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The Impact of Managerial Shareholding and Financial Constraints on Investment Decisions

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Abstract: *Agency conflicts arising from asymmetric information between insiders and outsiders affect company investment decisions in imperfect capital markets. This study examines the influence of managerial shareholding and financial constraints on investment choices. Utilizing panel data from 60 nonfinancial firms listed on the Pakistan Stock Exchange from 2011 to 2020, we employ the system GMM technique. Our findings indicate that both managerial shareholding and financial constraints significantly impact corporate investment decisions. Increased managerial ownership aligns incentives favorably, helping to mitigate agency problems and enhance the quality of investment projects. The reliance on internally generated funds for investments points to a high investment-to-cash-flow sensitivity, which reflects financial constraints. This study further investigates the factors influencing investment decisions in the manufacturing and energy/power sectors. Our results show that firms in the energy/power sectors are not financially constrained in their investments, while manufacturing firms exhibit a strong dependence on cash flows, indicating higher investment cash flow sensitivities.*

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1. Introduction

One of the primary objectives of firms is to utilize the most cost-effective sources of finance for investment purposes. According to the pecking order theory, companies initially rely on internal resources before resorting to more expensive external financing. In perfectly competitive markets, internal and external finances are considered substitutes, with firms incurring no additional costs when obtaining external funds. However, the reality is quite different (Vijayakumaran, 2021).

Jensen and Meckling (1976) argue that agency conflicts significantly influence corporate investment decisions. The agency problem arises from the conflict of interest between shareholders, who aim to maximize their wealth by investing in value-enhancing projects, and managers, who seek to enhance their own power and status by leading a well-regarded organization. Managers, possessing direct access to a firm's confidential data, hold an advantage over shareholders, who are typically dispersed and less capable of closely monitoring managerial actions

A diffused board of directors also makes it challenging for shareholders to oversee managers effectively. As a result, self-interested managers may be incentivized to utilize corporate resources to benefit their own interests rather than those of the shareholders. In such scenarios, the firms' investment decisions are unlikely to yield optimal returns, as managers may over-invest in low-return projects or under-invest in high-return projects to fulfill their personal objectives (Checkley et al., 2014). However, by providing managers with equity ownership, firms can alleviate some of the issues stemming from agency conflicts. When the interests of managers and shareholders align, corporate investment decisions tend to be more efficient.

In addition to agency conflicts, market frictions such as information asymmetry can impede a firm's ability to invest in high-return projects. The information gap between insiders (managers) and outsiders (external shareholders) elevates the cost of raising capital through external financing. When the disparity in information between managers and investors is significant, the potential for moral hazard increases. Investors will typically demand a premium to protect their interests, which covers the risks

associated with managerial moral hazard and adverse selection, thereby raising the cost of external capital. Firms facing information asymmetry often struggle to attract external financing, leading them to rely more heavily on internally generated funds. Consequently, their investments become increasingly sensitive to the availability of internal resources, and financial constraints may compel them to invest only in the most profitable projects (Campello et al., 2010; Driver & Muñoz-Bugarin, 2019).

This study investigates the influence of managerial shareholding and financial constraints on corporate investment decisions in Pakistan. Specifically, it focuses on the extent of managerial shareholding in nonfinancial firms listed on the Pakistan Stock Exchange (PSX) and explores its impact on these firms' investment choices. Additionally, we analyze the financial constraints that firms encounter in Pakistan and assess whether these constraints affect their investment activities. Given the significant information asymmetry and agency conflicts prevalent in Pakistani firms, it is crucial to understand the roles of managerial shareholding and financial constraints in shaping investment behaviors.

This study is pioneering in its approach, as most existing research in Pakistan primarily examines the effect of managerial ownership on financial performance. In contrast, we integrate both the direct and indirect impacts of managerial shareholding and financial constraints to evaluate their combined effect on investments in fixed capital among PSX listed firms. The findings of this study offer valuable insights for policymakers in developing reforms aimed at enhancing managerial shareholding, addressing agency problems, and improving firms' investment portfolios.

The organization of this study is as follows: Section 2 presents the theoretical framework and a review of the empirical literature. Section 3 outlines the methodology, while Section 4 discusses the results. Finally, Section 5 concludes the study.

2. Literature Review

2.1. Theoretical Framework

This study divides the theoretical framework into three main theories: (i) agency theory, (ii) pecking order theory, and (iii) Tobin's Q.

2.1.1. Agency Theory

Agency theory addresses the agency problem stemming from the separation between ownership and control. Shareholders, or principals, retain ownership, while managers, acting as agents, oversee the firm's internal operations. This dynamic creates a conflict of interest, leading managers to potentially divert corporate resources for personal gain. Not all managers are equipped to make tough decisions; those with poor governance often shy away from efforts to diversify the firm (Dong et al., 2021). A model by Aggarwal and Samwick (2006) demonstrates that the likelihood of underinvestment rises due to managerial complacency. Consequently, investment is positively related to managerial incentives, such as equity ownership, which encourages managers to act responsibly and make decisions that enhance the firm's value (Wu & Wu, 2021).

According to agency theory, conflicts between principals and agents can result in investment inefficiencies, including underinvestment and overinvestment (Jensen, 1986, 1993). Durnev and Kim (2005) further explain that when the goals of managers and shareholders align, particularly in countries with weak legal protections for investors, the positive outcomes of managerial shareholding are more pronounced.

