

## Research on the Impact of Sustainability of Technological Innovation in Automobile Manufacturing Enterprises on Market Share

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**Abstract:** This paper selects the domestic auto manufacturing listed companies from 2008 to 2017 as the research object, and analyzes the impact of technological innovation on market competitiveness. This paper starts from the perspective of technological innovation output and selects relative indicators to measure technological innovation. In terms of market competitiveness, the proportion of operating income to total market revenue is used. Findings: There is a significant positive correlation between the growth rate of technological innovation in the automotive industry and market competitiveness. Then, the classification research is further carried out from three aspects: the degree of regional property rights protection, the nature of the enterprise, and the brand awareness. For areas with good property rights protection and state-owned enterprises, the growth rate of invention patents can enhance the market competitiveness of the company, but the growth rate of invention patents can significantly improve the competitiveness of the market.

### 1. Introduction

Our country is at a critical moment of industrial structure transformation. The state attaches great importance to enterprise innovation. The Eighteenth National Congress of the Communist Party of China clearly put forward the strategy of innovation-driven development, which must be placed at the core of the overall national development [1]. This has also led to the government's strong support for technological innovation, but with the frequent occurrence of financial subsidies, the state's financial subsidies for the automobile manufacturing industry are also decreasing, including the "post-subsidy era" of new energy vehicles in 2020.

On the other hand, reducing carbon emissions has become the consensus of the international community [2].

### 2. Theoretical Analysis and Research Hypothesis

Since the late 1990s, technological innovation has been given wide attention. Technological innovation is a new combination of production conditions and factors [3]. The main activities consist of two parts: product innovation and process innovation, including the whole process of applying new products and process ideas, design, research, development, production and market development, and identification to commercialization (OECD, 2001).

With the acceleration of product renewal, competition among enterprises is ultimately technological competition. However, technological innovation is not an end in itself. It is the purpose to bring profits to enterprises when they are put into production. Some innovative products accurately identify the real needs of the market will enable enterprises to successfully seize the opportunities of the market (Porter, 1985). In the cruel market economy, the commodity-currency jump is unsuccessful, and the commodity owner must be the one who falls [4]. Therefore, the transformation of technological innovation into market competitiveness has also attracted much attention.

#### 2.1 Technological innovation and market competitiveness

Market competitiveness is a part of enterprise financial performance. At present, there are few

articles on the impact of financial performance on market competitiveness, most of which are included in the study of financial performance. The relationship between technological innovation and financial performance is still controversial. Compared with other industries, whether technological innovation can improve financial performance in automobile manufacturing industry is more complex. The market environment of both internal and external worries requires higher level of technological innovation in automobile manufacturing industry [5]. H1: The growth rate of invention patents can significantly improve the market competitiveness of enterprises.

Technological innovation may affect market competitiveness, and influencing factors will play a role in it. This paper also explores whether external factors will affect the ability of enterprises to transform technological innovation into financial performance.

## **2.2 The impact of regional and industrial characteristics**

### **2.2.1 Regional characteristics: degree of property rights protection**

Due to market failure and spillover effects of innovation, these spillovers are geographically constrained by geographical proximity to innovative producers (Acs et al., 1994; Anselin et al., 1997; Audretsch and Feldman, 1996; Jaffe et al., 1993). The industrial agglomeration, regional human resources support and regional research investment guarantee brought by knowledge spillover effect have positive effects on the comprehensive performance of enterprises, while the industrial diversification brought by knowledge spillover effect has negative effects on the comprehensive performance of enterprises (Zheng Jiliang, 2018). According to Schumpeter's point of view, enterprise innovation drive is the result of the game of innovation input, innovation profit and innovation risk. The profit brought by innovation input is enough to make up for the innovation cost and reduce the innovation risk effectively, which is the reason of enterprise initiative innovation. In the absence of good legal protection, the high-tech industry is facing a particularly serious risk of embezzlement [6]. The attributes of public goods and spillover effects of innovation may weaken the incentives for enterprises to engage in innovation [7]. A large number of studies show that property rights protection and law enforcement can effectively improve the investment and financing willingness and R&D efficiency of enterprises (Beck et al. 2005; Ang et al, 2014). The exclusive performance of patent protection is effectively protected, and the technological innovation achievements of enterprises can be better applied to products.

