Can University Connections of Independent Directors Improve Firm Performance? Evidence of Chinese Listed Manufacturing Companies over 2008-2013

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Authors' contributions

This work was carried out in collaboration between all authors. Author CZ designed the study, performed the statistical analysis, wrote the protocol and wrote the first draft of the manuscript. Authors JZ and QG managed the data analyses of the study and the literature searches. All authors read and approved the final manuscript.

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ABSTRACT

The paper investigates the effect of the university connections of independent directors on firm performance by choosing the panel data consisting of 2994 firm-year observations in Chinese listed manufacturing companies during 2008-2013 as research sample. Empirical analysis by adopting the multiple regression analysis based on OLS and the independent samples test with SPSS19.0 makes the following new finding: In the manufacturing companies in China, there is a positive relationship between the university connections of independent directors and firm performance measured by ROE, ROA and EPS. Further investigation shows that the independent directors from the universities would produce a higher productivity in the traditional labor-intensive firms rather in the technology-intensive firms, and what is more, if the independent directors from the universities attend more board meetings, their positive role in affecting firm performance would be enhanced.

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1. INTRODUCTION

Independent directors in the board are particularly important in developing economies, which are characterized by relatively weaker governance mechanisms and poorer institutions such as financial markets, regulators, monitoring and legal systems [1]. However, the question of whether and how would the presence of independent directors affect firm performance is still theoretically debated and empirically inconclusive [2]. The scholars of the existing studies have investigated the relationship of independent directors and firm performance mainly from the perspectives of independent directors' independence, proportion, characteristics and compensation [3], while the importance of the social connections (or role identities) of the independent directors in determining firm performance has been ignored to a large degree [4]. Among the social role identities, the political connections and the enterprise connections have been paid more and more attention in China [5]. However, the university connections of the independent directors have not been addressed effectively till today.

According to amounts of studies in China [6 and 7], the findings of the existing Chinese literature are similar to those of the international literature, especially the literature in American [8]. That is to say, the empirical evidence on the relationship between independent directors and firm performance is actually confused and mixed, either positive or negative or zero correlation. Facing such confusing conclusions, we would rather accept the explanation of *Feng* [9]. on this issue, who argue that different types of independent directors with distinct role identities have different orientations towards decision making, which are reflected in firm's long-term and short-term firm performance. According to this view, independent directors of rich political connections, social connections and university connections would respectively have distinct role identities, and thus they would potentially have different performance consequences.

As for the political connections, a growing body of literature has addressed the role of political connections in affecting firm running, and political connections are an important issue that has been found to be highly influential in the developing countries [10]. On the one hand, political connections are viewed as an important tool or mechanism to make firms get their success at a higher possibility; On the other hand, the politically connected firms are widely perceived to be closely related to poor corporate governance practices and are more risky as perceived by stakeholders such as auditors and lenders [11]. According to the existing literature, political connections are actually a double-edged sword. It can either enhance or jeopardize a firm's value. To be specific, in the existing literature, a negative effect of political connections on firm performance has been found. As an example, *Xu, Zhu and Lin* [12]. argue that when political control due to firm's political connections is curtailed, firm performance improves. For another example, *Fan, Wong and Zhang*[13].report that firms with politically connected CEOs underperform those without political connections by 37%. In some other studies, political connections of executives can play positive roles in helping firms to obtain more favorable bank loans [14], providing firms with easier access to equity capital [15] and debt financing [16], bringing the lower tax rates to firms [17], striving for the preferential regulatory treatments on firms and government bailouts [16], and finally improving firm performance [12]. On the whole, though the opposite view exists, it has been widely acknowledged by the existing literature that political connections do add value to firms [18,19].

As for the enterprise connections, many studies directors who have rich enterprise connections to outside groups have greater social capital because they have quick access to timely information, diverse ideas and critical resources [20,21]. Adequate resources can overcome the risk of uncertainty and thus are critical for the improvement of firm performance [22]. More specifically, lots of studies have suggested that interlocking directorate ties enable directors to obtain appropriate strategic knowledge and perspective to monitor and advise management in decision making [23]. and to facilitate the flow of critical resources, such as the knowledge, information, data and status [24].Therefore, enterprise connections of directors have been regarded as the critical factors in improving firm performance [25].

As for the university connections, however, the existing literature, except for very limited studies [26], has completely ignored the differences

between the university-connected independent directors with the other types of independent directors. Especially it is true in China, where only the multiple directorships and the political connections are receiving greater attention [27]. In order to fill this gap, this study advances the extant literature by investigating the effect of university connections belonging to the independent directors on firm performance. The paper chooses the balanced panel data consisting of 2994 firm-year observations in Chinese listed manufacturing companies over 2008-2013 as the sample, adopts the multiple regression analysis method based on OLS and the independent samples test as the empirical analysis methods, and explores the effect of the university connections of the independent directors on the firm performance.

The remainders of the paper are arranged as follows. Section 2 is the literature review and hypothesis. Section 3 provides the measures and sample. Section 4 shows the empirical results. Section 5 is the conclusions and suggestions on future research.

