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Research Paper

Moderating Effects of the Degree of Internationalization and Firm-Specific Assets on Corporate Performance

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ABSTRACT

By panel data analysis, this paper discusses the effects of the degree of internationalization (DOI) and firm-specific assets (FSA) on the corporate performance of China's non-financial listed companies from 2007 to 2019. According to the results, the degree of internationalization of Chinese enterprises has positive U-shaped effects on corporate performance, firm-specific assets significantly and positively moderate the effects of the degree of internationalization on corporate performance, and the cross-over study shows that the increase of intensity helps the development of enterprise internationalization (the right half of the U shape). While marketing intensity and capital intensity have inverted U-shaped effects, the difference is that the effects of capital intensity remain positive. This indicates that international marketing costs increase greatly in the later stage of internationalization, thus, marketing intensity leads to the negative effects of the degree of internationalization on corporate performance. The scale economy of a company has threshold effects.

Keywords: *degree of internationalization, firm-specific assets, panel data, interaction*
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I. INTRODUCTION

Regarding the comprehensive review of literature in recent decades, Vernon (1966) and Hymer (1976) explained the overseas direct investment of international enterprises, in terms of theoretical explanations or empirical verification, in-depth studies about the effects of internationalization on corporate performance have been made from various perspectives in academic circles. Whether internationalization can bring profits to firms is an important topic long discussed in academic circles and arouses the concern of the practice field.

Internationalization generally refers to the degree to which a company operates beyond its national boundaries and the fact that a company benefits from products and geographic diversification through scale economy and scope economy (Hitt et al., 1997). According to the ownership, location, and internalization advantages in the overseas investment theory, or the internalization theory and eclectic theory developed from the above theory (Buckley, 1976; Dunning, 1977), enterprises can achieve benefits through internationalization. While there are many study results, the findings and conclusions are not consistent. Most results show that there is a positive relationship (Grant, 1987; Daniels and Bracker1989, Gaur and Kumar, 2009; Filatotchev and Piesse, 2009; Brouther et al., 2009; Horta, 2016; Feng et al., 2019), negative relationship (Collins, 1990; Geringer et al., 2000; Goerzen and Beamish, 2003; Banalieva and Santoro, 2009; Zhao & Ma, 2016), or no relationship (Morck and Yeung, 1991; Zeng et al., 2009; Dastidar, 2009; Chen et al., 2015; Christian et al., 2018).

However, with the deepening of the discussions, the U-shaped relationship (Ruigrok and Wagner, 2003; Chiao et al., 2006; Driffield et al., 2008; Altaf and Shah, 2015; Wei et al., 2019), the ∩-shaped relationship (Hitt, Hoskisson, and Ireland, 1994; Sullivan, 1994; Juan et al., 2016; Raquel, 2017; Andres et al., 2018), and the S-shaped relationship (Contractor et al., 2003; Lu and Beamish, 2004; Hien et al., 2018; Majid & Preet, 2018) have emerged. Theorists supporting the U-shaped relationship consider that, in the initial stage of

internationalization, due to various factors, such as unfamiliarity with the foreign environment, lack of resources, immature technologies, and failure to achieve economic scale, the costs will outweigh the benefits, which lead to negative effects on performance (Ruigrok and Wagner, 2003). Theorists supporting the ∩-shaped relationship consider that the expansion of geographical markets can have immediate positive effects on corporate performance. However, once the degree of internationalization exceeds a certain threshold, due to various factors, such as a fragmented market, great increases in communication and coordination costs, and corporate resources and capabilities not growing as fast as overseas expansion, excessive internationalization has negative effects on corporate performance. Theorists supporting the S-shaped relationship advocate a 3-stage theory. In the first stage of international expansion, new international enterprises must bear learning costs, as they are small and young and do not have the capital to absorb the learning costs. Furthermore, these costs outweigh the benefits of internationalization and extend the process for international enterprises to make profits, which lead to a negative relationship between internationalization and corporate performance. In the second stage, with increased international experience, international enterprises learn how to increase the efficiency of their subsidiaries to reduce the costs of overseas subsidiaries. At the same time, with the increased degree of internationalization, they distribute asset advantages over a wider market and develop new capabilities in the international market; therefore, internationalization is positively related to corporate performance (Contractor et al., 2003; Lu and Beamish, 2004). However, with the increased degree of internationalization, the network of overseas subsidiaries becomes larger and companies conduct business in more and more countries, thus, the costs of corporate governance and coordination outweigh the benefits of internationalization again after increasing to a certain level, which lead to a negative relationship between internationalization and corporate performance. As there are so many different conclusions, it indicates that the relationship between the degree of internationalization and performance remains undefined, including whether internationalization can bring good performance to Chinese enterprises. Hence, the degree of internationalization is the first topic to be discussed in this study.