H2: For enterprises with strong property rights protection, the growth rate of invention patents can significantly improve the competitiveness of enterprises in the market.

### **2.2.2 Industry characteristics: state-owned and non-state-owned**

The degree of property rights protection may vary from region to region, but it is in the same region, and property rights protection is public goods. The patent value of non-state-owned enterprises and high-tech enterprises is more sensitive to the protection of intellectual property rights (Longxiaoning, Yiwei, Lin Zhifan. 2018). H3: For non-state-owned enterprises, the growth rate of invention patents can significantly improve market competitiveness.

## **2.3 The Impact of Enterprise Characteristics**

According to the brand signal theory, although consumers want to judge the quality of products to determine the purchase decision, it is difficult for consumers to evaluate them beforehand. In order to reduce transaction costs and risks, the emergence of brands can enable consumers to reduce the risk of adverse selection [7].

On the other hand, the traditional view is that technological innovation will affect brand, but brand effect in turn will affect technological innovation. For enterprises, strong brands can maintain high product prices, have strong financing capabilities, resist attacks from competitors, constantly create profits for the company, increase company value and so on (Lu Taihong, 2009), especially in the future profitability (Mizik, 2014).

H3: For enterprises with strong brand awareness, the growth rate of invention patents can significantly increase market share.

## 2.4 Research Design and Definition of Variables

### 2.4.1 Research and design

This paper tests the above hypothesis through panel data at the enterprise level. The empirical model of testing hypothesis H1 is as follows:

$$YYARZB = \lambda_0 + \lambda_1 X_{j,t} + \lambda_2 zc ds + \lambda_3 zc fz l + \lambda_4 sjkzr + \lambda_5 dqbl + \lambda_6 hyxnbl + \lambda_7 ssnf$$

In terms of the degree of property rights protection, this paper refers to Wang Fanglan (2017) to measure the degree of property rights protection in the region with the provincial market index of the invested enterprises. The samples are divided into good and bad sub-samples according to the degree of protection of regional property rights, and the others are poor sub-samples of protection of property rights. The sub-samples are regressed [7]. In terms of the nature of enterprises, this paper obtains the information of the actual controlling nature of enterprises from CSMAR Guotai'an database, and defines the enterprises with the actual controlling nature as "state-owned enterprises", "administrative organs and institutions", "central organs" and "local organs" as state-owned enterprises, while other enterprises are defined as non-state-owned enterprises.

### 2.4.2 Definition of variables

#### 1) Interpreted variables

In the aspect of market competitiveness, we choose the indicators reflecting the competitiveness of enterprises in the market: YYSRZB and YYSRZL, which mainly focus on the market share of business income, and the growth rate of sales revenue as the robustness analysis.

#### 2) Explanatory variables

Technological innovation is a continuous activity. Especially for the automobile manufacturing industry, it needs sustained efforts to form a large-scale patent pool, so as to promote the selection of relative indicators to measure the growth of technological innovation in this paper.

## 3. Empirical Research

### 3.1 Descriptive statistics

In this paper, the above variables are classified by year, and the reasons for the length are not shown in this paper. Operating revenue and operating costs are gradually rising, with an average increase of more than three times between 2006 and 17 years. Among them, 10 and 11 years of rapid growth in operating revenue and operating costs, the average profit margin is relatively large, just in line with the reality. On the other hand, 10 years ago, appearance patents were more than invention patents on average. After 10 years, invention patents were more than appearance patents, and the growth trend of appearance patents was more obvious.

It can be seen that the proportion of business income, business profit, total number of patents, invention patents, appearance patents and business income in areas with good property rights protection is significantly higher than those in areas with poor property rights protection. Moreover, from the perspective of variance, the differences between enterprises are more obvious in the areas where property rights are well protected, showing a strong Matthew effect.