2. LITERATURE AND HYPOTHESIS

2.1 Research on Effect of Independent Directors on Firm Performance

There is no any consensus as regards the impact of independent directors on firm performance because empirical evidence on the correlation between independent directors and firm performance is not consistent and even controversial. There exists either a positive or a negative correlation, or a non-linear correlation, or no correlation between independent directors and firm performance.

First, there is a positive correlation between the two concepts. For example, *Wagner* [28] conduct a meta-analysis of 63 empirical studies on the correlation between board composition and firm performance and the result of their work indicates that the higher ratio of independent directors is associated with higher firm performance. Lots of subsequent studies have confirmed to their result [29,30,31]. As a most recent example, *Nuria and Francisco* [8] have analyze how the tenure and the number of directorships of independent directors can affect the relationship between board independence and firm performance by adopting a sample composed of US-listed firms for the period 2008-

2012. Both the empirical analysis and their robustness checks and sensitivity analysis have confirmed that the board's independence positively influences firm performance.

Second, a negative correlation exists between the two concepts. For example, there is an influential and valuable empirical study by *Bhagat and Black* [32], who have conducted the first large sample, the long-horizon study of whether the proportion of independent directors affects firm performance. They conclude that there is a strikingly significant negative correlation between the proportion of independent directors and firm performance measured by a large variety of accounting measures. The finding is also confirmed by a stream of other empirical literature[33 and 34]. For another more recent study conducted by *Wang and Zhou* [35], the effect of legislation environment on the relation between independent director and firm performance in China with the purpose of providing the Chinese market evidence for the international corporate governance study is focused on. By adopting the mixed cross-sectional data of listed companies in Shanghai and Shenzhen Stock Exchange from 1998 to 2005, they have concluded that the proportion of independent director is significantly and negatively related to firm performance. However, the legislation does not seem to enhance or weaken the negative relationship between independent director and firm performance.

Third, a context-dependent correlation exists between the two concepts. Facing the fact that the family businesses are a group of heterogeneous companies with different levels of family involvement in their business operations, *Georges and Jasmina*[2] have tried to empirically explore how the combination of different family business governance structures jointly shape the effect of the independent directors on family businesses' performance in an understudied collectivist cultural setting. By adopting Qualitative Comparative Analysis (QCA) on a sample of 74 Lebanese family companies, their study finds that, depending on the family companies' governance structure, the existence of independent directors on the board would result in either positive or negative firm performance. That is to say, the relationship between independent directors and firm performance is contingent on some contextual variables.

Fourth, there is a nonlinear relationship between independent directors and firm performance. As an example, *Rebeca and Myriam* [36] have investigated the effect of independent directors on firm performance by adopting a sample of companies with a family ownership structure. By controlling for the two potential problems of endogeneity and unobserved heterogeneity, their final results prove that there is an inverted U-shaped relationship between independent directors and firm performance, which allows us to identify the optimal level of independent directors on the board. Some other studies have also confirmed the result, for example, *Sharifah* et al. [37]. In their study, the relationship between board independence and firm performance is examined in a few countries, and the results indicate a mixed nonlinear relation between the proportions of independent directors and firm performance. Such results may mean that high levels of independent directors are not always in the best interests of minority shareholders. This school of literature indicates that there is an optimum level of independent directors to maximize firm performance, and the existence of independent directors on board should be monitored in order to bring positive shareholder values.

Finally, there is no significant association between independent directors and firm performance. Though many empirical studies have agreed on the importance of independent directors to the success of a firm, some other studies embrace a zero relationship between the two. For example, the earliest evidence confirming to this view is perhaps provided by *Baysinger and Butler* [38], who have indicated that there is no significant and stable relationship between the proportion of the independent directors and the firm's profitability in the same year in 1970s under the condition of controlling the possible endogeneity issues. Several other following studies also find such a result [39 and 40]. The possible negative of independent directors on firm performance is that, though firms with high ratio of independent directors in a board face less frequent financial pressure [41] and firms with many independent directors have a lower probability of going towards bankruptcy when a business environment worsens [42]. And such a fact would make the firms become lazy in improving their management efficiency and changing their incorrect strategies. The positive effect deriving from more resources due to independent directors would be offset by the negative effect deriving from becoming lazy due

to more independent directors in management. In this case, the relationship between independent directors and firm performance has the possibility to be insignificant.

This study argues that the existence of different views on the effect of the independent directors on firm performance may derive from the ignorance of the university connections of the independent directors. Since the independent directors with different university backgrounds would have very different effects on firm running, the existing studies without paying any attention to such university connections of the independent directors would naturally make rather different findings when they face various independent directors components with different university connections.

2.2 Research on Consequences of Executives' Educational Background

Executives' educational background has a significant effect on firm's innovation. For example, Daellenbach, et al. [43] have examined the impact of the executives' characteristics on their commitment to firm innovation. Adopting the data of a total of 145 firms of the primary metals industry and 99 firms in the industry of semiconductors between 1988 and 1990, the results of the study has found evidence in support that the executives who have the technical educational backgrounds would devote more time, energy and spending in firm's innovation activities. Therefore, a better understanding of a company's vision direction and strategic change could be easily assessed using a deep analysis of the executives' educational background. Furthermore, they have pointed out that the firms managed by the CEOs with the educational background in the operations-related subjects and those with the technical education, would show better technological initiatives than the firms led by the executives with a support function like the finance and accounting. In this case, the firms maybe should focus on the selection of the top executives in the operations and technical experience if their core objectives and strategy for their future competition is innovation in product development. However, Barker and Mueller [44] have examined how a CEO's background is related to the R&D spending, which has confirmed that the level of the CEO education does not impact R&D spending.

