis, hierarchical analysis, entropy value method, CRITIC method, etc. The evaluation area is concentrated in provinces, and a small portion of it involves the whole country and economic zones. Regional studies show that China's new kinetic energy as a whole shows an upward trend, but regional differences are significant (Zheng and Xiong, 2021). Cheng et al. (2023) determined the weight of indicators by constructing a PP-IPM model, established an evaluation system for the development of new kinetic energy, and then studied the correlation patterns, system composition,

DOI: 10.5281/zenodo.15269816 Volume 1, Issue 2, 2025

and dynamic change laws of various economic factors. Qu et al. (2022) studied the effectiveness of cultivating new kinetic energy in the Yangtze River Economic Belt by constructing a dynamic model and confirmed the development characteristics of new kinetic energy in the region, which is continuously enhanced. Sun and Yuan (2022) found that the level of new kinetic energy in Guangdong Province has been continuously enhanced by factor analysis, and the external environment and science and technology factors have the most significant contribution, but the regional synergism is insufficient.

Regarding the economic effects of new kinetic energy, most scholars believe that new economic kinetic energy has a development of significant promoting role in the high-quality economy (Jiang, 2022). Liu and Huang (2023) found that the conversion of old and new kinetic energy is the intrinsic power of industrial transformation and upgrading. Hong (2018) argues that new kinetic energy leads to industrial innovation scientific and technological innovation and consumption upgrading, and promotes through the development of the new economy. Huang (2016) points out that the driving effect of new kinetic energy on economic development is not only reflected in the generation of new industries but also in the reform of institutional mechanisms to promote the transformation of traditional industries and optimize the structure of the industrial system. In terms of empirical research, Yu et al. (2022) used a spatial econometric model and found that there is a significant spatial spillover effect of China's new economic energies on high-quality development, and regional heterogeneity is obvious.

Current research on the new economy and new kinetic energy is becoming increasingly rich, but there are still deficiencies. For example, the literature mostly focuses on theoretical interpretation and countermeasure research, the design of the new kinetic energy assessment index system is not reasonable enough, it is difficult to obtain data, and there is a lack of systematic argumentation on the economic effects of new kinetic energy, etc., which still needs to be further expanded and improved. Therefore, constructing a scientific new kinetic energy index system for measurement and analysis is of great significance to development trends and economic effects, which is important for improving the theoretical system of new kinetic energy and guiding policy formulation.

3. Statistical measurement of new kinetic energy

3.1 Construction of the indicator system

Based on the connotation and characteristics of the new driving force for high-quality economic development, and by the criteria of scientific and reasonable indicators and accessible data, this paper takes 30 provincial-level administrative regions in China (excluding Hong Kong, Macao, Taiwan, and Tibet) as the research object from 2011 to 2022, and constructs a system for measuring the level of the new driving force in six dimensions, namely, "economic vitality, innovation power, digital capacity, green development, openness and public service", The index system for measuring the level of new impetus is constructed around the six dimensions of "economic vitality, innovation power, digital capacity, green development, openness level, and public service". Specific indicators are shown in Table 1.

Table 1: Indicator system for new economic kinetic energy

First-Level Indicators	*Second-Level Indicators*	*Indicator properties*	*weights*
Economic vitality	Proportion of Technical Contract Transaction in GDP (%)	positive	0.0753
	Proportion of retail sales of consumer goods in GDP (%)	positive	0.0050
	Software business income (100 million yuan)	positive	0.0950
	Express delivery income (100 million yuan)	positive	0.0987
	E-commerce sales (100 million yuan)	positive	0.0242
Innovation power	Number of authorized patent applications per 10,000 people (item)	positive	0.0544
	Proportion of expenditure on science and technology in local general budgets (%)	positive	0.0345
	R&D personnel full-time equivalents per 10,000 people (person)	positive	0.0439
	Proportion of persons employed in scientific research and technical services (%)	positive	0.0263
Digital capabilities	Broadband Internet subscribers per 100 people (person)	positive	0.0178
	Mobile Internet users per 100 people(person)	positive	0.0062
	Total postal and telecommunications business (100 million yuan)	positive	0.0623
	Proportion of persons employed in information transmission, software and information technology services (%)	positive	0.0471
	Number of enterprises with e-commerce trading	positive	0.0505

