

The Impact of Patents on the Relationship Between M&A Premium and M&A Performance

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Abstract: The phenomenon of "three-high mergers and acquisitions" characterized by high valuation, high goodwill, and high performance commitments often leads to significant declines in performance, which severely dampens the enthusiasm of market participants and hinders the stable development of the M&A market. Therefore, it is essential to further investigate the relationship between M&A premiums and performance. This study approaches the issue from the perspective of patents, aiming to find solutions to M&A risks through patent-related factors. An empirical study based on M&A and restructuring events in China reveals that M&A premiums have a significant negative impact on M&A performance—the higher the premium, the lower the performance. However, patent factors can mitigate the negative impact of M&A premiums on the return on equity, offsetting the adverse effects of high premiums on M&A performance. This study highlights the value and role of patents in M&A risk management, enriching the research on M&A risk control. The findings help deepen the understanding of patent value, M&A premiums, and synergies, providing insights and references for the stable development of the M&A market.

1. Introduction

In the field of mergers and acquisitions (M&A), the phenomenon of "three-high M&A" characterized by high valuation, high goodwill, and high performance commitments often results in significant performance declines. After the M&A is completed, the failure to meet promised performance targets forces listed companies to make substantial goodwill impairment provisions. The frequent occurrence of M&A risk events severely dampens the enthusiasm of market participants, leading to doubts about the rationality of premium acquisitions. The performance collapse of "three-high M&A" cases compels stakeholders in the M&A market to pay closer attention to the relationship between M&A premiums and M&A performance. Higher premiums typically correspond to better asset conditions of the target company and a favorable synergy outlook, theoretically leading to higher performance levels. However, the inconsistency between this theoretical expectation and actual outcomes makes it necessary to conduct in-depth research on the relationship between M&A premiums and M&A performance.

The core issues this study seeks to explore are: What impact does a premium acquisition have on M&A performance? If high premium acquisitions are detrimental to M&A performance, can patents mitigate or weaken this negative impact? This research aims to find solutions to the risks associated with premium acquisitions from the perspective of patents and to uncover the value and role of patents in M&A risk management. The study uses M&A and restructuring events of listed companies in China from 2008 to 2019 as the research sample. Major asset restructuring reports were manually retrieved to collect data on the characteristics, financial performance, and patent information of target companies. The collected data were then systematically integrated with information from the CSMAR database, INNOJOY patent search engine, and the National Intellectual Property Administration website to construct the empirical database required for this research. This data is used to study the impact of patents on the relationship between M&A premiums and M&A performance. This study helps deepen the understanding of patent value, M&A premiums, and synergies, and benefits M&A participants in making informed decisions. It also aids regulatory bodies in identifying high-quality M&A deals and implementing differentiated supervision to prevent investment risks, ultimately promoting the stable and healthy development of the M&A market.

2. Research Hypotheses and Theoretical Analysis

2.1. The Impact of M&A Premium on M&A Performance

High-premium M&A or excessive goodwill is a key research topic in the field of mergers and acquisitions. Whether high premiums lead to high performance remains an unresolved issue in existing research. Overall, opinions are divided into two categories. One view suggests that high premiums often result in high performance. Slusky et al., through studying large M&A events in the United States, found that there is a significant positive correlation between M&A premiums and financial synergies[1]. Kim et al. argue that when companies pursue sustained growth in operational scale, they tend to pay higher M&A premiums[2]. In domestic research, Cheng Min found a significant positive correlation between M&A premiums and post-acquisition cash flow performance[3]. Zhu Hongjun et al. believe that the higher the M&A premium, the greater the synergies generated by the acquisition, leading to better company performance[4].

The opposite view, however, concludes that high premiums have a negative impact on corporate performance. The higher the M&A premium, the lower the company's post-acquisition innovation capability. Compared to the pre-acquisition innovation capability of both parties, there is no significant correlation between M&A premiums and the incremental innovation generated through synergy after the acquisition, indicating that M&A premiums do not support innovation through M&A[5]. For example, Zhang Xin et al. argue that excessive goodwill resulting from M&A has a significant negative impact on a company's innovation output and performance. Excessive goodwill increases the debt financing costs of acquiring firms, thereby negatively affecting corporate innovation[6]. Excessive goodwill arises from uncertain factors such as valuation errors, agency problems, and managerial overconfidence. Wei Zhihua et al. argue that excessive goodwill wastes funds that would otherwise be invested in operations, advertising, and innovation, hindering long-term corporate development. Excessive goodwill leads to a decline in a company's market share and competitive advantage, ultimately harming business performance[7]. The above studies primarily analyze the relationship between M&A premiums and M&A performance without reaching a unified conclusion.

