

Study on the influence of exports on total factor productivity of listed food processing enterprises in China

Songyan Zhang¹, Xuyue Wang¹

¹*School of Economics and Management, Zhejiang University of Science and Technology, Hangzhou, Zhejiang, 310023, China*

Keywords: Food industry; Export trade; Total factor Productivity (TFP)

Abstract: With the continuous improvement of trade theory, many domestic scholars pay attention to the relationship and mechanism between export and total factor productivity of enterprises, and carry out research on the total factor productivity of different industries based on the micro level. Based on the panel data of 158 A-share listed food processing enterprises from 2010 to 2020, this paper uses Levinsohn-Petrin method to measure the total factor productivity of sample enterprises, and adopts two-way fixed effect model to empirically test the influence of export, ownership, location and other factors on the total factor productivity of food processing enterprises. The results show that the increase of export volume of Chinese food processing enterprises can significantly promote the growth of total factor productivity of enterprises. From the perspective of enterprise ownership, private enterprises are more obviously promoted by export scale; From the perspective of location, the export behavior of food processing industry in eastern China can improve the total factor productivity of enterprises.

1. Introduction

With the rapid development of China in economic globalization, China has become the world's second largest economy, export trade is an important part of the rapid growth of China's trade type, and is also one of the three carriers of economic growth. In recent years, due to the impact of the COVID-19 pandemic, the import and export trade of countries around the world has fallen into a downturn, but China's import and export trade has maintained a growth trend, and it has become the world's largest import and export trading country. As an extension of agriculture, the food industry is also known as post-agricultural industry. It is a cross-sector, multi-type comprehensive subdivision industry, which is developing rapidly along with the growth of the global economy. As an important link in the industrial chain and value chain of China's agriculture and manufacturing industry, it plays an important role in improving farmers' income and agricultural efficiency. It is playing a leading role in promoting the structural reform of the rural supply side and accelerating the coordinated development of the primary, secondary and tertiary industries. The CPC Central Committee's Proposal for the 14th Five-Year Plan emphasizes giving priority to agricultural and rural development. As the top priority in comprehensively building a modern socialist country, the work of "agriculture, rural areas and farmers" requires comprehensive promotion of rural revitalization and accelerated modernization of agriculture and rural areas. The No. 1 Central

document in 2023 also proposes to promote the high-quality development of rural industries, make the processing and circulation industry of agricultural products bigger and stronger, and encourage large agricultural enterprises to develop intensive processing of agricultural products^[1]. This document emphasizes how to guide the processing enterprises of agricultural products to sink towards the production area, concentrate on the industrial park, and actively improve and expand the backbone network of agricultural products circulation. In addition, the "14th Five-Year Plan" also clearly proposed that we should deeply implement the regional coordinated development strategy, pay attention to the rise of the central region and the western development policy, and encourage the eastern region to accelerate the modern process.

2. Productivity measurement and model construction

2.1 Measurement of total factor productivity of food processing enterprises

Total factor productivity (TFP) is an economic indicator that measures the output produced by a range of factors, including labor and capital investment. It measures how much output is created per unit of input, i.e. how efficiently resources are used. The estimation at the macro level and the micro level are based on different theoretical mechanisms, and the calculation methods for micro enterprises are mainly as follows: OLS, Akerberg-Caves-Frazer (ACF) semi-parametric method, Olley-Pakes (OP) semi-parametric method and Levinsohn-Petrin (LP) semi-parametric method. In order to retain a large sample size of China's listed food processing enterprises, this paper chooses LP method to measure the total factor productivity of sample enterprises.