Regarding multinational enterprises, firm specific advantages are also considered as one of the important factors affecting enterprises' multinational operation performance, thus, studies generally support that firm advantages have positive effects on firm performance (Delios and Beamish, 1999; Morck and Yeung, 1991). Other scholars have argued that the factor that helps to improve firm performance is ownership advantages (such as, research and development intensity, advertising intensity, and capital intensity) (Jung, 1991), and firm-specific assets (FSA) are the most important resource (Dess, Gupta, Hennart, and Hitt, 1995). According to the resource-based view (RBV) (Barney, 1991), companies gain competitive advantages and lasting superior returns with their unique resources and specific assets (Barney, 1991), which may include brand, skilled laborers, scientific knowledge, and efficient production processes (Wernerfelt, 1984). As these resources, such as assets, knacks, and skills, are difficult to formalize and be replicated by competitors, they can be used to obtain superior returns, and these resources are called firm-specific assets. At present, research and development intensity, capital intensity, and marketing intensity have been used in some studies to measure firm-specific assets (Caves, 1971). While firm-specific assets have also been used to discuss the performance of international enterprises, there have been no discussions regarding whether firm-specific assets affect the relationship between internationalization and corporate performance (Morck and Yeung, 1991). In addition, some studies only discussed the effects of research and development intensity and marketing intensity on internationalization and corporate performance (Qian and Wang, 1999), but did not consider the effects of capital intensity on internationalization and corporate performance. However, in studies on the effects of DOI and FSA on corporate performance, most scholars used one or two FSA variables and DOI to discuss their effects on corporate performance. According to Ren et al. (2015), when middle and small-sized enterprises have high research and development capabilities or marketing capabilities, internationalization has positive effects on innovation performance. However, it is worth noting that, with low research and development capabilities or marketing capabilities, internationalization has negative effects on innovation performance. In addition, according to the results, marketing capabilities can positively enhance the effects of research and development capabilities and internationalization on innovation performance. In terms of the effects of DOI and RDI, (Lu and Beamish, 2006; Pangarkar, 2008; Musteen et al., 2010), internationalization enables small and medium-sized enterprises to make better use of technology investments to obtain appropriate returns. Recently, many scholars have studied the effects of firm-specific assets and degree of internationalization on corporate performance. Lucas and Ayse (2018) pointed out that, provided that the research and development investment is larger than the critical threshold, increased internationalization promotes non-high-tech small and medium-sized enterprises to make more effective use of their research and development investments to improve their corporate performance. In terms of the effects of DOI and MI, Wenbin et al. (2019) considered that strong marketing capabilities can help international expansion achieve better results, but low marketing capabilities will not have these positive results. In terms of the effects of capital intensity and degree of internationalization on corporate performance, according to the study of Chaiporn (2017) on the large panel samples of non-financial listed companies in the

United States from 1990 to 2013, capital investment has negative effects on the degree of internationalization. In addition to internationalization, whether firm-specific assets can improve the corporate performance of Chinese firms is a topic to be clarified in this study.

In fact, there are few studies regarding the moderating effects of the degree of internationalization and firm-specific assets on corporate performance, especially in emerging countries. Ahmet et al. (2017) pointed out that firm-specific assets can help enterprises obtain higher returns in the process of internationalization. Through a study of American film production enterprises, Tashman (2019) also found the importance of firm-specific assets to corporate internationalization. In addition to the analysis of moderating effects, the analysis of interaction is another major topic of this study.

This paper consists of 4 main parts. The first part is the Introduction, which introduces the theory of enterprise internationalization, discusses literature regarding the effects of the degree of internationalization on corporate performance, and explains the moderating effects of firm-specific assets and the degree of internationalization on corporate performance. The second part is the Research Data and Research Method, which explains the study data (29825) and study period (2007-2019), introduces the 13 variables studied in this paper, and discusses the reasons and processes for using panel data analysis in detail. The third part is Empirical Analysis, and the results show that the degree of internationalization is U-shaped and has positive effects on Chinese enterprises' performance, firm-specific assets have positive moderating effects and interaction, and the 3 variables of firm-specific assets have different effects. The last part offers the Conclusions of this study.

1. Research Data and Research Method

This paper discusses the interaction between firm-specific assets and the degree of internationalization of China's non-financial listed companies on corporate performance from 2007 to 2019. There are 4 explanatory variables, 1 explained variable, and 8 control variables. The data compiled by this study were calculated based on the annual reports of companies and the stock prices published by securities companies. The missing data in the process and the abnormal data from companies (ST stocks) with operational problems were deleted, and the annual study data are collated, as shown in Table 1. According to Table 1, China's listed companies grew continuously during the study period, with a growth rate of nearly 3 times during the 13 years. A total of 3531 enterprises were selected as the samples in this study, with 29825 data. The number of enterprises varied from year to year, indicating unbalanced panel data in this study.

