ISSN: 1813-4890

Interactive Effect of Independent Innovation and High-quality Trade Development from the View of Biochemical Industry

Qiuying Ge

School of International Economics and Trade, Anhui University of Finance and Economics, Bengbu, China

qiuyingge@163.com

Abstract

This paper empirically studies the interactive effects between the independent innovation and the high-quality foreign trade development of internationalized enterprises by using the system estimation method (3SLS) and the time series data from 2011 to 2022 in biochemical industry. The estimated results of the foreign trade development equation and the independent innovation equation show that the relationship between independent innovation and the high-quality development of foreign trade is not jointly endogenous. Among the other variables in the foreign trade development equation, the comparative advantage of enterprises is an important factor affecting foreign trade activities. The change of trade pattern will promote the optimization of foreign trade activities. Among the other variables in the independent innovation equation, innovation needs a large amount of capital investment and technical support, and the demand effect has a significant impact on the level of independent innovation.

Keywords

Independent innovation, Management innovation, Technological innovation, Product innovation, High quality development.

1. Introduction

With the in-depth development of the world economic globalization, the trade between countries in the world is also more and more. Nowadays, the world is undergoing great changes unseen in a century, and the development of enterprises in our country is faced with new opportunities and challenges. Since the global financial crisis, the world economy has generally been in a state of long-term downturn and weak growth. Coupled with the acceleration of population aging, the tightening of large-scale stimulus policies, geopolitics, trade frictions, debt risks and major economies are facing internal and external difficulties, trade growth is declining, and trade wars and science and technology wars are showing a long-term trend. It will challenge the strategy of "bring in" and "go out" of enterprises in China.

With the world's largest trade in goods, the quality of China's foreign trade is related to the level of national economic development, so it is very necessary to promote the high-quality development of foreign trade.China's GDP increased from 2,182.62 billion yuan in 1991 to 121 trillion yuan in 2022. China's import and export volume of goods trade increased from 27.79 trillion yuan in 2017 to 42.07 trillion yuan in 2022, ranking first in the world for six consecutive years, with an average annual growth rate of 8.6% over the past five years, 0.7 percentage points higher than the average annual growth rate of the national GDP. China's net exports of goods and services will contribute 17.1 percent to GDP growth in 2022.With the continuous development of foreign trade of our country, many problems are gradually exposed, so to improve the high-quality development of foreign trade enterprises is of great significance.

Self-dependent innovation ability is considered to be an important factor affecting the high-quality development of foreign trade, and it is an important means for enterprises to upgrade their position in the global value chain and gain new comparative advantages in trade. Only by continuous innovation can China move from "made in China" to "created in China".Constantly strengthening the ability of self-dependent innovation can enterprises promote the high-quality development of foreign trade. Chinese enterprises have carried out a lot of practice in the field of innovation. it is particularly urgent to explore the impacts of self-dependent innovation on the development of foreign trade in order to promote the high-quality development of enterprises.

The concept of innovation was first introduced by Joseph Schumpeter. He believed that innovation was to establish a new production function, that is, to introduce a new combination of production factors and production conditions that had never been introduced into the production system. The independent innovation is mostly explored by scholars from the aspect of influencing factors[1]. Nelson and Phelps (1966) pointed out that human capital is the core carrier of all production factors, and the accumulation of human capital largely determines the strength of an enterprise's innovation ability[2]. Bronwyn andJohn (2000) believed that the preferential policies given by the state further reduced the cost of enterprise independent innovation and enhanced the capability of enterprise independent innovation[3].Wang (2018) found that the interaction effect of technology learning and management learning has a positive impact on independent innovation[4]. Gao&Zhang (2018) forwarded a theoretical framework of the integration of the realization path of independent innovation of enterprises from the three aspects of the path, mode and realization mechanism of independent innovation [5].Bai &Du (2019) made it clear that independent innovation is the driving force of high-quality development and high-quality development is the guarantee force of independent innovation [6]. He et al.(2019) studied that the industry with more intense market competition and higher human capital level can get more benefits from independent innovation in international competition [7].Song &Zheng (2020) empirically examined the impact of intermediate goods import on the quality upgrading of export products of Chinese manufacturing firms from the perspective of independent innovation [8].Zhou & Zhao（2021）argued that patent introduction has an inverted U-shaped impact on the independent innovation performance of enterprises, and exclusive patent introduction has a greater impact on independent innovation than non-exclusive patent introduction [9].Wei & Ma（2021）explored the role of acquirers' knowledge absorption capacity in the relationship between technological M&A and independent innovation capacity[10]. Zhang et al.(2022) pointed out that tax preference for technology import mainly promotes enterprises' independent innovation by intensifying market competition, and the promotion effect of tax preference for technology import on enterprises' independent innovation is heterogeneous[11].

