Research on the Relationship between Enterprise Internationalization Level and Performance Based on Multiple Regression and Hausman Test: Taking Electronic Manufacturing Industry as an Example

Zizheng Wang*

School of Economics, Shandong University, Jinan city, Shandong Province, 250100, China

Keywords: Internationalization of Enterprises, Enterprise Performance, Electronic Manufacturing Enterprises.

Abstract: Since the Belt and Road Initiative has been implemented, China has delivered more and more goods to the world in the past ten years as the world's largest exporter. Meanwhile, today's China not only needs to export more goods to foreign countries, but also needs higher quality development. Therefore, in the past decade, which development phase of China's "going out" enterprises is in? To what extent has the continuous sale of products in the international market helped the development of enterprises? Based on the sample of some listed companies in China's electronic manufacturing industry from 2015 to 2019, this paper uses multiple regression and Hausman test to determine the panel data fixed effect model for regression, so as to analyze the nonlinear relationship between the degree of internationalization of international enterprises and enterprise performance. The results show that there is a U-shaped relationship between Chinese electronic manufacturing enterprises internationalization degree and their performance, that is, they tend to reduce the benefits of enterprises in the short term and gain higher benefits in the long term. Based on the results, the paper puts forward some policy suggestions: the state should give some tax incentives to enterprises that want to operate internationally to resist the initial risks of operation, and at the same time, encourage enterprises to operate internationally, which has important practical significance for the long-term development of enterprises.

1 INTRODUCTION

1.1 Research Background

According to the "China's foreign direct investment communique of 2019" jointly issued by the Ministry of Commerce, the National Bureau of statistics and the State Administration of foreign exchange, China's foreign investment level has maintained the second level of flow in the last few years. At the same time, China's foreign investment also has the characteristics of large coverage, diversified fields and expanding world influence. In this background, enterprises as the main force of foreign investment, their ultimate goal is to expand their international business and world influence, and ultimately achieve the effect of improving the overall performance.

Meanwhile, in this context, the country is constantly implementing the policy of opening up. Enterprises are encouraged to actively integrate into the trend of national opening up and world economic globalization in various ways. For example, Haier sets up factories overseas, Huawei exports products directly, Lenovo merges part of the business of IBM, a well-known foreign enterprise and so on. Many enterprises are looking for ways that are suitable for them to expand their business departments in overseas markets and ultimately maximize the benefits of enterprises.

In the process of expanding overseas market and obtaining overseas profits, enterprises will also face many risks. For example: all kinds of costs necessary for enterprises to expand overseas business, differences in cultural systems between domestic and abroad, suppression of foreign enterprises in order to maintain their domestic market such as tariffs. At the same time, enterprises' international business also needs to bear a lot of opportunity costs, that is, in order to enhance the funds needed overseas, they must sacrifice the funds of domestic business. Can this part of funds that could have been put in China bring higher performance to enterprises? How will

expanding international business change the performance in the long run? In this regard, many domestic and international scholars have made analyses, their main conclusions are that the degree of internationalization and enterprise performance are positively correlated, negatively correlated, U-shaped relationship, n-shaped relationship and so on.

On this basis, some scholars also explain the potential reasons for the different results. The mainstream view is that the effect of enterprise internationalization level on performance is related to the maturity of the country's industry and the ability of technological innovation. For the early scholars who take the more developed regions as samples (such as the multinational enterprises in the United Kingdom and the United States), because the enterprises in these regions have better maturity and advanced technology, the improvement of internationalization will tend to help them obtain more economic benefits; on the contrary, for the scholars who take the enterprises of developing countries as samples in the empirical research, because these enterprises lack maturity and advanced technology, they need to adapt to the world environment, the improvement of inter-nationalization level will make the enterprises show a decline trend of enterprise profits at the initial stage.