Table 1 Annual distribution of sample size in this study

year	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
total	1288	1345	1448	1761	2027	2230	2241	2335	2529	2778	3173	3279	3327

1.1 Research Variables

Based on the above statement, the variables in this study were divided into 4 major categories: 1) the degree of internationalization (DOI) and firm-specific assets (research and development intensity (RDI), marketing intensity (MI), and capital intensity (CI) of the explanatory variables; 2) corporate performance Tobin's Q (CFP) of the explained variables; 3) board structure (board size BS), proportion of independent directors and supervisors (OB), directors and supervisors holding concurrent posts (BP), board chairmen holding concurrent post of general managers (BM), the stock pledge of major shareholders (BL)); 4)scale of the company (SC), equity ratio (ER), and listing age (AG) of the control variables. All variables are described as follows:

2.1.1 Independent variable

In order to explore the relationship of performance, this study converted the export sales as a percentage of total sales (ESTS) (Michel and Shaked, 1986; Shaked,1986) into the natural logarithms of the results, as obtained by dividing overseas sales by domestic sales (adding 1 to each of them to avoid being equal to 0, to calculate natural logarithms). The calculation method is, as follows.

$$DOI = LN\left(\frac{OS + 1}{IS + 1}\right) \qquad (1)$$

$$OS : \text{export sales as a percentage}$$

$$IS : \text{import sales as a percentage}$$

Sourced from the annual reports of major companies, the data were classified into domestic and overseas sales, and then, calculated by the above equation.

The term firm-specific assets was first included into moderating effects by Morck and Yeung (1991) to study the relationship between the degree of internationalization and corporate performance, then, different scholars studied many different firm-specific assets. Based on the summary of many scholars' studies, this study explored 3 variables of firm-specific assets, namely, research and development intensity, marketing intensity, and capital intensity (first used by Jung 1991).

$$RDI(t)_i = \frac{RD(t)_i}{S(t)_i} \qquad (2)$$

RD(t)$_i$: R & D expenses of i compant of t - period

S(t)$_i$: Total sale of i compant of t - period

$$MI(t)_i = \frac{MK(t)_i}{S(t)_i} \qquad (3)$$

MK(t)$_i$: marketing expenses of i compant of t - period

S(t)$_i$: Total sale of i compant of t - period

$$CI(t)_i = \ln\left(\frac{LA(t)_i}{LA(t-1)_i}\right) \qquad (4)$$

LA(t)$_i$: illiquid assets of i compant of t - period

Sources: Annual reports published by listed companies and Calculations by this paper

2.1.2 Dependent variable

In order to achieve business objectives and pursue shareholder wealth maximization, Tobin's Q, which is the most commonly used method to determine market performance, was adopted as the corporate performance in this study. Due to the difficulty in obtaining the data of replacement costs of assets and market values of liabilities, Proxy Q, as proposed by La Porta et al. (2002), was adopted in this study.

$$CFP(t)_i = \text{Proxy Q}(t)_i = \frac{ME(t)_i + BD(t)_i}{BA(t)_i} \qquad (5)$$

$ME(t)_i$: i market value of equity in Period t of Company I (common stocks + preferred stock)
$BD(t)_i$: total book liabilities in Period t of Company i
$BA(t)_i$: total book assets in Period t of Company i
Source: Shanghai and Shenzhen Stock Exchange (stock prices), major companies' annual reports, and calculations in this study

2.1.3 Control variables

This study divided the control variables into 2 major categories: corporate governance, as represented by board structure herein; the corporate system, and 3 variables commonly used by scholars were adopted herein.

Board structure is generally governed by board size (Yermack,1996; Setiawanet al., 2017), the proportion of independent directors and supervisors (Fama,1980; Baysinger and Hoskisson, 1990), the directors and supervisors holding concurrent posts (Core, Holthausen, and Larcker, 1999; Shivdasani and Yermack, 1999), board chairmen holding concurrent post of general managers (Jensen, 1993;Yermack, 1996), and stock pledge of major shareholders (Yeh and Lee, 2001).

$$BS = \text{Total seats of directs} \quad (6)$$

$$OB = \frac{\text{Seats of external directs}}{\text{Total seats of directs}} \quad (7)$$

$$BP = \begin{cases} 1 & \text{The concurrent position of directors is a virtual variable. If more than half of the board of directors assume three or more positions} \\ 0 & \text{other} \end{cases} \quad (8)$$

$$BM = \begin{cases} 1 & \text{Chairman and general manager} \\ 0 & \text{other} \end{cases} \quad (9)$$

$$PL = \frac{\text{Quantity of pledge by majority shareholding}}{\text{Total quantity of majority shareholding}} \quad (10)$$

