Is there a "Productivity Paradox" in Internationalization Strategy of High-tech Manufacturing Enterprises in China?

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Abstract. Export and outward foreign direct investment (OFDI) are the main approaches for enterprises to implement internationalization strategy, and theoretically, the productivity of OFDI enterprises is higher than that of export enterprises, but is there a paradox that the productivity of Chinese OFDI enterprises is lower than that of export enterprises? In this study, relevant listed high-tech manufacturing enterprises are selected for sample study (for the period from 2012 to 2018) to discuss the relationship between internationalization strategy choice and productivity of enterprise using a regression equation constructed from Probit model. The results show that there is no “productivity paradox” in the internationalization strategy of high-tech manufacturing enterprises in general. However, through sub-sample regression of listed enterprises by ownership and industry, it is found that foreign-invested enterprises and enterprises in some industries are affected by factors such as business environment, local policies and their own internationalization “genes”. Their internationalization strategy choices are independent of productivity, and there is a "productivity paradox".

Keywords: high-tech manufacturing enterprises; "productivity paradox"; internationalization strategy; Probit model

1 INTRODUCTION

One of the key strategic tasks proposed under Made in China 2025 is to improve the international development level of manufacturing industry, promote the international deployment of key industries and guide enterprises to improve their international competitiveness. As enterprise is the micro entity of industry, enterprise internationalization obviously is prerequisite for industrial internationalization. Enterprise internationalization refers to the cross-border expansion of any business activities including sales, manufacturing and R&D [1][2]. Some studies argued that, from the perspective of value

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chain [3][4][5][6], enterprise internationalization is the process of domestic enterprises getting embedded into international value chain, and is essentially to improve resource allocation efficiency and international competitiveness [7]. For high-tech manufacturing industry, as one of the key industries in China, promoting the implementation of internationalization strategy by related enterprises will help the industry to free itself from the "low-end trap" and extend to the high-end of the international value chain.

According to the internationalization process of enterprise and life cycle theory, enterprise internationalization can be divided into four stages [8][9][10][11][12] which are “export”, “seeking sole agency”, “establishing sales branches” and “setting up production lines”. Some studies [13] further summarize the specific forms of enterprise internationalization as “export”, “establishing sales agents abroad”, and “outward foreign direct investment (OFDI)”, among which “export” and OFDI are dominant. This study discusses the internationalization strategies of Chinese enterprises in terms of these two main forms.

As to the choice of enterprises between these two strategies—export and OFDI, Melitz [14] was the first to elaborate on this, arguing that enterprises with high productivity should engage in export trade and those with low productivity should supply only the domestic market, with OFDI not discussed. With the basic assumptions of Melitz's model, Helpman [15]included OFDI in their model discussion, and found that those with the highest productivity chose OFDI, those with lower productivity chose export, and those with the lowest productivity chose domestic sales, which is one of the core findings of the new-new trade theory.

However, for Chinese high-tech manufacturing enterprises, do their choices of internationalization strategy follow the above law? Do their inherent internationalization [16] characteristics incur the presence of “productivity paradox” in the internalization? In this regard, this study measures the total factor productivity of Chinese high-tech manufacturing enterprises that implement internationalization strategies to verify the existence of the "productivity paradox".

2 PRODUCTIVITY PARADOX

"Productivity paradox” was first proposed by Li and Yin [17], who verified the relationships among export, domestic sales and total factor productivity of Chinese industrial enterprises and concluded that the productivity of export enterprises is lower than that of enterprises supplying only the domestic market, contrary to the model of Helpman [15]. The main cause of the existence of the "paradox", excluding technical factors of data or calculation methods, is that the majority of Chinese exporters are labor-intensive enterprises mainly engaged in processing trade. These enterprises do not require high technological innovation and thus have low productivity. In addition, the low profitability of export products due to low value-added makes the profit of exporters not necessarily higher than that of domestic enterprises, so that enterprises with high productivity have no incentive to "go out", thus the "export-productivity paradox" emerges. Li [18]further found that with the same data and model, the "paradox" disappears after excluding processing trade enterprises. Some studies [19] [20] [21] [22] [23]

[24]also support the "export-productivity paradox". Some studies have also suggested that the existence of the "export-productivity paradox" is related to factors such as the form of ownership [25][26] or export intensity [27]. However, some studies [28][29][30][31] have demonstrated through empirical analysis that the export choices of Chinese enterprises are in line with the model findings of Melitz [14] and Helpman [15]. This suggests that there is no conclusive evidence on the existence of a "productivity paradox" in the strategic choice between export and domestic sales (Relationship 1 in Figure 1) for Chinese enterprises, including high-tech manufacturing enterprises.

