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EFFECT OF FIRM INNOVATION ON PERFORMANCE: EVIDENCE FROM CHINA A-LISTED FIRMS

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ABSTRACT: *The purpose of this research is to find out the effect of firm innovation activities on different firm's performance measures. Additionally, this study explore the extent of innovation-performance relationship between SOEs and Non-SOEs firms. Innovation data is collected from the Chines Security and Market Research Database (CSMAR) for the period 2008 to 2016. OLS regression with year and industry fixed effects is applied to the data. The results showed that the innovation activities measured through Patents grants, innovation grant and industrial design grants have a positive and significant effect on firm performance. When the data is divided into state vs non-state firms, we find that the state owned firm's innovative activities effect on firm is greater than the non-state firms. Our findings support the fact that innovation strategy is an important driver of firm performance and should be developed and executed as an integral part of the business strategy. Managers should recognize and manage the innovations in order to boost their operational performance. Having a clear understanding of the exact nature of innovations will help firms to prioritize their market, production and technology strategies, to be followed by appropriate subsequent action plan.*

KEYWORDS: Innovation; Firm Performance; State Owned vs Non-state owned; Emerging Market

INTRODUCTION

Innovation is considered as one of the driving factor in the performance of the firm (Jiménez-Jiménez & Sanz-Valle, 2011; Camisón & Villar-López, 2014). An innovative firm has a competitive advantage over its rival firms (Rosenbusch, Brinckmann, & Bausch, 2011; Urbancova, 2013) as well as it experiences a higher growth rate (Hashi & Stojčić, 2013). A vast variety of studies have explored the effect of innovation on firm performance and the results are mixed. Mariano & Casey (2015) found out that innovation leads to higher performance in the presence of better corporate governance system. A firm in competitive industry can have enhanced performance as compared to concentrated industry (Acs & Audretsch, 1988;. Cohen & Levinthal, 1990; Agha, Alrubaiee, & Jamhour, 2012).

In an emerging economy such as China, innovation has played a vital part in the overall growth of the industries. State Intellectual Property Office (SIPO) of the Peoples Republic China is responsible for authorizing the patenting of the firms. The People's Republic of China introduced the 1st Chinese Patent Law in 1984, and has since been changed so many time according to international standards to enable its growth into an innovative economy (Yueh, 2009;Trappey, Wu, Taghaboni-Dutta, & Trappey, 2011; Law, Taduri, Law, & Kesan, 2015; Hu, Zhang, & Zhao, 2017). China's State Intellectual Property Office (SIPO) grants three types of patents: invention patents, utility model patents, and design patents. An invention patent defends technical solutions or improvements relating to products or processes, while the

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structures and shapes cover by the utility model patent and design patents involves new designs, shapes, patterns, or colors. (Liegsalz & Wagner, 2013).

The Chinese listed firms are mostly owned by the government or government related entities (Sami, Wang, & Zhou, 2011; Yu, Li, & Yang, 2017). The state owned firms enjoys better financing from the banks as well as their management has deeper networks with the other government entities (Xiongyuan & Shan, 2013). The non-state firms on the other hand has lower agency cost and more efficient (Fang, He, & Li, 2016).

The purpose of this paper is to explore the effect of firm innovative activities on its performance. Additionally, this study seeks to analyze if there is a difference in the effect of innovation on performance in SOE's as compared to NSOE's. Data is collected from the Chinese data base website Chinese Stock Market and Accounting Research (CSMAR). The data is collected for the time period 2007 to 2016. Three measures of innovation namely Patents application granted, invention application granted and industrial design application granted are used as independent variables. The dependent variables used in the study are Return on Assets (ROA), Return on Equity (ROE) and Tobin's Q. For analysis purpose, ordinary least square (OLS) with year and industry fixed effects is estimated.

The results showed that the effect of the innovative activities on firm performance for overall sample is enhanced by the firm's innovative activities, growth and size while the Leverage, Loss and firm age negatively effects on the firm performance. The comparative analysis of state and non-state firms provides evidence that the effect of innovation on firm performance in state owned firms is greater as compared to non-state firms.

The remaining part of this paper is prepared as follows: the next section provides the theoretical background and hypotheses. The succeeding section describes the data and measures used in the research design. Then, this research shows the results and the last section provides arguments of the research findings and suggestions for future research directions.

LITERATURE REVIEW

Effect of Innovation on firm performance

The effect of innovation on firm performance has been explored by different strand of literature. Innovation gives the firms require derive to survive in the competitive industries (Gunday, Ulusoy, Kilic, & Alpkan, 2011; Tang, 2006). A number of studies have found a positive relationship between firm innovative activities and firm performance.

Jiménez-Jiménez & Sanz-Valle (2011) has investigated the effect of different innovation activities on firm performance by using data from 451 Spanish firms. By employing structural equation modeling (SEM), the result showed a positive association between innovation and organizational performance. Similarly, the technological innovation has also a positive effect on firm performance as explored by (Camisón & Villar-López, 2014). Using survey methodology and employing structural equation modeling on Spanish firms, they concluded that product and process leads to higher firm performance.

Gunday et al. (2011) explored the relationship between innovation and firm performance in Turkey. By using the 184 manufacturing companies as sample, they concluded that processes, products and services innovation of a firm have a positive relationship with firm performance.

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Ngo & O'Cass (2013) investigated the effect on the firm performance by surveying 259 Australian firms as sample. They analyzed data by using partial least square (PLS), the result showed innovation enhance the firm performance with mediating role of customer participation.

