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When Do Optimistic CEOs Enhance Firm Value?

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ABSTRACT

We predict how the effect of CEO optimism on firm value varies across firms and model how industry competition impacts the relation between CEO optimism and firm value. Estimating optimism from option-exercise behaviour, we find that CEO optimism increases firm value by about 17% on average. Consistent with theoretical predictions, CEO optimism is more value-enhancing in firms that are riskier, engage in greater innovation and investment, have more internal resources and operate in industries that are more competitive or have a larger fraction of optimistic CEOs. Various endogeneity checks support a causal impact of CEO optimism on firm value.

JEL Classification: Codes: G30, G32, G40, G41

1 | Introduction

Chief Executive Officers (CEOs) of firms influence their corporate policies.[1] CEO characteristics can thus affect a firm's performance or value.[2] Recent literature recognizes that the focus of early studies in assessing whether a particular CEO trait increases or decreases firm value is inadequate. Since a firm and its CEO complement each other, the effect of CEO characteristics on firm value depends on how these characteristics interact with firm characteristics.[3] That is, the same CEO trait may increase value in one firm and reduce value in another firm.

In this paper, we assess the effect of CEO optimism on firm value. Optimism is defined as an upward bias in expectations of future outcomes. Consistent with much of the recent literature, we use the terms optimism and overconfidence interchangeably.[4] We focus on CEO optimism for three reasons. First, overconfidence or optimism is a well-documented psychological trait. The finding that people are overconfident is one of the most robust in the psychology of judgement (De Bondt and Thaler 1995; Kahneman, Paul, and Tversky 1982, and Russo and Schoemaker 1990). Second, CEO optimism has been shown to impact a range of corporate policies, including financing, cash, investment, payout, acquisitions and corporate governance policies. Third, optimism spans a wide spectrum, so a corporate board facing CEO candidates with large differences in optimism would benefit from knowing how CEO optimism will likely affect its firm.

We assess the average effect of CEO optimism on firm value, establish that this effect is causal, and identify how this effect varies across different kinds of firms. We catalogue how optimistic CEOs reshape several corporate policies and characterize firms that are more likely to benefit from each policy change. We also develop a model that yields new predictions about the interaction between CEO optimism and industry competition. Our empirical analysis identifies the firm characteristics that increase or decrease the marginal impact of CEO optimism on firm value. Our results have practical implications for CEO selection and corporate governance.

Previous studies have examined how certain personality traits of CEOs affect firm value.[5] Many studies document how CEO

optimism affects corporate policies. For example, firms managed by overconfident CEOs rely more heavily on internal funds to finance their investment spending (Malmendier and Tate 2005), are more likely to engage in acquisitions (Malmendier and Tate 2008), pay less dividends (Deshmukh, Goel, and Howe 2013) and hold less cash (Deshmukh, Goel, and Howe 2021). These papers do not directly examine the effect of the relations they document on firm value. The conventional belief is that any deviation in an optimistic CEO's policies from those of a rational CEO is detrimental to firm value. However, since optimism lies on a spectrum, even CEOs not classified as optimistic may be slightly optimistic, rational or pessimistic, and may themselves deviate from the policies of a rational CEO. In this case, it is not obvious whether corporate policies chosen by optimistic CEOs increase or decrease firm value.

Other studies model different effects of CEO overconfidence/optimism that may increase firm value. For example, Goel and Thakor (2008) develop a model in which moderate CEO overconfidence enhances firm value and lowers the risk of forced turnover. Campbell et al. (2011) provide evidence that moderately confident CEOs face a lower probability of forced turnover. Hirshleifer, Low, and Teoh (2012) argue that overconfidence helps CEOs exploit innovative growth opportunities and translate these opportunities into higher firm value. In a similar vein, Galasso and Simcoe (2011) argue that overconfident CEOs pursue greater innovation and document higher R&D expenditures in firms managed by overconfident CEOs. Gervais and Goldstein (2007) argue that CEO overconfidence/optimism can make firms more valuable because overconfident individuals work harder. Englmaier (2010) suggests that optimistic managers are likely to be more aggressive, which might make their firms more profitable and more valuable. Gervais, Heaton, and Odean (2011) argue that overconfidence will make a risk-averse manager less conservative, making it economical for the firm to motivate her to invest in risky projects. While these studies suggest some advantages of having an optimistic CEO, empirical studies have not directly evaluated the magnitude of these effects on firm value and whether they offset the negative effects of CEO optimism on firm value described in other studies. We discuss both the positive and the negative effects of CEO optimism in Section 2.

A few recent studies document that CEO optimism is associated with higher firm valuation. For example, Alshorman and Shanahan (2021) show that optimism exhibited by Australian CEOs is positively related to subsequent firm valuation. Tang and Chang (2024) find that CEO overconfidence is positively associated with additional risk-taking and firm value for US firms. However, the potential endogeneity of CEO optimism and optimistic CEOs' policies, such as risk-taking, make it difficult to draw causal inferences.

We add to this literature by answering the following questions: (i) What is the overall average effect of CEO optimism on firm value? (ii) Which firms are more likely to benefit from CEO optimism? In addition to establishing the causal effect of CEO optimism on firm value, our main focus is on identifying the characteristics of firms that benefit most from optimistic CEOs. We use existing literature to identify the channels for the effect of CEO optimism on firm value. We then identify the firm characteristics which determine the strength of these channels. These analyses yield our hypotheses about whether different firm characteristics increase or decrease the impact of CEO optimism on firm value. Our results not only improve our understanding of the various effects of CEO optimism but can also help improve the matching of CEOs with firms.

We draw on the relevant literature on CEO optimism to predict that the marginal effect of CEO optimism on firm value is greater in riskier firms, in more innovative firms and in firms with more internal resources (e.g., cash flow). An optimistic CEO may impact a firm's value not only due to her own actions but also due to the responses of competing firms. The existing literature does not examine these strategic effects. We develop a model in which the actions of one firm impose externalities on competing firms in the industry. We show that the value-enhancing actions of an optimistic CEO result in a greater value gain in a more competitive industry, resulting in the prediction that CEO optimism creates greater value in more competitive industries. Another prediction is that CEO optimism's impact on firm value is greater in industries with a greater fraction of optimistic CEOs.

We test the above predictions using a sample drawn from the Execucomp database over the period 1992-2012. As in Malmendier and Tate (2005, 2008) and Malmendier, Tate, and Yan (2011), we identify optimistic managers as those who overinvest personal funds in their firms. We follow Campbell et al. (2011) by using the data on option compensation and classify a CEO as optimistic if she held an option that was more than 100% in the money at least once during her tenure.

We find a positive relation between CEO optimism and firm value, which implies that, on average, the positive effects of CEO optimism on firm value appear to outweigh the negative effects. The value of a firm managed by an optimistic CEO is about 17% higher than that of a firm managed by a non-optimistic CEO and represents the marginal increase in firm value attributable to CEO optimism over the CEO's tenure. This effect is statistically and economically significant. Contrary to the predominant negative notion of optimism, CEO optimism is not always bad and can be valuable for some firms. Our findings challenge the bulk of prior research that assumes that CEO optimism adversely affects firm value. Our findings are consistent with the evidence that moderate optimism is considered healthy and leads to superior outcomes for individuals (Puri and Robinson 2007; Sharot 2011).

We then show that the value effect of CEO optimism varies across firms. The increase in firm value resulting from CEO optimism is lower in firms that operate in more concentrated industries and higher in industries with a larger fraction of optimistic CEOs. These findings are consistent with the predictions from our model. We also examine the heterogeneity in the impact of CEO optimism on firm value across firms that vary in the following four attributes: cash-flow volatility (a measure of firm risk), R&D expenditures (a measure of innovation), investment spending, and cash flow, a measure of the availability of resources. We find that CEO optimism is associated with a greater increase in value in firms with more volatile cash flows, consistent with the greater willingness of

optimistic CEOs to take risk. CEO optimism is more valuable in firms with greater R&D, as optimistic CEOs invest more in innovation and have greater R&D productivity. Optimistic CEOs add more value to firms with greater investment spending. This is consistent with the role of CEO optimism in mitigating underinvestment, which is likely to be a bigger problem in firms that rely on high investment spending. CEO optimism is also more valuable in firms with greater cash flow, as optimistic CEOs feel less constrained in these firms and are, therefore, more willing to pursue risky but valuable investment opportunities.

We also examine the effect of changes in corporate governance on the relation between CEO optimism and firm value. We find that the value premium associated with optimistic CEOs declined following the passage of the Sarbanes-Oxley Act and the contemporaneous changes in the listing rules for NYSE/NASDAQ, suggesting that the constraints imposed by the regulation may have stifled the channels through which CEO optimism creates value.

Overall, our results show that firms led by optimistic CEOs are, on average, more valuable. The value premium associated with CEO optimism is greater in firms in more competitive industries, with higher cash flow volatility, with higher R&D expenditures, with higher cash flow and with higher overall investment spending.

We perform several tests to address identification concerns stemming from the potential endogeneity of CEO optimism. We instrument CEO optimism with the incidence of optimism in the candidate pool from which the board chooses a CEO. The results from the first stage of the two-stage least squares (2SLS) approach establish the relevance of the instrument while the results from the second stage indicate that the effect of optimism on firm value is both statistically and economically significant. These results suggest a causal relation between CEO optimism and firm value. Tests based on time variation in CEO optimism and on time variation in firm value rule out reverse causality from firm value to CEO optimism. CEO-firm fixed effects show that our results are robust to potential endogeneity arising from omitted variables that impact both firm value and the matching of firms and CEOs.

As another test to control for the impact of endogenous CEO choice, we distinguish between forced and unforced or voluntary CEO turnovers. Since unforced CEO turnovers are uncorrelated with firm performance, the endogeneity of CEO choice is more likely to impact firm value in forced CEO turnovers than in unforced turnovers. We manually examine news articles to determine the cause of each CEO transition in our sample and classify each transition as forced or unforced. We find that the positive effect of CEO optimism on firm value is statistically indistinguishable across forced and unforced turnovers.

Our theoretical contribution is a model linking the strength of the impact of CEO optimism on firm value to industry competition and externalities. Our empirical contribution is to characterize firms that are more likely to benefit from having optimistic CEOs, and to offer analyses that show that these effects are causal.

The paper proceeds as follows. Section 2 reviews the research on the relation between CEO optimism and corporate policies, models externalities across firms in an industry to examine how the impact of CEO optimism on firm value depends on industry competition and derives predictions about the relation between CEO optimism and firm value. Section 3 describes the data and method. Section 4 presents our findings on the relation between CEO optimism and firm value. Section 5 examines how these effects vary across different types of firms. Section 6 discusses the implications of the study. The proofs are in Appendix A. We examine the impact of the passage of the Sarbanes-Oxley Act in Appendix B.

2 | Theory

Malmendier and Tate (2015) point out that the theoretical predictions about how CEOs' overestimation of their own abilities affects corporate outcomes are often more subtle than they may at first appear. In Section 2.1, we summarize the insights from current models and identify the effects of CEO optimism on firm policies to extract their implications for firm value. In Section 2.2, we present a model of externalities within an industry to examine how the impact of CEO optimism on firm value depends on industry concentration.

2.1 | Implications of CEO Optimism for Firm Value

There is extensive literature that documents the prevalence of overconfidence or optimism in people across different domains (Williams and Gilovich 2008; Dunning 2012). About 80% of the population displays an optimism bias (Sharot 2011) and, consequently, a large fraction of CEOs are likely to be optimistic. Thus, assessing the impact of CEO optimism on marginal firm value is important for understanding the efficiency of CEO selection. Economists and other social scientists have addressed the issue of whether overconfidence confers a disadvantage or a benefit to individuals (Puri and Robinson 2007; Johnson and Fowler 2011; Sharot 2011; Schmitt et al. 2013). In most standard economic models of firms, optimism, like any other deviation from rationality, reduces firm value. Some explanations exist for why optimistic preferences survive in equilibrium. For example, Bernardo and Welch (2001) show that overconfident entrepreneurs are more willing to explore new information than rational entrepreneurs. This is privately costly to the overconfident entrepreneur but is socially optimal, so groups with some overconfident entrepreneurs are more likely to survive (see also Johnson and Fowler 2011 and Heifetz, Shannon, and Spiegel 2007). However, these models do not focus on whether CEO optimism is value-enhancing or value-destroying for a firm.

Testing these theories is not straightforward. While theoretical literature compares optimistic CEOs with rational CEOs, empirical literature compares more optimistic CEOs to less optimistic, rational or pessimistic CEOs and it is not clear if the value implications of CEO pessimism are the opposite of the value implications of CEO optimism.

