

Industry Resources and Firm Performance: Does Strategy Moderating Effect Matter?

Yang Han^a, Jing Fan^b, Xuan Yin^c, Yu-en Lin^{d*}

Abstract

Using financial data of US firms over 2000-2019 as research sample, to examine whether the industry resources influenced the firm performance, and what moderate effect does strategy show in this relationship. Our results could be summarized as follow. The results show that industry resources have an impact on firm performance. Young firms, small-scale firms, high-opacity firms, and high-free-cash-flow firms are less influenced by industry resources. Old firms, big-scale firms, low-opacity firms and low-free-cash-flow firms are more influenced by industry resources. Strategy can help reduce the negative impact of industry resources on firm performance, but can only help increase the positive impact of industry resources on low-free-cash-flow firms' performance. When adopting the prospecting strategy, high-opacity firms and high-free-cash-flow firms had better performance; when adopting a defend strategy, low-opacity firms, and low-free-cash-flow firms had better performance.

This study s enriches the literature of studying the relationship among industry factors, firm performance, and strategy. Second, the study contributes to the literature by examining how the relationship showed over all industries. Third, this study clarifies the moderate effect of strategy on the relationship between industry resources and firm performance.

Keywords Industry resources, Strategy, Firm performance, Business

JEL Classification: L16, L25, M21

1. Introduction

One primary question in firm strategy is whether the industry resources influenced the firm performance, and what moderate effect does strategy show in this relationship. Industry resources-firm performance-strategy theory predicts that industry resources have an impact on

firm performance, and strategy can reduce the negative effect and increase the positive effect. The former includes, for example, industry R&D investment can reduce firm performance. The latter includes, for example, defend strategy that can reduce the negative impact of industry R&D investments.

The theory addresses resources combinations affects performance, and encourages researchers to use different measurements to measure performance outcome (Brush and Chaganti, 1998). The theory by Fosuri et al. (2018) suggests that their research showed that mismatches between product and technology strategies can be detrimental to a firm's survival. The existing industry factor-firm performance studies have endeavored to use industry factors and strategy to explain the difference in firm performance. Industry resources, an important aspect of strategy factors, is surprisingly ignored by the existing literature.

The strategy has been tested and turned out that different strategies revealed a significantly different effect on firm groups (Smith. et al, 1989). With proper strategy, firms at a disadvantage have the opportunity to compete with those at an

^aEconomics and Management College, Jilin Agricultural University, Changchun, Jilin, PR. China
Changchun University Of Finance And Economics, Changchun, Jilin, PR. China

Tel: (86)-18643214902
Email: iisos@sina.com

^bEconomics and Management College, Jilin Agricultural University, Changchun, Jilin, PR. China
Tel: (86)-13578878849
Email: fanjing2010@yahoo.cn

^cBusiness School, Jilin University, Changchun, Jilin, PR. China
Tel: (86)-13943031972
Email: yxlife1999@163.com

^dCenter for Quantitative Economics, Changchun, Jilin, PR. China
Tel: (86)-1739006939
Email: sas@jlu.edu.cn

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Corresponding Author: Yu-En Lin, An Assistant Professor of Business School of Jilin University, Mailing Address: No.2699 Qianjin Street, Changchun City, China; Email: sas@jlu.edu.cn

advantage (Noumoff, 1999). As time passed, there have been scholars considered strategy as an endogenous factor in performance equations (Rocha et al. 2019). Therefore, the strategy has been more and more considered as an independent variable while performing as the dependent variable.

Until now, there is no consensus on whether industry resources influence firm performance and how strategy moderates that impact. Our paper fills this gap using industry size, industry Tobin's q ratio, and industry R&D investment as the measurement of industry resources. We contribute to the literature in three main ways. First, this study helps fill the gap in the literature of studying the relationship among industry factors, firm performance, and strategy. Second, previous studies have highlighted the relationships in specific industries or firms, however, the way how the relationship shows among all industries is still unclear. This study complements the literature by examining how the relationship showed over all industries. Third, this study clarifies the moderate effect of strategy on the relationship between industry resources and firm performance. It not only highlighted the moderate effect of strategy on the relationship but also considered the endogenous nature of the choice of such explanatory variables. This extends our knowledge of the moderate effect of strategy on the relationship between industry resources and firm performance.