Liao & Rice, (2010), stated that the innovation is a basic driver of a firm performance. They used 499 Australian manufacturing companies as a sample from the Business Longitudinal Survey from the Australian Bureau of Statistics. They developed a model to examine innovation impact on firm performance with mediation through firm's market engagement and transformation strategies. Finally they concluded that innovation positively affect the firm performance due to rapid change in technology.

The People's Republic of China has become one of the largest emerging markets in the world (Tong, Zhang, He, & Zhang, 2018). Bong Choi & Williams (2013), studied the relationship between innovation and firm performance in China and Korea. Research answered the three main questions (I) intensity of innovation, (II) scope of innovation and (III) spillovers impact firm performance with comparative institutional approach. By Analysis of 897 firms over a 4-year period, results shows patent intensity is a strong cross cross-contextual argument, Scope and spillover arguments to be more context-sensitive. Firms in Korea, enjoy better performance with technological innovation, while diversified innovation is more beneficial for firms in China. Spillovers have a stronger impact in Korea as compared to China. The countries such as Taiwan and Korea economic success is due to the change in their technological development strategy. In Taiwan and Korea governments have a complete road map about firm's innovation activities in Science and Technology (S&T). The road map cover the firms R&D investments in strategic industries, patent law and regulations, technology adoption from foreign countries. (Choi, Lee, & Park, 2013)

Summing up, innovation is regarded as key determinant of financial performance. Accordingly, our first hypothesis becomes;

H1: Firm innovative activities have a positive effect on firm performance in Chinese listed firms.

Effect of Innovation on Firm Performance in State and Non-state Firms:

The researchers have argued that the effect of ownership type on firm performance varies from state to non-state ownership. State owned firms have easy access to external financing (Claessens & Yurtoglu, 2013; Luo & Ying, 2014; Chen, Jiang, & Yu, 2015), greater market power (Mühlenkamp, 2015), better bargaining power (Q. Liu, Luo, & Tian, 2016) and have political connections (Li, Song, & Wu, 2015). The non-state firms on contrary has better governance system (Raelin & Bondy, 2013; Talke, Salomo, & Rost, 2010; Amore & Bennedsen, 2016) , greater managerial ability (Cull, Li, Sun, & Xu, 2015) and efficient utilization of resources (Subramaniam, Kansal, & Babu, 2017). This leads to a contradicting evidence on the effect of ownership types on firm performance in literature.

A lot of study has been done on ownership structure and firm performance and concluded that concentrated ownership has a positive effect on firm performance , (Klapper & Love, 2004). Ownership concentration leads the firms to easily enhance their innovation activities, research and development projects, which leads to increase firm's profitability (Chang, Chung, & Mahmood, 2006; Motohashi & Yun, 2007; Subramaniam, Kansal, & Babu, 2017). Chang et al. (2006) argued that the ownership structure play an important role in technological

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development of country, the reason behind that a small number of large-block shareholders like to make long-term investments in Research and development to increase the firms stability, relatively profit maximization in short term.

Many factors affect the firm's performance and firms innovative activities, institutional factors are one of them. Institutional factors strongly effect the firms' innovation activities with proper sources of information to adopt the technological change in the firm's infrastructure. Firm innovation activities also effected by government policies of the Country. (Amsden, 1989; Estrin & Prevezer, 2011).

China has focused on the privatization of state-owned enterprises (SOEs), to converting property rights from state sectors into non-state sectors with different types of ownership (Child & Yuan, 1996; H. Wang, Jiang, & Wang, 2011). Policy instruments include the facilitation of R&D investments in strategic industries, the management of government-funded research institutes, the establishment of patent regulations and law, the importation of advanced technology from foreign countries, and launch of national strategic projects. State ownership has positive effects on the performance of firms both in advanced and transition countries, Sun, Tong, & Tong, (2002).

In some literature, state-owned enterprises (SOEs) has a negative impact on firm performance due to lack of managerial knowledge and inefficient structure, bureaucratic nature and inefficient effects of State-owned enterprises (SOEs) negative effects on the innovation activities and firm performance. Chang, Chung, & Mahmood (2006) and Kim, Kim, & Hoskisson (2010) stated that, government play an important role in the process of industrialization and develop innovation capabilities with science and technology policies of Chinese government. So the result from their studies, state-owned firms have significant incentives and access to import infrastructure that will facilitate government-initiated innovation activities. Fang, He, & Li (2016) studied the innovation and its impact on firms growth by using the firm patent data from 1998-2007. In methodology they used patentees as the treatment group and non-patenting firms Propensity-Score Matching method as the control group. The result showed that firm size, exports, productivity and new product revenue share increased when firm increases in patent stock. They also found state-owned enterprises (SOEs) have low level of productivity and less innovative as compared non-state-owned (NSOEs).

Motohashi & Yun (2007) stated that state owned firms in china involved in science and technology outsourcing activities in the 1990s, increase the level of firm's innovative activity as compared to non-state firms.

Accordingly, our next hypothesis becomes:

H2: The effect of innovation on firm performance differs in SOE's and NSOE's.

METHODOLOGY

Sample Selection

This study is based on secondary data, the data is collected from Chinese stock market and accounting research (CSMAR) for innovative firms from the year 2008 to 2016. We excluded the data pertaining to financial sector because of its unique way of representation of financial statements. Also, the data of the firms with ST (Special treatment) or PT (Particular treatment)

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status are excluded. In China, these two categories are termed as financially distressed firms and needs special attention.

