Research on Entrepreneurship and Regional Economic Growth on the New Over the Counter Market Based on a Fixed Effects Model

Li Zhang[1], Sujuan Geng[2]*

[1]*Teaching and Experimental Equipment Management Center Harbin University of Commerce Heilongjiang Harbin, China*
[2]*School of Economics Harbin University of Commerce Heilongjiang Harbin, China*
**Corresponding author:gengsujuan1997@163.com*

Abstract
The impact of entrepreneurship on economic growth has been a hot topic of discussion among scholars in recent years. Based on the data of SMEs in the New Over the Counter Market, this paper establishes a fixed effects model to study the relationship between entrepreneurship and economic growth. Empirical research shows that entrepreneurship can promote economic growth; compared with the northeast and west, entrepreneurship has a greater role in driving economic growth in the central and eastern regions. It is necessary to focus on cultivating entrepreneurship in the central and eastern regions, give full play to the role of entrepreneurship in promoting economic growth, and ultimately promote the coordinated development of regional economies.

Keywords-*Entrepreneurship; the New Over the Counter Market; Regional economic growth*

1. INTRODUCTION

2020 is the most critical year for China to win a well-off society, but the outbreak of COVID-19 at the beginning of the year has caused a heavy blow to economic growth. As the main body of market economy, enterprises are directly impacted by the epidemic situation, especially small and medium-sized enterprises. In the early stage of development of the small and medium-sized enterprises , the behavior of entrepreneurs which is the embodiment of entrepreneurship affects the development of enterprises . Entrepreneurship which can promote economic growth is of great significance to give full play to the talents of entrepreneurs.

As the scarce resources, the rational allocation of entrepreneurship is the key to economic growth. At the beginning of reform and opening up, China put forward a series of policies that help to cultivate entrepreneurship, such as "the rich drive the rich" and the construction of market-oriented, rule of law and national market environment. The economy of the eastern region has been growing rapidly, and the gap between the eastern region and other economic regions has been widening. In order to narrow the gap of regional economic development, this paper studies economic growth from the perspective of entrepreneurship, and studies the impact of entrepreneurship on economic growth in different regions.

2. THEORETICAL ANALYSIS

Entrepreneurship has been the focus of scholars' research since it was put forward. Because entrepreneurship is the excellent quality of entrepreneurs themselves, its concept has not been accurately defined. Schumpeter (1934) put forward the idea of "creative destruction" and put forward that innovation is the most important driving force of economic development [1]. Covin and Slevin (1989) summarized entrepreneurship as innovative spirit, pioneering spirit and adventurous spirit [2]. Liu Liang (2008) divided entrepreneurship into two aspects: the innovation ability of the enterprise itself and the innovation ability of the enterprise environment [3].

Entrepreneurship is the most important quality of entrepreneurs, and entrepreneurs are the core of enterprise growth, so the role of entrepreneurship in enterprise growth is self-evident. Baumol (1996) proposed that entrepreneurs will carry out productive activities and also bring potential benefits to enterprises

G. Vilas Bhau et al. (Eds.): MSEA 2022, ACSR 101, pp. 61–67, 2023.
https://doi.org/10.2991/978-94-6463-042-8_11

through non productive activities, namely rent-seeking [4]. Li Xin (2014) constructed the evaluation index system of entrepreneurship, and the research shows that cultivating entrepreneurship is crucial to the growth of small and medium-sized enterprises [5].

Some scholars believe that entrepreneurship will promote economic growth. Lu Chuanyi and Li Zinai (2000) proposed to introduce entrepreneurship into economic growth theory [6]. Chen Fengwen (2018) confirmed the positive impact of entrepreneurship on economic growth by analyzing the entrepreneurship in the eastern, central and western regions of China [7]. To sum up, scholars' research on entrepreneurship can be roughly divided into two levels: one is the research on quantitative entrepreneurship index system at the micro level. The second is the research on entrepreneurship and macroeconomic growth at the macro level. However, there is little research on the entrepreneurship of small and medium-sized enterprises. Therefore, this paper makes an empirical study from this perspective.