2.1.1 | Negative Effects of CEO Optimism on Firm Value

CEO optimism impacts many corporate policies.[6] Malmendier and Tate (2005) show that optimistic CEOs overestimate the returns to investment. However, the CEO's desire to invest more than a rational CEO is checked by the CEO's perception that external financing is too costly.[7] Malmendier and Tate (2008) show that overconfident CEOs are more likely to undertake mergers and the market reaction to merger announcements of overconfident CEOs is significantly more negative than that of non-overconfident CEOs. Andreou et al. (2019) present a model in which overconfident CEOs are more likely to diversify when facing diminishing returns to scale in core business and they document that CEO overconfidence is more detrimental to firm value in diversified firms. Malmendier, Tate, and Yan (2011) show that overconfident managers use less external capital and, conditional on accessing external capital, are averse to equity financing. Deshmukh, Goel, and Howe (2013) show that optimistic CEOs pay lower dividends than rational CEOs. Banerjee, Humphery-Jenner, and Nanda (2015) show that adequate controls and independent viewpoints provided by an independent board mitigate the costs of CEO overconfidence. Deshmukh, Goel, and Howe (2021) show that an optimistic CEO holds less cash than a rational CEO. Assuming that rational CEOs maximize firm value, these studies suggest that CEO optimism is likely to result in suboptimal decisions that lower firm value.

If CEO optimism results in suboptimal corporate decisions, why do optimistic and rational CEOs coexist? This is not necessarily a puzzle as optimism is just one of many personality attributes and skills that firms observe when selecting CEOs. Hence, even if the CEO's optimism reduces firm value, a board that is interested in maximizing shareholder value may hire an optimistic CEO if she has a much higher ability than a rational CEO. Alternatively, a board may find it hard to discern whether the superior performance of a candidate for CEO is due to higher ability or due to overconfidence (Goel and Thakor 2008). Another potential explanation for the prevalence of optimistic CEOs is that CEO optimism confers some benefits to firms.

2.1.2 | Positive Effects of CEO Optimism on Firm Value

First, optimism or overconfidence 'serves to increase ambition, morale, resolve, persistence, or the credibility of bluffing, generating a self-fulfilling prophecy in which exaggerated confidence actually increases the probability of success' (see Johnson and Fowler (2011) and the references therein). Second, even if deviation from rationality hurts optimistic agents, they may benefit from externalities among agents. Either an optimistic CEO's actions cause a greater decline in the value of other firms than in her own firm's value, or a rational CEO's actions cause a greater increase in the value of the firm led by an optimistic CEO than in her own firm. Third, we know from existing literature that rational CEOs do not always maximize value. For example, risk aversion and agency problems may cause rational CEOs to underinvest. Compensation contracts cannot completely alleviate this problem. CEO optimism can counter risk aversion and ameliorate the underinvestment problem.

Next, we review research that highlights various channels through which CEO optimism may add value to firms. Specifically, we identify three channels and develop empirical predictions. In addition, we develop a model relating industry competition to the benefits of CEO optimism.

2.1.2.1 | Optimism and Risk-Taking. Goel and Thakor (2008) model CEO selection as a tournament among managers where the output of a manager's project depends on the manager's ability and risk choice. An overconfident manager underestimates risk and chooses a riskier project, which increases the probability that the manager outperforms others and is selected to be the CEO. The model predicts that overconfident CEOs are more likely to be found in firms in riskier industries and in firms that place a greater emphasis on merit-based promotions. Goel and Thakor (2008) further show that overconfidence or optimism in a CEO can be beneficial to the firm as optimism counteracts the underinvestment problem that results from the CEO's risk aversion. However, too much optimism can lead to overinvestment. Optimistic CEOs also underinvest in information acquisition. Thus, Goel and Thakor (2008) predict that moderate optimism increases firm value but very high optimism decreases firm value.

Gervais, Heaton, and Odean (2011) develop a model of capital budgeting in which risk-neutral shareholders use an endogenous compensation contract to incentivize a risk-averse manager to take on more risk. However, the strength of incentives is limited by the cost that the risk imposes on the manager. An overconfident manager underestimates the risk and is more willing to take on riskier projects. The firm can exploit this bias with a flatter compensation contract, a result consistent with the empirical evidence provided by Otto (2014). When firms compete in the labour market for managers, an overconfident manager can capture some of the surpluses he or she creates and can be better off than a rational manager. Gervais, Heaton, and Odean (2011) also show that overconfident managers exert greater effort to investigate risky projects because they overestimate the benefits from these projects. As in Goel and Thakor (2008), they also find that extreme levels of overconfidence can make managers worse off. Their model shows that the most overconfident executives will tend to end up in risky growth firms, a prediction confirmed by the evidence in Graham, Harvey, and Puri (2013). This literature yields the following predictions:

Prediction 1. *CEO optimism adds more value in riskier firms than in less risky firms* (*Goel and Thakor* 2008*; Gervais, Heaton, and Odean* 2011).

Prediction 2. *Moderate optimism increases firm value but sufficiently high optimism decreases firm value* (*Goel and Thakor* 2008).

2.1.2.2 | Optimism as Motivator. Gervais and Goldstein (2007) show that optimism in an agent can be beneficial to a firm when agents' actions are complements. The optimistic agent overestimates his productivity and works harder. In the absence of any strategic response from other agents, the optimistic agent will be worse off than rational agents. However, when agents' actions are complements, an optimistic agent's effort increases the productivity of other agents and they rationally work harder, which can make the firm and all agents

in the firm better off than if all agents were rational. Their analysis (Propositions 1 and 3) implies that firm value is increasing in CEO optimism and that CEO optimism will lead to a greater increase in firm value where employee or executive effort choices are important determinants of firm value and the effort choices are synergistic.

The influence of a CEO with strong beliefs on the firm's activities has also been addressed by Rotemberg and Saloner (2000) and Van den Steen (2005). Rotemberg and Saloner (2000) show that incentives for profitable innovation may be enhanced with a 'visionary' CEO, a CEO who is biased in favour of certain projects. Van den Steen (2005) shows that a CEO with strong beliefs attracts like-minded employees and can improve incentives and coordination. This literature leads to the following prediction:

Prediction 3. *The marginal firm value associated with CEO optimism is greater in firms where employee or executive effort choices are important determinants of firm value and their effort choices are synergistic* (*Gervais and Goldstein* 2007).

2.1.2.3 | Optimism and Innovation. Galasso and Simcoe (2011) present a model in which engaging in innovation is costly to CEOs but a successful innovation signals high CEO ability. An overconfident CEO overestimates his ability and is, therefore, more likely to engage in innovation. This effect is stronger in more competitive industries because the signalling value of innovation is assumed to be higher in more competitive industries. Their empirical tests confirm these predictions. Galasso and Simcoe (2011) also find that overconfident CEOs have greater R&D productivity. In a model extension, they predict that a marginal increase in cash flow tends to have a greater impact on the investment decisions of biased CEOs. This is also one of the main results in Malmendier and Tate (2005). If firms led by rational CEOs underinvest (e.g., due to CEO's risk aversion), then the result in Galasso and Simcoe (2011) implies that CEO optimism creates more value in firms with greater cash flow.

Hirshleifer, Low, and Teoh (2012) also test the link between CEO overconfidence and innovation. They find that overconfident CEOs invest more in innovation, obtain more patents and patent citations and achieve greater innovative success for given research and development expenditures. However, they find that overconfident managers achieve greater innovation only in innovative industries.

Prediction 4. *The marginal firm value associated with CEO optimism is greater in firms with greater R&D investment* (*Galasso and Simcoe* 2011*; Hirshleifer*, *Low*, *and Teoh* 2012).

Prediction 5. *The marginal firm value associated with CEO optimism is greater in firms with greater cash flow* (*Malmendier and Tate* 2005*; Galasso and Simcoe* 2011).

2.2 | Externalities and the Value Impact of CEO Optimism

Kyle and Wang (1997) present a model in which overconfidence dominates rationality, providing a potential explanation for why overconfidence persists in the population. In their duopoly model of informed speculation, two competing informed traders choose the intensity with which they trade on their common private information. Trading more aggressively allows a trader to increase profits by taking larger positions but also reveals private information and dilutes the expected profit margin on trades. The optimal trading intensity is based on a comparison of these two effects. However, an overconfident trader overestimates his information and trades more aggressively. Realizing that this may reveal too much private information, the rational trader reduces her trading intensity. Overconfidence, thus, acts as a commitment device and allows the overconfident trader to increase profits relative to the rational trader.

The idea that CEO optimism acts as a commitment device in R&D races has been modelled by Englmaier (2010) and Yu (2014). Yu (2014) presents a model in which an optimistic CEO's overinvestment in innovation reduces firm value. However, when competitors strategically respond in an oligopoly, the CEO's optimism acts as a commitment device and offers a strategic advantage. The paper predicts that the intensity of product-market competition and the equilibrium level of CEO overconfidence exhibit an inverted U-shaped relationship.

If firms led by optimistic CEOs benefit from externalities, as discussed above, then the benefits of CEO optimism may depend on the strength of externalities. To formalize and test this intuition, we now develop a parsimonious model in which the degree of industry competition determines the extent to which the actions of one firm influence the remaining firms in the industry. Our goal is to derive an empirical prediction linking the value impact of CEO optimism to the degree of competition in the industry.

Consider an industry with N firms. Each firm's CEO makes a personally costly investment in the firm that makes the firm more valuable. Specifically, assume that this investment increases the quality of the firm. A higher quality may represent, for example, a higher quality of products or lower costs of production. We assume that firm values are proportional to their respective qualities. This assumption is without loss of generality as we can redefine quality with a monotonic transformation.

Our second assumption is that the value gain for a firm from an increase in its quality comes at least partially at the expense of the other firms in the industry. This is our notion of competition. A special case of the model is a zero-sum game in which the total value of the firms in the industry is fixed. However, the model also allows for a situation in which an increase in a firm's quality increases the aggregate value of the firms in the industry but this increase is less than the value gain of the firm increasing the quality.

The following specification for the value V_i of firm i captures these two features.

$$V_i = \frac{Q_i}{\overline{Q}}\overline{V}, \tag{1}$$

where Q_i is the quality of firm i, $\overline{Q} = \sum_{j=1}^{N} Q_j/N$ is the average firm quality in the industry, and $\overline{V}$ is the average firm value in the industry, which depends on the average firm quality:

$$\overline{V} = C\overline{Q}^{\beta}, \tag{2}$$

where $0 \leq \beta < 1$. Here $\beta = 0$ represents a zero-sum competition among firms and $\beta > 0$ represents investments in quality that increase aggregate industry value.

Each CEO maximizes her firm's value net of the personal cost of quality choice.[8] The cost to the CEO of attaining quality Q is decreasing in the CEO's ability and increasing in the uncertainty $\sigma(Q)$ of the strategy needed to attain quality Q. The function $\sigma(Q)$ is increasing—there is more uncertainty about the strategy needed for attaining higher quality. Some CEOs may be optimistic. Consistent with the models of optimism, an optimistic CEO overestimates her ability or underestimates the uncertainty $\sigma(Q)$. One or both of these traits cause an optimistic CEO to underestimate the cost of attaining a quality.

For concreteness, suppose a CEO's personal cost of choosing a quality Q is aQ^2 where a is a positive constant.[9] A fraction p of the firms have optimistic CEOs. An optimistic CEO believes that her cost of choosing quality Q is αaQ^2 where $0 < \alpha < 1$. CEO optimism reduces the wedge between the CEO's objective and the shareholders' objective, analogous to the effect of optimism in mitigating managerial risk aversion in Goel and Thakor (2008), and benefits shareholders.

We consider a Nash equilibrium in which each CEO chooses her firm's quality, taking the quality choices of the other firms as given. Using equations (1) and (2), a rational CEO for firm i chooses Q_i to maximize

$$CQ_i\left(\frac{N}{Q_i + \sum_{j\neq i} Q_j}\right)^{\gamma} - aQ_i^2 \tag{3}$$

where $0 < \gamma = 1 - \beta \leq 1$. An optimistic CEO of firm i chooses Q_i to maximize

$$CQ_i\left(\frac{N}{Q_i + \sum_{j\neq i} Q_j}\right)^{\gamma} - \alpha aQ_i^2. \tag{4}$$

The following result characterizes the equilibrium.

Proposition 1. *There is a unique Nash Equilibrium in which each firm led by a rational CEO has the value V_R, each firm led by an optimistic CEO has the value V_O, $V_O > V_R$, and the ratio V_O/V_R is increasing in the number of firms in the industry and also increasing in the fraction of firms with optimistic CEOs.*

This result establishes that firms with optimistic CEOs are more valuable than those with rational CEOs. In addition, the value premium of a firm managed by an optimistic CEO relative to a firm managed by a rational CEO increases as the number of firms in the industry increases, or equivalently, as industry concentration decreases. The value premium is also increasing in the fraction p of optimistic CEOs.[10]

The intuition for the Proposition is that the impact of an optimistic CEO's policies is spread over a greater number of competing firms in less concentrated industries and has a smaller impact on any single competitor. As a result, rational CEOs change their strategies less aggressively in response to the strategy choice of optimistic CEOs, thereby allowing firms led by optimistic CEOs to absorb more of the positive impact of their CEOs' actions.

Notice that a rational CEO can mimic the policies of the optimistic CEOs to increase his/her own firm value, but doing so comes at an incremental cost. Optimistic CEOs underestimate this cost. A rational CEO, who does not underestimate this cost, cannot credibly commit to act as an optimistic CEO. Even if a board chooses to incentivize its CEO to act in an optimistic way, such incentive provision is less costly if the CEO is already optimistic than if the CEO is rational. The Proposition yields the following new predictions.

Prediction 6. *CEO optimism has a greater impact on firm value in more competitive industries* (*Proposition* 1).