In terms of corporate systems, 3 control variables are generally used, namely, the scale of the company under the effect of scale economy, the debt ratio (however, in order to make the variables tend to be normally distributed, the natural logarithm of equity ratio was adopted in this study) in the application of capital structure (Myers,1977), and listing age arising according to the characteristics of Chinese securities laws and regulations.

$$SC=\ln(\text{total asset}) \quad (11)$$

$$ER(t)_i = \ln\left(\frac{BD(t)_i}{BE(t)_i}\right) \quad (12)$$

$BE(t)_i$: total equity of i compant of t - period

the length of stock public(AG)

$$AG(t)_i = \ln(DATA(t)_i - IPO_i) \quad (13)$$

$DATA(t)_i$: 12/31 of the t - year

IPO_i : stock public of the date of i company

Source: major companies' annual reports and calculations in this study

1.2 Descriptive statistics

According to the previous introduction of the variables, the basic statistics of the variables in this study are shown in Table 2. According to Table 2, except that the averages of company scale and board size are large, the values of the variables in this study are in single digits, and the values of the degree of internationalization, equity ratio, and proportion of independent directors and supervisors are negative (the natural logarithms of the 3 variables are taken), indicating that the numerators are smaller than denominators. In terms of the degree of internationalization, the export sales are smaller than domestic sales, indicating that China is still dominated by domestic demands. The proportion of independent directors and supervisors is negative, indicating that there are more internal directors and supervisors than external directors and supervisors. The negative equity ratio clearly shows that liabilities are higher than equities. While the research and development intensity and marketing intensity are positive, they are not very large (0.03, 0.07), indicating that Chinese enterprises should invest more in research, development, and marketing. The positive capital intensity shows that the fixed assets of Chinese companies are increasing every year, indicating that enterprises should continue to invest in fixed assets, as they consider that the economy is still growing.

In terms of data distribution, the equity ratio and listing age are left-skewed, while the others are right-skewed. In terms of data concentration, the kurtosis shows that most of the study data are leptokurtic (K>3).

Table 2 Descriptive statistics of study variables

	CFP	RDI	MI	CI	DOI	BS	OB	BP	BM	PL	SC	ER	AG
Obs.	29761	29761	29761	29761	29761	29761	29761	29761	29761	29761	29761	29761	29761
Mean	2.63	0.03	0.07	0.19	-2.94	12.80	-1.03	0.10	0.26	0.20	22.04	-0.34	7.76
Med.	2.00	0.02	0.04	0.11	-3.64	12.00	-1.10	0.000	0.000	0.05	21.85	-0.30	8.06
Max.	34.01	0.60	0.60	5.99	4.62	43.00	0.69	1.00	1.00	1.00	28.64	6.28	9.27
Min.	0.44	0.000	0.000	-5.73	-4.62	7.00	-2.40	0.000	0.000	0.000	18.16	-4.94	0.000
Std. D.	2.07	0.05	0.08	0.41	1.90	2.74	0.22	0.30	0.44	0.26	1.32	1.07	1.16
Sk	3.66	3.50	2.61	2.27	0.89	1.47	0.69	2.72	1.07	1.16	0.84	-0.04	-1.64
K	27.47	23.32	11.29	30.97	2.96	7.59	4.97	8.37	2.15	3.18	4.12	3.78	7.18

1.3 Research Modeling

In order to explore the interaction between firm-specific assets and the degree of internationalization on corporate performance, this study first discussed the effects of firm-specific assets and the degree of internationalization on corporate performance, and then, the interaction between the two. According to the effects of the degree of internationalization on corporate performance, as explained in the literature review in the first chapter, there are independent, linear, U-shaped, S-shaped, and W-shaped relationships. Preliminary analysis shows that the degree of internationalization has a U-shaped relationship with corporate performance; hence, a quadratic relationship is adopted in the model. Many scholars have indicated that there is a quadratic relationship between firm-specific assets and corporate performance; however, according to the preliminary analysis of this study, there is no quadratic relationship, thus, a linear relationship is established. According to the scale economy, when a company has a certain size, there is a quadratic relationship, which is proved by preliminary analysis. Hence, this study established a quadratic relationship for the scale of company, and linear relationships for other variables. Higher-order terms cause multicollinearity, thus, higher-order variables are required. This study used the decentralized solution, as obtained by subtracting the average from the value, namely $X' = X - \overline{X}$, and decentralization is expressed by X' (including DOI', SC'). The 2 models established are shown, as follows.

