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Financial Flexibility and Corporate Investment

Evidence from a Market-Implied Measure

Supervisor: Elias Bengtsson

Examiner: Reda Moursli

Authors:

Anna Ekengren

Sebastian Fjellström

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Abstract

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Authors: Anna Ekengren, Sebastian Fjellström

Advisor/Examiner: Elias Bengtsson / Reda Moursli

Key words: Value of Financial Flexibility, Economic Policy Uncertainty, Capital Investment, Real Options Theory, Investment Sensitivity

Purpose: The purpose of this study is to examine how the market-implied value of financial flexibility, measured through the VOFF composite of Rapp et al. (2014), relates to firm-level capital investment decisions, and to investigate whether financial flexibility moderates the negative effect of economic policy uncertainty (EPU) on investment.

Methodology: The study applies a deductive quantitative research design using panel regressions on U.S.-listed firms. VOFF is constructed following Rapp et al. (2014) as a market-implied measure of the value that shareholders assign to financial flexibility.

Theoretical perspectives: The theoretical foundation draws on dynamic capital structure theory, financing-friction models, the precautionary motive for liquidity, and real options theory. Together, these perspectives imply that financial flexibility should be most valuable when external financing is costly and uncertainty raises the value of delaying irreversible investment.

Empirical foundation: The final estimation sample consists of 21,001 firm-year observations of U.S.-listed firms on the AMEX, NASDAQ, and NYSE exchanges over the period 2009–2023.

Conclusions: The results show that VOFF is positively associated with capital expenditure, while EPU is negatively associated with capital expenditure in specifications where the direct EPU effect can be identified. The positive VOFF × EPU interaction indicates that firms with above-average VOFF experience a smaller investment reduction when policy uncertainty rises. The moderating effect is strongest among smaller firms and low-technology industries.

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Abbreviations

VOFF	Value of financial flexibility
EPU	Economic policy uncertainty
CAPEX	Capital expenditures
NPV	Net present value
R&D	Research and development
OLS	Ordinary least squares
FE	Fixed effects
RE	Random effects
LOG	Natural logarithm
2SLS	Two-stage least squares

1. Introduction

This chapter introduces the topic of financial flexibility, economic policy uncertainty, and firm-level investment. It presents the background of the study, discusses the research gap, and outlines the purpose, research questions, contributions, limitations, and structure of the thesis.

1.1 Background

Corporate investment decisions lie at the core of corporate finance. Traditional theories, such as the Modigliani and Miller (1958) theorems, suggest that in perfect capital markets, financing choices do not affect firm value or investment decisions. However, real-world frictions such as information asymmetry and transaction costs challenge this assumption and make internal financial conditions highly relevant for investment behavior.

Contrasting some traditional theories, CFOs report that financial flexibility is the main determinant of decisions surrounding capital structure (Graham & Harvey, 2001; Brounen et al., 2006). By Rapp et al. (2014), the term is defined as "the ability of a firm to access and restructure its financing at a low cost". In other words, financial flexibility allows the firm to respond effectively to investment opportunities and adverse shocks. Firms constantly have to balance optimizing performance and retaining flexibility in order to respond to future uncertainties. It has also been highlighted as a strategic tool and a central part of the firm's financial policy (Yousefi & Yung, 2022).

What is also important to discuss in relation to investment decision making, is the external environment and the uncertainties under which firms operate. Economic policy uncertainty (EPU) captures political uncertainty, regulatory volatility, and macroeconomic shocks, and has emerged as a widely used measure of systematic and macroeconomic uncertainty. This type of uncertainty directly affects firms' expectations about future economic conditions including demand, financing costs, and regulatory constraints. In other words, corporate investment decisions reflect the combined influence of internal financial capacity and the external uncertainty.

In an environment characterized by heightened uncertainty and volatility, driven by economic policy changes, financial market fluctuations, and rapid technological development, the tradeoff between flexibility and current commitments reinforces the strategic role of financial flexibility in investment decision making. Without a clear understanding of the relationship between investment, financial flexibility, and uncertainty, firms risk underinvesting and misallocating capital. The managerial ability to interpret these dynamics, and incorporate them into decision-making under pressure is therefore crucial in order to preserve and optimize firm value. It is equally important for investors to have an understanding of these relationships, as they influence firm valuation, risk assessment, and expectations of future performance.

1.2 Problem Discussion

Prior research has established that financial flexibility is related to firm-level investment. Marchica and Mura (2010) show that firms maintaining spare debt capacity also invest more, while Denis and Sibilkov (2010) find that cash holdings are particularly valuable for financially constrained firms since they help prevent underinvestment. Similarly, Duchin et al. (2010) demonstrate that firms lacking financial flexibility reduced capital expenditure more sharply during the global financial crisis. These studies indicate that financial flexibility can preserve investment capacity, especially when external finance becomes costly.

Other articles examine the effect of uncertainty on corporate investment. Gulen and Ion (2016) find that higher EPU is associated with lower firm-level capital investment, particularly when investments are difficult to reverse. Bonaime et al. (2018) document a negative relationship between policy uncertainty and M&A activity. More recent studies integrate these perspectives by examining whether financial flexibility reduces the negative effects of uncertainty. Yousefi and Yung (2022), for instance, show that financial flexibility moderates how firms respond to EPU.

However, a key limitation in the existing literature is how financial flexibility is measured. Existing studies generally rely on one-dimensional proxies such as cash holdings, leverage, spare debt capacity, or financial slack. The VOFF measure of Rapp et al. (2014) addresses these limitations by combining five firm-level determinants of the value of cash, growth opportunities, profitability, the tax cost of holding cash, the cost of external financing, and capital reversibility into a single market-implied measure. Because VOFF is derived from equity returns rather than from accounting items, it captures the value that shareholders assign to a marginal unit of financial flexibility at a given firm-year, rather than the level of any single balance-sheet item. To date, VOFF has not been applied broadly in the investment–uncertainty literature. This thesis therefore contributes to the existing literature by applying this forward-looking VOFF measurement, providing a more value-based analysis of financial flexibility. Furthermore, the incorporation of the direct effect and an interaction term between VOFF and EPU allows for a more nuanced analysis of the relationship between the value of financial flexibility, economic policy uncertainty, and firm-level investment.

1.3 Purpose and Research Questions

The purpose of this study is to examine the relationship between value of financial flexibility and firm-level investment decisions, and to investigate the relationship under different levels of economic policy uncertainty (EPU). Specifically, the study aims to investigate if firms that are financially flexible are better positioned to sustain or adjust their levels of investment when there is higher uncertainty. Through incorporating a direct and interaction effect, the paper aims to deepen the understanding of how financial capacity shapes how firms respond to external pressure.

The research questions are formulated as follows:
RQ1: *How does the value of financial flexibility influence firm-level investment decisions?*

RQ2: *Does economic policy uncertainty negatively affect firm-level capital investment?*

RQ3: *How does the value of financial flexibility influence the effect of economic policy uncertainty on firm-level investment?*

To answer these research questions, the study adopts a deductive research approach and applies a quantitative methodology to test the proposed hypotheses.

1.4 Main Findings and Contributions

Using a panel of 21,001 U.S. firm-year observations over 2009–2023, this study finds that firms for which the equity market assigns a higher value to financial flexibility also invest more in physical capital. The study also finds evidence that higher policy uncertainty is associated with lower capital expenditure. Firms with above-average financial flexibility experience a smaller reduction in capital expenditure when EPU rises. The moderating effect is concentrated among smaller firms and firms in low-technology industries, consistent with financial flexibility being most valuable where financing frictions are highest.

As mentioned in chapter 1.2, the existing literature does study the effect of financial flexibility and EPU on investment levels. However, the methodological approach to measuring financial flexibility has differed, and the method applied in this paper has not previously been applied in this context. Therefore, the paper contributes to the existing literature by applying a forward-looking, market-implied measure of financial flexibility to the investment–uncertainty relationship, complementing accounting-based proxies that dominate prior work. By also combining a direct VOFF effect, a direct EPU effect, and a VOFF × EPU interaction in a single specification, it provides a more nuanced characterization of how financial flexibility shapes investment responses to policy uncertainty than the unidimensional moderating-role designs found in Yousefi and Yung (2022) and Chortareas and Noikokyris (2021).

1.5 Outline of the Paper

The remainder of the paper is structured as follows. Chapter 2 presents the theoretical framework, chapter 3 provides a review of the empirical literature on financial flexibility, EPU, and investment. Chapter 4 develops the three testable hypotheses that structure the empirical analysis. Chapter 5 describes the data sources and sample selection process, and chapter 6 outlines the empirical methodology of the study. Chapter 7 presents the empirical results which are analyzed and discussed in chapter 8. Finally, chapter 9 provides a comprehensive conclusion of the paper and its findings.

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2. Theoretical and Conceptual Framework

This chapter presents the theoretical foundations of the thesis. It discusses capital structure theory, financial flexibility, corporate investment theory, and real options theory in order to *explain how firms' financing capacity and external uncertainty may influence investment decisions.*

2.1 Traditional Capital Structure Theory and Financial Flexibility

The modern theories of capital structure are rooted in the Modigliani and Miller theorems (1958), that demonstrate how the value of a firm is independent of its financing mix in frictionless capital markets. The tradeoff theory, formalized by Kraus and Litzenberger (1973), reconciles this implication with observed moderate leverage levels by incorporating financial distress costs; firms balance the tax shield of debt against the expected costs of financial distress, arriving at an optimal leverage ratio. The pecking order theory of Myers and Majluf (1984) offers a complementary explanation rooted in information asymmetry between managers and outside investors. Since equity issuance signals that management believes the firm to be overvalued, external equity is prohibitively costly. Firms therefore prefer internal funds, then debt, and issue equity only as a last resort. The pecking order theory predicts that profitable firms, generating ample internal cash flows, will naturally maintain low leverage.

While both the tradeoff theory and the pecking order theory have substantial empirical support, neither one fully explains a persistent empirical regularity; many large, profitable, and low-growth firms maintain leverage well below what the tradeoff optimum would predict, and do so consistently over time. Dynamic capital structure theory extends the more static view of capital structure by emphasizing that firms do not choose leverage based purely on current tax benefits, distress costs, or financing needs, but also in anticipation of future conditions (Fischer et al., 1989). Rather than assuming that firms continuously remain at a fixed optimal leverage ratio, the dynamic capital structure perspective recognizes that firms may preserve financing capacity in order to respond to future conditions. DeAngelo and DeAngelo (2007) formalize this intuition within a dynamic framework, arguing that financial flexibility itself is an optimization objective. In their model, firms that anticipate future investment needs or adverse shocks rationally choose to hold debt capacity in reserve, accepting the foregone tax benefits as the price of preserving the option to raise cheap debt quickly when needed. The importance in understanding this perspective is highlighted through survey-based studies by Graham and Harvey (2001) and Brounen et al. (2006), which show that CFOs rank financial flexibility as the single most important determinant of capital structure decisions, above tax considerations, credit ratings, and transaction costs.

2.2 Defining Financial Flexibility and its Value

Building on the capital structure theories discussed above, financial flexibility can be understood as a dynamic financing capacity rather than a balance sheet item. A firm with financial flexibility is not only a firm with high cash holdings or low leverage, but a firm that has the capacity to finance future actions without being forced to rely on costly external financing under unfavorable conditions. This conceptual view is consistent with the broader corporate finance literature, which emphasizes that financial flexibility becomes valuable when capital markets are imperfect and external financing is not always available on favorable terms (Denis, 2011; Gamba & Triantis, 2008).

Financial flexibility can arise from a variety of different channels. The first is internal liquidity, most common in the form of cash holdings and other liquid assets. Internal liquidity allows firms to finance investment directly and reduces dependence on external capital markets, which is valuable especially when external financing is costly (Myers & Majluf 1984; Denis, 2011). Another channel through which financial flexibility can be achieved is spare debt capacity. Firms with conservative leverage preserve the ability to borrow in the future, which may be valuable if investment opportunities arise or if operating conditions deteriorate. The pecking-order logic of Myers and Majluf (1984) and the dynamic extension formalized by DeAngelo and DeAngelo (2007) both predict that firms anticipating future investment opportunities or adverse cash-flow realizations will rationally hold leverage below the static trade-off optimum, accepting the foregone tax shield as the price of preserving the option to issue cheap debt in the future. External finance is another channel for financial flexibility. Firms with lower information asymmetry, stronger collateral positions, stable cash flows, or better credit quality are generally better positioned to raise capital at a lower cost. Together, these channels show that financial flexibility is multidimensional and cannot be fully captured by one isolated proxy such as cash holdings or leverage (Rapp et al., 2014).

The theoretical value of financial flexibility is closely related to the precautionary motive. Since future cash flows, investment opportunities, and financing conditions are uncertain, firms may reserve liquidity and unused financing capacity as a buffer against possible future shocks or unexpected events. The precautionary motive suggests that firms accumulate liquid assets to protect against future declines in cash flow, and to avoid having to pass up on valuable investment opportunities when external financing is costly or unavailable (Opler et al., 1999; Bates et al., 2009). This means that financial flexibility has both a defensive and offensive function. It allows firms to absorb negative shocks without cutting investment or having to rely on costly external financing, while also allowing for NPV positive investment opportunities as they arise.

Critically, the value of financial flexibility depends on the firms' expected need for future financing and the cost of obtaining that financing externally. If external capital is easily available at low cost, the value of preserving financial flexibility is relatively limited. However, when external finance is costly, uncertain, or constrained, internal liquidity and spare debt capacity become more valuable. Firms facing stronger growth opportunities, higher uncertainty, greater information asymmetry, or lower asset reversibility may therefore place a higher value on maintaining flexibility. This is consistent with theoretical models (Gamba & Triantis, 2008), in which the value of financial flexibility depends on financing costs, taxes, investment opportunities, and uncertainty.

2.3 Corporate Investment Theory

Corporate investment theory provides a link between financial flexibility and firm-level investment decisions. In its most basic form, investment theory suggests that firms allocate capital to projects when the expected return exceeds the cost of investment. In the frictionless benchmark of Tobin's q-theory (1969), firms should invest whenever the market value of capital exceeds its replacement cost, making a firm's internal financial resources irrelevant to investment decisions. As Myers and Majluf (1984) show, costly external finance, arising from information asymmetry or financial distress risk, creates a wedge between internal and external capital. Two firms with identical investment opportunities may make different investment decisions if they differ in their financial flexibility.

Internally generated funds and reserves therefore become more valuable than external capital, creating a possibility of underinvestments if a firm experiences financial constraints. A firm may have access to NPV-positive projects, yet still reduce, delay, or turn down investment if it lacks sufficient internal liquidity or borrowing capacity. This is closely related to the broader financial constraints literature, which argues that firms with limited access to external finance are more dependent on internal funds when making investment decisions (Fazzari et al., 1988; Hubbard, 1998). In this context, financial flexibility becomes important because it reduces the likelihood that firms are forced to pass up on valuable investment opportunities due to financing limitations.

A theoretical mechanism closely related to underinvestment is debt overhang. When firms are highly levered, shareholders may be unwilling to finance new NPV-positive projects because part of the benefits from the investment would fall to the debt holders instead of the equity holders. This can be a cause of underinvestment even when projects are economically valuable (Myers, 1977). Firms with greater financial flexibility, particularly those with lower leverage and spare debt capacity, are less exposed to this problem because they are less constrained by existing debt obligations. Maintaining financial flexibility can therefore support investment by reducing the risk that leverage prevents firms from undertaking value-creating projects.