To mitigate agency problems, corporate governance codes have been established to promote financial transparency and enhance shareholder wealth (Veldman & Willmott, 2020). For example, Okamoto (2024) finds that implementing a code of conduct with disclosure requirements for corporations successfully reduces the prevalence of cross-shareholdings in Japan. These measures have significantly improved corporate governance, compelling companies to justify their cross-shareholding practices under the corporate governance code (Veldman & Willmott, 2020).

2.1.2. Pecking Order Theory

The pecking order is important for firms and potential investors as it reflects a firm's financing preferences, which can offer insights into its performance and financial health. Myers and Majluf (1984) argue that the pecking order theory emphasizes the use of internal resources for financing business activities instead of relying on expensive external finance. According to this theory, a firm should first finance its investments with internal funds before turning to debt and equity financing. When a company primarily utilizes internal finance, it sends a positive signal about its strength to the public. Additionally, reliance on debt financing indicates

that management is confident in the firm's ability to cover its monthly interest expenses.

Increasing managerial ownership can lead to more cost-effective investment decisions. As managerial shareholding rises, the goals of managers and shareholders become aligned, prompting managers to favor internal financing over costly external options. Generally, firms prefer internal finance as it is cheaper and less risky (Beynon-Davies et al., 2016). However, as firms depend more on internal finance, their investment sensitivity to cash flows increases, which can heighten financial constraints (Ali et al., 2024a). In a more recent study, Allini et al. (2024) find that highly stable firms are less likely to seek outside funding. When faced with a financial deficit, these firms prefer issuing equity over debt. Their findings support the pecking order theory by showing that high-yield firms adversely affect the capital mix.

2.1.3. Tobin's Q Theory

According to Tobin's Q theory, market performance can influence investment decisions (Blundell et al., 1992). Firms require financing to fund investment projects and can utilize either internal or external sources. Since internal finance is often insufficient, companies frequently rely on external financing to meet their investment needs. This external financing can take the form of long-term loans or issuing shares to raise equity. Shareholders invest in shares traded on the stock market with the goal of maximizing their returns through increased market value. Investors are more likely to buy shares when they anticipate a high return in the form of dividends.

Tobin's Q investment theory connects the stock market to investment through the Q ratio (Andrei et al., 2019). This is calculated by scaling the market value of equity against total assets. A high Q ratio suggests that firms are more likely to issue additional shares to raise funds for investment projects. When the Q ratio exceeds 1, firms are inclined to invest more in physical capital because, for every rupee spent on additional fixed assets, such as plant and equipment, they can sell their stock for Q rupees, yielding a return of $Q - 1$. This indicates that investing in physical capital is profitable as the value of the capital exceeds its acquisition cost; firms are motivated to increase their investments when Q is greater than 1. In this context, Tayeb et al. (2023) empirically demonstrate that Tobin's Q, as a proxy for firm performance, positively influences innovation activities in Chinese firms.

2.2. *Empirical Literature Review*

2.2.1. Factors Affecting Managerial Shareholding

The relationship between a firm's riskiness and managerial ownership is positively correlated. Stock price volatility serves as a measure of the risk a firm faces; firms exhibiting higher stock price volatility typically have higher levels of managerial shareholding. Demsetz and Lehn (1985) note that when firms encounter high risk, the potential for moral hazard among managers increases, leading them to potentially mislead uninformed parties to enhance their own rewards. To mitigate this issue, firms with higher risk should increase managerial shareholding to align the interests of managers and shareholders.

Larger firms often incur greater monitoring costs, which necessitate a higher level of managerial shareholding (Jensen & Meckling, 1976). Because these firms typically hire more experienced and well-trained managers, they are more likely to grant equity ownership to incentivize these managers to leverage their expertise and perform to their fullest potential.

Additionally, firms require lower levels of managerial shareholding when they efficiently allocate and manage funds for fixed assets (Shleifer & Vishny, 1997). In cases where fixed capital constitutes a significant portion of a company's inputs, managerial shareholding tends to be lower because the spending patterns in such firms are more transparent, reducing the potential for moral hazard. Conversely, as discretionary spending becomes more complex and less observable, the optimal level of managerial shareholding tends to increase. Firms with intricate and technical operations often have higher managerial ownership, as managers are more deeply involved in business activities; thus, providing equity ownership serves as a motivation for enhanced performance.

2.2.2. Effect of Managerial Shareholding on Firm Value, Performance and Financial Policies

As discussed above, managerial shareholding helps alleviate the principal-agent problem. When agency costs are reduced, the internal operations of a firm become smoother and more efficient, enhancing overall productivity. As a result, the profitability and value of the firm also increase. Increasing managerial shareholding has positive alignment effects (Anwar et al., 2024). When top management ownership rises, managers are less likely to deviate from the value-maximizing path, aligning their goals with

those of outside investors. This interest alignment process lowers agency costs and mitigates conflicts of interest, ultimately leading to the maximization of firm value.

However, there is an ambiguous link between managerial shareholding and firm performance due to mixed findings in previous studies. For instance, while Jensen and Meckling (1976) argue that increased managerial ownership improves performance by reducing agency costs, Fama and Jensen (1983) and Stulz (1988) contend that the power of internal owners increases with higher managerial ownership, while the authority of external owners remains limited. Consequently, no new ideas or perspectives are introduced into the business, hindering efficiency and performance.

Morck et al. (1988) find that Tobin's Q and firm performance are positively related when managerial shareholding ranges between 0 percent and 5 percent. However, a negative association is discovered at higher levels of managerial shareholding, ranging from 5 percent to 25 percent. In this range, managerial shareholding adversely affects firm performance, as entrenched managers may deviate from enhancing firm performance and value without accountability to other investors. Prior studies have established an inverse relationship between leverage ratio and managerial shareholding (Jensen, 1986). When managers are given an equity stake in firms, they align their interests with those of shareholders and work toward achieving the same objectives.