DOI: 10.5281/zenodo.15269816 Volume 1, Issue 2, 2025

	activities (item)		
	Digital Inclusive Finance Index	positive	0.0117
Green development	Greening coverage of built-up areas (%)	positive	0.0064
	Industrial pollution control completed investment (10000 yuan)	positive	0.0394
	Comprehensive utilization rate of industrial solid waste (%)	positive	0.0161
	Energy consumption per unit of GDP (ton)	negative	0.0057
Openness level	Total investment by foreign-invested enterprises (billion dollars)	positive	0.0933
	Total exports (billion dollars)	positive	0.0881
	Proportion of foreign investment in GDP (%)	positive	0.0383
Public service	Number of beds in health facilities per 10,000 people (item)	positive	0.0113
	Public library books per capita (item)	positive	0.0347
	Public transportation vehicles per 10,000 people (item)	positive	0.0116
	Non-hazardous treatment rate of domestic waste (%)	positive	0.0021

3.2 Data sources and processing

The research sample of this paper is 30 provincial administrative districts in China from 2012 to 2022, excluding Hong Kong, Macao, Taiwan, and Tibet due to data availability issues such as gender. The "Digital Financial Inclusion Index" comes from the "Peking Digital Financial Inclusion Index" compiled by the Digital Finance Research Center of Peking University. The data for other indicators are mainly from the China Statistical Yearbook, China Urban Statistical Yearbook, China Science and Technology Statistical Yearbook, EPS database China Energy Database, etc., and some of the missing data are processed by interpolation.

3.3 measurement method

In the existing literature, there are two main methods for measuring the level of new economic dynamics: the subjective assignment method and the objective assignment method. The subjective assignment method relies on the researcher's empirical judgment to assign weights, and common methods include the Delphi method, hierarchical analysis, and principal component analysis. The objective assignment method automatically generates weights based on the intrinsic characteristics of the indicator data, such as the entropy value method, cluster analysis, and so on. Considering the limitations of the subjective assignment method which is easily influenced by subjective judgment, this study chooses the entropy value method with strong objectivity for weight calculation, and the specific implementation steps are as follows:

(1) Dimensionless processing of indicators

In the process of constructing the new kinetic energy indicator system, different indicators come from different sources, with different specific properties and corresponding quantitative outlines, the original indicators need to be processed in a dimensionless way.

$$x_{ij}^* = \frac{x_{ij}-x_{min}}{x_{max}-x_{min}} \tag{1}$$

$$x_{ij}^* = \frac{x_{max}-x_{ij}}{x_{max}-x_{min}} \tag{2}$$

Equation (1) is the treatment method for forward indicators and (2) is the treatment method for reverse indicators. Among them,$x_{ij}$is the original value of the new economic momentum indicator, x_{ij}^* is the dimensionless value of the indicator, x_{min} and x_{max} are the minimum and maximum values of the indicator, respectively.

(2) Calculation of individual indicator weights

$$P_{ij} = \frac{x_{ij}^*}{\sum_{i=1}^{n} x_{ij}^*} \tag{3}$$

P_{ij}That is, the share of the value of the jth indicator in year i in each province.

(3) Calculating information entropy

$$e_j = -\frac{1}{ln(n)}\sum_{i=1}^{n} P_{ij} ln(P_{ij}) \tag{4}$$

(4) Calculation of the coefficient of variation

$$d_j = 1 - e_j \tag{5}$$

(5) Calculation of weights

$$w_j = \frac{d_j}{\sum_{j=1}^{m} d_j} \tag{6}$$

Where w_j is the weight of the jth indicator and m is the number of indicators.

(6) Calculation of composite score

$$S_i = \sum_{j=1}^{m} w_j \times x_{ij}^* \tag{7}$$

3.4 Results and analysis of the measurement of new economic kinetic energy

3.4.1 Overall analysis of new economic kinetic energy

The New Economic Kinetic Energy score is shown in Table 2. In terms of the national average, the index of new economic dynamics showed a continuous upward trend from 2012 to 2022, growing from 0.096 in 2012 to 0.215 in 2022, indicating that during these 11 years, the country as a whole has continued to cultivate and develop new economic dynamics, and the economic structure has been gradually optimized.