Wasserman, et al. [45] have found evidence to support the view that the effect of executives'

educational background on firm performance would vary across industry. To be specific, they have argued that in the companies where the executives have a heavy effect on firm performance, it would be suitable for the board and the shareholders to pay consideration in the educational background of the new executives than in an industry where the executives have a poor effect on firm performance. When Koyuncu, et al. [46] investigate the role of top executives' educational background has on firm performance adopting a sample of 437 firms selected from S&P 500, the fact is confirmed that the firms led by a CEO with the educational background in operation related subjects would produce better firm performance than the firms managed by executives with the other functional backgrounds. When Aron and Matthew [47] examine the role of the educational background of the executives in affecting firm performance, no evidence is found that the firms headed by the executives who have the MBA degree would produce better performance than the firms led by the executives who have the liberal arts degree, or the law degree. Furthermore, they have also failed to found any evidence in support that the firms led by the executives with a postgraduate degree would have better performance than the firms managed by the executives with a bachelor or undergraduate degree. In a similar way, when Gottesman and Morey [48] examine the relationship between the quality of CEO educational background and firm performance using the EXECUCOMP data, they find no evidence that firms with CEOs from more prestigious schools, as measured by average SAT and GMAT scores, would outperform those from less prestigious schools. Many other scholars have confirmed such a conclusion [48, 49 and 50].

Besides, many studies have confirmed the effects of the executives' educational background on the other organizational policies, and that, the education of business school can indeed affect the future decision-making behavior of students [51]. For the first example, Warren, et al. [52] have suggested that the CEO's professional education background and the corporate policies' setting are really correlated; For the second example, Li-Jen He, et al. [53] have investigated whether the company's chairman of the board and management's educational background is business or accounting, their decision making will cause the result of company's dividend policy or not. By adopting the logistic and OLS regression methods, the empirical result shows that when

the company's chairman of the board graduates from business school, the company will pay less cash dividend; For the third example, *Agrawal and Chadha* [54] have pointed out that the accounting profession can improve the monitoring mechanism of the company; For the last example, *Jalbert et al.*[55] have examined the educational background of CEOs from large U.S. firms by covering 500 or more firms for the period 1997-2006. Universities are ranked based on the number of graduates placed in the top CEO positions, and further the number of the total compensation their graduates earn as the CEOs is ranked. Empirical results show a low correlation between the university placement rankings and the compensation rankings.

2.3 Hypothesis on the Relationship between Independent Directors' University Connections and Firm Performance

Though the role of the educational background of the executives, including the directors, in determining firm performance has been examined widely, the role of the university connections of the independent directors has always been ignored to an extreme degree. According to our opinion, there are at least three paths for university connections of the independent directors to improve firm performance.

The first path is that the rich university connections of the independent directors can bring the extra human capital or intelligent capital to the top management teams specialized in theoretical analysis, which is absolutely needed in the firm's running process. As it has been indicated that thinking patterns' diversity can improve firm performance[56 and 57].The independent directors from the universities have different insights and viewpoints in decision-making, which are valuable for improving the decision's effectiveness. Top executives usually focus too much on the details of their firms' daily operations, while the university-connected independent directors usually pay more attention to the macro strategy, business mode and future orientation. The interactions of the two thinking patterns can enhance firm performance. Besides, they can draw the ideas from the other teachers of all kinds of scientific fields in their universities, which is naturally helpful to investigate and verify the strategies and business plans of their companies. On the whole, the independent directors from the universities have higher

capability in performing their consultation function.

The second path is that the rich university connections of the independent directors would improve the engagement/diligence level of all the independent directors. Compared with the directors from the other entities, university-connected independent directors have stronger motivations and richer available time to perform their monitoring and consultation functions. In reality, many directors from the other organizations who have multiple directorships bear too much work to do, and they actually have no enough time to really perform their duties as the independent directors. Lots of studies do have provided explanations that the lower engagement in the firms' running of the independent directors is the critical reason of their lower effectiveness [58,59,60].Obviously, university-connected independent directors can weaken this shortcoming.

The third path is that the rich university connections of the independent directors would enhance the credibility of the board of directors. As the teachers, the university-connected independent directors have been trained with more curriculum on ethics, and what is more, the teachers are always regarded as the group with higher ethical standards that the other groups. For example, Nagle, et al. [61] have empirically studied American companies, and find that ethics training can indeed reduce behaviors in violation of the company's accounting policies. In this case, more university-connected independent directors would perform better monitoring function. Besides, since university-connected independent directors have higher independence than their peers from the other entities, the minor stakeholders of the firms would be protected to a better degree by such "independent directors" [62,63]. At the same time, the higher believability of the board of directors due to more university-connected independent directors would improve the recognition degree from the various stakeholders, and thus the firm would enjoy a better environment for future development.

