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AN EMPIRICAL STUDY ON THE INFLUENCE OF PATENT OUTPUT BASED ON THE INTERNATIONALIZATION OF VENTURE ENTERPRISES OF CHINESE GEM ENTERPRISES

Junda Yang, Yun Xia

School of International Business, Jinan University, China.

ABSTRACT: *This paper delves deeply into the impact of domestic venture enterprise internationalization on patent output from two dimensions of patent output's efficiency and quantity amid the special institutional landscape of China's Growth Enterprise Market. The study found that innovation and internationalization intensify more efforts to become important strategic measures for GEM corporations. Yet the history of China's GEM companies is not too long but equipped with commendable international competitiveness. In addition, the internationalization strategy leverages the efficacy of patent output. That means that the higher the degree of internationalization of enterprises, the higher the efficiency of patent output; the enterprises that have implemented internationalization will have more patent output. The conclusion of this paper provides a new perspective and empirical evidence for us to know more about the relationship between the internationalization and independent innovation of Chinese venture enterprises, and presses ahead with a theoretical basis and decision-making underpinner for the country to deepen independent innovation and improve internationalization development policies.*

KEYWORDS: Venture Enterprise, Internationalization, Patent Output

INTRODUCTION

The importance and urgency of innovation and internationalization have stimulated China in-depth to initiate the development strategies of building an innovative country and"going out".The fact is that innovation and internationalization have registered the "new normal" of strategic behavior of Chinese corporations. However, it is inadequate to have a clear perception for the mutual influence between the two strategies of independent innovation and internationalization, which is not conducive to the implementation and compatibility formation of the two strategies. Aside from that, how to better integrate the worldwide resources to deepen and advance independent innovation of Chinese enterprises and then promote the sustainable development of China's economy has become an urgent issue to be resolved for realizing the dream of new innovation power at an early date. Therefore, exploring the impact of corporation internationalization on independent innovation can not only provide theoretical guidance for Chinese enterprises to make full use of foreign resources to improve their independent innovation capabilities, but also help us to deeply understand the economic consequences of internationalization and to correctly evaluate the effectiveness of domestic enterprise

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internationalization, which further put forward beneficial policies for carrying out the national strategy of "going global".

The research on the relationship between enterprise internationalization and enterprise innovation has always been an important topic of common concern in economics and management. However, the existing literature does not unify the research conclusions on the relationship between the two. There are two different views on whether the internationalization of enterprises can promote innovation (Hitt et al., 1997; Lileeva and Trefler, 2010; Bustos, 2011; Bratti and Felice, 2012; von Zedtwitz and Gassmann, 2002; Sanna - Randac - cio and Veugelers, 2007). The collection of empirical evidence has never been satisfied. One view contends that internationalization, as a fashion to study and accumulate knowledge, can conduce to acquiring more resources, information, ideas, technologies and opportunities (Kotabe, 1990; Kobrin, 1991; Hittd et al. 1997) for enterprises so as to form innovative strategic alliances (Santos et al. 2004) in a manner of the international market to dilute and reduce R&D costs (Granstrand et al. , 1993; Kotabe, et al. 2002).International can enhance learning effects (Bratti and Felice, 2012; Love and Ganotakis, 2013) and competitive incentives (Hitt et al. , 1997; Bratti and Felice, 2012),helping companies focus on innovation (Kobrin, 1991),improving innovation and earning more innovative exclusive benefits (Teece, 1986).Therefore, the internationalization of enterprises exerts a positive effect on innovation.

However, another point argues that internationalization on the one hand will increase the risk of corporate knowledge and technology leakage (Sanna - Randac-cio and Veugelers, 2007), and on the other hand enhance the cost of management, coordination and information exchange, and the incomprehension among R&D teams as well as opportunistic behavior (Fisch, 2003), which is hard to form a cohesive R& D team (Von Zedtwitz and Gassmann, 2002). Therefore, internationalization will increase the risks and costs of corporate innovation, thus hindering innovation.