As for the relationship between productivity and enterprises' choice of domestic sales or OFDI (Relationship 2 in Figure 1), most studies [32][33][34][35][36] support the conclusion of Helpman [15] that enterprises with higher productivity choose OFDI.

However, few studies have addressed the applicability of the conclusion of "enterprises of high productivity choose OFDI and those with lower productivity choose exports" (Relationship 3 in Figure 1) in the model of Helpman [15] to Chinese enterprises. Therefore, using Helpman [15] model, this study addresses the relationship between productivity and the choice of internationalization strategy of Chinese high-tech manufacturing enterprises based on total factor productivity determination with relevant data of listed enterprises in high-tech manufacturing industry.

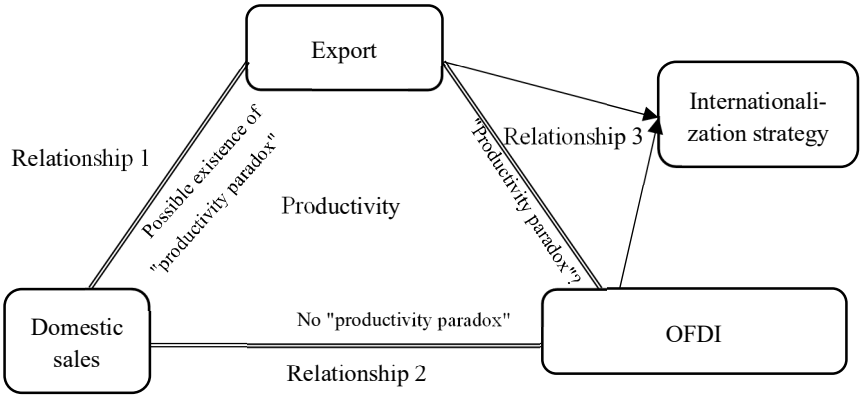

Fig. 1. Diagram of the relationship between internationalization strategy and productivity

3 DATA ACQUISITION AND VARIABLE SELECTION

3.1 Data Acquisition

Through the data comparison between "listed manufacturing companies" (on Shenzhen A-shares, Shanghai A-shares and Growth Enterprise Markets) ① and "high-tech enterprise database", a total of 1,551 listed high-tech manufacturing companies conforming

① The list of listed manufacturing companies is determined according to the industry classification of the China Securities Regulatory Commission.

to the Administrative Measures for the Determination of High and New Technology Enterprises (Guo Ke Fa Huo [2016] No. 32) were selected manually and included in the total sample pool for this study.

The sample study period is set as from January 1, 2012 to December 31, 2018, and a total of 788 sample enterprises are selected after exclusion of ST, *ST, in suspension, delisted enterprises and enterprises with abnormal or seriously missing data of major indicators. As high-tech manufacturing enterprises implementing internationalization strategies are of interest in this study, and that only 41 domestic sales enterprises, accounting for about 5% of the total, are identified through comparison with the table of business revenue by region in the CCER economic and financial research database, a sample size of 747 enterprises is included in the regression model test. Among them, according to the Overseas Direct Investment sub-database of CSMAR database of Guo-Tai'An, the Public List of Overseas Investment Enterprises (Institutions) Registration Results published by the Ministry of Commerce and the annual reports of listed companies, 572 OFDI enterprises and 175 export enterprises[②] are identified.

3.2 Variable Selection

Total factor productivity (tfp). Most studies measure the productivity of enterprises by labor productivity or total factor productivity. Among them, labor productivity considers labor as the only factor of production, which can accurately reflect the productivity level of labor-intensive enterprises. However, as high-tech enterprises may be capital- or knowledge-intensive, the choice of labor productivity as a proxy variable cannot accurately reflect the productivity level of enterprises. Total factor productivity treats all factors equally and can effectively measure the remaining technology and efficiency factors [32]. In fact, total factor productivity has been used as a proxy variable for enterprise performance in some studies [37][38][39]. Therefore, measuring the productivity of enterprises by total factor productivity is more consistent with the characteristics of high-tech manufacturing enterprises.

