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Economic Policy Uncertainty and Underinvestment in Indian Firms

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Abstract

Insufficient investment by the private sector, especially in manufacturing, has been a major cause of worry for policy makers in India. Not only does such underinvestment affect macroeconomic growth negatively, but it also affects job creation adversely which is a serious concern for a country like India with a growing working age population. This paper studies the impact of economic policy uncertainty on underinvestment by Indian manufacturing firms. Economic policy uncertainty is found to encourage underinvestment by Indian firms significantly, but the relationship is not linear. Further, underinvestment by firms improves firm performance in the short run but only when EPU is low.

Keywords: Economic Policy Uncertainty, Underinvestment, Firm Performance

1. Introduction

The latest economic survey of India emphasized the role of private sector capex in the following words - "..it is important to note that while it remains the government's responsibility to facilitate the development of infrastructure and address logistical challenges, it is incumbent upon the private sector to take forward the momentum in capital formation on its own and in partnership with the Government. Between FY19 and FY23, the share of private non-financial corporations in overall GFCF increased only by 0.8 percentage points from 34.1 per cent to 34.9 per cent. This was mostly driven by their fast-increasing share in the additional stock of dwellings, other buildings and structures. Their share in addition to the capital stock in terms of machinery and equipment, started growing robustly only since FY22, a trend that needs to be sustained on the strength of their improving bottom-line and balance sheets to generate high-quality jobs." Private investment is important for sustained economic growth as well as job creation in an economy like India. In this context the decline in Gross Private Fixed Capital Formation (GPFCF) as a percentage of GDP over the last decade is a cause for concern. After reaching a peak of 31 percent of GDP in 2011, GPFCF has remained below 30 percent of GDP for over a decade, falling below 24 percent during the pandemic and crawling back to the pre-pandemic levels only recently (see Chart 1).

While a lot of recent studies have looked at the phenomenon of overinvestment (i.e. firms investing more than what is 'optimal') and its impact on firm performance, few studies have focussed on the drivers of 'underinvestment' – whereby firms invest less than what would be optimal, and its impact on the firms. It is conceivable that 'underinvestment' by firms affects their performance differently than 'overinvestment' especially in the presence of irreversible investment. While overinvestment in the presence of irreversibility would mean firm being saddled with excessive capital in case the actual return on investment turns out to be low, an underinvesting firm can always increase the size of its capital stock in the future. At the same time, in the presence of 'strategic' investment opportunities to keep out potential competitors from entering the market or increase the market share, underinvesting firms risk losing these thereby affecting their performance adversely.

This paper looks at the relationship between economic policy uncertainty and 'underinvestment' using a panel of about 1500 Indian manufacturing firms. Uncertainty affects corporate investment adversely in the presence of investment irreversibility and imperfect competition (Caballero (1991)). Kulatilaka and Perotti (1998) on the other hand show that in markets where investment confers a greater capability to take advantage of future growth opportunities by dissuading entry or by inducing competitors to "make room" for the stronger competitor, increased uncertainty could encourage greater investment in growth options since higher uncertainty means more opportunity rather than simply larger risk. Henriques and Sadorsky (2011) find a U-shaped relationship between oil price volatility and firm-level investment and outline that overinvestment could be beneficial for firms in high-uncertainty circumstances but not at lower levels of uncertainty. The relationship between uncertainty and investment therefore remains a matter of empirical and theoretical debate. This study adds to the literature on uncertainty and mis-investment by looking at the relationship between economic policy uncertainty and underinvestment by manufacturing firms in India. We find that economic policy uncertainty increases underinvestment amongst Indian firms. The relationship between economic policy

uncertainty and underinvestment is however inverted U-shaped. At higher levels of uncertainty, strategic investment motive begins to take over and underinvestment increases at a slower rate in response to an increase in economic policy uncertainty. This result offers an important insight into the behaviour of investment at the firm level. Underinvestment is also found to affect firm performance positively in the short run with the impact getting weaker over time. Both the return on assets and Tobin's q increase in response to underinvestment. The positive impact is, however, stronger in periods with lower levels of EPU. This likely explains the non-linear relationship between EPU and underinvestment.

Rest of the paper is organised as follows. Section 2 provides a brief literature review while Section 3 describes our empirical methodology. Section 4 presents our dataset and results while Section 5 concludes.

2. Literature Review

Impact of uncertainty on investment has been a subject of interest for policy makers and researchers alike. The standard real-options-theory based approach predicts a negative relationship between investment and uncertainty independent of the financing decision (e.g., Pindyck (1991) and Dixit and Pindyck (1994)) while the modern macroeconomic and financial theory emphasizes the role of financial frictions emanating from asymmetric information, transaction costs etc. (see, e.g., Whited (1992) and Campello et. al. (2010)) in driving the investment-uncertainty relationship. A related strand of literature has looked at the role of uncertainty in driving firms' investment choices away from the optimal. Bebchuk and Stole (1993) show that short term managerial objectives can drive firms to under- or overinvest in long-term projects depending on the nature of uncertainty in the market about the firm's investment behaviour – i.e. uncertainty about the level of long-term investment undertaken or the productivity of those investment projects. Weeds (1999) highlights the role of technological uncertainty under risky market conditions in encouraging overinvestment in research. Higher uncertainty can lead to 'sleeping' patents as forward-looking firms engage in development of potentially profitable technology even in the absence of strategic anti-competitive motives. Overinvestment in technology in this case is a socially optimal outcome of rational choice by a forward-looking firm. Lorenzoni (2008) outlines the importance of financial frictions in the presence of revenue shocks that can lead firms to borrow and invest more than what is socially optimal. This happens because firms fail to take in to account the externality arising from the effects of their investment decisions on asset prices in case of an adverse revenue shock. More recently, Proost and Van Der Loo (2010) show that with long lead times to adapt capacity, congestion costs and inelastic demand, overinvestment could be socially optimal.

On the empirical side of the literature, most studies find a negative relationship between macroeconomic uncertainty and investment (e.g. Kang et.al. (2014)). Gulen and Ion (2016) show that higher economic policy uncertainty affects investments by US public corporations negatively with the effect being stronger for firms with higher degree of investment irreversibility and greater dependence on government-sector demand. Wang et. al (2016) provide evidence for higher inflation uncertainty reducing overinvestment in Chinese State-

Owned Enterprises (SOEs). Irawan and Okimoto (2021) focus on resource firms across 32 countries between the period 1986 to 2017 and find that changes in commodity prices rather than uncertainty in them leads to overinvestment. Further, they establish a positive relationship between firm performance and overinvestment after three years.