In addition, recent research indicates that corporate innovation has a reverse impact on the internationalization of enterprises, meaning that the competitive advantage generated by innovation can promote the internationalization of enterprises. Innovation drives companies to have stronger market power, which helps companies actively expand overseas markets (Roper and Love, 2002; López and García, 2005; Cassiman and Golovko 2011 Altomonte et al. 2013).An enterprise with strong innovation capability has a self-selection effect, and internationalization itself can be regarded as an innovation of the enterprise (Prashantham, 2005).Therefore, there is a strong endogeneity between the international operation of enterprises and enterprise innovation, which has largely caused the inconsistency and even contradictory status of the current research conclusions on the relationship between the two. Controlling endogeneity is a key strategy for identifying the relationship between corporate internationalization and corporate innovation.

From the perspective of existing domestic research, some scholars have examined the impact of internationalization on productivity based on the perspective of export (Zhang Jie et al, 2009. Qian Xuesen et al, 2011), and provided us with a preliminary understanding of whether

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localization of local enterprises promotes innovation. However, productivity is not the most direct alternative to innovation. Sales are used in calculations. Because price and quantity data cannot be separated, they cannot distinguish between price (market power) and quantity (productivity). Griliches (1990) pointed out that R&D is an activity process, whose direct output is patent. Studying R&D inputs and patent outputs can approximate the full picture of R&D activities. As an important screen for innovation capability and innovation quality, patent has become a universal indicator for measuring innovation in economics and management (Hall, et al. , 2001; XuXin and Tang Qingquan, 2012).The existing literature yet lacks in-depth and meticulous research on how Chinese companies' internationalization affects patent output. Therefore, it is inevitable to conduct in-depth research based on China's special scenarios.

This paper takes China GEM as the object, and studies the impact of China's entrepreneurial enterprise internationalization strategy on independent innovation from the two dimensions of the efficiency and quantity of patent output. The author believes that the special environment of China's GEM market provides us with a natural experimental site for in-depth study of the impact of entrepreneurial internationalization on independent innovation. The main reasons are as follows: First, the China GEM is positioned to promote the growth of strategic emerging industries and innovative enterprises. Independent innovation has become an important criterion for China's GEM to select listed companies. As such, the option of GEM-board corporation to be the research object is better to observe the effectiveness of internationalization on innovation. Second, taking China’s GEM companies as research objects, we can eliminate the impact of corporate scale effects on internationalization and innovation. Innovation economics believes that firm size is a key factor affecting innovation, but the relationship between them is controversial. Schumpeter (1942)believes that only large companies can afford R&D expenses, and large companies can withstand failure and absorb the benefits of innovation through a wide range of innovations, that is, the "Bear Peter Hypothesis". However, Porter (1985) and Barney (1991) believe that small businesses, while not having the scale advantage of large companies, have the flexibility to be technologically innovative and can focus on the technology they excel in. In addition, compared with small enterprises, large enterprises have the ability to bear the sunk costs of entering foreign markets, and are more likely to expand in foreign markets (Teece, 1986; Melitz, 2003; Bratti and Felice, 2012). Such being the case, it is necessary to control the impact of corporate scale effects on internationalization and innovation. Most of China's GEM companies are small enterprises in the initial stage and growth stage. Naturally, the scale effect of large enterprises is removed, and the impact of small business internationalization on innovation can be better examined. Third, the economic literature points out that corporate diversification has a profound impact on innovation (Schumpeter 1942). When examining the effects of internationalization, it entails to control the impact of corporate diversification on innovation. It is clearly stipulated on the Interim Measures for the Administration of Initial Public Offerings and Listing on the Growth Enterprise Market (May 1, 2009) promulgated by the China Securities Regulatory Commission and the Measures for the Administration of Initial Public Offerings and Listing on the Growth Enterprise Market (May 14, 2014) that “the GEM issuer should mainly operate one type of business”. This "prominent and exclusive management" rule removes the impact of

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diversified operations in the industry, which provides a natural experimental place for the author to study the effect of internationalization on innovation more cleanly.