In terms of the time dimension, changes in the national new momentum index can be divided into three stages: the first stage is the period of steady growth (2012-2016). During this period, the national average value grew from 0.096 to 0.134, a relatively stable growth, indicating that the cultivation of new economic dynamics in various regions during this period was in the exploration and accumulation stage, and various policies needed time to gradually bear fruit. The second stage is the period of rapid growth (2017-2019). The national average grew rapidly from 0.143 to 0.175, with a significantly faster growth rate. This may be due to the country's vigorous implementation of the

DOI: 10.5281/zenodo.15269816 Volume 1, Issue 2, 2025

innovation-driven development strategy, coupled with the rapid development of new technologies such as the Internet and artificial intelligence. The third stage is the period of stable development (2020-2022). The growth rate has slowed down compared to the previous stage but still maintains an upward trend. It may be that the development of new kinetic energy has entered a relatively stable stage of enhancement, while also being somewhat affected by the external environment such as epidemics and other factors.

Table 2: National index of new economic kinetic energy

year	entire	East China	Central China	Western China	northeastern China
2012	0.096	0.164	0.065	0.054	0.083
2013	0.111	0.184	0.081	0.065	0.094
2014	0.12	0.2	0.088	0.072	0.098
2015	0.127	0.215	0.096	0.076	0.089
2016	0.134	0.225	0.106	0.079	0.091
2017	0.143	0.241	0.114	0.084	0.097
2018	0.159	0.267	0.128	0.094	0.102
2019	0.175	0.292	0.145	0.103	0.109
2020	0.194	0.326	0.16	0.113	0.116
2021	0.201	0.347	0.161	0.115	0.117
2022	0.215	0.369	0.175	0.121	0.120

3.4.2 Regional analysis of new economic kinetic energy

According to Figure 2, all four regions show an upward trend in the economic new momentum index from 2012 to 2022, but the development level and trend are heterogeneous and more obviously unbalanced due to the level of economic development. More detailed scores for the economic new kinetic energy index for each province are in Appendix A.

The overall score of the eastern region is higher than that of other regions, and the average value reaches 0.369 in 2022, which is in the leading position in the country, for example, the index scores of provinces and municipalities such as Beijing, Shanghai, Guangdong, Jiangsu and Zhejiang are at a higher level in all years. In terms of development, the average value of the eastern region also shows a continuous upward trend, reflecting the good momentum and great potential for the development of new kinetic energy in the region. The average value of the central region has the highest growth rate, showing that the central region is actively promoting industrial upgrading and innovative development, and the new kinetic energy is gradually growing, but compared with the eastern region, the overall score is on the low side, and there are some differences in the development between the provinces, for example, Anhui and Hubei have relatively high scores in the central region and are growing fast, while Shanxi scores only 0.094 in 2022, which is at a low level. The average value of the western region grows slowly compared to the central region, and the overall score is relatively low in the four regions. However, some provinces such as Chongqing and Sichuan have seen more significant improvement in recent years, indicating that the western region is actively catching up and utilizing its own characteristic resources and policy support to cultivate new economic momentum. Growth in the Northeast has been relatively sluggish, and the scores of Liaoning, Jilin, and Heilongjiang provinces are mostly at a low level in all years, reflecting that the Northeast is facing greater challenges in economic transformation and the cultivation of new dynamics.

3.4.3 Analysis of sub-indicators of new economic kinetic energy

Based on the results in Figs. 3 and 4, overall, except the green development indicator, the scores of the other five sub-indicators are on an upward trend, in which the scores of economic vitality, innovation-driven, and digital economy have relatively large growth, contributing more significantly to the enhancement of new momentum, indicating that between 2012 and 2022, the atmosphere of entrepreneurship and innovation in China's market has become increasingly strong, the integration of digital technology and the real economy has accelerated, and new business models and formats continue to emerge, injecting new vitality into economic growth. Public service scores grew significantly, indicating that the government's investment in public services has been increasing, and the quality and level of public services have been gradually improved, providing a favorable social environment for the cultivation of new economic dynamics. The level of openness is also steadily increasing, but the pulling effect on new dynamics is relatively weak compared to the previous four. The green development score showed an upward trend in 2012-2014, but fluctuated somewhat between 2015-2022, especially showing a downward trend in 2019-2022, with a score of 0.0195 in 2022, indicating that China needs to further promote green development and strengthened to realize the coordinated and sustainable development of the economy and the environment.