Chiu et al. (2022) studied Taiwanese nonfinancial enterprises from 2005 to 2019 and argued that companies with managerial shareholding tend to overinvest after experiencing excess internal cash flow, which may adversely affect businesses with limited resources. According to Zhang (2022), financial constraints negatively impact ownership concentration when all other factors remain constant. In contrast, the likelihood of financial constraints is effectively reduced by an increase in ownership concentration. Therefore, a higher tendency for ownership concentration can improve a company's performance when fixed financial constraints exist.

2.2.3. Managerial Shareholding and Firm Investment

Jensen and Meckling (1976) argue that managerial shareholding positively aligns interests, prompting managers to weigh the costs and benefits of their decisions and to invest in more worthwhile projects. Agency theory posits that conflicts of interest between principals and agents can cause firms to stray from their optimal investment path, resulting in either

underinvestment or overinvestment. Additionally, developing countries such as Pakistan face challenges such as poor law enforcement and weak investor protection. Aligning managers' objectives with those of shareholders could significantly enhance investment in these regions (Durnev & Kim, 2005). However, Davies et al. (2005) find no significant correlation between managerial shareholding and investment.

Previous studies indicate that increasing managerial shareholding may help mitigate issues related to underinvestment and overinvestment. Aggarwal and Samwick (2006) note that managerial sluggishness can lead firms to invest below their optimal levels. Moreover, firms experiencing free cash flow problems tend to confront higher agency conflicts and may over-invest. According to Jensen (1986), these conflicts stem from the distribution of free cash (Checkley et al., 2014). Ideally, efficient firms should distribute excess cash to shareholders. However, doing so reduces the funds directly available to managers. Consequently, managers often use this surplus cash to finance low or negative net present value (NPV) projects to retain control over these resources. Managers' primary objectives are closely tied to firm size; a larger firm size typically enhances their prestige and power. This dynamic motivates managers to pursue expansion even when the investment costs exceed the expected returns. Nevertheless, Jensen (1986) argues that granting share ownership to managers could mitigate overinvestment issues, as managers would then focus solely on projects with positive NPV, ultimately enhancing shareholder returns. Therefore, we propose the following hypothesis:

Hypothesis 1: Managerial shareholding has a positive impact on investment decisions.

2.2.4. Role of Financial Constraints in Firms' Investment Decisions

The primary objective of firms in funding investments is to identify the most cost-effective option. They can finance their investments through three main sources: internal finance, long-term loans or debt finance, and equity finance. According to the pecking order theory, firms typically prioritize internal funds like cash flows before resorting to more expensive external sources such as debt and equity financing (Myers & Majluf, 1984).

Fazzari et al. (1988) argue that internal and external financing sources are not perfect substitutes for funding investment projects. They contend that financial dynamics shape the investment function; insufficient internal funds and limited access to costly external finance

hinder a firm's ability to invest in high-quality, efficient assets necessary for improving productivity and profitability. Vijayakumaran (2021) notes that firms facing significant information asymmetry and agency conflicts may struggle to secure external financing for high-quality projects. Consequently, when obtaining external finance becomes challenging due to high-risk premiums, firms increasingly rely on internal funds like cash flows for their investments. Naveed et al. (2020) conducted a study using quantitative data from individual investors actively trading on the PSX and found that both financial and nonfinancial information significantly influence investment decisions. Additionally, the mediating role of corporate reputation is crucial in these investment decisions.

Previous research has established investment to cash flow sensitivity as a measure of financial constraints. Firms facing significant constraints tend to exhibit high sensitivity to cash flows, largely because they rely heavily on internally generated funds for their investments. Small firms are particularly vulnerable, as issues arising from information asymmetry make it even more difficult for them to secure external financing (Beck & Maksimovic, 2002). Therefore, there is empirical evidence that investment to cash flow sensitivities reflect firms' financial constraints. In this context, we propose that in response to external financial constraints, firms may increasingly utilize their internal finances for investment purposes, suggesting that such constraints may positively influence investment decisions.

Hypothesis 2: Financial constraints have a positive impact on investment decisions.

2.2.5. Role of Managerial Shareholding and Financial Constraints in Investment Decisions

The ability of a firm to invest in high-quality projects is adversely affected by agency conflicts and asymmetric information. Agency problems are known to exacerbate the financial constraints experienced by firms. Vijayakumaran (2021) finds that increasing managerial shareholding can help resolve these conflicts and reduce financial restraints. Additionally, Jensen and Meckling (1976) suggest that external costs can be minimized by granting ownership to managers. This occurs because managers with shared ownership tend to internalize the costs and benefits of their choices, leading them to invest in more value-maximizing ventures (Ali et al., 2024b).

Managerial share ownership enables these individuals to raise external finance at a lower cost. This indicates that higher ownership levels reflect managerial competence and a commitment to mitigating the expropriation of investors' funds. Consequently, lenders are more likely to provide external financing at lower interest rates. Vijayakumaran (2021) also argues that managerial shareholding indirectly influences investment decisions. Managerial shareholding creates a positive incentive alignment effect that alleviates agency conflicts and streamlines the firm's operations. As managerial ownership increases, information asymmetry decreases, thereby reducing the financial constraints faced by firms (Ruan & Zhang, 2012).