This paper is closely related to the Irawan and Okimoto (2021) study as it looks at the determinant of mis-investment and its impact on firm performance. However, unlike them we look at underinvestment rather than overinvestment. At the same time, we focus on the impact of economic policy uncertainty rather than commodity price uncertainty on corporate mis-investment. Finally, we emphasize the presence of nonlinearity in the relationship between uncertainty and mis-investment and find strong evidence for the same. Ignoring non-linearity in the impact of uncertainty on firm's investment decisions is likely to give us misleading results (e.g. Bo and Lensin (2005)).

Our paper is related to two broad strands of literature. The first one looks at the impact of uncertainty on corporate investment. Key contributions in this area include Pindyck (1991), Whited (1992), Dixit and Pindyck (1994), Dixit (1995), Leahy and Whited (1996), Abel and Eberly (1999), Bloom et al. (2007), Bloom (2009), Campello et. al. (2010), Julio and Yook (2012), Kellogg (2014), Gulen and Ion (2016), Bolton et. al. (2019) and Liu and Wang (2021). These papers use irreversible investment and/or financial frictions resulting from asymmetric information to explain the negative impact of uncertainty on corporate investment. They also find significant impact of firm characteristics on uncertainty-investment relationship. Our results support the findings in these papers by showing a positive relationship between economic policy uncertainty and underinvestment by private firms.

The second strand of literature looks at the determinants of mis-investment by firms and its impact on firm performance. Prominent papers in this area include Kulatilaka and Perotti (1998), Weeds (1999), Chevalier-Roignant et al. (2011), and Henriques and Sadorsky (2011). These studies focus on strategic investment motives to explain the phenomenon of overinvestment by firms and its positive impact on firm performance. By investing in future growth opportunities when the outcomes are uncertain, firms can benefit by discouraging potential new entrants and/ or being the first ones in the market. When the option value of waiting to undertake new investment under uncertainty is less than the expected gains from strategically investing in future growth opportunities, the firms are likely to overinvest. In such cases higher uncertainty would encourage overinvestment as it represents greater opportunity apart from higher risk. Studies such as Fu (2010), however, report a negative impact of overinvestment on firm performance indicating that managers are not necessarily acting to maximize firm value when making investment decisions. Liu and Bredin (2010) find a similar negative relationship between overinvestment and firm performance for Chinese firms. They also find that funds and security companies decrease the level of overinvestment in Chinese firms. Malmendier and Tate (2005) show that overinvestment by firms in response to abundant internal funds is caused by overconfident managers overestimating the returns to their investment while seeing external funds as being unduly costly. Ling et. al. (2016) find that political connections increase overinvestment by Chinese real estate firms while adversely

affecting their returns. Unlike most of the studies in this literature, our paper looks at the reasons behind underinvestment by manufacturing firms and its impact on firm performance. Underinvestment is found to have a positive impact on firm performance even though the impact is not long-term. These results suggest that the choice to underinvest in the face of uncertainty is driven by managers' desire to maximize the firm value.
Next section outlines our empirical model.

3. Empirical Methodology

To study the determinants of underinvestment by firms and its impact on firm performance we use the framework proposed by Richardson (2006). We estimate the firm investment function using the following equation:

$$\ln\frac{I_{i,t}}{K_{i,t-1}} = \rho_0 + \rho_1 \ln\frac{I_{i,t-1}}{K_{i,t-2}} + \rho_2 \frac{V_{i,t-1}}{P_{i,t-1}} + \rho_3 \ln\frac{CASH_{i,t-1}}{K_{i,t-2}} + \rho_4 Leverage_{i,t-1} + \rho_5 \ln Age_{i,t-1} + \rho_6 Firm\ Size_{i,t-1} + \mu_i + \lambda_t + \epsilon_{i,t},\ \epsilon_{i,t} \sim iid\ N(0, \sigma_\varepsilon^2) \quad (1)$$

$I_{i,t}$ is the investment by firm i at time t defined as the change in its fixed assets while $K_{i,t}$ is firm i 's total capital at time t . $\frac{V_{i,t}}{P_{i,t}}$ is the ratio between the book value of shareholders' equity divided by market capitalization. A smaller book-to market value ratio indicates that the firm's stock is overvalued. $CASH_{i,t}$ is the total cash flow defined as profits before depreciation, interest, taxes and amortization. $Leverage_{i,t}$ is defined as firm's total debt divided by its equity while $Firm\ Size_{i,t}$ is the log transformation of firm's total assets. $Age_{i,t}$ is the firm age calculated as the current year minus the first year for which data are available in the CMIE-PROWESS database. Finally, μ_i & λ_t are firm specific and time specific fixed effects.

Investment level predicted by the above investment function is defined as expected investment - $\left(I/K\right)_{i,t}^{Expect}$. $\left(I/K\right)_{i,t}^{Expect}$ is used as a proxy for the level of investment one would expect if the firm was behaving optimally. We estimate the investment function given by equation (1) using fixed effect dynamic panel OLS.
Underinvestment is then defined as the difference between expected and actual investment level as follows –

$$Underinvest_{i,t} = \left(I/K\right)_{i,t}^{Expect} - \left(I/K\right)_{i,t} \quad (2)$$

A positive value of the above variable implies that the firm is investing below the level predicted by the investment function and therefore underinvesting while a negative value implies the opposite. One of the limitations of this approach to measuring mis-investment is that the OLS residuals have a mean zero property making estimates of average mis-investment zero by construction. However, as the next part of our analysis focuses on the probability of underinvestment rather than the level, this is less of a concern for us.

Economic Policy Uncertainty and Underinvestment

To study the impact of economic policy uncertainty on overinvestment we estimate the following panel Probit model –

$$\delta_{I.,t}^{Underinvest} = \gamma_0 + \gamma_1 Underinvestment_{i,t-1} + \gamma_2 EPU_{t-1} + \gamma_3 EPU_{t-1}^2 + \gamma_4 Free\ Cash\ Flow_{i,t-1} + \gamma_5 \Delta HGDP_{t-1} + \gamma_6 \Delta WGDP_{t-1} + \gamma_7 \Delta Inf_{t-1} + \gamma_8 GEE_{t-1} + \sum Indid + \epsilon_{i,t} \quad (3)$$

$\delta_{I.,t}^{Underinvest}$ is a dummy variable that takes a value of 1 if underinvestment variable is positive and zero otherwise. EPU_t is the measure of economic policy uncertainty defined as natural log of average news based economic policy uncertainty index proposed by Baker et. al. (2016) for India. To consider possible non-linearity in the relationship between EPU and underinvestment we also add squared EPU_t term. Together these two terms capture the relationship between economic policy uncertainty and underinvestment by firms.

