

Paths for New Productive Forces to Drive High-Quality Development of Foreign Trade

Weiyl Li

Southwest petroleum university, Chengdu, China

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Abstract

In the new era, China has identified high-quality development as the primary task in building a socialist modern country, and the construction of a dual-cycle pattern provides a continuous driving force for high-quality development. As a key link connecting the external and internal cycles, foreign trade's achievement of high-quality development is of great significance to the high-quality development of the economy. The new productive forces, characterized by high technology, high efficiency, and high quality, are an inevitable choice for the high-quality development of foreign trade. Based on this, this paper selects data from 41 cities in the Yangtze River Delta region, where China's foreign trade is highly developed, from 2010 to 2020 to measure the level of high-quality development of foreign trade and new productive forces. The results show that new productive forces have a significant positive impact on the level of high-quality development of foreign trade.

Keywords

high-quality development of foreign trade; Yangtze River Delta region; new productive forces

1. Research Background

1. New Productive Forces

Marx mentioned in "Das Kapital" that "productivity is the development of productive capacity and its elements." Productivity is the foundation for the existence and development of human society and the decisive force driving historical progress, showing a wave-like forward and spiral upward trend. [1] General Secretary Xi Jinping put forward the term "new productive forces" in September 2023, whose connotation is reflected in "new" and "quality", including new laborers, new objects of labor, and new means of labor. New laborers are a large number of innovative talents with higher education who can adapt to the rapidly changing situation. New objects of labor refer not only to intelligent devices but also to new objects such as data. New means of labor refer to the new technology-rich equipment that new laborers can use, including artificial intelligence, big data, and automation equipment.

It provides an important guide for us to build a new engine for economic development, enhance new momentum for development, and build new national advantages in the new development stage.

General Secretary Xi emphasized that the primary essence of new productive forces is scientific and technological innovation. Compared with traditional productive forces, which are limited by the three factors with continuous development, the momentum of new productive forces comes from scientific and technological innovation. With the breakthrough of modern technology in Moore's Law, new productive forces can achieve leapfrog development. In the context of the digital economy, new productive forces provide a new path for the high-quality development of the foreign trade industry. The integration of advanced science and technology with foreign trade products is specifically reflected in the great changes in foreign trade products promoted by science and technology. The prominent features of this year's Canton Fair are more innovative vitality, more digitalization and intelligence, and more green and low-carbonization. These products are favored in the international market. In addition to new technologies and products, new productive forces are also promoting the generation of new business forms. China's cross-border e-commerce, relying on the rapid development of the domestic Internet, has also become a new driving force for foreign trade growth.

2. High-Quality Development of Foreign Trade

In 2021, the Ministry of Commerce issued the "14th Five-Year Plan for the High-Quality Development of Foreign Trade", which made a detailed plan for China's trade development methods in the next 15 years and formulated work tasks and directions for the high-quality development of foreign trade. At present, the high-quality development of foreign trade is a relatively new theory. The theory of high-quality trade was first put forward in the "Guiding Opinions on Promoting the High-Quality Development of Trade". It can be seen from the "Opinions" that the realization path of the theory of high-quality trade is mainly divided into three aspects: first, the foundation of high-quality development of trade is the optimization of trade structure; second, the support for high-quality development of trade is the change of trade mode; third, the guarantee for the sustainable high-quality development of trade is the balanced development of trade.