1.2 Research Significance

From a practical point of view, with the continuous opening up of China and the gradual maturity and saturation of the domestic market, many enterprises want to improve their profits by expanding the international market, but the fact is that few have heard that some domestic enterprises have significantly improved their performance by occupying a certain share of the international market, and become influential in the world. Therefore, some academic empirical analyses can help domestic enterprises to analyze whether the current development level of enterprises can support the enterprise's international strategic behavior, and analyze the potential risk factors of going to the international market, so as to help enterprises allocate idle resources more accurately, provide reference for the enterprise's strategic objectives, and finally realize the maximization of enterprise profits; in addition, analyses can help relevant government departments analyze how to formulate relevant policies, let the government know how to support the enterprises that want to open the international market, and finally provide practical guidance for the internationalization strategy of Chinese enterprises.

From a theoretical point of view, many scholars tend to use the enterprises in developed countries as samples, which makes some conclusions inconsistent with the situation of domestic developing enterprises. Therefore, many different results are obtained, which are not compatible with the actual situation in China. This paper takes the electronic manufacturing enterprises with the highest proportion of overseas income of China's Listed Companies in 2019 as the sample to verify the relationship between internationalization level and enterprise performance, which can enrich some domestic research samples in this field and provide valuable reference for future research.

1.3 Literature Review

Under the background of the gradual rise of international trade in the 20th century, many scholars analyze data or create theories to study the relationship between internationalization degree and enterprise performance. And most of the early studies tend to have a positive correlation between enterprise performance and internationalization level.

Among them, the earliest tended to use large enterprises in developed countries as samples. The more representative theoretical research was the monopoly advantage theory proposed by Hymer in 1971. He believes that enterprises can finally make greater profits in international operation through the previously accumulated advantages by accumulating technical advantages, advanced management mode and economies of scale (Thomas, 1977). After that, many scholars further used data for empirical research. For example, Grant (1987) used the panel data of large British enterprises from 1971 to 1984 for regression analysis (Grant, 1987), and Kim (1993) obtained the data of 125 American enterprises in the Forbes list from 1982 to 1986 for analysis (Kim, 1993). All of them came to the conclusion that there is a positive correlation between enterprise performance and internationalization level. At the beginning of the 21st century, under the background of China's accession to the WTO and the expansion of international trade, Xue Youzhi (2007) also analyzed the manufacturing enterprises in Jiangsu Province from 2002 to 2004 in 2007. He also found that the internationalization of manufacturing enterprises can significantly promote enterprise performance (Xue, Zhou, 1990).

With the deepening of research, scholars continue to come up the idea that there may be a negative correlation or U-shaped, inverted U-shaped and horizontal S-shaped between enterprise performance

and internationalization level. For example, Collins (1990) made a comparative analysis of 133 of the world's top 500 enterprises and found that there was a negative correlation between enterprise performance and internationalization in developing countries (Wang, Hu, 2006). Wang Guoshun and Hu Sha (2006) conducted an empirical study on manufacturing export-oriented listed enterprises in Shanghai and Shenzhen, and also came to the conclusion that enterprise internationalization has a negative impact on performance (Lu, Beamish, 2001). After that, scholars also continue to realize that the internationalization level and performance of enterprises may not be a simple linear relationship, that is, there can be a threshold. After exceeding this threshold, there may be a quadratic parabolic relationship. For example, Lu (2001) and others' Empirical Research on 164 small and medium-sized enterprises in Japan from 1986 to 1997 shows that the internationalization level and performance of enterprises show a similar U-shaped relationship (Zhang, Chen, 2017). Domestic scholars Zhang Xiaotao and Chen Guomei (2017) also draw a conclusion that the two show a U-shaped relationship by analyzing the data of 180 Chinese enterprises from 2010 to 2014 (Geringer, Beamish, Dacosta, 1989); Through the transaction cost theory, many scholars believe that the increasing transaction scale will lead to the rising cost, so it presents an inverted U-shape, and use empirical research to verify this result. For example, Geringer (1989) conducted an empirical study on the top 100 large enterprises in the United States and Europe from 1977 to 1981, and obtained the conclusion that the internationalization level and performance of enterprises show an inverted U-shape.