Anderson et al. (2006) argue that firms with higher managerial ownership are better positioned to raise external finance for investment activities due to facing lower financial constraints, establishing a negative relationship between financial constraints and managerial ownership. Pawlina and Renneboog (2005) report that granting share ownership reduces the propensity to invest in low-return ventures for 'empire-building.' Firms with high managerial shareholding are less likely to misuse investors' funds and use corporate resources to enhance their own benefits (Ali et al., 2024c; Wahid & Mumtaz, 2018). Given the interrelationships between managerial ownership and financial constraints, we examine how their combined effect influences investment outcomes. To test the interaction effect between managerial shareholding and financial constraints on investment decisions, we hypothesize the following:

Hypothesis 3: The combined effect of managerial shareholding and financial constraints positively impacts investment decisions.

3. Research Methodology

This study utilizes panel data from 60 nonfinancial firms listed on the PSX, covering the period from 2011 to 2020. The data was collected from the firms' annual reports. They were chosen for their active participation in the stock market, making them ideal for examining the effects of financial constraints and managerial shareholding on investment decisions. Analyzing these firms over a ten-year period allows for a deeper understanding of the factors influencing their investment choices. Significant results from the Durbin-Wu-Hausman and Breusch-Pagan tests

indicate that our model is affected by endogeneity and heteroscedasticity.[1] Additionally, the Hausman test confirms the presence of endogeneity by rejecting the null hypothesis. Consequently, this study employs the generalized method of moments (GMM) to estimate the dynamic panel data model.

The GMM estimation techhnique, developed by Arellano and Bond (1991) and Blundell and Bond (1998), is suitable for endogenous dynamic panel models. In addition to addressing endogeneity and heteroskedasticity, the structure of our dataset supports the use of GMM, which effectively eliminates these issues while controlling for unobserved heterogeneity (Hasan et al., 2024). We opt for system GMM over difference GMM as it typically yields more efficient results in cases involving a large sample of firms observed over a short timeframe (Mairesse & Hall, 1996). The structural model is expressed as follows:

$$\left(\frac{I_{i,t}}{A_{i,t-1}}\right) = \beta_0 + \beta_1\left(\frac{I_{i,t-1}}{A_{i,t-2}}\right) + \beta_2\left(\frac{I_{i,t-1}}{A_{i,t-2}}\right)^2 + \beta_3\left(\frac{CF_{i,t-1}}{A_{i,t-1}}\right) + \beta_4 MS_{i,t-1} + \beta_5\left(\frac{CF_{i,t-1}}{A_{i,t-1}} \times MS_{i,t-1}\right) + \beta_6 SG_{i,t-1} + \beta_7\left(\frac{D_{i,t}}{A_{i,t-1}}\right) + \beta_8\left(\frac{WC_{i,t-1}}{A_{i,t-1}}\right) + \beta_9 SIZE_{i,t-1} + \beta_{10} EFD_{i,t-1} + \beta_{11}\left(\frac{D_{i,t}}{A_{i,t-1}} * SIZE_{i,t-1}\right) + \varepsilon_{i,t} \quad (1)$$

$\left(\frac{I_{i,t}}{A_{i,t-1}}\right)$ A proxy of the rate of investment. $I_{i,t}$ = net fixed assets + depreciation representing investment. A refers to total assets.

$\left(\frac{CF_{i,t-1}}{A_{i,t-1}}\right)$ This represents investment cash flow sensitivity and is used to indicate financial constraints. CF refers to cash flow representing internal funds, which combines net profit and depreciation.

$MS_{i,t-1}$ $MS_{i,t-1}$ shows managerial shareholding and is measured by the proportion of shares owned by directors and officers.

$SG_{i,t-1}$ A proxy for annual sales growth rate.

$\left(\frac{D_{i,t}}{A_{i,t-1}}\right)$ This denotes the leverage ratio. It is measured by dividing total debt by total assets.

[1] The p-value of the Durbin-Wu-Hausman test is 0.00. Therefore, we reject the null hypothesis and conclude that the model suffers from endogeneity. The results of the Breusch-Pagan test (p value = 0.00) and White test (p value = 0.00) show the presence of heteroscedasticity. Thus, we use the GMM estimation technique in this study.

$\left(\frac{WC_{i,t-1}}{A_{i,t-1}}\right)$ This represents working capital as a proportion of total assets.

$EFD_{i,t-1}$ A dummy variable represents equity financing, which takes a value of 1 if the company has issued shares and 0 otherwise.

$SIZE_{i,t-1}$ A dummy variable representing firm size is classified based on the median value of total assets. A value greater than the median represents large firms equal to 1 and 0 otherwise.

This study incorporates several control variables previously identified as influential on investment decisions. Specifically, we consider sales growth, leverage, working capital, equity financing, and firm size. Consistent with earlier research (see, for example, Fianto et al., 2018; Shefer & Frenkel, 2005), equity financing and firm size are treated as dichotomous variables. By focusing on prominent firms listed on the PSX, we categorize equity financing and firm size as dummy variables to clearly distinguish between firms based on these characteristics.

Additionally, we analyze the impact of Tobin's Q on firms' investment level. Tobin's Q serves as an indicator of a firm's investment prospects, reflecting its performance relative to the market value of equity. When the market value exceeds the recorded assets, Tobin's Q exceeds 1. Firms with a high Tobin's Q are incentivized to increase investments in fixed assets as these assets are deemed more valuable than their purchase prices. An increase in the market value of equity signifies greater confidence in firms, thereby expanding their investment opportunities.

$$\left(\frac{I_{i,t}}{A_{i,t-1}}\right) = \beta_0 + \beta_1\left(\frac{I_{i,t-1}}{A_{i,t-2}}\right) + \beta_2\left(\frac{CF_{i,t-1}}{A_{i,t-1}}\right) + \beta_3 MS + \beta_4\left(\frac{CF_{i,t-1}}{A_{i,t-1}} \times MS_{i,t-1}\right) + \beta_6 TQ_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

where $TQ_{i,t-1}$ is measured by scaling the sum of the market value of equity and long-term debt by total assets.

