

Does Adverse Business Environment Influence Corporate Innovation Performance?

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Abstract. An important question that was ignored in available literature is whether corporate innovation performance is influenced by adverse business environment. In this regard, this paper uses Chinese private enterprises as the example to conduct an empirical study on the relationship between innovation investment and corporate performance based on the World Bank's 2012 survey data of enterprises, and explores the moderating effect of adverse business environment on this relationship at a micro level. Conclusions drawn from the empirical analysis show that, in the context of economic transformation, innovation investment can help promote private enterprises' market competitiveness, but this positive relationship is restricted by unfavorable business environment factors such as tax burden and business access. This paper has important theoretical and practical implications for the in-depth understanding of corporate innovative activities in the new economic environment and for the government to promote relevant guiding measures.

1. Introduction

In recent years, Chinese economy has gradually moved from the mode of extensive growth to a new stage that features technological innovation and consumption growth. Under the positive guidance of a series of national policies, such as "Mass Entrepreneurship and Innovation", innovative and entrepreneurial activities have enjoyed unprecedented development. China spent 1.75 trillion CNY on research and development in 2017, among which enterprises accounted for more than 1.37 trillion CNY, according to the National Bureau of Statistics[1]. On the one hand, with enterprises becoming an important entity of innovative activities, the growth rate and quality of their innovation investment have significantly affected China's economic and social development results. On the other hand, for enterprises themselves, the implementation of innovation is also a key choice to adapt to the economic new normal, grasp market opportunities, cope with risks and challenges, and obtain competitive advantages and market position, so as to achieve rapid growth.

The discussion of corporate innovation has attracted much attention in the field of management. What is involved in the existing researches is basically four major topics, namely, driving factors, innovation entity, innovation behavior and innovation performance[2]. The existing researches have fully recognized the important contributions of innovation investment to corporate performance. Scholars further proposed that innovation was a key determinant of corporate performance[3,4]. Nonetheless, the relationship between innovation and corporate performance is still a controversial topic in the researches on innovation management, with the research results often showing significant differences[5,6]. Scholars agreed that these differences were caused by different measurement standards or sample characteristics of innovation investment[7], but some scholars

also pointed out that the relationship between innovation and performance might be regulated by various factors[8,9], especially the function of specific situations. Especially in an emerging economy like China, imperfect institutional mechanisms will inevitably lead to various defects in the environment, and these defects will inevitably produce factors that are not conducive to market competition, thus greatly impacting on the innovative behavior of private enterprises and on whether they can effectively obtain innovative benefits. As can be seen from the course of China's economic transformation over the past three decades, private enterprises are faced with all kinds of problems brought about by the imperfect system and appear more prominent. For example, private enterprises receive less government support and face the dual interference of market competition and policy preference in the course of running a business. According to the findings of the World Bank, private enterprises generally faced problems and obstacles related to tax burden, business access, policy stability and other issues in the course of running a business. Therefore, the analysis of the relationship between technological innovation and corporate performance cannot ignore the consideration of business environment factors. However, unfortunately, according to the literature published in recent years, rare studies were conducted at a micro level on the impact of business environment on corporate innovation performance[10], and even fewer discussed the varying corporate performance of innovation investment in combination with the practical difficulties faced by enterprises, which has become a deficiency in the current researches on innovation management.

Based on management theory and innovation research, this paper discusses the relations of innovation investment to corporate market competitiveness and that to enterprises' growth ability respectively using the World Bank's survey data of 2,700 enterprises, and explores deeply into the impact of adverse factors in the business environment on the relations.

2. Theoretical Background

2.1. Innovation Investment and Corporate Performance

In practice, innovation at a corporate level usually involves technology and products[11]. From the perspective of the enterprise itself, both technological innovation and product innovation can reflect enterprises' positive attitude on participation in the market competition. R&D investment is a specific manifestation of enterprises' concern over technology trends, market demands and competitive situations. Its intensity represents the enterprises' strategic commitment and emphasis on innovation[12]. Many researches were devoted to exploring the direct relationship between innovation and corporate performance. Scholars believed that enterprises' innovation investment usually had a corresponding impact on enterprise operation, and that such impact might present two positive effects, namely, short-term and long-term.