The interaction and mechanism of independent innovation and international trade are the topic many scholars made researches on. Grossman &Helpman (1990) believed that technology will flow between countries with international trade and then affect the level of enterprise innovation[12]. Guarascio et al. (2016) empirically analyzed the relationship between international trade and independent innovation, and found that product innovation has a significantly positive impact on foreign trade, while international trade also has a significantly positive impact on R&D investment [13].Qian (2014) considered that international trade can promote technological innovation through learning mechanism, competition mechanism, complementary mechanism and self-selection mechanism[14].Hu (2016) found that both the import and export trade of high-tech products have a significant positive impact on the technological innovation of high-tech industries [15]. Zhou and Liu (2011) showed that technology spillovers generated through international trade and intellectual property protection can promote independent innovation[16].Chen & Li (2020) pointed out that

ISSN: 1813-4890

innovation leading is an important aspect of the high-quality development of our country, and technological innovation in the manufacturing industry can form a new driving force with a driving role [17]. Tang et al. (2022) took Tianjin, a key city of the Beijing-Tianjin-Hebei coordinated development strategy, as the research object, based on the influence mechanism of technological innovation on import and export trade, analyzed the existing problems based on Tianjin's import and export trade data, and put forward countermeasures and suggestions for the high-quality development of Tianjin's foreign trade[18]. Dai（2021）pointed out that China's high-quality development of export trade must be supported by high-quality and high-level production factors, which requires our country to change from "commodity and factor flow opening" to "rules and other system opening". It is the only way for China to achieve high-quality development of export trade in the new situation and new stage by deepening reform to continuously optimize institutional mechanisms and accelerate rule-based opening up[19].
Although the existing literatures have analyzed the independent innovation of enterprises promoted by international trade and the independent innovation driving the development of international trade from various aspects, few literatures have involved the mutual influence of the two, and at the same time have not involved the mutual relationship or mutual influence between the hot topic of high quality development of foreign trade and independent innovation in recent years.

This paper tries to deeply analyze the interactive mechanism between independent innovation and high-quality development of foreign trade from the characteristics of biochemical enterprises in our country and constructs an interactive mechanism analysis framework to discuss the interactive effect between them. And through empirical test, it rises to the biochemical industry to investigate the interactive relationship between independent innovation and high-quality development of foreign trade. In order to provide theoretical and practical reference for the high-quality development of foreign trade in the biochemical industry and improve the independent innovation ability. This paper will use the system estimation method (3SLS) and the time series data from 2011 to 2022 in biochemical industry to focus on the interactive effectsanalysis between theself-dependent innovation and the high-quality foreign trade development of internationalized enterprises from the perspective of biochemical industry.We use the model of simultaneous equations, which can not only study the bidirectional causal relationship between independent innovation and foreign trade, but also examine the influence of some other variables on foreign trade and innovation.The research is to systematically and dynamically study the impact of self-dependent innovation on the foreign trade of internationalized enterprises of biochemical industry, with the expectation to provide theoretical and practical reference for the high-quality and improvement of self-dependent innovation ability of foreign trade enterprises of biochemical industry.

2. Theoretical Model, Variables and Data

2.1. Theoretical model

The economic system is a multi-dimensional complex system, this paper takes independent innovation and foreign trade development as endogenous variables, the model of simultaneous equations is used to bring them into the same equation system for analysis, and the internal relationship between them is tested. The model of the simultaneous equations is constructed as follows.

$$\mathrm{Trade}_t = \alpha_0 + \alpha_1 \mathrm{Innovation}_t + \alpha_2 \mathrm{Tts}_t + \alpha_3 \mathrm{Np}_t + \alpha_4 \mathrm{Nif}_t + \alpha_5 \mathrm{Oce}_t + \mu_t \quad \cdots\cdots (1)$$

$$\mathrm{Innovation}_t = \beta_0 + \beta_1 \mathrm{Trade}_t + \beta_2 R\&D_t + \beta_3 \mathrm{Price}_t + \beta_4 TC_t + \beta_5 \mathrm{Rank}_t + \upsilon_t \quad (2)$$

ISSN: 1813-4890

Equation (1) mainly tests the influence of independent innovation on foreign trade development, and equation (2) mainly tests the influence of foreign trade development on independent innovation. The two equations together constitute a complete cycle. Among them, $Trade_t$ is the development of foreign trade, measured by the total import and export volume of biochemical industry. $Innovation_t$ represents independent innovation and is the number of effective invention patents in the biochemical industry.