Prediction 7. *CEO optimism has a greater impact on firm value in industries with a greater fraction of optimistic CEOs* (*Proposition* 1).

Since CEO optimism has both positive and negative effects on firm value, we provide no prediction regarding the average effect of CEO optimism on firm value. However, we empirically determine the average effect of CEO optimism on firm value. In Section 5, we test Predictions 1, 4, 5, 6, and 7.

3 | Data and Variables

Our initial sample consists of firms included in the Standard and Poor's Execucomp database over the period 1992–2012. We eliminate observations for financial firms (SIC 6000–6999), utilities (SIC 4900–4999) and regulated telephone companies (SIC 4813), which result in 10,611 firm-year observations for 1587 firms. We supplement the data from Execucomp with various items from the COMPUSTAT database to construct our control variables.

Our measures for CEO optimism are based on the option-compensation data from the Execucomp database. CEOs have their human capital heavily invested in their firms and, typically, stock and options represent a large component of most CEO compensation packages. The options held by CEOs are non-tradeable and the CEOs are typically prohibited from hedging their exposure by short selling their company stock. As a result, CEOs are underdiversified and highly exposed to company-specific risk. Underdiversified CEOs should rationally exercise their vested options early if they are sufficiently deep in-the-money (Hall and Murphy 2002). An optimistic CEO, however, overestimates his firm's future payoff and perceives the firm's stock to be undervalued. So, despite being underdiversified, an optimistic CEO is less likely to exercise stock

options and thus holds the options longer than his/her non-optimistic counterparts. Malmendier and Tate (2005, 2008) use this rationale to derive CEO overconfidence measures based on the option-exercise behaviour of CEOs. Our measures of CEO optimism, *Optimism* and *Post-Optimism*, are also based on this rationale.

3.1 | Optimism

Following Campbell et al. (2011), we set Optimism equal to one over all the CEO-years of a CEO if the CEO held an option that was more than 100% in the money at least once during his/her tenure, and zero otherwise. The Optimism variable thus represents a fixed effect over all of a CEO's years. For robustness, we consider several alternative criteria for classifying CEOs as optimistic, based on Campbell et al. (2011) and Hirshleifer, Low, and Teoh (2012), and show that our results are robust to these alternative classifications. We discuss these results later.

Since the Execucomp database does not provide detailed data on the option holdings of a CEO or the exercise price associated with each option grant, we follow Campbell et al. (2011) to calculate the average moneyness of a CEO's option holdings for each year in our sample period. We compute the realizable value per option as the ratio of the total realizable value of exercisable options to the number of exercisable options. We subtract the realizable value per option from the fiscal-year-end stock price to obtain an estimate of the average exercise price of options. We divide the realizable value per option by the estimated average exercise price to determine the average moneyness of the options.

3.2 | Post-optimism

Optimism can be an inherent trait but can also vary across time based on life experiences (Gillham and Reivich 2004). We construct Post-optimism that allows for time variation in CEO optimism over the sample period and eliminates forward-looking information in the classification of a CEO. Post-optimism equals one in all CEO-years following (and including) the first year in which the CEO holds an option that is more than 100% in the money, and zero otherwise. This measure is motivated by the Post-Longholder measure in Malmendier and Tate (2005, 2008) and is similar to the rationale underlying the high-optimism measure in Campbell et al. (2011).

3.3 | Other Variables

To examine the effect of CEO optimism on firm value, we draw on the level regression model of firm value used by Dittmar and Mahrt-Smith (2007). This regression specification draws on Fama and French (1998), who use it to estimate the effect of debt tax shields on firm value. This specification has been used by other studies, such as Pinkowitz and Williamson (2004) and Pinkowitz, Stulz, and Williamson (2006), who investigate the effect of cash holdings on firm value. Pinkowitz, Stulz, and Williamson (2006) argue that even though this regression specification is ad-hoc, it does an effective job of explaining the cross-sectional variation in firm values. Controlling for this variation allows us to estimate the incremental effect of CEO optimism on firm value.

We use the regression model in Dittmar and Mahrt-Smith (2007) with the exception that we exclude the forward-looking variables. CEO optimism may affect these forward-looking variables, which, in turn, can affect firm value. To capture this potential indirect effect of CEO optimism on firm value, we exclude all forward-looking explanatory variables from the specification in Dittmar and Mahrt-Smith (2007). However, the results from our main regression models remain robust to the inclusion of the forward-looking variables, as in Dittmar and Mahrt-Smith (2007).

Our main independent variable of interest is CEO optimism. Our measure of optimism is based on the CEO's option-exercise behaviour of options highly in the money and may be correlated with the firm's past stock returns. To ensure that the optimism measure is not simply a proxy for high past stock returns, we follow Malmendier, Tate, and Yan (2011) and control for five lags of annual stock returns in all of our regressions.

We draw on Dittmar and Mahrt-Smith (2007) to calculate the variables. The dependent variable is the ratio of the firm's market value of assets to book value of assets. The market-to-book ratio is commonly used as a measure of firm value as it reflects investors' assessment of both expected cash flows and risk, and avoids the heteroskedasticity problem associated with using market value as the dependent variable. The control variables include those attributes that are likely to affect investors' expectations of future net cash flows, which, in turn, determine firm value (see Fama and French 1998). These include current levels and past changes in Earnings, R&D Expenditures, Dividends and Interest Expense, and past changes in Assets. All of these control variables are normalized by the firm's Book Value of Assets. In all of our regression models, we include both firm fixed-effects and year fixed-effects, and as noted earlier, five annual lags of stock return. We cluster standard errors by firm.

We estimate the following regression model:

$$\begin{aligned}\frac{\mathrm{MV}_{i,t}}{\mathrm{BVA}_{i,t}} = {} & \beta_0 + \beta_1 \mathrm{Optimism}_{i,t} + \beta_2 \frac{E_{i,t}}{\mathrm{BVA}_{i,t}} + \beta_3 \frac{dE_{i,t}}{\mathrm{BVA}_{i,t}} \\ & + \beta_4 \frac{RD_{i,t}}{\mathrm{BVA}_{i,t}} + \beta_5 \frac{dRD_{i,t}}{\mathrm{BVA}_{i,t}} + \beta_6 \frac{D_{i,t}}{\mathrm{BVA}_{i,t}} + \beta_7 \frac{dD_{i,t}}{\mathrm{BVA}_{i,t}} \\ & + \beta_8 \frac{I_{i,t}}{\mathrm{BVA}_{i,t}} + \beta_9 \frac{dI_{i,t}}{\mathrm{BVA}_{i,t}} + \beta_{10} \frac{d\mathrm{BVA}_{i,t}}{\mathrm{BVA}_{i,t}} \\ & + \sum_{j=1}^{5} \beta_{1j} \text{ Annual Stock Return}_{i,t-j} \\ & + \text{Year Fixed Effects} + \text{Firm Fixed Effects} + \epsilon_{i,t},\end{aligned} \tag{5}$$

where dX_t represents a change from time $t-2$ to t, $\mathrm{MV}_{i,t}$ equals the market value of assets at t and is calculated as price times

TABLE 1 | Summary statistics: Optimistic CEOs versus non-optimistic CEOs.

Panel A: All observations

	Optimistic CEOs			Non-optimistic CEOs		
Variable	**Mean**	**Median**	**Standard deviation**	**Mean**	**Median**	**Standard deviation**
MV-to-BV of assets	2.1361	1.7124	1.41	1.6212	1.3995	0.85
Book value of assets	6000.11	1481.72	21824.83	8619.37	1473.68	36552.81
Earnings to assets	0.0711	0.0825	0.12	0.0475	0.0653	0.14
RD to assets	0.0264	0	0.06	0.0246	0	0.06
Dividends to assets	0.0103	0	0.03	0.0142	0.0065	0.03
Interest expense to assets	0.0142	0.0111	0.02	0.0178	0.0145	0.02
Cash flow volatility	0.0778	0.0362	0.18	0.0738	0.0302	0.31
Capex to assets	0.0709	0.0507	0.07	0.0591	0.0424	0.06
CEO tenure (years)	9.56	8.00	8.11	4.94	3.00	6.05
Observations		4969			5114	

Panel B: Observations with time-varying optimism within a firm

	Optimistic CEOs			Non-optimistic CEOs		
Variable	**Mean**	**Median**	**Standard deviation**	**Mean**	**Median**	**Standard deviation**
MV-to-BV of assets	2.1333	1.7109	1.41	1.6566	1.4288	0.81
Book value of assets	7486.51	1755.80	25521.14	11219.19	1748.09	44175.44
Earnings to assets	0.0714	0.0819	0.11	0.0489	0.0672	0.13
RD to assets	0.0257	0	0.05	0.0268	0	0.05
Dividends to assets	0.0106	0.0037	0.03	0.0128	0.0047	0.02
Interest expense to assets	0.0146	0.0118	0.02	0.0171	0.0140	0.02
Cash flow volatility	0.0663	0.0333	0.15	0.0702	0.0295	0.22
Capex to assets	0.0700	0.0515	0.06	0.0608	0.0428	0.06
CEO tenure (years)	8.83	7.00	8.01	4.16	3.00	5.29
Observations		3557			3422	

Note: The summary statistics are based on pooled data over the period 1992–2012. The observations for optimistic CEOs (non-optimistic CEOs) correspond to observations for which Post-optimism equals one (zero). Post-optimism equals one in all CEO-years following (and including) the first year in which the CEO holds an option that is more than 100% in the money, and zero otherwise. MV-to-BV of assets equals the ratio of the market value of assets to book value of assets, where the market value of assets equals the market value of equity plus book value of total liabilities. Book value of assets is the book value of assets in $ millions. Earnings to assets equals the ratio of earnings to assets. RD to assets equals the ratio of R&D expenditures to assets. Dividends to assets equals the ratio of dividends to assets. Interest expense to assets equals the ratio of interest expense to assets. Cash flow volatility equals the standard deviation of the firm's cash flow over the prior 10-year period, where cash flow equals the ratio of operating income before depreciation *less* interest expense *less* income taxes *less* common and preferred dividends *to* book value of assets. Capex to assets equals the ratio of capital expenditures to assets. CEO tenure is the tenure of the CEO with the firm in years.

shares outstanding plus total liabilities, $BVA_{i,t}$ equals book value of assets at t, $E_{i,t}$ equals earnings before extraordinary items over the period $t-1$ to t, $RD_{i,t}$ equals R&D expenditures over the period $t-1$ to t (and set to zero if missing), $I_{i,t}$ equals the Interest expense over the period $t-1$ to t, and $D_{i,t}$ equals common dividends over the period $t-1$ to t.

4 | Empirical Results

We begin our empirical analysis with univariate comparisons between subsamples with Optimism = 1 (optimistic CEOs) and Optimism = 0 (non-optimistic CEOs). Next, we perform a multivariate analysis by estimating a regression model of firm value (measured by the market-to-book ratio of assets) as a function of CEO optimism and the control variables. We then discuss other potential explanations for our main findings. We perform many robustness and endogeneity checks, including the use of an instrumental variable to control for potential endogeneity of CEO selection. We then use interactive effects to examine how the incremental market-to-book ratio due to CEO optimism varies across firms.

The summary statistics in Panel A of Table 1 show that optimistic-CEO observations represent slightly less than half of the total firm-year observations. The mean and median values of the market-to-book ratio (of assets), our main variable of interest, are higher for optimistic-CEO observations. In addition, firms associated with optimistic-CEO observations are smaller on average, have higher average R&D, higher capital

expenditures, higher earnings, higher cash flow volatility, higher CEO Tenure (tenure of the CEO with the firm in years) and lower interest expense and dividends. The differences in firm characteristics may lead to differences in firm value across these two groups. Our multivariate analysis controls for variables that have been shown to explain the cross-sectional variation in firm values.

Since we control for firm fixed-effects in regressions, the impact of CEO optimism on firm value reflects within-firm variation rather than cross-sectional variation. Therefore, we need variation in CEO optimism within a given firm to determine how firm value differs between firms led by optimistic and non-optimistic CEOs. This variation is missing in those firms in our sample that have only optimistic CEOs or only non-optimistic CEOs. For these firms, the value of the optimism variable is either always one or always zero. In Panel B of Table 1, we exclude firms where the optimism variable is either always one or always zero and report summary statistics for the 941 firms in our sample that have an optimistic CEO in at least 1 year and a non-optimistic CEO in at least 1 year. There are 3557 firm-year observations for optimistic CEOs and 3422 firm-year observations for non-optimistic CEOs. As in Panel A, the mean and median values of the market-to-book ratio are meaningfully higher for firms with optimistic CEOs. The differences in the values of the other firm attributes are similar to those in Panel A. All of our reported results are based on regressions that use the entire data set (summarized in Panel A) in order to estimate the coefficients of control variables more precisely. However, our main results are qualitatively unchanged if we restrict data to observations summarized in Panel B.

4.1 | CEO Optimism and Firm Value

Our main regressions estimate Equation (5) for our sample. The independent variable of interest is CEO optimism. We control for firm fixed-effects, year fixed-effects, five annual lags of stock return and cluster standard errors by firm, unless stated otherwise. We estimate each model using all observations for which data are available on all variables for that model.