4. Results and Discussion

4.1. Summary Statistics

Table 1 gives the summary statistics of the variables used. Our sample's maximum investment rate is 96 percent, while the minimum rate is as low as 1 percent. The average investment rate represented by $(I_{i,t}/A_{i,t-1})$ is 44 percent in Pakistan, with a standard deviation of 23 percent. The mean

cash-flow-to-total-assets ratio (representing financial constraints) ($CF_{i,t-1}/A_{i,t-1}$) is 10 percent, with a standard deviation of 9 percent. The average percentage of managerial shareholding ($MS_{i,t-1}$) is reported to be 16 percent, while its standard deviation is 22 percent, confirming the significant presence of managerial ownership in firms listed on the PSX. Our sample shows that the maximum level of managerial shareholding is 95 percent while the minimum value is zero.

On average, the annual sales growth rate ($SG_{i,t-1}$) is 13 percent, with a standard deviation of 33 percent, while the average Tobin's Q is reported to be 1.13, with a standard deviation of 1.15. These variables validate the presence of reasonable growth opportunities in Pakistan during the sample period. The average leverage ratio ($D_{i,t}/A_{i,t-1}$) is estimated to be 9 percent, with a standard deviation of 13 percent, indicating the low dependency of Pakistani firms on long-term loans to finance assets and investment in general. The maximum leverage value is 76 percent, while the minimum value is 0 percent, implying lack of dependency on long-term debt for investment. The average working capital to assets ratio ($WC_{i,t-1}/A_{i,t-1}$) is 9 percent, with a standard deviation of 24 percent. The maximum working capital to assets ratio is 68 percent, whereas the minimum value is –88 percent. The mean value of equity financing ($EFD_{i,t-1}$) is 31 percent, with a standard deviation of 46 percent. This implies that many firms in our sample have raised funds by issuing shares. Lastly, on average, 33 percent of the sample firms are large.

Table 1: Summary Statistics

Variables	Mean	SD	Min	Max	Median	Skewness	Kurtosis
Rate of investment	0.44	0.23	0.01	0.96	0.43	0.19	-0.75
Financial constraints	0.10	0.09	-0.42	0.45	0.09	-0.20	2.10
Managerial shareholding	0.16	0.22	0.00	0.95	0.02	1.57	2.09
Sales growth rate	0.13	0.33	-0.91	3.89	0.10	3.54	34.37
Tobin's Q	1.13	1.15	0.04	8.34	0.78	2.49	7.97
Leverage ratio	0.09	0.13	0.00	0.76	0.04	2.31	5.79
Working capital	0.09	0.24	-0.88	0.68	0.07	-0.50	1.21
Equity financing	0.31	0.46	0.00	1.00	0.00	0.84	-1.29
Firm size	0.33	0.12	0.00	1.00	0.00	0.72	-1.22

Note: This table presents descriptive statistics for 60 nonfinancial firms listed on the PSX during the period 2011 to 2020.

4.2. Testing Cross-Section Dependence in Residuals

To test the cross-sectional dependence of the dataset, we apply the Pesaran cross-sectional dependence (CD) test, as the number of cross-

sections is greater than the time. Since the p-value of the Pesaran CD test is 0.00, which is less than 0.05, we do not accept the null hypothesis of cross-sectional independence in residuals and conclude that there is cross-sectional dependence in the residuals.[2]

4.3. Panel Unit Root Test

We employ a second-generation panel unit root testing technique to analyze the stationarity of our dataset, based on the cross-sectional dependence test. We utilize the cross-sectional augmented Dickey-Fuller (CADF) and cross-sectional augmented Im-Pesaran-Shin (CIPS) unit root tests (see Table 2). The results of the CADF test indicate that managerial shareholding, sales growth rate and Tobin's Q are significant in levels. In contrast, the investment rate, cash flow (financial constraints), leverage and working capital ratio are significant only in first difference. The CIPS test results reveal that all the variables, except for the working capital ratio, are significant in levels. The working capital ratio becomes significant when analyzed in first difference.

Table 2: Panel Unit Root Test Results

Variable	CADF		CIPS	
	I(0)	I(1)	I(0)	I(1)
Rate of investment	-1.83	-2.20***	-0.21**	-
Financial constraints	-1.97	-2.59***	-2.14**	-
Managerial shareholding	-2.61***	-	-3.23***	-
Sales growth rate	-2.32***	-	-3.37***	-
Leverage ratio	-1.74	-1.99**	-2.16**	-
Working capital	-1.84	-2.41**	-1.63	-2.50***
Tobin's Q	-3.14***	-	-2.60***	-

Note: *** and ** show the significance levels at 1 percent and 5 percent, respectively. Equity financing and firm size are dummy variables and so their unit root cannot be tested.

4.4. Financial Attributes of Firms' Investment

Model 1 considers only financial constraints and control variables, while Model 2 enhances the investment equation by adding the managerial shareholding variable, its interaction with cash flow (financial constraints) and the interaction between firm size and debt finance (see Table 3). This allows us to examine the indirect effect of firm size on the rate of investment. In both models, the estimated coefficient of the lagged investment ratio is

[2] We apply VIF to test multicollinearity. The results show that all variables exhibit values less than the benchmark.

positive and statistically significant, indicating that current investment is influenced by the previous year's investment. Additionally, the statistically significant negative coefficient of the square of the lagged investment ratio suggests that investment increases at a decreasing rate.

