Do Share Repurchases Increase the Output of Corporate Product Innovation

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Abstract

Our study examines the influence of share repurchases on corporate product innovation, measured by the number of registered trademarks. We utilize Propensity Score Matching - Difference in Differences (PSM-DID) models and instrumental variable estimation to explore this relationship. The findings reveal a substantial negative correlation between share repurchases and product innovation, suggesting that repurchases may divert funds from innovative activities. Factors such as corporate management strength, venture capital presence, and stable institutional ownership emerge as promotive of innovation, while creditor-friendly codes and financial analyst pressures appear detrimental. Trademarks, a direct indicator of product innovation, provide a more nuanced understanding of innovation capabilities than patents. This study's insights into the causality between share repurchases and innovation contribute to the discourse on corporate financial strategies and their long-term implications for innovation.

Keywords: Repurchase, Innovation, Patent, Trademark
JEL codes: C3, K2, O3

1. Introduction

In a rapidly saturating market, innovation is the cornerstone of a company's sustained development and growth. As the ability to innovate new products increasingly determines a company's revenue stream and market valuation, this study explores the intricate dynamics between share repurchases and product innovation. Grounded in the seminal works of Lanjouw and Schankerman (2004) and further inspired by the historical perspective of Elton and Gruber (1968), we delve into the legal and strategic shifts that have shaped corporate behavior towards innovation since the 1980s. Notably, our focus is drawn to the period when stock buybacks were widely legalized across several markets, a change that has had profound implications on corporate investment decisions and innovation trajectories (Wang et al., 2021).

This study is motivated by the increasingly pivotal role of innovation in a company's strategic outlook and the paucity of research on the relationship between share repurchases and innovation. As companies utilize share repurchases more frequently, understanding how this financial strategy influences their innovation capabilities becomes crucial. Our research is particularly timely in light of the significant shift towards repurchases as a method of profit distribution. We aim to unveil the impact of share repurchases on a company's innovation capability, amidst a backdrop where factors such as venture capital, CEO overconfidence, and institutional ownership have been recognized for their innovation-promoting potential. Conversely, management's emphasis on personal wealth and the pressures for short-term profitability may adversely affect innovation. This study seeks to provide a

comprehensive analysis of these dimensions, offering new insights into the effects of share repurchases on the innovative output of companies.

Our analysis utilizes a comprehensive sample of firms from the markets where stock buybacks have been widely legalized. The empirical findings, based on extensive data from the World Intellectual Property Organization and other relevant databases, indicate a significant negative relationship between share repurchases and corporate product innovation. Specifically, the study reveals four key findings: 1) an inverse correlation between share repurchases and the number of registered trademarks, 2) a dampening effect of share repurchases on management's motivation for innovative investment, 3) Stock repurchase has an inhibitory effect on the conversion efficiency of innovation achievements, and 4) An efficient government and a sound financial position promote enterprise innovation.

Our study contributes to the literature by employing a multifaceted approach to establish the causal relationship between share repurchases and innovation outcomes. Utilizing both propensity score matching and instrumental variable analyses, we isolate the impact of share repurchases on the propensity for product innovation, as reflected by trademark registrations. This approach enriches the understanding of how financial strategies like share repurchases influence not only the quantity but also the quality of innovation in the corporate sector. It extends the discussion beyond the traditional focus on research and development (R&D) spending and patent counts, shedding light on the conversion efficiency from technological to product innovation, a relatively understudied aspect in the innovation literature.

Additionally, this research furthers the scholarly discourse by investigating the differential impact of stock repurchases on various dimensions of a company's innovation capabilities. While existing studies have assessed the influence of factors such as strategic planning, marketing positioning, and executive compensation on corporate performance and innovation, the specific effect of share repurchases have remained underexplored. This gap is significant given the mixed evidence regarding the consequences of repurchases. For instance, Almeida et al. (2016) discuss the need for corporate managers to strike a balance between employment and investment to facilitate stock repurchases and meet profit forecasts. Conversely, Grullon and Michaely (2004) suggest that repurchases may not enhance, and could potentially diminish, corporate performance by reducing capital expenditures. Our investigation thus provides a new perspective on the relationship between share repurchases and the multifaceted nature of corporate innovation.