The results from Model 1 in Table 2 indicate that firm value, measured by the market-to-book ratio of assets, is positively related to optimism and the coefficient is statistically significant at the 1% level. The magnitude of the coefficient on Optimism, which represents the incremental effect of CEO optimism on firm value, is 0.3209. This magnitude is about 17% of the mean firm value of about 1.88 for the overall sample. Therefore, the effect of CEO optimism appears to be economically meaningful. The coefficient of 0.3209 on Optimism represents the average marginal increase in firm value attributable to CEO optimism over the CEO's tenure—it does not represent the annual change in firm value. Based on the average CEO tenure of 9.56 years for optimistic CEOs, CEO optimism increases firm value by approximately 1.8% each year.

In Model 2, we use Post-optimism in place of the Optimism variable. The overall results are qualitatively similar to those in Model 1. The coefficient on Post-optimism in Model 2 is economically significant—its magnitude is roughly 26% of the median market-to-book value (of about 1.52) for the overall sample.

As a robustness check, we estimate Models 1 and 2 using a specification that is identical to that in Dittmar and Mahrt-Smith (2007). The results with respect to the effect of optimism on firm value, presented in Models 3 and 4, respectively, are qualitatively similar to those in Models 1 and 2, respectively.

As noted earlier, observations for firms that have only optimistic CEOs in all years and for firms that have only non-optimistic CEOs in all years do not directly contribute to the estimation of the impact of CEO optimism on firm value in regressions with firm fixed-effects. As a robustness check, we estimate Models 1 and 2 in Table 2 using only those firms that had an optimistic CEO in at least 1 year and a non-optimistic CEO in at least 1 year (i.e., observations summarized in Panel B in Table 1). The results are presented under Models 5 and 6 in Table 2. The magnitudes of the coefficients on Optimism and Post-optimism in Models 5 and 6 are virtually identical to those in Models 1 and 2, respectively, and confirm that optimistic CEOs have an economically significant positive effect on firm value. The other coefficients are qualitatively similar to those in Models 1 and 2.

The inclusion of firm fixed-effects in our models indicates that our results are based only on within-firm variation in CEO optimism—an optimistic CEO is associated with higher firm value than a non-optimistic CEO for the same firm. This pattern is evident in Figure 1, which depicts the impact of a change in CEO on the market-to-book residual of the firm, which represents the part of the market-to-book ratio of the firm that cannot be explained by firm characteristics. The shaded bands represent 95% confidence intervals. A comparison of the two plots shows that the change in the market-to-book ratio across the CEO transition is higher when the newly appointed CEO is optimistic than when the newly appointed CEO is non-optimistic.[11]

As we note in Section 2.1, optimistic CEOs may pursue suboptimal corporate policies, lowering firm value. On the other hand, optimism may confer some benefits to firms. The results in Table 2 suggest that, on average, the benefits of CEO optimism outweigh the costs for the firms in our sample.

CEOs are not randomly assigned to firms and our results may reflect the appointment of optimistic CEOs in more valuable firms or a higher tendency of CEOs to turn optimistic in more valuable firms. We address these important endogeneity concerns, along with others, in Section 4.4.

4.2 | Ruling Out Other Potential Explanations of Our Findings

Our measures of optimism are based on the option-exercise behaviour of the CEO, which may be determined by factors other than optimism. However, Malmendier and Tate (2005, 2008) rule out several alternative interpretations of their option-based optimism measure. Specifically, they rule out taxes, board pressure, corporate governance, inside information, signalling, variation in volatility and inertia.

TABLE 2 | CEO optimism and firm value.

	All observations		All observations *with* forward-looking variables		Observations with time-varying optimism	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)	(Model 6)
Optimism	0.3209***		0.2739***		0.3137***	
	(7.86)		(6.10)		(8.15)	
Post-optimism		0.3935***		0.3126***		0.3886***
		(11.23)		(7.67)		(11.54)
Earnings to assets	0.8842***	0.9685***	0.8350**	0.6678*	1.0785***	1.0589***
	(3.62)	(4.53)	(2.35)	(1.66)	(4.44)	(3.99)
ΔL2 Earnings to assets	−0.3105**	0.2601**	0.2015**	0.3470***	0.0024	0.3078***
	(−2.36)	(2.54)	(2.27)	(3.47)	(0.02)	(2.69)
ΔF2 Earnings to assets			0.4376	0.4419		
			(1.48)	(1.30)		
R&D to assets	1.7197***	1.5554***	4.9203***	4.4221***	1.6355	2.8260*
	(2.92)	(2.72)	(2.95)	(2.58)	(1.14)	(1.84)
ΔL2 R&D to assets	−0.6172***	0.2353	0.6945	0.9207	3.1476***	0.7670
	(−3.27)	(1.53)	(0.84)	(1.08)	(4.86)	(0.75)
ΔF2 R&D to assets			4.8112***	4.6002***		
			(4.05)	(3.73)		
Dividends to assets	2.8245**	2.3855*	2.9101	2.7446	2.1153*	1.8012
	(2.39)	(1.83)	(1.50)	(1.31)	(1.84)	(1.51)
ΔL2 Dividends to assets	−0.3249	−0.4289	0.0830	0.0593	−0.2581	−0.2843
	(−0.86)	(−1.06)	(0.22)	(0.16)	(−0.82)	(−0.80)
ΔF2 Dividends to assets			1.5256**	1.4218*		
			(2.08)	(1.85)		
Interest expense to assets	−1.2391	3.7287**	−0.6843	0.6834	3.2019**	4.5214**
	(−1.40)	(1.99)	(−0.28)	(0.27)	(2.17)	(2.00)
ΔL2 Interest expense to assets	2.3002**	−4.5867***	−3.6560***	−4.5748***	−0.0753	−4.4626***
	(2.40)	(−3.27)	(−2.92)	(−3.51)	(−0.05)	(−2.57)
ΔF2 Interest expense to assets			−5.7479***	−5.6863***		
			(−4.12)	(−3.83)		
ΔL2 Assets to assets	0.0016	0.0046	0.0315	0.0386	−0.0316	0.0093
	(0.59)	(0.13)	(1.08)	(1.18)	(−0.84)	(0.25)
ΔF2 Assets to assets			0.7044***	0.7113***		
			(8.50)	(8.20)		
ΔF2 Market value to assets			−0.2545***	−0.2397***		
			(−8.23)	(−7.47)		
Five lags of stock return	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm	Firm	Firm	Firm	Firm	Firm
Standard errors clustered	By firm	By firm	By firm	By firm	By firm	By firm

(Continues)

TABLE 2 | (Continued)

	All observations		All observations *with* forward-looking variables		Observations with time-varying optimism	
	(Model 1)	(Model 2)	(Model 3)	(Model 4)	(Model 5)	(Model 6)
Firm-year observations	10,611	10,083	7610	7217	7291	6979
Adjusted R^2	0.6646	0.6847	0.7664	0.7740	0.6512	0.6732

Note: The estimates are from a regression model, estimated on the pooled data over the period 1992-2012. In all of the regression models, the dependent variable is the ratio of the firm's market value of assets to book value of assets. The independent variables are: Optimism, which equals one over all the CEO-years if the CEO held an option that was more than 100% in the money at least once during his/her tenure, and zero otherwise; Post-optimism, which equals one in all CEO-years following (and including) the first year in which the CEO holds an option that is more than 100% in the money, and zero otherwise; and the 2-year lagged change (ΔL2), the 2-year forward change (ΔF2), and the current values of the following ratios: earnings to assets, R&D to assets, dividends to assets and interest expense to assets. The other independent variables include the 2-year lagged change (ΔL2) and the 2-year forward change (ΔF2) in assets, and the 2-year forward change (ΔF2) in the market value of assets. All models include five lags of annual stock returns, firm fixed-effects and year fixed-effects. The standard errors are clustered by firm.
***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

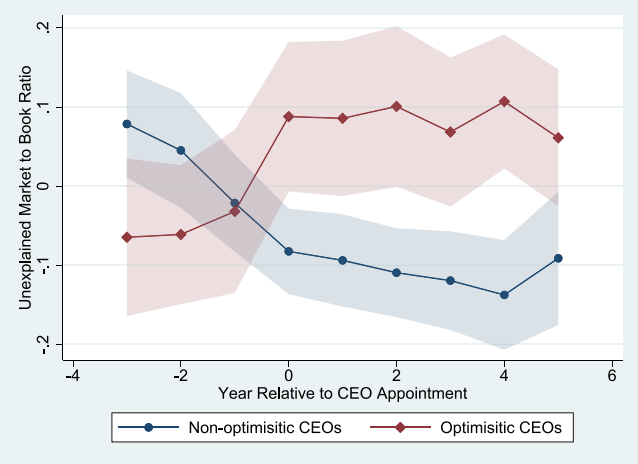

FIGURE 1 | Firm valuation and CEO transitions. [Color figure can be viewed at wileyonlinelibrary.com]

Our empirical proxy for CEO optimism may be capturing both irrational optimism and optimism based on private information (i.e., insider information). However, insider information is unlikely to explain our findings. If optimistic CEOs hold on to their options longer because they have positive inside information about their firm, then this information, by definition, is not public and cannot explain the higher market-to-book value of these firms, after controlling for known determinants of market-to-book value. To further differentiate CEO optimism from the CEO's private information, we test the theoretical predictions about how the impact of CEO optimism on firm value depends on firm characteristics. We would not observe the results of these interactive effects, documented later in the paper, if the optimism variable reflected only the CEO's favourable private information. We revisit this issue later in the paper in Section 5.5.

A CEO may postpone option exercise to defer a tax liability. However, there is no obvious economic rationale for a relation between personal income tax deferral by the CEO and higher firm value, particularly, after controlling for past stock returns.

Board pressure may affect the CEO's option-exercise behaviour. Since board composition tends to be stable over time, our inclusion of firm fixed-effects should control for differences in board influence and corporate governance.

If CEOs hold options longer due to a higher willingness to take risk, then their preferences are likely to be better aligned with diversified investors and their beliefs will coincide with those of investors. As we discuss later, we control for cash flow volatility, a measure of risk, and the CEO's ownership of both stock and vested options, which are likely to depend on the CEO's risk preferences. The positive relation between CEO optimism and firm value remains robust after controlling for these variables.

In sum, alternative interpretations of our optimism measure are unlikely to explain our findings.

4.3 | Robustness Checks

We perform several tests to check the robustness of our main findings.

By including control variables in our regressions, we do not measure any effect of CEO optimism on firm value through its impact on control variables. Even though we recognize that excluding the control variables may bias the coefficient on optimism, we estimate the overall effect of Optimism on firm value by excluding the other explanatory variables from Model 1 in Table 2, while retaining firm fixed-effects, year fixed-effects and clustering standard errors by firm. The coefficient on Optimism remains positive, and is both economically and statistically significant ($p = 0.000$). We re-estimate this model by replacing the optimism variable with the post-optimism variable and find qualitatively the same results. This result establishes an economically meaningful baseline average effect of CEO optimism on firm value.

We also estimate a simple regression model on the pooled data, where we neither include any fixed effects nor cluster the standard errors. Our untabulated results indicate that firm value is positively related to CEO optimism and the coefficient on optimism is statistically significant at the 1% level and is of a similar magnitude to that in Table 2. Next, we estimate a regression model by including year fixed-effects, industry fixed-effects (in contrast to firm fixed-effects in Table 2) and clustering the standard errors by firm. The industry fixed-effects are based on the Fama-French 30-industry classification. The untabulated results indicate that firm value is again positively

related to CEO optimism and the coefficient is statistically significant at the 1% level. However, the lower adjusted R^2 of 0.2853 compared to the adjusted R^2 of 0.6646 for Model 1 in Table 2 suggests that it is important to control for firm heterogeneity via firm fixed-effects. Therefore, we report all of our results using a model specification that includes year fixed-effects, firm fixed-effects and the clustering of standard errors by firm. We obtain qualitatively the same results when we use the post-optimism variable in place of the optimism variable.

We consider alternative moneyness thresholds to identify optimistic CEOs. First, as in Malmendier and Tate (2005) and in Hirshleifer, Low, and Teoh (2012), we adopt a moneyness threshold of 67% and create Optimism67, which equals one over all the CEO-years if the CEO held an option that was more than 67% in the money at least once during his/her tenure and zero otherwise. We construct two more measures, OptimismTwice and Post-optimismTwice following Campbell et al. (2011). We set OptimismTwice equal to one over all the CEO-years if the CEO held an option, that was more than 100% in the money, at least twice during his/her tenure, and zero otherwise. Post-optimismTwice equals one in all CEO-years following (and including) the first of at least 2 years in which the CEO holds an option, that is more than 100% in the money, and zero otherwise. We estimate Model 1 from Table 2 by successively replacing optimism with each of the three alternative measures: Optimism67, OptimismTwice and Post-optimismTwice. For each of these three optimism measures, we find that the coefficient on the optimism measure is positive, economically meaningful and statistically significant at the 1% level.

Our measure of CEO optimism may be correlated with other CEO characteristics that impact firm value. The summary statistics in Table 1 indicate that optimistic CEOs have a longer CEO tenure. A positive association between optimism and CEO tenure arises mechanically given the way we construct CEO optimism. CEO stock ownership controls for agency costs associated with managerial discretion and for any potential incentive effects on firm value. Option ownership may impact a CEO's incentive to increase firm value. We estimate Models 1 and 2 in Table 2 after including CEO tenure, CEO stock ownership and CEO option ownership and find that the relation between firm value and CEO optimism remains positive and is both economically and statistically significant.