Considering that the Levinson-Petrin (LP) method can effectively solve the endogeneity and selectivity bias problems of OLS regression through semi-parametric regression with intermediate inputs as instrumental variables [26], this study adopts the LP method to estimate the total factor productivity of high-tech manufacturing enterprises.

The production function of the enterprise is assumed to be a C-D function, i.e.,

$$Y_{it} = A_{it} K_{it}^{\alpha} L_{it}^{\beta} M_{it}^{\gamma}.$$

Taking logarithms of both sides of the C-D production function equation, we get $lnY_{it} = \mathrm{c} + \alpha lnK_{it} + \beta lnL_{it} + \gamma lnM_{it} + \varepsilon_{it}$, and through this regression equation, we get the estimates of the coefficients of the variables $\hat{\alpha}$, $\hat{\beta}$ and $\hat{\gamma}$.

Then we have the total factor productivity $tfp_{it} = lnY_{it} - ln\hat{Y}_{it} = lnY_{it} - \hat{\alpha} lnK_{it} - \hat{\beta} lnL_{it} - \hat{\gamma} lnM_{it}$, where:

[②] The business scope of export enterprises includes domestic sales, and similarly, the business scope of OFDI enterprises includes export and domestic sales.

(1) Y_{it} is the output of enterprises, measured by "value added of enterprises". According to the official definition of the National Bureau of Statistics ③, from the perspective of income, the value added of enterprises = depreciation of fixed assets + labor remuneration + net production tax + operating surplus for the current period④.

(2) K_{it} is the capital stock, which is estimated using the perpetual inventory method, i.e., $K_{it} = I_{it} + K_{it-1}(1 - \delta_{it})$, Where I_{it} is the current year investment of the enterprise, expressed as the difference between the original value of fixed assets in the current year and the original value of fixed assets in the previous year [40]. δ_{it} is the depreciation rate. Since the size of the depreciation rate is related to the nature of the industry, if all enterprises use a uniform depreciation rate to estimate the capital stock, a scientifically accurate estimate cannot be obtained. Therefore, referring to Chen [41], the current-period depreciation rate = (accumulated depreciation of fixed assets in the current period⑤ - accumulated depreciation of fixed assets in the previous year) ÷ the original value of fixed assets in the previous year. The capital stock in the initial year is measured by the enterprise's "net value of fixed asset" in 2012 ⑥ [42][35][40].

(3) L_{it} is the manpower, measured by the number of employees registered (active) in listed companies as disclosed in the annual report.

(4) M_{it} is the intermediate input. Referring to Yuan [43]and Zhu and Zhang [35], the intermediate inputs = cost of main business⑦ + sales, financial and administrative expenses - current-period depreciation of fixed assets - labor remuneration.

For the selection of other variables, see Table 1. It should be noted that for the treatment of the price factor, referring to Li [13], the ex-factory price index of industrial producers is used to price deflate the value added of enterprises, the fixed asset investment price index is used to price deflate the data related to fixed assets of enterprises, and the purchase price index of industrial producers is used to price deflate the indicators related to intermediate inputs, using 2012 as the base period [44]. The data related to price indices are obtained from the China Statistical Yearbook.

③ Refer to http://www.stats.gov.cn/tjzs/cjwtjd/201311/t20131105_455942.html.

④ Labor remuneration = cash paid to and for employees + current -period employees' remuneration payable - previous-period employees' remuneration payable; net production tax = taxes paid - tax refunds received + (current-period taxes payable - previous-period taxes payable); operating surplus = net profit.

⑤ Accumulated depreciation of fixed assets = original value of fixed assets - net value of fixed assets.

⑥ If "net value of fixed assets" is not disclosed in the annual report, "net fixed assets" is used instead.

⑦ The annual reports of listed companies do not report the "cost of main business" directly. Since after 1998, profit from main business = revenue from main business - cost from main business - taxes and surcharges on main business. After the adoption of the new standard in 2007, "taxes and surcharges on main business" is abolished and "taxes and surcharges on business" is used. In this study, we use "cost of main business = revenue from main business - profit from main business - business tax and surcharge" to calculate "cost of main business".