This paper has the following marginal contributions: Standing on the point of the unique environment of China's GEM market, from the aspects of the export sales intensity, the proportion of export sales, and the establishment of overseas institutions, the impact of the internationalization of entrepreneurial enterprises on patent output is examined. The study found that the internationalization strategy has an efficiency-enhancing effect on patent output. The higher the degree of internationalization, the higher the efficiency of patent output; the enterprises that implement internationalization will have more patent output. This helps us to understand the impact of the internationalization of Chinese entrepreneurial enterprises on innovation, expand our understanding of the factors influencing innovation, help to improve the independent innovation capability of Chinese enterprises, and provide a micro level of evidence and policy reference for an evaluation of the effectiveness of Chinese entrepreneurial enterprises in recent years.

RESEARCH DESIGN

Research hypothesis

As a crystallization of technological innovation, it is the primary indicator for measuring the efficiency of research and development. Griliches (1990) pointed out that explaining and optimizing the resource allocation behind patent output, and thus improving the efficiency of innovation output, is the primary question to be answered in the study of innovation economics. How to improve the independent innovation capability of Chinese enterprises faster and better has become a major problem that the country urgently needs to solve. Therefore, it is the key to improve the independent innovation capability of Chinese enterprises by scientifically and rationally optimizing the allocation of enterprise resources for technological innovation and focusing on improving the efficiency of patent output. The internationalization strategy not only enables companies to expand their business activities across borders, but more importantly, it encourages companies to integrate resources around the world, which has a positive and far-reaching impact on innovation.

However, international operations also expose companies to a more complex and changing world environment, which exposes companies to more risks. In a changing external landscape, whether enterprises can creatively integrate, construct and reconstruct internal and external resources for innovation, and further improve innovation efficiency, is an untested empirical issue. Some scholars in domestic researches have examined the impact of internationalization on productivity based on the perspective of export, and provided us with a preliminary understanding of whether localization of local enterprises promotes innovation. However, the organic relationship between the internationalization and innovation efficiency of Chinese enterprises is omitted, and there is still a lack of in-depth study on whether internationalization can improve the innovation efficiency of Chinese enterprises. In addition, in terms of R&D

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investment, exploring the impact of internationalization on patent output can alleviate the effects of endogenousity and better understand the relationship between international business and innovation. Therefore, this paper proposes the following research hypothesis:

Hypothesis: Under the same conditions, international operation has an efficiency improvement effect on enterprise patent output. The higher the degree of internationalization, the higher the efficiency of patent output. The higher the degree of internationalization, the more the number of the patent output.

Data source and sample selection

This paper takes China GEM listed companies as research samples from 2009 to 2012, whose relevant financial data comes from the CSMAR database. The author collected and collated relevant data on technology R&D, overseas income composition, and overseas institutions from the annual reports of listed companies. And The data of the listed company's patents comes with the China Patent Database of the Intellectual Property Publishing House of the Intellectual Property Office of China. The author classifies the patents owned by the listed company in chronicle sequence. After eliminating data missing values, the paper obtained a total of 825 observations, with 36, 153, 281, and 355 observations from 2009 to 2012, respectively.

Model design and variable definition

Hausman et al. (1984) conducted a groundbreaking study of the econometric model between R&D investment and patent output. Since the number of patents is a positive integer, a relatively accurate count model should be used. Therefore, in order to accurately examine the impact of internationalization on the efficiency of corporate patent output, based on the relevant literature (Hausman, et al., 1984; Bound, et al., 1 Xu Xin, 1984 and Tang Qingquan, 2012), this paper constructs the following Poisson regression model , the variables of which are defined in Table 1.

$$Patents = \beta 0 + \beta 1\ RD\_intensity + \beta 2\ Patent\text{-}past\text{-}total + \beta 3\ Age + \beta 4\ Size + \beta 5\ Lev + \beta 6\ Industry + \beta 7\ Year + \zeta \quad (1)$$

The behavior of enterprises to carry out cross-border development of business activities can be called internationalization. Whether it is sales, manufacturing or R&D entering different geographical regions or overseas markets is the embodiment of enterprise internationalization. Therefore, according to the relevant literature (Hitt et al., 1997; Lu and Beamish, 2004).This paper uses the overseas sales intensity Ovsea-Sales), the proportion of overseas revenue (Export-Rate) and the overseas institutions (Ovsea-Agency) to measure the degree of internationalization. Since China's Hong Kong, Macao and Taiwan regions are systematically different from mainland China, this paper will account for sales revenue in these regions.