This paper investigates whether the industry resources influence firm performance and how does strategy moderate that effect. However, ensuring the industry resources level is empirically challenging because of the endogeneity problem arising from choosing variables. To circumvent this problem, we use three different aspects of industry resources to ensure the level of industry resources.

Our study finds that, on average, industry resources have an impact on firm performance. Young firms, small-scale firms, high-opacity firms, and high-free-cash-flow firms are less influenced by industry resources. Old firms, big-scale firms, low-opacity firms, and low-free-cash-flow firms are more influenced by industry resources. Strategy can help reduce the negative impact of industry resources on firm performance, but can only help increase the positive impact of industry resources on low-free-cash-flow firms' performance. When adopting the prospecting strategy, high-opacity firms and high-free-cash-flow firms had better performance; when adopting a defend strategy, low-opacity firms and low-free-cash-flow firms had

better performance.

2. Literature review

With the increasing interest of industry resources, firm performance, and strategy, plenty of researches have been brought up by different researchers. One major theory believes that strategies affect the performance outcomes of firms, the effect is influenced by industry conditions (McDougall et al. 1994; Carter et al. 1994). The second theory explains that industry environment and industrial strategies influence the performance outcomes of firms, which the industrial factors have similar effects on firms in a particular industry but have some differences between those firms have different ages or sizes (Brush and Chaganti 1998; Hausmann et al. 2011). The third theory has a point that with proper strategy, a firm can increase its performance and the probability of survival (Audia et al. 2006; Fosuri et al. 2018).

2.1 Industry resources-performance relationship

This study will focus on using industry size, industry Tobin's q ratio, and industry R&D investment to represent industry resources. According to prior studies (Brenner and Dorner, 2017; Hsiao and Chen, 2013; Pamela and Mark, 1993; Barth, Kasnik and McNichols, 2001) that considered the explanatory variable of industry resources, this study considered industry size, industry Tobin's q ratio, and industry R&D investment as explanatory variables. The industry size is the average size of firms in every industry. The industry Tobin's q ratio is the industry average Tobin's q ratio. This ratio stands for the ability of enterprises to create value, and the industry average ratio can reflect the presence of industrial value creation. The industry R & D investment is the industry average R & D investment, this variable represents the value that the industry can pay for development, represents the development prospects of the industry. Industry resources have been involved in plenty of studies of firm performance, most of them conclude that industry resources play an effective role in their industries (Zachary, 1958; Shuai and Falla, 2006; Majumdar, 1997; Baron, 1982; Norman, Butler and Ranft, 2013).

However, most of these studies took place in the 1990s. With modern society changes, the conditions change rapidly. Those conclusions may lead to a different way nowadays. Also, the studies mostly being applied in case studying form, the conclusions may not reliable. This research will examine how the relationship turns out now, and

we will introduce strategy into this effect.

2.2 Strategy-performance relationship

A Strategy-performance relationship has been studied for decades. The strategy has been tested and turned out that different strategies revealed a significantly different effect on firm groups (Smith, et al, 1989). With proper strategy, firms at a disadvantage have the opportunity to compete with those at an advantage (Noumoff, 1999). As time passed, there have been scholars considered strategy as an endogenous factor in performance equations (Rocha et al. 2019). Therefore, the strategy has been more and more considered as an independent variable, while performing as the dependent variable. According to former researches (Glancey,1998; Claver et al.2006; Carmona, Climent and Alexandre,2019), this paper sets the return on the ratio of the total assets of the firm as an explained variable.