Equation (1) contains such exogenous variables as *Tts*（total trade in services）, *Np*（number of profit of biochemicalindustry companies), *Nif*（number of investmentin fixed assets in biochemical industry), *Oce*（organic chemical exports of biochemical industry, and so on.

Equation (2)contains such variables as *R&D* (biochemical industry R&D input), *Price* (chemical raw materials and chemical products price index), TC (organic chemical products trade competitive index), and Rank (the ease of doing business in China (mainland)) . μ_t and υ_t denotes the random error term and obeys the independent identically distributed assumption.

2.2. Variable definitions

(1) High-quality development of foreign trade. The high-quality development of foreign trade is the coordinated development of many aspects. It not only includes the balance of regional structure and industrial structure, but also involves the transfer and upgrading of industrial chains. Therefore, multiple indicators should be used to measure the high-quality development of foreign trade, not only a single indicator. However, from the perspective of data availability, this project still chooses the total import and export volume of biochemical industry to reflect the high-quality development of foreign trade. Because the total import and export volume of the industry can reflect the transformation of foreign trade to high-quality development to a certain extent.

(2) Level of independent innovation. The influence of independent innovation on products can be measured from the comparative advantages of product quality, product price, product difference, product brand and product structure. From the perspective of the source of innovation, it can be measured from three aspects: original innovation, integrated innovation and the level of introduction, digestion, absorption and re-innovation. In this project, the number of effective invention patents per year in the biochemical industry is chosen to represent the level of independent innovation.

(3) The basis of trade. The advantages of products, enterprises and industries contained in the trade base play a key role in the high-quality development of foreign trade. According to the theory of comparative advantage, the export of a certain product often means that the product has a comparative advantage in the international market. This project uses the export amount of organic chemicals to measure the product advantage. In general, corporate advantages can be transformed into corporate profits. In this project, corporate profits in the biochemical industry are selected to measure corporate advantages. Whether the industrial investment increases or not is one of the indicators to measure the industrial advantage. This project selects the fixed asset investment in the biochemical industry to measure the industrial advantage.

(4) Patterns of trade. Foreign trade to the high quality direction development needs to increase the service trade in foreign trade share, thus prompting our country's trade pattern to change. Biochemical industry is an important pillar industry of foreign trade of our country the change of service trade also has influence on the change of its trade pattern. Therefore, this project chooses total trade in services as an indicator to measure changes in trade pattern.

(5) Internal environmental factors. The process of high-quality development of foreign trade is for enterprises to realize capital accumulation and technology accumulation, as well as improve the "learning by doing" effect and improve the technical level of enterprises. R&D investment not only reflects the financial support of the enterprise for scientific and technological

ISSN: 1813-4890

innovation, but also reflects the internal scientific and technological level of the enterprise. Therefore, this project uses research and development investment in the biochemical industry to represent internal environmental factors.

(6) External environmental factors. Changes in the external environment of enterprises such as competition effect, demand effect and policy environment can stimulate enterprises to expand production capacity and improve product quality and technical level, thus forcing enterprises to carry out independent innovation. This project selects the proportion of the difference between imports and exports of organic chemical products in the total import and export, that is, the competitive advantage index of organic chemical products trade to represent the competitive effect. From the perspective of product demand market, select the price index of chemical raw materials and chemical products. From the perspective of whether the policy environment can provide convenience for enterprise operation, the ranking of the ease of doing business in China (mainland) is selected.

2.3. Data sources

Considering the possibility and validity of the data, this paper uses the time series data from 2012 to 2021. The data of the total import and export volume of biochemical industry, the number of effective invention patents in the biochemical industry, the profit of enterprises in the biochemical industry, the investment in fixed assets in the biochemical industry, the total trade in services, the R&D input in the biochemical industry, and the price index of biochemical raw materials and biochemical products are collected from the China Statistical Yearbook. The export value of organic chemicals and the competitive advantage index of organic biochemical products are obtained from UN Comtrade database, and the ease of doing business ranking of China (mainland) is obtained from Doing Business Report. The missing data of specific years are processed by interpolation method.

