Uncovering the Transmission of Uncertainty Shocks in an Emerging Economy: Evidence from India

Shelja Bhatia* and Bhanu Pratap#

Abstract

This study examines the relationship between private investment activity and macroeconomic uncertainty in an emerging market setting. We propose novel policy-specific uncertainty indices based on internet searches to capture uncertainty associated with monetary and fiscal policy in India. Using these indices in a sign-restricted vector autoregression (SRVAR) framework, we show that an unanticipated increase in uncertainty results in lower fixed capital formation at the aggregate level. Exploiting firm-level panel data, we further show that firms are compelled to scale back their capital expenditure when facing higher uncertainty. We also test channels through which uncertainty might affect private corporate investment. Our results suggest that the transmission happens mainly through the real-options channel that prompts firms to adopt a 'wait-and-see' approach before undertaking investments during times of heightened uncertainty.

JEL Classification: E22; G30; C55; C23; C32

Keywords: policy uncertainty; google trends; firm investment; sign-restricted VAR; fixed effect panel

* Shelja Bhatia, Reserve Bank of India, Mumbai, India. Email: sheljabhatia@rbi.org.in (corresponding author).
# Bhanu Pratap, Reserve Bank of India, Mumbai, India. Email: bhanupratap@rbi.org.in

The authors are thankful to Viral Acharya, Aeimit Lakdawala, Muneesh Kapur, an anonymous reviewer and participants at the 24th Biennial Conference of AIEFS for their insightful comments and suggestions on the paper. We also acknowledge the invaluable technical assistance received from Hardik.

Views expressed in this paper are those of the authors and not of the institution to which they belong. This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. The authors have no competing interests to declare. All standard disclaimers apply.

1. Introduction

Global policy landscape is replete with scenarios wherein uncertainty around economic policies – what, when and by how much would or should policymakers respond – has been a defining characteristic. For instance, as a once-in-a-century pandemic disrupted economic activity worldwide, policymakers across the world rushed to provide emergency support, including in the form of monetary and fiscal support, to respective economies. Yet, in the aftermath of the pandemic, policymakers had to face intense scrutiny of their goals and actions as they grappled with a return of high and persistent inflation amidst recessionary fears. Given the uncertainty pi, it is crucial to examine whether this policy-related uncertainty carries significant economic consequences. This paper focuses on the effect of policy uncertainty on private investment activity in the context of India, a large and important developing economy.

How do firms react to react to heightened uncertainty? Theory suggests that, during times of high uncertainty, firms tend to delay their investments and hiring. The literature, inter alia, has identified two key channels through which uncertainty affects firms in an economy. First, building on the irreversibility of investments, the *real options* theory emphasizes the importance of waiting and staging flexibility when making investment decisions in response to increased uncertainty (Bernanke, 1983; Bertola & Caballero, 1994; Abel & Eberly, 1996; Caballero & Pindyck, 1996; Bloom, 2009; Bloom *et al.*, 2018). Second, higher risk premium during uncertain times increases the *financing costs* to compensate lenders for surges in uncertainty (Arellano *et al.*, 2019; Gilchrist *et al.*, 2014; Christiano *et al.*, 2014; Gulen & Ion, 2016). Consequently, firms engage in more conservative business plans, when faced with high uncertainty, inducing protracted decline in investment spending. Hence, periods with higher uncertainty can be associated with a slack in capital investment while periods with lower uncertainty are correlated with investment booms.

While there exists a plethora of studies that probe into the macroeconomic impact of policy uncertainty, the literature in the context of emerging market economies (EMEs) remains at a nascent stage[1]. Moreover, much of these studies tend to utilize aggregate macroeconomic data and/or focus on overall uncertainty measures to study the relationship between uncertainty and the real economy. The understanding of specific economic mechanisms driving the impact of

[1] See Bloom (2009), Bachmann *et al.* (2013), Jurado *et al.* (2015), Baker *et al.* (2016), Chen *et al.* (2019), Li & Qiu (2021) for the causal impact of overall economic/policy uncertainty in the context of advanced economies. See Al-Thaqeb & Algharabali (2019) for a comprehensive review of theoretical and empirical literature on uncertainty.

uncertainty on the real economy, especially in India, also remains limited. This paper addresses gaps in the existing literature in several important ways. Specifically, we do three things. First, we provide evidence on the economic impact of uncertainty on private investment activity in India. In particular, we use disaggregate data on large, publicly listed, non-financial Indian firms in a panel regression framework to shed light on the impact of uncertainty on corporate investments at the firm-level. Second, we deep dive into the possible transmission channels to understand how uncertainty is transmitted to the real economy. Thus, we identify the channels through which policy uncertainty affects the corporate investment by exploiting firm-level data. Lastly, in doing so, we propose categorical i.e., policy-specific uncertainty indices aimed at separately measuring uncertainty associated with monetary and fiscal policies in the Indian context. Uncertainty related to government spending, and tax and budget adjustments act as an implicit cost that discourages businesses from investment (Hassett & Metcalf, 1999; Johannsen, 2014; Fernández-Villaverde & Guerrón-Quintana, 2015; Anzuini *et al.*, 2020; Beckmann & Czudaj, 2021). Similarly, uncertainty on future interest rate movements and the resulting reaction of monetary policy authorities may increase risk premiums in financial markets slowing down capital investment and consequently economic growth (Boukus & Rosenberg, 2006; Chang & Feunou, 2013; Schonhardt-Bailey, 2013; Barrero *et al.*, 2017; Bauer *et al.*, 2022; Husted *et al.*, 2020). Therefore, using internet search volumes and newspaper coverage, we introduce policy-specific uncertainty measures to distinctly capture uncertainty related to monetary and fiscal policies. Such categorical uncertainty indices, though available for other economies like US, Korea, Japan, Greece etc., hitherto did not exist for India[2].

The main findings of our paper suggest that policy uncertainty has a strong negative relationship with private investment activity in India. An unanticipated increase in economic uncertainty results in a sharp reduction in fixed capital formation at the aggregate level. Furthermore, our firm-level analysis suggests that higher uncertainty forces firms to scale back on their capital expenditure as they find it difficult to "reverse" their investments and therefore tend to delay their planned capital expenditure in the event of heightened uncertainty. In other words, firm behaviour corresponds to a "wait and see" approach, thereby deferring the current rate of investment independently of expectations about returns until uncertainty is resolved.

[2] Categorical indices for other countries can be found at: https://www.policyuncertainty.com/index.html.

This suggests that, in the Indian context, uncertainty is transmitted to the real economy through the *real options channel*.

Our paper builds on mainly two strands of literature. First, there is a rapidly growing literature on the use of alternative data, such as news text, earnings call transcripts, internet search volumes etc., and big data and machine learning techniques to measure economic uncertainty and studying the consequent macroeconomic implications (Gentzkow & Shapiro, 2010; Hoberg & Phillips, 2010; Boudoukh *et al.*, 2013; Alexopoulos & Cohen, 2015; Baker *et al.*, 2016). Our paper adds to this strand of literature by proposing novel measures to quantify policy-specific uncertainty using internet search volumes. The present study is also related to the literature on the detrimental effects of macroeconomic uncertainty on the real economy, especially growth and investment (Rodrik, 1991; Bloom, 2009; Bachmann *et al.*, 2013; Born & Pfeifer, 2014; Jurado *et al.*, 2015; Baker *et al.*, 2016; Chen *et al.*, 2019; Li & Qiu, 2021; Lakdawala & Moreland, 2024). Finally, within these group of studies, our paper relates to empirical studies that analyze the impact of economic uncertainty on firm behaviour in India (Bhaduri & Kanti, 2011; Bajaj *et al.*, 2021; Sahoo & Bishnoi, 2023; Mathur *et al.*, 2024). Our study contributes to this literature by undertaking a rigorous empirical analysis using both aggregate and disaggregate data to provide evidence on the transmission channels of economic policy uncertainty in the Indian setting.

The rest of the paper is organised as follows. Section II describes the methodology for computing the categorical uncertainty indices specific to monetary and fiscal policy. The empirical analysis, including the structural VAR model and firm-level panel data regression, is covered in section III, followed by a discussion of results in section IV. The last section concludes the paper along with some policy takeaways.

2. Constructing Categorical Economic Policy Uncertainty from Internet searches

While it plays a key role in economic decisions of firms, households and policymakers, uncertainty is difficult to quantify due to its latent nature. The empirical literature on uncertainty has suggested various approaches to measure uncertainty, ranging from market-based measures such as implied or realised volatility in economic variables (e.g., daily standard deviation of stock prices and stock returns) (Bloom, 2009; Gilchrist *et al.*, 2014), survey-based measures (e.g., using the cross-sectional dispersion of point forecasts in Survey of Professional Forecasters (SPF) which surveys forecasters from academia, banks, and otherwise on their expectations about different economic indicators) (Bomberger & Frazer, 1981; Bomberger,

1996; Bomberger, 1999; Bachmann *et al*, 2013; Scotti, 2016) have been proposed in the literature. On the other hand, text-based measures (developed by Baker *et al.*, 2016) make use of the coverage of uncertainty-related keywords in different newspapers to compute the level of economic uncertainty. Similarly, Dzielinski (2012), Castelnuovo & Tran (2017), Azqueta-Gavaldón (2017) use big data and/or machine learning methods to construct novel measures of economic policy uncertainty.