On the basis of combing the previous domestic and foreign scholars' existing literature on enterprise performance and internationalization, it is found that at different time points, using the data of different types of enterprises in different countries, the relationship between enterprise internationalization level and performance is also different. So the purpose of this paper is to analyze the internationalization level and enterprises performance on the basis of conforming to China's economic environment conditions, so as to get a convincing conclusion.

2 RESEARCH DESIGN

2.1 Samples and Data Sources

This paper takes the electronic manufacturing enterprises listed in Shanghai and Shenzhen A-share market from 2015 to 2019 as the research sample. In order to ensure the authenticity and reliability of the research data, the sample is selected in strict accordance with the following principles: 1) remove the enterprises that need special treatment due to abnormal financial data, mainly including St enterprises. 2) Eliminate the enterprises with missing data in a certain year. 3) Exclude the enterprises whose overseas sales revenue accounting for less than 10% of the total sales, that is, the internationalization level is still at a low level. After selecting, 525 observations of 105 electronic manufacturing enterprises were obtained. The sample data are mainly from CSMAR database. Stata12.0 software was used for data processing.

2.2 Research Hypothesis

According to the theory of first-mover advantage and the theory of post inferior position proposed by economist Watson, the first country can accumulate intangible wealth such as corporate reputation, brand, culture, and excellent system because of its earlier occupation of the market, and its economic activities are also more easily supported by local governments and have environmental advantages. The resources also have obvious advantages because they enter the market first, so the market left to the later entrants is not large. At this time, there are many barriers to enterprises in the developing countries when they enter the international market, such as the lack of advanced enterprise system and technology, so the enterprises in the latter developing countries have a great disadvantage in the early stage of internationalization because of their high costs According to the theory of international production compromise, enterprises must have the advantages of ownership and internalization in their export activities. The ownership advantage requires enterprises to have more advantages in technology or scale than host enterprises. Internal advantages require enterprises to have the ability to reduce risks and obtain information locally. Only after the two points can be fully met can enterprises choose to export internationally. According to the research of many domestic scholars, most of the enterprises in China are still in the early stage of internationalization, facing the burden of opening up the market with high cost. At this time, the investment of enterprises is generally greater than the profits.

To sum up, this paper predicts that there are many difficulties in the internationalization of domestic enterprises at this stage, so the growth of internationalization tends to cause negative returns to enterprises in the initial stage. At the same time, it is

predicted that with the continuous progress of enterprise internationalization, after gradually accumulating a certain reputation and forming a mature enterprise system, the strategic significance and overall benefits of domestic enterprise internationalization will gradually highlight. Therefore, this paper puts forward the following hypothesis

H0: Internationalization degree and performance of Chinese Enterprises show a U-shaped relationship.

2.3 Variable Selection and Measurement

2.3.1 Dependent Variable

In order to accurately measure the profits of enterprises, domestic and international scholars widely use financial performance or market performance. This paper uses the return on assets (ROA) in financial performance, that is, net profit after tax / total assets to measure.

2.3.2 Independent Variable

In the empirical analysis of the degree of internationalization of enterprises, most scholars measure the degree of internationalization of enterprises by the proportion of overseas assets, overseas sales revenue and overseas employees. Because China's enterprises are still mainly export-oriented at this stage, the author chooses the proportion of overseas sales revenue to the total sales revenue to measure.

2.3.3 Controlled Variable

This paper selects four controlled variables: (1) asset liability ratio. It is an important index to measure the performance of an enterprise, which is obtained from total liabilities / total assets. The enterprises with higher asset liability ratio will be more cautious in internationalization, and tend to reduce the risk of internationalization to reduce the risk of debt. (2) Enterprise scale. Measured by the natural logarithm of assets at the end of the year, larger enterprises will have more strength and need to expand overseas business and increase their transnational behavior. (3) Enterprise age. That is, the year of accounting report minus the year of establishment. Older enterprises tend to have more experience and survive for a longer time, which indicates that they have stronger management ability and more time to implement their strategies. (4) Research intensity. That is the proportion of research investment in total operating revenue. Research is very important for the

development of a country, an industry or an enterprise. Enterprises with higher research investment tend to pay more attention to long-term development and interests, have more ambition for development, and are more likely to implement internationalization strategy.