The model uses additional variables to capture the impact of firm characteristics and macroeconomic environment on underinvestment by firms. The former includes a free cash flow variable where free cash flow is defined as the difference between firms' operating profits and expenditures necessary to maintain the existing stock of capital (depreciation and amortization) plus the spending on research and development. The free cash flow variable takes a value of 1 if the firm has positive "free cash flow" in a particular year and zero otherwise. A negative coefficient on free cash flow variable could point towards the importance of financial constraints in driving underinvestment amongst firms.

We capture the effect of domestic and global business cycles on investment by including home (Indian) and world GDP growth - $\Delta HGDP_{t-1}$ and $\Delta WGDP_{t-1}$ respectively. Change in domestic inflation rate as measured by the consumer price index is included to capture the impact of inflation uncertainty on investment. The index of government effectiveness - GEE_{t-1}, provided by the World Bank is used to capture the effect of governance quality on investment inefficiency. Finally, we include industry dummies to capture and industry specific factors that might affect firm level investment.

All the variables are lagged one period.

Underinvestment and Firm Performance

Next step of our analysis looks at the impact of underinvestment on firm performance. We focus on two measures of firm performance – return on assets and Tobin's Q. While the former captures the current profitability of a firm, the latter captures market's assessment of firm's future performance. Following Irawan and Okimoto (2021) we estimate the following equation to study the impact of underinvestment on firm performance –

$$\aleph_{i,t} = \beta_0 + \beta_1 \ln\frac{I_{i,t-1}}{K_{i,t-2}} + \beta_2\delta_{i,t-1}^{Underinvest} + \beta_3\delta_{i,t-1}^{Underinvest} \times \ln\frac{I_{i,t-1}}{K_{i,t-2}} + \beta_4 \ln\frac{I_{i,t-2}}{K_{i,t-3}} +$$
$$\beta_5\delta_{i,t-2}^{Underinvest} + \beta_6\delta_{i,t-2}^{Underinvest} \times \ln\frac{I_{i,t-2}}{K_{i,t-3}} + \beta_7 \ln\frac{I_{i,t-3}}{K_{i,t-4}} + \beta_8\delta_{i,t-3}^{Underinvest} +$$
$$\beta_9\delta_{i,t-3}^{Underinvest} \times \ln\frac{I_{i,t-3}}{K_{i,t-4}} + \beta_{10}\frac{V_{i,t-1}}{A_{i,t-1}} + \beta_{11}Size_{i,t-1} + \beta_{12}\aleph_{i,t-1} + \mu_i + \lambda_t + \eta_{i,t} \quad (4)$$

Here $\aleph_{i,t}$ is the measure of firm performance. $\frac{V_{i,t}}{A_{i,t}}$ is the firm's market capitalization divided by its total assets that captures the firm's investment opportunities (e.g. Fu (2010)) while $Size_{i,t}$ is the natural logarithm of firm's total assets capturing organizational costs, diversification and other firm specific characteristics that can affect firm performance (see Hansen and Wernerfelt (1989)).

The direct effect of underinvestment on firm performance is captured by β_2 , β_5 and β_8– the coefficients on lags of underinvestment dummy. Along with these we also include interaction terms between underinvestment dummy and investment rate to capture the impact of underinvestment on the relationship between investment rate and firm performance. Following Irawan and Okimoto (2021) we use three lags of underinvestment and its interaction terms to take in to account the lag between disbursement of money and completion of investment projects. All estimates include firm and time fixed effects.

Next section describes our dataset and results.

4. Dataset and Results

Dataset

Our empirical analysis uses panel data on more than 1400 Indian manufacturing firms between the years 2001 and 2023 giving us a total of 6171 firm-year observations. Our dataset excludes government owned firms, firms in utility sector and firms with negative market capitalization. Table [1] presents definitions and summary statistics for our key variables. Firms in our sample cover 32 industries and have a median age of 19 years. The median investment rate in our sample is 3.7 percent while the median return on capital employed is about 15.5 percent. T-test for the difference in means strongly suggests a reduction in average investment rate around 2013 with the investment rate falling from 10 to 7 percent after 2012.

Average equity share held by the promoters is 50 percent in our sample with half of the firms having more than 52 percent of their equity held by promoters. Ownership by promoters can affect firms' investment behaviour by reducing agency costs or by allowing expropriation of minority shareholders (e.g. Villalonga and Amit (2006)). We estimate equations (1) to (4) for high and low ownership concentration firms separately to check for such differences.

A final test for robustness involves removing resource intensive petroleum and refining sectors from the sample before conducting the analysis where longer lags in investment projects and uncertainty due to global resource price changes can impact investment decisions.

Our key variable of interest is economic policy uncertainty which we capture using the news based Economic Policy Uncertainty Index (EPU hereafter) of Baker et. al. (2016)[1]. Chart [2] plots the EPU for India. Wald's test for structural break strongly suggests a break in the monthly EPU series for India around January 2008. Average EPU Index for India has increased from 70 to 93 since the 2008 global recession. We therefore check for the robustness of our results by restricting our sample to the period after 2008 before doing the analysis.

Looking at the remaining macroeconomic variables, India experienced a real GDP growth rate of around 6 percent during the period under consideration and an average CPI inflation rate of 6.2 percent. World GDP growth rate was around 3 percent during the same period. Next, we look at our main results.

Results

We start our analysis by estimating the investment equation (i) for the entire sample of manufacturing firms. The equation is estimated using panel OLS with firm and year fixed effects[2]. Table [2] presents the results from this regression. Coefficient on lagged investment rate in investment equation (1) is negative and statistically significant indicating mean reversion in investment series. The ratio of Book value to market capitalization - $V_{i,t-1}/P_{i,t-1}$ has a significant and negative coefficient indicating higher level of investment by overvalued firms. Cash flow on the other hand has a positive and significant impact on firm's investment level. Of the remaining variables size, age and leverage - all have a negative effect on firm level investment, but the impact is not statistically significant. Comparing the coefficients across different sub-samples, most coefficients retain their signs and significance except the coefficient on firm size which is unstable. Further, the coefficient on cash flow is not statistically significant in case of firms with low ownership concentration.