2.4 Real Options Theory

A separate stream of literature, grounded in real options theory, shapes when a firm should act. A firm holding a valuable investment opportunity also holds an option: the right, but not the obligation, to commit capital at a time of its choosing. Just as a financial call option derives value from the possibility of waiting for more favorable conditions before exercising, the option to invest has value precisely because uncertainty may resolve over time.

Bernanke (1983) formalizes this argument, showing that the option to postpone an irreversible investment is economically equivalent to a financial call option: its value rises with the uncertainty surrounding the underlying payoff. McDonald and Siegel (1986) extend this to a continuous-time setting, deriving the optimal investment threshold and showing that it lies strictly above the NPV break-even point; the firm should wait until the project value exceeds costs by a premium that reflects the option value of delay. This is further developed by Pindyck (1991), who argues that when a firm invests irreversibly, it permanently sacrifices its option to wait, an opportunity cost that must be added to the direct cost of the investment. The correct investment point is therefore at the NPV break-even point plus the value of sacrificing the option to wait. The optimal investment threshold therefore increases with the variance of the underlying value process; the more uncertain the future, the higher the hurdle that project value must clear before investment is optimal. Firms holding unexercised options can therefore exhibit rising market valuations alongside declining capital expenditures.

Building upon the Pindyck framework, Boyle and Guthrie (2003) introduce the interaction between real options and financial liquidity constraints. By doing so, Boyle and Guthrie modify the Pindyck assumption that firms are able to fund optimal investment. It is then demonstrated that financial constraints can force firms to invest sub-optimally early, exercising the investment option before the threshold is reached in order to avoid losing the project if financing becomes unavailable in the future. This creates a wedge between financially flexible and constrained firms. Flexible firms can afford to wait for the optimal investment moment, while constrained firms may be compelled to act prematurely or to forgo investment altogether. Financial flexibility therefore determines not only the level of investment but also whether the firm can optimally time its real option exercise.

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3. Literature Review

This chapter reviews the existing empirical research relevant to the subject, clarifying the gap in the literature that the paper aims to fill. The review is organized around three strands: financial flexibility and firm-level investment, EPU and firm-level investment, and the moderating role of financial flexibility in the investment–uncertainty relationship.

3.1 Financial Flexibility and Firm-Level Investment

A large body of empirical research supports the view that financial flexibility relaxes the financing constraints and helps firms preserve their capacity to invest. Across different measurement approaches, institutional settings, and time periods, prior studies generally find that financially flexible firms are better able to undertake investment when opportunities arise. However, the interpretation of this relationship depends on how financial flexibility is measured, as the literature commonly relies on proxies such as spare debt capacity or cash holdings.

A large strand of the literature measures financial flexibility through conservative leverage and spare debt capacity. Using a large panel of UK listed firms between 1965 and 2008, Marchica and Mura (2010) find that firms sustaining a policy of spare debt capacity over consecutive years subsequently exhibit higher investment rates. Specifically, their results show that financial flexibility increases investments by about 37%. Similar evidence is found by Ferrando et al. (2017), who show that financially flexible firms in the Euro area and the UK reduced capital expenditure less during the global financial crisis compared to non-flexible peers (6.8% compared to 14.4%), with the effect being strongest for private, younger, and smaller firms in countries with limited credit accessibility. A comparable pattern is found in a sample of 1,086 East Asian firms during the Asian financial crisis and the global financial crisis (Arslan-Ayaydin et al., 2014); financially flexible firms exhibited lower sensitivity of capital expenditure to internal funds during the crisis relative to less flexible peers. Taken together, these studies suggest that spare debt capacity has a measurable effect on investment, particularly when access to external finance becomes more limited.

Cash holdings represent another way of measuring financial flexibility. While spare debt capacity reflects a firm's ability to access future borrowing, cash holdings capture liquidity that is already available within the firm. Denis and Sibilkov (2010) examine U.S. firms between 1985 and 2006 and show that cash holdings are associated with higher investment and higher firm value, but predominantly for financially constrained firms. For unconstrained firms the cash-investment relationship is essentially flat. Their results are consistent with a precautionary-motive interpretation of cash holdings: constrained firms accumulate liquid buffers because doing so allows them to finance value-creating projects that would otherwise be foregone.

A related strand of research examines not the level of investment but the responsiveness of investment to value-generating opportunities. Fliers (2025) estimates firm-specific, time-varying investment sensitivities for a sample of large and mature U.S. firms over 1971–2017, showing that firms operating above their target debt level exhibit approximately 20% lower investment sensitivities than their peers, and that as firms recover their debt capacity, their investment responsiveness increases. This evidence complements the level-based findings of Marchica and Mura (2010) and Denis and Sibilkov (2010) by showing that financial flexibility shapes not only how much firms invest but also how efficiently they translate value opportunities into capital commitments.

A complementary strand examines the value the equity market assigns to additional cash, providing a direct window into how financial flexibility shapes investment capacity. Faulkender and Wang (2006) develop an excess-returns methodology to estimate the marginal value of corporate cash holdings for a broad sample of U.S. firms over 1972–2001. They find that the marginal value of cash declines with existing cash levels and with leverage, and is significantly higher for financially constrained firms, with the constrained premium ranging from \$0.27 to \$0.63. This differential is largest among firms combining constrained access to external capital with strong investment opportunities, confirming the precautionary-motive logic of Myers and Majluf (1984): liquid reserves translate into investment capacity when external financing is expensive or unavailable, and the equity market prices this option accordingly.

Building directly on the excess-returns framework of Faulkender and Wang (2006), Rapp et al. (2014) propose a market-based measure of financial flexibility. Their central insight is that the market should assign a higher price to an additional unit of cash for firms for which financial flexibility is more valuable. Using this measure they find that around the collapse of Lehman Brothers, firms with VOFF one standard deviation above the sample mean experienced an additional loss of approximately 1% in cumulative abnormal returns. They also found that a one standard deviation increase in VOFF is associated with a dividend payout ratio approximately 7% lower and high-VOFF firms are significantly more likely to omit dividends entirely when cash is needed for investment.

Taken together, the evidence reviewed in this section consistently supports the view that financial flexibility, whether captured through spare debt capacity, cash holdings, or a market-implied composite, positively predicts both the level and the quality of corporate investment, and that this relationship is most pronounced when financing conditions are tightest.

3.2 Economic Policy Uncertainty and Firm-Level Investment

In addition to firm-level characteristics, investment decisions are also shaped by the broader macroeconomic environment in which firms operate. Economic policy uncertainty (EPU) is a widely used measure of this external environment and has been shown to be an important determinant of corporate investment.

In a comprehensive study of U.S. firm-level investment, Gulen and Ion (2016) find that a one standard deviation increase in the EPU index is associated with a 4.8 percentage-point reduction in firm-level capital expenditure. This negative relationship is not uniform for all firms; it is concentrated in firms with higher asset irreversibility, meaning that the uncertainty-induced delay is most severe precisely where committing capital is hardest to undo. Consistent with this, Bonaime et al. (2018) document that heightened economic policy uncertainty is associated with a significant decline in U.S. merger activity, and that the negative relationship is concentrated in less reversible deals. Collectively these studies show the negative effects of uncertainty on investments, and that the magnitude of the effect is larger wherever the cost of committing the capital is the highest.

Extending the analysis to a crisis context, Dalwai (2023) examines Asian listed firms around COVID-19 and finds that firms responded to pandemic uncertainty by simultaneously accumulating higher cash balances and reducing leverage, a defensive reorientation of capital structure that increased their degree of financial flexibility precisely when the uncertainty was highest. Wu et al. (2024) study 26,621 North American-listed firms and 5,212 Chinese firms over 2000 to 2022, spanning the global financial crisis, the SARS outbreak, and COVID-19, and find that financial flexibility consistently reduces financial distress in the U.S. market across all economic environments, with the protective effect most evident during periods of heightened uncertainty. The pattern observed in both studies is consistent with the prediction that firms recognize the option value of maintaining financial slack and act strategically to preserve it when external conditions deteriorate.

3.3 The Moderating Role of Financial Flexibility

A substantial body of literature emphasizes that financial flexibility is crucial for firms in order to respond to shocks, preserve investment capacity, and avoid costly external financing. (Dalwai, 2023; Yousefi & Yung, 2022; Chortareas & Noikokyris, 2021; Bolton et al., 2019).

The most direct empirical evidence for a moderating role comes from Yousefi and Yung (2022) and Chortareas and Noikokyris (2021), both of which estimate investment specifications that explicitly interact uncertainty with measures of financial flexibility or financial constraints. Chortareas and Noikokyris (2021) study how financial flexibility affects the investment-uncertainty relationship from 1983 to 2019, amounting to 68,298 firm-year observations. They find that the negative relationship between uncertainty and investment is roughly two to three times larger in magnitude for financially constrained firms than for unconstrained ones. When they further interact this constrained-firm effect with proxies for how much value firms assign to their financial flexibility, including firm age, size, sales growth, and profitability, they find that the amplified sensitivity for constrained firms is significantly lessened for those that maintain a higher value of financial flexibility. This is further supported by the findings of Yousefi and Yung (2022), which also represents the closest precedent to the specification adopted in this thesis. Using U.S. Compustat data and several proxies for financial slack, they estimate investment regressions with an *EPU × slack* interaction term and document a statistically significant positive coefficient: firms with greater financial slack experience smaller investment declines when EPU rises.

Similarly, Bolton et al. (2019) find that not only do firms delay investment because they lack the funds to pursue current investment, but they do so intentionally as a result of precautionary motives. Further supporting evidence comes from crisis-period studies. Duchin et al. (2010) examine U.S. listed firms around the 2007–2008 subprime credit shock and document that the contraction in capital expenditure following the crisis was concentrated among firms with low ex-ante cash reserves, high net short-term debt, and high external-finance dependence. Firms that had maintained financial flexibility prior to the shock were better shielded from the investment decline. Ferrando et al. (2017) quantify a similar pattern in their European sample during the 2007–2010 financial crisis. Financially flexible firms had investment reductions that were 7.6% lower compared to those of non-financially flexible firms.

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4. Hypothesis Development

This chapter develops the hypotheses based on the theoretical framework and prior empirical findings. The hypotheses follow the same structure as chapter three: the effect of VOFF on *firm-level investment, the effect of EPU on firm-level investment, and the moderating role of VOFF in the relationship between EPU and investment.*

4.1 Hypotheses

The theoretical framework developed in chapter 2 suggests that investment decisions are shaped by both the value of available investment opportunities and the firm's ability to finance these. In a frictionless setting, firms should invest whenever the net present value is positive. However, when introducing financing frictions and uncertainty, investment becomes dependent on financial flexibility. Chapter 3 shows that prior empirical studies support this mechanism; financially flexible firms invest more when opportunities arise, while uncertainty tends to reduce investment, particularly when investment is difficult to reverse. The remaining question, which this thesis addresses, is whether a forward-looking, market-implied measure of flexibility identifies the same moderating role as the accounting proxies used in prior work.

Financial flexibility reflects the firm's ability to finance future investment opportunities without being forced to rely on costly external capital under unfavorable conditions. This capacity is valuable because financing frictions can prevent firms from undertaking otherwise value-creating projects. Furthermore, section 2.3 links this mechanism to corporate investment theory. When firms face costly external finance, investment depends not only on project profitability but also on available liquidity and spare debt capacity. Firms with higher VOFF should therefore be better able to fund investment when opportunities arise. This prediction is consistent with Marchica and Mura (2010), who document that firms maintaining a policy of spare debt capacity subsequently invest significantly more, and with Rapp et al. (2014) who show that high-VOFF firms tend to hold more cash. Based on this, together with Denis & Sibilkov's (2010) findings that firms with higher cash holdings tend to invest more, the following hypothesis is formulated:

H1: Value of Financial flexibility (VOFF) is positively associated with firm-level capital investment.

Real options theory predicts that when investment is irreversible, the option to wait has value precisely because uncertainty may resolve over time. Economic policy uncertainty represents this type of external uncertainty because it affects expectations about demand, regulation, taxes, and financing conditions. When EPU rises, firms face greater uncertainty about future project payoffs, making delays more valuable and reducing current capital expenditure. Bernanke (1983), McDonald and Siegel (1986), and Pindyck (1991) formalize this argument, showing that the optimal investment threshold rises monotonically with uncertainty; the higher the uncertainty surrounding future project value, the more the firm benefits from deferring capital commitment. From this, we formulate H2:

H2: Economic policy uncertainty (EPU) is negatively associated with firm-level capital investment.

The third hypothesis brings together the investment effects of uncertainty and the role of financial flexibility. When uncertainty rises, firms have stronger incentives to delay irreversible investment, as waiting allows them to gather more information before committing capital. However, firms with higher value of financial flexibility are better positioned to manage this tradeoff since they have internal liquidity and unused financing capacity. This allows them to continue funding valuable projects, or delay investment strategically, without being forced into underinvestment. Firms with lower value of financial flexibility might delay or reduce investment levels because external financing becomes more costly or entirely unavailable. Consistent with this, Boyle and Guthrie (2003) show that financially flexible firms can exercise their real options at the optimal moment, while constrained firms may be forced to invest prematurely or forgo investment altogether. Yousefi and Yung (2022) provide direct empirical support for a positive EPU × financial slack interaction on investment. Financially flexible firms, holding higher VOFF, are therefore expected to exhibit a smaller investment contraction when EPU rises compared to their constrained counterparts. H3 is formulated as follows:

H3: Greater value of financial flexibility (VOFF) moderates the negative effect of EPU on firm-level capital investment.

Through testing these hypotheses, we answer the research questions presented in section 1.3.

5. Data

This chapter describes the data used in the empirical analysis. It presents the sample selection process, the applied restrictions, and the data sources used to construct the final dataset.

5.1 Sample Selection & Restrictions

The study utilizes data from the three U.S. stock exchanges: AMEX, NASDAQ, and NYSE. The initial sample includes 32,780 firm-year observations. Years with very few complete observations are dropped, leading to the sample period being narrowed down to 2007–2023. Following Rapp et al. (2014), firms with SIC codes between 6000 and 6999, covering finance, insurance, and real estate, are excluded since firms in these industries differ substantially from other firms in financial structure and regulatory treatment. This restriction reduces the sample to 28,761 observations. Observations with negative market cap, missing total assets, negative dividends, and observations where the value of cash holdings exceeded the book value of assets are treated as data errors, and are consequently also dropped from the sample. This is also in line with the methodology applied by Rapp et al. (2014). After this, 25,425 firm-year observations remain. Furthermore, when creating the lagged variables, all observations with no prior period data are removed. The final data sample spans from 2009 to 2023, and consists of 21,001 firm-year observations.

5.2 Data Sources

The sample was retrieved using FactSet and Bloomberg Terminal, and the data was cross-checked to ensure completeness. Firm-level accounting data was drawn from FactSet and Bloomberg, while stock return and price data were drawn only from FactSet. The EPU index was obtained directly from the authors' website (Baker, Bloom & Davis, n.d.). Benchmark portfolio returns and NYSE breakpoints for the abnormal return calculation are taken from Kenneth French's data library (French, n.d.). Bid-ask spread data are sourced from Bloomberg Terminal. Industry classifications follow two-digit SIC codes collected from FactSet.