In this study, the strategy is considered as a moderator instead of an independent variable. Because strategy is endogenous, its moderating effect has been brought up. Activities done by a firm with one strategy are more effective than activities done by a firm with a different strategy (McAlister, et al.2016). In McAlister's research, they take strategy as a moderator, to measure the effectiveness of firm activities. This paper chose strategy as a moderator, which is based on former researches (Brush and Chaganti, 1998; Pietrobelli and Puppato, 2015; Hoskisson et al., 2004; Wang et al., 2011). The importance of strategy has been explained by many researchers, but this research picks different variables to explain industry resources and firm performance. The research methodology follows former research methodology: Calculate the ratio of research and development to sales, the ratio of employees to sales, a historical growth measure (one-year percentage change in total sales), the ratio of marketing to sales, employee fluctuations (standard deviation of total employees) and capital intensity. Each of the six measures is intended to capture different elements of a firm's business strategy. Strategy scores ranging from 6 (the minimum) to 12 as defenders, ranging from 24 to 30 (the maximum) as prospectors. After scoring the strategy, we can sort firms into different groups.

2.3 Industry resources-strategy relationship

The relationship between industry resources and strategy is an important topic in current studies. Some studies imply that industry resources play a lead role in the firm's strategy (Zhu and Chung,

2014). Industry resources recently have more content included, since more industry policies being applied to many fields. The increasing industry resources have a significant effect on emerging industries (Georgallis, Dowell and Durand, 2018). Assuming industry resources will have a similar effect on manufacturing industry firms will be promising.

The theories above explain some of the relationships between industry resources, firm performance, and strategy, but still, some other relationships haven't been analyzed. Since most researches considered strategy as an independent variable, and industry factor as mediation variable, the connection between industry resources and firm performance have left the picture for a long time. Some of those researches explained what effect would industry resources make on firms differ from size or age, but those just observe the small or retail firms, which may lead to some differences in results (Porter 1985; Wright, Smart, and McMahan 1995).

3.Hypothesis

This study follows Das.etal. (2008) footsteps, set industry size, industry Tobin's q ratio, and industry R&D investment as the representation of industry resources. For the prior research, industry resources affect firm performance (Zachary, 1958; Shuai and Falla, 2006; Majumdar, 1997; Baron, 1982; Norman, Butler, and Ranft, 2013). The studies have shown that despite the youngest and oldest group of firms, most firms had been influenced by industry resources on different levels (Brush and Chaganti, 1998) Optimizing resources in the industry have a promising effect on manufacturing industry firms (Davidson and Williams, 2002). The change in industry resources leads to firms' changing output and productivity. For this study, we concern firm performance as a return on total assets followed by Glancey (1998) and Claver.etal. (2006).

The most relevant studies took place in the 1990s. With modern society changes, the conditions change rapidly. New evidence may lead to a different way nowadays. Also, the studies mostly being applied in case studying form, the conclusions may not reliable. Our study examines the modern data to confirm the hypothesis below.
H₁: Industry resources and firm performance are positively related.

The firm strategy had been selected as an independent variable, dependent variable ,and moderator in prior relevant researches (Brush and Chaganti, 1998; Pietrobelli and Puppato, 2015;

Hoskisson et al., 2004; Wang et al., 2011; Hitt and Ireland, 1985; Edelman et al., 2005). Under this situation, this study concern strategy as the exogenous variable and explore its moderating role by using a two-step estimation procedure to avoid the endogeneity problem and achieve unbiased results. For former studies more considered strategy as the independent variable and dependent variable, we aim its moderating characteristic. We assume this role strategy played will relieve the pressure which industry resources puts on the firm and improve firm performance.

H₂: Firm strategies can relieve the negative impact of industry resources on firm performance and improve the positive impact of industry resources on firm performance.

4. Research methodology

4.1 Sample and data sources

The data of North American firms are selected from Wharton research data services, the data is the merge result of Compustat, IBES, and CRSP data. To test the applicability of the theory carried out by Brush and Chaganti (1998) in days after 2000, and to put this research in the same period as the research of Georgallis, Dowell and Durind (2018), the period of the independent and control variables is from 2000 to present while for dependent variable is from 2000 to 2019. After excluding missing data, the final sample includes 16,955 firm-year observations over a -year's time frame.