This study argues that, in the context of China, under the waves of successive M&A booms and against the backdrop of an incomplete and underdeveloped regulatory mechanism in the capital market, Chinese listed companies generally tend to overvalue target companies in the M&A market, leading to higher premiums. The level of performance commitments directly affects the acquisition premium, as can be observed from the fulfillment rate of the performance commitments of target companies after the acquisition. Luo Zhenji selected major asset restructuring cases in the Shenzhen market from 2016 to 2018 as a research sample and found that during the performance commitment period from 2018 to 2020, the proportion of target assets failing to meet performance commitments increased year by year, at 28.75%, 30.41%, and 37.40%, respectively[8]. High-premium acquisitions result in companies bearing debt burdens beyond their capacity, compressing resources for future strategic development, hindering performance improvement after the acquisition, and even leading to financial or operational crises. Based on the above analysis, we propose the following hypothesis:

Hypothesis 1: Premium acquisitions have a significant negative impact on M&A performance, where higher premiums lead to lower post-acquisition performance.

2.2. The Patent Factor's Ability to Hedge the Negative Impact of M&A Premiums on M&A Performance

The essence of an M&A premium lies in valuation. It is an estimation based on the inherent value of the target company while considering the potential and extent of its contribution to the acquirer's future performance. At the time of acquisition, the expected M&A performance should exceed the cost; otherwise, the M&A itself would lack rationality. If future performance fails to materialize, the root cause lies either in a misjudgment of the target company's quality or in an incorrect assessment of its expected future contribution. Patent factors significantly influence the acquirer's ability to evaluate these two issues. This study will explore the relationship between M&A premiums and M&A performance from a patent perspective, addressing how M&A premiums affect M&A performance

and whether patents influence the relationship between M&A premiums and performance. If M&A premiums negatively impact performance, can patents hedge this negative effect? Understanding this issue is crucial for gaining deeper insights into patent value, premiums, and M&A synergies.

This study posits that patent-based premium acquisitions can mitigate the adverse effects of premium acquisitions on M&A performance and, to some extent, improve post-acquisition performance. Patent-based premium acquisitions are valuable because patents can regulate the relationship between M&A premiums and M&A performance, reconciling the conflict between theoretical expectations and actual outcomes, thereby achieving a harmonious relationship between M&A premiums and performance. The underlying logic is that patents can help acquirers more accurately identify high-quality target companies, even if a high M&A premium is paid during the transaction. Subsequently, improved performance provides technical support for the realization of M&A performance, making the achievement and enhancement of performance more solid. As performance improves, the initial transaction price can be partially compensated, supporting the premium level during the transaction and hedging the negative impact of premium acquisitions on performance. Paying appropriate attention to patent factors during the acquisition process allows for a more objective evaluation of the target company, reducing the risk of failed synergies due to inadequate asset quality and subsequent performance collapses. Through these mechanisms, patents weaken the negative impact of premium acquisitions on M&A performance, ultimately achieving a balance between premium acquisitions and performance. Based on the above analysis, we propose the following hypothesis:

Hypothesis 2: Patents can hedge the adverse effects of high-premium acquisitions on M&A performance and suppress the negative correlation between M&A premiums and performance.