Table 3: Managerial Shareholding, Firm Investment and Financial Constraints

Variables	(1)	(2)
Rate of investment	0.214**	0.258**
	(0.096)	(0.112)
Rate of investment^2	-0.032**	-0.034**
	(0.014)	(0.016)
Financial constraints	1.043***	1.057***
	(0.047)	(0.005)
Sales growth rate	0.254**	0.289**
	(0.128)	(0.127)
Leverage ratio	0.750*	1.602**
	(0.414)	(0.755)
Working capital	-0.066	-0.069
	(0.052)	(0.064)
Firm size	0.137**	0.094
	(0.067)	(0.089)
Equity financing	0.079	0.212
	(0.095)	(0.172)
Managerial shareholding		0.723***
		(0.134)
Financial constraints * managerial shareholding		2.167***
		(0.712)
Leverage ratio * firm size		1.297**
		(0.584)
Constant	0.966**	-0.672*
	(0.193)	(0.291)
Observation	540	540
Groups	60	60
AR(2) test (p-values)	-1.52 (0.130)	-1.66 (0.097)
Hansen test of over-identification	41.74 (0.23)	40.84 (0.164)
Instruments	45	45
F-statistics	303189.52	53629.5

Note: This table gives the system GMM results. Standard errors are reported in parenthesis. ***, ** and * show the level of significance at 1 percent, 5 percent and 10 percent, respectively.

The positive and significant coefficient ($p < 0.01$) for financial constraints in both models indicates that firm investment is dependent on internally generated funds, supporting Hypothesis 2. As internally generated funds increase, the investment rate is also likely to rise. The coefficient for financial constraints is 1.043, with a standard deviation of

0.09, as shown in Table 1, and the average investment value is 0.44. This suggests that a one-standard deviation increase in internally generated funds would result in a 21.3 percent increase in firm investment, based on the average investment ratio of 0.44. Additionally, these results indicate that firms are unable to invest in high-return assets due to a lack of external financing, suggesting they are financially constrained. As cash flows increase, firms tend to rely solely on internal financing and seek to avoid costly external financing. This evidence shows that firms in Pakistan face financial constraints regarding investment, as their investment levels are sensitive to fluctuations in cash flows. This finding aligns with the pecking order theory, which posits an imbalance between debt and equity (Allini et al., 2024; Ali et al., 2024a).

We observe a positive and significant relationship ($p < 0.05$) between sales growth and investment, indicating that increased sales growth leads to higher net earnings and consequently an elevated investment rate. Higher sales generate greater retained earnings, prompting firms to invest in technologically advanced and efficient assets, which, in turn, enhance productivity and profitability. Additionally, a positive and significant leverage ratio ($p < 0.10$) suggests that firms do not rely solely on internally generated funds for investment. Rather, long-term borrowing can facilitate increased investment in fixed assets. This finding implies that firms with higher leverage have access to more financial resources that can be used to fund investments.

Higher-leveraged firms also exhibit better creditworthiness, allowing them to raise external financing quickly and at lower interest rates. In Model 1, firm size is positively significant, indicating that as size increases, so do financial resources, enabling a higher investment rate. The dummy variable for equity financing is positive, suggesting that increased equity financing leads to a rise in funds generated by the firm, thereby increasing the investment rate; however, this variable is insignificant. Lastly, the coefficient for the working capital to total assets ratio is negative, indicating that working capital is used to 'smooth fixed investment,' although this finding is insignificant in both models.

Model 2 presents the findings of the augmented version of the investment equation. The coefficient for managerial shareholding is positive and statistically significant ($p < 0.01$), indicating that an increase in managers' equity stakes is associated with higher firm investment, consistent with Hypothesis 1. This result supports the notion of agency theory (Aggarwal & Samwick, 2006; Okamoto, 2024). By increasing their

equity ownership, managers align their interests with those of shareholders, leading to decisions that maximize business returns.

The coefficient for the interaction term is positive and statistically significant, aligning with Hypothesis 3. This positive interaction suggests that greater managerial shareholding enhances the direct impact of financial constraints on investment. Managers tend to avoid raising external finance for investments as it is generally more expensive and risky. This behavior aligns the objectives of shareholders and managers, focusing on minimizing costs while maximizing returns. However, this alignment may have limitations. Avoiding external financing can cater to short-term interests, which aligns with Tobin's Q theory, suggesting that higher managerial shareholding could lead to entrenchment. Entrenched managers, who have substantial control, may act in ways that hinder improvements in firm performance and value. This situation can allow them to pursue self-serving actions without full accountability to other investors, ultimately jeopardizing the firm's long-term performance (Ali et al., 2024c; Tayeb et al., 2023).

We include the firm size * leverage interaction to capture the indirect effect of firm size. Our findings reveal a positive association, indicating that as firm size increases, reliance on debt financing also grows. This suggests that larger firms face fewer financial constraints in their investment activities. Generally considered more creditworthy, large firms have easier access to external finance (debt), allowing them to ramp up their investment rates. The other control variables in Model 2 exhibit similar relationships with investment, as noted in Model 1, with the exception of the firm size variable, which became insignificant in Model 2.

4.5. Sectoral Analysis

We classify textiles, automobile, cement, chemical and pharmaceutical industries as manufacturing firms, while oil and gas as well as power generation companies fall under the energy/power sector. Table 4 presents the empirical findings for both sectors.