Table 1. Variable descriptions

Variable	Symbol	Definition	Unit	Source
Explained variable				
Internationalization strategy (export/OFDI)	strategy	Dummy variable, 1 for exporters, 0 otherwise	0/1	Wind database, CSMAR database, *Public List of Overseas Investment Enterprises (Institutions) Registration Results*, and company annual reports
Explaining variable				
Total factor productivity	tfp	Estimated by LP method, logarithmically processed	1	Above calculation
	tfp_fe	Estimated with fixed effects, logarithmically processed	1	
Control variable				
Enterprise scale	scale	Logarithmic number of manpower	People	CSMAR database
Enterprise age	age	The difference between the year of establishment and the year of observation, logarithmically processed	Year	Wind database, National Enterprise Credit Information Publicity System
Ownership	equity	Dummy variable, 1 for "state-owned enterprises", 2 for "private enterprises", 3 for "foreign-invested enterprises", and 4 for the "others".	-	CSMAR database

4 ANALYSIS ON EMPIRICAL RESULTS

4.1 Descriptive Analysis

Table 2. Results of descriptive statistics

Variable	Mean	Standard deviation	Min	Max	strategy	tfp	scale	age	equity
strategy	0.234	0.424	0	1	1				
tfp	8.803	0.631	0.357	11.745	-0.137*** (0.000)	1			
scale	7.827	1.086	4.060	12.302	-0.211*** (0.000)	0.180*** (0.000)	1		
age	2.791	0.306	1.386	4.143	0.005 (0.731)	0.053*** (0.000)	0.246*** (0.000)	1	
equity	1.782	0.571	1	4	-0.093*** (0.000)	-0.032** (0.020)	-0.246*** (0.000)	-0.108*** (0.000)	1

Note: ***, ** and * represent that the coefficient is significant at the 1%, 5%, and 10% levels respectively, and P-values are reported in parentheses. Results are generated by Stata 14.0.

The results in Table 2 show that the standard deviations of all variables are less than 1.5, indicating good data stability. The small correlation coefficients between the

explaining variables and the control variables exclude the possibility of multicollinearity in the model to some extent. Meanwhile, the small correlation coefficients between the explained variable "strategy" and the explaining variables and control variables indicate that the linear relationship between strategy and other variables is not strong or there is no linear correlation, so the Probit model is used for regression below.

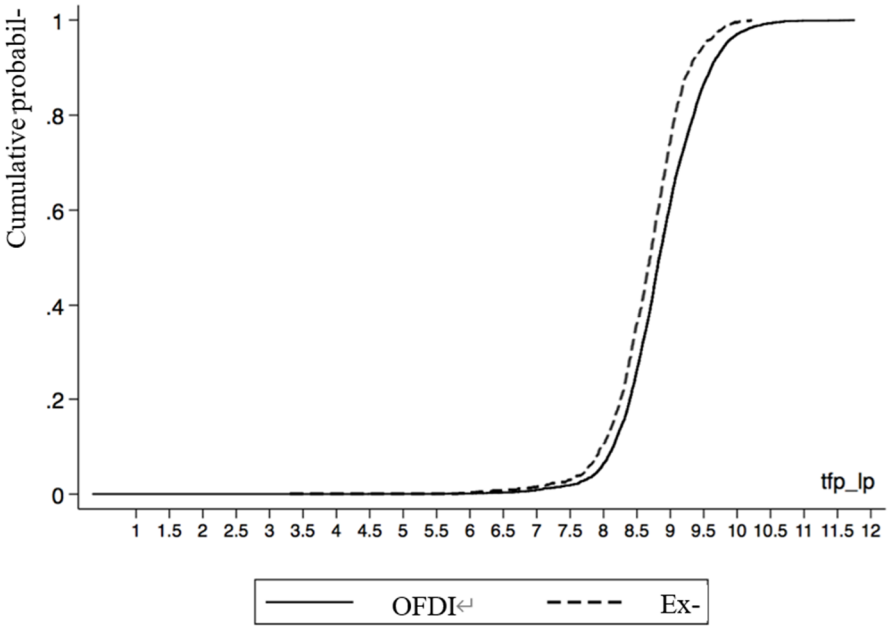

Fig. 2. Chart of cumulative probability distribution

Figure 2 shows the cumulative probability distribution of productivity by OFDI and export enterprises. Since the cumulative probability distribution of OFDI enterprises is on the right side of exporters, it can be intuitively judged that the productivity of OFDI enterprises is higher than that of exporters in general. To precisely verify this result, the regression test is conducted below using the Probit model with the following equation:

