Economic Policy Uncertainty and Economic Growth in India

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Abstract

Economic and political commentators in India have repeatedly noted their concern about the recent slowdown in the Indian economy. Several recent papers provide evidence that increase in the economic policy uncertainty (EPU) has played a significant role in the slowdown and the increase in unemployment in the US. In this paper we construct a measure of economic policy uncertainty for India and study its impact on the Indian economy. We find Indian GDP and Indian fixed investment are negatively related to EPU in India. Importantly, the economic magnitudes of these relations are quite significant. For example, if the economic uncertainty in India were to decrease today to the level observed in 2005, India's GDP growth would increase by 0.56%, and fixed investment growth would increase by 1.36%. Additionally, we document a negative correlation between the Bombay Stock Exchange (BSE) index and EPU in India, suggesting that increases in EPU lowers expectations of future growth or increases perceived risk of listed stocks. Lastly, we find that firm level capital expenditure rates are lowered when EPU increases. Thus, economic policy uncertainty has contributed in an important way to the recent economic slowdown.

Keywords: Economic Policy, Uncertainty, Growth, Investment, Slowdown, Capital Expenditures

1. Introduction

Economic and political commentators in India have repeatedly noted their concern about the slow-down in the Indian economy. GDP growth rate at factor cost declined from 8.3% in 2004-05 to 4.6% in 2012-13. The drop has been especially steep in the manufacturing sector. Importantly, investment in the private sector has declined both in absolute terms and as a fraction of GDP, in the last five years (Ministry of Finance 2014). In the same survey, recommendations for reviving the economy include creating a framework for sustained low and stable inflation, setting public finances on a sustainable path by tax and expenditure reform, and creating the legal and regulatory framework for a well-functioning market economy.

In this study, we examine whether economic policy uncertainty contributed to the recent slowdown in India. Several recent papers, in particular, Baker et al (2013) (BBD) and Bhagat and Obreja (2013) (BO), have provided evidence that increase in the economic policy uncertainty has played a significant role in the slow-down and the increase in unemployment in the US. In this paper, we draw on the empirical methodology of the above papers to study the impact of economic policy uncertainty (EPU) on the Indian economy.

Consistent with the findings of research on US data, we find Indian corporate investment activity negatively related to EPU in India. More importantly, the economic magnitudes of these relations are quite significant. For example, if the economic uncertainty in India were to decrease today to the level observed in 2005, India's GDP growth would increase by 0.56%, and fixed investment growth would increase by 1.36%. Additionally, we document a negative correlation between the Bombay Stock Exchange (BSE) index and EPU in India. Interestingly, EPU has a particularly negative impact on the BSE index during the recent international financial crisis. Lastly, we find that increases in EPU is associated with an increase in cost of projects stalled in both the government and private sector for up to six quarters following the initial increase.

We corroborate our macro-level findings with evidence from panel regressions of firm-level capital expenditure rates on EPU and control variables. Our results suggest that a 10% increase in EPU is associated with a 3% drop in investment rates. We find similar results when we estimate these regressions with industry-level data. Thus, economic policy uncertainty significantly slows down investment at the economy, industry, and firm levels.

These results are of great significance to policy makers. Policy uncertainty on foreign direct investment, capricious retroactive taxes, trade, and environmental regulations can have

substantial effects on decision making. Investment decisions are typically guided by the "net present value" and "best use of capital" rules. However, during times of high economic policy uncertainty, firms and governments stall projects and postpone spending. This suggests that it may be important for policymakers to find mechanisms to reduce unnecessary policy uncertainty so that investment spending is revived.

2. Uncertainty and the Economy

Why might uncertainty impact business and economic activity? Corporate investment policy has been studied by scholars in economics and finance for the better part of the past century. The net present value investment decision rule is a well-accepted paradigm. In the traditional paradigm, larger expected cash flows positively impact positively corporate investment, while larger corporate cash flow uncertainty negatively impacts corporate investment. An increase in uncertainty is likely to increase cost of capital (for both debt and equity). This in turn, will lead to lower investment spending because of the fall in the number of projects with expected returns higher than the cost of capital.