3. The Empirical Result Analysis

3.1. Descriptive statistical analysis

Table 1 shows the descriptive statistical results of each variable, in which the mean value of foreign trade development log is 7.854, the median value is 7.480, and the gap with the mean value is 0.374. The mean value of independent innovation after log was 8.643, and the median was 8.702, with a gap of 0.239 from the mean, indicating that the observed value of most independent innovation was lower than the average, and the maximum and minimum values were 9.289 and 7.046, respectively, with a gap of 2.243. The difference between the maximum and minimum values of other variables, such as R&D input in biochemical industry, trade competitive advantage index of organic biochemical products, and investment in fixed assets in biochemical industry after taking the logarithm is more than 1, indicating that the annual R&D input level, trade competitive advantage and investment in fixed assets are quite different and the development is unbalanced. No abnormal results were found in the descriptive statistics of total trade in services and exports of organic chemicals, indicating a good distribution of variables.

Table 1. Results of descriptive statistics

Variables	Mean value	standard deviation	Lowest value	Median	Maximum value
Trade	7.854	0.315	7.282	7.480	8.363
Innovation	8.463	0.735	7.046	8.702	9.289
Tts	10.653	0.211	10.247	10.715	10.958
Np	7.926	0.331	7.467	7.840	8.624
Nif	7.035	0.364	6.190	7.116	7.554

ISSN: 1813-4890

Oce	5.876	0.270	5.602	5.813	6.489
R&D	4.502	0.645	3.379	4.456	5.604
Price	4.608	0.078	4.533	4.574	4.780
TC	-0.057	0.309	-0.920	0.004	0.275
Rank	4.209	0.401	3.434	4.394	4.564

3.2. Correlation analysis

Table 2 shows the correlation coefficient matrix between all variables. The correlation coefficient between foreign trade development and independent innovation is 0.625, which passes the significance test at the 5% level, indicating that there is a significant positive correlation between foreign trade development and independent innovation. In addition, the correlation coefficient matrix showed that the profit of enterprises in the biochemical industry and the investment in fixed assets in the biochemical industry were significantly positively correlated with the development of foreign trade. The R&D input, the price index of biochemical raw materials and chemical products in the biochemical industry, and the competitive advantage index of organic chemical products trade were significantly positively correlated with independent innovation. The ease of doing business ranking in China (mainland) is negatively correlated with indigenous innovation. The correlation coefficients of each main endogenous variable and explanatory variable generally remained in a moderate range, and the endogeneity of the whole model can be considered to be within the acceptable range.

Table2. Result of correlation analysis

	trade	innovation	Tts	Np	Nif	Oce	RD	Price	TC	Rank
trade	1									
innovation	0.625**	1								
Tts	0.397	0.871***	1							
Np	0.540*	0.737***	0.773***	1						
Nif	0.533*	0.969***	0.919***	0.745***	1					
Oce	0.494	0.772***	0.759***	0.796***	0.793***	1				
R&D	0.741***	0.944***	0.788***	0.787***	0.925***	0.865***	1			
Price	0.524*	0.577**	0.648**	0.922***	0.579**	0.743***	0.641**	1		
TC	0.392	0.543*	0.394	0.499*	0.470	0.505*	0.590**	0.349	1	
Rank	-0.641**	-0.729***	-0.396	-0.411	-0.644**	0.710***	0.826***	-0.291	0.626**	1

Note: *,**,***indicate respectively that the significance test was passed at the 10%, 5%, and 1% confidence levels.

3.3. Results of simultaneous equation regression analysis

For the simultaneous equations model, it is difficult to obtain effective estimation results by OLS because of the prominent endogeneityproblem, but the instrumental variable method can solve the endogeneity problem. Firstly, the identifability of the simultaneous equations model was judged. Since the number of instrumental variables was greater than the number of endogenous variables, the equations were all over-identified, which met the order conditions of 2SLS and 3SLS for parameter estimation. In order to test the stability of the results, this paper uses OLS, 2SLS, 3SLS and iterative 3SLS of a single equation to estimate the parameters, and the results are shown in Table 3.