$$\Pr\left(F_{export} = 1|X_{it}\right) = \beta_0 + \beta_1 tfp_{it} + \sum_{j=2}^{4} \beta_j control_{it} + \lambda_{it} + \varepsilon_{it}$$

$$(i = 1, \ldots, 747; t = 1, \ldots, 7)$$

where, $control_{it}$represents a series of control variables; λ_{it} represents year effect, which eliminates the anomalous effect brought by different years to a certain extent; ε_{it} represents the random disturbance term.

4.2 Baseline Regression

Table 3 shows the results based on the full sample regression. However, the variable regression coefficient of neither Probit model or Logit model is marginal effect, so the marginal effects of the variables need be calculated separately. Model (1) uses the Probit model with total factor productivity calculated by the LP method as the explaining variable, and models (2) (3) (4) are tested for robustness by adding explaining variables, replacing existing explaining variables, and changing the regression equation model, respectively.

The prediction accuracy of model (1) is 76.99% and the model fit is acceptable. The results show that the coefficient of tfp is significantly negative at the 1% level, and its calculated marginal effect is -0.068, indicating that for each percentage point increase in total factor productivity, the probability that an enterprise chooses export decreases by 0.068%. This suggests that among all high-tech manufacturing enterprises implementing internationalization strategy, the higher the productivity, the greater the likelihood of OFDI, and the lower the productivity, the more likely to choose export.

Robustness test: Model (2) includes the total factor productivity that lags one period in the model, because enterprises may be influenced by the productivity of the previous period and change their internationalization strategy choice through the "learning effect"[35]. The results show that the presence or absence of the "learning effect" does not change the basic conclusion; however, when the "learning effect" is taken into account, the regression coefficient of current period productivity decreases and its marginal effect drops to -0.047, while the marginal effect of previous period productivity is -0.030, indicating that there is a delayed effect of productivity on the choice of internationalization strategy, and the influence of current period productivity is weakened when the previous productivity is considered. Model (3) incorporates total factor productivity estimated through fixed effects as an explaining variable in the regression model, and the basic conclusion remains unchanged. Model (4) is regressed with the Logit model and the conclusion remains unchanged.

Therefore, the regression model of model (1) is more robust and the results are reliable, i.e., in general, the "productivity paradox" of the relationship between OFDI and export is not found in high-tech manufacturing enterprises.

Table 3. Regression results

Model	Probit(1)	Probit(2)	Probit(3)	Logit(4)
Variable		strategy		
tfp	-0.245***	-0.174***		-0.424***
	(0.0334)	(0.0484)		(0.0578)
l.tfp		-0.107**		
		(0.0476)		
tfp_fe			-0.251***	
			(0.0338)	
scale	-0.391***	-0.394***	-0.409***	-0.668***
	(0.0212)	(0.0231)	(0.0212)	(0.0372)
age	0.136*	0.131	0.137*	0.237*
	(0.0721)	(0.0810)	(0.0721)	(0.1245)
2.equity	-0.612***	-0.613***	-0.613***	-1.044***

	(0.0463)	(0.0501)	(0.0463)	(0.0792)
3.equity	-0.797***	-0.799***	-0.798***	-1.445***
	(0.1218)	(0.1316)	(0.1218)	(0.2290)
4.equity	-0.156	-0.165	-0.154	-0.251
	(0.1668)	(0.1807)	(0.1670)	(0.2786)
Constant term	4.386***	4.756***	4.578***	7.564***
	(0.3706)	(0.4174)	(0.3890)	(0.6458)
Time effect	Fixed	Fixed	Fixed	Fixed
Pseudo R^2	0.0916	0.0957	0.0919	0.0910
Prob > chi2	0.0000	0.0000	0.0000	0.0000
Log pseudolikelihood	-2585.7199	-2206.4437	-2584.8998	-2587.6094
Observed value	5229	4482	5229	5229

Note: ***, ** and * represent that the coefficient is significant at the 1%, 5%, and 10% levels respectively, and robustness standard errors are reported in parentheses (the same below).