4.2 Model specification

To examine these hypotheses, this study constructed three models: industry resources-

performance model, moderate model, and robust model. The first was used to examine the relationship between industry resources and firm performance. The second was used to examine the moderate effect of strategy on the relationship. The third was used to examine the robustness of the first teocalli models.

4.2.1 Industry resources-performance model

The industry resources-performance model contained variables mentioned earlier, after controlled variables on three levels, the final model of testing the effects of industry resources on firm performance was as follows:

$$ROA_{i,t} = \beta_0 + \beta_1 IND_SIZE_{i,t} + \beta_2 IND_Q_{i,t} + \beta_3 IND_RD_{i,t} + \beta_4 FIRM_AGE_{i,t} + \beta_5 SIZE_{i,t} + \beta_6 CASH_{i,t} + \beta_7 IND_GROWTH_{i,t} + \beta_8 INSIDER_{i,t} + \sum YearIndicator + \sum IndustryIndicator + \beta_9 \quad (1)$$

In this model, IND_SIZE_{i,t} stands for industry size, IND_Q_{i,t} stands for industry Tobin's q ratio, IND_RD_{i,t} stands for industry R & D investment. As for the control variables, FIRM_AGE_{i,t} stands for firm age, SIZE_{i,t} stands for firm size, CASH_{i,t} stands for firm cash, IND_GROWTH_{i,t} stands for industry growth, INSIDER_{i,t} stands for insider shareholding ratio.

4.2.2 Moderate model

Following prior study (Brush and Chaganti, 1996; Wang et al., 2011; Wang et al., 2020), this study examined the moderate effect pf strategy on the relationship between industry resources and firm performance. The final model of testing the effects of industry resources on firm performance was as follows:

Table 1. Variable definitions

Variable type	Variable name	Code	Description
Explanatory variable	Industry size	<i>Ind_size</i>	Log of industrial total asset (Brenner and Dorner, 2017)
	Industry Tobin's q ratio	<i>Ind_q</i>	Industry average tobin's q ratio (Pamela and Mark, 1993)
	Industry research and development expense	<i>Ind_rd</i>	Log of industrial research and development expense (Barth, Kasnik and McNichols, 2001)
Explained variable	Return on total assets ratio	<i>Roa</i>	Log of firm's sales divide total asset multiply by EBIT (Carmona, Climent and Alexandre, 2019)
Moderate variable	Strategy	<i>Strategy</i>	The type of strategy that firm choose (Bension and Beach, 1996; Elangovan, 1995; Barbera, Berga and Moreno, 2010)
	Firm age	<i>Firm_age</i>	The numbers of years the firm has been listed on stock markets (Bianchini et al., 2018; Shrivastava and Tamvada, 2019)
	Firm size	<i>Size</i>	Natural logarithm of average total assets (Shrivastava and Tamvada, 2019)
Control variable	Cash	<i>Cash</i>	Firm's cash ratio, measured as cash and short term investment divide total asset (Ayers, Andrew and Schwab, 2018)
	Industry growth	<i>Ind_growth</i>	Measured as average of industry resources variables, over the average value is 1, less than the average value is 0. (Choi and Kim, 2020; Chazi et al., 2020)
	Insider shareholding ratio	<i>Insider</i>	Proportion of shares held by insiders (Chen et al., 2010)

$$ROA_{i,t} = \beta_0 + \beta_1 IND_SIZE_{i,t} + \beta_2 IND_Q_{i,t} + \beta_3 IND_RD_{i,t} + \beta_4 PROSPECT_{i,t} + \beta_5 IND_SIZE_{i,t} * PROSPECT_{i,t} + \beta_6 IND_Q_{i,t} * PROSPECT_{i,t} + \beta_7 IND_RD_{i,t} * PROSPECT_{i,t} + \beta_8 FIRM_AGE_{i,t} + \beta_9 SIZE_{i,t} + \beta_{10} CASH_{i,t} + \beta_{11} IND_GROWTH_{i,t} + \beta_{12} INSIDER_{i,t} + \Sigma YearIndicator + \Sigma IndustryIndicator + \epsilon_{i,t} \quad (2)$$