A majority of stock-option awards vest 3 to 4 years after the grant date (Chin, Wong, and Prabhakar 2013). Therefore, the CEO may need to be with the firm for at least 3 to 4 years before CEO optimism can be detected. To rule out a confounding effect of CEO tenure on our analysis, we estimate Model 1 in Table 2 by filtering out CEOs with a tenure less than 4 years. The positive relation between CEO optimism and firm value remains both economically and statistically significant. We obtain qualitatively similar results when we filter out CEOs with a tenure less than 3 years, 5 years and 6 years, respectively.

We control for the possibility that optimistic CEOs are attracted to industries that are performing well by estimating Models 1 and 2 from Table 2 with industry-by-year fixed effects, and clustering standard errors by firm. The relation between firm value and CEO optimism remains positive, and is both economically and statistically significant.

4.4 | Endogeneity Concerns

Our interpretation of the empirical results treats CEO optimism as exogenous. If CEO optimism is endogenously determined, then our results may be consistent with alternative explanations. We now consider and address the potential effects of endogeneity arising from CEO selection, reverse causality and omitted variables. The results from the following endogeneity checks suggest that CEO optimism has a causal effect on firm value.

Fee, Hadlock, and Pierce (2013) suggest that managerial style inferred from management changes may not represent causation as boards may simultaneously change the firm's leadership and corporate policies. They specifically note that 'F-tests on manager-specific dummy variables are not valid indicators of managerial-style effects'. While we take the endogeneity of CEO selection seriously in the following analyses, the specific criticism about manager-specific dummy variables is inapplicable in our case because our measure of CEO optimism is based on CEO's option-exercise behaviour, and is not a manager-specific dummy variable. Moreover, all of our empirical results hold with the post-optimism variable, which is time-varying, and therefore, clearly not determined at the time of CEO selection. Theoretically, if the relation between CEO optimism and firm value is not a causal one and merely driven by the endogeneity of the board's CEO choice, then it is difficult to come up with an explanation for why boards that adopt policies to enhance firm value also choose optimistic CEOs. Nonetheless, we perform and describe below several tests to address the broader point about the endogeneity of CEO selection.

We now consider the possibility that some firm characteristics that cause boards to hire optimistic CEOs also cause these CEOs to increase firm value. We address this concern using an instrumental-variable approach. This approach requires instruments that affect CEO optimism but not firm value other than possibly through the effect on CEO optimism. Firm characteristics are not good candidates for instruments because they may have an independent effect on firm value. CEO personality characteristics, such as CEO gender, may impact CEO optimism but cannot be considered exogenous because the board may base its CEO choice on these characteristics. That is, while CEO gender is exogenous to the CEO, it is not exogenous for the firm because the board can choose the CEO based on gender.

We use an instrumental variable and estimate our model using the two-stage least squares (2SLS) approach (see Roberts and Whited 2012). Our instrument measures the incidence of optimism in the candidate pool from which the board chooses a CEO. If a higher fraction of these candidates are optimistic, then the CEO chosen by the board is more likely to be optimistic even if the board does not specifically opt for an optimistic CEO.

We assume that the incidence of optimism among the CEOs hired in a given month is representative of the incidence of optimism in the population of candidates considered by a board

for the CEO position. We determine the months in which the CEOs in our data are appointed. For each month in which any CEO is appointed, we calculate the fraction of appointed CEOs that are optimistic CEOs as the ratio of the number of CEOs that are appointed that month and have a value of one for Optimism based on their option-exercise behaviour to the total number of CEOs appointed that month. We instrument for the optimism of a CEO of firm i with the fraction of optimistic CEOs among CEOs appointed in the same month. This fraction, based on the option-exercise behaviour of many CEOs in their respective firms, is unlikely to be related to the value of firm i other than through its potential influence on the CEO optimism of firm i. The instrument should, therefore, satisfy the exclusion condition.

We estimate Model 1 in Table 2 using the 2SLS approach where we instrument optimism with the fraction of optimistic CEOs. The first-stage results, presented under Model 1 in Table 3, indicate that the coefficient on the fraction of optimistic CEOs, the instrument, is positive and highly statistically significant. In addition, the first-stage regression of optimism on the instrument and other explanatory variables has a highly significant F statistic. In sum, the first-stage results establish the relevance of our instrument and indicate that a CEO is more likely to exhibit optimism when there is a greater fraction of optimistic CEOs among CEOs hired in the same month. The results from the second stage of the 2SLS approach, presented under Model 1 in Table 3, indicate that the coefficient on Optimism is positive and statistically significant (at the 1% level), indicating a causal effect of CEO optimism on firm value. In addition, this coefficient is economically significant and is of a similar magnitude as that in Model 1, Table 2.

Our instrument, the fraction of optimistic CEOs, varies across time and may reflect changing macroeconomic conditions. If so, the instrument might not be effective in addressing an endogeneity problem arising from time-varying macroeconomic conditions that affect both CEO optimism and firm value. However, time-varying macroeconomic conditions cannot explain our findings because our 2SLS model in Table 3 includes year fixed-effects.

While there is no economic rationale for our instrument to violate the exclusion condition, we examine if our inference is robust to a small violation of the exclusion condition using the plausibly exogenous instrument variable technique in Conley, Hansen, and Rossi (2012). This technique requires prior beliefs about the violation of the exclusion condition represented by the direct coefficient of the instrument variable (the fraction of optimistic CEOs) in explaining firm value (market-to-book ratio). While our prior belief is that the coefficient is zero, we consider a range of −0.1 to 0.1 for the coefficient. The resulting confidence interval for the coefficient of CEO optimism on firm value is 0.006 to 0.600. This indicates that our main results are robust to any violation of the exclusion condition such that the direct coefficient of the instrument variable on firm value is less than 0.1.

A prior distribution for the violation of the exclusion condition can be obtained with regression of firm value on the instrument variable for a zero-first-stage subsample, a subsample in which the first-stage coefficient of the instrument variable is expected to be zero (Kippersluis and Rietveld 2018). However, this procedure can be problematic with a binary endogenous variable like optimism (Angrist, Lavy, and Schlosser 2010; Andresen and Huber 2021). We therefore consider a subsample in which the continuous variable underlying optimism, the maximum moneyness of options held by a CEO, is not impacted by our instrument variable, the fraction of optimistic CEOs. We hypothesize that the instrument variable is unlikely to influence the maximum moneyness of the CEO's options if the number of potential CEO candidates is large. We conduct a regression with the maximum moneyness of the CEO's options as the dependent variable and the same independent variables as in Model 1 of Table 2, except that Optimism is replaced with the instrument variable, in a subsample of CEOs who were appointed in months in which more than 50 CEOs were appointed in our sample. We find that the coefficient of the instrument variable is not statistically significant. We follow the procedure in Kippersluis and Rietveld (2018) to regress the firm value on our instrument variable with the same control variables as in Model 1 of Table 2 for this subsample, and then again for the remaining sample. We use the results of both regressions to form a prior distribution about the direct coefficient of the instrument variable on firm value. We use this distribution as an input to the plausibly exogenous instrument variable analysis and find that the confidence interval for the coefficient of CEO optimism on firm value is 6.7 to 9.1, again suggesting that our result about the positive effect of CEO optimism on firm value is robust to a potential violation of the exclusion condition.

The relevance of our instrumental variable may arise mechanically if the number of CEOs appointed in a month is small and one CEO can have a large impact on the fraction of optimistic CEOs. As one robustness check, we repeat the 2SLS procedure with only those CEOs that were appointed in months with more than the monthly average of 12.42 CEO appointments. Our results continue to hold in this case. As another robustness check, we randomly split the sample into two halves, calculate the instrument using one half and then use it to estimate the 2SLS model on the other half. The results vary with each random split of the data. We replicate this procedure 100 times to get 100 values of all coefficients. Based on the sample distributions, both the first-stage coefficient for the relevance of the instrument and the second-stage coefficient on CEO optimism are statistically significantly positive at the 95% confidence level.

Another form of endogeneity may affect the interpretation of our results if the direction of causality is the opposite of our interpretation—that is, firm value affects CEO optimism. To rule out reverse causality, we create a variable, Pre-optimism, which equals one for those CEO years where Optimism equals one and Post-pptimism equals zero, and zero otherwise. As explained earlier, Post-optimism equals one in all those CEO-years that follow (and include) the year in which the CEO, for the first time, holds an option that exceeds the 100% moneyness threshold. The split of the optimism indicator variable into

TABLE 3 | Endogeneity checks: CEO optimism and firm value.

	Dependent variable				
	MVA to BVA (Model 1) 2SLS		MVA to BVA	Change in MVA to BVA	MVA to BVA
	First stage	Second stage	(Model 2)	(Model 3)	(Model 4)
Fraction of optimistic CEOs	1.1399***				
	(12.31)				
Optimism		0.3033***			
		(2.84)			
Post-optimism			0.3835***		0.5300***
			(9.01)		(11.19)
Pre-optimism			−0.0275		
			(−0.68)		
Lagged post-optimism				0.0977***	
				(3.42)	
Lagged MV of assets to				−0.5766***	
BV of assets				(−16.41)	
Earnings to assets	0.0685	0.8698***	0.9685***	0.7383***	0.9274***
	(1.35)	(3.85)	(4.53)	(3.76)	(3.61)
ΔL2 earnings to assets	−0.0051	−0.2962**	0.2606**	0.0178	0.1938
	(−0.19)	(−2.44)	(2.55)	(0.22)	(1.51)
R&D to assets	0.1177	1.7761***	1.5572***	1.8276***	1.2715**
	(0.80)	(3.27)	(2.72)	(2.64)	(2.49)
ΔL2 R&D to assets	−0.0078	−0.6027***	0.2355	−0.2998	0.1444
	(−0.22)	(−3.47)	(1.53)	(−0.50)	(0.75)
Dividends to assets	−0.4248	2.7985**	2.3803*	1.4238*	2.6169*
	(−1.13)	(2.54)	(1.82)	(1.93)	(1.88)
ΔL2 Dividends to assets	0.0636	−0.3398	−0.4287	0.1063	−0.6271
	(0.24)	(−0.94)	(−1.06)	(0.33)	(−1.34)
Interest expense to assets	−0.3798	−1.3722*	3.7514**	1.9865	4.0760
	(−1.59)	(−1.67)	(2.00)	(1.21)	(1.59)
ΔL2 Interest expense to assets	0.3600	2.4370***	−4.6114***	−0.7573	−4.0353**
	(1.40)	(2.71)	(−3.28)	(−1.48)	(−2.07)
ΔL2 Assets to assets	−0.0003	0.0016	0.0051	0.0079	−0.0045
	(−0.28)	(0.62)	(0.15)	(1.26)	(−0.09)
Lags of stock return	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Fixed effects	Firm	Firm	Firm	Firm	CEO-Firm
Standard errors clustered	By Firm	By Firm	By Firm	By Firm	CEO-Firm
Firm-year observations	10384	10384	10083	9918	10083

(Continues)

TABLE 3 | (Continued)

	Dependent variable				
	MVA to BVA (Model 1) 2SLS			Change in	
	First stage	Second stage	MVA to BVA (Model 2)	MVA to BVA (Model 3)	MVA to BVA (Model 4)
Adjusted R^2			0.6847	0.3879	0.7313
F statistic	10.27***	22.38***			

Note: The estimates are from a regression model, estimated on the pooled data over the period 1992–2012. In the first two models, the dependent variable is the ratio of the firm's market value of assets to book value of assets. In the third model, the dependent variable is the one-year change in the firm's market value of assets (MVA) to book value of assets (BVA). The independent variables are: Optimism, which equals one over all the CEO-years if the CEO held an option that was more than 100% in the money at least once during his/her tenure, and zero otherwise; fraction of optimistic CEOs, which serves as an instrument for optimism; Post-optimism, which equals one in all CEO-years following (and including) the first year in which the CEO holds an option that is more than 100% in the money, and zero otherwise; Pre-optimism, which equals one for those CEO years where Optimism equals one and post-optimism equals zero, and zero otherwise; the two-year lagged change (ΔL2) and the current values of the following ratios: earnings to assets, R&D to assets, dividends to assets and interest expense to assets; and the two-year lagged change (ΔL2) in assets. All models include five lags of annual stock returns, firm fixed-effects and year fixed-effects. The standard errors are clustered by firm.
***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

pre-optimism and post-optimism variables captures the time variation in CEO option-exercise behaviour.

We estimate Model 1 from Table 2 after replacing the Optimism variable with both pre- and post-optimism variables. The results from Model 2 in Table 3 indicate that the coefficient on Post-optimism is positive and statistically significant while the coefficient on Pre-optimism is not statistically significant. In addition, the coefficient on Post-optimism is of a similar magnitude to that in Table 2. This finding from the refinement in our model specification suggests that the impact of optimism on firm value is stronger after the CEO has exhibited optimism by delaying option exercise. If the option-exercise behaviour of CEOs is driven by firm value, then there should not be such a systematic difference in the relation between CEO optimism and firm value in the pre- and post-optimism years. Note that all of our regressions control for past firm performance by including five annual lags of stock return.