3. Research Design

3.1. Sample Selection and Data Sources

This study selects M&A and restructuring events of Chinese listed companies from 2008 to 2019 as research samples. The reason for excluding samples from 2020, 2021, and 2022 is that the M&A samples from these three years have not yet fully completed three accounting cycles, making it temporarily impossible to conduct research related to M&A performance. Information regarding the number of patents, patent structure, and other relevant data of the target companies in this study is manually collected from major asset restructuring reports. Data on patent citations and maintenance periods are sourced from the INNOJOY patent search engine and the National Intellectual Property Administration's patent database. The patent data of the acquiring companies at the acquisition time point is obtained from the INNOJOY patent search engine and the CSMAR listed company patent database. Other patent characteristics data are manually collected from the National Intellectual Property Administration's patent database. The corporate characteristics, industry data, financial data, and other relevant information of the target companies involved in this study are manually collected from major asset restructuring reports. Missing evaluation values and other M&A transaction characteristic data in the list of major asset restructuring events are also manually supplemented from these reports. The corporate characteristics, industry data, and financial data of the acquiring companies are obtained from the CSMAR database.

3.2. Variable Selection and Definitions

The specific meanings of the relevant variables are shown in Table 1 below:

Table 1: Variable Definitions and Descriptions

Variable Type	Variable Name	Variable Abbreviation	Variable Definition
Dependent Variable	Return on Equity (ROE)	Δ ROE	The change in ROE of the acquirer post-M&A compared to the ROE before the M&A. Δ ROE ₁ , Δ ROE ₂ , and

			ΔROE_3 represent the change in ROE in the first, second, and third years post-M&A compared to the ROE one year before the M&A. ΔROE_4 represents the change in the average ROE over the three years post-M&A compared to the average ROE over the two years before the M&A.
Independent Variables	Patent Quantity	Patent.N	The total number of patents held by the target company before the M&A announcement plus one, then taking the natural logarithm, representing the quantity of patents held by the target company.
	Patent Quality	Patent.Q	Patent quality, specifically represented by Patent-Q ₁ and Patent-Q ₃ , indicating the ratio of invention and utility model patents cited once or more than three times to the total number of such patents, representing the quality of the patents.
	M&A Premium	Premium	First, calculate the M&A premium using the formula: Premium = (Total transaction price - net assets of the target company) / net assets of the target company, then take the natural logarithm.
Control Variables	Relative M&A Size	Dealsize	Ratio of the M&A value relative to the market value of the acquirer at the end of the year before the M&A.
	Acquirer Size	Size ^M	Natural logarithm of the total assets of the acquirer.
	Acquirer's Tobin's Q	TobinQ	Tobin's Q value of the acquirer at the end of the year before the M&A.
	Acquirer's Leverage	Leverage ^M	Leverage ratio of the acquirer at the end of the year before the M&A.
	Acquirer's ROE	ROE ^M	Return on equity of the acquirer at the end of the year before the M&A.
	Acquirer's Gross Margin	GROSS ^M	Gross margin of the acquirer at the end of the year before the M&A.
	Target Company Size	Size ^T	Natural logarithm of the total assets of the target company.
	Target Company's Leverage	Leverage ^T	Leverage ratio of the target company at the end of the year before the M&A.
	Target Company's ROE	ROE ^T	ROE of the target company in the year before the M&A.
	Ownership Concentration	Ratio	The total proportion of shares directly or indirectly held by the actual controller of the acquirer.
	Duality	Dual	Equal to 1 if the chairman also serves as the CEO, otherwise 0.
	Payment Method	Stockdeal	Equal to 1 if the transaction involves stock payment, otherwise 0.
Valuation Method	Type	Equal to 1 if the valuation method is the income approach, 2 for the asset-based approach, and 3 for the market approach.	

	Performance Commitment	Commitment	Equal to 1 if a performance commitment is made, otherwise 0.
	Equity Acquisition Ratio	Sharecon	The proportion of equity acquired in the target company.
	Year Dummy Variables	Year	Year control variables are set for 2008-2019.
	Acquirer Industry Dummy Variables	Industry ^M	Industry dummy variables classified according to the latest "Industry Classification Guidelines for Listed Companies" issued by the China Securities Regulatory Commission, with manufacturing using a two-digit code.
	Target Company Industry Dummy Variables	Industry ^T	Industry dummy variables of the target company classified according to the latest "Industry Classification Guidelines for Listed Companies" issued by the China Securities Regulatory Commission, with manufacturing using a two-digit code.