The positive and significant coefficient of the lagged investment ratio in Models 1 and 2 indicates that the current investment rate of manufacturing firms is influenced by their investment from the previous year. The negative coefficient of the square of the lagged investment ratio suggests that investment in the manufacturing sector increases at a decreasing rate. Models 1 and 2 also reveal a significant positive relationship ($p < 0.01$) between financial constraints and investment, highlighting that

manufacturing firms heavily rely on internally generated funds. In Pakistan, manufacturing firms face challenges in accessing external finance, which can be costly due to interest obligations (Mumtaz & Ahmed, 2016).

The study finds that managerial shareholding does not have a direct impact on a firm's investment within the manufacturing sector. Model 2 indicates that managerial ownership negatively affects how manufacturing firms experience financial constraints. Conversely, sales growth has a positive effect on the investment ratio, confirming an accelerator effect of sales on firm investment in the manufacturing sector. As a key predictor of current investment, sales growth reflects available investment opportunities for these firms. The analysis also shows a negative relationship ($p < 0.05$) between working capital and firm investment, suggesting that manufacturing firms use their working capital to smooth out investment fluctuations (Model 1). Equity financing emerges as a significant predictor of investment in this sector, with the dummy variable for equity financing showing positive significance in Models 1 ($p < 0.10$) and 2 ($p < 0.05$). This indicates that manufacturing firms utilize equity financing as an important external source of funds for their investment activities.

Table 4: Managerial Shareholding, Firm Investment and Financial Constraints for Manufacturing and Energy/Power Sectors

Variables	Manufacturing sector		Energy/power sector	
	(1)	(2)	(3)	(4)
Rate of investment	0.754**	0.865*	0.846***	0.773*
	(0.365)	(0.472)	(0.347)	(0.390)
Rate of investment^2	-0.022**	-0.015*	-0.249**	-0.221*
	(0.010)	(0.008)	(0.114)	(0.121)
Financial constraints	1.829***	1.826***	-0.306	-1.243
	(0.231)	(0.271)	(0.377)	(0.863)
Sales growth rate	0.287***	0.269***	0.372***	0.364***
	(0.050)	(0.065)	(0.034)	(0.079)
Leverage ratio	0.107	0.344	0.199	0.442
	(0.298)	(0.424)	(0.244)	(0.405)
Working capital	-0.609**	-0.443	-0.143*	-0.260***
	(0.258)	(0.354)	(0.079)	(0.079)
Firm size	0.167	0.136	0.189	0.321
	(0.126)	(0.274)	(0.172)	(0.333)
Equity financing	0.906*	0.915**	0.083*	0.092*
	(0.484)	(0.423)	(0.047)	(0.050)
Managerial shareholding		-0.813		-0.464***
		(0.753)		(0.169)
Financial constraints * managerial shareholding		-1.004		6.359
		(2.385)		(3.964)

Variables	Manufacturing sector		Energy/power sector	
	(1)	(2)	(3)	(4)
Constant	0.612	0.472	0.083	0.042
	(0.599)	(0.765)	(0.136)	(0.184)
Observation	333	333	207	207
Groups	37	37	23	23
AR(2) test (p-values)	-0.59 (0.558)	-0.41 (0.684)	-1.54 (0.123)	-1.19 (0.234)
Hansen test of over-identification	18.86 (0.220)	14.75 (0.225)	6.88 (0.549)	3.79 (0.706)
Instruments	18	18	17	17
F-statistics	2200.22	1466.41	265.79	64.72

Note: This table gives the system GMM results for the manufacturing and energy/power sectors. Standard errors are reported in parenthesis. ***, ** and * show the levels of significance at 1 percent, 5 percent and 10 percent, respectively.

Models 3 and 4 present the results for the energy and power sectors. The financial constraints variable is negative and statistically insignificant in both models, indicating that firms in these sectors are not financially constrained and, therefore, are able to utilize external sources of finance for their investment activities. Model 4 reveals an inverse relationship between managerial shareholding and investment levels in these sectors. This finding contradicts the core tenets of agency theory, which suggests that managerial shareholding enables firms to select projects with a positive NPV since managers internalize the costs and benefits of their decisions, leading to better investment choices. However, granting excessive equity ownership to managers may distort the intended benefits of managerial shareholding. In positions of power, managers can leverage corporate resources for their own advantage, ultimately impacting the firms' profitability and investment results.

The interaction of financial constraints and managerial shareholding is positive but statistically insignificant in Model 4. Sales growth shows a positive and significant relationship ($p < 0.01$) with investment in both models, suggesting that higher sales lead to increased earnings and cash flows, which in turn expand the pool of internally generated funds available for investment. The working capital to assets ratio has a negative and statistically significant coefficient in both Model 3 ($p < 0.10$) and Model 4 ($p < 0.01$). The equity funding variable demonstrates a positive relationship with investment ($p < 0.10$), indicating that issuing equity shares bolsters the investment activities of firms in the energy and power sectors.

4.6. Financial Attributes of Firms' Investment: Tobin's Q Approach

We employ an alternative investment model, commonly known as Tobin's Q model, to investigate how Tobin's Q influences the level of investment in firms. Model 1 provides estimates that include control variables, while Model 2 presents an enhanced version of the original model to capture both the direct and indirect effects of managerial shareholding. The results from the system GMM analysis are displayed in Table 5.

Our findings indicate that financial constraints have a positive and significant impact on investment ($p < 0.01$). This supports the previous model's conclusion that Pakistani firms are experiencing financial limitations in their investment activities. As these firms increase their internally generated funds, their investment levels are also expected to rise. However, it also implies that as firms rely more on internal financing, they tend to shy away from costly external finance, which may exacerbate their financial constraints (Ali et al., 2024b; Tayeb et al., 2023). Model 1 shows a negative relationship between Tobin's Q and investment, although this result is statistically insignificant. In contrast, Model 2 indicates a positive coefficient ($p < 0.05$), suggesting that Tobin's Q reflects a firm's actual growth potential. This finding implies that firms are increasingly recognizing their potential, thereby expanding their investment opportunities.