Model

The baseline model to test the effect of firm's innovative activities on firm performance is measured through the following equation.

$$Firms\ Performance\ =\ innovative\ Activates\ +\ Control\ variable\ +\ \varepsilon$$

$$ROA = Patents\ Grants + Innovation\ Grants + Industrial\ design\ grants + Size + Leverage + Growth + Firm\ age + Loss\ dummy + \varepsilon \quad (1)$$

$$ROE = Patents\ Grants + Innovation\ Grants + Industrial\ design\ grants + Size + Leverage + Growth + Firm\ age + Loss\ dummy + \varepsilon \quad (2)$$

$$Tobin's\ Q = Patents\ Grants + Innovation\ Grants + Industrial\ design\ grants + Size + Leverage + Growth + Firm\ age + Loss\ dummy + \varepsilon \quad (3)$$

In the above model the ROA, ROE and Tobin's Q are the dependent variables and are measures of performance. While the Patents-Grants, Innovation-Grants and Industry design-Grants are the explanatory variables. The control variables are Size, Growth, Leverage, Firm age and Loss dummy respectively. All the explanations of variables are given in the variable measurement section.

Variable Measurements

The measurement of variables with respect to dependent, independent and control variables are given below.

Table1. Variables Measurement

	Variables	**Symbol**	**Measurement**	**Theoretical Support**
Performance Measures	Return on Assets	ROA	Net income before extra-ordinary items scaled by average total assets.	(Bhagat & Black, 2002; Sami et al., 2011; Y. Liu, Miletkov, Wei, & Yang, 2015)
	Return on Equity	ROE	Net income before extra-ordinary items scaled by average equity.	(Brown & Caylor, 2009; Salim & Yadav, 2012)
	Tobin's Q	Tobin's Q	Book value of debt plus market value of equity scaled by the book value of total assets	(Ferreira and Matos 2008; and Wei et al ; 2005;Peni, 2014)
Innovation Measures	Patents application accepted	Patents-Grants	Number of authorized applications for the	(Z. Chen & Guan, 2011:

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			current statistical year for inventions.	Nepelski & De Prato, 2015; Kline, Petkova, Williams, & Zidar, 2017)
	Innovation application accepted	Innovation-Grants	Number of authorized applications for the current statistical year for utility model.	(Gunday et al., 2011; Hashi & Stojčić, 2013)
	Industrial Design applications accepted	Industrial Design-Grants	Number of authorized applications for the current statistical year for industrial design.	(Geroski, Machin, & Reenen, 1993)
Control Variables	Size of Firm	Size	Natural Log of total assets	(Folta, Cooper, & Baik, 2006; (Kalkan, Erdil, & Çetinkaya, 2011)
	Leverage Level	Leverage	Total debt scaled by total assets	(Margaritis & Psillaki, 2010)
	Growth of firm	Growth	Current year sales minus previous year sales, scaled by previous year sales	(Zahra & Garvis, 2000)
	Age of Firm	Firm Age	The age of the firm in years calculated from since the year of listing on Shanghai stock exchange or Shenzhen stock exchange.	(Rosenbusch et al., 2011; Coad, Segarra, & Teruel, 2013; Cruz, Larraza-Kintana, Garcés-Galdeano, & Berrone, 2014)
	Loss Dummy	Loss	A dummy variable equals to one if the firm incur loss in a particular year; zero otherwise	(Lin & Chou, 2015)
	Industry Effect	Industry	We have used industry fixed effect to coupe for industry wise variations.	(Mühlenkamp, 2015)
	Year Effect	Year	A variation in year wise effect can be curtailed through year fixed effect.	(Rosenbusch et al., 2011; Hashi & Stojčić, 2013)

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RESULTS AND DISCUSSION

Descriptive Statistics

Table 1 shows the descriptive statistics of the overall sample firms. The mean value of firm's invention in the sample is 5.84 per year. The mean value of innovation and utility model applications accepted are 14.52 and 4.787 respectively. Innovative firms in China has average leverage ratio of 42.3 percent with an average growth of 7.8 percent. About 1.08 percent of the innovative firms are incurring losses for the last two years. This means that innovative firms are less prone to losses. The average age of innovative firms is about 6.683 years emphasizing on the fact that the young firms are more innovative. The innovative firms shows a positive market performance with the Tobin's Q value of 2.371. This shows that the market expects higher for the firms innovative activities. Similarly the book based returns as depicted by ROA and ROE are also positive with the values of 4.5 percent and 7.07 percent respectively.

The second part of the table gives a comparative picture of the state and non-state firms involved in the innovative activities. The level of innovation, invention and utility model grants in state owned companies is much greater than that of the non-state companies. It means state owned companies are more innovative. It has also been observed in many researches that the state owned companies have government backing and managers have political connections. Also the state owned companies have more access to bank finance that makes them less financially constrained. However on the contrary the performance of state firms is less than that of the non-state firms. The average value of Tobin's Q, ROA and ROE in non-state owned companies is 2.72, 5.37 percent and 8 percent as compared to 1.752, 3.19 percent and 5.38 percent of state owned companies.