2.2 Model construction

In order to test the relationship between export trade and total factor productivity growth of Chinese food processing enterprises, according to the literature review of many scholars on relevant theories, in order to reduce the impact of other individual factors on the estimated results, we introduce some key factors affecting the total factor productivity of enterprises into the above endogenous export growth model. Such as enterprise Size (Size), enterprise age (Firmage), per capita Wage (Wage), corporate Profit (Profit), corporate debt level (DFZ). A_{it} and X_{it} are represented by TFP_{it} and $Export_{it}$ respectively, and the following regression equation is established:

$$\ln TFP_{it} = \beta_0 + \theta \ln Export_{it} + \beta_1 \ln Size_{it} + \beta_2 \ln Firmage_{it} + \beta_3 \ln Wage_{it} + \beta_4 \ln Profit_{it} + \beta_5 \ln DFZ_{it} + \mu_i + v_t + u_{it} \quad (1)$$

2.3 Data source and variable description.

This paper selects micro-data of food processing enterprises listed in A-shares from 2010 to 2020 as research samples, and uses financial data such as main business income, main business cost and liabilities from WIND database, CSMAR Guotai Junan database and annual reports disclosed by listed companies. Enterprise export data comes from China Customs data and WIND database. The data matching process matches the database with the stock code and name of the listed company through the name of the listed company and the legal representative. According to the listed enterprises in the annual report of the province of the enterprise according to the degree of economic development is divided into east, middle and west regions for comparison. According to the industry code for sub-industry division, the first two are 13 agricultural and sideline food processing industry, 14 food manufacturing industry, 15 beverage manufacturing industry^[2]. In this paper, Yangchen classifies state-owned enterprises (central and local state-owned enterprises,

collective enterprises, public enterprises) and private enterprises (private enterprises and other enterprises) according to the company attributes of listed companies' annual reports [3]. Sample removal follows the following rules: delisted listed companies, listed companies that issue both A-shares and B-shares, companies at risk of delisting, and sample companies missing key variables are excluded.

3. Empirical results and analysis

3.1 Full sample regression analysis

Table 1 below contains the full sample regression. In the first column, when only the control variables of corporate profitability and wage level are added, the effect coefficient of export volume on TFP is 0.048. When the control variable of corporate debt level is introduced, the coefficient rises to 0.067. In order to increase the robustness of the model, the control variables of firm size and firm age are gradually added. Finally, the conclusion is reached that the effect coefficient of the core explanatory variable export trade volume on the total factor productivity of listed food processing enterprises is 0.038, which passes the test at the significance level of 1%, indicating that the average increase of export trade volume of food processing enterprises is 10%. It can boost the total factor productivity of enterprises by 3.9 percentage points. Through literature review and summary of the reasons, enterprises will continue to learn and improve themselves in the export process, and the cooperation with foreign advanced enterprises can also be influenced by advanced technology spillover. In addition, the competitive environment in the international market will also force enterprises to devote themselves to improving management level, optimizing resource allocation and reducing costs to strengthen market competitiveness after entering the export market. However, compared with other variables in the model, the estimated coefficient is relatively small. The reason may be that the export trade volume of the food processing industry is not large enough, the learning effect is insufficient, and the overall competitiveness needs to be improved due to the lack of technical and financial support. In the context of the global value chain division of labor, the expansion of export trade in the food processing industry can still effectively promote the upgrading of the agricultural product processing chain, improve the competitiveness of China's agricultural products import and export, and optimize the development mode of the agricultural industry^[4].

Table 1: Full sample regression

Variables	(1) <i>lnlfp</i>	(2) <i>lnlfp</i>	(3) <i>lnlfp</i>	(4) <i>lnlfp</i>
<i>lnExport</i>	0.0475*** (0.0177)	0.0672*** (0.0165)	0.0480*** (0.0139)	0.0377*** (0.0123)
<i>lnProfit</i>	0.380*** (0.0294)	0.326*** (0.0299)	0.0730** (0.0341)	0.0850*** (0.0319)
<i>lnWages</i>	0.150 (0.121)	0.0865 (0.112)	0.487*** (0.0861)	0.482*** (0.0785)
<i>DFZ</i>		-0.506*** (0.0860)	-0.601*** (0.0585)	-0.559*** (0.0597)
<i>lnSize</i>			0.475*** (0.0397)	0.480*** (0.0381)
<i>lnFirmage</i>				-1.510*** (0.231)
Constant	-2.269 (1.456)	-0.572 (1.370)	-3.678*** (1.033)	-2.177** (0.985)
R-squared	0.640	0.690	0.834	0.857