3. Research Design

According to the above theoretical analysis, entrepreneurship is to promote the growth of enterprises and economic growth through the following three aspects: one is to enhance the innovation ability of enterprises. Second, entrepreneurship will enhance the entrepreneurial ability of entrepreneurs. Third, entrepreneurship will help to enhance the entrepreneurs' ability to identify market opportunities. Therefore, this paper puts forward the following hypotheses.

H: In different economic regions, entrepreneurship has a positive impact on enterprise performance and economic growth. There is a gap in the sensitivity of economic level to the change of entrepreneurship index. In areas with poor economic level, entrepreneurship plays a relatively large role in driving the economy.

3.1. Data sources

In 2013, the State Council issued the decision on issues related to the national share transfer system for small and medium sized enterprises, which officially expanded the pilot of the New Over the Counter Market to the whole country. Therefore, this paper selects the enterprise data from 2014 to 2018 to study China's economic growth. In order to improve the authenticity and reference of the research, the samples of Special Treatment enterprises are excluded, also the samples with missing data and samples which has not published the annual report within five years. During the listing period, the enterprises may stop the share transfer by themselves or be forced to stop the transfer by the National Small and Medium-sized Enterprise Transfer System due to the operation problems or enterprise restructuring. At the same time, the enterprises that stop transferring more times in five years are excluded. Finally, 636 enterprises are left. The selection of data is from CSMAR, and some missing data is manually collected from the National SME transfer system.

3.2. Setting and description of variables

3.2.1. Construction of Entrepreneurship Index

Referring to the research results of Zuoyi Ye and Wenbin Wu (2018), the entrepreneurship index is constructed by using five indicators of fixed assets per capital, intangible assets per capital, R&D expenditure, independence of the board and per capital operating income [8]. Per capital fixed assets, per capital intangible assets and per capital operating income can show the entrepreneur's management capacity, which can be regarded as the entrepreneur's ability to identify market opportunities. The calculation formula of per capital fixed assets is:

$$FIX = \frac{fixed}{labor} \tag{1}$$

The variable of fixed is the total fixed assets of the enterprise, and labor is the number of employees of the enterprise. The calculation formula of per capital intangible assets is:

$$INT = \frac{intangible}{labor} \tag{2}$$

The variable of intangible is the total amount of intangible assets of the enterprise. The calculation formula of per capital operating income is:

$$REV = \frac{revenue}{labor} \tag{3}$$

The variable of revenue is the total business income of the enterprise. The independence of the board is the degree of independence that the board does not rely on external personnel to run the company. It reflects whether there is self employment in the enterprise and the spirit of the entrepreneurship. The independence of the board ultimately depends on whether the legal representative and the general manager of the company are integrated. R&D expenditure is used as the variable of internal innovation power. The composition of entrepreneurship index is shown in Table I below.

TABLE 1. Composition of Entrepreneurship Index

First Level Indicators	Secondary Indicators	Indicator Symbol
Management Capacity	Fixed assets per capital	FIX
	Intangible assets per capital	INT

	Operating income per capital	REV
Entrepreneurial Ability	Independence of the board	BOARD
Innovation Ability	R&D expenditure	R&D

In order to make the entrepreneurship index more objective and convincing, this paper uses entropy weight method [9] to quantify the entrepreneurship index.The first step is to standardize the data. Suppose K indexes are given

$$X_1, X_2, ..., X_k,\ X_i = \{x_1, x_2, ..., x_k\}$$

and the standardized value of each index data is

$$Y_1, Y_2, ..., Y_k$$

$$Y_{ij} = \frac{X_{ij} - min(X_i)}{max(X_i) - min(X_i)} \quad (4)$$

The second step is to calculate the entropy of information of each index. Information entropy of a set of data:

$$E_j = -\ln(n)^{-1} \sum_{i=1}^{n} P_{ij} \ln P_{ij} \quad (5)$$

$P_{ij} = Y_{ij} / \sum_{i=1}^{n} Y_{ij}$. If $P_{ij} = 0$, define $\lim_{P_{ij}=0} P_{ij} \ln P_{ij} = 0$.