6. Methodology

This chapter presents the empirical methodology used to test the hypotheses. It defines the variables, presents the regression models, explains the choice of estimator, and describes the diagnostic tests and robustness checks.

6.1 Variables

6.1.1 VOFF

We begin by calculating the main explanatory variable, the value of financial flexibility (VOFF) for all observations, following the method developed by Rapp et al. (2014). Unlike traditional proxies for financial constraints such as the Kaplan-Zingales Index (Kaplan & Zingales, 1997) or the Whited-Wu Index (Whited & Wu, 2006), the VOFF is explicitly designed to capture the value that shareholders assign to financial flexibility, rather than its current level. The measurement incorporates five main determinants of the value of financial flexibility: growth opportunities, profitability, effective cost of holding cash, cost of external financing, and reversibility of capital. Below, the main determinants are defined, and the full list of variables included in the regression can be found in Table 5.

Sales growth (SGR): proxying growth opportunities, since the option value of holding financial slack is larger for firms with more future investment opportunities.
Changes in earnings (ΔE/M): capturing profitability dynamics; firms with deteriorating earnings face higher future financing constraints, making cash more valuable.
Effective tax rate (T): reflecting the tax cost of retaining cash; a higher effective tax rate reduces the after-tax value of holding internal liquidity.
Bid-ask spread (Spread): proxying the cost of external financing through bid and ask spread. Following Diamond and Verrecchia (1991), as referenced in Anderson et al. (2009), the bid-ask spread is computed as the difference between the ask and bid price divided by the midpoint, expressed as a percentage.
Asset tangibility (Tang): capturing capital reversibility; firms with high tangibility can more readily liquidate assets to fund investments, reducing their dependence on financial slack.

The regression model used for estimating the coefficients of the VOFF determinants is specified in Eq. (1) below. The dependent variable is the firm's annual cumulative abnormal return, computed relative to the return on a benchmark portfolio formed on size and book-to-market using Kenneth French's 25 Fama-French portfolios. The key regressor is the unexpected change in cash scaled by lagged market value of equity ($\Delta C/M_{i,t-1}$), which is interacted separately with each of the five VOFF determinants (Rapp et al., 2014).

$$\begin{aligned} r_{i,t} - R^{B}_{i,t} = {} & \gamma_0 + \gamma_1 \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_2 SGR_{i,t} + \gamma_3 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_4 T_{i,t} + \gamma_5 Spread_{i,t} + \gamma_6 Tang_{i,t} \\ & + \gamma_7 SGR_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_8 \frac{\Delta E_{i,t}}{M_{i,t-1}} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_9 T_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{10} Spread_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} \\ & + \gamma_{11} Tang_{i,t} \times \frac{\Delta C_{i,t}}{M_{i,t-1}} + \gamma_{12} \frac{C_{i,t-1}}{M_{i,t-1}} + \gamma_{13} \frac{\Delta NA_{i,t}}{M_{i,t-1}} + \gamma_{14} \frac{\Delta RD_{i,t}}{M_{i,t-1}} + \gamma_{15} \frac{\Delta I_{i,t}}{M_{i,t-1}} + \gamma_{16} \frac{\Delta D_{i,t}}{M_{i,t-1}} \\ & + \gamma_{17} L_{i,t} + \gamma_{18} \frac{NF_{i,t}}{M_{i,t-1}} + \gamma_{19} Z_{i,t} + \epsilon_{i,t} \qquad \text{Eq. (1)} \end{aligned}$$

In the second step, the VOFF measure is created by combining the estimated interaction coefficients with each firm's observed characteristics. More specifically, each coefficient is weighted by the firm's actual value of the corresponding determinant in that year. This results in a time-varying VOFF score for each firm-year observation, reflecting the market-implied value of holding an additional unit of cash for a specific firm at a specific point in time. A higher VOFF indicates that cash holdings are more valuable to a given firm at a specific point in time, due to factors such as stronger growth opportunities, greater financing frictions, or higher uncertainty about future cash flows. The regression for estimating the VOFF is specified in Eq. (2) below:

$$VOFF_{i,t} = \gamma_1 + \gamma_7 SGR_{i,t} + \gamma_8 \frac{\Delta E_{i,t}}{M_{i,t-1}} + \gamma_9 T_{i,t} + \gamma_{10} Spread_{i,t} + \gamma_{11} Tang_{i,t} \qquad \text{Eq. (2)}$$

A key advantage of VOFF in this context is that it treats financial flexibility as a broader firm-level characteristic rather than a single proxy, such as cash holdings or leverage. By combining five distinct determinants into a single composite, the measure reduces limitations associated with relying on any single proxy. The approach is consistent with the theoretical framework developed by Gamba and Triantis (2008). Importantly, because VOFF is derived from equity returns rather than from pure accounting variables, it is less likely to be mechanically correlated with the investment variables that serve as the dependent variable in the models for this thesis. Another advantage of the measure is that it is forward-looking, as a result of the forward-looking nature of the input variables.

Because VOFF is constructed as a relative measure of a firm's financial flexibility, deviations from the sample average are more informative than the absolute level itself. VOFF is therefore entered in mean-centered form in all regression models. This means that the sample mean is subtracted from every observation, so that a value of zero represents the average level of VOFF in the sample. Mean-centering is useful in situations where 0 is not a meaningful value. In the case of VOFF, 0 is never a realistic value since there is always some level of value attributed to the financial flexibility of a firm. This is also supported by the bounds of our data sample. This transformation does not alter the interaction coefficient or its statistical significance. It does, however, make the results easier to interpret (further explained in section 6.3).

6.1.2 Economic Policy Uncertainty

The EPU index was established by Baker et al. in *Measuring Economic Policy Uncertainty* (2016). The index combines three measures: the news-based measure, tax code provisions, and forecaster disagreement. The news-based measure looks at the frequency at which newspaper articles include certain economic terms, or terms related to uncertainty. Tax code provisions measure how many federal tax changes are set to expire in the coming years. Forecaster disagreement is a proxy for economic uncertainty, which is calculated through dispersion in economic forecasts. The resulting index has become the standard measure of policy uncertainty in the empirical corporate finance literature (Gulen & Ion, 2016; Yousefi & Yung, 2022).

A central advantage of the EPU index is its exogeneity with respect to individual firm decisions. Other measures of uncertainty, such as stock return volatility, analyst earnings forecast dispersion, or firm-level cash flow volatility are endogenous to the firm's own investment and financing decisions. A firm that cuts investment during an uncertain period will typically exhibit lower earnings volatility and narrower analyst forecast dispersion as a direct consequence of its own actions. As the EPU index is constructed from aggregate national data driven by political and legislative events, no single firm can influence its value.

This property mitigates reverse causality concerns that would otherwise complicate the identification of the effect of uncertainty on investment.

Prior to entering the regression models, the monthly EPU index is averaged to annual frequency, and log-transformed following Yousefi and Yung (2022) to reduce skewness from extreme spikes around the financial crisis and the COVID-19 shock. The variable enters all models with a one-year lag. The lag allows uncertainty in year t-1 to affect investment policy in year t, whereas a same-year EPU value risks not being representative of within-year uncertainty due to late spikes or declines.

6.1.3 Interaction Term

The interaction term VOFF × EPU is the product of the mean-centered VOFF and mean-centered log EPU. It tests whether the within-firm sensitivity of investment to policy uncertainty is moderated by the firm's degree of financial flexibility. Due to the mean-centering of both VOFF and EPU, a positive and statistically significant coefficient on this interaction indicates that firms with above-average financial flexibility experience a smaller reduction in capital expenditure when EPU rises. This is further explained in section 6.2. Because VOFF varies across firms and time while EPU only varies over time, the interaction VOFF × EPU is identifiable even when firm and year fixed effects are jointly included in the model. This is what makes the moderation effect in H3 identifiable within a two-way fixed-effects framework.

6.1.4 Dependent Variable

The primary dependent variable is the capital expenditure ratio, defined as capital expenditures scaled by lagged total assets. This measure follows the convention in the investment literature (Gulen & Ion, 2016; Kim & Kung, 2017; Gallemore et al., 2025) and captures the intensity of physical capital investment. Capital expenditures are scaled by lagged total assets, rather than current assets, to avoid mechanical endogeneity between numerator and denominator, since current-year capital expenditure is already reflected in current total assets. R&D expenditure scaled by lagged total assets serves as a secondary dependent variable for the robustness specifications in Section 6.6.

6.1.5 Control Variables

We include a set of control variables that have been utilized in the panel finance literature (Rapp et al. 2014; Gulen & Ion 2016; Yousefi & Yung 2022). The inclusion of these controls ensures that the estimates of β_1 and β_3 are not affected by observable firm characteristics that are correlated with both financial flexibility and investment levels.

Firm Size is the natural logarithm of total assets, controlling for the well-documented relationship between firm size, capital market access, and investment. Larger firms typically face lower information asymmetries, enjoy more diversified cash-flow streams, and typically have better credit ratings, all of which reduce the cost of accessing external capital markets. Following Rapp et al. (2014) and Gulen and Ion (2016), controlling for size therefore ensures that the VOFF coefficient captures variation in the market-implied value of flexibility rather than the size premium in capital market access.

Leverage is computed as total debt (short-term plus long-term debt) divided by total assets, and is then lagged by one year. Consistent with the financial constraints literature, higher prior year leverage is expected to reduce investment capacity by increasing financial risk and limiting access to external financing. Firms approaching financial distress have limited additional debt capacity, restricting their ability to fund projects externally (Fazzari et al., 1988). This predicts a negative relationship between prior-period leverage and current capital expenditure. Since leverage is also negatively correlated with VOFF (Rapp et al. 2014), omitting it would upwardly bias the VOFF coefficient. Lagging leverage by one period mitigates reverse causality, as capital expenditure in year t cannot mechanically influence the debt ratio measured in year $t-1$, consistent with Marchica and Mura (2010).

Tobin's Q is calculated as the ratio of the market value of assets to their book value, proxied by (market capitalization + book value of debt) / total assets, and enters the regression with a one-year lag. Following Gulen and Ion (2016) and Rapp et al. (2014) Tobin's Q controls for heterogeneity in investment opportunities across firms. Two firms with the same VOFF but different growth prospects should invest at different rates, and failing to account for this would confound the flexibility mechanism with a pure investment-opportunity effect. Lagging Q by one period also addresses the concern that within-year stock price movements driven by investment announcements being explained would create a mechanical correlation between the regressor and the dependent variable.

Cash flow is defined as operating income before depreciation scaled by total assets, and enters the estimation with a one-year lag. Following the foundational work of Fazzari et al. (1988), cash flow captures the intensity of internal fund generation and serves as the primary channel through which financing constraints bind. When external capital is costly, a firm's ability to self-fund projects from operating earnings determines whether marginal investment opportunities are pursued. Including lagged cash flow ensures that the VOFF coefficient reflects the market-implied value of financial flexibility rather than the simple availability of operating earnings in the prior period.

Cash holdings are defined as cash and short-term investments divided by total assets and enter the estimation with a one-year lag. Firms accumulate liquid reserves through the precautionary motive: they hold cash to insure against future financing shortfalls and to preserve the ability to exploit investment opportunities when they arise (Opler et al., 1999; Bates et al., 2009). Prior-year cash holdings therefore proxy for the stock of readily deployable internal capital available to fund investment in year t, predicting a positive relationship with capital expenditure. Controlling for lagged cash holdings therefore prevents the VOFF coefficient from picking up the pure cash-accumulation effect documented by Denis and Sibilkov (2010) and Duchin et al. (2010).

Sales growth is the logarithmic year-on-year change in net revenues, entered with a one-year lag following (Gulen & Ion, 2016). Firms experiencing stronger growth are expected to invest more to accommodate growing output, independently of their financing conditions. Omitting this control could mix up the flexibility mechanism with a revenue-growth effect on investment. Lagging ensures that the control reflects prior demonstrated growth rather than current revenue realizations that may themselves be influenced by the year's investment activity.

Tangibility is defined as net property, plant, and equipment scaled by total assets and lagged by one year, consistent with Rapp et al. (2014). It operates as a measure of capital intensity. It controls for the differences in investment rates across industries. Asset-heavy sectors such as utilities or manufacturing maintain high and persistent capital expenditure ratios that are largely unrelated to year-on-year variation in financial flexibility. Tangibility can also serve as collateral in debt contracts, relaxing borrowing constraints and enabling firms to access external debt financing at lower cost.

6.2 Regression Models

To test the three hypotheses and analyze the relationship between investment, VOFF, and EPU, three panel regression models are estimated. The models progressively introduce explanatory variables: the first establishes the baseline VOFF-investment relationship, the second adds the EPU level, and the third adds the VOFF × EPU interaction term. The purpose of this is to first establish the baseline relationship between VOFF and investments before introducing the uncertainty models, allowing for a more nuanced analysis of the explanatory terms. All three models are estimated with firm-clustered standard errors.

Prior to estimation, all accounting variables are winsorized at the 1st and 99th percentiles to limit the influence of outliers and extreme observations. The panel finance literature consistently applies this treatment to the right-skewed distributions characteristic of accounting-based variables such as leverage, cash holdings, and Tobin's Q. No logarithmic transformation is applied to VOFF or to the investment ratios. These variables are already expressed as ratios and display approximately symmetric distributions after winsorization; the capital expenditure ratio is also bounded below at zero by construction, which rules out logarithmic transformation of the dependent variable. Both ratios are therefore used directly.

Model 1 is the baseline specification:

Model 1

$$Investment = \alpha + \beta_1 VOFF_{i,t} + controls_{i,t} + \varepsilon_{i,t}$$

This model regresses the capital expenditure ratio solely on VOFF and the full set of controls, with firm and year fixed effects. This provides the baseline test of H1 and establishes the relationship between VOFF and investment, conditional on time-invariant firm heterogeneity and aggregate annual shocks. Model 1 is tested using both firm and year fixed effects.

Model 2 adds the log-EPU index:

Model 2

$$Investment = \alpha + \beta_1 VOFF_{i,t} + \beta_2 EPU_{i,t} + controls_{i,t} + \varepsilon_{i,t}$$

Since EPU varies only at the annual level, it is perfectly collinear with the year fixed effects already included in the specification, and is consequently absorbed by the estimator. The coefficient β_2 therefore cannot be recovered in this two-way FE framework, and has to be estimated using only firm fixed effects. Removing year fixed effects frees the EPU level from the year-fixed-effects collinearity constraint and allows it to enter as a regressor in its own right, providing the primary evidence for H2. The trade-off is that this specification no longer absorbs aggregate time-varying macroeconomic effects, business cycle variation, and other annual factors that affect all firms simultaneously, so the EPU coefficient in this specification should be interpreted with more caution. To confirm that the inclusion of EPU does not alter the VOFF or control coefficients relative to the baseline model, model 2 is still estimated with both year and firm fixed effects, in parallel with a firm-fixed-effects-only specification.