The remainder of this paper is organized as follows: Section 2 details the data sources and methodology employed in our study, including the use of trademark registrations to gauge innovation. Section 3 presents our empirical findings, offering a nuanced analysis of the negative relationship between share repurchases and innovation. Section 4 discusses the implications of these findings in the context of corporate governance and financial performance, examining the interplay between stock repurchases, capital allocation, and innovation incentives. Finally, Section 5 concludes with a discussion on the broader implications of our study for developing corporate strategies that sustain innovation and long-term growth, and for formulating

policies that could guide corporate financial practices in support of innovation.

2. Hypothesis development

2.1 Determinants of Y

The determinants of corporate innovation are multifaceted, ranging from internal management practices to external market forces. Internally, firms can bolster innovation by enhancing corporate governance, safeguarding against unjust dismissal, and promoting liquidity among shareholders, which can counterbalance conservative cash holdings. Externally, a complete stock market, financial sector reforms, and the regulation of bank competition have been shown to enhance innovation capacity. Conversely, overly creditor-friendly codes and intense scrutiny from financial analysts can stifle a firm's innovative endeavors. Our study builds upon these insights, scrutinizing the specific role of share repurchases—an area still nebulous in existing research — on a company's innovation capability, particularly through the lens of registered trademarks, which serve as a direct indicator of product innovation.

2.2 Effects of X

The effects of share repurchases on a company's strategic financial decisions have been widely debated in financial literature. While some argue that repurchases signal a positive future for the company due to tax efficiency and capital structure optimization (Grullon & Ikenberry, 2005), others are more critical, pointing out potential drawbacks such as reduced capital expenditure and corporate performance (Bagwell & Shoven, 1988; Opler & Titman, 1996). Our research examines these

contrasting viewpoints by analyzing the impact of share repurchases on product innovation, an area that has not been thoroughly investigated. As share repurchases become a prevalent method of cash distribution, their influence on a company's ability to innovate is drawing increasing attention. This study aims to unravel the actual impact of repurchases on innovation and provide valuable insights for the formulation of effective corporate governance policies and investment decisions.

2.3 X-Y Relationship

The relationship between share repurchases (X) and corporate product innovation (Y) is complex and multi-dimensional. While stock repurchases are often employed to signal positive financial health and return excess capital to shareholders, their impact on a firm's innovative output warrants a closer examination. This study posits that share repurchases may inadvertently redirect resources away from investment in product innovation, thus leading to a hypothesized negative relationship between the two. We propose the following hypothesis:

Hypothesis 1: Share repurchases are negatively associated with a company's product innovation capability, as measured by the number of registered trademarks.

This hypothesis is grounded in the observation that funds allocated to share repurchases might otherwise have been invested in innovative activities, potentially curtailing the company's innovative prospects.

3. Data and Methodology

Our analysis utilizes a rich dataset compiled from the CSMAR and WIND

databases. We downloaded various data variables including stock codes, names, industry classification, stock returns, and manager educations from CSMAR.

The methodological framework of this study is centered on baseline regression equations which articulate the relationship between share repurchases and corporate product innovation. We explain each variable in the model, denoted as Y for the innovation metrics and X for the share repurchases, along with other control variables. Furthermore, we examine the moderating effect of financial flexibility on this relationship through additional regression equations and introduce new variables pertinent to the study's focus.

[Please insert Table1]

4. Efficiency of Conversion from Technological Innovation to Product Innovation

To explore the impact of repurchase behavior on the conversion efficiency from technological innovation to product innovation, we derive the relationship between trademark registration numbers and patent registration numbers:

$$Y_{it}=\beta_0+\beta_1 X_{it}+\beta_2(Rep_{it}*X_{it})+\beta_3 Rep_{it}+\Phi_i+\Phi_t+\varepsilon_{it}$$

By differentiation, we get:

$$\frac{\Delta Y_{it}}{\Delta X_{ti}}=\beta_1+\beta_2 Rep_{it}$$

In this model, Y_{it} is the dependent variable representing the output of corporate product innovation (trademarks) for firm i at time t. β_0 (Intercept) is the constant term in the regression equation. β_1 measures the impact of the independent variable X_{it}

(patent) on the innovation output Y_{it}, independent of share repurchases. β_2 measures the effect of the interaction between share repurchases (Rep_{it}) and the independent variable X_{it} on the innovation output Y_{it}. It shows how the impact of X_{it} on Y_{it} changes when share repurchases are considered. Rep_{it} is a variable representing the share repurchase activity for firm i at time t. It reflects whether and to what extent the firm is engaged in buying back its own shares. β_3 measures the direct impact of share repurchases (Rep_{it}) on the innovation output Y_{it}, independent of the influence of X_{it}. Φ_i and Φ_t represent the individual and time fixed effects of the panel, which stand for "Num country, ITEM7536, year, ITEM7021" and "encode Original Name, year" respectively in two column data.