For India, Baker *et al.* (2016) jointly with Bhagat *et al.* (2016) have developed a newspaper text-based measure of economic uncertainty using occurrences of uncertainty-related keywords in different newspapers[3]. More recently, Pratap & Priyaranjan (2023) also propose a new measure of aggregate economic policy uncertainty (EPU) based on the internet search volume data derived from *Google Trends*[4]. Following the approach in Pratap & Priyaranjan (2023), we construct categorical i.e., policy-specific uncertainty indices using internet search volume data on separate set of keywords related to monetary and fiscal policy in India. Using internet search volume data, provided by *Google Trends*, is a novel approach to capture policy uncertainty. The underlying idea remains the same – when economic shocks hit the economy, uncertainty increases, and economic agents turn towards the internet to gather more information on the current and future outlook of the economy. Thus, internet searches related to economic policy, over time and geography, can reflect the uncertainty around it.

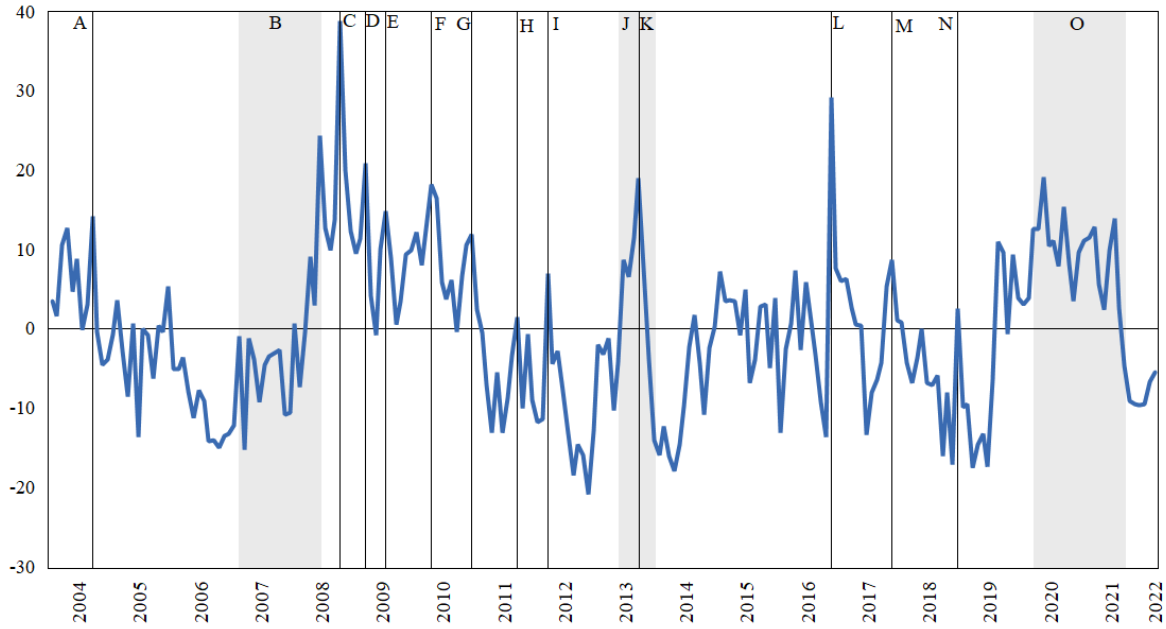
Google Trends provides an unbiased sample of internet search intensity for a given keyword "searched" on the online *Google* search engine in the form of a relative measure ranging between 0 to 100. This relative measure reflects the relative search volume of the given keyword relative to the total search volume during the specified period. The maximum value 100 corresponds to a particular time point where the relative search volume of the given keyword was maximum in the entire sample. A sudden increase in interest related to any topic shows in higher-than-usual search volumes resulting in a higher index value. This forms the underlying principle for using Google Trends to construct an uncertainty index.

Therefore, in the first step, we create a set of policy-related keywords. The set of keywords pertaining to monetary policy and fiscal policy used for computing the Google Trends-based Monetary Policy Uncertainty (MPU) and Fiscal Policy Uncertainty (FPU) index, respectively,

[3] The economic policy uncertainty (EPU) index for India, proposed by Baker *et al.*, 2016 can be found here - https://policyuncertainty.com/india_monthly.html.
[4] The google trends-based uncertainty index (GUI) for India, proposed in Pratap and Priyaranjan (2023) can be accessed here - https://policyuncertainty.com/india_gui.html.

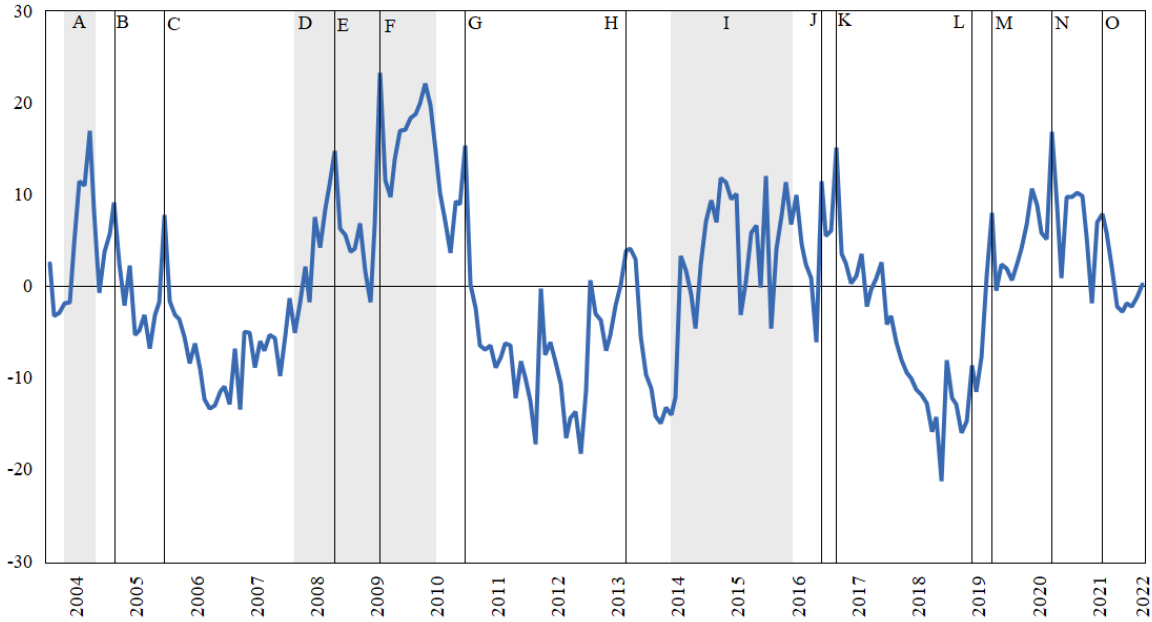
are provided in the Appendix (Table A.1). In the next step, we extract search volume data from Google *Trends* API using an automated program. After obtaining internet search volume data for respective keywords, we process the data to adjust it for sampling bias as well as any deterministic trend and seasonality in the data (see Pratap and Priyaranjan, 2023). This step ensures that the index filters the deterministic or predictable portion of underlying search data while capturing only its stochastic component. The final MPU and FPU indices along with various episodes of uncertainty in the context of monetary and fiscal policy in India are shown in Figure 1 and 2, respectively.

Figure 1: Monetary Policy Uncertainty (MPU) Index



Note: The above figure plots the Google Trends-based Monetary Policy Uncertainty Index for India. The vertical lines and grey shaded area represent – A. Sept 2004: CRR increased to absorb surplus liquidity and to counter unacceptable surge in headline inflation; B. Massive policy tightening in the wake of 2008 crisis; C. Oct 2008: Bailout announced by US and Euro, India - short term lending rates slashed unexpectedly; D. Mar 2009: Repo and reverse repo cut; E. July 2009: Another repo and reverse repo cut to encourage credit growth and ensure ample liquidity; F. Apr 2010: Annual policy statement by RBI, repo raised; G. Dec 2010: Mid-quarter monetary policy review, SLR reduced, OMOs announced; H. Sept 2011: Mid-quarter review by RBI, repo, reverse repo raised; I. Mar 2012: Base rate raised, CRR cut; J. May-Dec 2013: Taper Tantrum; K. Sept 2013: Rajan joined as Governor, made strong statements; L. Nov 2016: Demonetisation; M. Nov 2017: Onion prices skyrocketed, food/fuel inflation on rise, global and domestic tensions; N. Dec 2018: RBI Governor resigns; O. March 2020-September 2021: Covid-19 pandemic, off-cycle policy announcements in response to COVID, relief packages announced, various unconventional policy responses.
Source: Authors' calculations.

Figure 2: Fiscal Policy Uncertainty (FPU) Index



Note: The above figure plots the Google Trends-based Monetary Policy Uncertainty Index for India. The vertical lines and grey shaded area represent – A. July-September 2004: Enactment of Fiscal Responsibility and Budget Management (FRBM) Act; B. February 2005: First Union Budget of UPA-led government, increased expenditure on various development and social sector programmes, taxes reduced; C. Dec, 2005: Winter session of the parliament derailed; D. 2008 crisis; E. Oct, 2008: Stock market crash of around 10 per cent; F. July, 2009: Budget announcement in the parliament; G. Dec, 2010: Onion prices crisis, export prohibition announced; H. August 2013: National Food Security Bill passed in the parliament, rupee hit 20-year record low (around INR 68/USD); I. NDA-led government elected in 2014, announced various fiscal reforms; J. November 2016: Demonetisation; K. February 2017: GST discussion in the budget session; L. May, 2019: NDA-led government re-elected to the parliament; M. September 2019: Corporate tax rates slashed by around 22 per cent; N. September 2020: Farm Bills passed in the parliament; O. July 2021: Union cabinet reshuffled.
Source: Authors' estimates.