We illustrate the temporal pattern of the relationship between CEO optimism and firm valuation in Figure 2. The figure plots the part of the market-to-book ratio of the firm that cannot be explained by firm characteristics with respect to the time relative to the first time the CEO is identified as optimistic. The plot suggests that causality runs from CEO optimism to valuation, not from valuation to CEO optimism.

Firms with higher values may attract optimistic CEOs. Alternatively, our proxy for CEO optimism, which relies on the moneyness of stock options may be spuriously correlated with an increase in firm valuation in the year in which the CEO is identified as optimistic. In either case, this correlation should not predict subsequent changes in firm value to be higher for optimistic CEOs if CEO optimism does not have a causal effect on firm value.

We estimate a regression model of the change in firm value (over the fiscal year) using the lagged value of Post-optimism. We use post-optimism as it is time-varying and allows us to estimate the effect of CEO optimism on the change in firm value. We include lagged firm value as an explanatory variable.

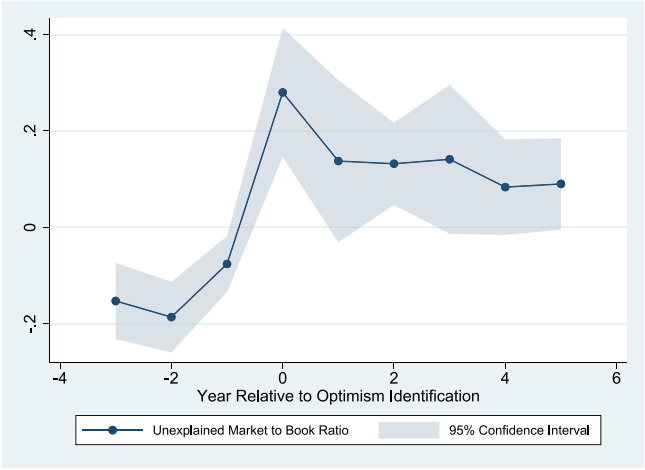

FIGURE 2 | Firm valuation and CEO optimism. [Color figure can be viewed at wileyonlinelibrary.com]

In addition, we include the five annual lags of stock return. The rest of the explanatory variables are the same as in Model 2 in Table 2. The results from Model 3 in Table 3 indicate that the change in firm value is positively related to CEO optimism and the coefficient is statistically significant at the 1% level and also economically significant. The coefficient of 0.098 on the Post-optimism variable in Model 3 in Table 3 indicates that the average incremental annual increase in firm value after the CEO has been identified as optimistic is about 5.2% of the mean value of 1.88 for the overall sample.

The positive relation between Post-optimism and the subsequent temporal change in firm value suggests that either reverse causality, or a spurious correlation between our proxy for CEO optimism and firm value, is unlikely to explain this finding. This test thus indicates that the causality runs from CEO optimism to firm value.

We now consider potential factors that determine both CEO choice and firm value but are not observed by us and are, therefore, omitted in our empirical analysis. We first assess whether a

potentially omitted variable can invalidate our main result about the effect of CEO optimism on firm value using impact threshold of a confounding variable (ITCV) methodology (Frank 2000; Ahmad, Farag, and Wang 2023). The procedure suggests that to invalidate our result, 77% of observations would have to be replaced with cases for which there is an effect of 0. Further, none of the control variables has an impact that meets the threshold for invalidating our main result, indicating that our results are unlikely to be driven by an omitted variable bias.

Nonetheless, we now consider another robustness check to address omitted variable bias. Suppose the CEO's optimism varies as

$$\text{Optimism}_{i,t} = \text{CEO}_i + v_{i,t}, \tag{6}$$

where CEO_i is a time-invariant characteristic of the CEO chosen by the board of firm i and $v_{i,t}$ is the time-varying component of CEO optimism. The board's choice of the CEO and hence, of CEO characteristic CEO_i, may depend on an omitted variable $w_{i,0}$ observed by the board at the time the CEO is hired:

$$\text{CEO}_i = \delta w_{i,0}. \tag{7}$$

The omitted variable $w_{i,0}$ may affect the firm's value, which varies as

$$\begin{aligned}\text{FirmValue}_{i,t} = \beta_0 + \beta_1 \text{Optimism}_{i,t} + \beta_2 \text{Control}_{i,t} \\ + \gamma w_{i,0} + u_{i,t}.\end{aligned} \tag{8}$$

where $w_{i,0}$ and $u_{i,t}$ are uncorrelated. The regressions in Table 2 do not control for the omitted variable $w_{i,0}$, so the composite error term $\gamma w_{i,0} + u_{i,t}$ may be correlated with $\text{Optimism}_{i,t}$ as it depends on $w_{i,0}$. This correlation may bias the regression coefficients in an OLS estimation of (8). To address this issue, we can rewrite (8) as

$$\begin{aligned}\text{FirmValue}_{i,t} = \beta_0 + \beta_1 \text{Optimism}_{i,t} + \beta_2 \text{Control}_{i,t} \\ + \frac{\gamma}{\delta}\text{CEO}_i + u_{i,t}.\end{aligned} \tag{9}$$

If the variable CEO_i is included as an additional control variable, then the error term $u_{i,t}$ is uncorrelated with $\text{Optimism}_{i,t}$ and the OLS estimation is unbiased. The variable CEO_i is fixed across time for each CEO hired by firm i and can, therefore, be modelled as a CEO-firm fixed effect. CEO-firm fixed effects have been used to control for endogenous matching of CEOs and firms by Graham, Harvey, and Puri (2013) and by Bennedsen, Pérez-González, and Wolfenzon (2020).

We estimate Model 2 in Table 2 by including fixed effects based on the CEO-firm combination and by clustering standard errors by the CEO-firm combination. Note that the firm fixed-effects that we use in all the other models remain constant for all observations of a firm regardless of the CEO. In contrast, the CEO-firm fixed effects may change for a firm with a switch in the CEO. We do not use the variable Optimism as a dependent variable because it is completely determined by the CEO-firm fixed effect. Instead, we use the Post-optimism variable which varies for a CEO over time. Our results from Model 4 in Table 3 indicate that the coefficient on Post-optimism is positive and statistically significant at the 1% level and its magnitude is notably higher than that in Model 2, Table 2. To the extent CEO optimism is higher in years where Post-optimism equals one; this result shows that the impact of CEO optimism on firm value is not driven by omitted variables.

Any bias in our results due to the endogeneity of CEO choice is more likely in forced CEO turnovers than in voluntary or unforced CEO turnovers—empirically, voluntary turnovers are uncorrelated with firm performance (Huson, Malatesta, and Parrino 2004; Taylor 2010). We follow an approach similar to that of Fracassi and Tate (2012) to identify unforced CEO transitions. For each CEO transition in our sample, we manually examine news articles to determine the cause of the CEO transition. We create two variables Unforced1 and Unforced2 that equal zero or one. If we determine a CEO turnover to be a result of death, health problem or retirement that is not considered a sudden retirement, then Unforced1 takes a value one for the newly appointed CEO. If we identify a different cause for the CEO turnover, then Unforced1 equals zero for the new CEO. The variable Unforced2 equals one for a CEO appointed following a turnover that we determine to be a result of death, health problem, retirement that is not considered a sudden retirement or orderly transition. We perform this classification only for CEOs whose predecessors are also in our sample. The variable Unforced1 equals one for about 44% of observations while the variable Unforced2 equals one for about 48% of observations.

If the positive effect of CEO optimism on firm value is due to the endogeneity of CEO choice, we expect this effect to be weaker in unforced turnovers. We repeat our main regression (Model 1 in Table 2) by including the interaction of Optimism with Unforced1. The results in Model 1 in Table 4 show that the coefficient on Optimism continues to be positive and statistically significant at the 1% level. The coefficient on the interaction of Optimism with Unforced1 is not statistically significant, suggesting that the value impact of CEO optimism does not differ across CEOs appointed as a result of forced or voluntary turnovers. When we replace Unforced1 and its interaction term with Optimism with Unforced2 and its interaction with Optimism, the results in Model 2 lead to the same inference. We repeat both regressions after replacing Optimism with Post-optimism. The results in Model 3 and Model 4 show that the coefficient of Post-optimism is positive and statistically significant at the 1% level in both models while the coefficients on the interaction of Post-optimism with Unforced1 and Unforced2 are not significant. There results suggest that CEO optimism has a causal effect on firm value that cannot be attributed to endogenous CEO selection.

5 | Heterogeneity in Impact of CEO Optimism on Firm Value

In this section, we explore which firms benefit more from CEO optimism. We do so by adding interactions of CEO optimism and various firm and industry characteristics in our regressions.

TABLE 4 | CEO optimism and firm value: Effect of unforced CEO turnovers.

	Model 1	Model 2	Model 3	Model 4
Optimism	0.2838***	0.2966***		
	(4.17)	(4.12)		
Post-optimism			0.3784***	0.3838***
			(6.62)	(6.52)
Unforced1	0.0772		0.0876	
	(1.11)		(1.41)	
Optimism*Unforced1	0.0228			
	(0.21)			
Post-optimism*Unforced1			0.0233	
			(0.27)	
Unforced2		0.0605		0.0684
		(0.97)		(1.26)
Optimism*Unforced2		−0.0038		
		(−0.04)		
Post-optimism*Unforced2				0.0125
				(0.15)
Earnings to assets	1.0240***	1.0199***	1.0858***	1.0807***
	(3.85)	(3.84)	(3.87)	(3.86)
ΔL2 Earnings to assets	−0.0887	−0.0879	0.1315	0.1347
	(−0.76)	(−0.75)	(1.22)	(1.25)
R&D to assets	0.4102	0.3780	1.1837	1.1519
	(0.30)	(0.28)	(0.80)	(0.78)
ΔL2 R&D to assets	2.2284***	2.2249***	0.0411	0.0300
	(3.44)	(3.43)	(0.03)	(0.02)
Dividends to assets	3.7396**	3.7449**	3.0576	3.0617
	(2.17)	(2.16)	(1.56)	(1.56)
ΔL2 Dividends to assets	−0.7370	−0.7346	−0.8097	−0.8057
	(−1.24)	(−1.24)	(−1.07)	(−1.07)
Interest expense to assets	2.3700***	2.3687***	0.8795	0.8657
	(3.11)	(3.11)	(0.30)	(0.29)
ΔL2 Interest expense to assets	0.3484	0.3451	−2.4041*	−2.3839*
	(0.54)	(0.54)	(−1.83)	(−1.82)
ΔL2 Assets to assets	−0.0208***	−0.0208***	−0.0295	−0.0305
	(−3.61)	(−3.61)	(−0.82)	(−0.84)
Lags of stock return	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Fixed effects	Firm	Firm	Firm	Firm
Standard errors clustered	By firm	By firm	By firm	By firm

(Continues)

TABLE 4 | (Continued)

	Model 1	Model 2	Model 3	Model 4
Firm-year observations	6167	6167	5816	5816
Adjusted R^2	0.6868	0.6866	0.7021	0.7019

Note: The estimates are from a regression model, estimated on the pooled data over the period 1992–2012. In all of the regression models, the dependent variable is the ratio of the firm's market value of assets to book value of assets. The independent variables are: Optimism, which equals one over all the CEO-years if the CEO held an option that was more than 100% in the money at least once during his/her tenure, and zero otherwise; Post-optimism, which equals one in all CEO-years following (and including) the first year in which the CEO holds an option that is more than 100% in the money, and zero otherwise; Unforced1 equals one for a CEO appointed as the result of a CEO turnover stemming from death, health problem or retirement (not sudden retirement); Unforced2 equals one for a CEO appointed as the result of a CEO turnover stemming from death, health problem, retirement (not sudden retirement) or orderly transition; the two-year lagged change (ΔL2) and the current values of the following ratios: earnings to assets, R&D to assets, dividends to assets and interest expense to assets; and the two-year lagged change (ΔL2) in assets. All models include five lags of annual stock returns, firm fixed-effects and year fixed-effects. The standard errors are clustered by firm.
***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

These interaction terms are motivated by Predictions 1, 4, 5, 6, and 7, which are based on the various channels through which CEO optimism is likely to affect firm value.[12] We use the Post-optimism variable in our regressions as it is time-varying. Finally, we consider an alternative measure of CEO optimism to further alleviate endogeneity concerns.

The various interactive effects that we explore next are additional tests of the causality of CEO optimism in determining firm value. Results consistent with several testable predictions of the causal impact of CEO optimism are unlikely to follow if CEO optimism did not have an effect on firm value.

5.1 | CEO Optimism and Industry Concentration

Prediction 6 states that the difference between the values of firms with optimistic CEOs and those with non-optimistic CEOs is higher in industries with lower concentration. We use the Herfindahl-Hirschman Index (HHI) to measure industry concentration, where a higher value of the HHI indicates greater industry concentration. We use two different measures of HHI. The first measure is based on Fama-French thirty-industry classification and the second is based on a textual analysis of 10K annual filings by firms (see Hoberg and Phillips 2016).