$$\begin{aligned} \textit{Model I} \quad CFP &= \beta_0 + \beta_1 DOI + \beta_2 DOI'^2 + \beta_3 RDI + \beta_4 MI + + \beta_5 CI \\ &+ \beta_6 BS + \beta_7 OB + \beta_8 BP + \beta_9 BM + + \beta_{10} PL \\ &+ \beta_{11} SC + \beta_{12} SC'^2 + \beta_{13} ER + \beta_{14} AG \end{aligned}$$

$$\begin{aligned} \textit{Model II} \quad CFP &= \beta_0 + \beta_1 DOI + \beta_2 DOI'^2 + \beta_3 RDI + \beta_4 MI + + \beta_5 CI \\ &+ \beta_6 DOI' \cdot RDI' + \beta_7 DOI'^2 \cdot RDI' + \beta_8 DOI' \cdot MI' \\ &+ \beta_9 DOI'^2 \cdot MI' + \beta_{10} DOI' \cdot CI' + \beta_{11} DOI'^2 \cdot CI' \\ &+ \beta_{12} BS + \beta_{13} OB + \beta_{14} BP + \beta_{15} BM + + \beta_{16} PL \\ &+ \beta_{17} SC + \beta_{18} SC'^2 + \beta_{19} ER + \beta_{20} AG \end{aligned}$$

1.4 Cointegration Test

Collinearity among variables is least expected in multivariate quantitative analysis (decentralization was used in the previous statement to solve the higher-order terms). This study tested whether there was collinearity among variables. First, a correlation coefficient matrix was established to verify the relationships among variables, as shown in Table 3. According to Table 3, the greatest correlation coefficient among the variables is 0.60 (DOI'^{2}*RDI1, RDI), which fails to meet the criteria of high correlation. In order to achieve preciseness, the cointegration test of Engle and Granger (1987) was adopted in this study. According to the results, t-Statistic=-14.17 and P-VALUE0.000, which indicates no cointegration and no collinearity among all variables of this study.

1.5 Research Method

This study was conducted from 2007 to 2019 and a total of 29825 panel data were collected. There are many modes to test whether panel data analysis is suitable. This study conducted the test by Pooled Regression Analysis. If the R^2 of the Weighted Statistic is larger than the R^2 of the Unweighted Statistic, and the SSE of the Weighted Statistic is smaller than the SSE of the Unweighted Statistic, then, panel data analysis is applicable to the study. The test results are shown in Table 4.

According to Table 4, for both models, the weighted R^2 (0.64, 0.63) is larger than the unweighted R^2 (0.26, 0.26) and the weighted SSE (83166.63, 83137.63) is larger than the unweighted SSE (94459.27, 94124.13). Hence, panel data analysis is applicable to the models in this study.

Table 3 Correlation Coefficient Matrix

	CFP	DOI	DOI'^{2}	RDI	MI	CI	DOI*RDI'	DOI^2*RDI'	DOI*MI'	DOI^2*MI'	DOI*CI'	DOI^2*CI'	SC	SC'^{2}	ER	AG	BS	OB	BM	BP	PL
CFP	1																				
DOI	0.000	1																			
DOI'^{2}	0.03	0.64	1																		
RDI	0.24	0.11	0.000	1																	
MI	0.17	-0.10	-0.06	0.23	1																
CI	0.05	0.000	0.01	0.08	0.01	1															
DOI*RDI	-0.05	0.000	0.000	-0.13	-0.06	-0.02	1														
DOI^2*RDI	0.16	0.08	-0.02	0.60	0.11	0.05	0.40	1													
DOI*MI	-0.09	-0.08	-0.11	-0.06	-0.36	-0.01	0.20	0.01	1												
DOI^2*MI	0.07	-0.16	-0.18	0.11	0.58	0.000	0.02	0.11	0.23	1											
DOI*CI	0.01	0.01	0.03	-0.02	-0.01	-0.06	0.08	0.03	-0.01	-0.03	1										
DOI^2*CI	0.02	0.02	0.04	0.04	0.000	0.51	0.02	0.07	-0.03	-0.06	0.55	1									
SC	-0.45	-0.06	-0.07	-0.20	-0.16	0.02	0.07	-0.11	0.09	-0.06	0.01	0.02	1								
SC'^{2}	-0.02	-0.04	-0.02	-0.09	-0.09	-0.01	0.01	-0.04	0.04	-0.04	0.01	0.000	0.48	1							
ER	-0.34	-0.07	-0.06	-0.34	-0.23	-0.06	0.06	-0.21	0.14	-0.09	0.000	-0.02	0.46	0.18	1						
AG	-0.25	-0.12	-0.08	-0.22	-0.07	-0.19	0.06	-0.15	0.08	-0.01	0.000	-0.09	0.36	0.06	0.38	1					
BS	-0.16	-0.08	-0.06	-0.14	-0.08	-0.07	0.03	-0.08	0.04	-0.04	0.000	-0.03	0.31	0.15	0.21	0.19	1				
OB	0.05	0.06	0.03	0.10	0.06	0.04	-0.01	0.06	-0.01	0.02	-0.01	0.01	-0.01	0.04	-0.07	-0.09	-0.25	1			
BM	0.12	0.10	0.08	0.17	0.10	0.08	-0.01	0.12	-0.05	0.04	0.01	0.05	-0.16	-0.05	-0.16	-0.22	-0.18	0.11	1		
BP	0.000	0.000	0.000	0.05	0.03	-0.02	0.000	0.02	-0.01	0.02	0.01	0.000	0.01	0.03	0.000	0.03	-0.08	0.05	0.01	1	
PL	-0.02	-0.01	-0.01	-0.01	0.01	-0.02	0.02	-0.01	0.02	0.04	-0.01	-0.01	-0.03	-0.09	0.11	0.16	-0.12	0.06	0.07	-0.01	1