In the short run, innovation can enhance enterprises' market competitiveness. The most direct impact of innovation on enterprises is to guarantee that enterprises' products or services, in terms of technical index and performance, are in the forefront of the development through the control over and effective investment in the advanced technology. Enterprises produce new products through technology research and development to meet the ever-changing market demands[13], and further to expand the potential consumer groups and increase market shares by selling the new products. More importantly, enterprises obtain the advanced knowledge and technology by means of independent innovation[14], and these intangible assets can further contribute to the emergence and development of technology prototypes. The recombination of existing means of production and the reallocation of resources capability, are conducive to creating new market demands, and will eventually help enterprises establish technology monopoly and gain a first mover advantage.

In the long run, continuous and stable R&D investment makes for the formation of exclusive technologies, products, and services, and mature innovation results can improve customer satisfaction and maintain the existing market[15]. Through systematic and purposeful innovation, enterprises can endow existing resources with new capacity, change resources' output value, and create unique products or trigger new consumer demands. Moreover, for them, in the process of innovating, investment in technology helps upgrade the existing human capital, and that in research

and development involves introducing high-level talents to continuously accumulate corporate intellectual capital. Investment in human resources and material resources can then, to some extent, help improve, or even reconstruct corporate production technology and production processes, thus forming the absorbable redundancy[16] of enterprises, which can through internal integration become enterprises' ability to resist market risks[17].

Therefore, this paper proposes the following hypotheses.

Hypothesis 1 Innovation investment significantly promotes corporate performance.

Hypothesis 1a Innovation investment can markedly boost corporate market competitiveness.

Hypothesis 1b Innovation investment can observably improve enterprises' growth ability.

2.2. Moderating Effect of Business Environment

Incomplete market monitoring mechanism of transition economies easily leads to unfairness and vicious competition[18]. Though the moderating effects of economy development level[19], industry character[20], enterprise type[21], and other factors on performance of innovation investment are taken into account, the adverse effects of practical difficulties faced by private enterprises are not considered. Different business environments may lead to significant differences in the impact of innovation on corporate performance. In a good business environment, enterprises face less pressure from unfair competition, and the results of innovation investment are protected by the system from being copied and imitated by other enterprises. In addition, those enterprises as the pioneers have clear advantages, such as enjoying alone and extending the accrual of benefits of innovation. In such cases, innovation is the embodiment of enterprises' own strength, and is also an important way for them to grow and gain competitive advantage.

However, firstly, when the business environment is unfavorable, the effectiveness of enterprises' innovation investment may be greatly reduced. The existing studies did not involve the direct impact of tax burden on corporate innovation performance, but the fact is that the excessively high tax burden has always been a common problem plaguing Chinese enterprises, especially private enterprises[22]. From inside the enterprise, tax burden may make it sensitive to cash flow, thus limiting the decision-makers' expectations for results of R&D investment, and capital investment. The attention paid to innovation investment will directly affect the level of innovation, while the prudence in that will gradually affect production, sales, after-sales service, and other corresponding market behaviors, and will further lower the promoting effect of innovation on corporate performance.

Secondly, the local government, driven by economic benefits, will restrict enterprises to entering the local market through barriers such as discriminating environmental standards or quality control standards, or some other business access, thus making the impact of business access on corporate innovation performance become more direct. On the one hand, institutional constraints behind business access will limit enterprises' innovation investment of technology and product, and may make the early investment become sunk cost and cannot be reflected in the final corporate performance; on the other hand, the technology or products of incumbent enterprises have been deeply embedded into the existing market environment, thus making the innovation of new enterprises face market obstacles in the commercialization process.

Finally, policy instability may weaken corporate innovation performance. Policy instability will lead to incomplete laws and regulations, as well as high market transaction costs. When non-market factors play an important role, enterprises' intellectual property rights cannot be effectively protected, thus making innovation soon copied and imitated by latecomers. In addition, the distrust of the market caused by unstable policies will greatly reduce consumer confidence, thus affecting the facilitation of innovation for enterprises to establish competitive advantages and maintain growth.

Hence, this paper proposes the following hypotheses.

Hypothesis 2 Business environment significantly moderates the relationship between innovation investment and corporate performance.

Hypothesis 2a Tax burden negatively moderates the relationship between innovation investment and corporate performance.

Hypothesis 2b Business access barriers negatively moderates the relationship between innovation investment and corporate performance.

Hypothesis 2c Policy instability negatively moderates the relationship between innovation investment and corporate performance.