Looking at the average Leverage value of state owned companies is 51.2 percent which is higher than non-state companies Leverage of 37.2 percent. These values again emphasize on the fact that state owned companies have greater access to outside financing that lead them to generate higher innovative activities. The average age of state owned companies is much higher than non-state companies' involved in innovative activities (10.35 years > 4.5 years). The growth rate of non-state companies (9.31 percent) is greater than that of the state owned companies (5.33 percent). Due to this reason the non-state companies transform the sales into profit hence increasing the overall performance.

Table 2: Panel A: Descriptive Statistics Overall

VARIABLES	Obs.	Mean	SD	Min	Max
Patent grants	12,718	5.841	67.39	0	3,589
Innovation grants	12,718	14.52	66.49	0	2,549
Industrial design grants	12,718	4.787	22.61	0	617
Leverage	9,494	0.423	1.121	0.00750	94.44
Size	9,494	21.77	1.242	16.71	28.51
Growth	8,133	0.0780	0.291	-12.76	1
Loss	9,494	0.0108	0.104	0	1
Age of firm	9,323	6.683	5.573	0	25
Tobin s Q	9,369	2.371	2.318	0.0456	92.11
ROA	9,494	0.0458	0.0549	-0.232	0.218
ROE	9,537	0.0707	0.115	-0.746	0.434

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Table 2: Panel B: Descriptive Statistics SOEs and Non-SOEs

	State Owned					Non-State Owned				
VARIABLES	Obs.	Mean	SD	Min	Max	Obs.	Mean	SD	Min	Max
Patent grants	3,465	11.03	102.5	0	3,589	9,253	3.898	47.89	0	3,493
Innovation grants	3,465	25.15	97.60	0	1,745	9,253	10.54	49.52	0	2,549
Industrial design grants	3,465	6.110	30.40	0	582	9,253	4.292	18.86	0	617
leverage	3,465	0.512	0.204	0.0221	2.295	6,029	0.372	1.396	0.00750	94.44
Size	3,465	22.40	1.427	19.21	28.51	6,029	21.41	0.950	16.71	28.51
Growth	3,095	0.0533	0.263	-4	1	5,038	0.0931	0.306	-12.76	0.942
Loss	3,465	0.0182	0.134	0	1	6,029	0.00663	0.0812	0	1
Age of firm	3,453	10.39	5.355	0	25	5,870	4.501	4.428	0	22
Tobin s Q	3,412	1.752	1.628	0.0909	18.68	5,957	2.726	2.566	0.0456	92.11
ROA	3,465	0.0319	0.0581	-0.232	0.218	6,029	0.0537	0.0512	-0.232	0.218
ROE	3,387	0.0538	0.147	-0.746	0.434	6,150	0.0800	0.0915	-0.746	0.434

Correlation Analysis

Table 2 shows the correlation analysis of dependent and independent variables. In our analysis the dependent variables are ROA, ROE and Tobin's Q while the independent variables are invention, innovation and utility model. We also used a number of control variables in our analysis namely, size, leverage, firm age, growth and loss. The correlation coefficient of independent variables is less than the critical value of 0.8 therefore we can say that there is no multicollinearity issue among the variables. The table also shows a positive and significant relationship between innovation and firm performance. The coefficient of invention is 0.14, 0.03 and 0.031 with ROA, ROE and TQ respectively. Similarly, innovation has a positive association with firm performance proxies having value of 0.021, 0.06 and 0.08 with ROA, ROE and TQ respectively. Looking at third measure of innovation, we also find a positive effect on firm performance. The control variables measured by leverage has a negative effect on firm performance while size has a positive effect on firm performance. Also, growth leads to high firm performance while loss and firm age leads to decline in firm performance as predicted by negative coefficients.

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Summing up, we find no multicollinearity in our model. The innovation is positively related to firm performance in Chinese listed firms. Size and growth have positive while loss, leverage and firm age has negative effect on firm performance.

Table 3: Correlation Analysis

	ROA	ROE	Tobin's Q	Invention	Innovation	Industrial Design	Size	leverage	Growth	loss	Age of firm
ROA	1										
ROE	0.8176*	1									
Tobin's Q	0.3177*	0.2036*	1								
Patent grants	0.0146	0.0305*	-0.0335*	1							
Innovation grants	0.0207*	0.0639*	-0.0891*	0.2683*	1						
Industrial Design grants	0.0514*	0.0748*	-0.0333*	0.1484*	0.4421*	1					
Size	-0.0761*	0.0273*	-0.3749*	0.1628*	0.3317*	0.1525*	1				
leverage	-0.4059*	-0.1727*	-0.3613*	0.0438*	0.1069*	0.0603*	0.4969*	1			
Growth	0.3571*	0.3316*	0.1129*	0.0248*	-0.0013	0.0183*	0.0019	-0.0279*	1		
loss	-0.0936*	-0.0648*	-0.0145	0.002	-0.0022	-0.011	0.0104	0.1110*	-0.0263*	1	
Age of firm	-0.2302*	-0.1412*	-0.2062*	0.0223*	0.0727*	0.0706*	0.4130*	0.4641*	-0.1511*	0.1045*	1

Effect of Innovation on Firm Performance

Table 3 shows the effect of firm's innovative activities on the financial performance. ROA, ROE and TQ are taken as dependent variables while innovation, invention and utility model are taken as independent variables. The innovation has a positive and significant effect on ROA and TQ (β=0.003, p-value=0.05; β=0.172, p-value=0.01). Invention shows a positive impact on the TQ with coefficient of 0.177 significant at 1 percent level. The last measure of innovation as measured by utility model has a positive and significant effect on all the three measures of performance (ROA: β=0.003, p-value=0.05; ROE: β=0.004, p-value=0.05; TQ: β=0.064, p-value=0.05).