On the whole, university connections of the independent directors can provide their firms with the extra essential knowledge, diversity and expertise. For the modern companies, which operate mainly depending on all kinds of intelligent capital, human capital and viewpoints, such university connections may have great significance on firm performance improvement.

This paper assumes that university-connected independent directors have both the willingness, the energy and the capability in utilizing their own knowledge, theories and methods, and their university ties to improve the firms' running. Therefore, the paper proposes the following hypothesis.

H1: University connections of independent directors have certain positive effects on firm performance in Chinese manufacturing companies.

3. METHODOLOGY

3.1 Measures

University connections of independent directors (UCID_N, UCID_R). UCID_N is the number of the independent directors who ever worked or are working in any universities. That is to say, if any independent director has the experience of ever working in any university, UCID_N adds 1. UCID_R is the ratio of UCID_N to the size of the board.

Firm performance. Return on equity (ROE) is taken as the main measure of firm performance for hypothesis test, while earnings per share (EPS) and return on assets (ROA) are chosen as the alternative measures of firm performance, which will be mainly used in the robustness test.

Control variables. Following the popular literature in investigating the antecedents of firm performance, six control variables are chosen. (1) Technology intensity (TI) is coded as 1 when the sub-industry to which the sample firm belongs within the manufacturing industry is viewed as technology-intensive industry, otherwise TI is coded as 0. In this study, according to the popular classification rules of industries in existing literature, the firms belonging to Metallurgical Industry, Computer, Communications and Other Electronic Equipment Manufacturing Industry, Pharmaceutical Manufacturing Industry, Special Equipment Manufacturing Industry and Automobile Manufacturing Industry are viewed as the technology-intensive companies. (2) Region (RG) is coded as 1 when the sample firm locates in the eastern provinces or regions in China, otherwise RG is coded as 0. (3) Firm size (LNTS) is the logarithm of total sales of the sample firm; (4) CEO duality (CD) is coded as 1 when the two positions of CEO (i.e., General

Manager) and Chairman of the board are taken by one person; otherwise, CD is 0; (5) CEO age (AGE) is the chronological age of CEO. (6) The first large shareholder's ratio (FLSR) is the ratio of the share of the first large shareholder to the total share of the firm; (7) Industry firm performance (IFP) is the average ROE of the sampling firms belonging to a certain industry. Each industry has its specialized IFP, which would determine the reasonable performance of each sampling firm belonging to the same industry to a large degree.

3.2 Sample and Data

Taking all the listed manufacturing companies which exist during 2008-2013 in Shanghai and Shenzhen stock exchange as the research's sample framework, the paper selects the final research sample according to the following requirements: (1) The firms should go public before 2007; (2) The firms should not be ever punished publicly by the government authorities for any reasons; (3) The firms should not be marked with ST, PT, SST, or *ST, etc.; (4) The firms should disclose all the data that the paper needs according to the above-mentioned measures' design; (5) The firms should run relatively normally and smoothly, i.e., the firms whose financial data contain the singular data, too high financial loss, or too high net profit should not be allowed. According to such rules, 499 manufacturing firms are chosen, and a panel sample consisting of 2994 firm-year observations are designed. The descriptive statistics analysis and correlation analysis results are shown in Table 1.

4. EMPIRICAL TESTING

4.1 Main Results

In order to test H1, the paper designs Model 1 based on OLS which takes ROE as the dependent variable, UCID_R as the predictor, and TI, RG, LNFS, CD, AGE, FLSR and IFP as the control variables.

$$ROE_{it} = \alpha + \beta_0 UCID\_R_{it} + \beta_1 TI_{it} + \beta_2 RG_{it} + \beta_3 LNFS_{it} + \beta_4 CD_{it} + \beta_5 AGE_{it} + \beta_6 FLSR_{it} + \beta_7 IFP_{it} + \varepsilon_{it}$$

(1)

With SPSS19.0, the paper makes the regression analysis on Mode1 1 by adopting the panel data with the above-mentioned 2994 firm-year observations. Results are shown in the second column of Table 2.

In the second column of Table 2, the unstandardized regression coefficient of UCID_R is 2.445 (T=2.017, P<0.05). The value of Durbin-Watson is 1.996, which means that the auto-correlation problem is acceptable; the mean of the Std. Residual is 0.000, which means that the homogeneity of variance of residual after estimation is satisfied to a good degree. And finally, the tolerance test of each independent variable is rather close to 1, which means that the multicollinearity problem is not serious in this regression model. All the results show that the validity of Model 1's regression results is high enough. Accordingly, H1 is confirmed. Our data support that the ratio of independent directors has certain pronounced and positive effects on firm performance.

When the authors changes UCID_R into UCID_N in Model 1, a new model investigating the number of university-connected independent directors on firm performance is built, which can be named as Model 2. The regression results of Model 2 with SPSS19.0 by adopting the research sample are shown in Table 2.