Table 3. Result of Least-squares regression at different stages

Variable	(1) OLS	(2) Two_SLS	(3) Three_SLS	(4) Three_SLS_iter
Trade				
Innovation	0.638	0.711	0.897*	1.408***
	(1.31)	(1.35)	(2.47)	(4.00)
Tts	-0.938	-0.896	-0.607	0.581
	(-0.83)	(-0.79)	(-0.78)	(0.82)

ISSN: 1813-4890

Np	0.370	0.357	0.275	-0.769*
	(0.77)	(0.74)	(0.83)	(-2.41)
Nif	-0.552	-0.711	-1.088	-1.314*
	(-0.45)	(-0.54)	(-1.21)	(-2.48)
Oce	0.0207	0.0243	-0.0796	-0.803
	(0.03)	(0.04)	(-0.19)	(-1.57)
_cons	13.00	13.13	12.40*	9.533
	(1.74)	(1.76)	(2.39)	(1.35)
Innovation				
Trade	-0.304	-0.355	-0.143	0.156
	(-0.73)	(-0.81)	(-0.47)	(1.49)
R&D	1.528**	1.540**	1.520***	0.998***
	(4.18)	(4.19)	(5.89)	(4.07)
Price	-1.352	-1.312	-1.424	1.604***
	(-0.76)	(-0.74)	(-1.15)	(3.31)
TC	0.0478	0.0414	0.00412	-0.0353
	(0.13)	(0.11)	(0.02)	(-0.50)
Rank	0.487	0.475	0.528	0.201
	(0.99)	(0.96)	(1.52)	(0.51)
_cons	8.070	8.270	7.040	-5.452*
	(1.25)	(1.27)	(1.55)	(-2.36)
R2	0.561	0.559	0.532	-0.679
ll	4.478		6.586	18.62

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

4. Conclusion and Suggestions

4.1. Conclusion

The estimation results of foreign trade development equation and independent innovation equation show that:

(1) Independent innovation level increased by one percentage point, foreign trade high quality development level increased 0.897 percentage points, that our country independent innovation ability has improved significantly, but because our country innovation driven strategy to promote later, many innovations have lag, so the impact on foreign trade high quality development has not been fully reflected.

(2) For every one percentage point increase in the level of high-quality development of foreign trade, the level of independent innovation will decrease by 0.143 percentage points, which is not significant at the 10% confidence level, indicating that the high-quality development of foreign trade cannot support the improvement of independent innovation level. It is not infeasible for an internationalized enterprise to promote independent innovation through foreign trade development. However, it is effective to complete the enterprise strategy of independent innovation to promote the cycle of high-quality development of foreign trade. On the whole, independent innovation and the high-quality development of foreign trade are not joint endogenous. The government should further promote the landing of innovation achievements in relevant industries and create economic effects as soon as possible.

Among the other variables in the foreign trade development equation, the results show the following:

(3) if the enterprise advantage of trade foundation increases by one percentage point, the high quality development level of foreign trade will increase by 1.520 percentage points. The

ISSN: 1813-4890

comparative advantage of enterprises is an important influencing factor of foreign trade activities, and only by improving the comprehensive competitiveness of enterprises can we obtain better foreign trade development. The estimated coefficient of industrial advantage is -1.088. The chemical industry is a traditional industry with labor intensive and large resource consumption, and its industrial advantage is not prominent, so it does not have a positive impact on the high-quality development of foreign trade.However, in recent years, the supporting policy documents for related industries have gradually increased. These documents especially emphasize the industrial transformation and upgrading under the demand of environmental protection in the future, and the industrial advantages of the chemical industry will gradually be highlighted. Product advantage increases one percent, foreign trade high quality development level decreases 0.080 percentage points, product is the cornerstone of trade, constantly improve product competitive advantage is one of the necessary means of foreign trade high quality development.

(4) The correlation coefficient of changes in trade pattern is -0.607. In the past, the foreign trade activities of our country mostly relied on the import and export of goods, and the high-quality development of foreign trade requires the coordinated development of trade in goods and trade in services. The gradual increase in service trade will lead to the decline of part of the traditional trade in goods, so the correlation coefficient is negative, but the changes in the relevant trade pattern will promote the optimization of foreign trade activities.

Among the other variables in the independent innovation equation, the results show the following:

(5) the factors affecting the internal environment are positively increased by one percentage point, and the independent innovation level is increased by 1.22 percentage points. Innovation is not water without a source of water, and a large amount of capital investment and technical support are needed. Only by continuously increasing the R&D investment of independent innovation, can an internationalized company achieve a number of independent innovation results.