3.3. Construction of the Econometric Model

First, to test Hypothesis 1 regarding the impact of M&A premiums on M&A performance, this study constructs the following basic regression model:

$$\Delta ROE_i = \alpha_0 + \alpha_1 Premium_i + \alpha_i \sum Controls_i + Industry_i + year_i + \varepsilon_i \quad (1)$$

Next, to test Hypothesis 2 regarding the moderating effect of patent quantity and quality on the relationship between M&A premiums and M&A performance, the study introduces interaction terms between M&A premiums and patent quantity, as well as patent quality. The regression models are constructed as follows:

$$\Delta ROE_i = \alpha_0 + \alpha_1 Premium_i + \alpha_2 Patent_N * Premium_i + \alpha_3 Patent_N + \alpha_i \sum Controls_i + Industry_i + year_i + \varepsilon_i \quad (2)$$

$$\Delta ROE_i = \alpha_0 + \alpha_1 Premium_i + \alpha_2 Patent_Q * Premium_i + \alpha_3 Patent_Q + \alpha_i \sum Controls_i + Industry_i + year_i + \varepsilon_i \quad (3)$$

ΔROE represents the change in return on equity (ROE); Patent-N represents the number of patents owned by the target company at the time of the acquisition; Patent-Q indicates the quality of patents owned by the target company (measured as the ratio of the number of invention and utility model patents cited a specific number of times to the total number of such patents). Premium refers to the M&A premium at the time of acquisition; Patent-N*Premium and Patent-Q*Premium are the interaction terms between patent quantity, patent quality, and the M&A premium. If the regression results show that the coefficients of the interaction terms are positive, it indicates that patent factors positively moderate the relationship between M&A premiums and M&A performance. Controls represent control variables, and ε is the random error term; Industry represents the fixed effects of the acquirer's and target company's industries; Year represents the time fixed effects.

4. Research Results and Analysis

4.1. Descriptive Statistical Analysis

Table 2 presents the descriptive statistics of the main variables. The mean value of the M&A premium is 478.73%, and the median is 352.45%. Regarding M&A performance, the median changes in return on equity (ROE) in the first, second, and third years after the acquisition compared to the year before the acquisition are 0.85%, -0.40%, and -2.39%, respectively. ΔROE_4 represents the change in the average ROE over the three years after the acquisition compared to the average ROE in the two years before the acquisition, with a median change of -2.12%. This indicates a decline in

the acquirer's ROE after the acquisition. The mean number of total patents held by the target companies before the acquisition is 50, with a median of 22, a maximum of 738, and a minimum of 1. The mean being greater than the median suggests that the total number of patents held by target companies shows a right-skewed distribution.

Table 2: Descriptive Statistics of Main Variables

VarName	Obs	Mean	SD	Min	Median	Max
Premium	446	478.73%	5.15	1.32%	352.45%	2861.03%
ΔROE_1	446	-1.14%	0.24	-196.60%	0.85%	207.39%
ΔROE_2	446	-5.10%	0.30	-213.28%	-0.40%	176.11%
ΔROE_3	446	-12.17%	0.65	-364.74%	-2.39%	246.61%
ΔROE_4	446	-6.06%	0.29	-401.34%	-2.12%	186.50%
Patent.N	446	50	94	1	22	738
Patent.Q ₁	446	75.23%	0.18	0.00%	77.78%	100.00%
Patent.Q ₂	446	39.40%	0.25	0.00%	35.71%	100.00%
Sharecon	446	93.89%	0.15	21.77%	100.00%	100.00%
Ratio	446	38.90%	0.14	11.54%	37.50%	86.49%
Size ^M	446	12.055	0.844	10.130	11.937	15.031
Dealsize	446	33.28%	0.68	0.32%	15.33%	791.10%
RobinQ	446	4.27	9.34	0.44	3.12	19.29
Leverage ^M	446	35.61%	0.19	0.00%	32.45%	103.73%
GROSS ^M	446	30.94%	0.17	-1.63%	29.57%	94.99%
ROE ^M	446	6.43%	0.14	-151.67%	7.16%	79.58%
Size ^T	446	10.699	1.331	7.582	10.575	15.648
Leverage ^T	446	50.10%	0.21	2.62%	50.11%	143.02%
ROE ^T	446	25.95%	0.20	-81.58%	22.32%	118.63%

4.2. Regression Results Analysis

To examine the impact of M&A premiums on M&A performance, this study sets up a regression model between M&A premiums and M&A performance. Table 3 reports the dynamic impact of M&A premiums on the return on equity (ROE) over the three years following the acquisition. Specifically, ΔROE_1 , ΔROE_2 , and ΔROE_3 represent the changes in ROE in the first, second, and third years after the acquisition compared to the year before the acquisition. To capture the overall change before and after the acquisition, another variable, ΔROE_4 , is introduced, which represents the change in the average ROE over the three years post-acquisition compared to the average ROE in the two years pre-acquisition.