Our categorical uncertainty indices compare well with important financial and macroeconomic indicators. In Table A.2, we report the pairwise correlation between our MPU and FPU indices and domestic financial indicators including exchange rate, short- and long-term interest rates, equity market index, total credit and total non-food credit growth in the economy. One can note that periods with higher fiscal policy uncertainty are associated with lower short- and long-term interest rates despite waning credit growth. Similarly, heightened monetary policy uncertainty coincides with depreciating exchange rate in addition to lower interest rates and poor credit growth. Furthermore, stock prices also tend to decline in periods with higher uncertainty about the monetary policy. Table A.3 reports the pairwise correlation between policy uncertainty and macroeconomic indicators. At the domestic level, higher uncertainty is associated with elevated inflation and thus validates the use of MPU and FPU indices, available at relatively higher frequency, for envisaging near-term inflation movements. Interestingly,

increased uncertainty in India also corresponds with higher volatility in US equity markets (as seen in the positive correlation with US VIX index) and lower policy rates in the US (see FED_SR). Moreover, although global uncertainty (EPU, GEPU, US_MPU) seem to have a negative and statistically significant relation with domestic GDP, our uncertainty indices are not contemporaneously correlated with domestic economic activity in a simple correlation framework. Thus, in the next section, we move to a formal empirical analysis to assess the macroeconomic impact of uncertainty shocks on the real economy.

3. Empirical Approach and Data

This section lays down the details of empirical framework and data used in our study. To motivate our study of firm-level impact of uncertainty and its potential transmission mechanisms, we begin our analysis by using a vector auto regression (VAR) model to assess the impact of uncertainty on investment activity at the macroeconomic level. We identify the model using sign-restrictions and analyse the impact of shocks to uncertainty using an impulse response analysis. Next, we describe our panel data regression approach to examine the impact of uncertainty on firm-level investment activity in India. In particular, we use a fixed-effects panel data model to examine how changes in uncertainty are transmitted to the real economy as well as provide evidence on two different channels that can drive firms' response in the event of heightened uncertainty.

4.1. Impact of Uncertainty shock on Aggregate Investment Activity: A Macroeconomic Analysis

The first part of our empirical analysis leverages macroeconomic data and a sign-restricted vector autoregression (SR-VAR) framework to identify the impact of uncertainty shocks on aggregate investment activity in the Indian context. Consider the following structural VAR model:

$$A \cdot y_t = \alpha_1 y_{t-1} + \cdots \ldots \ldots + \alpha_p y_{t-p} + \varepsilon_t \qquad (1)$$

where y_t is $n \times 1$ vector of endogenous variables while α_i and A are $n \times n$ parameter matrices. Components of ε_t, interpreted as structural shocks, are assumed to be uncorrelated with each other. Pre-multiplying Eq. (1) with A^{-1}, we obtain a reduced form VAR as follows:

$$y_t = \delta_1 y_{t-1} + \cdots \ldots \ldots + \delta_p y_{t-p} + \omega_t \qquad (2)$$

where $\omega_t = B \cdot \varepsilon_t$, $\mathrm{B} = A^{-1}$ and $E[\delta_t \delta_t'] = BB' = \sum$. However, identification of structural shocks requires placing restrictions to estimate the matrix $B = A^{-1}$. Following the *penalty*

function approach, proposed by Uhlig (2005), we impose restrictions on the sign of the impulse response vector to identify the relevant structural shock of interest.

Our VAR model consists of variables measuring investment activity, economic output, consumer prices, equity prices and our policy uncertainty index. Aggregate investments are proxied by real gross fixed capital formation (GFCF); real gross domestic product (GDP) is taken as a proxy for economic activity; consumer prices are measured using the official consumer price index (CPI) while the NSE-500 index is taken as a broad measure of equity prices. To identify the policy uncertainty shock, we use past empirical evidence to inform our choice of sign-restrictions on output, consumer prices, equity prices and policy uncertainty while remaining agnostic about the response of investment activity[5]. The restrictions are allowed to persist for one year. The identification scheme is highlighted in Table 1.

Table 1: Sign-restrictions to Identify Policy Uncertainty Shocks

Variable	Investment	Output	Consumer Prices	Equity Prices	Uncertainty
Restriction	?	< 0	> 0	< 0	> 0

The above model is estimated on quarterly data from 2004:Q1 to 2020:Q1 using Bayesian sampling method. We restrict our analysis to data prior to the Covid-19 pandemic as the large statistical volatility induced by the pandemic can affect and bias our estimates. All variables are seasonally adjusted using the X-13 ARIMA procedure and log-transformed, except uncertainty index, before estimation. The data is sourced from the *Database on the Indian Economy* (DBIE) maintained by the Reserve Bank of India (RBI).

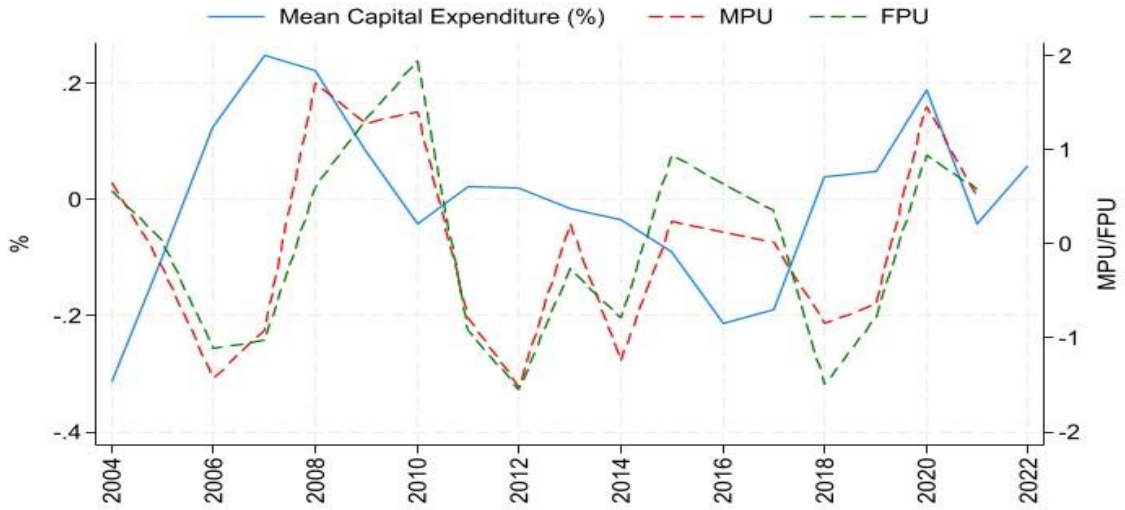
4.2. Impact of Policy Uncertainty on Corporate Investments: A Firm-level Analysis

While the above analysis based on aggregate data is useful, it is not suitable to pin down the economic mechanisms which may be governing the response of private investment to shifts in policy uncertainty. Therefore, we exploit a panel dataset of large, publicly listed non-financial Indian firms to understand how policy uncertainty shocks are transmitted to the real economy. As discussed earlier, within the uncertainty literature, there are two main channels of how uncertainty shocks transmit to the real economy, namely the *real options* channel and the *financial cost* channel. The first channel emphasizes the role of irreversible investments at the

[5] In the Indian context, Kumar *et al.* (2021) have shown that uncertainty shocks tend to propagate as aggregate supply shocks *i.e.*, it reduces output but leads to an increase in prices. This contrasts with developed economies, such as the US, where such shocks behave as aggregate demand shocks (see Leduc & Liu, 2016). Other studies, such as Bhagat *et al.* (2016) and Pratap and Priyaranjan (2023) also report similar findings using alternate indices and methods. Likewise, several studies also find that stock prices decline in response to policy uncertainty shocks.

firm-level, such that under situations of heightened uncertainty, a firm chooses to delay undertaking any planned investment projects. In such a scenario, the firm follows a *wait-and-watch* approach until uncertainty is resolved. On the other hand, the second channel posits that increased uncertainty raises the cost of capital faced by the firm thereby bringing down corporate investments. We analyse both these channels in our paper.

Figure 3: Corporate Investment and Policy Uncertainty



Note: The above figure shows the relationship between corporate investment and policy uncertainty. The average annual capital expenditure for our sample of firms is plotted as blue line (detrended and on left-hand side scale) while our measure of monetary policy uncertainty and fiscal policy uncertainty are shown by red and green dashed lines (both on the right-hand side scale), respectively.
Source: Authors' estimates.

At first glance, as shown in Figure 3, corporate investment and policy uncertainty appear to be negatively correlated. Thus, to formally investigate the relationship between policy uncertainty and firm investment, including its potential transmission channels, we construct a firm-level dataset consisting of annual data on non-financial firms from 2003 to 2022[6]. Following Gulen & Ion (2016) and Husted *et al.* (2020), we use the following baseline model specification to estimate the relationship between our measures of policy uncertainty and investments at the firm level:

$$CAPEX_{i,t} = \alpha_i + \beta_1 \cdot Unc_{t-1} + \sum \gamma_i F_{i,t-1} + \sum \delta_i M_{i,t-1} + \epsilon_{i,t} \quad (3)$$

where, capital expenditure for firm i at time t $(i.e., CAPEX_{i,t})$ measured as change in total property, plant and equipment (PPE) divided by lagged total assets (TA), is the main dependent

[6] Our sample consists of about 2000 firms listed on National Stock Exchange (NSE) and/or Bombay Stock Exchange (BSE).

variable and policy uncertainty (Unc) is the main independent variable of interest. We separately use MPU and FPU indices to reflect uncertainty related to monetary policy and fiscal policy, respectively. Lagged firm-level control variables included in vector $F_{i,t-1}$ are as follows: cash flows scaled by lagged TA (CF), sales growth (SG) i.e., the annual percentage growth in firm sales and Tobin's Q (TQ) computed as total enterprise value of the firm divided by total assets. These variables are commonly used for testing the Q theory of investment. To control for the size of the firm, we include the total assets (in logarithms) in the above regression. We use lagged annual growth in real GDP to control for macroeconomic conditions but also include a crisis dummy variable, that equals one for year 2008 and 2020 and zero otherwise, to control for the Great Financial Crisis and COVID-19 pandemic, respectively. These are captured by the vector of macroeconomic controls under $M_{i,t-1}$. The term α_i represent firm fixed effects. To mitigate the influence of outliers, all variables are winsorized (at 5th and 95th percentile) and thereafter normalised using the sample standard deviation to ensure comparability. Summary statistics for our firm-level data are given in Table B.1 in the Appendix. We report robust standard errors clustered at the firm level for all our regressions.