Endogeneity test: Due to the possible reciprocal causality between the explaining and explained variables and the existence of omitted variables, this study uses logarithmic R&D input (rdspend) ⑧ as the instrumental variable to test the endogeneity of the equation. The selection of instrumental variables should satisfy the two conditions of relevance and exogeneity, i.e., the effectiveness of the instrumental variables should be based on the fact that they can only indirectly influence the choice of enterprises' internationalization strategies via enterprises' total factor productivity [45]. The justification of using R&D input as an instrumental variable is that: the more the R&D input, the higher the total factor productivity of the enterprise, suggesting that the two are correlated[46], which satisfies the condition of "correlation" between the instrumental variable and the endogenous variable tfp; any strategic choice of the enterprise is based on output factors rather than input factors, meaning that the enterprise often makes decision based on existing output level rather than “sunk cost” similar to R&D input. Therefore, R&D input does not directly affect the internationalization choice of OFDI or export, and satisfies the "exogeneity" condition of the instrumental variable.

Table 4 provides the results of the Wald test for the original hypothesis of exogeneity "$H_0: \rho = 0$" with a p-value of 0.0000, so that tfp can be considered as an endogenous variable [47] at the 1% level. In this regard, the coefficient before tfp is significant at the 1% level and the marginal effect is -1.088. It is known that when the endogeneity of tfp is ignored, and estimated using the general Probit model, the negative effect of total factor productivity on enterprises' choice of export strategy will be underestimated; in short, the higher the total factor productivity, the more likely enterprises will choose OFDI. Since the number of instrumental variables is equal to that of endogenous variables, there is no need for over-identification tests [48]. The results of the weak instrumental variable identification show that the p-values of AR and Wald are

⑧ Unavailable data on R&D input are estimated with the ratio of R&D input to operating revenue is estimated as follows: if the ratio of R&D input to operating revenue remains basically the same or has a stable upward (downward) trend, the ratio is estimated by constructing a linear equation to calculate the R&D input; if the ratio does not have a stable trend, the average value of the ratio of R&D input is estimated for the two years before and after. The data were obtained from CSMAR database.

significant at the 1% level, which rejects the original hypothesis that "endogenous variables are not correlated with instrumental variables", so R&D input is not a weak instrumental variable.

Table 4. Endogenous test results

Model	Stage 1	Stage 2
Variable	tfp	strategy
tfp		-1.088***
		(0.1090)
rdspend	0.244***	
	(0.0097)	
scale	-0.088***	-0.325***
	(0.0110)	(0.0249)
age	-0.037	0.090
	(0.0300)	(0.0814)
2.equity	-0.009	-0. 644***
	(0.0191)	(0.0504)
3.equity	0.219***	-0.674***
	(0.0429)	(0.1205)
4.equity	-0.109	-0.229
	(0.0752)	(0.1957)
Constant term	5.131***	11.326***
	(0.1529)	(0.9421)
Time effect	Fixed	Fixed
R^2	0.1476	
F value	75.29	
chi2		75.65
Prob > chi2		0.0000
Observed value	5229	5229

4.3 Further Analysis

Among the sample enterprises in this study, there are 495 private enterprises, accounting for nearly 66.27% of the regression sample (747 enterprises), while there are 212 state-owned enterprises and 31 foreign-invested enterprises, accounting for 28.38% and 4.15%, respectively[9]. According to Qian et al. [31] and Tian and Yu [32], the ownership of enterprises can largely influence their internationalization strategy choices. Therefore, the relationship between internationalization strategy choice and productivity of enterprises by ownership is tested below.

The regression results in Table 5 show that there is no "productivity paradox" in the relationship between the internationalization strategies and productivity of state-owned enterprises and private enterprises, i.e., among enterprises implementing internationalization strategies, those with high productivity choose OFDI and those with low productivity choose export. However, this finding does not hold for foreign-invested enterprises, as the coefficient before tfp is negative but statistically insignificant,

[9] Since the ownership of enterprises with “other” ownership is unknown and there are only 9 such enterprises, the sample size is too small, so this study does not discuss this type of enterprises.