(6) Among the factors affecting the external environment, the fluctuation of the demand market increases by one percentage point, and the level of independent innovation decreases by 1.424 percentage points. The demand effect has a significant impact on the level of independent innovation. New demand leads to the birth of new products or new processes, and the inherent demand will hinder enterprises from seeking new and changing. For example, polylactic acid biomass materials are produced technological breakthroughs under the increasing demand for environmental protection. However, at present, the market is in the nascent stage, and the fluctuations are large. How to correctly deal with the fluctuations and guide the sustainable development of independent innovation is what the enterprises in the biochemical industry need to focus on. The promotion effect of competition effect on independent innovation is 0.004%. Reasonable and perfect competition mechanism promotes the birth of new technological inventions. For example, the PLA business of Enterprise grows and improves continuously in the competition with enterprises from other countries. The correlation coefficient of policy environment is 0.528. Due to the use of ranking data, the decline of the number represents the improvement of the policy environment and can promote the increase of the level of independent innovation, but the coefficient fails the 5% significance level test. Independent innovation is affected by many factors, and policies can increase the investment of physical capital in the short term. However, the more important improvements in education and human capital require long-term promotion to achieve results, so at present, the relevant policies do not significantly promote independent innovation.

ISSN: 1813-4890

4.2. Suggestions

To focused on the frontier of industrial development to improve the quality of foreign trade in the industry. Focusing on the frontier of the industry must emphasize the aggregation of innovation, should attach great importance to employee motivation. In terms of the current international enterprise competition situation, the master of the core technology will master the initiative of trade, and have the first advantage in the international competition. Innovation is the energy source, on this basis, enterprises should continue to speed up and improve the construction of innovation platform, continue to transport energy for enterprise innovation. Building ecological organization can fully release the innovation vigor of the chemical industry and other enterprises. Like the ecological circle in nature, ecological organization is also a mutualistic, spontaneous and sustainable living system. Ecotype organization is an open system. By breaking organizational boundaries, it greatly reduces management entropy and improves operational efficiency.

To create new growth drivers and expand foreign trade scope and market.Government should simplify the export procedures of enterprises and implement more convenient measures in foreign exchange control, customs clearance, investment and financing. In the process of independent innovation, Chinese chemical enterprises should actively change their thinking from factor-driven to demand-driven, strengthen communication with customers, pay attention to the actual needs of customers, pay attention to customer after-sales feedback, and let customers participate in the product innovation process. Build an intelligent open platform to allow customers to participate in the process of product customization, so as to meet their diverse individual needs. At the same time, it can also combine "Internet +", use big data to guide technology research and development, and build independent brands on the basis of improving product quality and service to enhance brand competitiveness. Driven by operational efficiency, enterprises should continuously improve the technical level, and pay attention to improve the production and operation efficiency of enterprises.

To improve the innovation ecosystem by deepening reform of the science and technology system. The innovation ecosystem is an extension of the innovation system, which pays more attention to the upstream and downstream chains of scientific and technological innovation, the environment for the development of talents, and the infrastructure conditions for scientific and technological breakthrough and knowledge flow. A good innovation ecosystem should be able to match the country's science and technology needs and strategy. The innovation-driven development strategy of our country requires that the innovation ecosystem can reflect the "five development concepts" and pull the high-quality development of economy. It is necessary to break the administration and homogenization of scientific research institutions in universities, let researchers concentrate on scientific and technological innovation, increase the openness of scientific research institutions in universities, and attract world-class scientists to participate in research. The last best innovation ecosystem should also include a social atmosphere that encourages innovation and tolerates failure in the whole society and relevant institutions that are supported by the government.

To give more support to the independent innovation of biochemical enterprises.The government should further increase the support for scientific and technological innovation research and development, encourage chemical foreign trade enterprises to improve the ability of independent innovation, and always transform theoretical knowledge into scientific and technological achievements as the goal of struggle. Firstly, to optimize the operation mechanism of the innovation subsidy policy.Appropriate subsidies are to be provided according to the difficulty of innovation projects, total investment, and early investment of enterprises, and installments are allocated according to the innovation investment and completion of each period of enterprises. The evaluation and assessment should be strengthened before, during and after the event, increase the punishment of false compensation

ISSN: 1813-4890

fraud and rent-seeking behavior, establish a comprehensive evaluation system of innovation performance oriented by R&D quality, and guide enterprises to carry out high-tech innovation. Secondly, to expand financing channels and improve preferential tax policies. To encourage enterprises to direct financing can increase the support for high-tech enterprises to go public and fund incentives. To encourage venture capital institutions, insurance funds and other channels can raise funds to invest in high-tech industries. Eligible enterprises are encouraged to raise funds for innovation by issuing bonds and financing bonds. Finally, improve the preferential tax policy. The preferential tax policy should be tilted to the research and development, technology transformation and other links. The threshold for enterprises to receive tax benefits and the tax rateare to be lowered. We will strengthen personal income tax incentives for high-tech talents.