$$ROA_{i,t} = \beta_0 + \beta_1 IND_SIZE_{i,t} + \beta_2 IND_Q_{i,t} + \beta_3 IND_RD_{i,t} + \beta_4 DEFEND_{i,t} + \beta_5 IND_SIZE_{i,t} * DEFEND_{i,t} + \beta_6 IND_Q_{i,t} * DEFEND_{i,t} + \beta_7 IND_RD_{i,t} * DEFEND_{i,t} + \beta_8 FIRM_AGE_{i,t} + \beta_9 SIZE_{i,t} + \beta_{10} CASH_{i,t} + \beta_{11} IND_GROWTH_{i,t} + \beta_{12} INSIDER_{i,t} + \Sigma YearIndicator + \Sigma IndustryIndicator + \epsilon_{i,t} \quad (3)$$

This equation shows how different aspects of strategy influenced the relationship between industry resources and firm performance.

This chart presents variable definitions.

Variables are computed for each firm and each year. Industry is defined using two-digit SIC codes.

5. Results

5.1 The results of descriptive statistics and correlation analysis

We examined the overall linear relationship among this all-inclusive group of antecedents and firm performance in Table 2 and Table 3. We found that, together, industry size, industry Tobin’s q ratio, and industry R&D investment have a significant relationship with firm performance. Suggesting that the improvement of industry size will improve firm performance, the improvement of industry Tobin’s q ratio and industry R&D investment will reduce firm performance.

Table 2. Summary statistics

	MEAN	STD	MIN	MEDIAN	MAX
ROA	3.531	2.355	-5.143	3.825	11.008
IND_SIZE	5.955	1.090	2.754	5.823	10.852
IND_Q	1.787	0.564	0.482	1.694	8.734
IND_RD	0.049	0.062	0.000	0.016	0.240
FIRM_AGE	14.466	13.949	0.083	9.167	65.000
SIZE	6.571	1.629	1.271	6.473	12.627
CASH	0.193	0.197	0.000	0.119	0.935
IND_GROWTH	0.779	0.415	0.000	1.000	1.000
INSIDER	15.733	20.675	0.000	7.736	100.000

This chart shows summary statistics of the variables. Our sample firms are from COMPUSTAT with non-missing financial information for the period from 2000 to 2019. Following prior research, we exclude financial firms whose Standard Industrial Classification (SIC) codes are between

6000 and 6999 from our sample. Next, we match our COMPUSTAT sample with IBES CRSP. Our final sample contains 16955 observations. ***, ** and * show the significance level at 1%, 5% and 10% respectively.

Table 3. Correlation of the variables

	ROA	IND_SIZE	IND_Q	IND_RD	FIRM_AGE	SIZE	CASH	IND_GROWTH	INSIDER
ROA	1.000								
IND_SIZE	0.367***	1.000							
IND_Q	-0.078***	-0.206***	1.000						
IND_RD	-0.341***	-0.355***	0.449***	1.000					
FIRM_AGE	0.357***	0.191***	-0.080***	-0.158***	1.000				
SIZE	0.723***	0.483***	-0.119***	-0.234***	0.343***	1.000			
CASH	-0.356***	-0.283***	0.343***	0.577***	-0.222***	-0.328***	1.000		
IND_GROWTH	-0.007	-0.080***	0.558***	0.276***	-0.019**	-0.048***	0.211***	1.000	
INSIDER	-0.103***	-0.049***	-0.048***	-0.075***	0.007	-0.200***	-0.017**	-0.062***	1.000

This chart shows the correlation coefficients of the variables. Our sample firms are from COMPUSTAT with non-missing financial information for the period from 2000 to 2019. Following prior research, we exclude financial firms whose Standard Industrial Classification (SIC) codes are between 6000 and 6999 from our sample. Next,

we match our COMPUSTAT sample with IBES CRSP. Our final sample contains 16955 observations. ***, ** and * show the significance level at 1%, 5% and 10% respectively.