In the third column of Table 2, the unstandardized regression coefficient of UCID_N is 0.764 (T=2.681, P<0.01). The value of Durbin-Watson is 1.996, which means that the auto-correlation problem is acceptable; the mean of the Std. Residual is 0.000, which means that the homogeneity of variance of residual after estimation is satisfied to a good degree. And finally, the tolerance test of each independent variable is rather close to 1, which means that the multicollinearity problem is not serious in this regression model. All the results show that the validity of Model 2's regression results is high enough. Results indicate that more university-connected independent directors would lead to higher firm performance.

$$ROE_{it} = \alpha + \beta_0 UCID\_N_{it} + \beta_1 TI_{it} + \beta_2 RG_{it} + \beta_3 LNFS_{it} + \beta_4 CD_{it} + \beta_5 AGE_{it} + \beta_6 FLSR_{it} + \beta_7 IFP_{it} + \varepsilon_{it}$$

(2)

4.2 Robustness Test

a. Robustness test on the change of firm performance's measure: ROE

First, in order to test the robustness of the empirical results, the paper uses ROA of the next year as the alternative measure of performance to replace ROE in Model 1, and takes the refined

Table 1. Descriptive statistics and correlation coefficients

	Mean	Standard deviation	ROA	ROE	EPS	UCID_R	UCID_N	TI	RG	LNTS	CD	AGE	FLSR	IFP
ROA	.016	.059	1											
ROE	5.983	16.678	.365**	1										
EPS	.289	.635	.371**	.565**	1									
UCID_R	.308	.237	.069**	.050**	.081**	1								
UCID_N	1.41	1.016	.112**	.087**	.109**	.841**	1							
TI	.460	.499	.006	.050**	.031	.055**	-.004	1						
RG	.570	.496	.029	.061**	.016	-.034	-.067**	.170**	1					
LNTS	21.409	1.392	.228**	.300**	.364*	.036*	.100**	.035	.079**	1				
CD	.160	.366	-.058**	-.039*	-.038*	-.052**	-.078**	.056**	.048**	-.097**	1			
AGE	52.21	7.016	.154**	.121**	.159**	.008	.014	-.013	.074**	.211**	-.022	1		
FLSR	.340	.141	.122**	.103**	.152**	.044*	.032	.024	.003	.177**	-.113**	.083**	1	
IFP	5.983	2.931	.220**	.176**	.225**	.052**	.113**	.298**	.024	.076**	-.041*	.063**	.107**	1

N=2994
*** represents significance level of 0.05*
**** represents significance level of 0.01*

Table 2. Regression results of Model 1 to Model 8

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
(Constant)	-76.831***	-76.288***	-.225***	-.222***	-3.606***	-3.572***	-77.374***	-77.026***
	(-16.535)	(-16.447)	(-13.459)	(-13.317)	(-21.063)	(-20.882)	(-16.642)	(-16.589)
UCID_R	2.445**		.013***		.159***		2.758***	
	(2.017)		(2.974)		(3.562)		(2.263)	
UCID_N		.764***		.004***		.033***		.744***
		(2.681)		(3.852)		(3.118)		(2.613)
TI	-.432	-.327	-.008***	-.007***	-.054**	-.049**	-.410	-.269
	(-.707)	(-.537)	(-3.578)	(-3.335)	(-2.422)	(-2.161)	(-.672)	(-.441)
ZUCID_R*ZTI							-.659**	
							(-2.297)	
ZUCID_N*ZTI								-.731**
								(-2.526)

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8
RG	1.193**	1.250**	.002	.002	-.015	-.013	1.164*	1.191**
	(2.028)	(2.122)	(1.006)	(1.141)	(-.681)	(-.619)	(1.980)	(2.022)
LNTS	3.226***	3.183***	.008***	.007***	.148***	.147***	3.230***	3.199***
	(14.923)	(14.673)	(9.860)	(9.548)	(18.616)	(18.331)	(14.954)	(14.757)
CD	-.052	.002	-.003	-.003	.027	.028	-.080	-.035
	(-.066)	(.003)	(-1.086)	(-.992)	(.939)	(.961)	(-.101)	(-.045)
AGE	.128***	.129***	.001***	.001***	.007	.007	.134***	.138***
	(3.080)	(3.108)	(5.573)	(5.617)	(4.627)	(4.659)	(3.223)	(3.314)
FLSR	2.012	2.174	.018**	.019**	.208***	.217***	2.372	2.536
	(.958)	(1.036)	(2.403)	(2.519)	(2.685)	(2.806)	(1.127)	(1.207)
IFP	.861***	.836***	.004***	.004***	.044***	.043***	.852***	.808***
	(8.362)	(8.084)	(11.576)	(11.186)	(11.506)	(11.196)	(8.284)	(7.771)
R	.346	.348	.332	.338	.431	.430	.348	.350
R^2	.120	.121	.112	.114	.186	.185	.121	.123
Aj-R^2	.117	.118	.110	.112	.183	.183	.119	.120
F	50.778	51.220	47.196	48.037	85.000	84.545	45.787	46.320
VIF MAX	1.120	1.138	1.141	1.138	1.141	1.138	1.141	1.146
Mean of Std. Residual	.000	.000	.000	.000	.000	.000	.000	.000
Durbin-Watson	1.996	1.996	1.217	1.843	1.769	1.767	1.826	1.827
N	2994	2994	2994	2994	2994	2994	2994	2994

Note: T values are in brackets.

model (i.e., Model 3) to match the data. Results in the fourth column of Table 2 show that, the unstandardized coefficient of UCID_R is 0.013 (T=2.974, P<0.01). H1 still holds.