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Table 1 **Table 1 Definitions of variables**

Variable type	Variable name	Variable symbol	Variable definition
Dependent variable	Number of new patent outputs	Patents	The number of new patents added by the enterprise in the year, including the sum of new invention patents, new utility model patents, and new design patents.
Investigate variables	Corporate internationalization	Ovsea_Sales	Corporate overseas sales strength = Corporate overseas sales revenue / Year-end total assets
		Export_Rate	Proportion of overseas income of enterprises = overseas sales revenue of the company in the current year / sales revenue of the current year
		Ovsea_agency	Corporate overseas institutions, dummy variables, if the company has branches or investment institutions overseas in the year, the value is 1, otherwise 0
	Technical development strength	RD_intensity	The strength of technology R&D of enterprises = research and development expenditure of enterprises in the current year / total assets at the end of the year
	Enterprise knowledge stock	Patents_past_total	The number of all patents in the past year, including the sum of new invention patents, new utility model patents, and new design patents.
	Corporate financial risk	Lev	Current year debt ratio = total liabilities / total assets

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Control variable	Business life cycle	Age	The annual value of the company's survival time from the establishment to the current year
	Business scale	Size	The natural logarithm of the total assets of the year
	Industry	Industry	If the company is in the industry, take 1, otherwise take 0
	Year	Year	If the company is in the year, take 1, otherwise take 0

Empirical analysis

Descriptive statistical analysis

Table 2 shows the overseas income of GEM companies. Among the 355 listed companies, 81 have never had overseas income, accounting for 22.82%; there are 190 companies with overseas income, accounting for 55.25%; 80 companies have obtained overseas income from scratch, 22.82% proportion; and only one company exits the overseas market. This shows that China's GEM companies have a high degree of internationalization, and most enterprises actively explore the international market to earn overseas income. At the same time, it shows that China's GEM companies have considerable technical competitiveness in the international market.

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Table 2 Overview of overseas income for Chinese Gem Enterprises

Industry	No overseas income	Overseas income	Overseas income later	Overseas income before	Others
A. Agriculture, forestry, animal husbandry, fishery	5	2	0	0	0
B. Extractive industry	3	2	0	0	0
C. Manufacturing	22	143	62	0	2
E. Construction industry	0	2	1	0	0
F. Transportation, warehousing industry	1	2	0	0	0
G. Information Technology Industry	50	24	2	1	0
H. Wholesale and retail trade	0	2	0	0	0
K. Social Services	0	8	10	0	0
L. Communication and cultural industries	0	5	5	0	1
Total	81	190	80	1	3

Note: Others refer to overseas income before and after, and there is no overseas income in one year.

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Table 3 Descriptive statistics of main variables

Variables	N	Mean	Max	Min	Median	SD
Patents	825	10. 7624	349. 0000	0. 0000	4. 0000	21. 0348
RD_intensity	825	0. 0232	0. 1400	0. 0000	0. 0200	0. 0171
Patents_past_total	825	16. 9285	859. 0000	0. 0000	6. 0000	46. 7520
Ovsea_Sales	825	0. 0584	0. 7783	0. 0000	0. 0050	0. 1083
Export_Rate	825	0. 1272	0. 9930	0. 0000	0. 0145	0. 2135
Ovsea_agency	825	0. 6424	1. 0000	0. 0000	1. 0000	0 . 4796
Lev	825	0. 1741	0. 7670	0. 0110	0. 1417	0. 1264
Age	825	9. 1952	26. 0000	1. 0000	9. 0000	4. 4421
Size	825	2. 1974	2. 2824	2. 1353	2. 1939	0. 0259