Looking at control variables, size has positive and significant effect on firm performance which shows that the larger firms perform better. Leverage on the other hand has a negative effect on firm performance which shows that as the firm increase leverage then the interest cost goes up, hence effecting the firm profitability. Growth positively effect the performance of the firms

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while the distress and age of firm has a negative impact on the firm performance as shown in table 3.

Summing up, the firm innovative activities have a positive effect on the firm performance in Chinese listed firms. Our results are in line with that of Camisón and Villar-López (2014) , Bowen et al. (2010) and Mol and Birkinshaw (2009), who also pointed out a positive link between innovation and firm performance.

Table 4: Effect of Innovation on Firm Performance

VARIABLES	ROA	ROE	Tobin's Q
Patents grants	-0.00326**	0.00115	-0.172***
	(0.00149)	(0.00288)	(0.0435)
Invention grants	0.00258	0.00267	0.177***
	(0.00158)	(0.00305)	(0.0459)
Industrial design grants	0.00305**	0.00497**	0.0640*
	(0.00121)	(0.00234)	(0.0353)
Size	0.00488***	0.0187***	-0.438***
	(0.00177)	(0.00348)	(0.0515)
Leverage	-0.00336***	0.00150	0.292***
	(0.000522)	(0.00101)	(0.0157)
Growth	0.00596*	0.156***	-1.454***
	(0.00348)	(0.0138)	(0.101)
Loss	-0.0523**	-0.0759	-0.239
	(0.0227)	(0.0487)	(0.656)
Age of firm	-0.00158***	-0.00188***	-0.0461***
	(0.000346)	(0.000673)	(0.0101)
Constant	-0.0258	-0.279***	12.43***
	(0.0468)	(0.0915)	(1.358)
F-stat	4.73	8.91	37.6
Observations	1,017	1,007	1,008
R-squared	0.114	0.197	0.509

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Effect of Innovation on Firm Performance in State vs Non-SOE Firms

Table 4 shows the effect of firm innovative actives on financial performance of state-owned enterprises (SOE) and non-state enterprises (NSOE). The effect of innovation on firm performance in SOE has a positive and significant effect (ROA: β=0.003, p-value=0.05; ROE: β=0.002, p-value=0.1; TQ: β=0.212, p-value=0.01) while the effect of innovation in NSOE is insignificant on firm performance (ROA: β=0.002, ROE: β=0.008, TQ: β=-0.04). Looking at the second measure of firm innovation denoted by invention, the effect is positive and significant in case of SOE's while has an insignificant effect on firm performance in case of NSOE's. The last proxy for firm innovation is industrial design which shows a positive impact

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on firm performance in case of SOE's while the relationship between industrial design and firm performance is insignificant in case of NSOE's as shown in the table.

Looking at the control variables, the effect of growth on SOE firm performance is greater than that of the NSOE. Leverage on the other hand has positive effect on NSOE firm value while it shows a negative effect in case of NSOE. One of the reasons behind this negative relationship is the high leverage of SOE which in turn results in higher interest costs hence effecting the profitability. The age of firm is negatively related with the firm performance both for SOE and NSOE.

Summing up, the effect of firm innovative activities on firm performance is positively related in case of SOE. The main reason behind this positive effect is the government backing of the state firms and also the high leverage allowed by the banks to finance the innovative activities. These results are in line with that of (M. Yu, 2013)

Table 5: Effect on innovation on Firm performance in SOEs and Non-SOEs

VARIABLES	ROA SOE	ROE SOE	Tobin's Q SOE	ROA Non SOE	ROE Non SOE	Tobin's Q Non SOE
Patents grants	-0.00378**	0.00208	-0.212***	0.00280	0.00877***	-0.0456
	(0.00190)	(0.00509)	(0.0454)	(0.00204)	(0.00303)	(0.0691)
Invention grants	0.00169	-0.00151	0.157***	-0.000146	0.00112	0.123*
	(0.00197)	(0.00529)	(0.0470)	(0.00217)	(0.00322)	(0.0730)
Industrial design grants	0.00472***	0.00883**	0.103***	0.00156	0.00209	0.0384
	(0.00152)	(0.00409)	(0.0364)	(0.00166)	(0.00246)	(0.0558)
Size	0.0109***	0.0298***	-0.305***	0.00453	0.0153***	-0.500***
	(0.00205)	(0.00574)	(0.0488)	(0.00283)	(0.00419)	(0.0964)
Leverage	-0.154***	-0.199***	-2.164***	-0.00339***	0.000912	0.295***
	(0.0126)	(0.0340)	(0.300)	(0.000524)	(0.000778)	(0.0180)
Growth	0.0833***	0.224***	0.852***	0.000644	0.128***	-1.630***
	(0.0105)	(0.0287)	(0.251)	(0.00359)	(0.0125)	(0.121)
Loss	-0.0536***	-0.0618	-0.156			
	(0.0197)	(0.0587)	(0.469)			
Age of firm	-0.000124	-0.000854	-0.0232**	-0.000625	0.00103	-0.0340
	(0.000471)	(0.00126)	(0.0112)	(0.000643)	(0.000957)	(0.0220)
Constant	-0.137**	-0.470***	8.485***	0.00276	-0.184*	14.39***
	(0.0600)	(0.164)	(1.429)	(0.0684)	(0.101)	(2.317)
F-stat	12.58	6.45	14.68	4.3	9.74	33.29
Observations	456	448	454	561	559	554
R-squared	0.401	0.259	0.440	0.149	0.286	0.580

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

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CONCLUSION

The aim of this study is to explore the effect of firm innovative activities on the firm performance. For this purpose two book based measures of performance namely ROA and ROE and one market based measure Tobin's Q is taken as dependent variable. Three proxies for firm innovative activities as measured by innovation application accepted, invention application accepted and utility grants awarded by the state intellectual property office (SIPO). The data is collected from Chinese stock market and accounting research (CSMAR) from the year 2008 to 2016. The sample only included those companies that are involved in innovative activities.