Next, we turn our attention to the transmission channels that could drive investment decisions at the firm level during times of heightened uncertainty. In particular, we examine how the negative impact of uncertainty varies across firms in line with existing theories. The first such channel – the real options theory – predicts that if a firm has an option to delay, increased uncertainty creates an incentive for it to delay the investment. The theory also predicts that the higher the investment irreversibility, higher is the incentive to delay. We gauge the role of real options channel by examining how investment irreversibility affects the relationship between policy uncertainty and firm investments through the following specification:

$$CAPEX_{i,t} = \alpha_i + \beta_1 IIR_{i,t-1} + \beta_2 Unc_{t-1} + \beta_3 Unc_{t-1} \cdot IIR_{i,t-1} + \sum \gamma_i F_{i,t-1} + \sum \delta_i M_{i,t-1} + \epsilon_{i,t} \quad (4)$$

where investment irreversibility (IIR) is defined as the ratio of total PPE to total assets (TA) while rest of the variables are as defined earlier. The idea is that firms with a higher fixed to total assets ratio are more reliant on physical capital and such firms would find it costly to divest (reverse) their investment should the need arise.

Alternatively, the financial cost theory postulates that higher uncertainty – by spreading the distribution of future cash flows of the firm – leads to a higher probability of default and in turn increases the financing cost for a firm. Thus, the effect of uncertainty on investment is

likely to be stronger for more financially constrained firms. We test this channel by estimating the following model:

$$CAPEX_{i,t} = \alpha_i + \beta_1 Lev_{i,t-1} + \beta_2 Unc_{t-1} + \beta_3 Unc_{t-1} Lev_{i,t-1} + \sum \gamma_i F_{i,t-1} + \sum \delta_i M_{i,t-1} + \epsilon_{i,t} \quad (5)$$

where firm leverage (Lev) is measured as the total long-term debt divided by the total assets of the firm. Higher leverage has been shown to be tightly linked with a higher cost of external finance, both theoretically and empirically[7].

4. Results and Discussion

5.1. Aggregate Impact of Policy Uncertainty

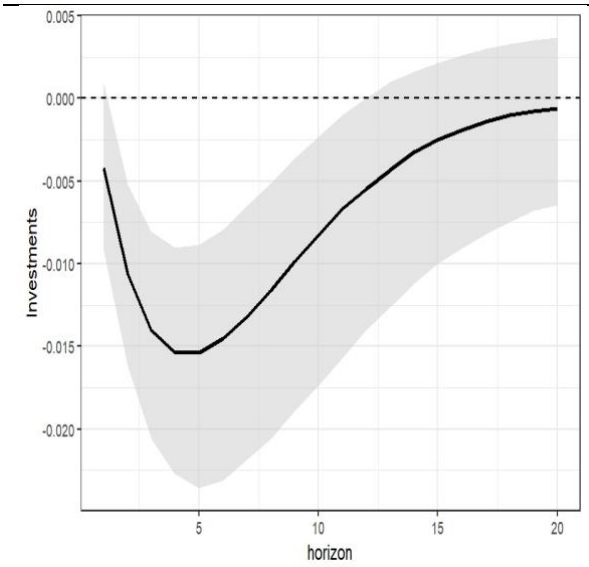
We begin our discussion by presenting the estimated impulse responses of aggregate investment to shocks to monetary policy uncertainty and fiscal policy uncertainty in Figure 4, panel (a) and (b), respectively.

The figure provides the median response of real GFCF (in logs) to a one standard deviation shock to policy uncertainty where the structural shock is identified using sign-restrictions approach. Impulse responses are provided for up to 20 quarters *i.e.,* for a five-year period following the shock impact. As we can observe, unanticipated increases in policy uncertainty i.e., uncertainty shocks tend to have a debilitating impact on aggregate investment activity. The impact on investment activity is almost instantaneous after the shock hits the economy, with the median estimate showing a peak impact of 1.5 per cent being felt around the fifth quarter. The contraction in investment activity also tends to persist for several years. The estimated responses to shocks to policy uncertainty, whether fiscal or monetary, are found to be qualitatively similar.

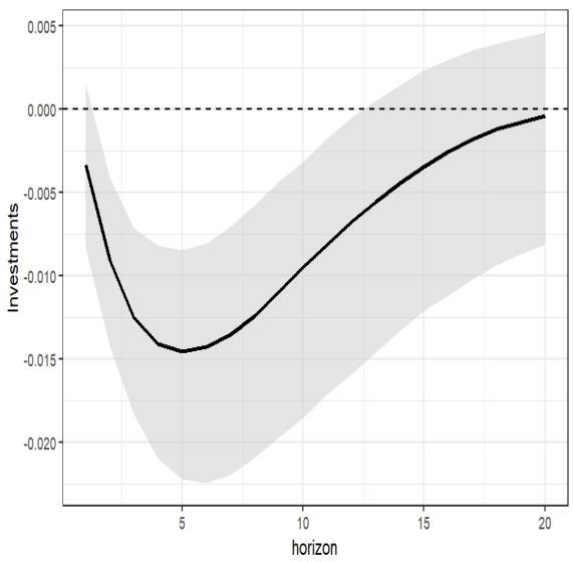
[7] Weighted average cost of capital (WACC) for a firm can be computed as: $WACC = L \cdot K_{debt} \cdot (1 - t) + (1 - Lev) \cdot K_{equity}$, where t equals tax rate, Lev is firm leverage while K_{debt} and K_{equity} reflect the cost of debt and equity, respectively.

Figure 4: Impulse responses to Policy Uncertainty shocks

(a) Response to MPU shocks



(b) Response to FPU shocks



Note: The above figure presents the estimated impulse response of aggregate investment to (a) MPU shock and (b) FPU shock. Aggregate investment is proxied by real gross fixed capital formation taken in natural logarithms. The solid black line shows the median response estimate, and the shaded grey area indicates the pointwise 68% posterior credible interval.
Source: Authors' calculations.

5.2. Firm-level Impact of Policy Uncertainty

The estimated results for Eq. (3) are presented in Table 2. Panel (1) and (2) report the coefficient estimates with MPU and FPU, respectively. As the results show, the coefficient on uncertainty, for both monetary policy and fiscal policy, is negative and statistically significant. A one standard deviation increase in MPU is associated with 0.036 standard deviation decrease in investment rate in the next year. This is equivalent to 0.3 per cent of the average investment rate in the sample. Similarly, a one standard deviation increase in FPU corresponds to a 0.051 standard deviation decrease in the investment rate in the subsequent year, which equals 0.4 per cent of the average investment. This shows that policy uncertainty has a strong negative relationship with corporate investment at the firm-level.

Amongst other things, the above results may also help explain why uncertainty shocks tend to behave like an aggregate supply shock at the macroeconomic level in the Indian context. As heightened policy uncertainty forces firms to cut down on their capital expenditure, the supply-side potential of the economy takes a hit. In other words, higher policy uncertainty lowers the rate of investment which in turn decreases the growth rate of capital stock in the economy. This reduces the overall potential output of the economy. Thus, when faced with demand-side

pressures, an economy with a limited supply will elicit an increase in prices thereby worsening the inflation-output for policy.

Table 2: Average Effect of Uncertainty on Capital Expenditure of Firms

	(1)	(2)
Dep. Var.	*CAPEX*	*CAPEX*
MPU_{t-1}	-0.036***	
	(0.007)	
FPU_{t-1}		-0.051***
		(0.006)
Tobin's Q_{t-1}	0.077***	0.076***
	(0.010)	(0.010)
Cash Flow$_t$	0.005	0.006
	(0.008)	(0.008)
Sales Growth$_t$	0.195***	0.194***
	(0.008)	(0.008)
Log(Assets)$_t$	-0.298***	-0.294***
	(0.023)	(0.023)
GDP growth$_{t-1}$	0.010*	0.014***
	(0.006)	(0.005)
$Dummy_{Crisis}$	0.221***	0.197***
	(0.019)	(0.019)
Constant	0.039***	0.041***
	(0.011)	(0.011)
Observations	19886	19886
Adjusted R^2	0.202	0.204
Firm FE	Yes	Yes
Firm Controls	Yes	Yes
Macro Controls	Yes	Yes

Note: The table represents the main results from the baseline specification described in equation 3. The dependent variable is always capital expenditure – change in total property, plant and equipment (PPE) divided by lagged total assets (TA) – of each firm *i* at time *t.* Robust standard errors clustered at firm-level are provided in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Source: Authors' calculations.

5.3. Transmission Mechanism

The coefficient estimates for the interaction term (β_3) in Eq. (4) and (5), with MPU and FPU as separate measures of uncertainty, are shown in Table 3. As shown in panel (1) and (3), the

interaction coefficient with investment irreversibility is negative and statistically significant. This confirms that investment irreversibility amplifies the impact of policy uncertainty on firm-level investment and firms with higher levels of investment irreversibility face more adverse impacts of MPU on their investments. On the other hand, panel (2) and (4) show that the firm leverage does not significant influence the relationship between uncertainty and corporate investments. Therefore, it can be concluded that policy uncertainty results in a protracted decline in firm investment in line with the real options theory.