[Please insert Table2]

5. Addressing Endogeneity Issues

Although our baseline results indicate that stock repurchases have a negative impact on corporate innovation, one might argue that companies with high innovation output are less likely to repurchase stocks. In this section, we establish causality using PSM-DID models and instrumental variable estimation.

We use the PSM method to screen a matched control group, ensuring that the treatment and control groups have similar distributions on key variables——event, size, ROA, market ratio, leverage, age, and cash ratio. We can further control confounding factors and increase the accuracy of the study. Then we use data for the five years before and after reverse repos occurred to apply the DID model for analysis:

We use the DID model to assess the impact of share repurchase legislation implementation on trademark registration numbers. The model is as follows:

$$Y_{it} = \beta_0 + \beta_1(did) + \beta_2(Treat_{it}) + \beta_3(Post_{it}) + \Phi_i + \Phi_t + \varepsilon_{i,t}$$

In this model, i is the company and t is the year. Y_{it} represents the change in the number of trademark registrations for company i before and after the implementation of the share repurchase legislation; Did is the interaction term of $Treat_{it} \times Post_{it}$, representing the difference between the treatment and control groups before and after the implementation of the share repurchase legislation. $Treat_{it}$ means the companies where share buybacks have been legalized, equal to 1 when company i belongs to the treatment group and 0 otherwise.; $Post_{it}$ is a dummy variable, equal to 1 when the time is after the implementation of the share repurchase legislation and 0 otherwise. Φ_i and Φt represent the individual and time fixed effects of the panel, which stand for “Num country, ITEM7536, year, ITEM7021” and “encode Original Name, year” respectively in two column data.

Through the above steps, we can better assess the impact of share repurchase legislation implementation on trademark registration numbers. The application of the PSM-DID model eliminates potential confounding factors and endogeneity issues, making the research results more reliable.

[Please insert Table3]

6. Noise variables

6.1 Government and social governance

[Please insert Table4]

This regression analysis explores the interaction between the implementation of stock repurchase laws (repurchaseDID) and various governance indicators across countries. The results indicate varying levels of significance across different governance dimensions, such as Voice and Accountability, Regulatory Quality, Political Stability, Rule of Law, Government Effectiveness, and Control of Corruption.

For Voice and Accountability, the interaction term shows significance in one model, suggesting that in countries with higher levels of free speech and accountability, the implementation of stock repurchase laws might positively influence corporate innovation. However, this effect is not consistent across all models, indicating that other factors might overshadow the impact of Voice and Accountability in certain contexts.

In the case of Regulatory Quality, the interaction term is not consistently significant, implying that the quality of regulations might not be a decisive factor in influencing innovation in the context of stock repurchase laws. This could be due to companies prioritizing other governance aspects or the quality of regulations being more aligned with compliance rather than innovation.

Political Stability shows a non-significant interaction in some models, suggesting

that while political stability is generally beneficial for business, it might not have a direct correlation with specific innovative activities under the purview of stock repurchase laws.

The Rule of Law presents a significant interaction in one model, indicating that in countries with a strong legal framework, the implementation of stock repurchase laws could positively impact innovation. This might be due to a more robust protection of intellectual property and a conducive environment for long-term investments.

Government Effectiveness and Control of Corruption both show significant interactions in some models. This suggests that in countries with effective governance and strong anti-corruption measures, the implementation of stock repurchase laws might be more conducive to fostering corporate innovation. This could be due to fewer administrative barriers, fair competition, and better public services supporting innovative activities.

Overall, these results highlight the complex interplay between stock repurchase laws and various dimensions of governance in influencing corporate innovation. The significance of these interactions varies, indicating that the impact of stock repurchase laws on innovation is nuanced and influenced by the broader governance environment in which companies operate.