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

3.2 Heterogeneity test

1) Regional regression

In Table 2 below, regression is performed according to regional classification samples. According to the regression results, the estimated coefficient of export trade for food processing enterprises in the eastern region on the total factor productivity of enterprises is 0.054, and is significant at the level of 1%, which indicates that the eastern region has both hardware and software advantages, such as perfect infrastructure and convenient transportation, which greatly reduces the export cost of enterprises. Enterprises in the western region are small in scale and lack capital capacity and anti-risk ability, so they need to pay more capital, manpower and other sunk costs when expanding exports. The burden of enterprises with more exports will gradually accumulate, but the productivity of enterprises will be reduced. The estimated coefficient of export volume of food processing enterprises in central China on total factor productivity is 0.02, showing a positive correlation, but the coefficient is not significant. This means that the central food processing enterprises can not increase the total factor productivity by expanding the export volume. The reason may be that the central and western regions are generally limited by factors such as the degree of market openness, transportation and policy resources, resulting in a relatively low degree of openness to the outside world, which weakens the promotion effect of export behavior on the total factor productivity of food processing enterprises^[5].

Table 2: Regression by region

	(1)	(2)	(3)
Variables	East	Central	West
<i>lnExport</i>	0.0542*** (0.0156)	0.0202 (0.0182)	-0.0622* (0.0320)
<i>lnProfit</i>	0.197*** (0.0357)	-0.0798 (0.0559)	-0.371** (0.139)
<i>lnWages</i>	0.376*** (0.1000)	0.194 (0.135)	1.594*** (0.348)
<i>DFZ</i>	-0.558*** (0.0676)	-0.474*** (0.163)	-0.434*** (0.108)
<i>lnSize</i>	0.371*** (0.0429)	0.528*** (0.105)	1.110*** (0.152)
<i>lnFirmage</i>	-1.748*** (0.248)	-2.342* (1.330)	-0.731 (0.653)
Constant	-2.386** (1.177)	5.031* (2.786)	-9.882*** (2.453)
Observations	156	41	30
R-squared	0.877	0.916	0.975

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

2) Regression by enterprise type

In Table 3 below, regression is performed according to the classified samples of enterprise type. One of the important factors affecting China's economic development is the resource allocation among enterprises of different ownership. Ownership forms affect total factor productivity through internal capital allocation efficiency and external resource allocation efficiency of enterprises. Most of the literature points out that there are obvious differences in the total factor productivity of enterprises with different ownership. According to the types of enterprises registered in the annual reports of listed companies, the food processing enterprises are divided into state-owned enterprises and private enterprises. The results show that the export of private enterprises can significantly improve the total factor productivity, and the reasons are as follows: In recent years, the government has increased the policy support for private enterprises, introduced more export incentives, and enhanced the development vitality of private enterprises. Compared with state-owned enterprises, the operation mode of private enterprises is more changeable and flexible, and it is easier to adapt to

the complexity and diversity of the international market environment. Private enterprises can make full use of trade exchanges with foreign advanced enterprises, and be good at exchanging production and technical experience, so as to accelerate technological progress and innovation, and thus stimulate the growth of total factor productivity of enterprises^[6].

Table 3: The regression of enterprise type

	(1)	(2)
	state-owned	privately operated
Variables	ln _{tfp}	ln _{tfp}
<i>LnExport</i>	0.0213	0.0501***
	(0.0307)	(0.0128)
<i>lnProfit</i>	0.272***	0.585***
	(0.0701)	(0.0383)
<i>lnWages</i>	-0.524*	-0.608***
	(0.287)	(0.0592)
<i>DFZ</i>	-3.783***	-1.421***
	(1.032)	(0.207)
<i>lnSize</i>	0.248***	0.0244
	(0.0409)	(0.0284)
<i>lnFirmage</i>	0.183	0.639***
	(0.135)	(0.104)
Constant	2.496	-3.909***
	(2.476)	(1.245)
Observations	60	171
R-squared	0.864	0.898

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

4. Conclusions and policy implications

Based on the above research results, this paper puts forward the following policy recommendations to promote the development of food processing enterprise trade.