Next, we examined how industry size relates to firm performance. Similar to Cheah and Ho (2019), general industry size was significantly and positively

related to firm performance ($r=0.367$, $p < 0.01$). We also found that industry Tobin's q ratio ($r=-0.078$, $p < 0.01$) and industry R&D investment ($r=-0.341$, $p < 0.01$) exhibited negative relationships with firm performance. Similar to Brush and Chaganti (1998), we found that firm age ($r=0.357$, $p < 0.01$) and firm size ($r=0.723$, $p < 0.01$) positively influenced the relationship. Cash ($r=-0.356$, $p < 0.01$) negatively and strongly influenced the relationship. Industry

growth has shown no significant effect on firm performance, but shown a significant effect on all other variables. Insider shareholding ratio ($r=-0.103$, $p < 0.01$) exhibited significant negative relationship with firm performance.

5.2 The results of regression analysis

Columns (1) to (5) of Table 4 are the results of OLS, respectively.

Table 4. The effect of industry resources on firm performance

	(1)	(2)	(3)	(4)	(5)
Intercept	-3.598*** (-12.62)	-3.072*** (-9.56)	-4.137*** (-14.22)	-3.024*** (-10.39)	-3.089*** (-9.37)
ind_size		-0.107*** (-3.60)			-0.094*** (-3.21)
Ind_Q			0.331*** (9.24)		0.361*** (10.02)
ind_rd				-9.873*** (-8.49)	-10.815*** (-9.32)
firm_age	0.012*** (10.61)	0.012*** (10.49)	0.012*** (10.67)	0.011*** (10.40)	0.011*** (10.34)
size	0.971*** (105.66)	0.975*** (105.74)	0.972*** (105.71)	0.972*** (105.99)	0.975*** (106.15)
cash	-0.419*** (-5.05)	-0.422*** (-5.08)	-0.447*** (-5.38)	-0.383*** (-4.63)	-0.413*** (-4.98)
Ind_Growth	0.410*** (11.36)	0.409*** (11.36)	0.325*** (8.79)	0.406*** (11.27)	0.313*** (8.48)
Insider	0.002** (2.32)	0.002** (2.30)	0.002** (2.57)	0.001** (2.15)	0.002** (2.37)
Year F.E.	YES	YES	YES	YES	YES
Industry F.E.	YES	YES	YES	YES	YES
R ²	65.87%	65.90%	66.05%	66.05%	66.28%
Adj R ²	65.15%	65.17%	65.33%	65.33%	65.56%
N	16955	16955	16955	16955	16955

This table reports the estimation results of the relationship between industry resources and firm performance. Our sample firms are from COMPUSTAT with non-missing financial information for the period from 2000 to 2019. Our final sample contains 16955 observations. ***, ** and * show the significance level at 1%, 5% and 10% respectively.

The coefficient of industry size is negative and significant at one percent level, the coefficient of industry Tobin's q ratio is positive and significant at the one percent level, the coefficient of industry R&D investment is negative and significant at the one percent level, which indicates strong evidence of the industry resources effect on firm performance. The positive signs of industry Tobin's q ratio shown that when the industry ratio of output to input rises, firm performance increases. The negative signs of industry size and industry R&D

investment have shown that when the industry input and competition rises, firm performance decreases. Additionally, the use of group OLS alleviates the association of industry resources in different groups to the OLS model. In Table 4, we discussed the results in different groups.