Acknowledgments

This work is supported by provincial level philosophy and social sciences planning project of Anhui province "Public welfare expenditure, population aging and high-quality development of trade"(Grant No: AHSKY2021D134）and "*Research on the mechanism and path of our country's industrial policy driving enterprise business model remodeling at the bottom of smile curve*"(Grant No: HSKF2021D08）

References

[1]Joseph Schumpeter. The theory of economic development[M]. Harvard University Press, 1934.

[2] Nelson, R. R. & Phelps, E.S., Investment in humans, technologicaldiffusion, and economic growth [J].American Economic Review, 1966, 56(1/2):69-75.

[3]Bronwyn Hall, John Van Reenen. How effective are fiscal incentives for R&D? A Review of the evidence[J].Research Policy,2000(29):449-469.

[4] Wang G. The impact of technology learning and management learning on independent innovation: the moderating role of technological complexity [J]. Scientific and Technological Progress and Countermeasures, 2018,35(21):80-86.

[5] Gao C, Zhang Y. Research on the path, mode and implementation mechanism of enterprise independent innovation [J]. Shandong Social Sciences,2018, 272(04):143-147.

[6]Bai X, Du J. Research on the interaction mechanism and empirical study of independent innovation and high-quality development [J]. Technical Economics and Management Research,2019, 278(09):39-44.

[7] HeY, Han Q, and Zeng Y. The impact of independent innovation on the international competitiveness of Chinese manufacturing industry [J]. Science Research Management,2019,40(07):33-46.

[8] Song Y, Zheng L. Import of intermediate goods, independent innovation and export product quality upgrading of Chinese manufacturing enterprises [J]. World Economic Research,2020,321(11):26-44+135.

[9]Zhou Y, Zhao M. The impact of patent introduction on independent innovation performance of enterprises [J]. Science and Technology Management Research,2021,41(17):106-115.

[10] Wei L, Ma Z. Research on the impact of technology merger and acquisition on the independent innovation capability of enterprises: from the perspective of knowledge absorptive capacity of acquirers [J]. South China Finance, 2021,534(02):67-78.

[11] Zhang S, Jin R, Liu A. Can tax incentives for technology import promote enterprises' independent innovation? [J] Journal of Financial and Economic Research, 2012,48(08):124-138.

[12] Grossman, G.M., and E. Helpman. Trade, innovation, and growth[J]. American Economic Review, 1990, 80(02):86-91.

[13] Guarascio, Ascio D., Pianta M., Bogliacino F. Export, R & D and new products: a model and a test on European industries[J]. Journal of Evolutionary Economics，2016, 26(04): 869-905.

ISSN: 1813-4890

[14]Qian H. Export and technological innovation structure: a panel analysis based on high-tech industries [J]. International Trade Issues,2014 (09): 13-23.

[15] Hu. The impact of high-tech product trade on the technological innovation ability of Chinese firms: an empirical study based on panel data of provincial high-tech industry [J]. Science and Technology Progress and Policy, 2016 (08): 77-80.

[16] Zhou J, Liu H. International trade, intellectual property rights and our country's technological innovation:an empirical study based on provincial panel data from 1998 to 2009 [J]. World Economic Research, 2011 (11):58-62.

[17] Chen X, Li Y. Dynamic capability and high quality development of manufacturing technology innovation: based on the perspective of innovation leadership[J]. Science and Technology Progress and Countermeasures,2020, 37(06):92-101.

[18]Tang W, Hou L, Pan W. Research on the influence of technological innovation on the high quality development of Tianjin's foreign trade[J]. Industrial Innovation Research, 2022, 94(17):16-19.

[19]Dai X. Factor division, institutional opening and high-quality development of export trade[J]. Tianjin Social Sciences, 2021(03):93-98.