The regression results in Table 3 show that in the first, second, and third years following the acquisition, the regression coefficients of the M&A premium (Premium) on the change in ROE (ΔROE) are -0.0038, -0.0018, and -0.0025, respectively, all significantly negative at the 1% level. These results indicate that the M&A premium has a significant negative impact on the ROE in the specific periods of the first, second, and third years after the acquisition, significantly reducing the acquirer's ROE post-acquisition. The regression coefficient of the M&A premium (Premium) on the change in ROE (ΔROE_4) is -0.0030, also significantly negative at the 1% level. The regression results align with the trends observed in the individual years, suggesting that M&A premiums tend to decrease the acquirer's ROE post-acquisition.

These regression results confirm that M&A premiums have a significantly negative impact on M&A performance post-acquisition—the higher the M&A premium, the lower the M&A performance. High M&A premiums negatively impact corporate performance and can be detrimental to a company's overall performance[9]. Mergers and acquisitions can consume substantial capital, and high premiums imply that the acquiring company has assigned a high valuation and premium to the target company, paid a higher consideration, and thereby constrained other areas of investment. Additionally, the accompanying risk of goodwill impairment makes the company's future operations increasingly challenging[10]. Hypothesis 1 of this study is thus validated.

Table 3: The Impact of M&A Premium on M&A Performance

VARIABLES	1 ΔROE_1	2 ΔROE_2	3 ΔROE_3	4 ΔROE_4
Premium	-0.0038*** (-11.95)	-0.0018*** (-3.85)	-0.0025*** (-4.86)	-0.0030*** (-6.23)
Ratio	0.0454*** (5.21)	0.1051*** (8.08)	0.0067 (0.46)	0.0589*** (4.36)
Stockdeal	0.0045 (1.10)	-0.0031 (-0.52)	-0.0514*** (-7.65)	-0.0360*** (-5.74)
Type	-0.0094** (-2.32)	0.0340*** (5.67)	0.0393*** (5.86)	0.0068 (1.08)
Commitment	0.0419*** (11.58)	0.0271*** (5.03)	0.0177*** (2.95)	0.0296*** (5.27)
Dual	-0.0018 (-0.62)	0.0100** (2.35)	0.0171*** (3.60)	0.0114** (2.56)
Sharecon	-0.0246** (-2.59)	-0.0908*** (-6.40)	-0.1078*** (-6.82)	-0.1380*** (-9.35)
Size ^M	-0.0190*** (-8.08)	-0.0294*** (-9.08)	-0.0247*** (-6.31)	-0.0077** (-2.12)
Dealsize	0.0564*** (22.80)	0.0336*** (9.19)	0.0235*** (5.72)	0.0055 (1.44)
RobinQ	-0.0083*** (-14.21)	-0.0001 (-0.58)	-0.0209*** (-21.55)	-0.0044*** (-4.82)
Leverage ^M	-0.0210** (-2.59)	0.0347*** (2.87)	-0.2646*** (-19.60)	-0.1396*** (-11.08)
Size ^T	-0.0085*** (-5.58)	-0.0094*** (-4.12)	0.0070*** (2.76)	0.0007 (0.31)
Leverage ^T	-0.0082 (-1.13)	0.0239** (2.23)	-0.0423*** (-3.53)	0.0171 (1.53)
ROE ^T	0.0411*** (5.77)	0.0800*** (7.53)	0.0643*** (5.43)	0.0265** (2.40)
Constant	0.9592*** (9.99)	0.9373*** (13.45)	1.2998*** (16.31)	0.6821*** (9.17)
Observations	446	446	446	446
R-squared	0.855	0.867	0.844	0.891
Industry ^M	YES	YES	YES	YES
Industry ^T	YES	YES	YES	YES
year	YES	YES	YES	YES

Note: The symbols *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively.