The third step is to determine the weight of each index. The weight of each index is calculated by information entropy:

$$W_i = \frac{1 - E_i}{k - \sum E_i} \quad (6)$$

(i=1,2,...,K)Using the software of Rstudio to calculate the weightW_i.The formula for calculating the Entrepreneurship Index is :

$$E = w_1 FIX + w_2 INT + w_3 REV + w_4 BOARD + w_5 R\&D \quad (7)$$

The calculated values are shown in Table II.The weight of indicators fluctuated slightly from 2014 to 2018, but the difference was not significant.

TABLE 2. INDICATORS OF ENTREPRENEURSHIP INDEX AND WEIGHT OF EACH YEAR

Variable	2014	2015	2016	2017	2018
FIX	0.2183	0.1741	0.2273	0.2557	0.2625
INT	0.2886	0.2430	0.3264	0.3320	0.3349
REV	0.1326	0.1891	0.1281	0.0733	0.0786
BOARD	0.2311	0.2305	0.2121	0.1924	0.1236
R&D	0.1294	0.1633	0.1061	0.1466	0.2004

In order to study the impact of entrepreneurship on economic growth, this paper calculates the average of financial data according to the year and the region where the enterprise is located, and obtains a new panel data with cross-sectional data of 24 and time series of 5. A cross-sectional sample point of panel data is regarded as a representative enterprise of the region and which has been existed for five years from 2014 to 2018. The entrepreneurship index of the representative enterprise represents the entrepreneurship index of the region. Therefor, taking 2018 data for example, we can obtain the regional entrepreneurship index that is shown in Table III. It can be seen from the table that there are great differences in entrepreneurship among provinces. The maximum of the entrepreneurship index is about 0.67 in Xinjiang, and the minimum is about 0.18 in Chongqing.

TABLE 3. ENTREPRENEURSHIP INDEX CALCULATED BY ENTROPY WEIGHT METHOD

Area	E	Area	E
AH	0.53402	**JL**	0.41409
BJ	0.42002	**JS**	0.52021
CQ	0.17802	**JX**	0.60082
FJ	0.58839	**LN**	0.55195
GD	0.45424	**SC**	0.42390
GX	0.47254	**SD**	0.52338
GZ	0.63214	**SH**	0.47282
HEB	0.42834	**SX**	0.47735
HLJ	0.50764	**TJ**	0.45201
HN	0.52949	**XJ**	0.66796
HUB	0.50332	**YN**	0.66594
HUN	0.54456	**ZJ**	0.43633

[a.] Note: Take the entrepreneurship index of 24 provinces in 2018 as an example.

3.2.2. Economic growth variables

Most scholars use Gross Domestic Product (GDP) to indicate the local economic level or the growth rate of GDP (GDP growth rate) to measure economic growth. Due to that the entrepreneurship is built from the per capital perspective, this paper uses per capital GDP to express economic growth. The GDP of a region is obtained from the statistical annual report of each region, so is the local population data. The value of per capital GDP is obtained by the calculation

$$PGDP = \frac{GDP}{Population} \quad (8)$$

The calculated annual per capital GDP is shown in the table IV,which takes the 2018 data as the example.

TABLE 4. ANNUAL PER CAPITAL GDP OF EACH REGION

Year	Province	GDP per capital	Year	Province	GDP per capital
2018	AH	47711.66	2018	JS	115168.40
201	BJ	140211.	201	JX	47433.95

8		24	8		
2018	FJ	91197.25	2018	LN	58007.52
2018	GD	86412	2018	SD	76267.26
2018	GX	41489.17	2018	SX	63477.47
2018	GZ	41243.59	2018	SH	134982
2018	HEB	47772.22	2018	SC	48883.17
2018	HN	50152.22	2018	TJ	120710.80
2018	HLJ	43274.40	2018	XJ	49474.712
2018	HUB	66615.70	2018	YN	37136.28
2018	HUN	52948.60	2018	ZJ	98643.41
2018	JL	55610.92	2018	CQ	65932.72

Note: Take the PGDP of each province in 2018 as an example.