Table 3: Effects of Policy Uncertainty on Investments: Investment Irreversibility vs. Financial Constraints

	Monetary Policy Uncertainty			*Fiscal Policy Uncertainty*	
	(1)	(2)		(3)	(4)
Dep. Var.	*CAPEX*	*CAPEX*	*Dep. Var.*	*CAPEX*	*CAPEX*
MPU_{t-1}	-0.029***	-0.171***	FPU_{t-1}	-0.041***	-0.146***
	(0.006)	(0.011)		(0.006)	(0.009)
IIR_{t-1}	-0.358***		IIR_{t-1}	-0.355***	
	(0.016)			(0.016)	
Lev_{t-1}		-0.019	Lev_{t-1}		-0.013
		(0.016)			(0.016)
$MPU_{t-1} \times IIR_{t-1}$	**-0.015*** **		$FPU_{t-1} \times IIR_{t-1}$	**-0.021*** **	
	(0.006)			**(0.006)**	
$MPU_{t-1} \times Lev_{t-1}$		-0.015	$FPU_{t-1} \times Lev_{t-1}$		-0.015*
		(0.010)			(0.009)
Observations	19886	11080	Observations	19886	11080
Adjusted R^2	0.235	0.198	Adjusted R^2	0.236	0.202
Firm FE	Yes	Yes	Firm FE	Yes	Yes
Firm Controls	Yes	Yes	Firm Controls	Yes	Yes
Macro Controls	Yes	Yes	Macro Controls	Yes	Yes

Note: The table represents the main results from the model specifications described in equation 4 and 5. The dependent variable is always capital expenditure – change in total property, plant and equipment (PPE) divided by lagged total assets (TA) – of each firm *i* at time *t.* Robust standard errors clustered at firm-level are provided in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: Authors' calculations.

V.4. Robustness Analysis

Lastly, we carry out several essential checks to examine the robustness of our findings from both the VAR-based impulse response analysis and the firm-level regression analysis. First in the spirit of Romer & Romer (2004), we extract the residuals from regressing our MPU (or FPU) index on growth in real GDP, inflation and a short-term interest rate (weighted average

call rate or WACR in our case) and name it MPU-R (or FPU-R), respectively. Similarly, we regress MPU on FPU and *vice-versa*, extract the *purged* residuals and name them MPU-X and FPU-X, respectively. We then estimate the impulse responses of aggregate investment activity with these measures of policy uncertainty shocks. The median response estimates, along with our baseline results, are provide in Figure C.1 in the appendix. Although marginally lower, the impulse responses are qualitatively similar to the baseline results. Therefore, our estimates consistently indicate that positive policy uncertainty shocks reduce capital investments at the aggregate level in India.

To ensure robustness of our firm-level findings, we investigate the possibility of industry-level heterogeneity in the investment decisions using industry fixed effects. The results remain consistent, with both MPU and FPU having a negative and significant impact on firms' investments, primarily through the real options channel (Table D.1). Next, we use MPU-R (or FPU-R), the residuals from regressing our MPU (or FPU) index on growth in real GDP, inflation and a short-term interest rate (as used in the aggregate analysis) in order to address possible endogeneity concerns from unobserved macroeconomic dynamics. Specifically, we extract the purely exogenous component to capture uncertainty beyond macroeconomic forces (Table D.2). Similarly, the residuals from a regression of overall policy uncertainty on MPU (FPU), i.e. EPU-MPU (EPU-FPU), along with the primary uncertainty regressor are used as a control for other sources of uncertainty (Table D.3). The robustness is tested by considering the impact of global factors driving the corporate investment. We include US VIX, a measure of volatility in the S&P 500 stock index, as a global control and find that our baseline coefficients become even tighter (Table D.4). Finally, we also estimate all the regression models with uncertainty variable lagged by two periods and find that the results hold. This suggests that the negative effect of policy uncertainty can persist over multiple years. We do not report the results here for brevity. All robustness checks are presented in the appendix.

5. Conclusion and Way Forward

Uncertainty around economic policies and policymakers' actions can have significant impact on the economy. Taking cue from past literature which suggests, that unlike in developed countries, uncertainty has a dominant supply-side impact in India, we analyze the firm-level impact of increase in policy uncertainty in the economy. By constructing categorical economic policy uncertainty indices using internet searches, we shed light on the economic impact of uncertainty pertaining to monetary policy and fiscal policy in India. Our findings indicate that

increased policy uncertainty can lead to a protracted decline in investment activity as firms are forced to cut back on their planned capital expenditure mainly through the real options channel as opposed to the cost of financing channel.

The findings of our study have important implications for policy and future research. Beginning in 2011-12, private investments in India have remained sluggish. Despite policy efforts to nudge firms to undertake capital expenditure, the private sector does not seem to be stoked about capacity expansion in the country[8,9,10]. On the other hand, while the policy framework on both fronts – monetary and fiscal – has evolved substantially, it remains mired with frequent and sometimes abrupt shifts. This does not bode well for policy credibility. As our results indicate, firms react to the uncertainty caused by such policy shifts by lowering their fixed investments. A reduced investment rate lowers the potential output of the economy. Therefore, by providing indices that measure uncertainty around monetary and fiscal policy, our study provides a tractable way for policymakers and researchers to integrate uncertainty into policy analysis. Furthermore, our results also underline the importance of establishing robust institutions and stable policy frameworks that adhere to forward-looking and credible policies.

Finally, while we analyze the impact of uncertainty on corporate investments through the lens of two main channels, namely the real options theory and financing cost theory, there are several other channels through which economic uncertainty impacts the economy. For instance, at the household-level, the *precautionary savings* channel causes households to delay discretionary spending and investments. Similarly, theory also suggests that increased uncertainty can influence pricing behaviour of firms as they would choose to insure themselves against lower future profits by increasing their prices today thereby leading to higher inflation. Rigorous empirical evidence on such channels would be desirable. Going forward, we aim to publicly disseminate the categorical uncertainty indices proposed in this paper to facilitate policy simulation, research and forecasting.

[8] https://www.business-standard.com/economy/news/pvt-sector-investment-in-fy23-fell-to-covid-year-levels-govt-s-share-up-124050700688_1.html
[9] https://www.newindianexpress.com/business/2024/Mar/17/indias-private-investment-puzzle
[10] https://indianexpress.com/article/business/banking-and-finance/corporate-investment-stagnation-bank-credit-to-industries-sees-sluggish-growth-on-weak-demand-9099309/

References

Hassett, K. A., & Metcalf, G. E. (1999). Investment with uncertain tax policy: Does random tax policy discourage investment. *The Economic Journal, 109*(457), 372-393.

Fernández-Villaverde, J., & Guerrón-Quintana, P. A. (2015). Fiscal volatility shocks and economic activity. *American Economic Review, 37*, S118-S146.

Barrero, J. M., Bloom, N., & Wright, I. (2017). Short and long run uncertainty. *National Bureau of Economic Research, No. w23676*.

Baker, S. R., Bloom, N., & Davis, S. J. (2016). Measuring economic policy uncertainty. *The quarterly journal of economics, 131(4)*, 1593-1636.

Bernanke, B. S. (1983). Irreversibility, uncertainty, and cyclical investment. *The quarterly journal of economics, 98(1)*, 85-106.

Bertola, G., & Caballero, R. J. (1994). Irreversibility and aggregate investment. *The Review of Economic Studies, 61(2)*, 223-246.

Abel, A. B., & Eberly, J. C. (1996). Optimal investment with costly reversibility. *The Review of Economic Studies, 63(4)*, 581-593.

Caballero, R., & Pindyck, R. S. (1996). Investment, uncertainty and industry evolution. *International Economic Review, 37(3)*, 641-662.

Veronesi, P. (2019). Heterogeneous households under uncertainty. *National Bureau of Economic Research, (No. w25448)*. .

Friedman, M. (1968). The Role of Monetary Policy. *American Economic Review, 58*, 1-17.

Rodrik, D. (1991). Policy uncertainty and private investment in developing countries. *Journal of Development Economics, 36(2)*, 229-242.

Born, B., & Pfeifer, J. (2014). Policy risk and the business cycle. *Journal of Monetary Economics, 68*, 68-85.

Gentzkow, M., & Shapiro, J. M. (2010). What drives media slant? Evidence from US daily newspapers. *Econometrica, 78(1)*, 35-71.

Hoberg, G., & Phillips, G. (2010). Product market synergies and competition in mergers and acquisitions: A text-based analysis. *The Review of Financial Studies, 23(10),*, 3773-3811.

Boudoukh, J., Feldman, R., Kogan, S., & Richardson, M. (2013). Which news moves stock prices? A textual analysis. *National Bureau of Economic Research, No. w18725*.

Alexopoulos, M., & Cohen, J. (2015). The power of print: Uncertainty shocks, markets, and the economy. *International Review of Economics & Finance, 40*, 8-28.

Husted, L., Rogers, J., & Sun, B. (2020). Monetary policy uncertainty. *Journal of Monetary Economics, 115*, 20-36.

Arellano, C., Bai, Y., & Kehoe, P. J. (2019). Financial frictions and fluctuations in volatility. *Journal of Political Economy, 127(5)*, 2049-2103.

Christiano, L. J., Motto, R., & Rostagno, M. (2014). Risk Shocks. *American Economic Review, 104(1)*, 27-65.

Kimball, M. S. (1990). Precautionary saving and the marginal propensity to consume. *Discussion Paper, National Bureau of Economic Research*.

Eberly, J. C. (1994). Adjustment of consumers' durables stocks: Evidence from automobile purchases. *Journal of political Economy, 102(3)*, 403-436.

Gilchrist, S., Sim, J. W., & Zakrajšek, E. (2014). Uncertainty, financial frictions, and investment dynamics. *National Bureau of Economic Research, No. w20038*.