$$ROA_{it+1} = \alpha + \beta_0 UCID\_R_{it} + \beta_1 TI_{it} + \beta_2 RG_{it} + \beta_3 LNFS_{it} + \beta_4 CD_{it} + \beta_5 AGE_{it} \\ + \beta_6 FLSR_{it} + \beta_7 IFP_{it} + \varepsilon_{it}$$

(3)

Second, in order to test the robustness of the empirical results, the paper uses ROA as the alternative measure of performance to replace ROE in Model 2, and takes the refined model (i.e., Model 4) to match the data. Results in the fifth column of Table 2 show that, the unstandardized coefficient of UCID_N is 0.004 (T=3.852, P<0.001). H1 still holds.

$$ROA_{it+1} = \alpha + \beta_0 UCID\_N_{it} + \beta_1 TI_{it} + \beta_2 RG_{it} + \beta_3 LNFS_{it} + \beta_4 CD_{it} + \beta_5 AGE_{it} \\ + \beta_6 FLSR_{it} + \beta_7 IFP_{it} + \varepsilon_{it}$$

(4)

b.   Robustness test on the change of firm performance's measure: EPS

First, in order to test the robustness of the empirical results, the paper uses EPS as the alternative measure of performance to replace ROE in Model 1, and takes the refined model (i.e., Model 5) to match the data. Results in the sixth column of Table 2 show that, the unstandardized coefficient of UCID_R is 0.159 (T=2.3.562, P<0.01). H1 still holds.

$$EPS_{it} = \alpha + \beta_0 UCID\_R_{it} + \beta_1 TI_{it} + \beta_2 RG_{it} + \beta_3 LNFS_{it} + \beta_4 CD_{it} + \beta_5 AGE_{it} \\ + \beta_6 FLSR_{it} + \beta_7 IFP_{it} + \varepsilon_{it}$$

(5)

Second, in order to test the robustness of the empirical results, the paper uses EPS as the alternative measure of performance to replace ROE in Model 2, and takes the refined model (i.e., Model 6) to match the data. Results in the seventh column of Table 2 show that, the unstandardized coefficient of UCID_N is 0.033 (T=3.118, P<0.01). H1 still holds.

$$EPS_{it} = \alpha + \beta_0 UCID\_N_{it} + \beta_1 TI_{it} + \beta_2 RG_{it} + \beta_3 LNFS_{it} + \beta_4 CD_{it} + \beta_5 AGE_{it} \\ + \beta_6 FLSR_{it} + \beta_7 IFP_{it} + \varepsilon_{it}$$

(6)

c.   Robustness test on the change of data analysis method

Independent Samples Test is used to test whether the positive effect of the independent directors' university background on firm performance is robust to the change of the data analysis method. The cutting point of UCID_R is 0.31. The test results are respectively shown in Table 3 and Table 4, which show that H1 still holds.

4.3 Further Investigation and Discussion

We guess that the role of the independent directors' university background in determining firm performance is contingent on some contextual variables, for example, technology intensity or the number of board meetings (NBM).

a. The moderating role of TI in the relationship between UCID_R and ROE

Taking ROE as the dependent variable, UCID_R ,TI and ZUCID_R*ZTI as the predictors, and RG, LNFS, CD, AGE, FLSR and IFP as the control variables, Model 7 is built. Based on the above-mentioned sample in this study, the regression results of Model 7 are shown in the eighth column of Table 2.

$$ROE_{it} = \alpha + \beta_0 UCID\_R_{it} + \beta_1 TI_{it} + \beta_2 ZUCID\_R_{it} *ZTI_{it} + \beta_3 RG_{it} + \beta_4 LNTS_{it} + \beta_5 CD_{it} + \beta_6 AGE_{it} \\ + \beta_7 FLSR_{it} + \beta_8 IFP_{it} + \varepsilon_{it}$$

(7)

The eighth column of Table 2 shows that the coefficient of ZUCID_R*ZTI on ROE is -0.659 (P<0.05), which confirms that UCID_R has a weak but significant negative moderating effect on the relationship between technology intensity and firm performance.

Table 3. Group statistics of firm performance contingent on UCID_R (Cutting point=0.31)

	UCID_R	N	Mean	Std. deviation	Std. error mean
ROA	>= .31	1379	.0186	.06169	.00166
	< .31	1615	.0129	.05746	.00143
ROE	>= .31	1379	6.6536	15.63070	.42092
	< .31	1615	5.4121	17.50734	.43565
EPS	>= .31	1379	.3429	.76747	.02067
	< .31	1615	.2445	.49200	.01224

Table 4. Independent samples test results of firm performance contingent on UCID_R (Cutting point=0.31)