implying that productivity is not a factor in the choice of internationalization strategy of these enterprises, i.e., there is a "productivity paradox". Excluding technical factors such as sample size and data errors, the possible causes of the "paradox" are as follows: according to Melitz [14], the expansion of overseas markets is often the result of "self-choice" by enterprises, and productivity is the criterion for choice. In the face of high transportation costs, overseas expansion costs, and uncertainty of overseas markets, the deciding factor for state-owned enterprises (SOEs) and private enterprises to implement internationalization strategies and decide specific strategic choices under the loss of "protection" such as domestic tax incentives and subsidies can only be productivity. However, foreign-invested enterprises, due to their natural ties with overseas markets [26] can not only effectively avoid the negative effects of uncertainties such as exchange rate risks, but also have a deeper understanding of overseas markets and are more likely to be "favored" by overseas partners than SOEs and private enterprises, so the choice of export or OFDI is not or not entirely determined by productivity.

Table 5. Regression results according to different equities

Model	State-owned enterprise	Private enterprise	Foreign-invested enterprise
Variable		strategy	
tfp	-0.375***	-0.178***	-0.118
	(0. 0573)	(0. 0414)	(0. 1083)
scale	-0.419***	-0.408***	0.152***
	(0. 0368)	(0. 0289)	(0. 0552)
age	-0.352**	0.206**	1.670***
	(0.1387)	(0.0888)	(0.3483)
Constant term	7.046***	3.134***	-5.629***
	(0.6605)	(0.4485)	(1.5465)
Time effect	Fixed	Fixed	Fixed
Pseudo R^2	0.1251	0.0696	0.0950
Prob > chi2	0.0000	0.0000	0.0000
Log pseudolikelihood	-805.1912	-1631.0405	-86.7676
Observed value	1484	3465	217

Since industry heterogeneity causes large differences in the total factor productivity levels of enterprises in different industries, which affect their internationalization choices, it is reasonable to doubt that industry attribute is also one of the factors affecting the existence of "productivity paradox" in the internationalization strategy of enterprises. In fact, when regressions are conducted for high-tech manufacturing enterprises in different industries, it is found that "productivity paradox" does exist in a small number of industries. However, given the small sample size of some industries[9], the results

[9] These industries include: C13 agricultural and food processing industry, with 11 enterprises; C14 food manufacturing industry, with 5 enterprises; C15 wine, beverage and refined tea manufacturing industry, with 2 enterprises; C18 textile, clothing and apparel industry, with 10 enterprises; C19 leather, fur, feather and their products and footwear industry, with 4 enterprises; C20 wood processing and wood, bamboo, rattan, palm and grass products industry, with 4 enterprises; C21 furniture manufacturing industry, with 2 enterprises; C22 papermaking and paper products industry, with 8 enterprises; C23 printing and recording media reproduction industry, with 5 enterprises; C24 cultural, educational, industrial art, sports and

are not credible if they are included in the regression equation model. Therefore, only the top 14 enterprises in different industries that meet the regression conditions are subjected to sub-sample regression, i.e., with 680 enterprises, accounting for 91.03% of the total. Table 6 shows the regression results by industry.

Table 6. Regression results in different industries

Code	Industry	Enterprise(s)	Regression result	Existence of "productivity paradox"
C17	Textile	12	-0.918*** (0.3108)	No
C26	Chemical feedstock and chemical products manufacturing	77	0.026 (0.0919)	Yes
C27	Pharmaceutical manufacturing	83	-0.411*** (0.0931)	No
C29	Rubber and plastic products	32	0.031 (0.1985)	Yes
C30	Non-metallic mineral products	30	-0.231 (0.2020)	Yes
C32	Non-ferrous metal smelting and rolling processing	23	-0.986*** (0.3064)	No
C33	Metal products	23	0.282 (0.2361)	Yes
C34	General equipment manufacturing	50	-0.234* (0.1400)	No
C35	Special equipment manufacturing	75	-0.358*** (0.1253)	No
C36	Automobile manufacturing	41	-0.313** (0.1411)	No
C37	Railroad, ship, aerospace and other transportation equipment manufacturing	16	-1.351*** (0.4063)	No
C38	Electrical machinery and equipment manufacturing	82	-0.020 (0.1130)	Yes
C39	Computer, communication and other electronic equipment manufacturing	123	-0.554*** (0.0913)	No
C40	Instrument manufacturing	13	-1.149*** (0.4270)	No

Note: Regression results of control variables are not reported in this table and are available from the author upon request.