Looking across different sub-samples we find that firms with higher share of promoter's equity ownership (above 50 percent) and those in petroleum and refining sector underinvest on average whereas firms with lower equity ownership by promoters and those excluding petroleum and refining sector overinvest. Further, average level of underinvestment has increased significantly in the period after 2008 (see Table [3]). This is true across the various sub-samples including firms with low promoters' equity share and those outside petroleum and refining sectors who underinvest on an average in the period after 2008.

Next stage of our analysis looks at the relationship between EPU and underinvestment. Table [4] presents the results from our panel probit regression (each entry in the table is the marginal effect of independent variable on the probability of underinvestment by firms). EPU increases the probability of underinvestment by firms across all subsamples. The relationship is, however, non-linear with the positive impact of EPU on underinvestment declining at higher levels of EPU. Higher economic policy uncertainty decreases the probability of

[1] Source: www.PolicyUncertainty.com
[2] Using Arellano-Bond two stage GMM estimator gives us similar results.

underinvestment as firms wait for greater clarity on returns from investment (e.g. Bernanke (1983)). At the same time, a delay in investment may allow competitors to seize the opportunity to gain market share or expand (Kulatilaka and Perotti (1998)). These two effects would give rise to a U-shaped relationship between economic policy uncertainty and investment. These results are in line with the U-shaped relationship between oil price volatility and firm level investment found by Henriques and Sadorsky (2011) who write - "Increases in uncertainty increase the option value of waiting to invest which postpones investment, but after some point, further increases in uncertainty lead to increases in investment as the value of the pre-emptive strategic effects starts to increase relative to the option value of waiting to invest. […[The theory of strategic growth options and compound options can give rise to a curvilinear (U shaped) relationship between investment and uncertainty."

Looking at the other explanatory variables, free cash flow affects the probability of underinvestment positively in all the sub-samples except in case of firms with high ownership concentration. The impact is, however, statistically insignificant for all sub-samples except for low ownership concentration firms. Overall, these results do not support the presence of financial constraints as being responsible for inefficient investment. Home GDP growth representing the domestic business cycle has a negative impact on the probability of underinvestment as expected but the effect is only statistically significant for the sample after 2008. World GDP growth on the other hand has a positive effect on the probability of underinvestment by firms with the effect becoming economically and statistically significant after 2008. This possibly reflects faster world GDP growth driving up prices of critical inputs that affect firm level investment decisions in emerging countries like India adversely. Faster inflation growth increases the probability of underinvestment in line with the findings of Wang et al. (2016) that inflation uncertainty reduces overinvestment tendencies, given a positive correlation between inflation and inflation uncertainty. Better governance as measured by the World Bank's governance effectiveness index has a negative but insignificant impact on the probability of underinvestment as expected.

Finally, we look at the relationship between underinvestment and firm performance. We choose two measures of firm performance, namely – return on assets (ROA) and Tobin's q. Tables 5 and 6 present the results from this exercise. Underinvestment has a positive effect on firm performance as measured by ROA and Tobin's q but the effect declines after a couple of years. Further, underinvestment improves the effect of investment on firm performance as seen by the coefficient on the interaction term between the underinvestment dummy and lagged investment. While on its own, investment seems to affect firm performance negatively with a lag (possibly on account of adjustment costs accompanying investment decisions), underinvestment reduces this negative impact. This relationship carries across the various sub-samples though the impact is a bit weaker in case of low ownership concentration firms. As expected, the market capitalization to asset ratio - $\frac{V_{i,t}}{A_{i,t}}$ has a positive impact on firm performance whereas firm size has mostly negative (and statistically insignificant) impact on firm performance across the different subsamples.

To check whether the non-linearity in the relationship between EPU and underinvestment extends to the impact of underinvestment on firm performance we divide our sample in to 'High' and 'Low' uncertainty periods based on the median level of EPU. We then estimate equation (4) for these two periods separately for the each of the sub-samples. One would expect underinvestment to have a much stronger positive impact on firm performance when EPU is low since the value of option to wait and invest later would be much greater than the strategic value of higher investment now in this case. Tables [7]-[10] present the results from this exercise.

Underinvestment has a much stronger positive impact on firm performance when EPU is low (at or below its median value) across all the samples. The difference is especially stark when we consider ROA. The impact of underinvestment on firm ROA is six times bigger when EPU is low in the complete sample. For firms with low promoters' equity ownership, underinvestment improves ROA significantly when EPU is low but has an adverse impact on ROA when EPU is high. In case of Tobin's q, the impact of underinvestment remains unchanged or declines in periods of high EPU except for firms with high promoters' equity ownership. These findings compliment our findings on non-linear relationship between EPU and underinvestment.

5. Conclusion

Inefficient corporate investment can affect a country's macroeconomic performance adversely apart from reducing the firm's value. We therefore look at the impact of EPU on private corporate investment in India and find a significant, positive but non-linear relationship between EPU and underinvestment by Indian firms. Further investigations show that underinvestment affects the firm performance positively, but that effect is stronger in periods of low EPU. These findings have important implications for policymakers in countries like India trying to achieve the dual objectives of job creation and sustained economic growth. Identifying and mitigating the various sources of high EPU should be an important policy priority for the governments in these countries.