(1) The increase of export volume does promote the improvement of total factor productivity of enterprises. The government should encourage technological innovation and brand building to promote the expansion of export scale of food processing enterprises. The government should bolster food processing firms' global trade participation and urge increased R&D investment for faster technological innovation. Through preferential and welfare policies, high-tech talents should be incentivized to join these firms, thereby enhancing their multi-layered advantages and product quality. Strengthening brand building is an important link in China's economic and social transformation, and it is also the only way for food processing enterprises to develop foreign trade with high quality. Leveraging brand leadership can stimulate firms' innovation and quality pursuit, enhancing product value and upgrading food processing value chains. Further international market exploration aids in stabilizing and increasing market share, thereby improving the export's influence on the overall productivity of food processing enterprises.

(2) The government should optimize the operating environment of private food processing enterprises. For example, optimizing export approval procedures to reduce the time cost and economic cost of private enterprises participating in international trade; Establish a trade remedy mechanism, optimize tax policies, promote the efficiency of enterprise capital use, and invest more funds in technology research and development and the introduction of high-tech talents. The government should establish multi-level institutions to provide credit support to private enterprises and broaden financing channels. We will introduce policies on investment, science and technology, and human resources to support the construction of industrial clusters for food processing enterprises. This helps enterprises to enhance the degree of specialization through efficient division of labor and cooperation, improve the efficiency of integrating resources, support and cooperate with each other, extend the industrial chain and develop finishing, and launch higher quality

products, so as to achieve the integration and development of industrial clusters and professional markets, and promote the improvement of core competitiveness^[7]. State-owned enterprises should give full play to their advantages of sufficient capital and scale, enhance their international competitiveness, accelerate market-oriented reform and carry out technological innovation at the same time to revitalize their business vitality.

(3) The western region needs to speed up infrastructure construction, and the government should give preferential policies to the central and western regions. Due to the influence of geographical factors, the transportation in the central and western regions is inconvenient, the economic development is relatively backward, and the process of opening up is relatively slow, so the food processing industry bears a large domestic and foreign trade cost. The government should focus on optimizing the operation and development environment of enterprises in the Midwest, make full use of the "Belt and Road" policy, and use the market advantages of countries along the route to encourage food processing enterprises in the Midwest to expand the market and participate in international trade through "going out". At the same time, the government should introduce relevant policies to cultivate the development of food processing enterprises in the eastern region to become leading enterprises, and adhere to technological innovation and brand building. The above measures can help enterprises consolidate production and operation advantages, and make full use of these advantages to enhance external influence. Enterprises can effectively play a leading role in driving the large-scale and high-quality development of the entire eastern industrial cluster.

References

- [1] Li Jinchang, Shi Longmei, Xu Aiting. *Discussion on the evaluation index system of high-quality development* [J]. *Statistical Research*, 2019, 36(01): 4-14.
- [2] Cheng Dazhong, Li Xiaoyi, Li Shuang. *Exports and Economic performance: Micro evidence from Chinese listed companies; proceedings of the 7th Annual Conference of Shanghai Social Sciences, Shanghai, China, F, 2009* [C].
- [3] Yang Chen, Han Qingxiao. *Export scale, export geographic direction and Productivity of Chinese service industry firms: An empirical analysis based on dynamic panel data* [J]. *World Economic Research*, 2015, (11): 50-60+128.
- [4] Gao Y. *Study on the influence of export scale and export location on productivity of agricultural products processing enterprises* [D]; Nanjing Agricultural University, 2017.
- [5] Qiu Bin, Yan Zhijun. *Heterogeneous export fixed cost, productivity and firm export decision* [J]. *Economic Research*, 2015, 50(09): 142-155. (in Chinese)
- [6] Li Lei, Zhou Duanming. *Export Firms and Total Factor Productivity: Why do State-owned Enterprises have an Advantage?* [J]. *Journal of Anqing Normal University (Social Science Edition)*, 2021, 40(04): 77-83.
- [7] Hu Chuen, Wang Zhenhua, Zhang Guangsheng. *Explanation of low total factor productivity of agricultural processing enterprises: Based on the perspective of financing constraints and skill structure imbalance* [J]. *Rural Economy*, 2021, (03): 119-127.