Table 3: Score of sub-indicators of new economic drivers from 2012 to 2017

Dimension	*2012*	*2013*	*2014*	*2015*	*2016*	*2017*
Economic vitality	0.0137	0.0159	0.0185	0.0209	0.0240	0.0270
Innovation drive	0.0231	0.0252	0.0261	0.0270	0.0281	0.0289
Digital economy	0.0108	0.0160	0.0192	0.0246	0.0270	0.0312
Green development	0.0198	0.0238	0.0251	0.0226	0.0227	0.0205
Openness level	0.0171	0.0177	0.0181	0.0179	0.0167	0.0182
Public service	0.0115	0.0122	0.0134	0.0144	0.0158	0.0175
The total	0.0959	0.1109	0.1204	0.1274	0.1343	0.1434

Table 4: Score of sub-indicators of new economic drivers from 2018 to 2022

Dimension	*2018*	*2019*	*2020*	*2021*	*2022*
Economic vitality	0.0308	0.0352	0.0397	0.0456	0.0511
Innovation drive	0.0320	0.0336	0.0383	0.0445	0.0447
Digital economy	0.0389	0.0467	0.0535	0.0450	0.0474
Green development	0.0204	0.0207	0.0196	0.0192	0.0195
Openness level	0.0193	0.0195	0.0227	0.0269	0.0286

DOI: 10.5281/zenodo.15269816 Volume 1, Issue 2, 2025

Public service	0.0179	0.0191	0.0199	0.0201	0.0232
The total	0.1593	0.1749	0.1937	0.2015	0.2145

4. Empirical analysis

4.1 Model construction

In order to analyze the interaction between the new kinetic energy, economic growth and industrial structure, this paper empirically investigates using the panel vector autoregressive model (PVAR). The model can effectively capture the dynamic relationship between variables, and systematically examine the interaction mechanism of the three in the time series by constructing a system of equations containing lagged terms. The model is as follows:

$$Y_{it} = \alpha_i + \beta_i + \gamma_0 + \sum_{j=1}^{p} \gamma_j Y_{i,t-j} + \varepsilon_{it} \qquad (8)$$

Where $Y_{it} = \{ngm, lnrgdp, theil\}^T$, ngm is the new kinetic energy index measured above, lnrgdp is the logarithm of regional GDP per capita, reflecting regional economic growth, and theil is the ratio of tertiary value added to secondary value added, reflecting changes in the regional industrial structure. i stands for the region, t stands for the year,α_i andβ_i denote the individual fixed effect and time fixed effect, p is the lagged order, andε_{it} is the random interference term.

4.2 model checking

In order to ensure the scientificity of the model set, this paper adopts the unit root test methods such as LLC and ADF to test the smoothness of the variables, and the results show that all the variables have reached a smooth state after first-order differencing; then, based on the three kinds of information criterion of MBIC, MAIC and MQIC, the optimal lag order of the model is determined to be the first order; then, the model parameters are estimated by GMM estimation method, and the model stability is validated by the unit circle test to verify the stability of the model. Finally, the impulse response function is applied to analyze the dynamic influence relationship between variables, and the contribution of each variable to the prediction error is quantified by the variance decomposition technique, and the results are shown in Figure 1 and Table 4.