Chart [1] Private Capital Formation in India

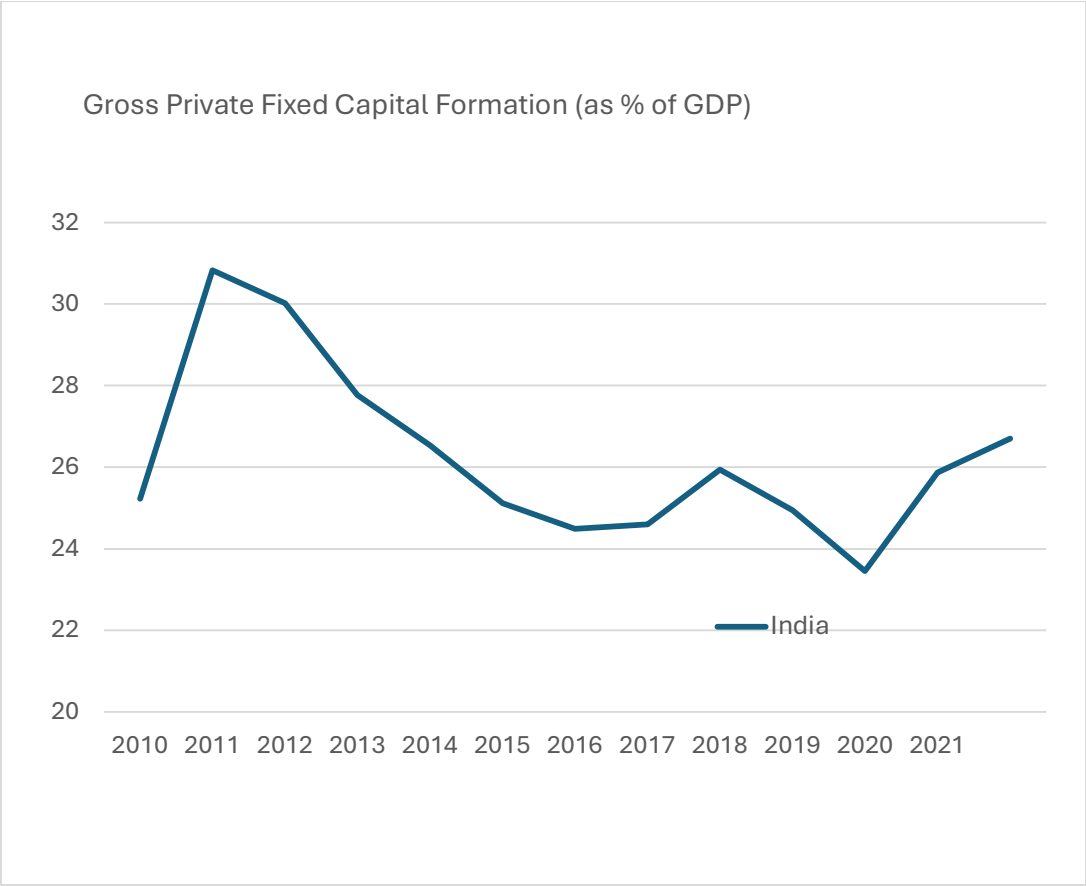

Chart [2] Economic Policy Uncertainty

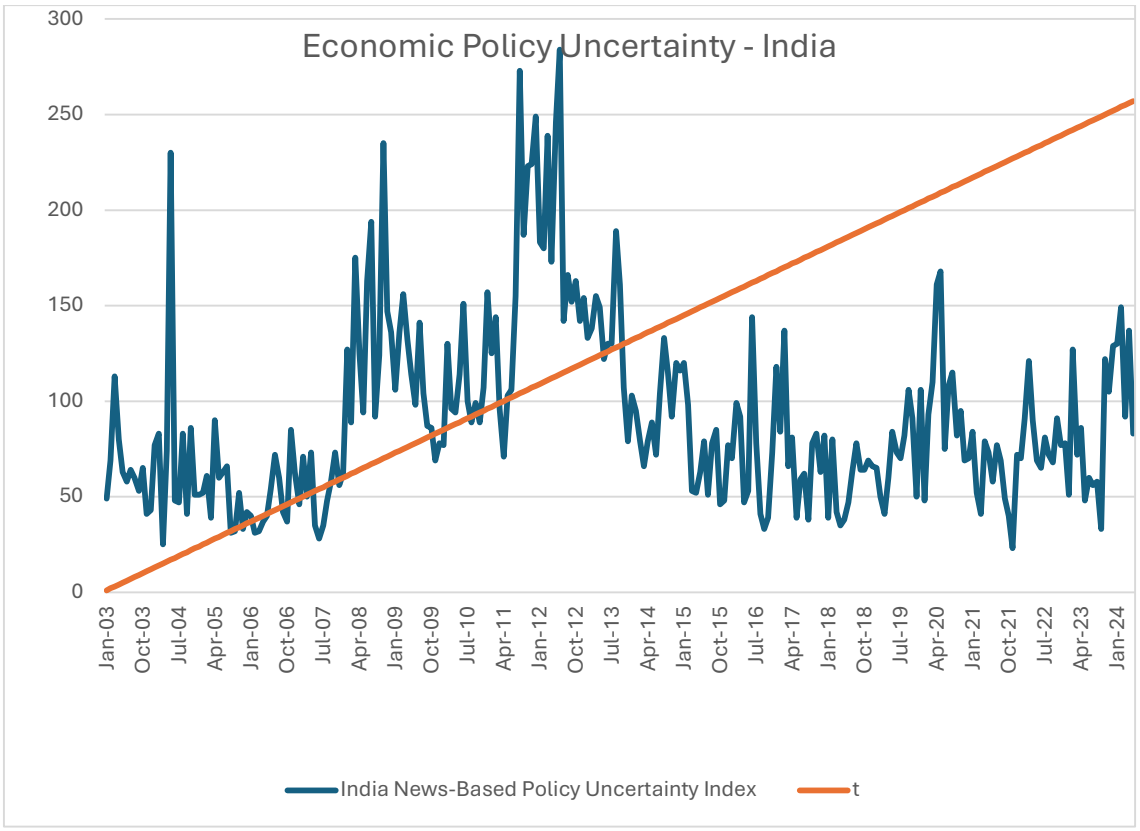

Table [1] Key Variables

Variable	Definition	Mean	Median	Standard Deviation
Firm Specific Variables				
$\frac{I_{i,t}}{K_{i,t-1}}$	Change in Gross Fixed Assets divided by lagged level of Gross Fixed Assets	0.086	0.037	0.17
$\frac{V_{i,t}}{P_{i,t}}$	Book value of equity divided by market capitalization	1.12	0.77	4.5
$\frac{V_{i,t}}{A_{i,t}}$	Market Capitalization divided by total assets.	0.84	0.38	1.3
$Leverage_{i,t}$	Total debt divided by equity	4.7	0.8	125
$Age_{i,t}$	Age	23	19	18
$Firm\ Size_{i,t}$	Natural log of Total Assets	5.9	6	2.3
$\frac{Cash\ Flow_{i,t}}{K_{i,t-1}}$	Cash flow (defined as profit before depreciation, interest, tax and amortization) divided by lagged level of Gross Fixed Assets	0.17	0.12	3.7
Promoters Equity Share	Equity shares held by the promoters (and PAC) divided by the total number of equities shares outstanding	50	52.4	21
Measures of Firm Performance				
$ROA_{i,t}$	Log transformed PAT net of prior period and extra-ordinary transactions divided by the average of the total assets of the company at the beginning of the year and at the end of the year.	3.3	3.2	1.5
$TobinsQ_{i,t}$	(Market value of equity+ Book value of debt)/(Book value of Total Assets)	0.55	0.86	1
Macroeconomic Variables				
$\Delta HGDP_t$	Growth in India's GDP at constant prices	6.1	7	3.3
$\Delta WGDP_t$	Growth in World's GDP at constant prices	2.9	3.1	1.9
ΔInf_t	Annual difference in CPI Inflation rate	0.05	0.48	1.6
EPU_t	News based Economic Policy Uncertainty Index by Bloom et. al.	90.2	74.7	36.2