China is in the stage of transforming from a large foreign trade country to a strong foreign trade country. In 2023, China's trade in goods ranked first in the world for six consecutive years. Under the background of developing new productive forces, China's trade goal has also become "quality improvement and stable quantity". Since the new era, China's status in global trade has significantly improved. Since the proposal of the "the Belt and Road" cooperation initiative in 2013, more than 150 partner countries have joined, which has greatly enriched the objects of China's foreign trade cooperation. The implementation of the "the Belt and Road" strategy mainly affects China's foreign trade from three aspects: policy, transportation, and

finance. [2] In September 2013, China's first free trade zone, the Shanghai Free Trade, was established. The free trade zone has a promoting effect on local finance ranging from 6% to 9%. [3] The influence path of the free trade zone on the foreign trade industry is mainly realized from two aspects: first, directly affecting trade and investment. The establishment of the free trade zone can eliminate tariff and non-tariff barriers, thus promoting cross-border trade and foreign investment. Second, indirectly promoting industrial structure upgrading. In the process of development, the free trade zone will take the initiative to introduce advanced foreign technologies, which can accelerate the innovative development of relevant industries in China and promote industrial structure upgrading.

2. Theoretical Mechanism

The "large but not strong" situation of China's foreign trade is a major obstacle to China's transformation into a trade power. According to the most cutting-edge research on the new-new trade theory, enterprises with high productivity will choose to export, while enterprises with low productivity only supply the domestic market. This conclusion is contrary to China's situation and is called the "export-import paradox". [4] There are mainly two reasons for this: first, processing trade accounts for "half of the country" in China's export trade. The "two ends outside" processing-oriented foreign trade mode, where raw materials are imported, products are exported for sale, and only the production link is domestic, usually has low productivity. Second, most of China's export industries are labor-intensive industries. Export products need to intensively use local labor, leading to more fierce competition in the domestic market. As a result, enterprises entering the domestic market need higher productivity, while enterprises exporting to foreign markets have lower productivity. In this case, to become a trade power and achieve high-quality development of foreign trade, it is necessary to improve the productivity of export trade, integrate scientific and technological innovation into foreign trade, and increase the productivity of export trade enterprises through scientific and technological innovation.

The "new" in new productive forces is strongly related to scientific and technological innovation. The integration of new productive forces into the foreign trade industry has two positive effects: technology spillover effect and cost effect. New productive forces, dominated by scientific and technological innovation, can guide the foreign trade industry to produce new technologies and new business forms, which can not only promote the overall improvement of the industry but also force enterprises with old thinking to make changes in line with the rhythm of the new era. The factor endowment theory also shows that compared with traditional extensive factors, high-tech factors have higher productivity. China's trade also faces the problem of transforming from large export volume to high quality. Through innovation, new productive forces can improve productivity, enhance product quality, and then re-

duce costs according to the scale effect. Therefore, this paper puts forward the first hypothesis:

H1: New productive forces can significantly promote the level of high-quality development of foreign trade.

3. Research Design

1. Data Source

This paper selects 41 cities in the Yangtze River Delta region as the initial research sample (Chaohu City was abolished in 2011, so it is not included in the research). At the same time, to maintain the balance of panel data and reduce the impact of missing values, this paper selects panel data of 41 cities from 1998 to 2020. Relevant energy and environmental data come from the "China Energy Statistical Yearbook" and "China City Statistical Yearbook". Data on industrial structure, population quantity, etc., come from the "China Statistical Yearbook", EPS database, "China Urban Construction Statistical Yearbook", etc. For missing data in individual years, this paper uses linear interpolation to fill them.

2. Index Selection

(1) Explanatory Variable

The explanatory variable in this paper is new productive forces (NQU). At present, there are few academic studies on new productive forces. Therefore, based on the essential requirements of Chinese-style modernization, following General Secretary Xi Jinping's important expositions on new productive forces, the innovation-driven development strategy, and the realization of high-level scientific and technological self-reliance and self-improvement, and referring to the principles of establishing indicators by scholars such as Cao Dongbo and Cai Yu (2024) [5], Lu Jiang and Guo Ziang (2024) [6], this paper constructs an indicator system for measuring new productive forces from three aspects: innovative productivity, green productivity, and digital productivity.