The effect of uncertainty on investment is analyzed by Bernanke (1983) from a different angle. He considers a setting where business investment and employment are viewed as real options; that is, capital investments are somewhat irreversible and hiring and firing employees is costly. In this situation he predicts that businesses, when faced with increased uncertainty, are likely to defer making capital investments or hiring employees. That is, firms and governments should wait and see until uncertainty is resolved or reduced and then make investments. As businesses defer investing and hiring, the economy slows down (Pindyck 1988).

Panousi and Papanikolaou (2012) show how managerial ownership can interact with uncertainty to influence investment spending. In particular, they predict that increases in uncertainty can lead to underinvestment and that this effect is magnified in firms where the ownership level of insider-managers is high. A high level of ownership by insider-managers creates a wedge between insiders' and other shareholders' incentives and exacerbates the underinvestment problem. This is especially relevant to the Indian economy, where ownership concentration levels in the private sector is quite high.

In terms of empirical evidence on business uncertainty and investment, Bloom (2009) develops and tests a model where firm-level uncertainty shocks generate short sharp recessions

and recoveries. Using partly confidential business survey data from the US and Germany, Bachmann et al (2012) find that positive innovations to business uncertainty lead to prolonged declines in economic activity. BO find that cash flow uncertainty has a significantly negative impact on corporate employment and corporate investment in both tangible and intangible assets. Further, they show that cash flow uncertainty has had a more negative impact on corporate employment and corporate investment in tangible and intangible assets during economic recessions than during economic expansions. Gilchrist et al (2014) show that after controlling for indicators of marginal product of capital, increase in firm uncertainty (measured by idiosyncratic volatility) is associated with a substantial decline in the rate of capital formation.

A recent and emerging literature focuses on policy uncertainty as a specific form of uncertainty that influences investment. In a very early paper, Friedman (1968) argues that uncertainty in monetary policy has a negative impact on economic growth. Rodrik (1991) shows that even moderate amounts of policy uncertainty can deter investment, and that otherwise sensible reforms may prove damaging if they induce doubts as to their permanence.

Turning to empirical evidence on policy uncertainty, BBD develop a new index of economic policy uncertainty (EPU) based on several indicators, including the frequency of newspaper references to policy uncertainty. They report EPU negatively influences investment and hiring, especially for firms heavily exposed to government contracts. At the macro level, they find that EPU is a leading indicator of declines in investment, output and employment in vector autoregression models. Fernandez-Villaverde et al (2013) present evidence of time-varying volatility in the processes for tax and government spending as a share of output in the US. Additionally, they show fiscal volatility shocks (their proxy for policy uncertainty) reduce economic activity measured as output, consumption, investment, and hours worked. Gulen and Ion (2012) find that EPU is negatively related to firm and industry level investment in the US and that approximately two thirds of the 32% drop in corporate investments observed during the 2007-2009 crisis can be attributed to policy related uncertainty.

Studies have also examined how EPU influences contemporaneous stock returns and volatility. Pastor and Veronesi (2011) predict and find that EPU is higher in a weaker economy; EPU causes stocks to be more volatile and more correlated and commands a risk premium. Brogaard and Detzel (2012), using data for twenty-one countries, find that we find that when

EPU increases by 1%, contemporaneous market returns fall by 2.9% and market volatility increases by 18%.

While prior empirical work on uncertainty in general, and EPU, in particular, has concentrated on the US and developed countries, we focus on a key emerging economy: India. During the first six months of 2009, while developed economies struggled to recover from the financial crisis, economies like India (and China and Brazil) reported significant growth. However, in recent years, especially 2013, several commentators assert that India is in throes of a recession. Thus, the effect of EPU on the Indian economy is both interesting and topical from a policy perspective. In this study, we build on prior work and examine the impact of EPU on economy-level output, market capitalization, and interest rates for the years 2003-2012. We also present evidence on how EPU impacts economy-level data on stalled projects. Lastly, we examine firm-level data on capital expenditures to see how EPU influences investment decision in the Indian private sector.