3. Methodology

3.1. Samples

The data in this paper are from the World Bank's 2012 database of survey on Chinese enterprises, and some variables span three years (2009~2011). The sample information included sample survey of surveyed sample enterprises about their basic information, business status, and local business environment. The survey involved 2,700 private enterprises in 25 cities across the country, covering both manufacturing and service industries.

Table 1 lists the basic information of samples related to the research in this paper. As can be seen from table 1, there are significant individual differences between the sales volume and R&D investment of the sample enterprises, and the new product revenue of the sample enterprises can account for more than a quarter of the annual sales revenue on average. From the perspective of business environment, tax burden, business access, and policy stability more or less impede the operation of most sample enterprises.

Table 1. Descriptive statistics

Variables	Obs.	Mean	S.D.	Min.	Max.
Sales (10,000)	2693	16078.16	131447	3	4000000
New product revenue ratio	1183	25.25	19.72	0	100
R&D investment	694	388.27	2604	0	60000
Tax burden	2686	1.89	1.01	1	5
Business access	2681	1.34	0.63	1	5
Policy stability	2641	1.28	0.59	1	5
Age	2620	11.73	7.91	0	124
Staff Number	2693	236.12	1121.73	4	30000
Operation experience	2634	16.34	7.53	1	55
International certification	2663	0.62	0.49	0	1
Production capacity	1657	86.75	10.80	7	100
Concentration of ownership	1214	59.78	17.67	0	100

3.2. Variable

(1)Dependent Variable

Growth ability. we used the total sales in 2011 to measure enterprises' growth ability. In order to reduce the influence of outliers on regression coefficient estimation, we take the natural logarithm of sales revenue.

Market competitiveness. Following previous studies, this paper employs the proportion of new product sales revenue to total product sales revenue to measure the contribution of product innovation to sales, and reflects the new product innovation cycle and market competitiveness from a side[23].

(2)Independent Variable

Innovation investment. we use the amount of enterprises' annual investment in R&D activities in the past three years on average is used to measure. The results in table 1 show that there are great differences among different enterprises. In order to reduce the influence of outliers on regression coefficient estimation, we take the natural logarithm of the value of R&D revenue.

(3)Moderating Variable

According to the survey results, major problems and obstacles faced by private enterprises are selected and measured respectively from three aspects, including tax burden, business access and

policy stability. These indicators are also generally used as important indicators of marketization degree. In this paper, the measurement of the three indicators derived from entrepreneurs' assessment of the hindrance of the above indicators to existing business activities from the World Bank's 2012 business environment questionnaire, and minor adjustments were made by using 1~5 to refer to "no", "a little", "moderate", "much", and "severe".

(4)Control Variable

Organizational development theory emphasizes the importance of enterprise characteristics to enterprise behavior and decision making. Based on the previous studies, this paper controls some variables that may influence performance, such as enterprises' years of the establishment, development scale and operation experience, as well as other enterprise characteristics that may have an impact on performance, including international certification, production capacity of the current year, and concentration of ownership.

4. Empirical Analysis

4.1. Correlation Analysis

Table 2 reflects the relationship matrix among explanatory variable, explained variable, moderating variable and control variable. As expected, there exist significant positive relations of innovation investment to corporate market competitiveness and that to enterprises' growth ability, with the correlation coefficients being 0.186 (p<0.01) and 0.027 (p<0.05), respectively.

In terms of the relations of independent variable to control variable, and control variable to moderating variable, correlation coefficients are mostly lower than 0.5 of multicollinearity threshold of empirical literature, with the largest three being 0.547, 0.477, and 0.345, which shows that multicollinearity problem is not that serious. Nevertheless, in order to avoid if possible this problem, we performed VIF tests for all variables except explained variable in our research, and the results showed that the VIF value of all variables was below 2, which was lower than the threshold value 10 defined by empirical analysis, and the average VIF value was 1.26. Therefore, it can be basically judged that there is no collinearity problem among the variables, which will be justified in the later regression analysis.