Table 3 is a descriptive statistic of the main variables, in which the average value of the sample company's RD-intensity is 2.32%, which exceeds the world-recognized basic survival line of enterprises by 2%. This reflects that under the guidance of building an innovative national strategy in recent years, Chinese enterprises attach great importance to independent research and development, and the investment in technological innovation has been greatly improved. At the same time, it also mirrors the clear positioning of China's GEM market and selects premier “high-tech and high-growth” companies to help them grow bigger and stronger being as the listed. The average number of patents added is 10.7624, which indicates that China's GEM companies have strong innovation ability, but with unevenly distribution of the number of new patents and large standard deviation of 21.0348. It reflects the large differences in the ability of sample companies to innovate. In addition, the standard deviation of patents-past-total is large, with a value of 46.752, which implies the large differences in the stock of knowledge among sample companies.

In terms of internationalization, the average value of overseas income (Export-Rate) is 12.72%, indicating that the average income of China's GEM companies is 12.72% of the income from overseas markets. The average value of overseas institutions (Ovsea-agency) is 0.624, which indicates that 64.24% of the sample companies have established branches overseas. In addition, the average age of the sample company is 9.952, and the median is 9. This shows that China's GEM companies are generally younger.

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ANALYSIS OF MULTIPLE REGRESSION RESULTS

Table 4 Regression analysis results of the influence of internationalization on patents output efficiency

Variables	Predicted sign	Full Samples	Ovsea_Sales > 0	Ovsea_Sales = 0
		Patents	Patents	Patents
		Model(1)	Model(2)	Model(3)
RD_intensity	+	18. 370***	13. 859***	14. 841***
		(30. 40)	(23. 14)	(9. 76)
Patents_past_total	+	0. 003***	0. 003***	0. 021***
		(38. 65)	(33. 88)	(32. 17)
Age	—	− 0. 013***	− 0. 005*	− 0. 083***
		(− 5. 01)	(− 1. 80)	(− 12. 84)
Size	+	1. 335***	1. 391***	0. 680***
		(29. 11)	(26. 96)	(6. 06)
Lev	—	0. 124	− 0. 524**	2. 384***
		(1. 39)	(− 5. 05)	(13. 01)
Constant	?	− 12. 519***	− 10. 570***	− 6. 764***
		(− 28. 10)	(− 22. 71)	(− 6. 60)
Industry		Yes	Yes	Yes
Year		Yes	Yes	Yes
LR chi2		4689. 27***	2310. 36***	1794. 68***
Prob > chi2		0. 0000	0. 0000	0. 0000
Pseudo R2		0. 2395	0. 1770	0. 3516
N		825	503	322

Remark：***, ** and * indicate significant levels at 1%, 5%, and 10%, respectively.

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Table 4 reports on the impact of entrepreneurial internationalization on the efficiency of patent output. Among them, the model (1) shows that after controlling other variables, the RD-intensity and the Patents-past-total are significantly positively correlated with the new patents (Patents), and the regression coefficients are respectively 18.370 and 0.003, both are significant at the 1% level. This shows that the greater the investment in enterprise technology research and development, the more knowledge stock, the more the number of patent outputs.

In addition, the contrast between models (2) and (3) can be found that the corporate internationalization strategy has a significant impact on the relationship between technology development and patent output. In international entrepreneurial ventures (Ovsea-Sales > 0), the regression coefficient of RD-intensity and new patents is 13.859, which is significant at the 1% level and non-internationalized. In the startup (Ovsea-Sales =0), the regression coefficient of technology research and development and new patents is 14.841, which is significant at the 1% level. This shows that compared with non-international entrepreneurs, internationalized entrepreneurs have higher patent output efficiency, and each additional 1 unit of patent output requires 13.859 units of R&D investment intensity rather than internationalization. For each additional unit of patent output of a startup enterprise, a research and development investment intensity of 14.841 units is required. It can be seen that the internationalization strategy has an efficiency-enhancing effect on patent output. The research hypothesis of this paper has been verified.