3. Data and Measurement

Our objective is to examine the effect of EPU on both country-level indicators as well as firm-level investment metrics. To measure EPU, we construct an index from two underlying components. One component quantifies newspaper coverage of policy-related economic uncertainty of seven leading English language newspapers from India. A second component uses disagreement among economic forecasters as a proxy for uncertainty.

News coverage about policy-related economic uncertainty: We construct this index using a method that is similar to that used in constructing the BBD index based on US newspapers. We include 7 newspapers from India: *The Economic Times, The Times of India,* the *Hindustan Times, The Hindu, The Statesman, The Indian Express,* and *Financial Express*. As with the US newspaper index, we utilize the number of news articles containing the terms such as uncertain, uncertainty, worry, or fear, economic or economy, as well as policy relevant terms (scaled by the total number of articles). Policy relevant terms include terms such as 'regulation', 'central bank', 'monetary policy', 'policymakers', 'deficit', 'legislation', and 'fiscal policy'. Each paper-specific series is normalized to standard deviation of one prior to 2011 and then summed. The series is normalized to mean of 100 prior to 2011.

Indian Forecast Data: The second component of our Indian policy-related uncertainty index draws from forecast data from Consensus Economics. From Consensus Economics, we obtain monthly data on individual forecasts of economic variables by professional forecasters. In particular, we utilize individual-level forecasts of consumer prices and federal government budget balances. We chose these variables because they are directly influenced by monetary policy and fiscal policy actions. For each series, we look at the monthly forecasts for the following year. We treat the dispersion in the forecasts of these variables as proxies for uncertainty about monetary policy and about federal fiscal policy. This approach builds on a long literature using disagreement among forecasters as a proxy for economic uncertainty. For inflation, we look at the individual forecasts for the monthly consumer price levels for the following year. To construct the dispersion component, we take the inter-quartile range of each set of inflation rate forecasts in each month. For the budget balance component, we look at the raw inter-quartile range of forecasts for the following year's budget balance and then divide this range by India's contemporaneous annual GDP.

For both of these variables, due to the mechanically decreasing variance in forecasts as the next calendar year approaches, we remove monthly fixed effects from the data (post-removal components given in the downloadable data). Furthermore, because some forecasters report only once per quarter, we use the most recent forecast data for up to three months after a given forecaster's last forecast.

To construct our overall index of policy-related economy uncertainty for India, we first normalize each component by its own standard deviation prior to January 2011. We combine the components using weights of two-thirds on our broad news-based policy uncertainty index and one-thirds on each forecast dispersion measure. Compared to the European and US indices, we weight the newspaper component more heavily relative to the forecast component due to a larger number of newspapers and a smaller number of individual forecasters. Finally, we standardize the mean to equal 100 prior to 2011. The data are available at www.policyuncertainty.com.

Figure 1 highlights a secular increase in EPU in India during the past decade. Some of the peaks in this index are noteworthy such as the Congress Party's surprise election victory in April 2004, the Lehman bankruptcy and associated financial crisis events in September 2008, and the onion price rise and inflationary fears in December 2010.

Our study relates to the years 2003-2012. We obtain data on key macroeconomic indicators from the following sources. Monthly data for the Bombay Stock Exchange Sensex index (BSE) are from www.bseindia.com. Monthly data on inter-bank call rates (IBCR), Index of Industrial Production (IIP), and Rupee-Dollar exchange rates are from Reserve Bank of India's web site: http://dbie.rbi.org.in. Quarterly data for growth in GDP (CHGDP), growth in Fixed Investment (CHFI), and growth in Private Consumption (CHPC) are from Central Statistical Organization, India. We obtain quarterly data on the cost of stalled projects from the CAPEX database of the Centre for Monitoring Indian Economy Pvt. Ltd (CMIE). We obtain firm-level annual data on capital expenditures, market-to-book ratio, sales, total assets, and NIC classification from the PROWESS database of CMIE.