3.2.3. Control variable

Cobb-Douglas shows that the output of enterprises is affected by the input of capital and labor, so the paid-in capital (*CAP*) and the number of employees (*Lab*) are introduced as the control variables of the model. At the same time, Asset liability ratio (*Lev*) of enterprises shows the capital structure, and the capital structure also affects the performance of the enterprise, so the variable of *Lev* is introduced as the control variable of the model. The fiscal policies (government purchase, transfer payment and government revenue) in different regions have different impact on the development environment and growth of enterprises. Fiscal policy contains the local government's revenue and expenditure. Considering that the data of fiscal revenue is difficult to obtain, this paper only considers fiscal expenditure. In order to show the business environment of enterprises, the ratio of provincial fiscal expenditure to local GDP (expe) is introduced as the model control variable.

3.3. The construction of model

In order to verify the hypothesis, the following models (9) and (10) are considered. Using the software of Rstudio to do *F* test on panel data, the *p* value is far less than 0.05, so we choose the fixed effect model. In order to further determine the model, this paper continues to do the *Hausman* test. The *p* value obtained by Hausman test was 0.03672 < 0.05. The original hypothesis was rejected and the fixed effect model was finally determined. At the same time, EGLS was used to estimate the coefficients. The following models were established for H.

$$\ln PGDP_{it} = c + \alpha_s \ln E_{it} + \ln CON_{it} + \mu_{it} \quad (9)$$

$$\begin{aligned} \ln PGDP_{it} &= c + \alpha_{s1} \ln FIX_{it} + \alpha_{s2} \ln INT_{it} \\ &+ \alpha_{s3} \ln BOARD_{it} + \alpha_{s4} \ln R\&D_{it} \\ &+ \alpha_{s5} \ln REV_{it} + \ln CON_{it} + \mu_{it} \end{aligned} \quad (10)$$

Among them, *PGDP* is the per capital GDP of each province, $lnPGDP_{it}$ is the logarithm of the per capital GDP of each province ; *E* is the entrepreneurship index, which is the result of entropy weight method; *i=1,2,.....24* represents 24 provinces respectively, *t=2014,2015,...,2018* represents 5 years respectively, *s= 1,2,3,4* represents four regions of China's economic regionres pectively, namely the Eastern, Central, Western and Northeast. *C* represents the individual characteristics of the cross-section unit, that is the fixed effect of the enterprise; μ_{it} is the reflection of the missing factors which changes with the cross-section and time series at the same time. α is the coefficient to be estimated.

According to the Division Method of East West Central and Northeast Regions issued by the National Bureau of statistics in 2011, China's economic regions are divided into four major regions: Eastern, Central, Western and Northeast. The Eastern region includes *Beijing, Tianjin, Hebei, Shanghai, Jiangsu, Zhejiang, Fujian, Shandong, Guangdong and Hainan*; the Central region includes *Anhui, Jiangxi, Henan, Hubei, Hunan, Shanxi and Inner Mongolia*; the Western region includes *Sichuan, Chongqing, Guizhou, Yunnan, Shanxi, Xinjiang, Guangxi, Gansu, Ningxia, Tibet and Qinghai*; the Northeast region includes *Liaoning, Jilin and Heilongjiang*. In the process of data screening , it is found that there are only single digits of enterprise data in several provinces. In order to improve the reference of the research, the provinces with little enterprise data are deleted, which are *Gansu, Shanxi, Hainan, Inner Mongolia, Tibet, Qinghai* and *Ningxia* (without *Hong Kong, Macao* and *Taiwan*). Among them, *Gansu, Ningxia, Tibet* and *Qinghai* belong to the Western, *Shanxi* and *Inner Mongolia* belong to the Central, and *Hainan* to the Eastern.

4. EMPIRICAL ANALYSIS

4.1Regression analysis

4.1.1 Analysis of H test results

Equations (9) and (10) are analyzed by using eviews10 software. The results are shown in Table V. The adjusted R^2 of the eastern region were all above 0.95, and the fitting degree of the model was very good, P < 0.01. The coefficient of entrepreneurship index is 0.74 > 0, and it is significant at the 1% significance level, which verifies the establishment of H. Entrepreneurship has a positive effect on enterprise

performance and economic growth in the eastern region. It can be seen from the third column of table V that the independence of the board of directors of enterprises in the eastern region has an impact on economic growth at a significant level of 1%. Per capital operating income, per capital fixed assets, per capital intangible assets and R&D expenditure have positive impacts on economic growth. In the more competitive market in the eastern region, entrepreneurship drives the growth of local economy by improving the operation ability and innovation ability of enterprises.