Table [2] Investment Function

Dependent Variable	$\ln\left(\frac{I_{i,t}}{K_{i,t-1}}\right)$				
Variables	Full Sample	Promoters' Equity Share: Low	Promoters' Equity Share: High	After 2008	Excluding Petroleum and Refining
$\ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	-0.05*** (-3.2)	-0.08*** (-2.6)	-0.05*** (-2.7)	-0.08*** (-4.8)	-0.05*** (-3.2)
$V_{i,t-1}/P_{i,t-1}$	-0.04** (-2.1)	-0.02 (-0.5)	-0.06* (-1.8)	-0.08** (-2.3)	-0.04** (-2.1)
$\ln\left(\frac{Cash\ Flow_{i,t}}{K_{i,t-1}}\right)$	0.13*** (2.6)	0.1 (1.2)	0.14** (2.3)	0.1 (1.9)	0.12** (2.5)
$Size_{i,t-1}$	-0.01 (-0.1)	0.13 (1.1)	-0.03 (-0.3)	0.09 (0.1)	-0.01 (-0.1)
$Leverage_{i,t-1}$	-0.2 (-0.8)	-0.05 (-1.1)	-0.003 (-0.1)	-0.09 (-0.3)	-0.02 (-1)
$Age_{i,t-1}$	-0.1 (-0.6)	-0.15 (-0.7)	-0.1 (-0.5)	-0.1 (-0.5)	-0.08 (-0.5)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	6171	2060	4077	5560	6109
No. of Groups	1468	601	1085	1391	1458

Table [3] Underinvestment by Indian Firms

Underinvestment	Full Sample (1)	Promoters' Equity Share: Low (2)	Promoters' Equity Share: High (3)	Before 2008 (4)	After 2008 (5)	Excl. Petroleum and Refining (6)	Petroleum and Refining (7)
Mean	0	-0.0042	0.0030	-0.0879	0.0097	-0.00642	0.633
Std, Dev	0.017	0.030935	0.0210	0.0022	0.00025	0.0002	0.024
Obs.	6171	2059	4078	611	5560	6109	62
t-test for equality of means		**Mean (2)-Mean (3)** -0.0072*** (-10.7)		**Mean (4)-Mean (5)** -0.0975*** (-94.6)		**Mean (6)-Mean (7)** -0.639*** (-197)	

Table [4] Underinvestment and Uncertainty

Dependent Variable: Under-investment dummy - $\delta_{i,t}^{Underinvest}$						
Variables	Full Sample		Promoters' Equity Share: Low	Promoters' Equity Share: High	After 2008	Excluding Petroleum and Refining
$Underinvest_{i,t-1}$	0.06***	0.06***	0.08***	0.07***	0.07***	0.06***
	(8.4)	(8.3)	(6.8)	(7.2)	(9.6)	(8.2)
EPU_{t-1}	0.01	0.13**	0.4***	0.1	0.13**	0.12*
	(0.6)	(2)	(3.1)	(1.44)	(2.1)	(1.9)
EPU_{t-1}^2		-0.02**	-0.05***	-0.02	-0.02**	-0.02*
		(1.97)	(-3)	(-1.6)	(-2.1)	(-1.8)
$Free\ Cash\ Flow_{i,t-1}$	0.01	0.006	0.08**	-0.03	0.01	0.01
	(0.5)	(0.2)	(2.1)	(-1)	(0.4)	(0.3)
$\Delta HGDP_{t-1}$	-0.004	-0.01*	-0.01	-0.01	-0.01*	-0.01
	(-1)	(-1.7)	(-1.2)	(-1.4)	(-1.9)	(-1.8)
$\Delta WGDP_{t-1}$	0.01	0.01	0.01	0.01	0.02**	0.01*
	(1.3)	(1.6)	(0.9)	(1.2)	(2.1)	(1.8)
ΔInf_{t-1}	0.000	0.001	-0.003	0.01	0.006	0.00
	(0.1)	(0.2)	(-0.4)	(1)	(1)	(0.2)
GEE_{t-1}	0.04	-0.04	-0.002	-0.1	-0.08	-0.02
	(0.6)	(-0.6)	(-0.2)	(-1.1)	(-1)	(-0.3)
Industry Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3720	3720	1181	2402	3523	3692
Number of groups	1006	1006	359	704	972	999

Table [5] Underinvestment and firm performance

Dependent Variable $-RoA_{i,t}$					
	Full Sample	Low Promoters' share	High Promoters' share	After 2008	Excl. Petroleum and refining
$\ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	-0.06** (-2.1)	-0.6 (-1)	-0.1*** (-3.2)	-0.06** (-2)	-0.06** (-2.2)
$\delta_{i,t-1}^{Underinvest}$	0.3** (2.2)	0.2 (0.8)	0.4*** (2.6)	0.3** (2.5)	0.25* (1.96)
$\delta_{i,t-1}^{Underinvest} \times \ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	0.08** (2.4)	0.08 (1.2)	0.12*** (2.95)	0.1** (2.6)	0.07** (2.2)
$\ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	-0.04 (-1.2)	-0.002 (-0.05)	-0.08* (-1.7)	-0.05 (-1.3)	-0.04 (-1.3)
$\delta_{i,t-2}^{Underinvest}$	0.2 (1.5)	-0.2 (-0.7)	0.4** (2.2)	0.2 (1.5)	0.2 (1.4)
$\delta_{i,t-2}^{Underinvest} \times \ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	0.06 (1.5)	-0.05 (-0.7)	0.12** (2.3)	0.07 (1.6)	0.06 (1.5)
$\ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	0.002 (0.1)	-0.02 (-0.4)	-0.00 (-0.01)	0.001 (0.05)	-0.00 (-0.00)
$\delta_{i,t-3}^{Underinvest}$	0.1 (1)	-0.009 (-0.05)	0.3 (1.3)	0.1 (1)	0.1 (1)
$\delta_{i,t-3}^{Underinvest} \times \ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	0.03 (1)	0.01 (0.2)	0.07 (1.1)	0.03 (0.8)	0.04 (0.9)
$Firm\_Size_{i,t-1}$	-0.07 (-1)	-0.4*** (-2.75)	-0.01 (-0.1)	-0.08 (-1)	-0.06 (-0.7)
$V_{i,t-1}/A_{i,t-1}$	0.08 (2.3)	0.02*** (2.8)	0.05 (1)	0.08** (2.4)	0.08** (2.4)
$RoA_{i,t-1}$	0.34*** (4.6)	0.24* (1.9)	0.24** (1.98)	0.3*** (4.1)	0.3*** (4.5)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	2137	613	1317	2058	2102
R^2	0.1	0.05	0.5	0.45	0.5