4.3 impulse response

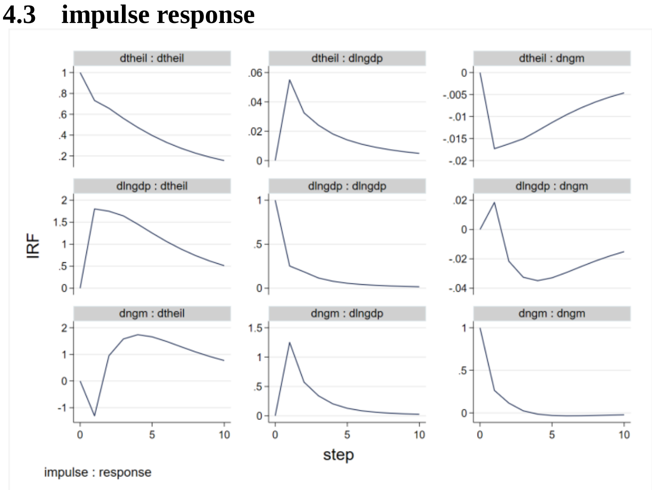

Figure 1: Impulse response

First of all, the three graphs on the positive diagonal show the response of the variables to their shocks, indicating that economic growth, industrial structure, and new economic kinetic energy are significantly positively affected, in the face of their own shocks but the response declines rapidly, and then gradually stabilizes. The 2nd graph shows that the impact of industrial structure on economic growth is positive, first rising and then rapidly declining, and then leveling off, implying that changes in the regional industrial structure may have a certain role in promoting economic growth in the short term and the long-term impact is weakened and stabilized. The 3rd graph shows that the impact of industrial structure on new economic dynamics is negative, and then gradually rises and stabilizes, indicating that the increase in the proportion of the tertiary industry may inhibit the development of new dynamics in the short term. From the 4th and 6th graphs, it can be seen that economic growth can play a positive role in promoting both new kinetic energy and industrial structure upgrading, but over time, the promotion of industrial structure gradually weakened, and the impact on new kinetic energy turned to negative, the reason may lie in the fact that in the short term, economic growth brought about by the accumulation of capital and the expansion of the market, which will provide a good environment for the cultivation of new kinetic energy, but in the long term, if the economic growth is overly reliant on the traditional industry, it However, in the long run, if economic growth is overly dependent on traditional industries, it will form a crowding-out effect on resources, thus inhibiting the enhancement of new dynamics in the economy. Figures 7 and 8 show that the impact of energies on economic growth and industrial structure new economic is positive, indicating that new economic energies play an important role in economic growth and sustainable development.

4.4 variance decomposition

Table 5: Results of Variance Decomposition

shocked variable	*phase*	*shock variable*		
		dngm	dlngdp	dtheil
dngm	1	1.0000	0.0000	0.0000
	5	0.9102	0.0280	0.0619
	10	0.8711	0.0475	0.0814
dlngdp	1	0.0130	0.9870	0.0000
	5	0.0841	0.8960	0.0199
	10	0.0842	0.8940	0.0218
dtheil	1	0.0165	0.1530	0.8305
	5	0.0388	0.3080	0.6533
	10	0.0350	0.3462	0.6187

As can be seen from Table 5, the new economic momentum is completely affected by its own shocks in the 1st period, but with the growth of time, the contribution of its own shocks decreases, and it still accounts for a large proportion of 87.11% in the 10th period, and the influence of economic growth and changes in industrial structure is on a slow upward trend, which suggests that in the long run, although the fluctuations of the new economic momentum are still mainly determined by itself, the influence of economic growth and industrial structure on its changes is in the gradually increasing. For economic growth, the initial fluctuation is mainly due to its factors, with a contribution of 98.7%, and with the increase of the number of periods, the influence of new economic dynamics and industrial structure on economic growth grows to respectively in the 10th

DOI: 10.5281/zenodo.15269816 Volume 1, Issue 2, 2025

period8.42% and 2.18%. It shows that the regional economic growth relies on internal factors in the short term, but is strengthened by the influence of new kinetic energy and industrial structure in the long term. The industrial structure is more affected by its own shocks and economic growth, and the influence of new kinetic energy on it grows steadily over time. In conclusion, the three variables of new economic energies, regional economic growth, and regional industrial structure are mainly affected by their own factors in the short term, but the interactions between the variables gradually increase over time.

5. Conclusions and recommendations

Based on the connotation of new kinetic energy in the context of high-quality economic development, this paper combed through related literature, constructed evaluation indexes to measure and analyze the economic new kinetic energy index of China's 30 provincial-level administrative regions in 2012-2022, and further constructed a PVAR model to explore the relationship between the new kinetic energy of the economy, economic growth, and changes in industrial structure. The study finds that: (1) the development of new kinetic energy is good but regionally imbalanced. 2012-2022 China's economic new kinetic energy is generally on the rise, but regional development differences are obvious, with the eastern region leading the way by its resource advantages, the central region growing at the fastest rate but the overall level is still lower than that of the eastern region, and the western and northeastern regions are lagging in the cultivation of new kinetic energy and facing the challenge of transformation. (2) Uneven contribution of sub-indicators. Economic vitality, innovation-driven, and digital economy play a prominent role in the enhancement of new kinetic energy, reflecting active market innovation and significant results in the integration of the digital economy with the real economy. Public service investment has increased, and the level of openness has been steadily rising, but the pull of openness on the promotion of new kinetic energy is limited. Green development fluctuates, indicating that the coordinated development of the economy and environment needs to be strengthened. (3) Interaction between variables and long-term effects have increased. New economic kinetic energy, economic growth, and industrial structure are closely linked, and each variable is mainly influenced by its own factors in the short term, while their mutual influence is gradually increasing in the long term. New economic energies have a positive effect on economic growth and industrial structure upgrading, but over-reliance on traditional industries for economic growth will inhibit the development of new energies.