The logic for selecting indicators to measure new productive forces in this paper is as follows:

First, General Secretary Xi Jinping pointed out that "new productive forces are an advanced form of productivity dominated by innovation and in line with the new development concept". This indicates that new productive forces are positioned as an advanced productivity dominated by innovation, and the key to grasping new productive forces lies in grasping their innovative characteristics. Therefore, this paper selects innovative productivity as the criterion layer of indicators and measures the contribution of innovative productivity to new productive forces from three perspectives: innovation input, output, and R&D.

Second, General Secretary Xi Jinping pointed out when presiding over the 11th collective study of the Political Bureau of the Communist Party of China Central Committee in January 2024 that "new productive forces are inherently green productive

forces". It can be seen that green development is an inherent requirement of new productive forces. Therefore, this paper closely focuses on green productivity, the background color of high-quality development, and measures the greening of productivity from three aspects of China's current development problems: high consumption, heavy pollution, and low efficiency, using energy efficiency, environmental pollution rate, and green conversion rate.

Third, the proposal of new productive forces reflects the connotation of the era of productivity leap caused by the digital technology revolution, focusing on promoting the innovative allocation of production factors with data development and utilization as the engine, thus generating new business forms and momentum. Digital technology endows the means of production with digital attributes. Therefore, this paper selects Internet penetration rate, digital employment concept, and postal and telecommunications services related to the digitalization of productivity to measure digital productivity.

Criterion Layer	Element Layer	Element Layer	Index Layer
Innovative Productivity	Innovation Output	Number of Patent Grants (unit)	+
	Innovation Input	R&D Expenditure (100 million yuan)	+
	Innovation R&D	Number of R&D Researchers (person)	+
Green Productivity	Energy Efficiency	Energy Efficiency (%)	+
	Green-Conversion Rate	Comprehensive Utilization Rate of General Industrial Solid Wastes (%)	+
	Environmental Pollution Rate	Industrial Sulfur Dioxide Emissions (tons)/Regional GDP (%)	—
Digital Productivity	Internet Penetration Rate	Number of Internet Users per 100 People (person)	+
	Digital Employment Concept	Proportion of Employees in the Tertiary Industry (%)	+
	Postal and Telecommunications Services	Total Postal and Telecommunications Business Volume (10,000 yuan)	+

Figure 3-1. Indicator System for Measuring New Productive Forces

(2) Explained Variable

The explained variable in this paper is the high-quality development of foreign trade (HQ). General Secretary Xi Jinping put forward the new development concepts of innovation, coordination, greenness, openness, and sharing at the Fifth Plenary Session of the 18th Central Committee of the Communist Party of China. At the same time, the new development concepts are the concept system that must be followed in economic development during the 14th Five-Year Plan period and the basic principles of current economic development. The high-quality development system of foreign trade designed in this paper follows the new development concepts and is established from five aspects: innovation, coordination, greenness, openness, and sharing as first-level indicators. Referring to the measurement indicators of Chen Haibo (2023) [7], Zhou Shen, and Ren Sirong (2024) [8], these five aspects are improved into trade innovation development, trade coordination development, green trade development, trade openness development, and trade development sharing,

and these five dimensions are further divided into 9 third-level indicators. The specific indicators are shown in Figure 3-2 below.

First-Level Indicator/Criterion Layer	Second-Level Indicator/Index Layer	Calculation Method	Efficacy	Weight
Innovation	Number of Patent Applications per 10,000 People O1	Number of Patent Applicants/Total Population	+	0.170
Coordination	Trade Balance O2	Regional Imports/Exports	+	0.317
	Added Value of Trade Contribution O3	Export Added Value/GDP	+	0.045
Green	Energy Consumption per Unit of Import and Export O4	Energy Consumption/Total Import and Export Volume	—	0.011
	Waste Emission Intensity O5	Waste-Emissions/Industrial Output Value	—	0.006
Open	Foreign Trade Dependence O6	Total Imports and Exports/GDP	+	0.203
	Foreign Direct Investment Level O7	Foreign Direct Investment/GDP	+	0.107
Development	Economic Strength O8	Per Capita Real GDP	+	0.091
	Social Consumption O9	Total Retail Sales of Social Consumer Goods/GDP	+	0.050

Figure 3-2. Measurement Index System for the Level of High-Quality Development of Foreign Trade

(3) Control Variables

Based on previous literature and existing studies, this paper selects the following control variables: human capital (HC), financial support (CY), financial development level (FL), and tertiary industry structure (IS) as the main control variables.