The coefficient of entrepreneurship index in the central region is about 1.17 > 0, and entrepreneurship also positively promotes the economic growth of the central region, which shows that the entrepreneurship index in the central region has a significant impact on economic growth at a significant level of 5%. The adjusted R^2 of the model is 0.75, and the fitting degree of the model is acceptable. R&D expenditure is positively correlated with economic growth. The increase of R&D expenditure will improve the technological level of enterprises, and technological progress will promote economic growth. Per capital intangible assets, per capital operating income and the independence of the board of directors have positive effects on economic growth.

The R^2 after the adjustment of the western region model is above 0.98, and the fitting degree of the model is good. The influence of entrepreneurship index on economic growth is positive, with an estimated coefficient of about 0.023. It shows that when the entrepreneurship index increases by 1%, the economic growth increases by 0.023%. The average GDP of eastern region in 2018 is 5014.7914 billion yuan, that of central region in 2018 is 2961.086 billion yuan, while that of western region in 2018 is only 2153.125 billion yuan. By contrast, the development environment of enterprises in the western region is worse. Because of the lack of perfect business environment and guidance of large enterprises, the development of small and medium-sized enterprises in the western region is more dependent on the entrepreneurial spirit owned by entrepreneurs. According to table V, the per capital intangible assets, R&D expenditure of enterprises and the independence of the board of directors have positive effects on economic growth. Therefore, the western region can use entrepreneurship to improve the innovation ability and entrepreneurial ability of enterprises to promote economic growth.

The coefficient of entrepreneurship index in northeast region is about 0.44, and the adjusted R^2 is above 0.94, and the fitting degree of the model is good. The results show that entrepreneurship in northeast region has a positive effect on economic growth. The development of small and medium-sized enterprises depends on entrepreneurs. When the entrepreneurship is limited, the development of small and medium-sized enterprises will be restricted accordingly, so the positive role of entrepreneurship on economic growth is difficult to play. The state-owned enterprises in northeast region are mainly traditional enterprises, and fixed assets per capital have positive impact on the growth of enterprises and economic growth. The *expe* in this area has a negative impact on economic growth. When *expe* increases by 1%, it will cause the economic growth decreases by 0.15%. *Expe* embodies the intervention of regional government on the market. In order to promote economic growth, the northeast region government should reduce the intervention on the market, reduce the role of "visible hand", and attach importance to the role of "invisible hand" of the market.

TABLE 5. MODEL REGRESSION RESULTS

Variable	Eastern		Western		Central		Northeast	
C	8.6100*** (-5.0079)	8.4349*** (4.6334)	12.8224*** (7.7089)	15.1227*** (13.9183)	5.6223* (2.0762)	-2.6221 (-0.2967)	12.0970*** (4.8211)	16.4030 (1.9407)
E	0.7386*** (3.1101)		0.0230 (0.2028)		1.1659** (2.4639)		0.4400 (1.5238)	
FIX		0.0625 (0.2271)		-0.4462*** (-4.4462)		0.2486 (0.4210)		0.1563 (0.1730)
INT		0.5446 (1.1145)		1.6262*** (6.6784)		0.9112 (0.9728)		1.3310 (0.7994)
BOARD		0.3474*** (3.1936)		0.3081** (2.3278)		0.9119 (0.7088)		1.8098 (1.1906)
R&D		0.0848 (0.4373)		0.1188** (2.7531)		0.3489 (1.4166)		0.0786 (0.4899)
REV		0.3164 (1.3529)		-0.0210 (-0.2654)		0.8729** (2.4245)		-0.1997 (-0.6291)
CAP	0.2849 (1.0238)	-0.8775** (-2.4813)	-0.4853* (-1.9970)	-2.3162*** (-7.6787)	0.4346 (1.0980)	-0.5634 (-0.8849)	-0.3100 (-1.5996)	-1.2838 (-1.1054)
LEV	0.1044 (1.1016)	-0.1599 (-1.1662)	-0.1471 (-0.6706)	-0.1136 (-0.7186)	-0.0261 (-0.1004)	0.0189 (0.0404)	-0.2062 (-0.9619)	-1.3566 (-0.9267)