2.4 Research Model

Referring to the literature of domestic scholars, this paper sets up the regression equation (1):

$$ROA=\beta0+\beta1Fsts+\beta2Fsts2+\beta3Debt+\beta4Size+\beta5Age+\beta6Rd+ai+\theta it \qquad (1)$$

In the equation, ROA represents enterprise performance，$\beta0$ is a constant term, Fsts is the degree of internationalization of an enterprise, Fsts2 is a quadratic term to measure the degree of internationalization of an enterprise, which is used to test the convexity and convexity of an enterprise, Debt is the asset liability ratio of an enterprise, Size represents the scale of the enterprise, age represents the age of the enterprise, and Rd represents the Research intensity of the enterprise, ai is a constant random interference term in time, θit It is a random interference term that will change with time.

2.5 Multiple Regression and Hausman Test

Multiple regression refers to using more than two independent variables to find their relationship with the dependent variables, and hausman test is a significance test for the difference between two estimators of the same parameter in order to obtain more accurate estimation results.

In this essay, we first use the established multiple regression model to explore the diversification results that affect enterprise profits. Then, according to the random effect and fixed effect of panel data, the two estimators are obtained and analyzed by Hausman test.

3 EMPIRICAL ANALYSIS

3.1 Descriptive Analysis

The descriptive statistics of the whole sample data in 2015-2019 are shown in the table below.

Table 1: Descriptive statistics of whole sample mean.

Variables	Sample size	Mean				
Year		2015	2016	2017	2018	2019
Enterprise performance	105	4.876	5.343	5.354	3.933	3.683
Internationalization level	105	41.918	41.481	40.443	39.995	37.841
Asset liability ratio	105	0.363	0.371	0.391	0.415	0.419
Enterprise size	105	20.316	20.560	20.746	20.841	20.841
Enterprise age	105	15.952	16.952	17.952	18.952	19.952
Research intensity	105	6.728	6.825	6.521	6.846	7.036

Table 2: Correlation among variables.

	ROA	Fsts	Debt	Size	Age	Rd
ROA	1					
Fsts	-0.0138	1				
Debt	-0.1614	-0.0679	1			
Size	0.1021	0.3915	0.5838	1		
Age	-0.0389	-0.1308	0.1451	0.1054	1	
Rd	-0.0277	-0.0307	0.1898	-0.1887	-0.1215	1

As can be seen from the table, from the average point of view, the average proportion of overseas sales revenue of the electronic manufacturing enterprises after selection is very high, about 40%. And due to the selecting conditions, the lowest is more than 10%; at the same time, the average survival age of such enterprises is about 20 years. Combined with the data, the average life span of group enterprises in China is 7-8 years, and that of private enterprises is only 3.7 years, which indicates that the average life span of international enterprises is longer than average; the asset liability ratio is about 40%, which is lower than 63% of the average asset liability ratio of Chinese enterprises which shows that the average debt ratio of international enterprises is relatively low. In addition, the ratio of research investment to total operating income is about 7%. From the perspective of trend, the mean value of the proportion of overseas income decreases year by year, but the asset liability ratio increases year by year. It can be preliminarily seen that the internationalization behavior of enterprises may tend to let enterprises bear more costs and more liabilities at the initial stage. Therefore, from the perspective of internationalization trend, enterprises tend to slowly reduce the degree of internationalization.

Before using panel data for more detailed regression analysis, this paper also conducted correlation test on the main variables, and the results are shown in the table 2.

The correlation coefficient in the table also preliminarily verifies the conclusion of descriptive statistics, that is, there is a negative correlation between international operation and enterprise performance. On this basis, in order to ensure the authenticity of the regression, it is necessary to verify the relationship between the independent variables. From the table, except that the correlation coefficient between asset liability ratio and enterprise size is higher, which is 0.5638, the absolute value of the correlation coefficient between each variable is under 0.4. In order to more accurately ensure that there is no strong correlation between independent variables, the author further calculated the variance expansion coefficient (VIF), and obtained that the variance expansion coefficient is 1.51, which is far less than 10. Therefore, the author verifies that there is no high correlation between independent variables, and on this basis, the author carries out the regression analysis of panel data.