Among them, human capital is represented by the proportion of ordinary college students in the total population of the region to control the impact of talents on new productive forces; financial support is represented by the proportion of local government general public budget expenditure to regional GDP to control the impact of relevant government policies on import and export trade; financial development level is represented by the ratio of added value of the financial industry to national GDP to control the impact of financing costs in financial innovation on the high-quality development of export trade; the tertiary industry structure is represented by the proportion of added value of the tertiary industry to GDP.

3. Model Construction

(1) Model Selection

Based on the above theoretical analysis, to determine whether the econometric model in this paper selects a fixed-effects model or a random-effects model, this paper first conducts a Hausman test on the data. Table 4-3 shows the results of the Hausman test. The null hypothesis of the Hausman test is "H0: both μ_i and ε_{it} must be independently and identically distributed", that is, the null hypothesis is to select a random-effects model. As shown in the figure, $\chi^2(10)=31.09$, $\text{Prob} > \chi^2 = 0.0000$. Since $P=0.0000$ in the Hausman test, the null hypothesis is strongly rejected, so this paper uses a fixed-effects model for analysis.

	FE	RE	Difference
NQU	0.25486	0.31567	-0.60816

HC	0.06672	0.06569	0.001025
CY	1.06e-06	1.44e-07	9.17e-07
FL	0.0001584	-0.0000385	0.00019
IS	-0.00391	-.26832	0.26442
Constant Term	0.02827	0.12441	-0.00956
Observations	451	451	451
R2	0.3582	0.3392	0.019

Figure 3-3. Results of Hausman Test

According to Hypothesis 1, this paper tests the impact of new productive forces on the high-quality development of foreign trade.

$$HQ_{i,t} = \alpha_0 + \beta_j NQU_{it} + \sum \beta_k Controls_{i,t} + \mu_i + \lambda_t + \xi_{i,t} \quad (1)$$

Among them, HQ_{it} represents the level of high-quality development of foreign trade in city i in year t, NQU_{it} represents the level of new productive forces in city i in year , Controls_{it} represents control variables, , μ_i and λ_t represent time and regional fixed effects respectively, and $\xi_{i,t}$ represents random error terms.

(2) Measurement Method

The main measurement methods in existing literature are principal component analysis and entropy weight method. Principal component analysis has the problem that if the relationship between variables is weak, information is easy to lose after data processing. The entropy weight method can objectively reflect the differences and importance between different indicators, and the calculation results are more accurate and not affected by subjective factors. Therefore, this paper chooses the entropy weight method to measure new productive forces and the level of high-quality foreign trade.

The first step is to standardize each indicator to make the data dimensionless.

$$\text{Positive indicator: } X'_{itj} = \frac{X_{itj} - \text{Min}(X_{itj})}{\text{Max}(X_{itj}) - \text{Min}(X_{itj})} \quad (2)$$

$$\text{Negative indicator: } X'_{itj} = \frac{\text{Max}(X_{itj}) - X_{itj}}{\text{Max}(X_{itj}) - \text{Min}(X_{itj})} \quad (3)$$

Let i be the city, j be the indicator, and t be the year. X_{ijt} represents the observed value of the j-th indicator of city i in year t. When calculating the minimum value, the result is 0. To ensure the significance of the entropy weight method, the minimum value is set to 0.00001.