Blanchard, O., & Perotti, R. (2002). An empirical characterization of the dynamic effects of changes in government spending and taxes on output. *The Quarterly Journal of economics, 117(4)*, 1329-1368.

Romer, C. D., & Romer, D. H. (2010). The macroeconomic effects of tax changes: estimates based on a new measure of fiscal shocks. *American Economic Review, 100(3)*, 763-801.

Giavazzi, F., & Pagano, M. (1990). Can severe fiscal contractions be expansionary? Tales of two small European countries. *NBER macroeconomics annual, 5*, 75-111.

Johannsen, B. K. (2014). When are the effects of fiscal policy uncertainty large?

Anzuini, A., Rossi, L., & Tommasino, P. (2020). Fiscal policy uncertainty and the business cycle: Time series evidence from Italy. *Journal of Macroeconomics, 65*, 103238.

Beckmann, J., & Czudaj, R. L. (2021). Fiscal policy uncertainty and its effects on the real economy: German evidence. *Oxford Economic Papers, 73(4)*, 1516-1535.

Bomberger, W. A. (1996). Disagreement as a Measure of Uncertainty. *Journal of Money, Credit and Banking, 28(3)*, 381-392.

Bomberger, W. A. (1999). Disagreement and uncertainty: a reply to Rich and Butler. *Journal of Money, Credit and Banking, 31(2)*, 273-276.

Bomberger, W. A., & Frazer, W. J. (1981). Interest rates, uncertainty and the Livingston data. *The Journal of Finance, 36(3)*, 661-675.

Bachmann, R., Elstner, S., & Sims, E. R. (2013). Uncertainty and economic activity: Evidence from business survey data. *American Economic Journal: Macroeconomics, 5(2)*, 217-249.

Scotti, C. (2016). Surprise and uncertainty indexes: Real-time aggregation of real-activity macro-surprises. *Journal of Monetary Economics, 82*, 1-19.

Dzielinski, M. (2012). Measuring economic uncertainty and its impact on the stock market. *Finance Research Letters, 9(3)*, 167-175.

Castelnuovo, E., & Tran, T. D. (2017). Google it up! a google trends-based uncertainty index for the United States and Australia. *Economics Letters, 161*, 149-153.

Stock, J. H., & Watson, M. W. (2018). Identification and estimation of dynamic causal effects in macroeconomics using external instruments. *The Economic Journal, 128(610)*, , 917-948.

Mertens, K., & Ravn, M. O. (2013). The dynamic effects of personal and corporate income tax changes in the United States. *American economic review, 103(4)*, 1212-1247.

Carriero, A., Mumtaz, H., Theodoridis, K., & Theophilopoulou, A. (2015). The impact of uncertainty shocks under measurement error: A proxy SVAR approach. *Journal of Money, Credit and Banking, 47(6)*, 1223-1238.

Gulen, H., & Ion, M. (2016). Policy uncertainty and corporate investment. *The Review of Financial Studies, 29(3)*, 523-564.

Çolak, G., Durnev, A., & Qian, Y. (2017). Political uncertainty and IPO activity: Evidence from US gubernatorial elections. *Journal of Financial and Quantitative Analysis, 52(6)*, 2523-2564.

Bonaime, A., Gulen, H., & Ion, M. (2018). Does policy uncertainty affect mergers and acquisitions? *Journal of Financial Economics, 129(3)*, 531-558.

Li, X. M., & Qiu, M. (2021). The joint effects of economic policy uncertainty and firm characteristics on capital structure: Evidence from US firms. *Journal of International Money and Finance, 110*, 102279.

Chen, P. F., Lee, C. C., & Zeng, J. H. (2019). Economic policy uncertainty and firm investment: evidence from the US market. *Applied Economics, 51(31)*, 3423-3435.

Jurado, K., Ludvigson, S. C., & Ng, S. (2015). Measuring uncertainty. *American Economic Review, 105(3)*, 1177-1216.

Chang, B. Y., & Feunou, B. (2013). Measuring uncertainty in monetary policy using implied volatility and realized volatility. *Bank of Canada working paper, (No. 2013-37)*.

Bauer, M. D., Lakdawala, A., & Mueller, P. (2022). Market-based monetary policy uncertainty. *The Economic Journal, 132(644)*, 1290-1308.

Boukus, E., & Rosenberg, J. V. (2006). The information content of FOMC minutes. *Available at SSRN 922312*.

Schonhardt-Bailey, C. (2013). Deliberating American monetary policy: A textual analysis. *MIT Press*.

Im, H. J., Park, H., & Zhao, G. (2017). Uncertainty and the value of cash holdings. *Economics Letters, 155*, 43-48.

Kumar, A., Mallick, S., & Sinha, A. (2021). Is uncertainty the same everywhere? Advanced versus emerging economies. *Economic Modelling, 101*, 105524.

Pratap, B., & Priyaranjan, N. (2023). Macroeconomic Effects of Uncertainty: A Google trends-based analysis for India. *Empirical Economics*.

Bhaduri, S. N., & Kanti, M. (2011). Macroeconomic uncertainty and corporate liquidity: the Indian case. *Macroeconomics and Finance in Emerging Market Economies, 4(1)*, 167-180.

Bajaj, Y., Kashiramka, S., & Singh, S. (2021). Economic policy uncertainty and leverage dynamics: Evidence from an emerging economy. *International Review of Financial Analysis, 77, 101836*.

Sahoo, P., & Bishnoi, A. (2023). Drivers of corporate investment in India: The role of firm-specific factors and macroeconomic policy. . *Economic Modelling, 125, 106330*.

Mathur, A., Sengupta, R., & Pratap, B. (2024). Equity market responses to surprise Covid-19 lockdowns: The role of pandemic-driven uncertainty . *Journal of Asian Economics, 91, 101691*.

Bloom, N., Floetotto, M., Jaimovich, N., Saporta-Eksten, I., & Terry, S. J. (2018). Really uncertain business cycles. *Econometrica, 86(3)*, 1031-1065.

Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica, 77(3)*, 623-685.

Al-Thaqeb, S. A., & Algharabali, B. G. (2019). Economic policy uncertainty: A literature review. *The Journal of Economic Asymmetries, 20, e00133*.

Azqueta-Gavaldón, A. (2017). Developing news-based economic policy uncertainty index with unsupervised machine learning. *Economics Letters, 158*, 47-50.

Bhagat, S., Ghosh, P., & & Rangan, S. (2016). Economic policy uncertainty and growth in India. *Economic and Political Weekly*, 72-81.

Uhlig, H. (2005). What are the effects of monetary policy on output? Results from an agnostic identification procedure. *Journal of Monetary Economics, 52(2)*, 381-419.

Leduc, S., & Liu, Z. (2016). Uncertainty shocks are aggregate demand shocks. *Journal of Monetary Economics, 82*, 20-35.

Romer, C. D., & Romer, D. H. (2004). A new measure of monetary shocks: Derivation and implications. *American economic review, 94(4)*, 1055-1084.

Lakdawala, A., & Moreland, T. (2024). Firm-level uncertainty and the transmission of monetary policy. *Review of Economics and Statistics*, 1-28.

Appendix

A. Google Trends-based Uncertainty Indices

Table A.1: List of Keywords

Index	Keywords
MPU	monetary policy, interest rate, repo rate, repo, reverse repo, reverse repo rate, liquidity, laf, liquidity adjustment facility, inflation, inflation rate, rate cut, rate hike, open market operations, omos, money supply, exchange rate, usd inr rate, forex, reserves, foreign exchange reserves, cash reserve ratio, statutory reserve ratio, crr, slr - camera, call money rate, wacr, msf, marginal standing facility, gdp, growth, inflation target, bond yield, bond yields, yield curve, monetary policy transmission, transmission, pass-through, term premia, term premium, lending rate, deposit rate, borrowing rate, government securities, asset purchase, g-sap, forward guidance, business cycle, unconventional monetary policy, operation twist, ltro, quantitative easing, rbi-recruitment, reserve bank of india, reserve

	bank, governor, rbi governor, deputy governor, central bank, monetary policy committee, mpc
FPU	fiscal policy, tax, taxation, tax rate, tax rates, taxes, revenue deficit, fiscal deficit, government revenue, government debt, government budget, union budget, government expenditure, fiscal stimulus, double taxation, duty, duties, levy, levies, excise tax, service tax, custom duty, corporate tax, income tax, gst, goods and services tax, government spending, frbm, fiscal multiplier, balanced budget, reform, fiscal reforms, tax burden, subsidy, subsidies, parliament, finance, finance minister, minister of finance, finance ministry, gst council, finance commission, finance secretary, chief economic adviser

Table A.2: Correlation with Domestic Financial Indicators

Correlation	FPU	MPU	INRUSD	TBILL3M	GSEC1Y	GSEC10Y	NIFTY	CR	NF_CR
FPU	1.00								
MPU	0.81	1.00							
INRUSD	0.04	**0.20**	1.00						
TBILL3M	**-0.44**	**-0.34**	**0.19**	1.00					
GSEC1Y	**-0.44**	**-0.37**	**0.17**	**0.97**	1.00				
GSEC10Y	**-0.33**	**-0.33**	**0.14**	**0.81**	**0.87**	1.00			
NIFTY	-0.04	**-0.16**	**-0.43**	**-0.15**	**-0.14**	-0.06	1.00		
CR	**-0.21**	**-0.15**	0.02	**0.20**	**0.24**	**0.23**	0.01	1.00	
NF_CR	**-0.20**	**-0.15**	0.01	**0.18**	**0.21**	**0.20**	0.01	**1.00**	1.00

Notes: (1) FPU: Fiscal Policy Uncertainty Index, (2): MPU: Monetary Policy Uncertainty Index, (3): INRUSD: INR-USD Exchange Rate, (4): TBILL3M: 3-Month T-Bill Rate, (5): GSEC1Y: 1-year G-Sec Yield, (6): GSEC10Y: 10-year G-Sec Yield, (7): NIFTY: NIFTY 50 index, (8): CR: Credit growth, (9): NF_CR: Non-food credit growth, (10): Bold cells indicate statistical significance at 5 per cent level.
Source: Authors' estimates.