We followed the step of Brush and Changanti (1998), divided firm by size and age. For different firm age. In old firms, all explanatory variables showed a significant effect. Industry size showed a negative effect at 5% respectively. Industry Tobin's q ratio showed a positive effect at 1% respectively. Industry R&D investment showed a negative effect at 1% respectively. In young firms, industry size, industry Tobin's q ratio, and industry R & D investment all showed a significant effect, Industry size showed a negative effect at 10% respectively. Industry Tobin's q ratio showed a positive effect at 1% respectively. Industry R&D investment showed a

negative effect at 1% respectively. Old firms entered the industry earlier, have time to accumulate capital and are more related to the industry, so the overall impact of the industry is more obvious than young firms. While young firms entered the industry for a shorter time, accumulated less capital, are vulnerable to industry resources. The larger the industry scale, the more intense the industry competition and the fewer industry resources, which has a negative impact on firm performance.

For different firm sizes. In large-scale firms, all explanatory variables showed a significant effect. Industry size showed a negative effect at 1% respectively. Industry Tobin's q ratio showed a positive effect at 1% respectively. Industry R&D investment showed a negative effect at 1% respectively. In small-scale firms, industry Tobin's q ratio, and industry R & D investment both showed a significant effect, Industry size showed a positive but insignificant effect. Industry Tobin's q ratio showed a positive effect at 1% respectively. Industry R&D investment showed a negative effect at 1% respectively. Large firms and small firms are affected by industry resources to the same extent, but small firms are less affected by industry size. The reason for this is that small firms have fewer resources and their performances are less linked to industry resources. As industry resources increase, large-scale firms are more positively affected.

5.3 The results of regression analysis including the moderate effect of strategy

Table 5 reports the estimation results. The result in table 4 shows that industry resource affects on firm performance since the coefficient is significant. These results are in line with those reported by Brush and Chaganti (1998) and confirm our (H_1). In our models, the strategy variable is discovered to show a moderate effect.

This chart shows the relationship between industry resources and Prospect or defend strategies interacting with firm performance in full model and different groups. Our sample firms are from COMPUSTAT with non-missing financial information for the period from 2000 to 2019. Our final sample contains 16955 observations. ***, ** and * show the significance level at 1%, 5% and 10% respectively. For the full model, strategy type showed no direct effect on firm performance, but the moderate effects have shown in results. When the adjustment effect is not considered, the size of the industry has a significant negative impact on firm performance, the industry's Tobin's q ratio has a generally positive impact on firm performance, and the industry's R & D investment has a significant

negative impact on firm performance. When the firm adopts prospect strategy, the negative impact of industry size is no longer significant, the negative impact of industry Tobin's q ratio is reduced, but still significant at 1% respectively. The positive impact of the industry's Tobin's q ratio became significant at 10% respectively. When applying prospect strategy, the firm will increase investment, therefore decrease the variable value of firm performance. After adopting the defend strategy, the impact of industry Tobin's q ratio and industry R&D investment on firm performance has become insignificant and positive. The impact of industry size became positive and significant at 5% respectively. Because of the defense strategy, the firm's investment will be stable and reliable, so the negative impact of industry resources on firm performance will be reduced.

Table 5. The moderating effect of strategy interacting with firm performance on industry resources

	(1)	(2)
Intercept	-2.133*** (-7.66)	-1.861*** (-6.48)
ind_size	-0.196*** (-9.18)	-0.225*** (-9.12)
Ind_Q	0.254*** (7.96)	0.253*** (6.04)
ind_rd	-12.240*** (-10.57)	-12.671*** (-10.69)
ind_size*PROSPECT	-0.075 (-1.06)	
ind_size*Defend		0.055** (2.29)
Ind_Q*PROSPECT	0.254* (1.73)	
Ind_Q*Defend		0.004 (0.09)
ind_rd*PROSPECT	-6.591*** (-3.29)	
ind_rd*Defend		0.420 (0.92)
PROSPECT	0.058 (0.13)	
Defend		-0.452*** (-2.63)
size	0.972*** (105.39)	0.969*** (104.25)
firm_age	0.011*** (10.19)	0.010*** (9.18)
Ind_Growth	0.281*** (7.83)	0.284*** (7.94)
cash	-0.365*** (-4.41)	-0.368*** (-4.45)
Insider	0.001** (1.97)	0.001** (2.10)
Year F.E.	YES	YES
Industry F.E.	YES	YES
R ²	65.79%	65.78%
Adj R ²	65.08%	65.08%
N	16955	16955

6. Discussion and conclusions

This study focus on using industry size, industry Tobin's q ratio and industry R&D investment to represent industry resources.