Model 3 (Main) is the primary model to test Hypothesis 3:

Model 3 (Main)

$$Investment = \alpha + \beta_1 VOFF_{i,t} + \beta_2 EPU_{i,t} + \beta_3 (VOFF \times EPU)_{i,t} + controls_{i,t} + \varepsilon_{i,t}$$

Interaction terms can be utilized to see how one variable affects another variable (Wooldridge, 2016). Model 3 extends Model 2 by adding the VOFF × EPU interaction term. The mean-centering of VOFF and EPU becomes useful in Model 3, where the interacting variables depend on one another. The coefficient β_1 now captures the within-firm marginal effect of VOFF on capital investment evaluated at the sample-mean level of EPU. Similarly, β_2 captures the within-firm marginal effect of EPU on capital investment evaluated at the sample-mean level of VOFF. The coefficient β_3 captures how the effect of VOFF on investment changes as EPU increases, and vice versa. For the sake of consistency when interpreting the variables, we will interpret it as how the effect of VOFF on investment changes as EPU increases.

6.3 Pooled OLS, Fixed Effect, and Random Effect Models

A challenge when using panel data is how to handle the unobserved firm-specific heterogeneity, and the choice of panel estimator is important to ensure drawing reliable conclusions. Prior studies in the financial flexibility and investment literature have predominantly relied on fixed-effects OLS estimation (Marchica & Mura, 2010; Gulen & Ion, 2016; Yousefi & Yung, 2022). This approach is motivated by the need to control for time-invariant unobserved firm heterogeneity that may otherwise contribute to a biased estimation.

Given that this thesis uses panel data, the use of pooled OLS (POLS) would be problematic since it ignores all time-invariant firm characteristics. It treats all observations as independent and ignores the panel structure of the data, pooling observations across firms and time periods. While computationally straightforward, POLS is inconsistent when unobserved firm-specific effects, α, are correlated with the regressors (Wooldridge, 2016; Bailey, 2020).

The two alternatives to POLS are random effects (RE) and fixed effects (FE), which both aim to test for heterogeneity. RE treats the time-invariant unobserved heterogeneity (α) as a random variable drawn independently of the explanatory variables, allowing it to be absorbed into a composite error term and estimated using generalized least squares. Under this assumption, RE produces unbiased and efficient estimates and retains the ability to estimate coefficients on time-invariant regressors (Wooldridge, 2016). However, the validity of RE depends entirely on the assumption that α_i and the regressors are independent. If this assumption does not hold, the model is biased.

FE functions by demeaning each within-firm variable over time. With this method, all time-invariant unobserved heterogeneity (α) is eliminated, as well as β_1 and β_3, based on within-firm variation in VOFF, EPU, and the control variables. The downside of FE is that it focuses only on within-firm changes over time, thereby excluding potentially valuable information about between-firm variation, which in turn could cause less exact estimations. However, FE is still the better option if the assumption of α_i being independent of the regressors does not hold.

6.4 Diagnostic Tests

6.4.1 Hausman Test

In order to choose between fixed or random effect models, a Hausman test is computed. Under the null hypothesis of no systematic difference between the FE and RE coefficients, both estimators are consistent, but RE is more efficient. Under the alternative, only FE is consistent. Consequently, rejection of the null provides statistical justification for adopting the FE estimator (Wooldridge, 2016).

6.4.2 Heteroskedasticity

To check for heteroskedasticity, we conduct a modified Wald and a Breusch-Pagan test. The modified Wald test examines whether the variance of the residuals is the same across firms. A significant test statistic indicates that some firms have systematically larger or smaller residuals than others, violating the homoskedasticity assumption (Wooldridge, 2016). The Breusch-Pagan test is used as an additional check for heteroskedasticity. It tests whether the variance of the residuals changes with the level of the fitted values, meaning that the residuals do not have constant variance.

6.4.3 Multicollinearity Tests

With the purpose of assessing potential multicollinearity among the non-absorbed regressors, we compute variance inflation factor (VIF) from a pooled OLS regression of the main CAPEX specification prior to absorbing fixed effects.

6.5 Endogeneity

Despite the use of fixed effects and lagged variables, there is still a potential concern for endogeneity when estimating the models (Roberts & Whited, 2013; Bailey, 2020). VOFF may be correlated with unobserved time-varying firm characteristics such as managerial quality or sector-specific investment cycles, that simultaneously drive both financial flexibility and capital expenditure decisions. To assess the robustness of the main results to potential endogeneity, we adopt an instrumental variable (IV) approach.

A valid instrument must satisfy two conditions: the relevance condition and the exclusion condition (Bailey, 2020). The relevance condition requires that the instrument is a statistically significant predictor of the endogenous variable in the first stage. The exclusion condition requires that the instrument affects investment only through its effect on VOFF and not through any direct channel or through other unobserved variables. While the relevance condition is testable via the first-stage F-statistic, the exclusion restriction is inherently untestable and must be justified on theoretical grounds (Roberts & Whited, 2013).

VOFF is instrumented using the leave-one-out mean of VOFF across firms in the same two-digit SIC industry and year, computed by averaging VOFF across all other firms in that industry-year group while excluding the firm itself. The intuition is that variation in the average valuation of financial flexibility across industry-year groups reflects common shocks to the investment environment and financing conditions within industries, rather than idiosyncratic choices of any individual firm (Leary & Roberts, 2014). Industry-year cells containing only a single firm are excluded because the leave-one-out mean is not defined in such cases. In specifications that treat both VOFF and VOFF × EPU as jointly endogenous, the leave-one-out mean is interacted with EPU to provide a second instrument.

The exclusion restriction is the most demanding requirement for this leave-one-out instrument. The IV identifies a valid causal effect only if industry-peer VOFF affects own investment exclusively through its effect on own VOFF, and not through other industry-level shocks such as demand spillovers, common supply-chain disturbances, or industry-wide changes in financing conditions. To partially address this concern, a specification that adds industry-by-year fixed effects is also estimated; these absorb all common industry-level shocks in each year, leaving only within-industry-year variation in peer VOFF to identify the coefficient. This industry-by-year specification provides the most defensible IV test of the main result. The other IV specifications are reported as sensitivity checks.

To evaluate instrument strength and the validity of the IV approach, several diagnostic statistics are reported for each specification in Section 7.4.3. Instrument relevance is assessed using the Kleibergen–Paap F-statistic, which tests for weak instruments. The presence of endogeneity is assessed using a Durbin–Wu–Hausman test, with rejection of the null indicating that the OLS estimates are inconsistent and the IV approach is warranted.

6.6 Robustness Specifications

A number of robustness checks are completed to complement the main result. First, we construct the three models using R&D expenditure scaled by lagged total assets as the dependent variable. Including R&D alongside capital expenditure allows us to test whether the moderating role of financial flexibility extends to intangible investment, which tends to be more uncertain and less reversible than physical capital (Hall & Lerner, 2010).

An important caveat for the R&D results is sample selection. The R&D regression excludes firms that do not report R&D expenditures. R&D-reporting firms are systematically different from non-reporting firms in terms of industry, size, and VOFF levels. The estimated R&D coefficients should therefore be interpreted as conditional on being an R&D-reporting firm, and their generalizability to the broader population of listed firms is limited.

Alternative VOFF specifications. To test whether the main results are sensitive to the treatment of outliers in the VOFF measure, the models are re-estimated using a version of VOFF that is winsorized at the 1st and 99th percentiles prior to mean-centering. If the findings are still present under this alternative construction, it can be concluded that they are not driven by a small number of observations with extreme VOFF scores.

Alternative Investment specification. Following Yousefi and Yung (2022) another investment specification utilizes the current instead of lagged total assets. Under this alternative scaling the denominator grows with the firm's investment in the current period, which due to the accounting nature of R&D investments in some cases should reduce the ratio. Stability of the interaction coefficient under this alternative would indicate that the moderating role of financial flexibility is a genuine economic relationship rather than an effect of the scaling method used.

Firm size Subsamples. The theoretical case for financial flexibility rests on the presence of financing frictions. The value of internal liquidity and spare debt capacity should be greatest for firms that face the highest cost of external financing. Larger firms, which could have better capital market access and lower information asymmetries, could therefore benefit less from financial flexibility than their smaller counterparts. The main CAPEX and R&D regressions are re-estimated separately for firms in the bottom, middle, and top tercile of the firm-size distribution, where size is measured by the natural logarithm of total assets and tercile boundaries are defined within the estimation sample.

Industry Subsamples: High-Tech versus Low-Tech. Financial flexibility and its interaction with uncertainty may function differently across industries depending on the nature of investment and the degree of asset tangibility. Firms in high-tech industries invest more in intangible assets, including R&D and human capital, which are largely internally financed and do not require large discrete capital expenditures. To test this prediction, the main specification is re-estimated separately for high-tech and low-tech subsamples. High-tech industries are defined as two-digit SIC codes 35–39 (industrial and electrical machinery, computers, electronics, and instruments) and SIC code 73 (business services including software). All remaining industries are classified as low-tech.

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7. Empirical Results

This chapter presents the empirical results of the study. It reports the diagnostic tests, descriptive statistics, the regression results for the main models, and finally, the robustness tests used to assess the consistency of the findings.

7.1 Diagnostic Tests

7.1.1 Hausman Test

The Hausman specification test is applied to both the CAPEX main model, and the R&D robustness model (Table 1), with the purpose of determining the appropriate panel estimator. The test yields a chi-square of 157.25 ($p < 0.0001$) for the CAPEX specification, and a chi-square of 577.57 ($p < 0.0001$) for the R&D specification. Both results decisively reject the null hypothesis of no systematic difference between the fixed-effects and random-effects coefficients. This indicates that unobserved firm-specific heterogeneity is correlated with the regressors. Therefore, random-effects estimation is inconsistent for both dependent variables, and all main specifications are estimated using two-way fixed effects (firm and year) throughout.

7.1.2 Heteroskedasticity

The Modified Wald test for groupwise heteroskedasticity (Tables 2a and 2b) rejects the assumption of constant residual variance at conventional significance levels for both the CAPEX specification (chi-square of 29,385,111; $p < 0.0001$) and the R&D robustness specification (chi-square of 267,489,594; $p < 0.0001$). We also conduct a Breusch-Pagan test. The Breusch-Pagan test, which tests the null hypothesis of constant residual variance against the fitted values, yields chi-square of 22,563.00 for the CAPEX specification ($p < 0.0001$) and chi-square of 52,325.93 for the R&D robustness specification ($p < 0.0001$), in both cases rejecting the hypothesis that there is homoskedasticity within the sample. These results confirm the use of firm-clustered standard errors in all specifications.

7.1.3 Endogeneity

To evaluate potential endogeneity of VOFF and its interaction with EPU, a Durbin-Wu-Hausman control-function test is conducted on the CAPEX specification (Table 3). The test yields an F-value of 32.69 ($p < 0.0001$), rejecting the null hypothesis of exogeneity and confirming that an instrumental variables approach is warranted as a robustness check.

7.1.4 Multicollinearity

A variance inflation factors (VIF) test is computed with a pooled OLS regression of the main CAPEX specification prior to absorbing fixed effects. Table 4 shows that VIF values remain below 4.0 with the highest value of a variable being cash holdings with 1.98. These results indicate that multicollinearity does not pose a material threat to the precision of the estimates.

7.2 Descriptive Statistics and Correlation Table

Given the central role of VOFF in the empirical analysis and the multi-step process of its construction, this section reports summary statistics for both the full estimation sample and the inputs to the VOFF weighting regression.

7.2.1 VOFF Summary Statistics

Table 5 reports summary statistics for the inputs to the VOFF construction. These statistics serve two purposes: they document the quality of the underlying data and provide transparent references for the composite measure. The dependent variable in the VOFF weighting regression, the annual cumulative abnormal return (CAR), has a mean of 0.020 and a standard deviation of 0.514, consistent with normal cross-sectional return variation. The unexpected change in cash scaled by lagged market equity, the key regressor in Stage 1, has a mean close to zero (0.009) with a standard deviation of 0.136, reflecting that realized cash changes are, on average, close to their expected values.

The five firm-level determinants that enter VOFF are economically meaningful and behave in line with the channels they are intended to capture. Sales growth, the proxy for the option value of holding slack against future investment opportunities, has a mean of 7.3%. The change in earnings scaled by lagged market equity, capturing profitability dynamics, averages 2.0%. The effective tax cost of holding cash, reflecting the after-tax penalty associated with maintaining internal liquidity, has a mean of 1.27 with a wide cross-sectional dispersion that primarily reflects firm-level differences in the use of operating loss carry-forwards and the level of pre-tax income. The bid-ask spread, our proxy for the cost of external equity financing, averages 2.5% and is highly skewed, as expected for an illiquidity measure. Tangibility, the reversibility-of-capital proxy, has a sample mean of 25.4%. The final VOFF composite has a mean of 0.868 and a standard deviation of 0.115.

7.2.2 Sample Summary Statistics

Table 6 reports the descriptive statistics for all variables used in the main regression specification.[1] The capital expenditure ratio, the primary dependent variable, has a mean of 0.049 and a standard deviation of 0.057, with a median of 0.031. This means that the distribution is right-skewed, with a relatively small number of capital-intensive firms pulling the average upward. The raw EPU index averages 160.8 with a standard deviation of 50.4. This reflects variation in U.S. policy uncertainty over the sample period, including pronounced spikes around the global financial crisis and the COVID-19 shock. After log

[1] The descriptive statistics for the R&D robustness sample are reported in table 2b for the sake of transparency and validity. The numbers are overall in alignment with the full CAPEX sample, with no notable differences or outliers.

transformation and mean-centering, the index has a mean of zero and a standard deviation of 0.264.

Among the control variables, the average firm size (log of total assets) is 6.97, with a standard deviation of 2.07, indicating substantial variation in firm scale across the sample. Mean leverage is 0.265, and Tobin's Q averages 1.895 (standard deviation 1.718), the latter reflecting the presence of high-growth firms with elevated market-to-book ratios. Cash flow has a mean of 0.057, and average cash holdings are 0.202 of total assets. Sales growth averages 7.3%, and mean tangibility is 25.4%.

7.2.3 Correlation Table

Table 7 presents the pairwise correlation matrix for all variables in the CAPEX sample. VOFF is negatively correlated with CAPEX at -0.090 and significant at the 1% level. This can be explained as high-VOFF firms tending to be growth-oriented and knowledge-intensive, investing primarily in intangible rather than physical capital, as confirmed by the strongly positive correlation between VOFF and R&D expenditure (0.280).

CAPEX is most strongly correlated with tangibility 0.547, significant at the 1% level, which is expected given that tangible-asset-intensive firms both invest more in physical capital and hold more existing PPE. Cash flow is positively correlated with CAPEX 0.165. Sales growth 0.133 and firm size 0.080 are also positively related to capital investment. Leverage shows a small positive correlation 0.054, which likely reflects the fact that more capital-intensive firms tend to use more debt financing.

EPU is negatively correlated with CAPEX -0.067 and significant at the 1% level. EPU is also positively correlated with VOFF (0.193), which is consistent with the interpretation that during high-uncertainty periods, investors place a higher value on financial flexibility at the margin, firms holding more flexible financial positions command a premium on their cash holdings.

7.3 Regression Model Results

The main regression results are reported in Table 8 for the CAPEX specification and Table 9 for the R&D specification. Columns (1) through (3) include two-way firm and year fixed effects; columns (4) and (5) include firm fixed effects only, allowing EPU to enter as an identified regressor. All models use EPU lagged one period and controls lagged one year, with the exception of firm size. The final main estimation sample contains 21,001 firm-year observations.