To promote China's economic new momentum to achieve sustained development, combined with the findings of the study, this paper puts forward the following recommendations: (1) Promote coordinated regional development. The eastern region should play a leading role, increase investment in scientific and technological research and development, form an innovation highland, and move toward the high end of the global value chain. Meanwhile, it should strengthen industrial cooperation with the central and western regions and the northeastern region, and drive the synergistic development of the region through industrial transfer and technology export. The central region should continue to undertake the transfer of industries from the east, increase innovation support, build regional innovation centers, and attract high-end talents and innovation resources to gather, and lay out the development of emerging industries. The western region should utilize local resources to develop characteristic industries, such as characteristic agriculture, clean energy, culture and tourism, etc., to create industrial clusters. The northeast region should promote the reform of state-owned enterprises to stimulate vitality, increase support for the transformation and upgrading of traditional industries, and cultivate emerging industries such as ice and snow tourism and digital creativity. (2) Strengthen the key support for new kinetic energy. Increase investment in basic research, improve independent innovation capability, and breakthrough core technology bottlenecks. Improve the innovation incentive mechanism and support innovative enterprises through tax incentives and subsidies. Strengthen intellectual property protection and create a favorable innovation environment. Meanwhile, accelerate the construction of new infrastructure such as 5G, big data, and artificial intelligence, promote the integration of digital technology with the real economy, and develop new business forms of the digital economy. (3) Promote green and low-carbon development. Improve the green development policy system, set strict environmental standards and industrial access thresholds, and force enterprises to save energy and reduce emissions. Increase support for green industries and encourage green technology research and development through tax incentives and loan support. Promote the application of energy-saving and environmental protection, clean production, resource recycling, and other technologies, and build an industry-university-research cooperation platform to enhance green innovation capabilities. (6) Enhance the level of openness and public services. Optimize the business environment, simplify the approval process for foreign investment, strengthen intellectual property protection, and attract foreign-funded enterprises. Expand foreign trade cooperation, strengthen trade cooperation with countries and regions along the "Belt and Road", develop cross-border e-commerce and other new forms of business, and improve the pulling effect of the open economy on new momentum. Continuously increase investment in public services such as education, medical care, and culture, and improve the quality and equalization of public services. Strengthening vocational education and training, cultivating high-quality talents adapted to the needs of the development of new kinetic energy, and providing talent guarantee for the cultivation of new economic kinetic energy.

Acknowledgements

We thank the financial support from Postgraduate Research & Practice Innovation Program of Jiangsu Province (KYCX24_1900).

References

[1] Scott, W. L. (2016). The “New Economy”: Outcomes, Perspectives, and Public Policy. Social Science Electronic Publishing.

[2] Hayton, J. C. (2005). Competing in the new economy: The effect of intellectual capital on corporate entrepreneurship in high-technology new