Panel data have many advantages, and three of them are described, as follows: first, panel data contain more samples and information, which can reduce the possibility of collinearity among variables, increase the degree of freedom of the test statistics, and enhance the validity of estimates; second, as there are cross-section and time dimensions, panel data have a dynamic analysis model, thus, the time changing trend of the effect can be examined; third, panel data can reduce the malicious endogenous problem (meaning endogeneity due to missing variables).

Table 4 Weighted and Unweighted Statistic of $R^2$and SSE for Pooled Regression Analysis

MODEL		I	II
R^2	Weighted	0.64	0.63
	Unweighted	83166.63	83137.63
SSE	Weighted	0.26	0.26
	Unweighted	94459.27	94124.13

2. Empirical Analysis

There are 2 effects of panel data analysis: fixed effect and random effect, which can be tested by the chi-square test of Hausman (1978), and the results are shown in Table 5. According to the result, the p-value is less than 0.05, indicating that the fixed effect is best to explain the 2 models in this study.

Table 5 Table of the Hausman Test

MODEL	χ^2 Statistic	d.f.	Prob.
I	288.27	14	0.000
II	326.68	20	0.000

The analysis results of the fixed effect are shown in Table 6. According to Model I, the degree of internationalization has a significantly U-shaped relationship with corporate performance, and firm-specific assets (research and development intensity 5.07, marketing intensity 1.47, capital intensity 0.16) have a significantly positive relationship with corporate performance. In terms of control variables, the scale of the company positively affects (also U-shaped) corporate performance after reaching the threshold, and the equity ratio (-0.17) and listing age (-0.04) significantly and negatively affect corporate performance. In the board structure, board size (0.01), proportion of independent directors and supervisors (0.11), and board chairmen holding the concurrent post of general managers (0.06) significantly and positively affect corporate performance. The directors and supervisors holding concurrent posts and the stock pledge ratio of major shareholders shows a significant relationship, as based on the sample size of this study.

Model II discusses the effects of cross terms. Before analysis, by comparison, the results are the same as those of the variables in Model I. The degree of internationalization has a U-shaped relationship with corporate performance, as shown in Figure 1. Its positive effects on corporate performance are maintained, and accelerate the increase when the value declines to -0.71 (export sales accounting for 28.6%).

$$CFP(DOI)=-0.06976DOI+0.01567\ (DOI+2.9389)^2+G_1(x)$$

$$\xrightarrow{\text{differenti al}} CFP'(DOI)= -0.06976+0.3135\ (DOI+2.9389)=0$$

$$DOI=-0.7135$$

The function of the effects of research and development intensity and degree of internationalization on corporate performance is, as follows (including significant effects).

Obviously, the intensity of research and development (4.23) positively affects corporate performance, and the interaction (0.27) between research and development intensity and the square of the degree of internationalization helps corporate performance.

$$CFP(DOI, RDI)= -0.0698DOI+0.0157\ (DOI+2.9389)^2+4.2307RDI$$

$$+0.2671(DOI+2.9389)^2*\ (RDI- 0.0327)\ +G_2(x)$$

Table 6 Fixed effect analysis

Model	I			II		
Variable	Coefficient	t-Statistic	Significant level	Coefficient	t-Statistic	Significant level.
C	19.44	(89.84)	***	19.44	(89.82)	***
DOI	-0.07	(-10.61)	***	-0.07	(-10.86)	***
DOI'^{2}	0.02	(6.93)	***	0.02	(6.53)	***
RDI	5.07	(22.16)	***	4.23	(13.35)	***
MI	1.47	(12.72)	***	1.61	(8.99)	***
CI	0.16	(6.75)	***	0.20	(6.53)	***
DOI1*RDI1			***	-0.16	(-1.07)	
DOI'^{2}*RDI1			***	0.27	(4.30)	***
DOI1*MI1			***	-0.15	(-1.71)	*
DOI'^{2}*MI1			***	-0.07	(-2.24)	**