7.3.1 Model 1

The baseline specification in column (1) regresses the capital expenditure ratio on the mean-centered VOFF composite and the full set of controls, without EPU and the interaction term. The coefficient on VOFF is 0.0169 and is statistically significant at the 1% level. The coefficient remains positive and statistically significant at the 1% level across all five columns, ranging from 0.0134 in Column (4) to 0.0192 in Column (3). This supports H1, even after absorbing all time-invariant firm characteristics and aggregate annual shocks, an increase in the market-implied value of financial flexibility within a firm is associated with a higher rate of capital expenditure relative to lagged total assets. In economic terms, a one-standard-deviation increase in VOFF (approximately 0.115 units) is associated with a $0.115 \times 0.0169 \approx 0.19$ percentage-point increase in the capital expenditure ratio, equivalent to ~3.9% of the sample mean CAPEX ratio of 0.049. The model achieves an R square of 0.6653, meaning that the model explains 66.53% of the variation in CAPEX.

An apparent contradiction is the negative VOFF-CAPEX correlation with a positive fixed effect coefficient. High VOFF firms are systematically different from low-VOFF firms; they are more R&D-intensive, more growth-oriented, and less tangible-asset-heavy, meaning that they cross-sectionally invest less in physical capital.

7.3.2 Model 2

Column (2) adds the log EPU_{t-1} index to the baseline. The coefficients on VOFF and the controls are unchanged from column (1). This confirms that the inclusion of EPU does not bias the baseline VOFF estimate, and the column is retained primarily to make the absorption issue transparent. The direct effect of Economic Policy Uncertainty (EPU) on investment is not identified in our two-way fixed-effects specification, since EPU is perfectly collinear with the year fixed effects. We therefore draw the estimate from the no-year-FE specification, presented in column (4), in which the coefficient on lagged log EPU is −0.0098, significant at the 1% level. The economic interpretation of this coefficient is as follows. Because both VOFF and EPU are mean-centered, the EPU coefficient represents the marginal effect on capital investment of a one-unit increase in mean-centered log EPU for a firm whose VOFF is at the sample mean. The log-EPU index has a standard deviation of approximately 0.264 in the estimation sample. A one-standard-deviation increase in log EPU is therefore associated with a reduction in the capital expenditure ratio of approximately $0.0098 \times 0.264 \approx 0.26$ percentage points. This is supportive of H2, holding firm fixed effects and the full set of lagged controls constant, an increase in policy uncertainty is associated with a reduction in capital expenditure.

7.3.3 Model 3

Column (3) reports the main specification, which adds the VOFF × EPU interaction term to the two-way fixed-effects framework. The coefficient on VOFF increases to 0.0192 and retains significance at the 1% level, now representing the within-firm marginal effect of financial flexibility on capital investment evaluated at the sample-mean level of EPU. The interaction coefficient is 0.043, statistically significant at the 1% level. This means that a one-unit increase in mean-centered log EPU increases the marginal effect of VOFF on CAPEX by 0.043. Like Model 2, Model 3 has also been estimated without the fixed year effect. In the no-year-FE analogue (column 5), the interaction coefficient is 0.0297 and remains statistically significant at the 1% level, confirming that the result is not an artefact of how aggregate time-series variation is handled.

Economically, the interaction coefficient implies that for a firm with VOFF one standard deviation above the sample mean, a one-standard-deviation increase in log EPU is associated with a $0.043 \times 0.115 \times 0.264 \approx 0.13$ percentage-point higher CAPEX ratio, equivalent to approximately 2.67% of the sample mean CAPEX ratio. The high-VOFF firm therefore experiences a CAPEX decline of approximately 0.13 percentage points rather than 0.26 percentage points, corresponding to an attenuation of approximately 50% of the baseline effect. Both estimates are supportive of H3 and indicate that financially flexible firms experience a smaller investment contraction when policy uncertainty rises.

7.3.4 Control Variables

The control variable estimates are stable and sign-consistent across all three models. Firm size is positive with a coefficient of 0.0056, and is statistically significant at the 1% level. This can be explained by larger firms having better capital market access. Leverage is negative and significant (-0.0289, $p < 0.01$), consistent with debt overhang limiting investment. Tobin's Q is positive and significant (0.0056, $p < 0.01$), confirming the standard q-theoretic relationship. Cash flow is positive and significant (0.0128, $p < 0.01$). Cash holdings are positive 0.0081, reflecting how firms that have historically held cash are in a better position to invest in year t, though the coefficient does not achieve statistical significance in any of the main specifications. Sales growth is positive and significant (0.0058, $p < 0.01$). Tangibility is also positive and significant (0.0213, $p < 0.05$), consistent with its role as both a collateral asset and a measure of capital intensity.

7.4 Robustness Tests

A number of robustness checks are conducted to assess the consistency of the main findings. The robustness tests address the alternative dependent variable of R&D, the treatment of outliers in VOFF, the scaling of the investment ratio, the role of firm size and industry composition, and the potential endogeneity of VOFF.

7.4.1 R&D Results

Table 9 reports the estimates of the same three model specifications with R&D expenditure scaled by lagged total assets as the dependent variable. In the R&D sample, the coefficient on VOFF is 0.0283 in the baseline (Model 1) and 0.0288 in the main specification (Model 3), in both cases statistically significant at the 1% level. Within the sample of R&D-reporting firms, increases in VOFF are therefore associated with significantly higher R&D intensity. The interaction coefficient VOFF × EPU is 0.0084 and not statistically significant in the R&D model, indicating that the moderating role of financial flexibility documented for capital expenditure does not extend to R&D investment in our sample.

The R&D control variables estimates exhibit several notable differences compared with the CAPEX specification. Firm size is negative and significant (−0.0128, $p < 0.01$), which is the reverse of the result for CAPEX. Indicating that R&D firms are generally smaller than their CAPEX counterparts. Leverage is negative and significant (−0.0293, $p < 0.01$), mirroring the CAPEX result and consistent with debt overhang constraining investment. Tobin's Q is positive and significant (0.0128, $p < 0.01$), but with a coefficient roughly twice as large as in the CAPEX regression. Cash flow is negative and significant (−0.2225, $p < 0.01$), which stands in sharp contrast to the positive and highly statistically significant cash flow coefficient in the CAPEX regression. This reversal partly reflects the link between R&D spending and operating earnings: because R&D spending reduces operating income in the period it is incurred, firms with higher reported R&D intensity mechanically display lower cash flow. Cash holdings are positive (0.0102) but do not achieve statistical significance, consistent with the CAPEX result. Sales growth is positive and significant (0.0093, $p < 0.01$). Tangibility is positive and significant (0.1001, $p < 0.01$). Overall, the R&D control variable estimates are stable across all five model columns and confirm that the main R&D findings are not sensitive to the inclusion of VOFF and the interaction term.

7.4.2 Alternative VOFF Specifications

Alternative VOFF specification

The models are re-estimated using a version of VOFF that is additionally winsorized at the 1st and 99th percentiles. For the CAPEX specification, the interaction coefficient is 0.0412 ($p < 0.01$), essentially unchanged from the main estimate of 0.043. The direct VOFF coefficient is 0.0187 ($p < 0.01$), also consistent with the preferred specification. These results confirm that the main findings are not driven by a small number of observations with extreme flexibility scores.

Alternative investment scaling

Following Yousefi and Yung (2022), an alternative investment specification uses current-year total assets as the denominator. Under this scaling, the direct VOFF coefficient is 0.0067 ($p < 0.05$), somewhat smaller in magnitude than the 0.0192 in the lagged-TA model, as expected given that current assets already reflect the investment being explained. The interaction coefficient is 0.0423 ($p < 0.01$), essentially identical to the main specification and confirming that the moderating role of financial flexibility is not sensitive to the choice of asset denominator.

Under the alternative current-asset scaling, the R&D interaction is negative and significant (−0.0297, $p < 0.05$), which contradicts the lagged-asset result. We interpret this sign flip as a scaling artefact rather than evidence of a genuinely negative moderating effect. When R&D is scaled by current-year total assets, the denominator incorporates within-year asset accumulation that R&D-intensive growth firms experience, which depresses the ratio for high-VOFF firms in periods when they are simultaneously investing and growing. The lagged-asset specification, is the preferred denominator and is the basis for the inference that R&D investment is not significantly moderated by VOFF in our sample.

Firm size regressions

The regressions were also run with firms being divided into terciles based on size. Table 13 shows that the VOFF direct coefficient declines monotonically with firm size: 0.0223 ($p < 0.01$) for small firms, 0.0133 ($p < 0.05$) for medium firms, and 0.0098 ($p < 0.10$) for large firms. The interaction coefficient is 0.0421 ($p < 0.05$) for small firms and 0.0470 ($p < 0.05$) for medium firms, but only 0.0125 and not statistically significant for large firms.

High-tech vs low-tech industries

For the CAPEX specification, the VOFF coefficient is 0.0194 ($p < 0.01$) for high-tech and 0.0190 ($p < 0.01$) for low-tech firms, as shown in Table 14. However, the interaction coefficient is 0.0463 ($p < 0.01$) for low-tech firms but only 0.0244 and not statistically significant for high-tech firms. For R&D, the direct VOFF coefficient is 0.0150 ($p < 0.05$) in high-tech and 0.0154 ($p < 0.05$) in low-tech, while the interaction is negative and not significant in both subsamples.

7.4.3 Instrumental Variables

As reported in Section 7.1.3, the Durbin–Wu–Hausman test rejects the exogeneity of VOFF, and the main results are therefore supplemented with a two-stage least squares (2SLS) model. A second instrument, the leave-one-out mean interacted with EPU_{t-1}, is added in specifications where both VOFF and VOFF × EPU are treated as jointly endogenous. Industry-year cells containing a single observation are excluded.

Instrument relevance is strong: the Kleibergen–Paap Wald F-statistic is 31.64 for the single-instrument specification (IV-A) and 15.87 for the jointly endogenous specification

(IV-B), comfortably exceeding conventional thresholds. The Sanderson–Windmeijer first-stage F-statistics are 32.49 for VOFF and 111.67 for VOFF × EPU in specification IV-B, ruling out weak-instrument concerns at the individual regressor level.

In specification IV-B, the VOFF coefficient is 0.1652 ($p < 0.05$) and the interaction coefficient is 0.1995 ($p < 0.01$), both substantially larger in magnitude than the OLS estimates of 0.0192 and 0.0430, respectively. The amplification is consistent with attenuation bias in OLS arising from measurement error in the VOFF composite, which is derived from noisy equity returns. In specification IV-C, which adds industry-by-year fixed effects to absorb industry-level confounders, the interaction coefficient is 0.0427 ($p < 0.05$), extremely close to the OLS estimate of 0.0430 from the main specification. The Kleibergen–Paap F-statistic for IV-C is 43.61, confirming strong instrument relevance in the most demanding specification. The results from the 2SLS specification increases the validity of the preferred main model specifications.

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8. Analysis

This chapter analyzes the empirical findings in relation to the theoretical framework and previous research, and discusses the extent to which the three hypotheses presented in section 4 can be supported. The analysis proceeds by addressing each hypothesis in turn before discussing the findings on R&D investment, the implications of the robustness tests, and the broader theoretical contributions of the paper.

8.1 The Direct Relationship Between VOFF and Capital Investment

Based on the regression results in section 7 we find support for H1, which predicted that financial flexibility, measured through VOFF, would be positively associated with firm-level investment. This is evident in the coefficient on VOFF, which remains positive and statistically significant at the 1% level throughout all five model specifications, with a minimum coefficient of 0.0134 and maximum of 0.0197.

As established, contrary to the traditional Modigliani and Miller framework, firms face financing frictions such as information asymmetry, transaction costs, and taxes, making internal liquidity and financing capacity valuable in imperfect capital markets. A higher VOFF means that the market values this flexibility higher relative to other firms. The positive coefficient therefore means that firms with a higher VOFF are better at using this flexibility in order to fund capital expenditures. It is also consistent with the theoretical argument that financial flexibility allows firms to pursue investment opportunities without relying as heavily on costly external financing.

The results also align with the dynamic capital structure framework by DeAngelo and DeAngelo (2007), predicting that firms rationally hold financing capacity in reserve in anticipation of future investment needs, and stating that this reserve is most valuable when external financing is costly. The positive association between VOFF and capital expenditure is consistent with the interpretation that firms for which financial flexibility is most valuable are also those most effectively converting that flexibility into investment. Furthermore, parallels can be drawn to the financial flexibility mechanism documented by Marchica and Mura (2010). UK firms that maintained financial flexibility over consecutive years are shown to subsequently invest significantly more than comparable constrained firms when investment opportunities arise. Further, this is consistent with the theoretical predictions of Gamba and Triantis (2008), who within a dynamic continuous-time model demonstrate that firms optimally accumulate financial slack in anticipation of future investment needs, particularly when external financing costs are high.

A further implication of the positive VOFF coefficient concerns the pecking order of Myers and Majluf (1984). High-VOFF firms are those for which information asymmetry between insiders and outside investors is most severe, making external equity issuance particularly costly as a signal of overvaluation. According to the pecking order, these firms should rely most heavily on internal funds and preserved borrowing capacity to finance investment. The positive VOFF coefficient is consistent with this mechanism: when firms face high information asymmetry and therefore high external financing costs, they accumulate and protect financial slack precisely in order to be able to fund investment from internal sources when opportunities arise. The market prices this strategic behavior into a higher VOFF, and the positive VOFF–CAPEX relationship reflects the outcome: firms with the strongest motive to build internal financing capacity also convert that capacity into physical investment.

The same effect is also visible in R&D expenditure. Within the sample of R&D-reporting firms, the coefficient on VOFF is 0.0283 in the baseline and 0.0288 in the main specification, significant at the 1% level in both cases. The larger magnitude relative to the CAPEX coefficient is consistent with the precautionary motive being particularly important for R&D investment. Research and development projects are characterized by high adverse selection costs and information asymmetries between insiders and outside investors, limited collateral value, and uncertain payoffs (Bates et al., 2009; Hall & Lerner, 2010), which together make R&D especially dependent on internal financing. Firms for which the equity market assigns a high value to financial flexibility are therefore also the firms that most rely on this flexibility to fund R&D projects.

8.2 The Effect of Economic Policy Uncertainty on Capital Investment

The sign of the EPU coefficient confirms H2 and is consistent with real options theory frameworks of Bernanke (1983), McDonald and Siegel (1986), who show that, under investment irreversibility, the optimal investment threshold increases as the variance of the underlying value process rises. Higher uncertainty therefore raises the value of waiting and influences firms to delay or scale back capital expenditure even for projects with positive expected NPV. EPU can also be argued to capture the variance from the Pindyck (1991) framework where the cost of permanently sacrificing the option to wait must be added to the direct cost of the project. Since it reflects aggregate uncertainty about future demand, taxation, regulation, and macroeconomic conditions that jointly shape project payoffs. The negative EPU coefficient documented in this study is therefore consistent with the interpretation that, as policy uncertainty rises, the option value of delaying irreversible capital commitments increases and firms reduce current investment accordingly.