The second step is to calculate the proportion value P of each indicator, formula (4), and the entropy value Q, formula (5).

$$P_{itj} = \frac{X'_{itj}}{\sum_i \sum_t X'_{itj}} \quad (4)$$

$$Q_j = -\frac{1}{\ln n} \sum_i \sum_t P_{ijt} \ln(P_{ijt}) \quad (5)$$

The third step is to calculate the indicator difference coefficient E_j and the indicator weight W_j . The larger the difference coefficient, the more important the indicator is and the larger the weight.

$$E_j = 1 - Q_j \quad (6)$$

$$W_j = \frac{E_j}{\sum_{j=1}^9 E_j} \quad (7)$$

Finally, weighted summation is performed to obtain the comprehensive indicator.

$$Z = \sum W_j * X'_{ij} \quad (8)$$

4. Empirical Analysis

1. Descriptive Statistical Analysis

Table 4-1 below shows the descriptive statistical results of each variable in this paper. As shown in the table, the mean value of the high-quality development level of foreign trade (NQU) is 0.156, the maximum value is 0.909, and the minimum value is 0.027, indicating that there is a large difference in the level of high-quality development of foreign trade between cities, and the development level of foreign trade in different cities varies greatly, with uneven development. The mean value of new productive forces (HC) is 0.179, the standard deviation is 0.077, the maximum value is 0.6, and the minimum value is 0.05. Compared with the high-quality development level of foreign trade, the distribution of new productive forces in various cities is relatively similar. The average value of the financial development level (FL) in the Yangtze River Delta region is 0.221, indicating that the Yangtze River Delta region as a whole attaches great importance to the development of the financial industry, and the growth rate is relatively fast.

Variable Name	Mean (Proportion)	Standard Deviation	Maximum Value	Minimum Value
NQU	0.15551	0.147151	0.9093766	0.0277353
HC	0.17933	0.07658	0.5999531	0.0502028
CY	0.0976322	0.0599337	0.3779	0.018813
FL	0.21136	0.038383	0.5263549	0
IS	0.4735585	0.1996329	2.800645	0.2336687
HC	0.01114	0.01607	.0889282	0.0004994

Figure 4-1. Descriptive Statistical Results

2. Benchmark Regression Results

Figure 4-2 below reports the regression results of the impact of new productive forces on the high-quality development of foreign trade. To reduce the impact of endogeneity, this paper uses a dual fixed-effects model for analysis on the basis of se-

lecting the fixed-effects model. Column (1) shows the direct impact of new productive forces on the high-quality development of foreign trade. The coefficient of new productive forces is 0.087, which is significant at the 5% level, indicating that for every 10% increase in the level of new productive forces, the level of high-quality development of foreign trade will increase by 0.87%. This indicates that new productive forces can significantly promote the high-quality development of China's foreign trade. With the rapid development of new productive forces, the speed of information flow has accelerated, trade costs have decreased, which has further promoted the improvement of the quality of export products, thus driving the high-quality development of foreign trade, and Hypothesis 1 is verified. Column (2) adds control variables, and the coefficient of new productive forces becomes 0.091, which is also significant at the 5% level. After adding control variables, the coefficient of new productive forces increases, effectively eliminating interfering variables and reducing the impact of errors.

	HQ	
	(1)	(2)
NQU	0.087**	0.091**
Control Variables	No	Yes
Constant Term	0.182***	0.191***
Time	Yes	Yes
City	Yes	Yes
Observations	451	451
R2	0.861	0.860

Figure 4-2. Benchmark Regression Results

3. Robustness Test

1. Lagging the Explanatory Variable by One Period

Lagging the explanatory variable by one period is a common method in robustness tests. This paper chooses to lag HC by one period for testing. The results are shown in column (1) of Table 8. The regression results are consistent with the 调节效应 results. With the explanatory variable lagged by one period, new productive forces still have a significant impact on the level of high-quality development of foreign trade, which is significant at the 5% confidence interval.