Table 5: Regression analysis results of the influence of internationalization on patents output efficiency (Grouped regression analysis ac-cording to Ovseas_agency and Export_Rate)

Variables	Predicted sign	Ovsea_agency = 1	Ovsea_agency = 0	Export_Rate > Mean	Export_Rate≤Mean
		Patents	Patents	Patents	Patents
		Model(1)	Model(2)	Model(3)	Model(4)
RD_intensity	+	12. 354***	13. 303***	7. 928***	20. 517***
		(20. 06)	(5. 42)	(5. 47)	(28. 52)
Patents_past_total	+	0. 003***	0. 021***	0. 016***	0. 003***
		(31. 28)	(28. 81)	(28. 15)	(30. 35)
Age	−	− 0. 009***	− 0. 069***	0. 012***	− 0. 018***
		(− 3. 31)	(− 9. 49)	(2. 85)	(− 5. 65)
Size	+	1. 482***	1. 225*	0. 222***	1. 660***

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		(29.58)	(1.77)	(2.63)	(30.51)
Lev	−	−0.466***	−2.192***	−0.274	0.705***
		(−4.59)	(−10.43)	(−1.52)	−6.8
Constant	?	−13.144***	−5.247***	−1.080	−15.827***
		(−27.03)	(−3.53)	(−1.33)	(−30.36)
Industry		Yes	Yes	Yes	Yes
Year		Yes	Yes	Yes	Yes
LR chi2		3054.51***	1333.73***	1455.92***	4741.63***
Prob > chi2		0.0000	0.0000	0.0000	0.0000
Pseudo R2		0.2208	0.3248	0.3211	0.3162
N		540	295	234	591

Remark: ***, ** and * indicate significant levels at 1%, 5%, and 10%, respectively.

In order to further explore the effect of the internationalization strategy of the enterprise on the efficiency of patent output, this paper conducts a group regression on the samples, and further distinguishes them as overseas institutions (Ovsea-agency =1)and no-overseas institutions(Ovsea-agency = 0). And based on the average of the export-Rate average, it is further divided into companies with higher internationalization (Export-Rate >Mean) and companies with lower internationalization (Export-Rate ≤Mean). Table 5 reports the corresponding empirical results.

The results in Table 5 show that the corporate internationalization strategy has a significant efficiency improvement effect on patent output. Specifically, the comparison models (1) and (2) show that in enterprises with overseas institutions (Ovsea-agency = 1), the regression coefficient of RD-intensity and new patents (.) is 12.354, significant at the 1% level. In terms of no-overseas institutions (Ovsea-agency =0), the regression coefficient of technology R&D and new patents was 13.303, which was significant at the 1% level. This result indicates that enterprises with overseas institutions require an investment intensity of 12.354 units for each additional unit of patent output, while enterprises without overseas institutions require 13.303 units of R&D investment strength for each additional unit of patent output. Seeing from that, setting up an institution overseas can improve the efficiency of corporate patent output.

In addition, the comparison models (3) and (4) show that in the more internationalized enterprises (Export-Rate > Mean), the regression coefficient of RD-intensity and new patents (.) is 7.928, significant at the 1% level. In the less internationalized companies (Export-Rate ≤ Mean), the regression coefficient is 20.517, which is notable at the 1% level. This result indicates that for companies with a higher degree of internationalization, for each additional

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unit of patent output, 7.928 units of R&D investment intensity are required, while for companies with less internationalization, for each additional unit of patent output,20.517 units strength of the R&D investment is required. Therefore, compared with companies with a lower degree of internationalization, companies with higher degrees of internationalization have higher patent output efficiency. It can be indicated that the internationalization strategy has obvious efficiency improvement effect on patent output. The higher the degree of internationalization, the higher the efficiency of enterprise patent output. The research hypothesis of this paper is supported again.