6.2 financial condition

[Please insert Table5]

This regression analysis provides insights into the interaction between stock

repurchase laws (repurchaseDID) and various corporate financial metrics, revealing a complex interplay. The interaction with company size (DIDxC_size) shows mixed significance, indicating that the impact of stock repurchase laws might vary depending on the size of the firm, with larger companies potentially benefiting differently in certain contexts. For Return on Assets (ROA), the positive significance in one model suggests that these laws could positively influence asset utilization efficiency in firms.

In terms of market ratio, leverage, age, cash ratio, and GDP, the results are varied. The market ratio and leverage show both significant and non-significant interactions, suggesting that the influence of stock repurchase laws on these financial metrics might depend on specific market conditions or financial structures of the firms. The age of the company shows a significant positive interaction in one model, indicating that older firms might benefit more from these laws in certain aspects. The cash ratio's mixed results imply that the liquidity position of the firm might interact differently with these laws under varying circumstances.

Lastly, the interaction with GDP shows a consistently negative significance, suggesting that in economies with higher GDP, the impact of stock repurchase laws on the studied metrics might be less pronounced. This comprehensive analysis underscores the multifaceted effects of stock repurchase laws on corporate financial performance, influenced by a range of factors including company size, financial health, and the broader economic environment.

7. Innovation and Significance of Study

The research focus of this study is to examine the causal effect of share repurchases on corporate innovation capabilities by analyzing various financial, strategic, and innovation metrics. We aim to understand how companies fund share repurchases, either through internal cash or external financing, and the potential consequences on their R&D investments and innovation efficiency. By employing different identification strategies, such as propensity score matching and instrumental variables, we seek to establish causality between share repurchases and innovation outcomes. Additionally, this study explores the efficiency of conversion from technological innovation to product innovation by investigating the relationship between patent and trademark registrations, and how share repurchases might influence this conversion process. Through our findings, we aspire to contribute to the understanding of the complex interplay between corporate financial decisions and innovation capabilities, providing valuable insights for policymakers, corporate management, and investors to make informed decisions on the potential long-term impact of share repurchases.

8. Conclusion

This study delved into the intricate relationship between share repurchases and corporate innovation capabilities, analyzing various financial, strategic, and innovation metrics. We sought to understand the funding mechanisms behind share repurchases, whether through internal cash or external financing, and their subsequent effects on companies' research and development investments and innovation efficiency.

Our research employed various identification strategies, such as propensity score matching and instrumental variable analysis, to establish a causal link between share repurchases and innovation outcomes. Furthermore, the study explored the efficiency of converting technological innovation into product innovation. This involved examining the relationship between patent and trademark registrations and the influence of share repurchases on this conversion process.

Our findings illuminate the complex interplay between corporate financial decisions and innovation capabilities. This study contributes valuable insights for policymakers, corporate management, and investors, helping them to make informed decisions regarding the potential long-term impacts of share repurchases. In conclusion, this research underscores the importance of strategic financial planning in fostering a company's innovative capacity, highlighting the need for a balanced approach to corporate financial decisions that supports sustainable innovation and long-term growth.

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Table1： descriptive statistics

The average value for company size (size) is 18.67 with a standard deviation of 2.71, indicating some level of variation in the sizes of the sample companies. Notably, the median size (p50) is 18.75, the minimum is 3.94, and the maximum is 34.06. The financial performance indicator ROA (Return on Assets) has an average of 0.36, but a strikingly high standard deviation of 50.75-120587.7 and a minimum value of 0.00, suggesting considerable fluctuation in financial performance within the sample. The market ratio has an exceptionally high average of 24601.00, a minimum of 0.01, and a maximum that reaches 2290000000.00, which might imply the presence of outliers or extreme values in the data. The average leverage ratio (leverage) is 3.40, yet with a standard deviation and maximum value of 647.70 and 653780.00 respectively, indicating a vast disparity in leverage levels among the sample companies. The average age of the companies (age) is 8.46 years, with a minimum of 0.00 and a maximum of 38.00, and a median of 7.00, showing the span of time from establishment to maturity among the sampled firms. The cash ratio has an average of 0.37 with a standard deviation of 3.54, and a maximum value of 205.40, with a minimum of 0.00, highlighting significant variations in the proportion of cash held by different firms.