This paper explores how firm strategies influence the relationship between industry resources and firm performances (Jones et al. 1998), we can assume the firms in chosen industries relied on industry resources on different levels. We use industry size, industry Tobin's q ratio and industry R & D investment as metrics of industry resources (Brenner and Dorner, 2017; Hsiao and Chen, 2013; Pamela and Mark, 1993; Barth, Kasnik and McNichols, 2001), return on total assets ratio (Glancey, 1998; Claver et al. 2006) as metric of firm performances. As for strategy, we are sorting strategies into different groups, and measuring strategies by firms' outcomes on related funds.

To avoid industrial effects, industry growth was controlled. This study is inspired by prior studies (Choi and Kim, 2020; Chazi et al., 2020, measured industry growth as the comparison of every industry's median value of industry Tobin's q ratio, industry R & D investment and industry size to the median value of all industries, up 1/2 group set as 1 while others set as 0. Value 1 means this industry grew in that year, value 0 means this industry didn't grow in that year.

To avoid firm-level effects, this study selected firm age, firm size and cash as control variables. According to Brush and Chaganti (1998), firm size and firm age showed a strong effect on firm performance, therefore controlled these two variables can effectively control other alternative effects on firm-level. According to Ayers, Andrew and Schwab (2018).

To avoid CEO level effect, this study selected insider shareholding ratio as a control effect, measured as the percentage of insider shareholding (Chen et al., 2010). The insider shareholding ratio has been considered as an important variable that affects return on total assets ratio. This financial variable reflects the firm's shareholding structure, controlling this variable can effectively remove the influence of the firm's shareholding structure.

Building on the resources-based perspective, this study examines the relationship between industry resources and firm performance. The empirical findings support part of the hypotheses within this study.

The results showed that there is a certain relationship between industry resources and enterprise performance, specifically: industry size is significantly negatively correlated with firm

performance, industry input to output ratio is significantly positively correlated with firm performance, and industry R&D investment is significantly negatively correlated with firm performance. This result is similar to former studies (Brush and Chaganti, 1998).

The results of the moderating role regression model showed that after joining the influence of strategy, the negative impact of industry resources on firm performance has been significantly weakened, while the positive impact has only increased in the low-free-cash-flow firm group. This shows that strategy can effectively offset the negative effects of the industry, but it cannot promote the positive effects of the industry for all firms. This result partially proves Hypothesis 2. The results extend our knowledge of the moderate effect of strategy on the relationship between industry resources and firm performance.

Our framework makes several contributions to the literature. First, current literature focuses on the direct link among strategy, firm performance, and industry factors. Many variables have been chosen, but we first consider the industry resources as the measurement of industry factors. Second, based on Fosfuri et al. (2018), Cheah and Ho (2019), and Georgallis, Dowell and Durind (2018), this study helps fill the gap in the literature of studying the relationship among industry factors, firm performance, and strategy. Third, previous studies have highlighted the relationships in specific industries or firms, however, the way how the relationship shows among all industries is still unclear. In so doing, this study complements the literature by examining how the relationship showed overall industries, an embryonic idea so far Cheah and Ho (2019). Fourth, it also clarifies the moderate effect of strategy on the relationship between industry resources and firm performance. It not only highlighted the moderate effect of strategy on the relationship but also considered the endogenous nature of the choice of such explanatory variables. This extends our knowledge of the moderate effect of strategy on the relationship between industry resources and firm performance.

However, our study still has some limitations. We didn't examine enough groups to get to a more detailed conclusion. There is more than one way to measure industry resources, which may lead to different conclusions. In future studies, we will carry on to build a set of more detailed conclusions.

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