With the R&D results being similar to the CAPEX results, policy uncertainty therefore depresses both physical and intangible investment at similar rates, broadening the support for H2 beyond capital expenditure alone. This interpretation is further supported by the fact that R&D investments can be treated as more continuous than physical capital expenditures (Hall & Lerner, 2010). The option to defer applies less strictly to ongoing research programs.

Heightened policy uncertainty could raise the cost of external financing and strengthen the precautionary motive for holding internal liquidity. The models of Bolton et al. (2019), Bates et al. (2009) and Acharya et al. (2007) suggest that the negative EPU effect documented may reflect more than just the real-options channel. In addition to increasing the value of waiting, higher uncertainty may reduce investment through financing-cost and liquidity dynamics, as firms preserve cash and avoid costly external finance. These mechanisms are likely to operate alongside each other, reinforcing the negative effect.

8.3 Interaction Effect

The main result of this study concerns the moderating role of financial flexibility in the EPU investment relationship. In the main two-way FE specification, the coefficient is 0.043 and significant at the 1% level. In the no-year-FE version, the coefficient is 0.0297 with 1% significance. The positive sign and statistical significance are consistent across both specifications, confirming that the result is not an artefact of how aggregate time-series variation is handled.

This moderating role is consistent with the prediction of Boyle and Guthrie (2003), where constrained firms may be forced to exercise their investment option prematurely, before the optimal threshold has been reached, in order to avoid losing the project if external financing becomes unavailable in a deteriorating environment. Financially flexible firms can retain the ability to hold the option of waiting until it is optimal to exercise it. This ability has its highest value when EPU is high, because the option value of waiting is itself largest when uncertainty peaks, meaning that the cost of being forced to act sub-optimally is also largest. This mechanism is complemented by the dynamic capital structure perspective and the value of financial flexibility frameworks. DeAngelo and DeAngelo (2007) and Gamba and Triantis (2008) show that firms which anticipate future investment needs or adverse shocks rationally preserve debt capacity and liquidity. High-VOFF firms are the firms for which the equity market judges this precautionary strategy to be most valuable. The positive VOFF × EPU coefficient therefore captures the realized payoff of this strategy. In the high-uncertainty states for which financial flexibility was accumulated, those firms are able to deploy preserved capacity to fund continued investment, while their constrained counterparts are forced to forgo investments.

Further, the robustness specifications indicate that the interaction is heterogeneous across firm size and industry. By firm-size tercile, the interaction is significant for small firms and medium firms but not for large firms. Smaller firms typically face larger information asymmetries between insiders and outside investors, possess lower-quality collateral, and have more limited access to public debt and equity markets, all of which raise the precautionary value of internal financial capacity. Faulkender and Wang (2006) document this dimension of heterogeneity directly by showing that the marginal value of cash is significantly higher for constrained firms.

By industry, we find the interaction to be significant for low-tech firms but not for high-tech firms. Both patterns are consistent with the Boyle-Guthrie (2003) prediction that the wedge between unconstrained and constrained behavior should be larger where external financing frictions are tighter and where investment is more lumpy and irreversible. Smaller firms typically face larger information asymmetries and more limited access to external capital markets. Low-tech firms typically commit capital in large, discrete, reversible physical investments, whereas high-tech firms invest more heavily in intangible assets including R&D and human capital, which are largely internally financed and tend to be maintained continuously regardless of macroeconomic conditions (Hall & Lerner, 2010). For high-tech firms, the investment option may therefore be less sensitive to EPU and less dependent on financial flexibility for its exercise, consistent with the insignificant interaction in that subsample.

This interpretation is reinforced by the R&D results. The interaction coefficient VOFF × EPU in the R&D specification is 0.0084 and not statistically significant, in sharp contrast to the large and significant interaction estimated for CAPEX (0.0430, $p < 0.01$). This could be because the EPU × flexibility mechanism operates primarily through the real option to defer large, irreversible physical capital commitments, as emphasized by Bernanke (1983) and Pindyck (1991), rather than through the incremental funding of ongoing research programs. R&D expenditures tend to be more continuous than CAPEX and rely on existing teams, laboratories, and accumulated firm specific knowledge that cannot easily be paused and restarted. Firms therefore appear to maintain R&D spending during periods of elevated economic uncertainty, not because financial flexibility provides a buffer but because the ongoing nature of research requires continuous commitment regardless of the economic uncertainty.

8.4 Limitations

The main limitation of the study lies in the modest economic magnitudes of the documented effects. A one-standard-deviation increase in VOFF predicts a 0.19 percentage-point increase in the CAPEX ratio (3.9% of the sample mean), and the moderating effect of VOFF on the EPU response amounts to approximately a 30% attenuation. While our findings are statistically robust across a range of specifications, they should not be interpreted as implying large quantitative changes in aggregate corporate investment

The sample is restricted to publicly listed firms on U.S. stock exchanges, which constrains the generalizability of the findings. Private firms and firms in other institutional settings face different financing conditions, disclosure requirements, and corporate governance structures; the specific VOFF mechanisms documented here may not translate directly to non-listed contexts. The R&D analysis is further restricted to firms that report positive R&D expenditure, a subset that differs systematically from the broader sample in industry composition, size, and VOFF levels, so the R&D estimates should be interpreted as conditional on being an R&D-reporting firm

We measure uncertainty solely through the Baker-Bloom-Davis EPU index, which captures aggregate policy uncertainty at the national level. The index does not capture firm-specific or industry-specific sources of uncertainty that may also influence the investment–flexibility relationship. Future work could combine our VOFF measure with firm-level uncertainty proxies (option-implied volatility, analyst forecast dispersion), industry-specific uncertainty measures, or alternative aggregate uncertainty indices such as climate-policy uncertainty indices.

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9. Conclusion

Prior research has established that financial flexibility and economic policy uncertainty are both important determinants of firm-level investment. However, the empirical literature has primarily utilized one-dimensional proxies for financial flexibility, like cash holdings or leverage. The purpose of this study is to examine how the market-implied value of financial flexibility, measured through the VOFF composite of Rapp et al. (2014), relates to firm-level capital investment, and to investigate whether financial flexibility moderates the negative effect of economic policy uncertainty on investment. To examine these questions we estimate panel regression models on a sample of 21,001 firm-year observations of U.S.-listed firms over the period 2009–2023.

The empirical findings provide support for all three hypotheses. In relation to H1, the VOFF coefficient is positively and statistically significant. A one-standard-deviation increase in VOFF is associated with a 0.19 percentage-point increase in the capital expenditure ratio, equivalent to approximately 3.9% of the sample mean. As for H2, EPU is found to have a statistically significant negative effect on investments. The coefficient on lagged log EPU is −0.0098, indicating that higher policy uncertainty is associated with lower capital expenditure.

The main finding of this study is that VOFF has a moderate effect on the negative effect of increased EPU found through the interaction term VOFF × EPU. The positive interaction coefficient indicates that the CAPEX sensitivity is lower for firms with above average VOFF. The size tercile regressions reinforce this view as the magnitude of the coefficient decreases with firm size, consistent with financial flexibility being most valuable where financing frictions are highest. The R&D analysis reveals a positive and significant direct VOFF effect on R&D intensity, but an insignificant interaction coefficient, suggesting that the moderating role of financial flexibility does not extend to intangible investment in our sample.

Limitations to be acknowledged include that the sample is restricted to U.S.-listed firms with sufficient disclosed information to construct the VOFF measurement, which excludes private firms and smaller firms with limited data availability. The EPU index captures aggregate national policy uncertainty but does not measure firm-specific or industry-specific uncertainty, which may operate through different channels. The leave-one-out instrumental-variables strategy provides corroborating evidence but relies on an exclusion restriction that is inherently untestable, even after the inclusion of industry-by-year fixed effects.

This paper contributes to the existing literature by extending the Rapp et al. (2014) measurement to an investment context with the investment-flexibility relationship. The paper also provides evidence for the moderating role of financial flexibility in the EPU-investment relationship using a forward-looking, market-implied measure rather than accounting-based proxies, complementing the findings of Yousefi and Yung (2022) and Chortareas and Noikokyris (2021).

For future research, several potential avenues exist. It would be valuable to replicate the analysis in non-U.S. settings or across different institutional environments, where financing frictions and the value of financial flexibility may differ substantially. Another possibility would be for future research to examine whether VOFF-driven investment translates into higher investment efficiency or long-run firm performance. Finally, applying the VOFF framework to other forms of uncertainty beyond the EPU index, such as political risk or climate-related uncertainty, represents a natural direction for future inquiry.

10. References

Acharya, V. V., Almeida, H., & Campello, M. (2007). Is cash negative debt? A hedging perspective on corporate financial policies. *Journal of Financial Intermediation*, vol. 16, no. 4, pp.515–554, https://doi.org/10.1016/j.jfi.2007.04.001

Anderson, R. C., Duru, A., & Reeb, D. M. (2009). Founders, heirs, and corporate opacity in the United States. *Journal of Financial Economics*, vol. 92, no. 2, pp.205–222, https://doi.org/10.1016/j.jfineco.2008.04.006

Arslan-Ayaydin, Ö., Florackis, C., & Ozkan, A. (2014). Financial flexibility, corporate investment and performance. *Review of Quantitative Finance and Accounting*, vol. 42, no. 2, pp.211–250, https://doi.org/10.1007/s11156-012-0340-x

Bailey, M. A. (2020). Real Econometrics: The Right Tools for the Right Questions, 2nd edn, New York: Oxford University Press

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring Economic Policy Uncertainty. *The Quarterly Journal of Economics*, vol. 131, no. 4, pp.1593–1636, https://www.jstor.org/stable/26372674

Baker, S. R., Bloom, N., & Davis, S. J. (n.d.). Economic Policy Uncertainty, https://www.policyuncertainty.com [Accessed 27 May 2026]

Bates, T. W., Kahle, K. M., & Stulz, R. M. (2009). Why Do U.S. Firms Hold So Much More Cash than They Used To?, The Journal of Finance, vol. 64, no. 5, pp.1985–2021, https://doi.org/10.1111/j.1540-6261.2009.01492.x

Bernanke, B. S. (1983). Irreversibility, Uncertainty, and Cyclical Investment. *The Quarterly Journal of Economics*, vol. 98, no. 1, pp.85–106, https://www.jstor.org/stable/1885568

Bolton, P., Wang, N., & Yang, J. (2019). Investment under uncertainty with financial constraints. *Journal of Economic Theory*, vol. 184, https://doi.org/10.1016/j.jet.2019.06.008

Bonaime, A., Gulen, H., & Ion, M. (2018). Does policy uncertainty affect mergers and acquisitions?, *Journal of Financial Economics*, vol. 129, no. 3, pp.531–558, https://doi.org/10.1016/j.jfineco.2018.05.007

Boyle, G. W., & Guthrie, G. A. (2003). Investment, Uncertainty, and Liquidity. *The Journal of Finance*, vol. 58, no. 5, pp.2143–2166, https://www.jstor.org/stable/3648186

Brounen, D., de Jong, A., & Koedijk, K. (2006). Capital Structure Policies in Europe: Survey evidence, *Journal of Banking & Finance*, vol. 30, no. 5, pp.1409–1442, https://doi.org/10.1016/j.jbankfin.2005.02.010

Chortareas, G., & Noikokyris, E. (2021). Investment, firm-specific uncertainty, and financial flexibility. *Journal of Economic Behavior and Organization*, vol. 192, pp.25–35, https://doi.org/10.1016/j.jebo.2021.09.042

Dalwai, T. (2023). Impact of economic policy uncertainty on financial flexibility before and during the COVID-19 pandemic. *Journal of Asian Business and Economic Studies*, vol. 30, no. 4, pp.283–295, https://doi.org/10.1108/JABES-08-2022-0205

DeAngelo, H. & DeAngelo, L. (2007). Capital Structure, Payout Policy, and Financial Flexibility. *Marshall School of Business Working Paper*, no. FBE 02-06, http://dx.doi.org/10.2139/ssrn.916093

Denis, D. J. (2011). Financial Flexibility and Corporate Liquidity, *Journal of Corporate Finance*, vol. 17, no. 3, pp.667–674, https://doi.org/10.1016/j.jcorpfin.2011.03.006

Diamond, D. W., & Verrecchia, R. E. (1991). Disclosure, liquidity, and the cost of capital. *The Journal of Finance*, vol. 46, no. 4, pp.1325-1359, https://doi.org/10.2307/2328861

Duchin, R., Ozbas, O., & Sensoy, B. A. (2010). Costly external finance, corporate investment, and the subprime mortgage credit crisis. *Journal of Financial Economic*s, vol. 97, no. 3, pp.418–435, https://doi.org/10.1016/j.jfineco.2009.12.008

Faulkender, M., & Wang, R. (2006). Corporate Financial Policy and the Value of Cash. *The Journal of Finance*, vol. 61, no. 4, pp.1957–1990, https://www.jstor.org/stable/3874732

Fazzari, S. M., Hubbard, R. G., & Petersen, B. C. (1988). Financing Constraints and Corporate Investment, *Brookings Papers on Economic Activity*, vol. 1988, no. 1, pp.141–206, https://doi.org/10.2307/2534426

Ferrando, A., Marchica, M., & Mura, R. (2017). Financial Flexibility and Investment Ability across the Euro Area and the UK. *European Financial Management*, vol. 23, no. 1, pp.87–126, https://doi.org/10.1111/eufm.12091

Fischer, E. O., Heinkel, R., & Zechner, J. (1989). Dynamic Capital Structure Choice: Theory and tests, *The Journal of Finance*, vol. 44, no. 1, pp.19–40, https://doi.org/10.1111/j.1540-6261.1989.tb02402.x

Fliers, P. T. (2025). The Impact of Market Power and Financial Flexibility on Corporate Investment Policy. *Applied Economics*, vol. 57, no. 52, pp.8710–8725, https://doi.org/10.1080/00036846.2024.2402575

French, K. (n.d.). Data Library, Tuck School of Business, Dartmouth College, https://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html [Accessed 27 May 2026]

Gallemore, J., Hollander, S., Jacob, M. and Zheng, X. (2025), Tax Policy Expectations and Investment. *Journal of Accounting Research*, vol. 63, no. 1, pp.363–412, https://doi.org/10.1111/1475-679X.12577

Gamba, A., & Triantis, A. (2008). The Value of Financial Flexibility, *The Journal of Finance*, vol. 63, no. 5, pp.2263–2296, https://doi.org/10.1111/j.1540-6261.2008.01397.x

Graham, J. R., & Harvey, C. R. (2001). The Theory and Practice of Corporate Finance: Evidence from the field, *Journal of Financial Economics*, vol. 60, no. 2–3, pp.187–243, https://doi.org/10.1016/S0304-405X(01)00044-7

Gulen, H., & Ion, M. (2016). Policy Uncertainty and Corporate Investment. *The Review of Financial Studies*, vol. 29, no. 3, pp.523–564, https://doi.org/10.1093/rfs/hhv050

Hall, B. H., & Lerner, J. (2010). The Financing of R&D and Innovation, in B. H. Hall & N. Rosenberg (eds), Handbook of the Economics of Innovation, vol. 1, Amsterdam: Elsevier, pp.609–639, https://doi.org/10.1016/S0169-7218(10)01014-2

Hubbard, R. G. (1998). Capital-Market Imperfections and Investment. *Journal of Economic Literature*, vol. 36, no. 1, pp.193–225, https://www.jstor.org/stable/2564955

