Transformation of Enterprise Innovation Achievements and Enterprise Growth Under Environmental Protection Regulation
-Evidence from China

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ABSTRACT

Using the panel data of Chinese listed enterprises from 2007 to 2020, this paper analyzes the impact of enterprise innovation achievement transformation cycle on enterprise growth. It further analyzes the impact of policy pressure and enterprise internal governance on the above process. The results are as follows: the transformation cycle of enterprise innovation achievements has a negative impact on enterprise growth; The pressure of environmental regulation positively regulates the relationship between the transformation cycle of enterprise innovation achievements and enterprise growth; Internal governance positively regulates this mechanism. This paper contributes to more effective R & D and innovation.

Keywords: enterprise innovation performance, Enterprise growth, Environmental protection regulation, Internal governance.

1. INTRODUCTION

In recent years, the focus of capital market investment has gradually turned to innovative enterprises with high growth. High growth enterprises have fast development speed, high value-added ability, can cause changes in the contemporary production field, and are at the forefront of the contemporary economy. They show their resilience to deal with the change of the economic environment in the huge impact of the epidemic. [1]. Under the background that China is committed to building a new development pattern with the domestic cycle as the main body and the international and domestic double cycles promoting each other, high growth innovative enterprises can play a vital role in improving the innovation ability, profitability, operation ability and risk control ability of Chinese enterprises. Therefore, the study of enterprise growth and its influencing factors has guiding significance for enterprises to adjust their development strategies according to their own situation and external environment.

As a high gathering place of national patents and independent intellectual property rights, the growth of innovative enterprises is closely related to the transformation cycle of their innovative achievements. How to carry out efficient follow-up development experiments to transform scientific and innovative achievements into new products and industries is very important for high-tech enterprises to improve the level of productivity and their long-term development. However, few scholars consider the impact of the transformation cycle of enterprise innovation achievements on enterprise growth. Most of the existing literature only evaluates enterprise growth, [2] and studies some influencing factors, such as tax burden [3] and financing efficiency[4] . Therefore, the research on the transformation cycle of innovation achievements is extremely necessary.

At the same time, with the development of economy and society, the Chinese government actively implements the sustainable development strategy, greatly improves environmental protection and governance, and the introduction of environmental control policies is becoming more and more intensive, which poses new challenges to the development of enterprises. Novel coronavirus pneumonia is also affected by the international political and economic

situation. The pace of China's high growth and innovative enterprises has slowed down by [1], which has tested the adaptability of enterprises to domestic policies and the efficiency of internal governance.

Based on this, this paper uses the panel data of Chinese listed enterprises from 2007 to 2020 to analyze the impact of enterprise innovation achievement transformation cycle on enterprise growth. It further analyzes the impact of policy pressure and enterprise internal governance on the above process. The research results not only help to enrich the research perspective in the field of enterprise growth and further broaden the relevant mechanism of government policy regulation on enterprise development, but also provide useful inspiration and reference for innovative enterprises to formulate their own development strategy and improve management efficiency and productivity in the new international and economic environment.

2. THEORETICAL ANALYSIS AND ASSUMPTIONS

2.1. Transformation of innovation achievements and enterprise growth

The transformation of innovative achievements refers to a series of activities such as subsequent test, R & D, practice and promotion of the amount of innovative scientific and technological achievements produced by enterprise production research and scientific and Technological Development in order to improve the production level of enterprises, until the formation of new products, new processes, new materials and the development of new industries. The transformation cycle of innovation achievements refers to the time interval from the completion of R & D of enterprise innovation research products to putting into quantitative production and use. At present, the transformation of innovation achievements, as an important indicator of the transformation of R & D investment results, has a vital impact on the development and value of enterprises. Previous scholars have directly studied the relationship between government tax reduction and tax reduction and enterprise growth, but the enterprise life cycle stage, as an important factor affecting enterprise innovation and R & D, has not been considered, and the existing literature has not analyzed the relationship between innovation achievement transformation cycle and enterprise growth. The process of enterprise innovation is a process of transforming knowledge, skills and materials into products or services that satisfy customers; It is the evolutionary process of the generation, creation and application of knowledge; It is a process of information interaction and processing. After this process, it can increase the enterprise value, improve the core competitiveness of enterprises, and promote the

comprehensive, coordinated and sustainable development of enterprises.