2. Excluding Municipal Samples

Referring to the method of Hong Shuai [9] in relevant articles, due to the great economic particularity of China's municipalities directly under the Central Government, this paper excludes their samples to test the robustness of the results. The results show that new productive forces still have a significant impact on the level of high-quality development of foreign trade at the 5% significance level, which is consistent with the basic regression results.

	Lagging Explanatory Variable by One Period	Excluding Municipal Samples
	(1)	(2)
NQU	0.0935276**	0.0910042**

Control Variables	Yes	Yes
Constant Term	0.1894897***	0.181***
Time Fixed Effects	Yes	Yes
Regional Fixed Effects	Yes	Yes
Observations	451	440
R2	0.866	0.86

Figure 5-3. Robustness Test Results

5. Research Conclusions and Suggestions

To respond to the report of the 20th National Congress of the Communist Party of China, which proposes to adhere to high-level opening-up, accelerate the construction of a new development pattern with domestic circulation as the main body and domestic and international circulations reinforcing each other, and promote the high-quality development of foreign trade driven by new productive forces, this paper uses data from 41 cities in the Yangtze River Delta region from 2010 to 2020, with the new development concepts in the new era as the ideological guide, constructs a measurement system for the level of high-quality development of foreign trade and new productive forces, studies the impact of new productive forces on the high-quality development of foreign trade, and discusses the spatial spillover effect. The main conclusions are as follows:

(1) The overall level of high-quality development of foreign trade in the Yangtze River Delta region has steadily increased, with a large increase in the comprehensive score, and great progress has been made in the high-quality development of foreign trade. In 2015 and 2016, affected by the downturn of the world trade economy, Brexit and other geopolitics, the overall development level decreased slightly, but steadily recovered in 2017 and subsequent years. The level of high-quality development of foreign trade in some cities decreased slightly in 2020 due to the impact of the epidemic. The overall foreign trade situation in the Yangtze River Delta region is good. The achievements of the integrated development of the Yangtze River Delta region are not only reflected in the gradual improvement of trade scale but also in the increasingly open system and more abundant levels of opening-up.

(2) There is a large difference in the level of new productive forces between different cities, showing that the development of new productive forces in the eastern part of the Yangtze River Delta is far better than that in the western part, the development in the southern part is better than that in the northern part, and the coastal cities are better than the inland cities. The gap in the level of new productive forces between cities has decreased year by year.

The following policy implications are provided to accelerate the high-quality development of foreign trade in China's Yangtze River Delta region and narrow the gap in the level of high-quality trade development in the Yangtze River Delta region:

First, boost domestic demand and accelerate the integration of domestic and foreign trade. As one of the key elements connecting the domestic cycle and the international market, foreign trade should first enhance domestic demand in high-quality development to release the domestic demand potential of the large population advantage. In the measurement system of high-quality foreign trade, the score of social consumption is low, social consumption does not promote the foreign trade market enough, and the relationship between the two needs to be strengthened. To boost domestic demand in the Yangtze River Delta region, it is necessary to focus on service consumption and develop new consumption. An important path for the integration of domestic and foreign trade is to build a platform for the integrated development of domestic and foreign trade. More platforms similar to the Canton Fair and Yiwu Commodity City should be built in the Yangtze River Delta region. On the supply side, promoting "same line, same standard, and same quality" for domestic and foreign trade products can improve enterprises' ability to develop both markets and utilize both resources, and strengthen the connection between the two markets.

Second, innovation leads development and adheres to the new development concept. An important element of new productive forces is the integration of the concept of scientific and technological innovation. We should innovate the development mode of trade, adopt an attitude of expanding and strengthening general trade, actively support processing trade and cooperate with pilot cities for its rapid implementation, and adopt a developmental attitude towards other types of trade. Such targeted innovative development of trade can also optimize the existing trade structure. Innovate the operation mode of foreign trade. Although there are many industrial clusters, there is a lack of sound management structures and public service platforms. It is necessary to focus on these two points to innovate the current operation mode and promote the construction of national foreign trade transformation and upgrading bases.

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