		Levene's test for equality of variances		t-test for equality of means						95% confidence interval of the difference	
		F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Std. error difference		Lower	Upper
ROA	Equal variances assumed	6.474	.011	2.631	2992	.009	.00573	.00218		.00146	.01001
	Equal variances not assumed			2.616	2843.491	.009	.00573	.00219		.00144	.01003
ROE	Equal variances assumed	.449	.503	2.031	2992	.042	1.24155	.61119		.04316	2.43995
	Equal variances not assumed			2.050	2986.051	.040	1.24155	.60577		.05378	2.42933
EPS	Equal variances assumed	23.084	.000	4.236	2992	.000	.09846	.02324		.05289	.14404
	Equal variances not assumed			4.099	2275.575	.000	.09846	.02402		.05136	.14557

b. The moderating role of TI in the relationship between UCID_N and ROE

Taking ROE as the dependent variable, UCID_N, TI and ZUCID_N*ZTI as the predictors, and RG, LNFS, CD, AGE, FLSR and IFP as the control variables, Model 8 is built. Based on the above-mentioned sample, the regression results of Model 8 are shown in the ninth column of Table 2.

$$ROE_{it} = \alpha + \beta_0 UCID\_N_{it} + \beta_1 TI_{it} + \beta_2 ZUCID\_N_{it} * ZTI_{it} + \beta_3 RG_{it} + \beta_4 LNTS_{it} + \beta_5 CD_{it} + \beta_6 AGE_{it} + \beta_7 FLSR_{it} + \beta_8 IFP_{it} + \varepsilon_{it}$$

(8)

The ninth column of Table 2 shows that the coefficient of ZUCID_N*ZTI on ROE is -0.731 (P<0.05). Both the eighth and the ninth column of Table 2 confirm that technology intensity of the independent directors has a negative moderating effect on the relationship between the university background and firm performance. Such a result means that the independent directors from the universities would perform a little worse in the technology-intensive firms than in the labor-intensive firms. It is a surprising result since the independent directors from the universities are traditionally viewed as the most knowledgeable experts who are naturally good at dealing with the issues belonging to the technology-intensive firms.

c. The moderating role of NBM in the relationship between UCID_R and ROE

Taking ROE and the dependent variable, UCID_R, NBM and ZUCID_R*ZNBM as the predictors, and TI, RG, LNFS, CD, AGE, FLSR and IFP as the control variables, Model 9 is built. By adopting the above-mentioned sample, the data are simulated with Model 9. Due to the limitation of paper length, the detailed results are omitted.

$$ROE_{it} = \alpha + \beta_0 UCID\_N_{it} + \beta_1 TI_{it} + \beta_2 RG_{it} + \beta_3 LNFS_{it} + \beta_4 CD_{it} + \beta_5 AGE_{it} + \beta_6 FLSR_{it} + \beta_7 IFP_{it} + \beta_8 NBM_{it} + \beta_9 ZUCID\_N_{it} * ZNBM_{it} + \varepsilon_{it}$$

(9)

According to the regression result, the unstandardized coefficient of ZUCID_N*ZNBM on ROE is 0.618 (P<0.05). The number of board meetings can enhance the positive effect of the university background of independent directors on firm performance. It is easy to understand that higher effort investment in the firms' running of the university-connected independent directors by taking participation in more board meetings would make a better use of their knowledge and human capital, and also, their monitoring function.

d. Discussion on the empirical results

According to the empirical results, several conclusions can be made as follows: (1) The university background of the independent directors can improve firm performance to a moderating degree; (2) The independent directors from the universities would produce a higher productivity in the traditional labor-intensive firms rather in the technology-intensive firms; (3) When the independent directors from the universities attend more board meetings, their positive role in affecting firm performance would be enhanced ; (4) From the perspective of time and energy investments, the independent directors with richer university connections would improve firm performance; (5) The reliability of the university-connected independent directors would improve firm performance by improving their firms' reputations; (6) The appearance of more university-connected independent directors would provide diversified views and higher monitoring intensity, while simultaneously, without making the managers become lazy by the resource enrichment due to the other types of independent directors; (7) University-connected directors would have richer knowledge and audit expertise in monitoring the firm's running and decision-making processes, which would make their firms face less financial pressure.

Compared with the positive effect of the independent directors on firm performance in the study of *Nuria and Francisco*[8]*, the positive effect of the independent directors' university connections on firm performance found in this study is rather similar in its strength. Besides, *Bhagat and Bolton* [34]*, Georges and Jasmina* [2]*, and Elloumi and Gueyié* [41] provide the very different results on the performance consequences of the independent directors. Of course, all the mentioned studies, including the unmentioned ones, have not addressed the role of the independent directors' university connections in determining performance. That is maybe the main reason why the existing studies have not reached a consensus on such a topic.

The literature most related to this study is the research on the performance consequences of the independent directors' political connections. As far as we know, there are a only few studies which have focused on the issue of the

relationship between the independent directors' political connections and firm performance, which mainly include *Zheng Luhang* [64]and *Lihong Wang*[65]. First, using a sample of 1548 firms between 2006 and 2007, *Zheng Luhang* [64] finds a positive link between the ratio of politically connected independent directors and firm performance. Second, using 7487 firm-year observations from the Shanghai stock exchange during the period of 2003-2012, *Lihong Wang*[65]has found that the value effect and incentives of hiring the independent directors with political ties are shaped by a firm's ownership structure.

However, the performance consequences of university-connected independent directors have not been explored up to now. Especially it is true in China. The study has filled this theoretical gap by contributing a new finding on this topic: There is a positive relationship between university connections of the independent directors and firm performance in Chinese listed manufacturing companies. Such a positive effect is mainly based on the new knowledge and valuable perspectives derived from the university connections, which is different from the resource enrichment effect brought by the independent directors' political connections [7].