To sum up, the transformation cycle of innovation achievements is an important quantitative indicator of the transformation efficiency of innovation achievements, and the transformation of innovation achievements is an important indicator of the transformation of enterprise R & D investment results. Therefore, based on the data at the enterprise statement level, this project will distinguish the different life cycle stages of the enterprise, study the relationship between the transformation cycle of innovation achievements and enterprise growth, and measure the enterprise growth as a comprehensive evaluation index. Therefore, this paper proposes:

Hypothesis 1: the transformation of innovation achievements is negatively correlated with enterprise growth

2.2. Regulatory role of policy pressure

Nowadays, the global environmental protection industry has entered a stage of rapid development. The national control over environmental protection, energy conservation and greening has been continuously improved. The 19th National Congress of the Communist Party of China has gathered to promote the construction of ecological civilization, adhere to the policy of giving priority to conservation, protection and natural restoration, and strengthen environmental protection. Since the 13th five year plan, the state has formulated and implemented ecological and environmental protection plans, comprehensive energy conservation and emission reduction plans, resource conservation and recycling, fighting a tough battle for pollution prevention and control, and the unification of economy and environmental protection. Energy conservation and emission reduction have been included in the 11th Five Year plan, major environmental protection projects have been included in the 12th Five Year Plan, and the concept of green development has been included in the 13th five year plan plan. For the problems of air pollution, water pollution and land pollution caused by the economic development of enterprises and the development of industrialization and manufacturing industry, the relevant national departments have successively promulgated policies such as ten articles on air, ten articles on water and ten articles on soil.

It can be seen that the status of environmental protection and energy conservation has gradually improved, the formulation of environmental control standards has become more and more strict, and the introduction of environmental control policies has become more and more intensive. Wang Bingrong [1] pointed out in his research that in the face of the

pressure of national environmental protection policies, enterprises also need to adjust their industrial technology and innovation R & D in paying attention to environmental protection, promote technological innovation, improve enterprise competitiveness on the premise of adapting to national environmental protection policies, so as to achieve economic growth, increase enterprise business value and achieve the win-win goal of environmental protection and economic development. Therefore, this paper proposes:

Hypothesis 2: policy pressure positively regulates the impact of innovation achievement transformation on enterprise growth

2.3. *Regulating role of internal governance quality*

Internal governance refers to the formal institutional arrangement of corporate governance confirmed by law, which is the basis of corporate governance. It mainly refers to the game equilibrium arrangement and game equilibrium path among shareholders (board), directors (board), supervisors (board) and managers. Zhao Jinlian [2] demonstrated in his research that in line with the requirements of the development trend of the times, the two rights, namely ownership and management rights, were finally separated, and various internal governance problems appeared, with complex interactions, which affected the effectiveness of internal control and reduced the investment efficiency of the enterprise. Previous studies have concluded that there is a positive correlation between corporate governance and internal control quality; The empirical results of internal control quality and investment efficiency show that there is a positive correlation between them. It can be seen that the empirical results of internal governance quality and investment efficiency show a positive correlation, which affects the investment of enterprises in innovation and the transformation of innovation achievements. Therefore, this paper proposes:

Hypothesis 3: internal governance quality negatively regulates the impact of innovation achievement transformation on enterprise growth

3. EMPIRICAL TEST

3.1. *Variable definition*

Referring to the current relatively perfect research, this paper first quantifies the transformation cycle of innovation achievements. In previous studies, the output efficiency of innovation achievements is often used to quantify. In this paper, the ratio of innovation output to output input is used to quantify, and the innovation quantification method is adopted.

Secondly, in the process of quantifying dependent

variables, this paper selects the existing methods. The existing studies mostly use the financial dimension to quantify. The quantitative methods include enterprise inventory turnover period, enterprise cash flow and asset ratio, etc. This paper draws on the existing research conclusion: the goal of enterprise development and production is profit. Therefore, the growth rate of operating revenue can be quantified.

This paper also quantifies the regulatory variables. This paper holds that enterprises will be paid more attention by the authorities after discharging pollutants and failing in environmental supervision, so as to be under the pressure of environmental regulation. Therefore, this paper constructs an environmental regulation index: the sum of the number of excessive pollutant emissions, the number of environmental violations and the number of environmental letters and visits is the environmental regulation index. For another regulatory variable: internal governance index, this paper also constructs the index. We believe that according to the signal transmission theory, enterprises' attention and confidence in internal governance will promote them to publish their own internal governance. Therefore, we take whether the internal governance report is published or not as the regulating variable: the quantitative variable of the internal governance index. It should be noted that this variable is a binary variable.

According to previous studies, in order to increase the robustness of this study, reduce the endogeneity between various variables, and promote the research to be more in line with the actual situation. This paper controls the total asset turnover rate, asset liability ratio, book to market ratio and enterprise scale.

3.2. *Data and methods*

The data in this paper are from CSMAR database, which contains the financial data of most Chinese listed companies. It should be noted that, referring to the previous research methods, in order to promote the reliability and robustness of the research samples, this paper excludes the data of listed companies and St enterprises in the financial industry. In this paper, multiple linear regression method is used to verify the research hypothesis.