The core issue addressed in this study is the impact of patents on the relationship between M&A premiums and M&A performance. As mentioned earlier, M&A premiums negatively affect M&A performance. This study aims to explore whether patent-related factors can hedge the negative impact of M&A premiums on M&A performance and mitigate the adverse effects of M&A premiums. The model includes an interaction term between patents and the M&A premium (Premium*Patent) to observe whether the moderating effect exists and thereby verify the role of patents. In Table 4, ΔROE has the same meaning as ΔROE_4 in the previous table, representing the change in the average return on equity over the three years post-acquisition compared to the average ROE in the two years pre-acquisition. The variable Patent-N represents the number of patents, while Patent-Q indicates patent quality, which is characterized by specific citation frequency indicators. Patent-Q₁ is the ratio of the number of invention and utility model patents with citation records to the total number of patents, while Patent-Q₂ is the ratio of the number of invention and utility model patents cited more than three times to the total number of patents.

Table 4: The Moderating Effect of Patent Quantity and Quality on the Relationship Between M&A Premiums and M&A Performance

VARIABLES	1 ΔROE	2 ΔROE	3 ΔROE
Premium	-0.0045*** (-3.53)	-	-
Premium* Patent.N	0.0081** (2.09)	-	-
Patent.N	0.0024 (0.85)	-	-
Premium	-	-0.0080*** (-3.84)	-
Premium* Patent.Q ₁	-	0.0085*** (3.60)	-
Patent.Q ₁	-	0.0143 (0.83)	-
Premium	-	-	-0.0047*** (-5.98)
Premium* Patent.Q ₂	-	-	0.0042*** (2.76)
Patent.Q ₂	-	-	-0.0278** (-2.48)
Ratio	0.1247*** (8.61)	0.0553*** (4.01)	0.0552*** (4.47)
Stockdeal	-0.0379*** (-5.67)	-0.0166** (-2.59)	-0.0365*** (-6.36)
Type	0.0028 (0.41)	-0.0142** (-2.23)	0.0024 (0.42)
Commitment	0.0389*** (6.46)	0.0397*** (6.94)	0.0303*** (5.92)
Dual	0.0164*** (3.42)	0.0166*** (3.65)	0.0149*** (3.67)
Sharecon	-0.0912*** (-5.76)	-0.0254* (-1.69)	-0.1418*** (-10.53)
Size ^M	-0.0244*** (-6.26)	-0.0391*** (-10.46)	-0.0023 (-0.69)
Dealsize	-0.0006 (-0.15)	0.0352*** (8.97)	0.0068* (1.95)
RobinQ	-0.0092*** (-9.49)	-0.0134*** (-14.33)	-0.0041*** (-4.99)
Leverage ^M	-0.0616*** (-4.56)	-0.1021*** (-7.93)	-0.1500*** (-13.00)
Size ^T	0.0016 (0.59)	-0.0080*** (-3.28)	-0.0013 (-0.59)
Leverage ^T	-0.0139 (-1.16)	-0.0034 (-0.30)	0.0308*** (3.01)
ROE ^T	0.0248** (2.10)	0.0220* (1.96)	0.0275*** (2.73)
Constant	0.7482*** (11.85)	1.4329*** (17.25)	0.6642*** (9.66)
Observations	446	446	446
R-squared	0.894	0.848	0.912
Industry ^M	YES	YES	YES
Industry ^T	YES	YES	YES
Year	YES	YES	YES

Note: The symbols *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively.

Table 4 reports the moderating effect of patent quantity and patent quality on the relationship between M&A premiums and M&A performance. Column 1 of Table 4 shows the moderating effect of patent quantity on the relationship between M&A premiums and M&A performance. The regression results indicate that for the relationship between the M&A premium (Premium) and the change in ROE (Δ ROE), the regression coefficient of the M&A premium (Premium) is -0.0045, and the M&A premium (Premium) has a significantly negative impact on ROE at the 1% level. The regression coefficient of the interaction term between patent quantity (Patent-N) and M&A premium (Premium) (Patent-N*Premium) is 0.0081, and the coefficient is significantly positive at the 5% level. The regression results suggest that patent quantity can moderate the negative relationship between M&A premiums and M&A performance, thereby mitigating the adverse effects of M&A premiums on M&A performance.