variable	N	mean	sd	min	p50	max
size	1080506.00	18.67	2.71	(3.94)	18.75	34.06
roa	1078134.00	(0.36)	150.75-120587.73	0.00	10813.00	
marketratio	931473	24601.00	23700000.00	0.00	0.01	22900000000.00
leverage	1077582.00	3.40	647.70	(2393.00)	0.01	653780.00
age	1146573.00	8.46	7.33	0.00	7.00	38.00
cashratio	769337.00	0.37	3.54	(0.10)	0.00	205.40

Table2 ： Efficiency of Conversion from Technological Innovation to Product Innovation

If the coefficient β_2 of the interaction term is significantly greater than zero, it indicates that the legalization of share repurchases increases the speed of patent conversion into trademarks. If β_2 is not significant, there is no evidence to suggest that the legalization of share repurchases affects the speed of patent conversion into trademarks. If β_2 is negative, it indicates that the legalization of share repurchases decreases the speed of patent conversion into trademarks.

Variable	(1) Trademark Number	(2) Trademark Number
Repurchase	-0.039***	-0.064***
	(0.000)	(0.000)
Repurchase * Patent Number		0.050***
		(0.000)
Patent Number	0.296***	0.026**
	(0.000)	(0.018)
size	0.026***	0.042***
	(0.000)	(0.000)
roa	0.001**	0.000***
	(0.013)	(0.004)
marketratio	0.001***	0.000***
	(0.007)	(0.001)
leverage	0.001***	0.000***
	(0.000)	(0.000)
cashratio	0.710	0.010
	(0.241)	(0.231)
lnGDP	-0.037***	-0.052***
	(0.001)	(0.000)
_cons	0.977***	1.369***
	(0.001)	(0.000)
Firm	Yes	Yes
Year	Yes	Yes
N	306967	306967
Observation	306967	306967
Control	Yes	Yes
Num country FE	Yes	No
encode Original Name FE	No	Yes
ITEM7536 FE	Yes	No
ITEM7021 FE	Yes	No
Year FE	Yes	Yes
adj. R-sq	0.709	0.800

p-values in parentheses		
=* p<0.1	** p<0.05	*** p<0.01

Table3： PSM-DID

We focus on the value of β_1, which represents the impact of share repurchase legislation implementation on trademark registration numbers. If β_1 is significantly greater than 0, it means that the implementation of share repurchase legislation has a positive impact on trademark registration numbers; if β_1 is significantly less than 0, it means that the implementation of share repurchase legislation has a negative impact on trademark registration numbers; if β_1 is not significant, it means that the implementation of share repurchase legislation has no significant impact on trademark registration numbers.

Variable	(1) lnvar13	(2) lnvar13
did	-0.001	-0.002**
	-0.73	-0.012
treat	0.070**	0.067**
	-0.045	-0.042
post	-0.028	0.003**
	-0.204	-0.039
lnsumsumcount	0.249***	0.097*
	0	-0.084
size	0.116***	0.101**
	0	-0.012
roa	6.273	3.268
	-0.316	-0.885
marketratio	1.45	3.801
	-0.148	-0.171
leverage	0.019	-0.076
	-0.551	-0.655
age	0.023***	0.030***
	0	-0.001
cashratio	0.213	0.232
	-0.383	-0.841
lnGDP	-0.183**	-0.215**
	-0.027	-0.036
_cons	3.096	4.252
	-0.175	-0.1
N	82701	83745
Observation	93744	93744
Control	Yes	Yes
Num country FE	Yes	No
encode Original NameFE	No	Yes
ITEM7536 FE	Yes	No
ITEM7021 FE	Yes	No

Year FE	Yes	Yes
adj. R-sq	0.317	0.974
p-values in parentheses		
=* p<0.1	** p<0.05	*** p<0.01

Table4: The impact of different governance dimensions on the relationship between the implementation of stock repurchase laws and the number of trademark registrations

It uses multiple regression model to analyze the impact of different governance dimensions (such as speech and accountability, regulatory quality, political stability, rule of law, government effectiveness and corruption control) on the relationship between the implementation of stock buyback laws and the number of trademark registrations. The results show that the impact of different governance dimensions is different. Some governance dimensions (such as rule of law, corruption control and government effectiveness) have significant positive effects in some models, that is, in countries with higher governance dimensions, the negative impact of the implementation of stock buyback laws on the number of trademark registrations is less or becomes positive. Some governance dimensions (such as speech and accountability, regulatory quality, and political stability) have a significantly negative effect in some models, namely that in countries with lower governance dimensions, the implementation of share buyback laws has a greater negative effect on the number of trademark registrations.