Supplementary verification

If the internationalization strategy has an efficiency-enhancing effect on patent output, then companies that implement internationalization will have more patent output. As such, this paper further examines the impact of internationalization on the number of patents produced by enterprises according to whether the company has overseas institutions and the level of internationalization (Export-Rate).

Table 6 makes the group test according to whether the company has overseas institutions and the degree of internationalization. The results show that both the overseas institutions (Ovsea-agency = 1) and the more international companies (Export-Rate >Mean) have more patented output, both in the mean and in the median. This explicates that internationalization can promote enterprises to produce more patents, which further supports the efficiency improvement effect of internationalization strategy on patent output. The research hypothesis of this paper has been further supported.

Table 6: Grouped tests of the influence of internationalization on patents output quantity (Grouped tests according to Ovseas_agency and Export_Rate)

	Mean(samples)			Median(samples)		
Variables	Ovsea_agency = 1	Ovsea_agency = 0	T Test	Ovsea_agency = 1	Ovsea_agency = 0)	Z Test
Patent	14. 0094(540)	4. 9288 (295)	1. 7186*	6. 0000 (540)	1. 0000 (295)	51. 0893***
	Mean(samples)			Median(samples)		
Variables	Export_Rate > Mean	Export_Rate≤Mean	T Test	Export_Rate > Mean	Export_Rate≤Mean	Z Test
Patent	12. 0641(234)	10. 2470(591)	6. 0708***	6. 0000 (234)	3. 0000 (591)	13. 0008****

Remaek: ＊＊＊ p ＜ 0. 01， ＊＊ p ＜ 0. 05， ＊ p ＜ 0. 1.

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MAIN RESEARCH CONCLUSIONS AND ENLIGHTENMENT

On the backdrop of innovation and internationalization becoming the “new normal”, how to integrate resources around the world to deepen and promote independent innovation of Chinese enterprises, and then advance the long-term development of China's economy has become a major issue that the country urgently needs to solve. This paper takes China GEM as the research object, based on the perspective of patent output efficiency, and it deeply discusses the impact of China's venture enterprise internationalization strategy on independent innovation. The main findings are as follows:

First, innovation and internationalization are becoming vital strategic initiatives for GEM companies. A large number of GEM companies have implemented an internationalization strategy. 64.24% of GEM companies have established overseas offices, and 77.18% of them actively expand overseas markets to earn overseas income. In addition, although China's GEM companies are relatively young, they already have considerable international competitiveness. On average, 12.72% of GEM companies' revenues come from overseas markets.

Second, the internationalization strategy has an measurable efficiency improvement effect on the patent output of venture enterprises. Compared with enterprises with a lower degree of internationalization, enterprises with higher degree of internationalization have higher patent output efficiency, and the higher the degree of internationalization of enterprises, the higher the efficiency of patent output. Initiating an institution overseas can improve the efficiency of corporate patent output. Compared with companies without overseas institutions, companies with overseas institutions have higher patent output efficiency. At the same time, companies that implement internationalization will have more patent output.

Innovation is the first driving force for development, and internationalization strategy is the booster for improving innovation. The conclusions of this paper show that the internationalization strategy is conducive to deepening the independent innovation of Chinese enterprises, and it can help to improve the independent innovation ability of Chinese entrepreneurial enterprises in the two dimensions of patent output efficiency and quantity. This provides a new perspective and evidence for us to understand the relationship between business internationalization and innovation. Therefore, on the one hand, China's entrepreneurial enterprises should clearly recognize that the internationalization strategy is an important way to enhance the ability of independent innovation. We must unswervingly “go global” and actively expand overseas markets through exports, investment, alliances, mergers and acquisitions and the establishment of overseas institutions and other ways to actively integrate the resources of the world to enhance their innovation capability to deal with the complex and volatile landscape. On the other hand, in addition to further strengthening the efforts to encourage and guide enterprises to internationalize their operations, the state should also work hard to promote the process of internationalization of strategic emerging industries, so that innovative enterprises can obtain more resources, information, technology and opportunities, and set foot themselves in the overseas market as soon as possible, so as to realize the transformation and upgrading of the national industry faster and better.

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