Column 2 of Table 4 shows the moderating effect of patent quality (Patent-Q₁) on the relationship between the M&A premium (Premium) and M&A performance (Δ ROE). The regression results indicate that the M&A premium (Premium) has a significantly negative impact on ROE at the 1% level (coefficient: -0.0080). The regression coefficient of the interaction term between patent quality (Patent-Q₁) and M&A premium (Premium) (Patent-Q₁*Premium) is 0.0085, and the coefficient is significantly positive at the 1% level. For patent quality (Patent-Q₃), the regression coefficient of the M&A premium (Premium) on ROE is significantly negative at the 1% level (coefficient: -0.0047). The regression coefficient of the interaction term between patent quality (Patent-Q₃) and M&A premium (Premium) (Patent-Q₃*Premium) is 0.0042, and the coefficient is significantly positive at the 1% level. The regression results indicate that patent quality (Patent-Q) can moderate the negative relationship between M&A premiums and ROE, significantly weakening or suppressing the adverse effects of M&A premiums on ROE. The regression results validate Hypothesis 2 of this study, which posits that patents can hedge the adverse effects of high-premium acquisitions on M&A performance and suppress the negative correlation between M&A premiums and performance. The validation of this hypothesis further confirms the value of patents in the context of M&A. Patents are valuable not only because they can enhance the premium of the target company, reflecting the value of patents in the transaction process, but also because they can support the acquirer's premium acquisition and mitigate the adverse impact of premium acquisitions on M&A performance.

4.3. Robustness Test

By replacing ROE, which represents M&A performance, with gross profit margin (GROSS) as the dependent variable, using patent structure (Patent-S) instead of citation counts to represent patent quality as the independent variable, and adjusting the model to include industry fixed effects of the target company, the robustness test confirms that the research conclusions remain consistent.

5. Conclusion and Implications

This study focuses on a core risk issue in the field of mergers and acquisitions: Does the M&A premium adversely affect post-acquisition performance? In such a scenario, can patents hedge the negative impact of the premium on performance? The performance "plunge" caused by "three-high M&A"—characterized by high valuation, high goodwill, and high performance commitments—has severely dampened the enthusiasm of M&A market participants, disrupted market order, and hindered the healthy and stable development of the M&A market. This study attempts to explore this issue from the perspective of patents. If patents can mitigate the negative impact of high-premium acquisitions on M&A performance, then paying attention to and leveraging patents during the M&A process could provide a new perspective and approach for managing M&A risks.

This research first examines the impact of M&A premiums on M&A performance. The findings indicate that M&A premiums have a significant negative impact on M&A performance—the higher the premium, the lower the performance. The core issue explored in this study is whether patent-based premium acquisitions can achieve better performance. Specifically, this is achieved by analyzing the moderating effect of patents on the relationship between M&A premiums and performance. Building on the analysis of the impact of M&A premiums on M&A performance, this

study further tests the moderating effect of patents on the relationship between M&A premiums and performance. The results show that M&A premiums have a significant negative impact on M&A performance and significantly affect the return on equity post-acquisition. After introducing patent variables, it is found that patents can hedge the negative impact of M&A premiums on return on equity, mitigating the adverse effects of high-premium acquisitions on M&A performance. Patents significantly weaken or suppress the negative correlation between M&A premiums and performance.

In the M&A process, to proactively address potential risk events, the signaling function of patents can be fully utilized during the screening of target companies to identify high-quality targets. Patents can hedge the negative impact of M&A premiums on performance, and selecting companies with high-quality patent characteristics can reduce the likelihood of future M&A risk events to some extent. During M&A integration, synergies at the technical and operational levels can partially offset the burden imposed by high-premium acquisitions and help drive high-quality development for the company. The ability of patents to mitigate the negative impact of M&A premiums on performance demonstrates their value and role in M&A risk management, enriching the research in this area. This study deepens the understanding of patent value, M&A premiums, and M&A synergies, providing insights and references for the stable development of the M&A market.

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