4. Economic Policy Uncertainty, Business Activity and Economic Growth in India

Our primary objective is to understand whether and to what extent policy uncertainty affects investment at the macro level and firm level. Before presenting the key results, we report descriptive statistics on various macroeconomic variables in tables 1 and 2. The mean (median) value of our monthly EPU index is 110.9 (112.4), indicating that the variable is approximately normally distributed. Further, the mean (median) change is a positive 3.0% (1.74%) reflecting the secular increase in EPU in our sample period.

The average performance of the Indian economy in the years 2003-2012 has been positive as indicated by the mean monthly change in the BSE index of 1.85% and the mean change in the Index of Industrial Production of 0.75%. Because GDP data for India is available only at a quarterly frequency, we fit a spline function and construct a monthly series from the quarterly series. The mean monthly imputed GDP growth is 1.3%. We also obtain data on the fixed investment and consumption expenditure components of GDP as each of these components could be influenced differentially by EPU. The mean imputed growth rate in fixed investment is 3.55% and that of consumption expenditure is 2.28%. Lastly, table 1 provides descriptive statistics on monthly inter-bank call rates, our proxy for cost of borrowing, and percentage change in rupee-dollar exchange rates; their means are 5.92% and 0.13%, respectively. Figure 2 contains time-series plots of the some of the key macroeconomic variables.

Table 2 contains univariate Pearson correlations among the various macro-economic variables, including EPU. Of interest to us is the significant negative correlation between

percentage change in the BSE index with both the level and change in EPU (-0.345 and -0.323). Increases in policy uncertainty increases the riskiness in stocks or lowers growth expectations, or both, and thus lowers the level of the market wide index. The level of EPU is also highly negatively correlated with changes in fixed investment (-0.556). Thus, consistent with our expectation, policy uncertainty reduces fixed investment spending at the economy level.

Table 3 presents regressions of the level and change in the Bombay Stock Exchange (BSE) index on EPU and control variables (monthly series). Our control variables consist of the Index of Industrial Production, the dollar-rupee rate, and the Consumer Price Index. All variables are expressed in logs to reduce the effect of skewness in the variable and also for ease of interpretation of results. The market capitalization of listed companies captures a significant fraction of economy-wide performance. For example, the ratio of market capitalization of all listed companies to GDP in 2003 was 45% in 2003 and grew to 68% in 2012 (source: data.worldbank.org). Being a forward-looking measure, it reflects the effect of EPU on future expectations of growth and risk. Our index is based on the top 30 stocks, which tends to co-vary strongly with the entire market.

The results in panel A of table 3 (columns (1) and (2)) show that EPU has a negative and economically important impact on BSE index. For example, the coefficient on EPU in column (2) is -0.37 (t-statistic = -3.83), implying that a 10% increase in EPU reduces the BSE index by 3.7%. In columns (3) and (4), we evaluate the role of EPU during the global financial crisis. We define a dummy variable, CRISIS, that equals one for the two years 2008 and 2009, and zero otherwise and include both CRISIS and its interaction with EPU. Interestingly, the CRISIS dummy is positive and significant suggesting that the BSE index was on average higher during the crisis. Importantly, the coefficient on the interaction is negative and significant (t-statistic = -2.07). The coefficient of -0.37 suggests that, the EPU lowered the BSE index by an additional 0.37% during the crisis.

Because levels regressions are susceptible to spurious correlations, we estimated the models in panel A with the dependent variable equal to the percentage change in the BSE index. Our conclusions are similar. For example, consider the results in the column (4) which is the model with most independent variables. The coefficient on EPU is again negative and significant (t-statistic = -3.51) and the coefficient on the interaction between CRISIS and EPU is also negative and significant (t-statistic = - 2.60). The economic interpretation of the results is as

follows. A 10% increase in EPU caused the change in the BSE index to decline by 0.8%, on average, and by an incremental 3.3% during the financial crisis. Overall, increases in EPU reduce market expectations of growth or increase perceived risk of listed stocks, or both.