Table A.3: Correlation with Global and Domestic Macroeconomic Indicators

Correlation	FPU	MPU	RGDP	INF	WACR	EPU	ECB_SR	FED_SR	GEPU	US_VIX	US_MPU
FPU	1.00										
MPU	**0.83**	1.00									
RGDP	0.20	-0.10	1.00								
INF	**0.23**	**0.29**	-0.07	1.00							
WACR	**-0.45**	**-0.29**	-0.21	0.00	1.00						
EPU	-0.01	**0.20**	**-0.48**	**0.54**	**0.43**	1.00					
ECB_SR	0.07	0.10	**0.34**	**0.24**	0.08	0.14	1.00				
FED_SR	**-0.20**	**-0.13**	**0.27**	**-0.40**	**-0.31**	**-0.57**	**0.28**	1.00			
GEPU	-0.13	0.01	**-0.54**	-0.02	0.06	**0.22**	**-0.82**	**-0.23**	1.00		
US_VIX	**0.25**	**0.50**	**-0.39**	**0.44**	-0.09	**0.50**	**0.25**	-0.13	0.09	1.00	
US_MPU	0.03	0.19	-0.19	**0.30**	0.04	**0.38**	0.20	0.04	**0.27**	**0.50**	1.00

Notes: (1) FPU: Fiscal Policy Uncertainty Index, (2): MPU: Monetary Policy Uncertainty Index, (3): RGDP: Real GDP growth rate of India, (4): INF: Inflation in India, (5): WACR: Weighted Average Call Money Rate, (6) EPU: Economic Policy Uncertainty Index of India as developed by Baker *et al.* (2016), (7): ECB_SR: Short-term rate of ECB, (8): FED_SR: US Federal Funds Rate, (9): GEPU: Global Economic Policy Uncertainty Index, (10): US_VIX: US CBOE's Volatility Index, (11): US_MPU: US Monetary Policy Uncertainty Index, (12): Bold cells indicate statistical significance at 5 per cent level.
Source: Authors' estimates.

B. Firm-level Panel Data – Summary Statistics

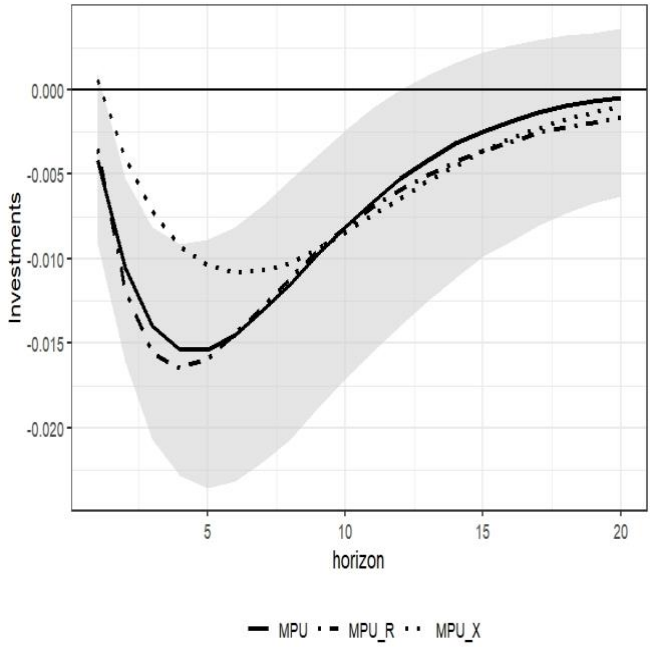
Table B.1: Descriptive Statistics

Statistics	**CAPEX**	**MPU**	**FPU**	**Tobin's Q**	**Cash Flows**	**Sales Growth (%)**	**Total Assets (in Logs)**	**IIR (Asset Tangibility)**	**Leverage**	**GDP Growth (%)**
Mean	0.052	-0.208	-0.117	1.264	0.009	16.492	8.190	0.436	5.677	6.781
Median	0.023	0.294	1.268	0.825	0.001	11.963	8.230	0.407	1.877	7.419
Maximum	-0.046	-10.544	-11.373	0.233	-0.064	-40.459	4.564	0.021	0.007	-6.690
Minimum	0.286	11.463	14.007	4.552	0.132	103.465	11.566	1.009	35.877	10.950
Std. Dev.	0.080	6.822	7.256	1.125	0.041	32.493	1.873	0.288	8.965	3.682
Skewness	1.609	0.172	0.056	1.718	1.320	0.885	-0.098	0.355	2.260	-2.564
Kurtosis	5.013	1.870	1.919	5.134	5.468	4.013	2.320	2.123	7.384	10.132
Obs.	28470	33426	33426	22692	27415	27909	31275	30549	16895	33426

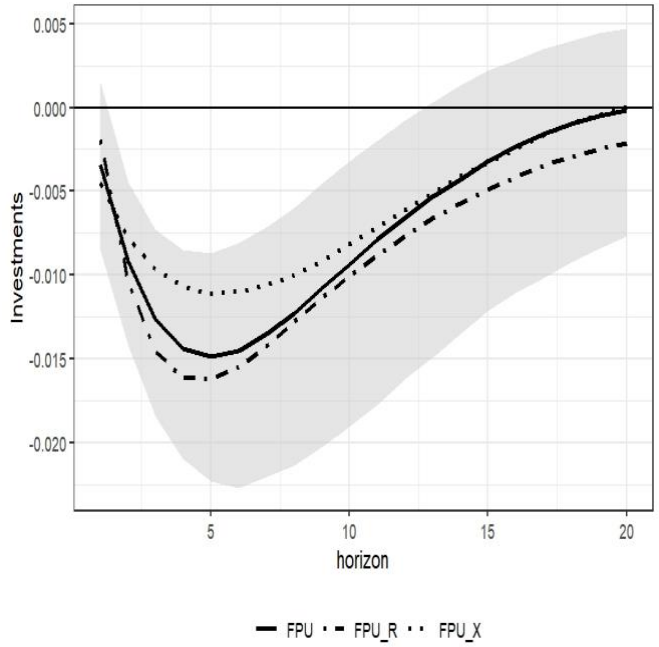
C. Sign-restricted VAR – Robustness Checks

Figure C.1: Impulse responses to Policy Uncertainty shocks

(a) Response to MPU shocks



(b) Response to FPU shocks



Note: The above figure presents the estimated impulse response of aggregate investment to (a) MPU shock and (b) FPU shock. Aggregate investment is proxied by real gross fixed capital formation taken in natural logarithms. The solid black line and the shaded grey area show the median response estimate and pointwise 68% posterior credible interval corresponding to MPU (FPU) shocks. Responses to MPU-R (FPU-R) and MPU-X (FPU-X) shocks are shown by the black dot-dash and dashed lines.
Source: Authors' calculations.

D. Panel Data Regression Results – Robustness Checks

Table D.1: Robustness Test - Using Industry Fixed Effects

Monetary Policy Uncertainty				*Fiscal Policy Uncertainty*			
	(1)	(2)	(3)		(4)	(5)	(6)
Dep. Var.	CAPEX	CAPEX	CAPEX	Dep. Var.	CAPEX	CAPEX	CAPEX
MPU_{t-1}	-0.029***	-0.028***	-0.150***	FPU_{t-1}	-0.047***	-0.047***	-0.133***
	(0.007)	(0.007)	(0.011)		(0.006)	(0.006)	(0.009)
IIR_{t-1}		0.041***		IIR_{t-1}		0.042***	
		(0.009)				(0.009)	
Lev_{t-1}			0.027***	Lev_{t-1}			0.029***
			(0.009)				(0.009)
$MPU_{t-1} \times IIR_{t-1}$		-0.017***		$FPU_{t-1} \times IIR_{t-1}$		-0.024***	
		(0.006)				(0.006)	
$MPU_{t-1} \times Lev_{t-1}$			-0.005	$FPU_{t-1} \times Lev_{t-1}$			-0.009
			(0.009)				(0.009)
Observations	19886	19886	11080	Observations	19886	19886	11080
Adjusted R^2	0.130	0.131	0.127	Adjusted R^2	0.132	0.133	0.130
Industry FE	Yes	Yes	Yes	Industry FE	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Firm Controls	Yes	Yes	Yes
Macro Controls	Yes	Yes	Yes	Macro Controls	Yes	Yes	Yes

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table D.2: Robustness Test - Using Uncertainty "Shocks" (MPU-R/FPU-R)

Monetary Policy Uncertainty				*Fiscal Policy Uncertainty*			
	(1)	(2)	(3)		(4)	(5)	(6)
Dep. Var.	CAPEX	CAPEX	CAPEX	Dep. Var.	CAPEX	CAPEX	CAPEX
$MPU\text{-}R_{t-1}$	-0.062***	-0.055***	-0.136***	$FPU\text{-}R_{t-1}$	-0.072***	-0.060***	-0.093***
	(0.007)	(0.006)	(0.010)		(0.006)	(0.006)	(0.007)
IIR_{t-1}		-0.356***		IIR_{t-1}		-0.350***	
		(0.016)				(0.016)	
Lev_{t-1}			-0.011	Lev_{t-1}			-0.005
			(0.016)				(0.016)
$MPU_{t-1} \times IIR_{t-1}$		-0.011*		$FPU_{t-1} \times IIR_{t-1}$		-0.026***	
		(0.006)				(0.006)	
$MPU_{t-1} \times Lev_{t-1}$			-0.008	$FPU_{t-1} \times Lev_{t-1}$			-0.005
			(0.010)				(0.008)
Observations	19886	19886	11080	Observations	19886	19886	11080
Adjusted R^2	0.205	0.237	0.195	Adjusted R^2	0.207	0.239	0.191
Firm FE	Yes	Yes	Yes	Firm FE	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Firm Controls	Yes	Yes	Yes
Macro Controls	Yes	Yes	Yes	Macro Controls	Yes	Yes	Yes