We estimate the regression model of firm value in Model 2, Table 2 by including the interaction between Post-optimism and each of the two measures of HHI along with the HHI measure. The results are presented in Models 1 and 2 in Table 5. The coefficient on each measure of HHI is positive while the coefficient on the interaction between each measure of HHI and Post-optimism is negative. The coefficients on the interactive variables in the two models are significantly different from zero at the 5% level or better. The negative coefficient on the interaction term shows that the increase in firm value resulting from CEO optimism is lower in firms that operate in more concentrated industries—consistent with Prediction 6.

Prediction 7 states that the difference between the values of firms with optimistic CEOs and those with non-optimistic CEOs is higher in industries in which there is a larger fraction of optimistic CEOs. For each firm-year observation, we calculate the fraction of optimistic CEOs in the industry in which the firm operates using the Fama-French 30-industry classification. We estimate the regression model of firm value in Model 2, Table 2 by including the fraction of optimistic CEOs in the industry along with the interaction between post-optimism and the fraction of optimistic CEOs in the industry. The results are presented in Model 3 in Table 5. The coefficients on both the fraction of optimistic CEOs in the industry and the interaction term are positive and statistically significant at the 5% level or better. The positive coefficient on the interaction term shows that the increase in firm value resulting from CEO optimism is higher in firms that operate in industries in which there is a larger fraction of optimistic CEOs and is consistent with Prediction 7.

5.2 | CEO Optimism and Cash-Flow Volatility, R&D Expenditures, and Cash Flow

In this section, we examine Predictions 1, 4, and 5, which represent the interactive effects of CEO optimism with each of the following three firm-specific attributes on firm value: cash-flow volatility (a measure of firm risk), R&D expenditures (scaled by book value of assets and set to zero if missing), and cash flow. Cash Flow equals the ratio of operating income before depreciation less interest expense less income taxes less common and preferred dividends to assets. Cash Flow Volatility equals the standard deviation of the firm's cash flow over the prior ten-year period. We use the time-varying Post-optimism variable to estimate the interactive effects more precisely.

We estimate the regression model of firm value in Model 2, Table 2 by including the interaction between Post-optimism and each of these firm-specific attributes. The rest of the explanatory variables are the same as those in Model 2 of Table 2. We present the results under Models 1, 2, and 3 in Table 6. In all of the models, the coefficient on Post-optimism is positive and statistically significant at the 1% level. In addition, the coefficient on each of the interaction terms is also positive and statistically significant at the 5% level or better.

First, the positive coefficient on the interaction term between Post-optimism and Cash Flow Volatility suggests that the incremental firm value associated with CEO optimism is higher in riskier firms—consistent with Prediction 1. Second, the positive coefficient on the interaction term between Post-

TABLE 5 | Firm value and interactive effects of CEO optimism with industry concentration and with fraction of optimistic CEOs in an industry.

	Model 1	Model 2	Model 3
Post-optimism	0.5027***	0.4625***	−0.3433***
	(8.14)	(8.83)	(−3.13)
Fama-French-industry-based HHI	1.8226***		
	(2.59)		
Post-optimism*Fama-French-industry-based HHI	−2.0205**		
	(−2.50)		
Text-based HHI		0.1428*	
		(1.78)	
Post-optimism*text-based HHI		−0.3430***	
		(−3.28)	
Fraction of optimistic CEOs in the industry			0.3045**
			(2.06)
Post-optimism * Fraction of optimistic CEOs in the iIndustry			1.3422***
			(5.99)
Earnings to Aassets	0.9751***	0.9314***	0.9604***
	(4.55)	(4.21)	(4.58)
ΔL2 Earnings to assets	0.2556**	0.2696**	0.2588**
	(2.50)	(2.39)	(2.55)
R&D to assets	1.5653***	1.4237**	1.5328***
	(2.75)	(2.50)	(2.80)
ΔL2 R&D to assets	0.2294	0.2442	0.2360
	(1.49)	(1.44)	(1.55)
Dividends to assets	2.3599*	2.1875*	2.3922*
	(1.80)	(1.70)	(1.84)
ΔL2 Dividends to assets	−0.3995	−0.3879	−0.4616
	(−0.99)	(−0.96)	(−1.17)
Interest Expense to assets	3.6180*	3.6452	4.1795**
	(1.94)	(1.62)	(2.24)
ΔL2 Interest expense to assets	−4.5469***	−5.3455***	−4.6996***
	(−3.25)	(−3.45)	(−3.35)
ΔL2 Assets to assets	0.0030	0.0187	−0.0003
	(0.09)	(0.49)	(−0.01)
Lags of stock return	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Fixed effects	Firm	Firm	Firm
Standard errors clustered	By firm	By firm	By fm
Firm-year observations	10083	9388	10083
Adjusted R^2	0.6854	0.6908	0.6924

Note: The estimates are from a regression model, estimated on the pooled data over the period 1992–2012. In all of the regression models, the dependent variable is the ratio of the firm's market value of assets to book value of assets. The independent variables are: Post-optimism, which equals one in all CEO-years following (and including) the first year in which the CEO holds an option that is more than 100% in the money, and zero otherwise; Fama-French-industry-based HHI is the HHI (Herfindahl–Hirschman Index) based on Fama-French 30-industrial classification; text-based HHI is the HHI based on industrial classifications derived from a textual analysis of 10-K annual filings; fraction of optimistic CEOs in the Industry equals the fraction of optimistic CEOs for each firm-year observation, calculated based on the Fama-French 30-Industrial Classification; the 2-year lagged change (ΔL2) and the current values of the following ratios: earnings to assets, R&D to assets, dividends to assets, and interest expense to assets; and the 2-year lagged change (ΔL2) in Assets. All models include five lags of annual stock returns, firm fixed-effects, and year fixed-effects. The standard errors are clustered by firm.

***Significant at the 0.01 level.

**Significant at the 0.05 level.

*Significant at the 0.10 level.

TABLE 6 | Firm value and interactive effects of CEO optimism with cash-flow volatility (firm risk), R&D, cash flow, and investment spending.

	Model 1	Model 2	Model 3	Model 4
Post-optimism	0.3613***	0.3072***	0.2805***	0.1909***
	(9.79)	(9.25)	(4.99)	(4.13)
Post-optimism*Cash Flow Volatility	0.4931***			
	(2.57)			
Post-optimism*R&D		3.4169***		
		(4.02)		
Post-optimism*Cash Flow			1.1431**	
			(2.12)	
Post-optimism*Investment Spending				2.1829***
				(4.85)
Cash Flow Volatility	−0.0969			
	(−0.70)			
Cash Flow			1.4445***	
			(4.08)	
Investment Spending				0.3492
				(1.07)
Earnings to assets	0.9832***	0.9686***	0.4073***	1.0564***
	(4.61)	(4.64)	(2.76)	(5.19)
ΔL2 Earnings to assets	0.2503**	0.2162**	0.2664**	0.1784*
	(2.44)	(2.10)	(2.52)	(1.72)
R&D to assets	1.5657***	−0.6522	3.2575***	
	(2.68)	(−0.71)	(3.60)	
ΔL2 R&D to assets	0.1865	0.2677*	−0.0837	0.1722
	(1.11)	(1.72)	(−0.46)	(1.17)
Dividends to assets	2.3020*	2.3763*	4.0827***	2.5323*
	(1.74)	(1.80)	(3.27)	(1.94)
ΔL2 Dividends to assets	−0.3087	−0.3985	−0.2302	−0.4762
	(−0.73)	(−0.99)	(−0.65)	(−1.20)
Interest expense to assets	3.7322**	4.2559**	5.1040***	4.4246**
	(2.01)	(2.32)	(2.59)	(2.41)
ΔL2 Interest expense to assets	−4.5167***	−5.1833***	−4.3365***	−4.8473***
	(−3.32)	(−3.42)	(−2.91)	(−3.51)
ΔL2 Assets to assets	0.0065	0.0138	−0.0111	0.0147
	(0.20)	(0.37)	(−0.33)	(0.42)
Lags of stock return	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Fixed effects	Firm	Firm	Firm	Firm
Standard errors clustered	By firm	By firm	By firm	By firm

(Continues)

TABLE 6 | (Continued)

	Model 1	Model 2	Model 3	Model 4
Firm-year observations	10072	10083	10056	10025
Adjusted R^2	0.6855	0.6879	0.6940	0.6918

Note: The estimates are from a regression model, estimated on the pooled data over the period 1992–2012. In all of the regression models, the dependent variable is the ratio of the firm's market value of assets to book value of assets. The independent variables are: Post-optimism, which equals one in all CEO-years following (and including) the first year in which the CEO holds an option that is more than 100% in the money, and zero otherwise; Cash Flow, which equals the ratio of operating income before depreciation less interest expense less income taxes less common and preferred dividends to assets; Cash Flow Volatility, which equals the standard deviation of the firm's cash flow over the prior 10-year period; Investment Spending, which equals the ratio of the sum of R&D and Capital Expenditures to Assets; the 2-year lagged change (ΔL2) and the current values of the following ratios: earnings to assets, R&D to assets, dividends to assets, and interest expense to assets; and the two-year lagged change (ΔL2) in Assets. All models include five lags of annual stock returns, firm fixed-effects, and year fixed-effects. The standard errors are clustered by firm.
***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

optimism and R&D expenditures suggests that the incremental firm value associated with CEO optimism is higher in more innovative firms—consistent with Prediction 4. Third, the positive coefficient on the interaction term between Post-optimism and Cash Flow suggests that the incremental firm value associated with CEO optimism is higher in firms that have access to greater internal resources—consistent with Prediction 5.

5.3 | CEO Optimism and Investment Spending

Given the above findings, we now explore the interactive effect of optimism with investment spending on firm value. This test is motivated by Malmendier and Tate (2005), who show that overconfident CEOs overestimate the returns on investment spending. However, this tendency to overinvest is curbed by the CEO's perception that external financing is overly costly. Thus, it is not clear whether the marginal investment of optimistic CEOs creates higher or lower firm value than that of non-optimistic CEOs. We determine this interactive effect empirically by estimating the regression model of firm value in Model 2, Table 2 and including the interaction between Post-optimism and Investment Spending. We calculate Investment Spending as the ratio of the sum of R&D and capital expenditures to book value of assets. We present the results under Model 4 in Table 6. The coefficient on Post-optimism is positive and statistically significant at the 1% level and the coefficient on the interaction term is also positive and statistically significant at the 1% level. This result indicates that, other things equal, the marginal investment made by optimistic CEOs creates firm value.

5.4 | CEO Optimism Estimated From Prior Firm

The endogeneity checks presented in Section 4.4 support the causal interpretation of our results. To further alleviate endogeneity concerns associated with the Optimism measure, we now consider a proxy for CEO optimism which is not influenced by the characteristics of the firm. Specifically, we estimate a CEO's optimism from the CEO's option-exercise behavior at a previous firm instead of at the current firm. This measure, PreviousOptimism, can be created only for CEOs who switch firms. PreviousOptimism equals one if the CEO was identified as optimistic based on the option-exercise behavior in a previous firm. PreviousOptimism equals zero if the CEO was previously a CEO of one or more firms for at least 1 year, but was not identified as optimistic based on his/her option-exercise behavior in any of these previous firms.

PreviousOptimism is defined for 356 observations spanning 102 firms. We estimate our main model and the models with interactive effects by using PreviousOptimism as a measure of optimism. However, we do not include firm fixed-effects because only 5 out of the 102 firms in this sample vary in PreviousOptimism. We first estimate Model 1 from Table 2 after replacing Optimism with PreviousOptimism. Our untabulated results indicate that the coefficient on PreviousOptimism is not statistically significant. The non-significance of the coefficient likely results from a small sample size and inadequate statistical power.

Another interpretation, suggested by our tests of interactive effects, is that optimistic CEOs create more value in some types of firms and some of the 102 firms in this sample are not the types where optimistic CEOs are expected to create value. To further examine this issue, we repeat our tests of interactive effects from Tables 5 and 6 after replacing Optimism with PreviousOptimism and removing firm fixed-effects. The interactive coefficient with respect to industry competition variables is not statistically significant when we use the HHI based on textual analysis. However, when we measure HHI based on Fama-French thirty-industry classification, the interactive coefficient is statistically significant and has the same negative sign as our main results. Further, in the regressions corresponding to those of Table 6, we find that the coefficients on the interactions of PreviousOptimism with Cash Flow Volatility, R&D, and Investment Spending have the same signs as in Table 6 and are statistically significant with p-values of 0.000, 0.039, and 0.044, respectively. In contrast, the coefficient on the interaction of PreviousOptimism with cash flow is statistically nonsignificant. Overall, this analysis provides further support for a causal interpretation of CEO optimism on firm value.

5.5 | Ruling Out an Information-Based Explanation of Our Results

Our results with respect to two interactive effects coupled with CEO optimism estimated from a prior firm rule out the possibility that our CEO optimism measure reflects private or insider information. First, the result that CEO optimism creates more

value in more competitive industries is consistent with one of our predictions. However, if our results were driven by CEO's private information, then competitors would be more likely to react to the actions of the firm and erode any value gain from the CEO's private information. Thus, a CEO with private information is likely to create more value in less competitive industries, which is opposite to what we find. Second, our result that an optimistic CEO creates more value in riskier firms is also consistent with an empirical prediction. However, there is no economic reason why the private information of a CEO should create more value in a riskier firm. Third, we document several interactive effects consistent with our predictions using a measure of optimism that is based on the CEO's option exercise in a previous firm. Importantly, this measure of optimism is not based on any of the characteristics of the current firm including private information. These various findings suggest that our results are unlikely to be driven by private information of CEOs.