3.3. *Descriptive statistical analysis*

This paper makes a statistical test on the relevant data to analyze its data characteristics. As can be seen from the table below, among the variables selected in this paper, the variance between various variables of the enterprise is large, indicating that the concentration of variables is not strong. Therefore, this paper processes the data with winorsize to the extent of 1% and 99% to improve the robustness of this study.

Table 1 .Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation	Kurtosis	
						Std. Error
Enterprise growth	-118235.347779	1314102566.0000	4835.29620568	2519732.3345701	271987.953	.009
Total asset turnover	-.207164	134.366773	.31291251	.458161955	24332.534	.009
Asset liability ratio	-.683827	9795000.250000	31.79672536	17506.878938961	313033.841	.009
Book to market ratio	.000023	1.963518	.61899739	.248799582	-.579	.013
Enterprise scale	0	35136284	48979.70	713499.116	860.556	.008
Internal governance index	-2	2	-.03	.205	51.598	.005
Environmental regulation index	-2	2	-.01	.134	163.648	.005
Transformation cycle of innovation achievements	.00	7769500000.00	18955610.8805	140367159.88953	1006.786	.030

3.4. Correlation test

After completing the processing of the original data, this paper tests the correlation of the main variables to analyze their preliminary relationship. As can be seen from the table below, the correlation coefficient between the independent variable and the dependent variable and the correlation coefficient with the regulating variable are less than 0.5, indicating that there is no strong collinearity between the main variables, so the regression equation can be analyze

Table 2 .Correlations

		Enterprise growth	Internal governance index	Environmental regulation index	Transformation cycle of innovation achievements
Enterprise growth	Pearson Correlation	1	-.010**	.000	.000
	Sig. (2-tailed)		.000	.919	.046
Internal governance index	Pearson Correlation	-.010**	1	.224**	.009
	Sig. (2-tailed)	.000		.000	.125
Environmental regulation index	Pearson Correlation	.000	.224**	1	.006
	Sig. (2-tailed)	.919	.000		.304
Transformation cycle of innovation achievements	Pearson Correlation	.000	.009	.006	1
	Sig. (2-tailed)	.046	.125	.304	

**. Correlation is significant at the 0.01 level (2-tailed).

Table 3 Regression results

	Model 1	Model 2	Model 3
Transformation cycle of innovation achievements	-1.947(-0.052)	-2.030(-0.054)	-1.246E-5 (-.033)
Total asset turnover	-5057.338(-0.050)	-5159.370(-0.051)	-8544.486 (-.084)
Asset liability ratio	21.492(0.008)	28.859(0.011)	5.237 (.002)
Book to market ratio	224243.950(1.114)	222806.221(1.107)	223875.096 (1.112)
Enterprise scale	-.057-0.161)	-.057(-0.162)	-.059 (-.167)
Internal governance index		22608.759(0.322)	-205606.133 (-2.062)
Environmental regulation index			22590.683 (0.322)

3.5. *Regression test*

Firstly, this paper analyzes how the transformation cycle of innovation achievements affects enterprise growth. The results are shown in the table below. It can be seen from the table that the regression coefficient is -1.947, indicating that the longer the transformation cycle of innovation achievements, the lower the growth of enterprises. Hypothesis 1 of this paper has been verified. The variance expansion coefficient (VIF) of the main effect is less than 3, indicating that the effect is robust.

This paper tests the regulatory role of environmental regulation. As can be seen from the table below, the regression coefficient of innovation achievement transformation cycle has increased significantly after being incorporated into environmental regulation; It shows that environmental regulation plays a positive role in regulating the relationship between the transformation cycle of enterprise innovation achievements and enterprise growth. Hypothesis 2 is verified.

Finally, this paper brings the enterprise internal governance index into the research system for test, and obtains the results shown in the table below. It can b45e seen from the results that after being included in the enterprise internal governance index, the regression coefficient between innovation achievement transformation cycle and enterprise growth is significantly improved, indicating that enterprise internal governance positively regulates the relationship between enterprise innovation achievement transformation cycle and enterprise growth. This is inconsistent with the original assumption. We make a logical derivation and speculate that there are the following relationships: the improvement of the internal governance index improves the internal development power of the enterprise, so as to improve the growth of the enterprise; However, this internal governance does not directly affect the enterprise's innovation investment and R & D, so the regression coefficient of the two is significantly improved.

4. CONCLUSION

After empirical analysis, this paper verifies hypothesis 1 and 2, but does not verify hypothesis 3.

This paper plays a guiding role in the rational planning and development of enterprises and balancing their own innovation and profitability.

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