Kaplan, S. N., & Zingales, L. (1997). Do investment-cash flow sensitivities provide useful measures of financing constraints? *The Quarterly Journal of Economics*, vol. 112, no. 1, pp.169–215, https://www.jstor.org/stable/2951280

Kim, H. & Kung, H. (2017). The Asset Redeployability Channel: How Uncertainty Affects Corporate Investment. *The Review of Financial Studies*, vol. 30, no. 1, pp.245–280, https://doi.org/10.1093/rfs/hhv076

Kraus, A., & Litzenberger, R. H. (1973). A State-Preference Model of Optimal Financial Leverage. *The Journal of Finance*, vol. 28, no. 4, pp.911–922, https://doi.org/10.2307/2978343

Leary, M. T., & Roberts, M. R. (2014). Do Peer Firms Affect Corporate Financial Policy?, *The Journal of Finance*, vol. 69, no. 1, pp.139–178, https://doi.org/10.1111/jofi.12094

Marchica, M. T., & Mura, R. (2010). Financial flexibility, investment ability, and firm value: evidence from firms with spare debt capacity. *Financial Management*, vol. 39, no. 4, pp.1339–1365, https://www.jstor.org/stable/40963513

McDonald, R. & Siegel, D. (1986). The Value of Waiting to Invest. *The Quarterly Journal of Economics*, vol. 101, no. 4, pp.707–727, https://doi.org/10.2307/1884175

Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment, *The American Economic Review*, vol. 48, no. 3, pp.261–297, https://www.jstor.org/stable/1809766

Myers, S. C. (1977). Determinants of corporate borrowing. *Journal of Financial Economics*, vol. 5, no. 2, pp.147–175, https://doi.org/10.1016/0304-405X(77)90015-0

Myers, S. C., & Majluf, N. S. (1984). Corporate Financing and Investment Decisions When Firms Have Information That Investors Do Not Have, *Journal of Financial Economics*, vol. 13, no. 2, pp.187–221, https://doi.org/10.1016/0304-405X(84)90023-0

Opler, T., Pinkowitz, L., Stulz, R., & Williamson, R. (1999). The determinants and implications of corporate cash holdings. *Journal of Financial Economics*, vol. 52, no. 1, pp.3–46, https://doi.org/10.1016/S0304-405X(99)00003-3

Pindyck, R. S. (1991). Irreversibility, Uncertainty, and Investment. *Journal of Economic Literature*, vol. 29, no. 3, pp.1110–1148, http://www.jstor.org/stable/2727613

Rapp, M. S., Schmid, T., & Urban, D. (2014). The Value of Financial Flexibility and Corporate Financial Policy, *Journal of Corporate Finance*, vol. 29, pp.288–302, https://doi.org/10.1016/j.jcorpfin.2014.08.004

Roberts, M. R., & Whited, T. M. (2013). Endogeneity in Empirical Corporate Finance, in G. M. Constantinides, M. Harris & R. M. Stulz (eds), Handbook of the Economics of Finance, vol. 2A, Amsterdam: Elsevier, pp.493–572, https://doi.org/10.1016/B978-0-44-453594-8.00007-0

Tobin, J. (1969). A general equilibrium approach to monetary theory. *Journal of Money, Credit and Banking*, vol. 1, no. 1, pp.15–29, https://www.jstor.org/stable/1991374

Whited, T. M., & Wu, G. (2006). Financial Constraints Risk, *The Review of Financial Studies*, vol. 19, no. 2, pp.531–559, https://doi.org/10.1093/rfs/hhj012

Wooldridge, J. M. (2016). Introductory Econometrics: A Modern Approach, 6th edn, Mason, OH: South-Western Cengage Learning

Wu, W., Zhang, S., Fan, Y., & Shi, Y. (2024) Financial flexibility, firm performance, and financial distress. *International Review of Financial Analysis*, vol. 96, part B, https://doi.org/10.1016/j.irfa.2024.103706

Yousefi, H., & Yung, K. (2022). Financial flexibility and economic policy uncertainty: Evidence from firm behavior and firm value. *Journal of Corporate Accounting & Finance*, vol. 33, no. 1, pp.11–22, https://doi.org/10.1002/jcaf.22521

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11. Tables

Table 1: Hausman Test

Endogeneity Test	H_0	Test Statistic	P-value	Decision	FE or RE
Test A: Hausman Test (Chi-square)					
CAPEX model	Regressor is exogenous	157.25	0.0000	Reject	FE
R&D model	Regressor is exogenous	577.57	0.0000	Reject	FE

Table 2a: Heteroskedasticity

Heteroskedasticity Test	H_0	Test Statistic	P-value	Decision	Heteroskedasticity
Test A: Breusch-Pagan/Cook-Weisberg Test					
CAPEX model	Constant variance	22,563.00	0.0000	Reject	Yes
R&D model	Constant variance	52,325.93	0.0000	Reject	Yes

Table 2b: Modified Wald Test for Groupwise Heteroskedasticity

CAPEX model	$\sigma_i^2 = \sigma^2$ for all i	267,489,594.02	0.0000	Reject	Yes
R&D model	$\sigma_i^2 = \sigma^2$ for all i	29,385,111.13	0.0000	Reject	Yes

Table 3: Endogeneity

Endogeneity Test	H_0	Test Statistic	P-value	Decision	Endogeneity
Joint Durbin-Wu-Hausman					

Model 3	Regressors are exogenous	32.69	0.0000	Reject	Yes

Table: 4 VIF Test

Variable	VIF	1/VIF
Cash holdings (lagged, win)	1.98	0.505645
Cash flow (lagged, win)	1.51	0.662295
Firm size (log)	1.43	0.698755
Tangibility (lagged)	1.33	0.751700
VOFF (mean-centered)	1.33	0.752156
Tobin's q (lagged)	1.32	0.757073
Leverage (lagged)	1.24	0.807927
EPU (lagged, logged)	1.08	0.926929
VOFF × EPU (lagged, mean-centered)	1.04	0.959055
Sales growth (lagged)	1.04	0.961064
Mean VIF	1.33	

Table 5: Descriptive Statistics – VOFF Construction Inputs

	Mean	SD	Min	P25	Median	P75	Max	N
Cum. abnormal return	0.020	0.514	-0.938	-0.276	-0.045	0.208	2.401	25,425
ΔCash / ME(t-1)	0.009	0.136	-0.499	-0.025	0.002	0.035	0.684	25,425
Sales growth	0.073	0.336	-1.220	-0.036	0.059	0.171	1.575	25,425
ΔEarnings / ME(t-1)	0.020	0.238	-0.850	-0.024	0.004	0.033	1.436	25,425
Effective tax cost	1.273	1.718	0.000	0.000	0.522	2.081	8.173	25,425
Bid-ask spread	0.025	0.049	0.000	0.001	0.004	0.024	0.287	25,425
Tangibility	0.254	0.239	0.002	0.072	0.164	0.372	0.892	25,425
Cash(t-1) / ME(t-1)	0.186	0.244	0.001	0.039	0.103	0.228	1.479	25,425
ΔNet assets / ME(t-1)	0.042	0.349	-1.488	-0.025	0.022	0.100	1.694	25,425
ΔR&D / ME(t-1)	0.001	0.019	-0.113	0.000	0.000	0.002	0.081	25,425
ΔInterest / ME(t-1)	0.001	0.016	-0.072	-0.001	0.000	0.002	0.085	25,425
ΔDividends / ME(t-1)	-0.000	0.015	-0.072	-0.001	0.000	0.000	0.092	25,425
Market leverage	0.220	0.211	0.000	0.038	0.166	0.347	0.846	25,425
Net financing / ME	0.263	0.730	-0.036	0.000	0.004	0.151	5.035	25,425
SGR × ΔCash	0.004	0.082	-0.884	-0.002	0.000	0.003	1.027	25,425
ΔEarnings × ΔCash	0.001	0.077	-0.706	-0.001	0.000	0.001	0.967	25,425
Tax × ΔCash	-0.002	0.227	-3.431	-0.027	0.000	0.033	4.719	25,425
Spread × ΔCash	-0.000	0.008	-0.131	-0.001	-0.000	0.001	0.179	25,425

Tang. × ΔCash/ME$_{t-1}$	-0.002	0.031	-0.318	-0.005	-0.000	0.004	0.436	25,425
VOFF	0.868	0.115	0.058	0.820	0.883	0.939	1.310	25,425

Notes: VOFF is constructed following the two-step procedure of Rapp et al. (2014). In the first step, annual cumulative abnormal returns are regressed on the unexpected change in cash (scaled by lagged market equity) interacted with five firm-level determinants: sales growth (growth opportunities), change in earnings scaled by lagged market equity (profitability), effective tax rate (cost of holding cash), bid-ask spread (external financing costs), and tangibility (capital reversibility). In the second step, VOFF is the weighted sum of each firm's determinant values using the estimated interaction coefficients, yielding a time-varying, market-implied measure of the value of financial flexibility. All statistics are for the CAPEX estimation sample (N = 25,425).

Table 6: Descriptive Statistics – Main Sample

	Mean	SD	Min	P25	Median	P75	Max	N
CAPEX / TA	0.049	0.057	0.000	0.015	0.031	0.060	0.343	25,425
VOFF	0.868	0.115	0.058	0.820	0.883	0.939	1.310	25,425
EPU (raw)	160.774	50.407	92.467	142.396	147.776	175.253	326.320	25,425
ln(EPU)	5.042	0.264	4.527	4.959	4.996	5.166	5.788	25,425
Firm size	6.966	2.073	2.247	5.547	7.029	8.396	11.723	25,425
Leverage	0.265	0.226	0.000	0.070	0.240	0.393	1.063	25,425
Tobin's Q	1.895	1.718	0.348	0.891	1.314	2.177	10.435	25,425
Cash flow	0.057	0.214	-1.039	0.044	0.100	0.153	0.417	25,425
Cash holdings	0.202	0.224	0.001	0.038	0.115	0.282	0.921	25,425
Sales growth	0.073	0.336	-1.212	-0.036	0.059	0.171	1.577	25,425
Tangibility	0.254	0.239	0.002	0.072	0.164	0.372	0.892	25,425

Table 6b: Descriptive Statistics – Reported R&D Sample

	Mean	SD	Min	P25	Median	P75	Max	N
R&D / TA	0.089	0.136	0.000	0.006	0.032	0.111	0.785	13,155
VOFF	0.884	0.108	0.072	0.837	0.897	0.953	1.305	13,155
EPU (raw)	160.8	51.4	92.5	138.0	153.2	175.3	326.3	13,155
ln(EPU)	5.040	0.270	4.527	4.927	5.032	5.166	5.788	13,155
Firm size	6.824	2.092	2.247	5.341	6.865	8.222	11.723	13,155
Leverage	0.229	0.214	0.000	0.035	0.197	0.350	1.063	13,155
Tobin's Q	2.190	1.921	0.348	0.989	1.544	2.607	10.435	13,155
Cash flow	0.038	0.237	−1.039	0.015	0.100	0.154	0.417	13,155
Cash holdings	0.257	0.244	0.001	0.065	0.170	0.388	0.921	13,155
Sales growth	0.085	0.351	−1.212	−0.032	0.064	0.183	1.577	13,155
Tangibility	0.184	0.174	0.002	0.063	0.128	0.244	0.892	13,155

Notes: The reported R&D sample includes firm-year observations for which R&D expenditure is non-missing and positive. Statistics are for the same 2009–2023 sample period as Table 1.

Table 7: Pairwise Correlation Table

	CAPEX / TA_{t-1}	R&D / TA_{t-1}	VOFF	EPU (log)	Firm size	Leverage	Tobin's Q	Cash flow	Cash holdings	Sales growth	Tangibility
CAPEX / TA_{t-1}	1.000										
R&D / TA_{t-1}	-0.089***	1.000									
VOFF	-0.090***	0.280***	1.000								
EPU (log)	-0.067***	0.034***	0.193***	1.000							
Firm size	0.080***	-0.359***	0.039***	0.057***	1.000						
Leverage	0.054***	-0.109***	-0.021***	0.110***	0.308***	1.000					
Tobin's Q	0.003	0.379***	0.219***	0.053***	-0.133***	-0.005	1.000				
Cash flow	0.167***	-0.679***	-0.186***	-0.055***	0.404***	0.069***	-0.116***	1.000			
Cash holdings	-0.184***	0.642***	0.264***	0.020***	-0.404***	-0.299***	0.408***	-0.490***	1.000		
Sales growth	0.133***	0.145***	0.380***	-0.000	-0.010	-0.012*	0.161***	0.025***	0.085***	1.000	
Tangibility	0.547***	-0.305***	-0.284***	0.009	0.266***	0.246***	-0.210***	0.212***	-0.419***	-0.041***	1.000

Table 8: CAPEX Investment Regressions -- Main Models

	(1) (1) Baseline	(2) (2) EPU	(3) (3) Main	(4) (4) EPU, no year FE	(5) (5) Main, no year FE
VOFF	0.0169***	0.0169***	0.0192***	0.0134***	0.0155***
	(0.0040)	(0.0040)	(0.0040)	(0.0037)	(0.0039)
ln(EPU), t-1				-0.0098***	-0.0098***
				(0.0012)	(0.0012)
VOFF x ln(EPU), t-1			0.0430***		0.0297***
			(0.0113)		(0.0109)
Firm size	0.0058***	0.0058***	0.0056***	0.0011	0.0009
	(0.0014)	(0.0014)	(0.0014)	(0.0013)	(0.0013)
Leverage (t-1)	-0.0289***	-0.0289***	-0.0289***	-0.0373***	-0.0373***
	(0.0039)	(0.0039)	(0.0039)	(0.0039)	(0.0039)
Tobin's Q (t-1)	0.0056***	0.0056***	0.0056***	0.0052***	0.0051***
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
Cash flow (t-1)	0.0133***	0.0133***	0.0128***	0.0168***	0.0164***
	(0.0048)	(0.0048)	(0.0048)	(0.0048)	(0.0048)
Cash holdings (t-1)	0.0080	0.0080	0.0081	0.0100**	0.0100*
	(0.0051)	(0.0051)	(0.0051)	(0.0051)	(0.0051)
Sales growth (t-1)	0.0057***	0.0057***	0.0058***	0.0066***	0.0068***
	(0.0013)	(0.0013)	(0.0013)	(0.0012)	(0.0012)
Tangibility (t-1)	0.0209**	0.0209**	0.0213**	0.0189**	0.0190**
	(0.0092)	(0.0092)	(0.0092)	(0.0094)	(0.0094)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No	No
Observations	21,001	21,001	21,001	21,001	21,001
R-squared	0.6653	0.6653	0.6657	0.6570	0.6572

Notes: Dependent variable is CAPEX scaled by lagged total assets. Columns (1)–(3) include firm and year fixed effects (two-way FE); columns (4)–(5) include firm fixed effects only, which allows the direct ln(EPU) coefficient to be identified. In the two-way FE columns, ln(EPU) is perfectly collinear with year dummies and is therefore absorbed. VOFF and ln(EPU) are mean-centered; controls are lagged one year except firm size. Standard errors in parentheses, clustered by firm.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 9: R&D Investment Regressions -- Reported-R&D Sample