6 | Conclusion

There is now extensive literature on the interactions between CEO optimism and various corporate policies. The evidence suggests that CEO optimism affects several corporate policies with implications for firm value. We study the relation between CEO optimism and firm value, focusing on identifying the circumstances under which CEO optimism increases the value of a firm.

We draw on the existing literature to derive several empirical predictions regarding the impact of various firm characteristics on the relation between CEO optimism and firm value. Specifically, our predictions relate to the interactive effect of CEO optimism and various firm-specific and industry attributes on firm value. In addition, we develop a simple model of the effect of CEO optimism on firm value against a backdrop of industry competition. This enables us to empirically determine the overall effect of CEO optimism on firm value in a nuanced way.

Our results indicate a positive relation between CEO optimism and firm value on average. This result is economically significant and robust to alternate specifications and endogeneity checks.

The variation in the value impact of CEO optimism across different kinds of firms suggests that optimistic CEOs are better suited for some firms than for others. Our results show that optimistic CEOs create more value in firms (i) in less concentrated (or more competitive) industries, (ii) in industries with a larger fraction of optimistic CEOs, (iii) with a higher cash flow volatility (a measure of firm risk), (iv) with higher R&D expenditures, (v) with higher cash flow (a measure of the availability of internal resources), (vi) with higher overall investment spending and (vii) in years before the passage of the Sarbanes-Oxley Act. That is, CEO optimism is more likely to be a value-enhancing trait for firms that are riskier, operate in more competitive industries, engage in greater innovation and investment, and have more internal resources.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

No new data were created or analyzed in this study.

Endnotes

[1] Bertrand and Schoar (2003) note that the variation in management styles of top executives accounts for some of the unexplained variations in a wide range of corporate policies. Cronqvist, Makhija, and Yonker (2012) find that corporate leverage choices mimic the personal leverage choices of CEOs. Graham, Harvey, and Puri (2013) use psychometric tests to identify behavioural traits of CEOs and show that these traits are related to corporate financial policies. Gow et al. (2016) document that the personality traits of CEOs predict financing choices, investment choices and firm operating performance.

[2] Some papers that examine the effect of top executives or board members on firm value are Adams, Almeida, and Ferreira (2005); Pérez-González (2006); Villalonga and Amit (2006); Goldman, Rocholl, and So (2009); Halford and Hsu (2020), and Bennedsen, Pérez-González, and Wolfenzon (2020).

[3] See Allgood and Farrell (2003) and Pan (2017) for discussions of determinants and consequences of CEO-Firm match.

[4] Overconfidence can also refer to overestimation of the precision of one's information leading to underestimation of risk. See Hirshleifer (2001)

[5] See Goldman, Rocholl, and So (2009); Jalbert, Furumo, and Jalbert (2010); Halford and Hsu (2020); Wowak et al. (2016) and Bandiera et al. (2020).

[6] See Armstrong and Huck (2010) and Malmendier and Tate (2015) for surveys discussing some of this work.

[7] Deshmukh, Goel, and Howe (2021) show that, despite perceiving external financing to be too costly, an optimistic CEO invests as much as or more than what a rational CEO invests.

[8] We abstract from optimal compensation contracts that may mitigate but not eliminate the CEO's aversion to this cost.

[9] The quadratic cost can be generalized to any increasing and convex function.

[10] The model considers a benefit of CEO optimism. If, on the other hand, CEO optimism leads to behaviour that reduces firm value (e.g., if $\alpha > 1$), then the model would predict that the decline in firm value associated with CEO optimism is greater in industries with more firms. Specifically, any positive or negative effect of CEO optimism on firm value is expected to be stronger in less concentrated industries.

[11] The difference in the two plots before the CEO appointment is likely a consequence of including firm-fixed effects.

[12] We examine in Appendix B if the regulatory and governance environment influences the effect of CEO optimism on firm value.

Specifically, we investigate the effect of the passage of the Sarbanes-Oxley Act and the changes in the listing rules for NYSE/NASDAQ on the relation between CEO Optimism and firm value.

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Appendix A

Proof

Proof of Proposition 1. Substituting Q_R and Q_O as the equilibrium qualities of firms with rational and optimistic CEOs, respectively, in (3) and (4), we get:

$$Q_R = \arg\max_{Q_i} \; CQ_i\left(\frac{N}{Q_i + \{(1-p)N-1\}Q_R + pNQ_O}\right)^{\gamma} - aQ_i^2 \quad \text{and} \tag{A1}$$

$$Q_O = \arg\max_{Q_i} \; CQ_i\left(\frac{N}{Q_i + (1-p)NQ_R + (pN-1)Q_O}\right)^{\gamma} - \alpha a Q_i^2. \tag{A2}$$

The corresponding first-order conditions are:

$$\frac{C}{\overline{Q}^{\gamma}} - \frac{\gamma C Q_R}{N\overline{Q}^{1+\gamma}} = 2aQ_R \quad \text{and} \quad \frac{C}{\overline{Q}^{\gamma}} - \frac{\gamma C Q_O}{N\overline{Q}^{1+\gamma}} = 2\alpha a Q_O, \tag{A3}$$

where $\overline{Q} = (1-p)Q_R + pQ_O$. Substituting $\lambda = Q_O/Q_R$ in the ratio of the two equations,

$$\frac{N\overline{Q} - \gamma Q_O}{N\overline{Q} - \gamma Q_R} = \alpha\lambda. \tag{A4}$$

Substituting $\overline{Q} = (1-p)Q_R + pQ_O$, replacing Q_O/Q_R with λ, and simplifying, we get

$$Z(\lambda, N, p) \equiv \alpha p\lambda^2 + \{\alpha(1-p) - p + (1-\alpha)\gamma/N\}\lambda - (1-p) = 0. \tag{A5}$$

Since $Z(0, N, p) = p - 1 < 0, Z(1, N, p) = (1-\alpha)(\frac{\gamma}{N} - 1) < 0, Z(\lambda, N, p) > 0$ as λ takes arbitrarily large values, and $Z(\lambda, N, p)$ is quadratic in λ, there is a single positive solution to the above equation: $\lambda^* > 1$. Moreover, $\partial Z/\partial\lambda|_{\lambda^*} > 0$.

The ratio $\lambda^* = Q_O/Q_R$ is increasing in N:

$$\frac{\mathrm{d}\lambda^*}{\mathrm{d}N} = -\frac{\partial Z/\partial N|_{\lambda^*}}{\partial Z/\partial\lambda|_{\lambda^*}} = \frac{(1-\alpha)\gamma\lambda/N^2}{\partial Z/\partial\lambda|_{\lambda^*}} > 0. \tag{A6}$$

The ratio $\lambda^* = Q_O/Q_R$ is increasing in p:

$$\frac{\mathrm{d}\lambda^*}{\mathrm{d}p} = -\frac{\partial Z/\partial p|_{\lambda^*}}{\partial Z/\partial\lambda|_{\lambda^*}} = \frac{(\lambda^* - 1)(1 - \alpha\lambda^*)}{\partial Z/\partial\lambda|_{\lambda^*}} > 0 \tag{A7}$$

because $\lambda^* > 1$ and $\alpha\lambda^* < 1$ (follows from substituting $Q_O > Q_R$ in (A4)). The claims in the Proposition follow from the proportionality of V_i and Q_i. □

Appendix B

Effect of the Sarbanes-Oxley Act on the Relation Between CEO Optimism and Firm Value

We now examine the combined effect of the passage of the Sarbanes-Oxley (SOX) Act of 2002 and changes in the listing rules for NYSE/NASDAQ on the relation between CEO optimism and firm value. Banerjee, Humphery-Jenner, and Nanda (2015) view the concurrent passage of the SOX Act and the changes in the NYSE/NASDAQ rules as a natural experiment and explore whether the resulting improvement in corporate governance moderated the value-reducing effects of CEO overconfidence.

SOX was intended to provide greater oversight of corporate actions and strengthen corporate governance. The act was a response to the corporate scandals that were blamed to some extent on unethical management behaviour and on the inability or the unwillingness of boards in exercising control over management. SOX's effectiveness in diminishing the impact of agency conflicts may increase firm valuation but has no implication for the relation between CEO optimism and firm value as CEO optimism is not an agency problem. However, SOX also intended to change the balance of power between management and the board of directors. To the extent SOX shifted the balance of power from the management to the board, a CEO's leverage in structuring corporate policies in cases of disagreement with the board and the consequent impact on firm performance would have weakened following SOX. One situation in which such disagreement arises is when the CEO is optimistic relative to shareholders. Thus, we expect the impact of CEO optimism on firm value, positive or negative, to moderate following SOX.

We follow Banerjee, Humphery-Jenner, and Nanda (2015) and represent the changes resulting from the SOX Act and the changes in the

TABLE B1 | Interactive effect of CEO optimism and the passage of the Sarbanes-Oxley Act on firm value.

	(Model 1)	(Model 2)
Optimism	0.4192***	
	(7.85)	
Post-optimism		0.6052***
		(10.84)
Optimism*SOX	−0.1497***	
	(−2.84)	
Post-optimism*SOX		−0.3201***
		(−5.88)
Earnings to assets	0.8944***	0.9822***
	(3.66)	(4.59)
ΔL2 Earnings to assets	−0.3151**	0.2384**
	(−2.41)	(2.34)
R&D to assets	1.7231***	1.5403***
	(2.92)	(2.70)
ΔL2 R&D to assets	−0.6231***	0.2072
	(−3.32)	(1.35)
Dividends to assets	2.9489**	2.6458**
	(2.47)	(1.98)
ΔL2 Dividends to assets	−0.3594	−0.4808
	(−0.95)	(−1.17)
Interest expense to assets	−1.2363	3.6842**
	(−1.41)	(2.01)
ΔL2 Interest expense to assets	2.3056**	−4.4741***
	(2.41)	(−3.19)
ΔL2 Assets to assets	0.0019	0.0022
	(0.70)	(0.06)
Lags of stock return	Yes	Yes
Year fixed effects	Yes	Yes
Fixed effects	Firm	Firm
Standard errors clustered	By Firm	By Firm
Firm-year observations	10611	10083
Adjusted R^2	0.6651	0.6875

Note: The estimates are from a regression model, estimated on the pooled data over the period 1992–2012. In all of the regression models, the dependent variable is the ratio of the firm's market value of assets to book value of assets. The independent variables are: Optimism, which equals one over all the CEO-years if the CEO held an option that was more than 100% in the money at least once during his/her tenure, and zero otherwise; Post-optimism, which equals one in all CEO-years following (and including) the first year in which the CEO holds an option that is more than 100% in the money, and zero otherwise; SOX, an indicator variable that equals one if the observation occurs in 2002 or later, and zero otherwise; the 2-year lagged change (ΔL2) and the current values of the following ratios: earnings to assets, R&D to assets, dividends to assets, and interest expense to assets; and the 2-year lagged change (ΔL2) in assets. All models include five lags of annual stock returns, firm fixed-effects and year fixed-effects. The standard errors are clustered by firm.
***Significant at the 0.01 level.
**Significant at the 0.05 level.
*Significant at the 0.10 level.

NYSE/NASDAQ rules with a variable SOX that equals one if the firm-year observation occurs in 2002 or later, and zero otherwise. We investigate the effect of SOX on the relation between CEO optimism and firm value by estimating Model 1 in Table 2 and including the interaction between Optimism and SOX. We present the results under Model 1 in Table B1. The coefficient on Optimism is positive and statistically significant at the 1% level while the coefficient on the interaction term is negative and statistically significant at the 1% level. This result indicates that, other things equal, optimistic CEOs create lower firm value in the post-SOX years. Specifically, the coefficient of −0.1497 on the interaction term indicates that the value created by optimistic CEOs is about 35% lower in the post-SOX years than in the pre-SOX years. In Model 2, Table B1, we use the Post-optimism variable in place of the Optimism variable. Our results are qualitatively the same as in Model 1. However, the coefficient of −0.3201 on the interaction term (between Post-optimism and SOX) indicates that the value created by optimistic CEOs is about 53% lower in the post-SOX years than in the pre-SOX years. We reach a qualitatively similar conclusion if we use a regression specification similar to that used by Banerjee, Humphery-Jenner, and Nanda (2015).

Banerjee, Humphery-Jenner, and Nanda (2015) recognize that CEO optimism can have both positive and negative effects, but their empirical analysis focuses on the value-reducing effects of CEO overconfidence and shows that those effects are moderated post-SOX. Our results from the various interactive effects point to the overall value-enhancing effects of CEO optimism (or overconfidence). Our results from Table 6 suggest that the additional value created by CEO optimism is lower in the post-SOX years. These results suggest that while SOX may have curbed the value-reducing effects of CEO optimism, it likely also stifled the channels through which CEO optimism creates value.

The strong and systematic interactive effects that we document above, coupled with our various endogeneity checks, provide corroborating evidence in support of a causal effect of CEO optimism on firm value.