DOI1*CI1			***	0.06	(4.17)	***
DOI'^{2}*CI1			***	-0.01	(-1.89)	*
SC	-0.79	(-80.23)	***	-0.79	(-80.27)	***
SC'^{2}	0.17	(49.10)	***	0.17	(49.04)	***
ER	-0.17	(-15.82)	***	-0.17	(-15.55)	***
AG	-0.04	(-4.13)	***	-0.04	(-3.91)	***
BS	0.01	(2.99)	***	0.01	(2.95)	***
OB	0.11	(2.58)	***	0.11	(2.64)	***
BM	0.06	(2.58)	***	0.05	(2.44)	**
BP	-0.04	(-1.20)		-0.04	(-1.15)	
PL	-0.01	(-0.21)		-0.001	(-0.09)	
R^2		0.42			0.42	
F-statistic		824.18			672.70	
Prob		0.000			0.000	

The function of the effects of marketing intensity and the degree of internationalization on corporate performance is, as follows (including significant effects).

$$CFP(DOI, MI)= -0.0698DOI+0.0157 (DOI+2.9389)^2+ 1.6121MI$$
$$-0.1455(DOI+2.9389)* (MI- 0.0716)$$
$$-0.0703 (DOI+2.9389)^2* (MI-0.0716) +G_3(x)$$

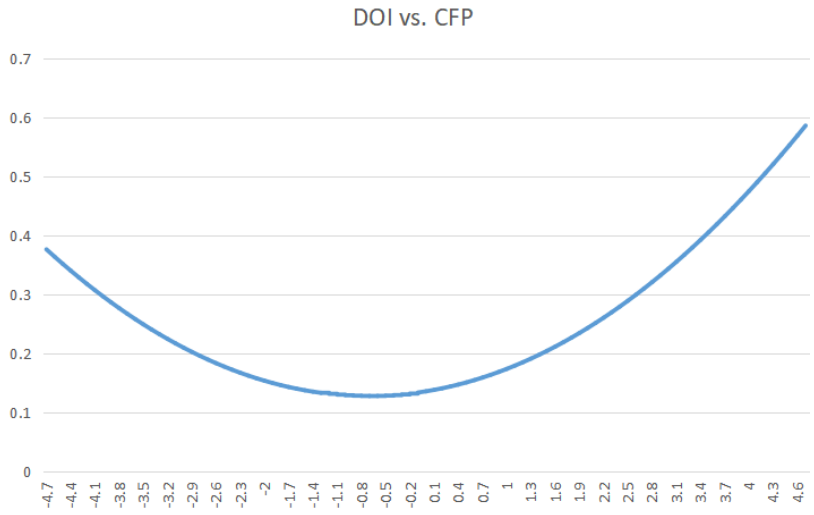

Figure 1 Trend of the relationship between degree of internationalization and corporate performance

Marketing intensity positively affects corporate performance (1.6121). However, the interaction between marketing intensity and the square of the degree of internationalization becomes a negative acceleration effect, which is like the right half of an inverted U shape. The interaction becomes completely negative when DOI=1 (the proportion of export sales=0.71), which seems to explain the difficulty of international marketing. While internal marketing helps the development of corporate performance, the development of international marketing is unhelpful to corporate performance. (As shown in Figure 2)

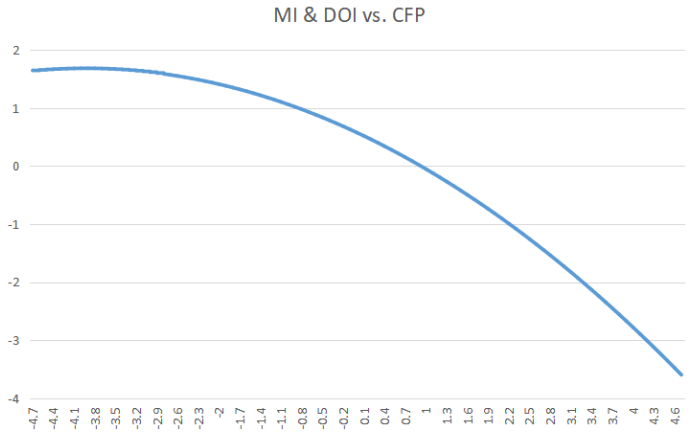

Figure 2 Trend of interaction between degree of internationalization and marketing intensity on corporate performance

The function of the effects of capital intensity and degree of internationalization on corporate performance is, as follows (including significant effects).

$$CFP(DOI, CI) = -0.0698DOI + 0.0157\,(DOI+2.9389)^2 + 0.1994CI + 0.0648\,(DOI+2.9389)^2 * (CI - 0.1884) - -0.0089\,(DOI+2.9389)^2 * (CI - 0.1884) + G_4(x)$$