3.2 Regression Results and Analysis

After confirming that there is no strong correlation between the variables, the author uses stata12.0 software to test the panel data with fixed effect model and random effect model respectively, in order to determine the relationship between the electronic manufacturing enterprises and the degree of enterprise internationalization. In order to test which of the two models fits the equation better, this paper uses Hausman test to select the model. The results are as follows:

Table 3: Results of Hausman test.

	Coef.
Prob	0.0001
Chi-square test value	27.53

SO reject the original hypothesis: random effect is at the significance level of 1%. Therefore, the fixed effect model regression was selected. The analysis results of fixed effect model are shown in the table below.

Table 4: Influencing factors of enterprise performance (fixed effect).

Independent variable	Coefficient
Fsts	-0.384
	(-3.49)
Fsts2	0.003
	(3.16)
Debt	-27,999
	(-6.84)
Size	2.63
	(2.47)
Age	-0.325
	(-1.35)
Rd	-0.773
	(-4.53)
Constant term	-18.803
	(-1.05)
Sample size	105
R square within group	0.1165
F value	3.64
Prob	0.0000

From the fixed effect model fitting results, except for the age of the enterprise, each variable is significant at the 5% significance level, and the F statistical value of the joint regression is also significant. The first and second lines of the table report the first and second order conditions of the internationalization level on the enterprise performance. The first-order coefficient is significantly negative, which means that the performance of electronic manufacturing enterprises will decrease by 0.38% when the internationalization level of electronic manufacturing enterprises increases by 1%; but at the same time, in the long run, the quadratic coefficient of enterprises is significantly positive, which verifies the hypothesis at the beginning of this paper to a certain extent: the internationalization level of enterprises and performance present a U-shaped relationship of first decreasing and then increasing. At the same time,

according to the preliminary test of quadratic coefficient in this paper, it is 0.003. According to the formula, when the internationalization level of enterprises reaches about 64%, it can reach the lowest point of U-shape, and turn losses into profits.

3.3 Robustness Check

At present, the main methods of robustness test are: (1) adjusting the classification of data (such as adjusting the observation year of panel data); (2) replace variable with related variable (3) different measurement methods (such as GMM) are used to test whether the results are robust. This paper mainly adopts the second method, by replacing ROA with ROE, that is, net profit after tax / shareholders' equity, to measure the enterprise performance, to verify the robustness of the above results. The results are as follows:

Table 5: Regression results of robustness test (fixed effect).

Independent variable	Coefficient
Fsts	-0.766
	(-4.19)
Fsts2	0.006
	(3.63)
Debt	-51.494
	(-7.11)
Size	5.278
	(2.95)
Age	-0.738
	(-1.83)
Rd	1.143
	(-4.00)
Constant term	-42.566
	(-1.42)
Sample size	105
R square within group	0.1158
F value	3.42
Prob	0.0000

In the fixed effect model replaced by dependent variable, except that the coefficient of variables changed slightly, the sign and significance level of other variables were consistent with the above. Therefore, this study is reliable.

4 CONCLUSIONS AND SUGGESTIONS

4.1 Main Conclusions

In the 43 years since 1978 when China implemented the "reform and opening up" policy, the state has constantly put forward various reform policies and adhered to the principle of continuous opening up and mutual benefit. On this basis, all industries in our country continue to absorb foreign advanced knowledge, while also selling our goods to the world. And China as a typical late developing economy. Which stage is the internationalization behavior of domestic enterprises in now? How does the increasing overseas sales affect the profits of enterprises at this stage? All above has become valuable research topics.