The summary statistics shows that Innovative firms in China has average leverage ratio of 42.3 percent with an average growth of 7.8 percent. About 1.08 percent of the innovative firms are incurring losses for the last two years. This means that innovative firms are less prone to losses. The average age of innovative firms is about 6.683 years emphasizing on the fact that the young firms are more innovative. The innovative firms shows a positive market performance with the Tobin's Q value of 2.371. This shows that the market expects higher for the firms innovative activities. The level of innovation, invention and utility model grants in state owned companies is much greater than that of the non-state companies. It means state owned companies are more innovative. It has also been observed in many researches that the state owned companies have government backing and managers have political connections. Also the state owned companies have more access to bank finance that makes them less financially constrained.

The correlation analysis depicted no presence of multicollinearity problem in the data. The regression result of the effect of the innovative activities on firm performance for overall sample shows that the firm performance is enhanced by the firm's innovative activities, growth and size while the Leverage, Loss and firm age negatively effects on the firm performance. The comparative analysis of state and non-state firms provides evidence that the effect of innovation on firm performance in state owned firms is greater as compared to non-state firms.

Implication to Research and Practice

Our findings support the fact that innovation strategy is an important major driver of firm performance and should be developed and executed as an integral part of the business strategy. Managers should recognize and manage the innovations in order to boost their operational performance. Having a clear understanding of the exact nature of innovations will help firms to prioritize their market, production and technology strategies, to be followed by appropriate subsequent action plan

Future Research

Despite taking into account all the relevant material, our study have few limitations. Data can be increased before 2007 but the CSMAR has no data in that regard. More advanced tests such as GMM can be used for detailed oversight. We do not assess how the type of the industry (i.e., manufacturing vs. service) impacts ownership and innovation strategy of firms in China. For future studies, the effect of ownership concentration on relationship between innovation and firm performance can be explored.

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REFERENCES

Acs, Z. J., & Audretsch, D. B. (1988). Innovation In Large And Small Firms: An Empirical Analysis. *The American Economic Review*. https://doi.org/10.2307/1811167

Agha, S., Alrubaiee, L., & Jamhour, M. (2012). Effect of Core Competence on Competitive Advantage and Organizational Performance. *International Journal of Business and Management*. https://doi.org/10.5539/ijbm.v7n1p192

Amore, M. D., & Bennedsen, M. (2016). Corporate governance and green innovation. *Journal of Environmental Economics and Management*. https://doi.org/10.1016/j.jeem.2015.11.003

Amsden, A. (1989). South Korea and Late Industrialization. *Oxford University*. https://doi.org/10.1093/0195076036.001.0001

Bhagat, S., & Black, B. (2002). The Non-Correlation Between Board Indpendence and Long-Term Firm Performance. *Journal of Corporation Law*. https://doi.org/10.2139/ssrn.133808

Bong Choi, S., & Williams, C. (2013). Innovation and firm performance in Korea and China: A cross-context test of mainstream theories. *Technology Analysis and Strategic Management*. https://doi.org/10.1080/09537325.2013.774346

Bowen, F. E., Rostami, M., & Steel, P. (2010). Timing is everything: A meta-analysis of the relationships between organizational performance and innovation. *Journal of Business Research*. https://doi.org/10.1016/j.jbusres.2009.10.014

Brown, L. D., & Caylor, M. L. (2009). Corporate governance and firm operating performance. *Review of Quantitative Finance and Accounting*. https://doi.org/10.1007/s11156-007-0082-3

Camisón, C., & Villar-López, A. (2014). Organizational innovation as an enabler of technological innovation capabilities and firm performance. *Journal of Business Research*. https://doi.org/10.1016/j.jbusres.2012.06.004

Chang, S.-J., Chung, C.-N., & Mahmood, I. P. (2006). When and How Does Business Group Affiliation Promote Firm Innovation? A Tale of Two Emerging Economies. *Organization Science*. https://doi.org/10.1287/orsc.1060.0202

Chen, D., Jiang, D., & Yu, X. (2015). Corporate philanthropy and bank loans in China. *Pacific Basin Finance Journal*. https://doi.org/10.1016/j.pacfin.2015.03.004

Chen, Z., & Guan, J. (2011). Mapping of biotechnology patents of China from 1995-2008. *Scientometrics*. https://doi.org/10.1007/s11192-011-0380-3

Child, J., & Yuan, L. (1996). Institutional Constraints on Economic Reform: The Case of Investment Decisions in China. *Organization Science*. https://doi.org/10.1287/orsc.7.1.60

Choi, B. B., Lee, D., & Park, Y. (2013). Corporate social responsibility, corporate governance and earnings quality: Evidence from Korea. *Corporate Governance: An International Review*. https://doi.org/10.1111/corg.12033