Quantile Regression (Koenker and Bassett 1978) is an approach that examines the behavior of the dependent variable, in our case the BSE index, not just at its mean, but also at various researcher-chosen percentiles, for example, at the 10^{th}, 20^{th}, 80^{th}, and 90^{th} percentiles. By examining the behavior of the regression curve for different quantiles of the dependent variable (Y), with respect to independent variables (X) we might obtain very different conclusions, compared to examining the curve only at the average of Y. In the presence of a non-constant regression curve, OLS coefficients are inefficient. Further, unlike OLS, quantile estimators are robust to outliers and therefore are especially useful for analyzing data that are not normally distributed.

To see the difference between ordinary least squares and quantile regression more clearly, recall the usual regression:

$$Y_i = X_i^T \beta + \varepsilon_i, \qquad E(\varepsilon_i | X_i) = 0$$

where β is chosen to minimize the squared error loss function:

$$\min_{\beta} \sum_{i=1}^{n} (Y_i - X_i^T \beta)^2$$

In contrast, with a quantile regression, for $0 < \tau < 1$, minimization is based on the "check function" $\rho_\tau(\cdot)$,

$$\min_{\beta} \sum_{i=1}^{n} \rho_\tau (Y_i - X_i^T \beta),$$

where $\rho_\tau(u) = u \times (\tau - I_{(u \le 0)})$ and $I_{(\cdot)}$ is the indicator function. For example, for a median regression, $\tau = 0.5$ and we choose β to minimize

$$\sum_{i=1}^{n} |Y_i - X_i^T \beta|$$

Figure 3 graphically depicts quantile regression (QR) results. Our interest is to analyze the τ quantile of the distribution of the BSE index, for various values of τ. Specifically, we consider $\tau \in \{0.05, 0.10, 0.25, 0.50, 0.75, 0.90, \text{and } 0.95\}$. The three graphs show the parameter estimates at various quantiles of the BSE index with "." sign indicating the posterior means of

the parameter and the shaded areas marking the 95% credible intervals. The solid black line marks the constant line at 0. The solid red line indicates the average value of the parameter estimates.

The left panel of figure 3 provides strong evidence of the negative correlation between the BSE index and EPU in India. It is interesting to see that EPU has a reliable negative effect on the index above the 50^{th} quantile and this effect becomes increasingly negative at higher quantiles. Thus, the index is especially sensitive to uncertainty when the market is at very high levels. This result emphasizes the importance of carrying out quantile regression at different values of τ.

While not the focus of the paper, the effect of IIP (middle panel) and exchange rates (right panel) also show considerable variation across quantiles. IIP has a reliably positive effect on the index, at all quantiles, with the effect increasing with quantile levels. Consistent with OLS results, exchange rates have a reliably negative impact on the BSE index, with the effect being most negative at the lower quantiles of the Index.

We also examine the effect of EPU on cost of debt. Pastor and Veronesi (2011) predict that EPU will cause of cost of capital to increase. We use the monthly Inter-Bank Call Rate series to measure cost of borrowing. Panel C of table 3 presents regressions of the rate series on EPU, the CRISIS dummy, and the interaction between EPU and the CRISIS dummy. We employ both the actual and the log-transformed values of the interest rate. The percentage change in CPI is included as a control variable. The results indicate that call rates are positively correlated with EPU. Further, this correlation is more pronounced during the recent international financial crisis. Thus, our results confirm the predictions of basic finance theory that increases in EPU, an aspect of uncertainty, raise the cost of borrowing.

To assess the impact of EPU on future macroeconomic performance, we employ a vector autoregression (VAR) framework. VAR estimation allows to jointly model the dynamics of multiple variables without requiring any strong restrictions on the underlying parameters. Essentially, each variable in the VAR system is modeled as linear functions of lagged values of itself and the other variables. VAR analyses provide impulse response functions that depict the effect of a shock of one variable on the path of all the variables in the system. For example, in our case, we can estimate the impact of a unit increase in EPU on future GDP growth.