Anderson et al. (2006) predict that managerial ownership reduces information asymmetry and acts as a form of collateral for debt financing, enabling firms to more easily fund their investment activities through external sources. Managerial shareholding is shown to have a positive and significant effect in Model 2 ($p < 0.10$), aligning with our earlier results that indicate higher managerial ownership leads to more responsible management and better investment decisions. While the direct effect of managerial shareholding is consistent with prior findings, the indirect effect presents a contrasting result. Specifically, the interaction term in Model 2 is negative ($p < 0.05$), challenging our earlier conclusion and suggesting that the influence of financial constraints on investment weakens as managerial ownership increases. This suggests that firms with higher managerial ownership may not effectively utilize internal financing to the same degree as those with lower ownership levels. It is possible that entrenched managers are hesitant to seek external funding or to engage in riskier investment choices.

Table 5: Firm Investment, Managerial Shareholding and Financial Constraints: Tobin's Q Approach

Variables	(1)	(2)
Rate of investment	0.107***	0.075***
	(0.001)	(0.002)
Financial constraints	0.856***	0.897***
	(0.001)	(0.002)
Tobin's Q	-0.005	0.011**
	(0.003)	(0.005)
Managerial shareholding		0.593*
		(0.320)
Financial constraints * managerial shareholding		-1.723**
		(0.766)
Constant	0.320***	0.273***
	(0.007)	(0.009)
Observation	540	540
Groups	60	60
AR(2) test (p-values)	-1.11 (0.266)	-1.11 (0.267)
Hansen test of over-identification	44.41 (0.220)	46.68 (0.110)
Instruments	42	42
F-statistics	870670.83	478441.57

Note: This table gives the system GMM results of Tobin's Q model. Standard errors are reported in parenthesis. ***, ** and * show levels of significance at 1 percent, 5 percent and 10 percent, respectively.

5. Conclusion

We investigate the simultaneous impact of managerial shareholding and financial constraints on a firm's investment decisions. Previous studies indicate that various financial factors can influence investment. To explore the relationship between managerial shareholding, financial constraints, and firm investment, we examine 60 nonfinancial firms listed on the PSX from 2011 to 2020. Utilizing the system GMM technique, our results reveal that all variables, except the working capital to total assets ratio and equity financing, significantly affect the level of investment. The findings confirm that past investments influence current corporate investment and that investments tend to increase at a decreasing rate.

Our results indicate that past investments have a spillover effect on present investments, suggesting that engaging in investment activities is a 'smooth process' for firms in Pakistan. As firms continue to increase their investments, they are likely to avoid incurring high adjustment costs. Furthermore, the growing reliance of Pakistani enterprises on internally generated funds imposes financial constraints and heightens the sensitivity of their investments to cash flows. The results also demonstrate an incentive

alignment effect associated with managerial shareholding, as it positively impacts firms' investment levels. Notably, managerial shareholding has a significant indirect effect, indicating that Pakistani firms prefer to avoid costly external financing and primarily rely on internally generated resources, thereby confirming the pecking order hypothesis.

When analyzing by sector, we find that firms in Pakistan's energy/power sector are not financially constrained in their investments; they tend to rely on external sources such as long-term loans, share issuances, and government grants and subsidies. In contrast, manufacturing firms are financially constrained and depend on cash flows to finance their investment projects. Interestingly, managerial ownership does not affect investments in manufacturing firms. However, in the energy/power sector, managerial equity ownership has a negative yet significant effect on the investment rate, highlighting the influence of managerial entrenchment in this sector. Overall, smooth and efficient business operations create a healthy corporate environment that positively impacts economic performance. This study contributes to effective investment decision-making by assisting shareholders and financial investors in evaluating investment choices and expanding investment opportunities.

This paper emphasizes the significance of managerial shareholding and financial constraints, providing valuable insights for policymakers. It suggests that ownership reforms in Pakistan need to be revised, and the proper implementation of these reforms must be ensured. By legally requiring firms to offer equity ownership to managers, agency conflicts and issues stemming from information asymmetry can be reduced. Such policies could lead to improved investment decisions and promote economic growth. Additionally, recognizing that firms in the energy and power sectors face fewer constraints and actively utilize external financing indicates the potential for developing tailored financial policies to address sector-specific needs. These insights can guide financial institutions and investors on where to allocate resources for maximum impact.

Nevertheless, this study has some limitations. First, it focuses on 60 nonfinancial firms listed on the PSX from 2011 to 2020. This relatively small sample may not adequately represent the diversity of investment behaviors across various sectors, potentially limiting the generalizability of the findings. Future research could benefit from a larger sample size to enhance this aspect. Second, the operational definitions of financial constraints and managerial shareholding might not capture all relevant dimensions. Future studies could explore alternative measures to better understand the

relationships between these variables and investment decisions. Third, while the study identifies associations among variables, it does not establish causal links. Experimental designs could provide more robust evidence regarding the causal effects of managerial shareholding and financial constraints on investment decisions. Finally, this study does not clarify how these factors influence a firm's investment decisions. For future research, we recommend examining how managerial shareholding and financial constraints affect a firm's investment choices. In this context, considering two or more markets could facilitate a comparison of shareholding patterns and identify the impact of financial constraints on firm investments.

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