DOI: 10.5281/zenodo.15269816 Volume 1, Issue 2, 2025

ventures. R&D Management, 35(2), 137-155.
[3] Galbi, D. A. (2003). Growth in the “new economy”: US bandwidth use and pricing across the 1990s. Telecommunications Policy, 25(1), 139－154.
[4] Chai, S. G., & Li, J. C. (2021). Research on statistical measurement of new driving force of China’s economic growth. Journal of Statistics and Information, 36(1), 47－58.
[5] Sheng, C. X. (2020). Thinking and countermeasures of promoting the conversion of new and old kinetic energy in the 14th five-year plan period. Reform, (2), 5－19.
[6] Shi, B., & Zhang, B. Y. (2018). The new era, new momentum and new economy—Analyzing the current high quality development of China’s economy. Shanghai Journal of Economics, (5), 25－33.
[7] Zhang, L. X., Wang, F., & Wang, Y. P. (2018). Breakthrough point and path of new and old kinetic energy conversion in Shandong—An empirical analysis based on municipal－level panel data from 2002 to 2016. Review of Economy and Management, (5), 27－41.
[8] Wu, J. (2019). Evaluation of new and old energy conversion for economic development in new era: A case study of Qingdao City. Areal Research and Development, 38(5), 41–44.
[9] Yang, H. X., & Jiao, Y. (2018). New and old kinetic energy conversion: Theoretical exploration and practical research. Research on Economics and Management, 39(7), 16－28.
[10] Huang, S. A. (2017). Transformation of old and new kinetic energy and economic development in Shandong Province. Shandong Social Sciences, (9), 101－108.
[11] Li, P., Fu, Y. F., & Zhang, Y. F. (2017). Can the productive service industry become new momentum for China’s economic growth. China Industrial Economics, (12), 5－21.
[12] Pei, C. H., & Ni, J. F. (2020). Economic analysis of Xi Jinping’s important discourses on shifting from old drivers of growth to new ones. Economic Perspectives, (5), 3－14.
[13] Zhao, B. X., Xiao, W. W., & Yin, R. R. (2018). On the connotation and enlightenment of new kinetic energy. Review of Economic Research, (2), 72－76.
[14] Chen, B. M., Tian, J. T., He, J., et al. (2018). Cultivating new kinetic energy for economic growth. Forum on Science and Technology in China, (8), 1－7.
[15] Ren, B. P., & Miao, X. Y. (2021). The Cultivation of the new economic momentum of China’s high-quality development in the “14th Five-Year Plan”. On Economic Problems, 41(2), 1－11, 106－106.
[16] Sui, J., Liu, J., & Zhao, J. (2021). The path of financial institutions to develop green finance to support the conversion of new and old kinetic energy in Shandong Province. E3S Web of Conferences, 03017-.
[17] Zhou, Y. C. (2024). Green collaborative innovation, transformation of old and new driving forces, and economic growth. Proceedings of Business and Economic Studies, 6, 60－66.
[18] Bai, J. (2018). Quantitative measurement and countermeasure research on the conversion of new and old kinetic energy in Hubei Province. Hubei Social Sciences, (7), 53－58.
[19] Zheng, S., & Xiong, L. (2021). Assessment and policy suggestions for new kinetic energy of China’s economic development. Journal of Technology Economics, 40(1), 1－11.
[20] Cheng, K., Wu, X., & Zhuang, Y. (2023). China’s provincial new economy and new impetus: Statistical measurement, spatial pattern and association network. Statistical Research, 40(3), 18－31.
[21] Qu, L., Yan, Z., & Luo, J. (2022). From digital economy to data factors: Statistical measurement and development path of new data kinetic energy in the Yangtze River Economic Belt. Times of Economy & Trade, 19(4), 102－106.
[22] Sun, Z., & Yuan, R. (2022). Research on the measurement of the new kinetic energy of economic development in Guangdong Province based on factor analysis. Journal of Computational and Financial Econometrics, 1.
[23] Jiang, L. (2022). Dynamic evaluation and mechanism path of new kinetic energy for high-quality economic development in China. Guizhou Social Sciences, (11), 115－125.
[24] Liu, J., & Huang, J. (2023). Statistical measurement and economic effect analysis of new kinetic energy for economic development in Jiangsu Province. China Price Journal, (5), 44－46.
[25] Hong, Y. (2018). Cultivating new kinetic energy: An upgraded version of supply-side structural reform. Economic Science, (3), 5－13.
[26] Huang, Q. (2016). Policy focus on developing the new economy in China. Administration Reform, (9), 41－45.
[27] Hong, Y., Liu, W., & Song, H. (2022). Spatial econometric analysis of the effect of new economic momentum on China’s high-quality development. Research in International Business and Finance, prepublish, 101621-.