Table 2. Correlation coefficient analysis

Variable	1	2	3	4	5	6	7	8	9	10	11
1. Growth ability	1										
2. Competitiveness	-0.20	1									
3. Innovation	0.19*	0.03*	1								
4. Tax burden	0.06*	-0.02	0.11*	1							
5. Business access	-0.00	-0.08*	0.05	0.48*	1						
6. Policy stability	-0.02	-0.03	0.01	0.35*	0.55*	1					
7. Age	0.15*	-0.05*	0.03	-0.02	0.02	0.02	1				
8. Scale	0.73*	-0.02	0.19*	-0.04*	0.02	0.02	0.19*	1			
9. Experience	0.23*	-0.13*	0.09*	0.11*	0.05*	-0.02	0.29*	0.09*	1		
10. Certification	0.31*	0.02	0.04	-0.12*	-0.03*	0.01	0.11*	0.10*	0.05*	1	
11. Production	0.08*	-0.19*	-0.06	0.01	0.08*	0.01	0.06*	0.02	0.035	0.06*	1
12. Ownership	-0.09*	-0.12*	-0.05	-0.01	0.02	-0.011	-0.06*	0.01	-0.16*	-0.05	0.06*

Note: numbers with * indicate the significance level at the 5% level or better (two-ailed).

4.2. Regression Analysis

4.2.1. Direct Effect of Innovation investment on Operating Performance

Table 3 demonstrates the regression results of enterprises' Innovation investment for the two types of performance indicators. Contrary to the expected results, the regression results of model 1-2 and model 3-2 show that, in the short term, Innovation investment has a significant promoting effect on the market competition of enterprises ($\beta=0.222, p <0.1$). Instead, the results of model 2-2 and 4-2 show that, private enterprises' innovation investment has no significant direct effect on enterprises'

long-term growth ability ($\beta=0.033, p >0.1$). OLS and OLS Robust regression results both partially support hypothesis 1a, that is, private enterprises' innovation investment can significantly elevate their market competitiveness, but does not have a significant impact on their long-term growth.

Table 3. Robust regression results of the influence of innovation investment on business performance

Variables	OLS regression				Robust OLS regression			
	Market competitiveness		Growth ability		Market competitiveness		Growth ability	
	1-1	1-2	2-1	2-2	3-1	3-2	4-1	4-2
Age	-0.069	0.082	-0.002	-0.008	-0.069	0.082	-0.002	-0.008
Scale	0.255	-0.735	1.033***	1.033***	0.255	-0.735	1.033***	1.033***
Experience	-0.504***	-0.603***	0.018***	0.025***	-0.504***	-0.603***	0.018***	0.025***
Certification	3.931	1.975	0.185**	0.156	3.931	1.975	0.185**	0.156
Production	-0.302***	-0.302***	0.003	0.003	-0.302***	-0.302***	0.003	0.003
Ownership	-0.195***	-0.167**	-0.002	0.001	-0.195***	-0.167**	-0.002	0.001
Innovation		0.222*		0.033		0.222*		0.033
Intercept	70.09***	72.88***	11.75***	11.22***	70.09***	72.88***	11.75***	11.22***
N	359	279	762	375	359	279	762	375
F-value	7.95***	5.11***	215.3***	97.43***	6.775***	4.35***	168.89***	92.91***
R ²	0.117	0.119	0.631	0.650	0.119	0.119	0.631	0.650
Adj-R ²	0.094	0.104	0.628	0.643				-

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

4.2.2 Moderating Effect of Business Environment

In order to further test the functional mechanism of enterprises' innovation investment for corporate performance in the current environment, we have considered the moderating effect of tax burden, business access, and policy stability on corporate innovation performance in the operating environment. Table 4 shows the regression results of innovation investment for enterprises' market competitiveness under the influence of different business environment variables. In terms of regression coefficients, the three variables of business environment do not have a direct effect on market competitiveness, which is consistent with our expected results. Model 5-1 and model 5-2 show that the interactive item of innovation investment and tax burden has a significant negative effect on market competitiveness ($\beta=-0.502, p<0.1$), and the interactive item of innovation investment and business access also has a significant negative effect on market competitiveness ($\beta=-0.923, p<0.1$), thus making hypothesis 2a and 2b supported. But model 5-3 shows that the interactive item of innovation investment and policy stability is not statistically significant to market competitiveness, so hypothesis 2c is not supported. Above all, hypothesis 2 is partially supported.