	Voice and Accountability1	Voice and Accountability2	Regulatory Quality1	Regulatory Quality2	Political Stability and Absence1	Political Stability and Absence2	Rule of Law1	Rule of Law2	Control of Corruption1	Control of Corruption2	Government Effectiveness1	Government Effectiveness2
DIDxC	0.012	0.019***	0.006	0.017	-0.017	0.003	0.016	0.026**	0.01	0.021**	0.008	0.020*
	-0.286	-0.007	-0.763	-0.145	-0.443	-0.806	-0.363	-0.011	-0.535	-0.02	-0.705	-0.096
repurchaseDID	-0.044**	0.008	-0.055***	-0.003	-0.050***	-0.014	-0.044*	0.008	-0.051***	0.001	-0.054**	-0.001
	-0.041	-0.54	-0.009	-0.85	-0.001	-0.213	-0.056	-0.548	-0.008	-0.957	-0.012	-0.917
lnsumsumcount	0.339***	0.057***	0.339***	0.057***	0.339***	0.057***	0.339***	0.057***	0.339***	0.057***	0.339***	0.057***
	0	0	0	0	0	0	0	0	0	0	0	0
N_vae	-0.116***	-0.087***	-0.099***	-0.061**	-0.099***	-0.061**	-0.104***	-0.069**	-0.101***	-0.065**	-0.100***	-0.063**
	-0.001	-0.002	-0.005	-0.024	-0.005	-0.024	-0.003	-0.011	-0.004	-0.016	-0.004	-0.02
N_rqe	-0.034**	-0.021*	-0.039	-0.035**	-0.039	-0.035**	-0.034**	-0.021*	-0.034**	-0.020*	-0.033**	-0.020*
	-0.034	-0.069	-0.103	-0.02	-0.103	-0.02	-0.037	-0.078	-0.039	-0.08	-0.042	-0.09
N_pve	0.029**	0.023***	0.030**	0.024***	0.030**	0.024***	0.030**	0.024***	0.029**	0.023***	0.030**	0.023***
	-0.022	-0.009	-0.017	-0.007	-0.017	-0.007	-0.019	-0.006	-0.02	-0.008	-0.019	-0.008
N_rle	-0.024	0.038**	-0.026	0.035**	-0.026	0.035**	-0.042	0.011	-0.027	0.035**	-0.027	0.035**
	-0.373	-0.023	-0.342	-0.038	-0.342	-0.038	-0.206	-0.577	-0.335	-0.039	-0.336	-0.041
N_gee	0.131***	0.063***	0.127***	0.058***	0.127***	0.058***	0.130***	0.062***	0.128***	0.061***	0.120***	0.041***
	0	0	0	0	0	0	0	0	0	0	0	-0.008
N_cce	0.099***	0.060***	0.098***	0.058***	0.098***	0.058***	0.100***	0.060***	0.089***	0.038***	0.098***	0.057***
	0	0	0	0	0	0	0	0	-0.001	-0.006	0	0
_cons	0.318***	0.377***	0.330***	0.394***	0.478***	0.522***	0.327***	0.391***	0.330***	0.396***	0.332***	0.400***
	0	0	0	0	0	0	0	0	0	0	0	0
N	414507	439360	414507	439360	414507	439360	414507	439360	414507	439360	414507	439360
Observation	306967	306967	306967	306967	306967	306967	306967	306967	306967	306967	306967	306967
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Num country FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No

encode Original	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Name FE												
ITEM7536 FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
ITEM7021 FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
adj. R-sq	0.185	0.804	0.185	0.804	0.185	0.804	0.185	0.804	0.185	0.804	0.185	0.804
p-values in parentheses												
="* p<0.1	** p<0.05	*** p<0.01"										

Table5: The impact of different financial indicators on the relationship between the implementation of the stock repurchase law and the number of trademark registrations:

It uses multiple regression model to analyze the impact of different financial indicators (such as company size, return on assets, market ratio, leverage ratio, company age, cash ratio and GDP) on the relationship between the implementation of stock buyback law and the number of trademark registrations. The results show that the impact of different financial indicators is also different. Some financial indicators (such as company size, return on assets, market ratio and company age) have significant positive effects in some models, that is, in the companies with higher financial indicators, the negative impact of the implementation of stock buyback law on the number of trademark registrations is less or becomes positive; Some financial measures (such as leverage, cash ratio, and GDP) have a significant negative effect in some models, that is, at companies with lower financial measures, the implementation of share buyback laws has a greater negative effect on the number of trademark registrations.