DOI: 10.5281/zenodo.15269816 Volume 1, Issue 2, 2025

Appendix A. National index of new economic kinetic energy, 2012-2022

region	province	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
entire	average value	0.096	0.111	0.120	0.127	0.134	0.143	0.159	0.175	0.194	0.201	0.215
East China	Beijing	0.257	0.281	0.302	0.316	0.332	0.371	0.379	0.406	0.441	0.477	0.515
	Tianjin	0.166	0.180	0.197	0.218	0.198	0.197	0.200	0.210	0.235	0.262	0.248
	Hebei	0.054	0.072	0.089	0.087	0.090	0.101	0.134	0.132	0.145	0.139	0.152
	Shanghai	0.219	0.242	0.262	0.275	0.305	0.319	0.333	0.370	0.397	0.446	0.482
	Jiangsu	0.220	0.246	0.258	0.286	0.294	0.307	0.346	0.376	0.416	0.421	0.440
	Zhejiang	0.194	0.222	0.241	0.264	0.281	0.295	0.334	0.372	0.416	0.420	0.445
	Fujian	0.108	0.124	0.136	0.147	0.147	0.154	0.175	0.189	0.207	0.218	0.226
	Shandong	0.130	0.151	0.177	0.176	0.198	0.204	0.221	0.243	0.274	0.304	0.343
	Guangdong	0.232	0.261	0.276	0.312	0.333	0.391	0.477	0.533	0.582	0.598	0.621
	Hainan	0.061	0.061	0.062	0.067	0.070	0.070	0.072	0.087	0.146	0.185	0.219
	average value	0.164	0.184	0.200	0.215	0.225	0.241	0.267	0.292	0.326	0.347	0.369
Central China	Shanxi	0.058	0.076	0.071	0.069	0.070	0.079	0.086	0.093	0.099	0.095	0.094
	Anhui	0.077	0.097	0.103	0.118	0.139	0.141	0.154	0.178	0.198	0.209	0.232
	Jiangxi	0.053	0.065	0.070	0.082	0.081	0.097	0.115	0.130	0.144	0.147	0.151
	Henan	0.062	0.081	0.092	0.095	0.112	0.118	0.130	0.150	0.164	0.158	0.170
	Hubei	0.074	0.095	0.111	0.118	0.134	0.138	0.154	0.175	0.189	0.196	0.219
	Hunan	0.063	0.073	0.081	0.092	0.099	0.110	0.128	0.147	0.168	0.159	0.183
	average value	0.065	0.081	0.088	0.096	0.106	0.114	0.128	0.145	0.160	0.161	0.175
Western China	Inner Mongolia	0.054	0.074	0.083	0.073	0.076	0.077	0.079	0.082	0.085	0.087	0.089
	Guangxi	0.051	0.061	0.065	0.068	0.066	0.070	0.079	0.091	0.104	0.125	0.125
	Chongqing	0.070	0.084	0.093	0.100	0.104	0.108	0.126	0.132	0.147	0.156	0.172
	Sichuan	0.071	0.085	0.096	0.105	0.111	0.124	0.147	0.164	0.187	0.179	0.188
	Guizhou	0.038	0.046	0.053	0.061	0.064	0.072	0.086	0.096	0.110	0.100	0.112
	Yunnan	0.046	0.056	0.060	0.067	0.065	0.069	0.079	0.092	0.105	0.093	0.102
	Shanxi	0.082	0.099	0.106	0.116	0.127	0.125	0.139	0.157	0.170	0.172	0.175
	Gansu	0.044	0.051	0.053	0.056	0.061	0.067	0.076	0.087	0.094	0.095	0.103
	Qinghai	0.051	0.051	0.056	0.059	0.066	0.072	0.077	0.068	0.071	0.077	0.083
	Ningxia	0.046	0.057	0.066	0.065	0.071	0.074	0.082	0.085	0.090	0.099	0.104
	Xinjiang	0.046	0.055	0.061	0.061	0.060	0.061	0.067	0.073	0.077	0.078	0.085
	average value	0.054	0.065	0.072	0.076	0.079	0.084	0.094	0.103	0.113	0.115	0.121
northeastern China	Liaoning	0.122	0.135	0.140	0.112	0.109	0.118	0.124	0.134	0.145	0.151	0.157
	Jilin	0.060	0.070	0.075	0.073	0.079	0.085	0.093	0.104	0.108	0.101	0.099
	Heilongjiang	0.067	0.077	0.080	0.082	0.084	0.087	0.089	0.090	0.097	0.099	0.103
	average value	0.083	0.094	0.098	0.089	0.091	0.097	0.102	0.109	0.116	0.117	0.120