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table D.3: Robustness Test – Controlling for EPU - MPU/FPU

Monetary Policy Uncertainty				*Fiscal Policy Uncertainty*			
	(1)	(2)	(3)		(4)	(5)	(6)
Dep. Var.	CAPEX	CAPEX	CAPEX	Dep. Var.	CAPEX	CAPEX	CAPEX
MPU_{t-1}	-0.037***	-0.030***	-0.163***	FPU_{t-1}	-0.041***	-0.034***	-0.119***
	(0.007)	(0.006)	(0.011)		(0.006)	(0.006)	(0.010)
$EPU\text{-}MPU_{t-1}$	0.049***	0.032*	0.107***	$EPU\text{-}FPU_{t-1}$	0.116***	0.088***	0.105***
	(0.017)	(0.017)	(0.020)		(0.016)	(0.016)	(0.020)
IIR_{t-1}		-0.357***		IIR_{t-1}		-0.350***	
		(0.016)				(0.016)	
Lev_{t-1}			-0.019	Lev_{t-1}			-0.012
			(0.016)				(0.016)
$MPU_{t-1} \times IIR_{t-1}$		-0.016***		$FPU_{t-1} \times IIR_{t-1}$		-0.022***	
		(0.006)				(0.006)	
$MPU_{t-1} \times Lev_{t-1}$			-0.014	$FPU_{t-1} \times Lev_{t-1}$			-0.015*
			(0.010)				(0.009)
Observations	19886	19886	11080	Observations	19886	19886	11080
Adjusted R^2	0.203	0.235	0.201	Adjusted R^2	0.206	0.237	0.204
Firm FE	Yes	Yes	Yes	Firm FE	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Firm Controls	Yes	Yes	Yes
Macro Controls	Yes	Yes	Yes	Macro Controls	Yes	Yes	Yes

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table D.4: Robustness Test – Controlling for Global factors (using US VIX)

Monetary Policy Uncertainty				*Fiscal Policy Uncertainty*			
	(1)	(2)	(3)		(4)	(5)	(6)
Dep. Var.	CAPEX	CAPEX	CAPEX	Dep. Var.	CAPEX	CAPEX	CAPEX
MPU_{t-1}	-0.079***	-0.074***	-0.173***	FPU_{t-1}	-0.076***	-0.067***	-0.146***
	(0.008)	(0.008)	(0.011)		(0.006)	(0.006)	(0.009)
IIR_{t-1}		-0.359***		IIR_{t-1}		-0.355***	
		(0.016)				(0.016)	
Lev_{t-1}			-0.018	Lev_{t-1}			-0.012
			(0.016)				(0.016)
$MPU_{t-1} \times IIR_{t-1}$		-0.015**		$FPU_{t-1} \times IIR_{t-1}$		-0.022***	
		(0.006)				(0.006)	
$MPU_{t-1} \times Lev_{t-1}$			-0.015	$FPU_{t-1} \times Lev_{t-1}$			-0.015*
			(0.010)				(0.009)
Observations	19886	19886	11080	Observations	19886	19886	11080
Adjusted R^2	0.206	0.239	0.199	Adjusted R^2	0.207	0.240	0.202
Firm FE	Yes	Yes	Yes	Firm FE	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Firm Controls	Yes	Yes	Yes
Macro Controls	Yes	Yes	Yes	Macro Controls	Yes	Yes	Yes
Global Controls	Yes	Yes	Yes	Global Controls	Yes	Yes	Yes

Standard errors in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

E. News-based Categorical Uncertainty Index

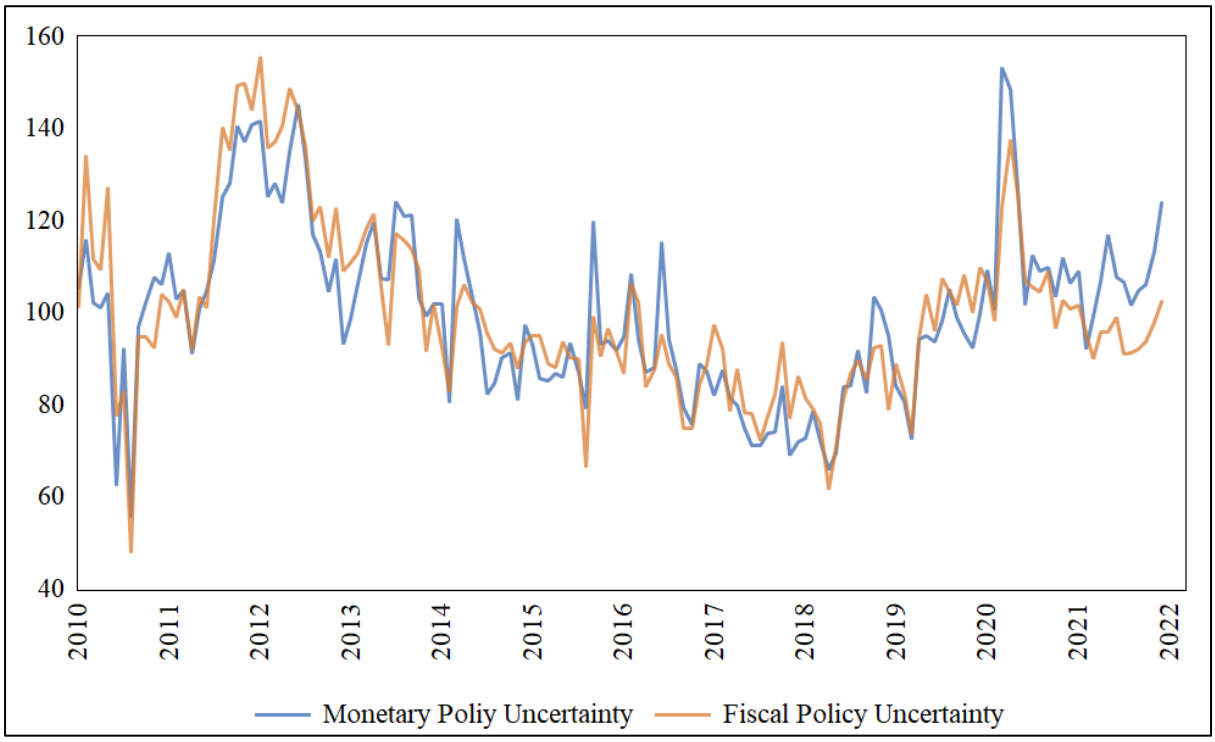
Following Baker *et al.* (2016), we use five Indian business news dailies – Economic Times, The Hindu Business Line, The Financial Express, The Mint and The Business Standard – and classify all the articles with at least one of the keywords listed in the corresponding lists in Table E.1. Once the articles are classified, the daily count of such articles are aggregated and normalized (using the same procedure as in and Pratap and Priyaranjan (2023)) to obtain monthly series for monetary policy uncertainty (MPU) and fiscal policy uncertainty (FPU) indices.

Table E.1: List of Keywords for News-based Uncertainty Indices

Index	Keywords
MPU	• economy, economies, economic, macroeconomic, macroeconomy • monetary, monetary policy, interest rate, repo, reverse repo, liquidity, inflation, rate cut, rate hike, open market operations, omos, rupee, currency, money supply, rupee, dollar, exchange rate, reserves, forex, gdp, growth, inflation target, cash reserve ratio, statutory liquidity ratio, marginal standing facility, crr, slr, msf, inr, usd, wacr, bond yield, bond yields, quantitative easing, ltro, tltro, operation twist, unconventional, yield curve, transmission, lending rate, borrowing rate, deposit rate, term premium, term premia, asset purchases, forward guidance, business cycle; reserve bank, reserve bank of india, rbi, governor, central bank, monetary policy committee, mpc • uncertainty, uncertainties, uncertain, unclear, possibility, possibilities, doubt, doubts, predict, unpredictable, unpredictability, speculative, speculation, dilemma, unsure, reservation, wait and see, ambiguous, ambiguity, remains to be seen, instability, likelihood, unstable, jeopardize, unforeseeable, precarious, undecided, unclear, risk, risks, risky
FPU	• economy, economies, economic, macroeconomic, macroeconomy • fiscal, fiscal policy, tax rate, taxation, taxed, tax, taxes, revenue, expenditure, debt, government, budget, union, deficit, debt, expenditure, revenue, stimulus, corporate, income, duty, duties, levy, levies, excise, service, custom, customs, gst, double taxation, tax slab, tax slabs, spending, frbm, reform, reforms, multiplier, burden, subsidy, subsidies, parliament, finance, finance minister, gst council, finance commission • uncertainty, uncertainties, uncertain, unclear, possibility, possibilities, doubt, doubts, predict, unpredictable, unpredictability, speculative, speculation, dilemma, unsure, reservation, wait and see, ambiguous, ambiguity, remains to be seen, instability, likelihood, unstable, jeopardize, unforeseeable, precarious, undecided, unclear, risk, risks, risky

The categorical news-based uncertainty indices are presented below in Figure E.1.

Figure E.1: Newspaper-based Categorical Uncertainty Indices



Source: Authors' estimates.