Table 1

	Mean	Min	Max	Std	Mean	Min	Max	Std
yysr	2.64e+10	3.40e+08	8.58e+11	8.65e+10	5.08e+09	5.98e+07	1.06e+11	1.28e+10
yycb	2.23e+10	2.94e+08	7.42e+11	7.46e+10	4.04e+09	2.85e+07	8.58e+10	1.02e+10
YYLR	1.98e+09	-2.66e+09	5.41e+10	6.81e+09	4.39e+08	-1.46e+09	1.23e+10	1.31e+09
zlzs	154.0338	0	4264	444.7084	109.2661	0	2128	293.6397
fmzl	56.20923	0	1818	184.061	42.58716	0	1263	147.4005
wgzl	26.63692	0	627	76.18964	17.23242	0	436	48.99682
yysrzb	0.0253344	0.000259	0.44032	0.063482	0.004027	0.0000526	0.054232	0.008420

### 3.2 Regression analysis

In this paper, the weighted least squares method is used to get a more suitable model by regression

item by item. As follows:

Table 2

Zlzs	.000333(.0003175 )		
Fmzlb		.0005727***(.0002168)	
Wgzlb			-.0002813(.0001988)
Zc	.0082567***(.000585)	.0084283***(.0006366)	.0094983***(.0006286)
Zcfz	.0048452*(.002723)	.0059472**(.0030036 )	.0064038(.0039133)
Dq	.0035928**(.0017307)	.003929**(.0017541)	.0063259**(.0026979)
Sjkz	.0061336***(.0011477)	.00684***(.0012563 )	.0083301***(.0016398)
Ssnf	-.0010962***(.0001795)	-.0011198***(.0001838)	-.0014903***(.0002369)
Hyxn	.0029681**(.0012506)	.0026622*(.0014392)	.0013014(.0013494)

From Table 2, we can see that the growth rate of invention patents has a significant role in promoting the market competitiveness of automobile manufacturing enterprises.

Table 3

	Ppzm=1	Ppzm=0	zcd=1	zcd=0	sjkz=1	sjkz=0
FMZLb	.0006551 (.000569)	.0004492* (.0002489)	.0006031***(.000222)	-.0006986 (.0006285)	.0013841***(.000436 )	.0000803(.0001224 )
Zc	.0108186* ** (.000634)	.006611*** (.0012241)	.0086482*** (.0006715)	.006772*** (.001553)	.0102685*** (.0007304)	.0052137*** (.0008513)
Zcfz	-.0044927 (.003933)	.0090824** (.0040589)	.0066022** (.003023)	.0202739** (.009369)	.02689 *** (.0056295)	.0018285(.0023805 )
Dq	.0025486 (.0028721)	.0045084*** (.0016684)	.0063255**(.0030901)	-.0041152** (.0017762)	-.0026037(.0016633)	.0100208 *** (.0023739)
Sjkz	.0105127* ** (.0017444)	.0047014*** (.0014441)	.0068795*** (.0013488)	.0091201** (.0040729)	0	0
Hyxn	-.001145 (.0014506)	.0056593** * (.0024676)	.002487(.0016922)	.0131301* ** (.0040538)	-.0030703*(.0017276 )	.0101153*** (.0014634)
Ssnf	-.0013171 *** (.0002163)	-.0007854*** (.0002699 )	-.0012144*** (.000209)	-.0008884** (.0003549 )	-.0014657*** (.0002936)	-.0008805*** (.0001733)

As can be seen from the table above, brand awareness is an important division for automobile manufacturing enterprises. Contrary to the expected hypothesis, the market is more tolerant for enterprises with low brand awareness and brand awareness. Invention patents can better improve the market value of enterprises. On the other hand, for enterprises with low brand awareness, the growth rate of invention patents has a significant role in promoting their market share. It is attributed to the fact that technological innovation of enterprises with low brand awareness can significantly enhance the future potential of enterprises through market signal transmission, thereby enhancing the market value of enterprises and seizing market share.

#### 4. Research Conclusions and Enlightenment

Firstly, the steady growth of invention patents in automobile manufacturing enterprises can enhance their market competitiveness.

Secondly, in terms of brand awareness, we borrow Dickens' famous saying: "This is the worst era, and also the best era." Automobile manufacturing industry is facing internal and external problems. Invention patents themselves can not effectively improve the profitability and market share of enterprises, but also bring a turning point to enterprises with low brand awareness. Steady growth of invention patents can improve market share and occupy a place in the fierce market competition.

Thirdly, the state should strengthen the construction of intellectual property rights, so as to ensure

that technological innovation achievements of enterprises can be transformed into competitive advantages of enterprises, and then promote the long-term sustainable development of the automobile industry.

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