Table [6] Underinvestment and firm performance

Dependent Variable – $Tobin'sq_{i,t}$					
	Full Sample	Low Promoters' Ownership	High Promoters' Ownership	After 2008	Excl. Petroleum and refining
$\ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	-0.1** (-2.4)	-0.04 (-1)	-0.14* (-1.95)	-0.1*** (-2.6)	-0.1** (-2.5)
$\delta_{i,t-1}^{Underinvest}$	0.4** (2.5)	0.07 (0.4)	0.5** (2)	0.4** (2.4)	0.4** (2.4)
$\delta_{i,t-1}^{Underinvest} \times \ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	0.13*** (2.7)	0.02 (0.4)	0.2** (2.2)	0.13*** (2.8)	0.14*** (2.7)
$\ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	-0.04 (-1)	-0.07 (-1.4)	-0.03 (-0.4)	-0.04 (-1)	-0.05 (-1.1)
$\delta_{i,t-2}^{Underinvest}$	0.5** (2.4)	-0.1 (-0.4)	0.56* (1.84)	0.5** (2.4)	0.5** (2.4)
$\delta_{i,t-2}^{Underinvest} \times \ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	0.1* (1.93)	0.00 (0.01)	0.1 (1.3)	0.1* (1.9)	0.1** (2)
$\ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	-0.00 (-0.1)	-0.06 (-0.9)	0.05 (0.7)	-0.003 (-0.1)	-0.00 (-0.03)
$\delta_{i,t-3}^{Underinvest}$	0.25 (1.4)	-0.3 (-1.1)	0.2 (0.8)	0.25 (1.3)	0.3 (1.5)
$\delta_{i,t-3}^{Underinvest} \times \ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	0.06 (1.1)	-0.04 (-0.6)	0.03 (0.4)	0.06 (1.1)	0.06 (1.2)
$Firm\_Size_{i,t-1}$	-0.02 (-0.1)	0.02 (1)	0.07 (0.3)	-0.01 (-0.05)	-0.02 (-0.2)
$V_{i,t-1}/A_{i,t-1}$	0.2*** (3.8)	0.18* (1.8)	0.3*** (2.9)	0.2*** (3.8)	0.2*** (3.8)
$Tobin'sq_{i,t-1}$	0.45*** (7)	0.46*** (3.2)	0.4*** (5.6)	0.45*** (7)	0.45*** (6.9)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	1523	442	936	1523	1506
R^2	0.8	0.8	0.73	0.8	0.8

Table [7] Underinvestment and firm performance – Low Economic Policy uncertainty

Dependent Variable $-RoA_{i,t}$					
	Full Sample	Low Promoters' share	High Promoters' share	After 2008	Excl. Petroleum and refining
$\ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	-0.1*** (-2.7)	-0.2*** (-2.9)	-0.1* (-1.9)	-0.1** (-2.5)	-0.1*** (-2.8)
$\delta_{i,t-1}^{Underinvest}$	0.6*** (2.8)	0.7*** (3)	0.6** (2.5)	0.7*** (3.1)	0.6*** (2.64)
$\delta_{i,t-1}^{Underinvest} \times \ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	0.2*** (3)	0.3*** (3.5)	0.2** (2.5)	0.2*** (3.1)	0.2*** (2.9)
$\ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	-0.1* (-1.65)	-0.04 (-0.6)	-0.1* (-1.9)	-0.1*** (-2.7)	-0.1* (-1.8)
$\delta_{i,t-2}^{Underinvest}$	0.4* (1.8)	0.1 (0.3)	0.9*** (2.64)	0.5** (2.2)	0.4 (1.6)
$\delta_{i,t-2}^{Underinvest} \times \ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	0.1** (2)	0.04 (0.5)	0.2** (2.5)	0.2** (2.5)	0.1* (1.84)
$\ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	-0.00 (-0.1)	-0.08 (-1)	0.02 (0.4)	-0.03 (-0.7)	-0.01 (-0.1)
$\delta_{i,t-3}^{Underinvest}$	0.3 (1.3)	0.4 (1.4)	0.3 (1)	0.3 (1.5)	0.3 (1.2)
$\delta_{i,t-3}^{Underinvest} \times \ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	0.08 (1.1)	0.1 (1.6)	0.07 (0.8)	0.1 (1.5)	0.08 (1.1)
$Firm\_Size_{i,t-1}$	0.01 (0.1)	-0.3 (-1.7)	0.2 (1)	-0.1 (-1)	0.02 (0.2)
$V_{i,t-1}/A_{i,t-1}$	0.1** (2.4)	0.01 (0.1)	0.1 (1.6)	0.1** (2.6)	0.14** (2.4)
$RoA_{i,t-1}$	0.2 (1.5)	0.6*** (5)	0.00 (0.03)	0.05 (0.4)	0.2 (1.4)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	1172	307	762	1120	1152
R^2	0.4	0.2	0.1	0.1	0.4

Table [8] Underinvestment and firm performance – High Economic Policy uncertainty