Claessens, S., & Yurtoglu, B. B. (2013). Corporate governance in emerging markets: A survey. *Emerging Markets Review*. https://doi.org/10.1016/j.ememar.2012.03.002

Coad, A., Segarra, A., & Teruel, M. (2013). Like milk or wine: Does firm performance improve with age? *Structural Change and Economic Dynamics*. https://doi.org/10.1016/j.strueco.2012.07.002

Cohen, W. M., & Levinthal, D. A. (1990). Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly*. https://doi.org/10.2307/2393553

Cruz, C., Larraza-Kintana, M., Garcés-Galdeano, L., & Berrone, P. (2014). Are Family Firms

Print ISSN: 2053-4019(Print), Online ISSN: 2053-4027(Online)

Really More Socially Responsible? *Entrepreneurship: Theory and Practice*. https://doi.org/10.1111/etap.12125

Cull, R., Li, W., Sun, B., & Xu, L. C. (2015). Government connections and financial constraints: Evidence from a large representative sample of Chinese firms. *Journal of Corporate Finance*. https://doi.org/10.1016/j.jcorpfin.2014.10.012

Estrin, S., & Prevezer, M. (2011). The role of informal institutions in corporate governance: Brazil, Russia, India, and China compared. *Asia Pacific Journal of Management*. https://doi.org/10.1007/s10490-010-9229-1

Fang, J., He, H., & Li, N. (2016). *China's Rising IQ (Innovation Quotient) and Growth: Firm-level Evidence*. *IMF Working Paper*.

Folta, T. B., Cooper, A. C., & Baik, Y. S. (2006). Geographic cluster size and firm performance. *Journal of Business Venturing*. https://doi.org/10.1016/j.jbusvent.2005.04.005

Geroski, P., Machin, S., & Reenen, J. Van. (1993). The Profitability of Innovating Firms. *The RAND Journal of Economics*. https://doi.org/10.2307/2555757

Gunday, G., Ulusoy, G., Kilic, K., & Alpkan, L. (2011). Effects of innovation types on firm performance. *International Journal of Production Economics*. https://doi.org/10.1016/j.ijpe.2011.05.014

Hashi, I., & Stojčić, N. (2013). The impact of innovation activities on firm performance using a multi-stage model: Evidence from the Community Innovation Survey 4. *Research Policy*. https://doi.org/10.1016/j.respol.2012.09.011

Hu, A. G. Z., Zhang, P., & Zhao, L. (2017). China as number one? Evidence from China's most recent patenting surge. *Journal of Development Economics*. https://doi.org/10.1016/j.jdeveco.2016.09.004

Jiménez-Jiménez, D., & Sanz-Valle, R. (2011). Innovation, organizational learning, and performance. *Journal of Business Research*. https://doi.org/10.1016/j.jbusres.2010.09.010

Kalkan, A., Erdil, O., & Çetinkaya, Ö. (2011). The relationships between firm size, prospector strategy, architecture of information technology and firm performance. In *Procedia - Social and Behavioral Sciences*. https://doi.org/10.1016/j.sbspro.2011.09.114

Kim, H., Kim, H., & Hoskisson, R. E. (2010). Does market-oriented institutional change in an emerging economy make business-group-affiliated multinationals perform better? An institution-based view. *Journal of International Business Studies*. https://doi.org/10.1057/jibs.2010.17

Klapper, L. F., & Love, I. (2004). Corporate governance, investor protection, and performance in emerging markets. *Journal of Corporate Finance*. https://doi.org/10.1016/S0929-1199(03)00046-4

Kline, P., Petkova, N., Williams, H. L., & Zidar, O. (2017). Who Profits from Patents? Rent-Sharing at Innovative Firms. *Working Paper*.

Law, K. H., Taduri, S., Law, G. T., & Kesan, J. P. (2015). An ontology-based approach for retrieving information from disparate sectors in government: The patent system as an exemplar. In *Proceedings of the Annual Hawaii International Conference on System Sciences*. https://doi.org/10.1109/HICSS.2015.252

Li, S., Song, X., & Wu, H. (2015). Political Connection, Ownership Structure, and Corporate Philanthropy in China: A Strategic-Political Perspective. *Journal of Business Ethics*. https://doi.org/10.1007/s10551-014-2167-y

Liao, T. S., & Rice, J. (2010). Innovation investments, market engagement and financial performance: A study among Australian manufacturing SMEs. *Research Policy*.

Print ISSN: 2053-4019(Print), Online ISSN: 2053-4027(Online)