Based on the existing analysis of the relationship between internationalization degree and performance, By using multiple regression and Hausman test, this paper analyzes the internationalization degree of Chinese electronic manufacturing enterprises and the evolution of various important indicators over time, and draws the conclusion that the internationalization department of Chinese enterprises at the present stage is not mature enough. At the same time, in the long run, there is a U-shaped relationship between internationalization degree and enterprise performance. Specifically speaking, in order to open up the international market, due to the first mover advantages of enterprises in other developed countries, the barriers to entry and the immature factors of our own, Chinese enterprises will face a huge entry cost in the initial stage of setting up an international department, and the short-term performance of enterprises will tend to decrease due to the improvement of the degree of internationalization. After that, with time elapsing, after the internationalization behavior of enterprises has gradually established a certain market reputation, adapted to the international market habits, and formed a perfect internationalization system, the internationalization behavior of enterprises will tend to bring greater benefits to enterprises.

4.2 Policy Suggestion

The conclusion of this paper has a very important practical significance for the government, the enterprises that are implementing the internationalization strategy and the enterprises that want to implement the internationalization.

For the government, it should realize that Chinese enterprises are still in the primary stage of socialism. At this time, enterprises that want to go abroad will face great costs. Therefore, if government want to continue to cultivate some internationally influential enterprises, it should continue to introduce a series of reform policies, such as giving some tax incentives to multinational enterprises and reducing financing costs. One belt, one road, and other big policies should be adopted to reduce the pressure of enterprises in the initial stage of international operation and improve the survival rate of enterprises.

For the enterprises that are implementing internationalization, they should actively deal with all kinds of problems in the process of internationalization. From the empirical research, internationalization behavior can promote the improvement of enterprise benefit and value in the long run. With the continuous development of economic globalization and the continuous saturation of domestic market in many industries, enterprises need to expand their competitiveness in order to continuously achieve profits. The broad international market brings many challenges as well as opportunities for development. Enterprises with international operations should focus on long-term interests and overcome the difficulties encountered in the initial stage of internationalization.

For the enterprises that want to enter the international market, they should first objectively evaluate the business status and strength of the enterprises, so as to determine the feasibility of entering and the strategic objectives of the enterprises. Because international operation in the early stage will have a greater negative impact on the performance of enterprises, and for the enterprise itself, continuous operation and profit is the first goal. Therefore, whether they can bear the initial cost of international operation is the first consideration for such enterprises. They should not be tempted by the international market and make a wrong assessment of their current strength.

REFERENCES

Geringer J M, Beamish P W, Dacosta R C. Diversification strategy and internationalization: Implications for mne performance[J]. Strategic Management Journal, 1989, 10(2):109-119.

Grant, Robert M. Multinationality and Performance among British Manufacturing Companies[J]. Journal of International Business Studies, 1987, 18(3):79-89.

Kim W C, Burgers H W P. Multinationals\" Diversification

and the Risk-Return Trade-Off[J]. Strategic Management Journal, 1993, 14(4):275-286.

Lu J W, Beamish P W. The internationalization and performance of SMEs[J]. Strategic Management Journal, 2001, 22(6-7):565-586.

Thomas G. Parry. The International Operations of National Firms: A Study of Direct Foreign Investment. Stephen Herbert Hymer[J]. 1977, 85(5) : 1096-1098.

Wang Guoshun, Hu Sha. Enterprise internationalization and business performance: An Empirical Study of Chinese Manufacturing Listed Companies [J]. Systems engineering, 2006 (12): 80-83.

Xue Youzhi, Zhou Jie. Product diversification, internationalization and corporate performance -- Empirical Evidence from Chinese Manufacturing Listed Companies [J]. Nankai management review, 2007 (03): 79-88Collins, Markham J. A Market Performance Comparison of U.S. Firms Active in Domestic, Developed and Developing Countries[J]. Journal of International Business Studies, 1990, 21(2):271-287

Zhang Xiaotao, Chen Guomei. Research on the impact of internationalization degree and OFDI location distribution on Enterprise Performance -- Based on the evidence of China's A-share listed manufacturing enterprises [J]. International business (Journal of University of foreign economics and trade), 2017 (02): 72-85.