Capital intensity positively affects corporate performance (0.1994). However, the interaction between marketing intensity and the square of the degree of internationalization becomes U-shaped (positive). In the beginning of internationalization, the increase of capital intensity has positive acceleration effects on corporate performance; however, when DOI=1, the effects decelerate. (As shown in Figure 3)

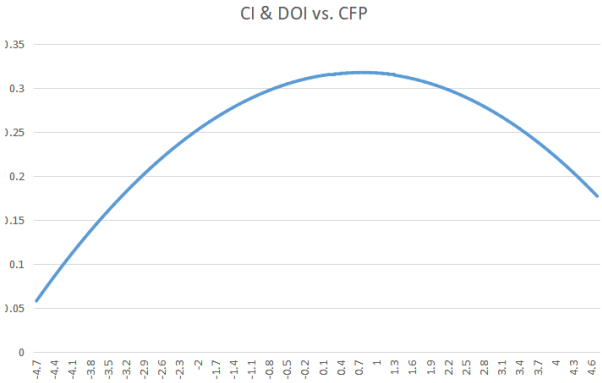

Figure 3 Trend of interaction between degree of internationalization and capital intensity on corporate performance

$$\xrightarrow{\text{differenti al}} \frac{\partial CFP\ (DOI\ , CI\ )}{\partial CI} = 0.1994\ + 0.0648\ (DOI\ + 2.9389\ ) - 0.0089\ (DOI\ + 2.9389\ )^2$$ The effects of the scale of a company are U-shaped, as shown in Figure 4; however, they are not all positive. The effects on corporate performance are obviously positive only for small companies; however, the positive effects start to decline as companies get bigger. When SC is about 14, the scale of the company has negative acceleration effects on corporate performance; when SC is around 24, a reversal occurs; when SC=35, the effects of scale economy on corporate performance become significant.

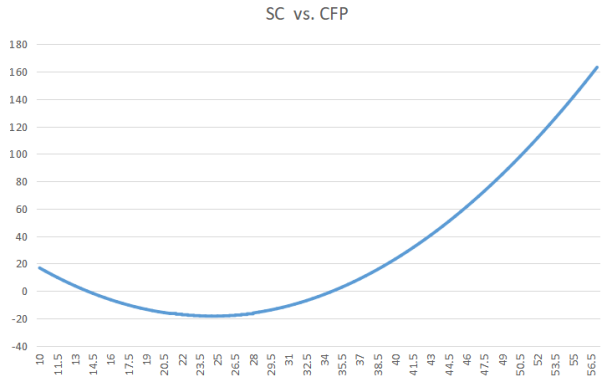

Figure 4 Trend of the relationship between the scale of the company and corporate performance

II. CONCLUSION

By panel data analysis, this paper discusses the effects of the degree of internationalization (DOI) on corporate performance of China's non-financial listed companies (3531 enterprises, a total of 29825 data) from 2007 to 2019, which is supplemented with firm-specific assets for cross-analysis. Company attributes (scale of company, equity ratio, and listing time) are added as the control variables, and board structure is used to solve the problem of endogeneity.

The results consist of three parts. First, the degree of internationalization of Chinese enterprises has U-shaped positive effects on their corporate performance. While the initial decline of the U shape has no negative effects on corporate performance, the positive acceleration effects on corporate performance will be obvious with the development of internationalization to a certain degree (export sales account for about 30%). Second, the cross effects of firm-specific assets and the degree of internationalization on corporate performance are discussed. Firm-specific assets significantly and positively moderate the effects of the degree of internationalization on corporate performance, and increased research and development intensity strengthens the positive acceleration effects of the degree of internationalization on corporate performance (the right half of the U shape). Thus, it is clear that the increased research and development intensity helps the development of enterprise internationalization. Marketing intensity has inverted U-shaped effects, which indicates that the international marketing cost increase greatly in the later stage of internationalization (export sales accounting for about 70%), meaning that marketing intensity leads to negative effects of the degree of internationalization on corporate performance. Capital intensity also leads to the inverted U-shaped effects of the degree of internationalization on corporate performance; however, different from marketing intensity, such inverted U-shaped effects remain positive. In other words, the increase of capital intensity has positive acceleration effects on corporate performance in the early stage of internationalization, but has decreasing acceleration effects in the later stage due to the rise of internationalization costs.

Finally, this study discussed the control variables. According to the studies of past scholars on board structure, the board size and proportion of independent directors and supervisors positively moderate the effects of the degree of internationalization on corporate performance. Autocratic decision-making (board chairmen holding concurrent post of general managers) helps the development of internationalization. The stock pledge ratio of major shareholders also reflects their company operations, which shows obvious negative effects. The scale economy of a company has threshold effects.

This study explored the degree of internationalization (DOI) of Chinese enterprises on corporate performance. As different companies have different needs for firm-specific assets, separate studies of various enterprises may lead to different conclusions.

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