https://doi.org/10.1016/j.respol.2009.11.002
Liegsalz, J., & Wagner, S. (2013). Patent examination at the State Intellectual Property Office in China. *Research Policy*. https://doi.org/10.1016/j.respol.2012.06.003
Lin, T.-T., & Chou, J.-H. (2015). Trade credit and bank loan: Evidence from Chinese firms. *International Review of Economics & Finance*. https://doi.org/10.1016/j.iref.2014.11.004
Liu, Q., Luo, T., & Tian, G. (2016). Political connections with corrupt government bureaucrats and corporate M&A decisions: A natural experiment from the anti-corruption cases in China. *Pacific Basin Finance Journal*. https://doi.org/10.1016/j.pacfin.2016.03.003
Liu, Y., Miletkov, M. K., Wei, Z., & Yang, T. (2015). Board independence and firm performance in China. *Journal of Corporate Finance*. https://doi.org/10.1016/j.jcorpfin.2014.12.004
Luo, D., & Ying, Q. (2014). Political Connections and Bank Lines of Credit. *Emerging Markets Finance and Trade*. https://doi.org/10.2753/REE1540-496X5003S301
Margaritis, D., & Psillaki, M. (2010). Capital structure, equity ownership and firm performance. *Journal of Banking and Finance*. https://doi.org/10.1016/j.jbankfin.2009.08.023
Mariano, S., & Casey, A. (2015). Is organizational innovation always a good thing? *Management Learning*. https://doi.org/10.1177/1350507615569429
Mol, M. J., & Birkinshaw, J. (2009). The sources of management innovation: When firms introduce new management practices. *Journal of Business Research*. https://doi.org/10.1016/j.jbusres.2009.01.001
Motohashi, K., & Yun, X. (2007). China's innovation system reform and growing industry and science linkages. *Research Policy*. https://doi.org/10.1016/j.respol.2007.02.023
Mühlenkamp, H. (2015). From state to market revisited: A reassessment of the empirical evidence on the efficiency of public (and privately-owned) enterprises. *Annals of Public and Cooperative Economics*. https://doi.org/10.1111/apce.12092
Nepelski, D., & De Prato, G. (2015). International technology sourcing between a developing country and the rest of the world. A case study of China. *Technovation*. https://doi.org/10.1016/j.technovation.2014.07.007
Ngo, L. V., & O'Cass, A. (2013). Innovation and business success: The mediating role of customer participation. *Journal of Business Research*. https://doi.org/10.1016/j.jbusres.2012.03.009
Peni, E. (2014). CEO and Chairperson characteristics and firm performance. *Journal of Management and Governance*. https://doi.org/10.1007/s10997-012-9224-7
Rosenbusch, N., Brinckmann, J., & Bausch, A. (2011). Is innovation always beneficial? A meta-analysis of the relationship between innovation and performance in SMEs. *Journal of Business Venturing*. https://doi.org/10.1016/j.jbusvent.2009.12.002
Salim, M., & Yadav, R. (2012). Capital Structure and Firm Performance: Evidence from Malaysian Listed Companies. *Procedia - Social and Behavioral Sciences*. https://doi.org/10.1016/j.sbspro.2012.11.105
Sami, H., Wang, J., & Zhou, H. (2011). Corporate governance and operating performance of Chinese listed firms. *Journal of International Accounting, Auditing and Taxation*. https://doi.org/10.1016/j.intaccaudtax.2011.06.005
Subramaniam, N., Kansal, M., & Babu, S. (2017). Governance of Mandated Corporate Social Responsibility: Evidence from Indian Government-owned Firms. *Journal of Business Ethics*. https://doi.org/10.1007/s10551-015-2804-0
Sun, Q., Tong, W. H. S., & Tong, J. (2002). How does government ownership affect firm

Print ISSN: 2053-4019(Print), Online ISSN: 2053-4027(Online)

performance? Evidence from China's privatization experience. *Journal of Business Finance and Accounting*. https://doi.org/10.1111/1468-5957.00422

Talke, K., Salomo, S., & Rost, K. (2010). How top management team diversity affects innovativeness and performance via the strategic choice to focus on innovation fields. *Research Policy*. https://doi.org/10.1016/j.respol.2010.04.001

Tang, J. (2006). Competition and innovation behaviour. *Research Policy*. https://doi.org/10.1016/j.respol.2005.08.004

Tong, T. W., Zhang, K., He, Z. L., & Zhang, Y. (2018). What determines the duration of patent examination in China? An outcome-specific duration analysis of invention patent applications at SIPO. *Research Policy*. https://doi.org/10.1016/j.respol.2018.01.002

Trappey, C. V., Wu, H. Y., Taghaboni-Dutta, F., & Trappey, A. J. C. (2011). Using patent data for technology forecasting: China RFID patent analysis. *Advanced Engineering Informatics*. https://doi.org/10.1016/j.aei.2010.05.007

Urbancova, H. (2013). Competitive Advantage Achievement through Innovation and Knowledge. *Journal of Competitiveness*. https://doi.org/10.7441/joc.2013.01.06

Wang, H., Jiang, H., & Wang, J. (2011). Environmental protection in China. In *Pollution in China*. https://doi.org/10.1017/S0376892900019433

Xiongyuan, W., & Shan, W. (2013). Chairman's government background, excess employment and government subsidies: Evidence from Chinese local state-owned enterprises. *China Journal of Accounting Research*. https://doi.org/10.1016/j.cjar.2012.08.005

Yu, M. (2013). State ownership and firm performance: Empirical evidence from Chinese listed companies. *China Journal of Accounting Research*. https://doi.org/10.1016/j.cjar.2013.03.003

Yu, Z., Li, J., & Yang, J. (2017). Does corporate governance matter in competitive industries? Evidence from China. *Pacific Basin Finance Journal*. https://doi.org/10.1016/j.pacfin.2017.04.008

Yueh, L. (2009). Patent laws and innovation in China. *International Review of Law and Economics*. https://doi.org/10.1016/j.irle.2009.06.001

Zahra, S. A., & Garvis, D. M. (2000). International corporate entrepreneurship and firm performance. *Journal of Business Venturing*. https://doi.org/10.1016/S0883-9026(99)00036-1

Print ISSN: 2053-4019(Print), Online ISSN: 2053-4027(Online)