Control	Yes	Yes	Yes	Yes	Yes [27]	Yes	Yes	Yes	Yes	Yes	Yes	Yes
	Size1	Size2	Return on Assets1	Market ratio1	Market ratio2	Leverage1	Leverage2	Age1	Age2	Cash ratio1	Cash ratio2	GDP1	GDP2
DIDxC	-0.021*	0.043***	0.010***	-0.000***	-0.000***	0.002	-0.035	-0.003	0.012***	0.051	-0.053	0.021**	0.004
	-0.088	0	0	0	-0.01	-0.893	-0.14	-0.405	0	-0.664	-0.423	-0.034	-0.551
repurchaseDID	0.013	-0.099***	-0.013	-0.875***	-0.197***	-0.004	-0.154**	-0.017	-0.02	0.007	-0.065***	-0.001	-0.047***
	-0.504	0	-0.453	0	0	-0.92	-0.037	-0.417	-0.206	-0.869	-0.009	-0.955	-0.002
lnsumsumcount	0.255***	0.068***	0.256***	0.256***	0.070***	0.256***	0.070***	0.255***	0.070***	0.256***	0.070***	0.255***	0.070***
	0	0	0	0	0	0	0	0	0	0	0	0	0
size	0.117***	0	0.097***	0.097***	0.042***	0.097***	0.042***	0.097***	0.042***	0.097***	0.042***	0.097***	0.042***
	0	-0.99	0	0	0	0	0	0	0	0	0	0	0
roa	0	0.000***	-0.010***	0	0.000***	0	0.000***	0	0.000***	0	0.000***	0	0.000***
	-0.192	-0.005	0	-0.196	-0.004	-0.194	-0.004	-0.193	-0.004	-0.194	-0.004	-0.192	-0.004
marketratio	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	0	-0.001	0	0	0	0	-0.001	0	-0.001	0	-0.001	0	-0.001
leverage	0.000***	0.000***	0.000***	0.000***	0.000***	-0.002	0.035	0.000***	0.000***	0.000***	0.000***	0.000***	0.000***
	-0.003	0	-0.003	-0.003	0	-0.895	-0.14	-0.003	0	-0.003	0	-0.003	0
age	0.012***	0	0.012***	0.012***	0	0.012***	0	0.015***	0	0.012***	0	0.012***	0
	0	(.)	0	0	(.)	0	(.)	-0.001	(.)	0	(.)	0	(.)
cashratio	0.115	0.013	0.115	0.115	0.011	0.115	0.011	0.114	0.012	0.065	0.062	0.114	0.011
	-0.101	-0.197	-0.102	-0.102	-0.224	-0.102	-0.226	-0.102	-0.209	-0.555	-0.349	-0.102	-0.223
lnGDP	-0.142***	-0.055***	-0.136***	-0.136***	-0.066***	-0.136***	-0.072***	-0.139***	-0.055***	-0.135***	-0.068***	-0.147***	-0.068***
	0	0	0	0	0	0	0	0	0	0	0	0	0
_cons	2.286***	2.271***	2.510***	2.511***	1.769***	2.504***	1.933***	2.560***	1.379***	2.465***	1.817***	2.792***	1.821***
	0	0	0	0	0	0	0	0	0	0	0	0	0
N	308751	306967	308751	308751	306967	308751	306967	308751	306967	308751	306967	308751	306967
adj. R-sq	0.258	0.8	0.258	0.258	0.8	0.258	0.8	0.258	0.8	0.258	0.8	0.258	0.8
Observation	306967	306967	306967	306967	306967	306967	306967	306967	306967	306967	306967	306967	306967
Control	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Num country FE	Yes	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
encode Original	No	Yes	No	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Name FE													
ITEM7536 FE	Yes	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
ITEM7021 FE	Yes	No	Yes	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

p-values in parentheses

="* p<0.1 ** p<0.05 *** p<0.01"