Table 4. Moderating effect of business environment (1)

Variables	Market competitiveness							
	1-2	5-1	5-2	5-3	3-2	6-1	6-2	6-3
Innovation	0.22*	1.26**	1.43*	0.77*	0.22*	1.26***	1.43***	0.77*
Tax		3.41				3.41		
Innovation × Tax		-0.50*				-0.50***		
Business access			10.12				10.12**	
Innovation × business access			-0.92*				-0.92**	
Policy stability				7.06				7.06
Innovation × policy stability				-0.42				-0.42
N	279	279	276	270	279	279	276	270
F-value	5.11***	5.74***	5.07***	4.77	4.35	4.78	4.91	4.35
R ²	0.119	0.161	0.146	0.142	0.119	0.161	0.146	0.142
Adj-R ²	0.104	0.133	0.118	0.112	-	-	-	-

Note: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 5 presents the regression results of innovation investment for corporate growth ability under the influence of different business environment variables. From the perspective of regression coefficient, model 7-1 and model 7-3 show that tax burden and policy instability have an adverse direct impact on corporate growth ability ($\beta = -0.472, p < 0.01$; $\beta = -0.437, p < 0.1$), but model 7-2 shows that the direct impact of business access on growth ability is not prominent. Inconsistent with expectations, the impact of the interactive item of three environmental factors and innovation investment on corporate growth ability isn't statistically remarkable, hence, neither hypothesis 2 nor its subordinate hypotheses are supported.

Table 5. Moderating effect of business environment (2)

Variables	Growth ability							
	2-2	7-1	7-2	7-3	4-2	6-1	6-2	6-3
Innovation	0.033	-0.041	0.029	-0.015	0.033	-0.041	0.029	-0.015
Tax burden		-0.472***				-0.472*		
Innovation× tax burden		0.037***				0.037*		
Business access			-0.191				-0.191	
Innovation×business access			0.003				0.003	
Policy stability				-0.437				-0.437*
Innovation × policy stability				0.035				0.035
<i>N</i>	375	373	370	363	375	373	370	363
<i>F-value</i>	97.43	77.00	77.19	74.12	92.91	72.86	77.54	70.57
<i>R</i> ²	0.650	0.656	0.659	0.654	0.650	0.656	0.659	0.654
<i>Adj-R</i> ²	0.644	0.648	0.650	0.645				

Note: inside the parentheses is the *t* value. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

5. Discussion and Conclusion

All economic activities need to be embedded in a specific business environment. A series of institutional problems, such as heavy tax burden, difficult business access and unstable policies, constitute the external environment for technological innovation and inevitably affect the behavior and results of enterprises. Therefore, the process of analyzing business environment's impact on performance of innovation investment is of great significance. In this paper, an empirical study was conducted on a sample of 2,700 enterprises from the World Bank's enterprise survey, and the results showed that private enterprises' innovation investment was conducive to building differentiated market competitive advantage, but had no significant impact on enterprises' sustainable growth. Besides, business environment restricts enterprises to achieving their performance of innovation investment, and excessive tax burden and business access will significantly weaken the market competitiveness brought by technological innovation.

This paper has the following contributions.

Firstly, through empirical analysis, this paper proves that technological innovation enables enterprises to maintain their differentiated market position, which further deepens academia's understanding of the relationship between technological innovation and performance. It is worth mentioning that the results of our research show that there is no clear connection between private enterprises' innovation investment and increase of product sales revenue. This suggests that although technological innovation plays an important role in promoting private enterprises' market competitiveness, current innovation investment cannot guarantee enterprises' development and growth in the long run, which is, to some extent, different from the descriptions in the existing literature, and thus a supplement to innovation research.

Secondly, directed against the actual situation of Chinese enterprises, and by exploring the environmental determinants in the process of realizing innovation performance, this paper discusses the conditions for performance of innovation investment to generate and change, and verifies the functional mechanism for "innovation-performance" process under the dynamic changes of environmental factors such as tax burden, business access and policy stability. In addition, this

paper studies the impact of adverse business environment on corporate innovation performance at a micro level and reveals the internal functional mechanism of technological innovation of transition economies for corporate performance.

Thirdly, this paper has some implications for both corporate management practice and government supervision mechanism. Concerning corporate management practice, this paper first affirmed that at current stage more investment in technological innovation might be an appropriate choice for Chinese enterprises to establish and maintain market competitive advantage, but meanwhile, indicated that technological innovation played a minor role in helping enterprises maintain sustainable growth ability. For this reason, private enterprises also need to put more energy on operation and management. Furthermore, in view of the fact that corporate innovation's value will be damaged by a bad business environment, effective measures should be taken to reduce and avoid the adverse impact of the existing environment, and to actively protect the effectiveness of corporate innovation. In relation to government supervision mechanism, this paper implied that government should enhance fairness in the market, cut down on business access barriers for private enterprises, optimize tax policy for them, and actually reduce their tax burden, to facilitate their healthy growth.

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