According to this empirical result, in Chinese listed manufacturing companies, the knowledge of college teachers can be changed into the profits and wealth by taking the role of the independent directors to a certain degree. For the CEOs and executives, to invite the college teachers as their independent directors is valuable for them to improve firm performance.

4.4 Discussion on the Control Variables

First, technology intensity is positively related with firm performance with weak validity. In the fourth column of Table 2, the unstandardized regression coefficient of TI on EPS is -0.008 (P=0.000), while in the second and third column, the standardized regression coefficient of TI on ROE are not significant. Such a fact shows that CEOs of the technology-intensive manufacturing companies in China have no enough capability in facing the high risk and strict competition properly.

Second, manufacturing companies located in the eastern areas of China have higher performance than the ones located in the western and middle areas of China. In the second column of Table 2,

the unstandardized regression coefficient of RG on ROE is 1.193 (P<0.05); In the third column of Table 2, the unstandardized regression coefficient of RG on ROE is 1.250 (P<0.05). In existing literature, companies in the eastern regions would have higher performance than their peers because of the differences in talents, institutional environment and management level between the eastern areas and other areas. This empirical analysis result basically confirms that the regional gap in firm performance still exists. However, the regional gap has been reduced to a great degree with the implementation of the policy of Opening Up The West in China.

Third, firm size of manufacturing companies is positively related to firm performance in China. In the second column of Table 2, the unstandardized regression coefficient of LNTS on ROE is 3.226 (P=0.000); In the third column of Table 2, the unstandardized regression coefficient of LNTS on ROE is 3.183 (P=0.000). It can be seen that the larger firms would get much higher performance than the smaller firms. The result confirms to the prior literature on the relationship between firm size and firm performance[66]. Among the mentioned control variables in this paper, firm size has the most significant and strong effect on firm performance. Such a fact shows that the Scale Economies Effect, instead of the Innovation Effect or Differential Effect, is still the most important drive for improving firm performance for Chinese manufacturing companies.

Fourth, CEO age has positive effect on firm performance, which is rather significant than we have expected. In the second column of Table 2, the unstandardized regression coefficient of AGE on ROE is 0.128 (P=0.000); In the third column of Table 2, the unstandardized regression coefficient of AGE on ROA is 0.129 (P=0.000). CEO age potentially has both negative and positive effects on firm performance. On the one hand, older CEOs would have richer experience, more available resources and higher interpersonal skills which would be helpful for improving firm performance [67]; On the other hand, older CEOs would possibly get somewhat conservative, react passively to the rapid change of the external environment and hold the obsolete management skills, which would be harmful for improving firm performance [68]. Our empirical results show that, in Chinese listed manufacturing companies, the positive effect of CEO age on firm performance exceeds the

negative one. It is a new finding worthy of further in depth investigation.

Finally, the shareholding ratio of the first large shareholder is positively related to firm performance. However, such a relationship is weak and unsteady. In the fourth column of Table 2, the unstandardized regression coefficient of FLSR on ROE is 0.018 ($P<0.05$); In the fifth column of Table 2, the unstandardized regression coefficient of FLSR on ROA is 0.019 ($P<0.05$). Such results confirm to the conclusions of the recent literature on the performance consequences of ownership concentration to a certain degree. As an example, Grosfeld, et al. [69] have found that the positive impact of ownership concentration on the firm value detected in OLS regressions becomes even stronger when they control for the endogeneity of ownership by focusing on all non-financial companies traded on the Warsaw Stock Exchange. In this case, for Chinese listed manufacturing companies, keeping moderate ownership concentration has positive effects on firm performance.

5. CONCLUSION

This paper investigates the determination of firm performance from the perspective of the university connections of the independent directors, which has not been explored in detail till today by Chinese scholars. Data from Chinese listed manufacturing companies over 2008-2013 do prove that the independent directors can improve firm performance by providing richer knowledge, viewpoints, information and diversity of thinking patterns for the firms' running with the application of their university connections to a good degree. Such a positive effect is not the same with the positive performance consequences of the politically connected independent directors, which come from the richer resources and relationships due to their political connections, instead of coming from the new ideas, new knowledge and better perspectives which would improve firms' long-term competitive edge. Therefore, it is a good choice for the listed manufacturing companies to improve their management level and competitive edge by paying more attention to enriching independent directors' university connections.

Though the authors have provided rather robust and comprehensive evidence of the relationship between independent directors' university connections and firm performance of the listed manufacturing companies in China, there are still many other important research questions that remain unexplored. To be specific, in the future, more empirical studies should be done in the following aspects: (1) Samples should go beyond the limitation of the manufacturing companies; (2) Though the paper has examined some of the potential channels through which independent directors' university connections can affect firm performance, there are invariably other channels that should be explored; (3) Future research can also measure independent directors' university connections by adopting more reasonable indexes, such as the independent directors' discipline backgrounds or academic titles in their universities; (5) Suggestions in policies and countermeasures on improving or utilizing the university connections of the independent directors should be addressed in a heavier manner.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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