Dependent Variable $-RoA_{i,t}$					
	Full Sample	Low Promoters' share	High Promoters' share	After 2008	Excl. Petroleum and refining
$\ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	-0.05 (-1.3)	-0.05 (-0.7)	-0.1* (-1.8)	-0.07 (-1.4)	-0.05 (-1.2)
$\delta_{i,t-1}^{Underinvest}$	0.1 (0.6)	-0.2 (-0.8)	0.4* (1.7)	0.2 (1.1)	0.06 (0.3)
$\delta_{i,t-1}^{Underinvest} \times \ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	0.04 (0.9)	-0.04 (-0.5)	0.1** (2.1)	0.07 (1.3)	0.03 (0.5)
$\ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	0.01 (0.2)	0.07 (1.3)	-0.04 (-0.6)	0.00 (0.1)	0.01 (0.2)
$\delta_{i,t-2}^{Underinvest}$	-0.05 (-0.3)	-0.8** (-2.3)	0.1 (0.4)	-0.06 (-0.3)	-0.01 (-0.1)
$\delta_{i,t-2}^{Underinvest} \times \ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	-0.03 (-0.5)	-0.2** (-2.6)	0.05 (0.5)	-0.02 (-0.4)	-0.02 (-0.3)
$\ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	0.01 (0.4)	0.04 (0.6)	-0.05 (-0.8)	0.01 (0.3)	0.01 (0.3)
$\delta_{i,t-3}^{Underinvest}$	-0.02 (0.1)	-0.2 (-0.7)	0.2 (0.7)	0.005 (0.03)	-0.03 (-0.2)
$\delta_{i,t-3}^{Underinvest} \times \ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	-0.01 (-0.1)	-0.06 (-0.7)	0.07 (1)	-0.001 (-0.03)	-0.01 (-0.2)
$Firm\_Size_{i,t-1}$	-0.2* (-1.8)	-0.2 (-1.2)	-0.26** (-2.2)	-0.18* (-1.8)	-0.2 (-1.68)
$V_{i,t-1}/A_{i,t-1}$	0.02 (0.7)	0.1* (1.8)	-0.07 (-1.6)	0.02 (0.6)	0.03 (0.9)
$RoA_{i,t-1}$	0.5*** (6.6)	0.3*** (3.1)	0.6*** (4.5)	0.5*** (6.2)	0.48*** (6.5)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	965	306	555	938	950
R^2	0.35	0.1	0.3	0.34	0.4

Table [9] Underinvestment and firm performance – Low Economic Policy Uncertainty

Dependent Variable – $Tobin'sq_{i,t}$					
	Full Sample	Low Promoters' Ownership	High Promoters' Ownership	After 2008	Excl. Petroleum and refining
$\ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	-0.2*** (-2.7)	-0.06 (-1)	-0.2** (-2.4)	-0.2*** (-3)	-0.2*** (-2.9)
$\delta_{i,t-1}^{Underinvest}$	0.5** (2.1)	0.3 (1.2)	0.6 (1.6)	0.5** (2)	0.5** (2.1)
$\delta_{i,t-1}^{Underinvest} \times \ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	0.2*** (2.7)	0.1 (1.2)	0.25** (2.2)	0.2*** (2.8)	0.2*** (2.76)
$\ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	-0.1 (-1.5)	-0.1 (-1.1)	-0.06 (-0.7)	-0.08 (-1.5)	-0.1 (-1.5)
$\delta_{i,t-2}^{Underinvest}$	0.7** (2.4)	0.07 (0.2)	0.7* (1.8)	0.7** (2.4)	0.7** (2.3)
$\delta_{i,t-2}^{Underinvest} \times \ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	0.2** (2.1)	0.02 (0.2)	0.2 (1.4)	0.2 (2.1)	0.17** (2.1)
$\ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	0.01 (0.2)	0.01 (0.1)	0.08 (0.6)	0.01 (0.1)	0.01 (1)
$\delta_{i,t-3}^{Underinvest}$	0.3 (1)	-0.4 (-1.1)	0.07 (0.2)	0.3 (0.9)	0.32 (1)
$\delta_{i,t-3}^{Underinvest} \times \ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	0.07 (0.7)	-0.1 (-0.9)	-0.005 (-0.04)	0.07 (0.7)	0.07 (0.8)
$Firm\_Size_{i,t-1}$	-0.3 (-1)	-0.08 (-0.3)	-0.4 (-1.2)	-0.2 (1)	-0.3 (-1.1)
$V_{i,t-1}/A_{i,t-1}$	0.3*** (3.5)	0.2 (1.3)	0.3*** (2.7)	0.3*** (3.4)	0.3*** (3.4)
$Tobin'sq_{i,t-1}$	0.2*** (2.6)	0.2 (0.6)	0.2** (2.3)	0.2*** (2.6)	0.2** (2.6)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	930	249	600	930	920
R^2	0.46	0.6	0.33	0.5	0.45

Table [10] Underinvestment and firm performance – High Economic Policy Uncertainty

Dependent Variable – $Tobin'sq_{i,t}$					
	Full Sample	Low Promoters' Ownership	High Promoters' Ownership	After 2008	Excl. Petroleum and refining
$\ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	-0.07 (-1.6)	0.04 (0.7)	-0.12 (-1.5)	-0.07 (-1.6)	-0.08* (-1.75)
$\delta_{i,t-1}^{Underinvest}$	0.5* (1.93)	-0.2 (-0.9)	1.5** (2.2)	0.5* (1.97)	0.5* (1.84)
$\delta_{i,t-1}^{Underinvest} \times \ln\left(\frac{I_{i,t-1}}{K_{i,t-2}}\right)$	0.15* (1.89)	-0.08 (-1)	0.4** (2.1)	0.14* (1.86)	0.15* (1.89)
$\ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	0.04 (0.7)	-0.04 (-0.6)	0.02 (0.2)	0.03 (0.8)	0.02 (0.3)
$\delta_{i,t-2}^{Underinvest}$	0.2 (0.8)	-0.5 (-1.7)	1.1 (1.66)	0.25 (1)	0.2 (0.7)
$\delta_{i,t-2}^{Underinvest} \times \ln\left(\frac{I_{i,t-2}}{K_{i,t-3}}\right)$	0.003 (0.04)	-0.13 (-1.5)	0.18 (1.1)	0.02 (0.3)	0..02 (0.2)
$\ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	0.03 (0.4)	-0.07 (-1.2)	0.07 (1)	0.02 (0.4)	0.01 (0.2)
$\delta_{i,t-3}^{Underinvest}$	-0.06 (-0.3)	-0.2 (-0.6)	-0.04 (-0.1)	-0.02 (-0.1)	-0.02 (-0.1)
$\delta_{i,t-3}^{Underinvest} \times \ln\left(\frac{I_{i,t-3}}{K_{i,t-4}}\right)$	-0.03 (-0.3)	-0.04 (-0.4)	-0.03 (-0.3)	-0.01 (-0.2)	-0.01 (-0.2)
$Firm\_Size_{i,t-1}$	0.01 (1)	0.2 (1.1)	-0.002 (-0.01)	0.01 (0.1)	0.01 (0.1)
$V_{i,t-1}/A_{i,t-1}$	0.004 (0.05)	-0.005 (-0.05)	-0.1 (-0.6)	0.01 (0.1)	0.001 (0.02)
$Tobin'sq_{i,t-1}$	0.7*** (6.4)	0.8*** (4.2)	0.77*** (7)	0.7*** (6.5)	0.7*** (6.2)
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes
Observations	593	193	336	593	586
R^2	0.8	0.7	0.74	0.8	0.84

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