Table 6 shows that the choice of enterprises' internationalization strategy is not related to productivity in the five industries where the "paradox" exists. According to Li [49], the causes of the existence of the "paradox" include the existence of processing trade enterprises or foreign-funded enterprises, the difference in factor intensity, and

entertainment products manufacturing industry, with 2 enterprises; C28 chemical fiber manufacturing industry, with 8 enterprises; C31 ferrous metal smelting and rolling processing industry, with 3 enterprises; C41 other manufacturing industry, with 1 enterprise; C42 comprehensive utilization of waste resources industry, with 2 enterprises.

the difference in export intensity, etc. Although only high-tech manufacturing enterprises are of interest in this study and the productivity of these enterprises is generally high, the possibility of labor-intensive enterprises is not excluded. Especially in the four industries, namely, chemical feedstock and chemical products manufacturing, rubber and plastic products, non-metallic mineral products, and metal products, the average annual total factor productivity of enterprises is lower than the overall average of the sample. For labor-intensive high-tech manufacturing enterprises, labor cost is often an important factor in the selection of investment targets, and thus enterprises with high productivity in this case may not have an incentive to seek overseas expansion. For example, the company with stock code 000400 is an exporter, and its export business revenue accounts for about 3% to 5% of its total revenue, but its productivity is as high as 9.7. Its 17 affiliates and subsidiaries are all domestic companies, and it has no OFDI business. For non-labor-intensive high-tech manufacturing enterprises, it is also possible that productivity is not a decisive factor in choosing their internationalization strategy, and the favorable policies of the host country of investment and the reduced business risks may also influence the strategy decision of the enterprises. In this case, the possibility of an enterprise with low productivity choosing OFDI is not excluded. For example, the company with the stock code 002382 mainly produces and sells health protection gloves, and has realized the automation of production process and the intelligence of key processes, making it a capital and technology intensive enterprise. However, its productivity is only 8.08, far below the sample average. It has 27 subsidiaries (sub-subsidiaries) and associates overseas, and a large number of OFDI businesses, and is engaged in overseas trade, production or sales, thus allowing it to disperse geographical risks and enjoy favorable industry policies in different regions.

5 CONCLUSION AND DISCUSSION

“Enterprises with the highest productivity chose OFDI, those with lower productivity chose export, and those with the lowest productivity chose domestic sales" is one of the core conclusions of the new-new trade theory. However, Chinese enterprises practically shows that there may be a "productivity paradox" in the overseas expansion of enterprises. But most studies have focused on the "export-domestic sales productivity paradox" and the "OFDI-domestic sales productivity paradox". This study discusses the existence of the "productivity paradox" in high-tech manufacturing enterprises implementing internationalization strategies, from the perspective of two internationalization strategies, namely export and OFDI. The results show that, in general, enterprises with high productivity choose OFDI and those with low productivity choose export, and there is no "productivity paradox", which is in line with the theoretical expectation of Helpman [15]. The sub-sample regressions of enterprises by ownership and industry attributes show that the internationalization choices of foreign-invested enterprises and some industries are not fully determined by productivity due to factors such as business environment, local policies, and enterprises' own internationalization "genes", and thus the "productivity paradox" exists.

There are several limitations to this study. First, due to the limitation of statistical data, the sample period of this study is as of December 31, 2018. However, in view of the COVID-19 pandemic in 2020, the world economy is facing a deep recession, coupled with the increasing complexity of international relations, which brings unprecedented challenges to Chinese enterprises, especially high-tech manufacturing enterprises. The productivity level may not be the decisive factor in the choice of OFDI, export or domestic sales strategy, especially for enterprises in some industries where there is a "paradox", as their internationalization strategy choice is influenced by the host country's policies. Second, this study only discusses the relationship between the internationalization strategy choice of listed companies and its productivity. However, there are a large number of small and medium-sized private enterprises in China, and some large enterprises (such as Huawei) are not listed companies. It is unknown whether there is a "productivity paradox" in the export and OFDI of such enterprises. Based on these limitations, the researchers suggest that future research studies could use questionnaire to further test the relationship between internalization choice and productivity. At the same time, it is also a future direction discuss the differences in the relationship of internationalization choices and productivity in different destination countries.

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