LABOR	0.1089 (0.7023)	0.5478*** (3.2805)	0.3485*** (5.1052)	0.3968*** (5.4773)	0.4882** (2.3660)	1.1736*** (3.4400)	0.3966** (2.3154)	0.3234 (0.6653)
EXPE	0.6141** (2.4145)	0.4480 (1.6292)	0.0272 (0.1626)	0.2650* (1.8296)	-0.8158** (-2.5102)	-0.2897 (-0.4734)	-0.1503 (-0.5615)	0.3563 (0.6178)
Adj.R^2	0.9530	0.9551	0.9802	0.9828	0.7521	0.8139	0.9694	0.9455
F	69.5688	56.0319	154.0122	130.2859	9.0910	9.0757	64.4173	23.0619
P	0.0000	0.0000	0.0000	0.0000	0.0001	0.0004	0.0000	0.0127

b. Note: The values outside the brackets are the estimated coefficients, and the values inside the brackets are the T values of the estimated coefficients. Among them, * *, * *, and * * are significant at the levels of 1%, 5%, and 10%, respectively.

4.1.2 Robustness check

This paper discusses and tests the robustness of the model from the following aspects. First, whether control variables are added or not, the results show that the sign and significance level of the parameter estimators of the entrepreneurship index and other variables are basically consistent, which reflects the robustness of the model established in this paper. Second, we use the value-added tax of a single variable as an alternative variable to measure the relationship between economic growth and entrepreneurship index. The results show that entrepreneurship can significantly promote the increase of GDP growth rate, which is consistent with the results of this paper, indicating that the model established in this paper is robust.

5. CONCLUSION AND SUGGESTION

5.1Conclusion

The above research shows that: first, entrepreneurship can promote enterprise performance and economic growth. It can be seen from this paper that improving the operation ability, entrepreneurial ability and innovation ability of enterprises will promote economic growth. Entrepreneurs with entrepreneurial spirit tend to increase the "soft power" of intangible assets, patents, goodwill and other enterprises, so as to help form the core competitiveness of enterprises and improve their performance. The ratio of regional fiscal expenditure to government GDP indicates the government's support for enterprises. When the government's support for enterprises increases, the risk of entrepreneurs' entrepreneurship decreases, the entrepreneurial will increases, and the entrepreneurial spirit of entrepreneurs is fully developed to promote economic growth. Second, entrepreneurship promotes economic growth in the eastern, central, Western and northeast regions, but the driving force of entrepreneurship on economic growth is different between regions. The differences may come from the support of local government, the protection of property rights and the level of local economic development. Compared with the western, eastern and northeast regions, the entrepreneurship of the central region can also promote economic growth to a greater extent. The entrepreneurship index of the central region increases by 1%, resulting in economic growth of about 1.16%.

5.2. Suggestion

According to the above conclusions, this paper puts forward the following suggestions: first, the government should continue to increase the cultivation of entrepreneurship, especially in the northeast and central regions. It can be seen from the paper that the driving force of entrepreneurship on economic growth is different among regions. The driving force of entrepreneurship on economic growth and enterprise performance in eastern and central regions are greater than that in northeast and western regions. For the northeast region, we should deal with the relationship between state-owned enterprises and private enterprises, develop non-public economy, attract more private enterprises, and improve the economic efficiency. We should strengthen the protection of patents and other intellectual property rights, mobilize the enthusiasm of entrepreneurs for innovation, help enterprises form core competitiveness, and promote the improvement of enterprise performance. Second, the government should create a more fair and legal competition environment for entrepreneurs to play their entrepreneurship. Xi Jinping proposed to create a market oriented, rule of law and nationalized market environment. There are many opportunities in the market economy environment, and the fair and legal competition environment provides greater possibility for entrepreneurs to identify and seize opportunities. Entrepreneurs take advantage of these opportunities to develop their own enterprises, improve enterprise performance and drive economic growth. The government should cultivate entrepreneurship as a breakthrough, create a more market-oriented, rule of law, national market environment, establish a more effective new mechanism of regional coordinated development, and ultimately promote the coordinated growth of regional economy.

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