	(1)	(2)	(3)	(4)	(5)
	(1) Baseline	(2) EPU	(3) Main	(4) EPU, no year FE	(5) Main, no year FE
VOFF	0.0283***	0.0283***	0.0288***	0.0282***	0.0283***
	(0.0079)	(0.0079)	(0.0083)	(0.0076)	(0.0081)
ln(EPU), t-1				-0.0104***	-0.0104***
				(0.0025)	(0.0024)
VOFF x ln(EPU), t-1			0.0084		0.0015
			(0.0289)		(0.0268)
Firm size	-0.0128***	-0.0128***	-0.0129***	-0.0162***	-0.0162***
	(0.0029)	(0.0029)	(0.0029)	(0.0025)	(0.0025)
Leverage (t-1)	-0.0293***	-0.0293***	-0.0293***	-0.0337***	-0.0337***
	(0.0100)	(0.0100)	(0.0100)	(0.0098)	(0.0098)
Tobin's Q (t-1)	0.0128***	0.0128***	0.0127***	0.0123***	0.0123***
	(0.0012)	(0.0012)	(0.0012)	(0.0012)	(0.0012)
Cash flow (t-1)	-0.2225***	-0.2225***	-0.2226***	-0.2223***	-0.2223***
	(0.0180)	(0.0180)	(0.0180)	(0.0180)	(0.0180)
Cash holdings (t-1)	0.0102	0.0102	0.0102	0.0095	0.0095
	(0.0121)	(0.0121)	(0.0121)	(0.0122)	(0.0122)
Sales growth (t-1)	0.0093***	0.0093***	0.0093***	0.0098***	0.0098***
	(0.0034)	(0.0034)	(0.0034)	(0.0033)	(0.0034)
Tangibility (t-1)	0.1001***	0.1001***	0.1002***	0.0913***	0.0913***
	(0.0190)	(0.0190)	(0.0190)	(0.0185)	(0.0185)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No	No
Observations	12,783	12,783	12,783	12,783	12,783
R-squared	0.8771	0.8771	0.8771	0.8761	0.8761

Notes: Dependent variable is R&D expense scaled by lagged total assets; observations with missing R&D are excluded (N = 12,783). Columns (1)–(3) include firm and year fixed effects; columns (4)–(5) include firm fixed effects only, allowing the direct ln(EPU) coefficient to be identified. Controls are lagged one year except firm size. VOFF and ln(EPU) are mean-centered. Standard errors in parentheses, clustered by firm.
* p < 0.10, ** p < 0.05, *** p < 0.01.

Table 10: Consolidated 2SLS Robustness -- Instrumental Variables

	(1)	(2)	(3)	(4)
	(1) First stage: VOFF	(2) IV-A	(3) IV-B	(4) IV-C
LOO mean VOFF	0.2256***			
	(0.0417)			
LOO mean VOFF x ln(EPU), t-1	-0.1481**			
	(0.0719)			
VOFF		0.1376**	0.1652**	0.0094
		(0.0682)	(0.0725)	(0.0070)
VOFF x ln(EPU), t-1			0.1995***	0.0427**
			(0.0535)	(0.0178)
Firm size	0.0122***	0.0044***	0.0030*	0.0041***
	(0.0023)	(0.0015)	(0.0016)	(0.0014)
Leverage (t-1)	-0.0479***	-0.0228***	-0.0219***	-0.0230***
	(0.0079)	(0.0052)	(0.0052)	(0.0039)
Tobin's Q (t-1)	0.0061***	0.0049***	0.0046***	0.0050***
	(0.0008)	(0.0006)	(0.0006)	(0.0004)
Cash flow (t-1)	-0.0509***	0.0191***	0.0176***	0.0091*
	(0.0109)	(0.0059)	(0.0060)	(0.0049)
Cash holdings (t-1)	0.0108	0.0070	0.0077	0.0137***
	(0.0095)	(0.0051)	(0.0052)	(0.0049)
Sales growth (t-1)	-0.0017	0.0061***	0.0066***	0.0048***
	(0.0030)	(0.0013)	(0.0013)	(0.0013)
Tangibility (t-1)	-0.1202***	0.0357***	0.0394***	0.0253***
	(0.0161)	(0.0128)	(0.0131)	(0.0089)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry x Year FE	No	No	No	Yes
Kleibergen-Paap Wald F		31.64	15.87	43.61
Observations	20,943	20,943	20,943	20,943

Column (1) reports the first-stage regression of VOFF on the two leave-one-out (LOO) mean instruments, with the IV-B specification (firm and year FE, full controls, clustered SE). Columns (2)-(4) report 2SLS second-stage results. Dependent variable: CAPEX scaled by lagged total assets. IV-A instruments for VOFF only. IV-B and IV-D instrument jointly for VOFF and VOFF × EPU using the LOO mean and its EPU-interaction. IV-D additionally absorbs 2-digit SIC x year fixed effects. Industry-year cells with a single firm are excluded. The exclusion restriction requires peer VOFF to affect firm-level investment only through own VOFF; IV results are reported as robustness evidence rather than conclusive causal identification. Standard errors clustered by firm in parentheses.

* p < 0.10, ** p < 0.05, *** p < 0.01.

Table 11: Robustness -- Alternative VOFF Definition

	(1) (1) CAPEX	(2) (2) CAPEX (wins.)	(3) (3) R&D	(4) (4) R&D (wins.)
VOFF	0.0192***		0.0288***	
	(0.0040)		(0.0083)	
VOFF (winsorized)		0.0187***		0.0258***
		(0.0039)		(0.0080)
ln(EPU), t-1				
VOFF x ln(EPU), t-1	0.0430***		0.0084	
	(0.0113)		(0.0289)	
VOFF (wins.) x ln(EPU), t-1		0.0412***		-0.0035
		(0.0113)		(0.0279)
Firm size	0.0056***	0.0056***	-0.0129***	-0.0127***
	(0.0014)	(0.0014)	(0.0029)	(0.0029)
Leverage (t-1)	-0.0289***	-0.0289***	-0.0293***	-0.0293***
	(0.0039)	(0.0039)	(0.0100)	(0.0100)
Tobin's Q (t-1)	0.0056***	0.0056***	0.0127***	0.0128***
	(0.0004)	(0.0004)	(0.0012)	(0.0012)
Cash flow (t-1)	0.0128***	0.0127***	-0.2226***	-0.2227***
	(0.0048)	(0.0048)	(0.0180)	(0.0180)
Cash holdings (t-1)	0.0081	0.0082	0.0102	0.0103
	(0.0051)	(0.0051)	(0.0121)	(0.0121)
Sales growth (t-1)	0.0058***	0.0058***	0.0093***	0.0093***
	(0.0013)	(0.0013)	(0.0034)	(0.0034)
Tangibility (t-1)	0.0213**	0.0212**	0.1002***	0.0998***
	(0.0092)	(0.0092)	(0.0190)	(0.0189)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	21,001	21,001	12,783	12,783
R-squared	0.6657	0.6656	0.8771	0.8771

Notes: Dependent variable: CAPEX (cols 1-2) or reported R&D (cols 3-4), each scaled by lagged total assets. Columns (1) and (3) use the preferred VOFF (not re-winsorized). Columns (2) and (4) additionally winsorize VOFF at 1/99 before mean-centering. All models include firm and year fixed effects. The direct EPU level effect is absorbed by year FE. Standard errors clustered by firm in parentheses.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 12: Robustness -- Investment Scaled by Current Total Assets

	(1) (1) CAPEX / TA(t)	(2) (2) CAPEX / TA(t), no year FE	(3) (3) R&D / TA(t)	(4) (4) R&D / TA(t), no year FE
VOFF	0.0067**	0.0046	-0.0104**	-0.0071
	(0.0031)	(0.0030)	(0.0045)	(0.0043)
ln(EPU), t-1		-0.0084***		0.0006
		(0.0010)		(0.0013)
VOFF x ln(EPU), t-1	0.0423***	0.0301***	-0.0297**	-0.0389***
	(0.0084)	(0.0081)	(0.0146)	(0.0134)
Firm size	-0.0016	-0.0035***	-0.0251***	-0.0202***
	(0.0012)	(0.0010)	(0.0021)	(0.0017)
Leverage (t-1)	-0.0195***	-0.0239***	-0.0099	-0.0031
	(0.0031)	(0.0031)	(0.0065)	(0.0064)
Tobin's Q (t-1)	0.0028***	0.0026***	0.0006	0.0007
	(0.0003)	(0.0003)	(0.0007)	(0.0007)
Cash flow (t-1)	0.0191***	0.0210***	-0.0832***	-0.0857***
	(0.0034)	(0.0035)	(0.0115)	(0.0114)
Cash holdings (t-1)	0.0039	0.0046	0.0247***	0.0225***
	(0.0041)	(0.0042)	(0.0081)	(0.0081)
Sales growth (t-1)	0.0044***	0.0056***	0.0046**	0.0056***
	(0.0009)	(0.0009)	(0.0022)	(0.0021)
Tangibility (t-1)	0.0111	0.0087	0.0259***	0.0231***
	(0.0075)	(0.0077)	(0.0071)	(0.0070)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No
Observations	21,001	21,001	21,003	21,003
R-squared	0.6993	0.6932	0.8799	0.8780

Notes: Dependent variables are CAPEX (columns 1–2) and R&D expense (columns 3–4) scaled by current-year total assets (TA□), following Yousefi and Yung (2022) as an alternative to the preferred lagged-TA denominator. Columns (1) and (3) are the main interaction models with firm and year fixed effects; columns (2) and (4) drop year FE so the direct ln(EPU) coefficient can be estimated. Both dependent variables are winsorized at the 1st and 99th percentiles. Standard errors in parentheses, clustered by firm.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 13: Subsample Analysis -- Firm-Size Terciles

	(1) CAPEX	(2) CAPEX	(3) CAPEX	(4) R&D	(5) R&D	(6) R&D
VOFF	0.0223***	0.0133**	0.0098*	0.0479***	0.0188*	0.0279***
	(0.0063)	(0.0064)	(0.0058)	(0.0157)	(0.0101)	(0.0099)
ln(EPU), t-1						
VOFF x ln(EPU), t-1	0.0421**	0.0470**	0.0125	0.0617	0.0251	-0.0407
	(0.0167)	(0.0195)	(0.0179)	(0.0525)	(0.0315)	(0.0254)
Firm size	0.0129***	0.0078**	-0.0012	-0.0098	-0.0160***	-0.0124***
	(0.0027)	(0.0030)	(0.0028)	(0.0064)	(0.0032)	(0.0031)
Leverage (t-1)	-0.0233***	-0.0310***	-0.0313***	-0.0222	-0.0320***	-0.0127**
	(0.0056)	(0.0073)	(0.0066)	(0.0180)	(0.0102)	(0.0062)
Tobin's Q (t-1)	0.0048***	0.0041***	0.0087***	0.0164***	0.0075***	0.0083***
	(0.0006)	(0.0007)	(0.0012)	(0.0020)	(0.0016)	(0.0019)
Cash flow (t-1)	-0.0006	0.0484***	0.0207	-0.2295***	-0.1231***	-0.0785*
	(0.0060)	(0.0129)	(0.0187)	(0.0214)	(0.0260)	(0.0456)
Cash holdings (t-1)	0.0000	0.0144*	0.0219**	0.0106	0.0008	0.0209*
	(0.0063)	(0.0078)	(0.0088)	(0.0207)	(0.0117)	(0.0117)
Sales growth (t-1)	0.0048***	0.0060**	0.0057*	0.0112**	0.0012	-0.0042
	(0.0014)	(0.0028)	(0.0030)	(0.0044)	(0.0049)	(0.0060)
Tangibility (t-1)	0.0025	0.0256	0.0438***	0.1067***	0.0564***	0.0901***
	(0.0168)	(0.0197)	(0.0117)	(0.0391)	(0.0164)	(0.0190)
Size group	Small (T1)	Medium (T2)	Large (T3)	Small (T1)	Medium (T2)	Large (T3)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	6,860	6,892	7,032	5,016	3,968	3,643
R-squared	0.5681	0.7512	0.7653	0.8629	0.9178	0.9073

Notes: Dependent variable is CAPEX (columns 1–3) or R&D expense (columns 4–6) scaled by lagged total assets. Firm-size terciles are defined by log total assets within the main CAPEX estimation sample. Tercile 1 (Small): bottom third; Tercile 2 (Medium): middle third; Tercile 3 (Large): top third. All models include firm and year fixed effects; the direct EPU level effect is absorbed by year FE. Standard errors in parentheses, clustered by firm.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 14: Subsample Analysis -- High-Tech vs. Low-Tech Industries

	(1)	(2)	(3)	(4)
	(1) CAPEX HT	(2) CAPEX LT	(3) R&D HT	(4) R&D LT
VOFF	0.0194***	0.0190***	0.0180*	0.0363***
	(0.0065)	(0.0051)	(0.0093)	(0.0132)
ln(EPU), t-1				
VOFF x ln(EPU), t-1	0.0244	0.0463***	0.0010	0.0170
	(0.0179)	(0.0141)	(0.0310)	(0.0468)
Firm size	0.0016	0.0088***	-0.0202***	-0.0045
	(0.0022)	(0.0019)	(0.0035)	(0.0047)
Leverage (t-1)	-0.0147**	-0.0352***	-0.0384***	-0.0242
	(0.0065)	(0.0049)	(0.0104)	(0.0157)
Tobin's Q (t-1)	0.0037***	0.0070***	0.0117***	0.0134***
	(0.0005)	(0.0006)	(0.0013)	(0.0021)
Cash flow (t-1)	0.0189**	0.0101*	-0.1745***	-0.2500***
	(0.0077)	(0.0061)	(0.0188)	(0.0261)
Cash holdings (t-1)	0.0046	0.0175**	-0.0264**	0.0528**
	(0.0066)	(0.0072)	(0.0135)	(0.0219)
Sales growth (t-1)	0.0080***	0.0053***	0.0045	0.0117***
	(0.0022)	(0.0015)	(0.0048)	(0.0044)
Tangibility (t-1)	0.0672***	0.0136	0.0983***	0.1005***
	(0.0186)	(0.0104)	(0.0261)	(0.0258)
Industry group	High-tech	Low-tech	High-tech	Low-tech
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	8,021	12,980	6,677	6,106
R-squared	0.5922	0.6817	0.8529	0.8891

Notes: Dependent variable is CAPEX (columns 1–2) or R&D expense (columns 3–4) scaled by lagged total assets. High-tech industries are defined as 2-digit SIC codes 35–39 (industrial and electrical machinery, computers, electronics, instruments) and SIC 73 (business services and software). Low-tech comprises all remaining SIC codes. All models include firm and year fixed effects; the direct EPU level effect is absorbed by year FE. Standard errors in parentheses, clustered by firm.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

12. Appendix

Use of generative AI

In the process of writing the thesis the Anthropic models Claude Sonnet 4.5 and Opus 4.7 as well as ChatGPT 5.4 and 5.5 have been primarily used to generate and further develop STATA code. Additionally, they have been used in the retrieval of data from Bloomberg and FactSet by localizing correct BDH and FDS codes. The excel plugin for Claude has also been used during the data handling and retrieval process. With regard to the writing process, the previously mentioned models have been used in order to discuss early ideas.