We evaluate the effect of EPU on four measures of output in the Indian economy: GDP growth, change in IIP, change in fixed investment, and change in private consumption (all monthly variables). We employ two-variable VAR models with EPU paired with each of the four output measures, one at a time. Following BBD, we include six monthly lags of all variables. Figure 4 reports impulse response functions for the four VAR models. The X-axis ranges from month 1 through 36 relative to the initial shock in EPU. Whereas industrial production in the US declines for 14 months after a shock in EPU (BBD), in India both change in GDP and change in private consumption decline for only six and seven months, respectively, before reverting to original levels. Interestingly, change in fixed investment declines for 12 months before reverting to original levels. Change in fixed investment includes investment by all participants in the economy (households, government, and private sector).

The impulse responses are in standard deviation units. Thus, the peak decline for change in fixed investment is -0.53% in response to one standard-deviation increase in EPU in month 0. Magnitudes for peak declines are smaller for change in GDP (-0.22%) and change in private consumption (-0.09%). The effect of EPU on change in index of industrial production is statistically insignificant. To provide a measure of economic significance from Figure 4, note that the increase in EPU from the end of 2005 to the end of 2012 is 103 points (55 to 158). Because the standard deviation of EPU is forty points, the impact of increase in EPU on GDP growth over this period is -0.56% at six months. Similarly, the impact on one-year-ahead change on fixed investment is -1.36%. In other words, if the economic policy uncertainty in India were to decrease today to the level observed in 2005, India's GDP growth would increase by 0.56%, and fixed investment growth would increase by 1.36%. Overall, economic policy uncertainty significantly reduces future GDP growth, especially its fixed investment component.

A critical indicator of investment slowdown is the cost of projects stalled. The CAPEX database of CMIE provides quarterly data on this cost at the economy level for both private sector projects and government projects. Again, using the cubic spline we transform the monthly EPU into a quarterly series to align it with the cost data and examine how EPU impacts these costs. We expect that as EPU increases the stalled project costs should increase in the future because firms and the government are likely to hold off on spending in response to policy uncertainty. We use the VAR approach and estimate two bivariate VAR(6) models: EPU and

cost of projects stalled in the private sector (PRIVATE_STALL) and EPU and the cost of projects stalled in the government sector (GOVT_STALL).

Figure 5 reports impulse response functions for the two models. The X-axis ranges from quarter 1 through 12 relative to the initial shock in EPU. The unit responses are in millions of Rupees. Interestingly, a one-standard deviation increase in EPU causes the cost of stalled private sector projects to increase for five quarters after that shock. The cumulative increase at the end of the fifth quarter is over Rs. 100,000 million. A similar plot is reported for stalled government projects. The cost of stalled government projects increases for six quarters after the initial shock in EPU. The economic impact of EPU on government projects is more significant; at the sixth quarter point, the cost of stalled projects increases up to Rs. 200,000 million. Thus, EPU has a significantly more debilitating effect on stalled projects in the government sector.

Having examined the effect of EPU on economy-level output and investment, we turn to firm-level data to examine if EPU influences firm spending on capital expenditures. We do so by estimating panel regressions of capital expenditure rates on EPU and control variables. The sample consists of all NSE listed firms for the years 2002-2012 that have a March fiscal year end and with complete data for all regression variables on PROWESS. We exclude firm-years in which a firm changed its fiscal year and firm-years for which sales equals zero. Our final sample is a panel of 9,085 firm-year observations.

The dependent variable is defined as capital expenditure for year t (CAPEX) deflated by end of year t total assets. CAPEX is the sum of purchases of fixed assets and changes in the balance of capital work-in-progress. Our main independent variable of interest is EPU. Because data on CAPEX is available only annually, we compute an annual EPU defined as the average of monthly EPU for each of the years 2012-2013 (years are defined in terms of April-March twelve month periods). Consistent with prior literature on investment spending (Fazzari, Hubbard, and Petersen 1988), we include firm-level controls for growth opportunities and liquidity. Specifically, we include beginning of year t market-to-book ratio, defined as the ratio of Market Capitalization to Shareholder's Equity (MB) and year t operating cash flow from operations deflated by year t total assets (OCF).

We also include the annual GDP growth, obtained from the Central Statistical Organization, to control for economy-level influences on capital investment. Further, because, firms' investment is likely related to general economic uncertainty, we include the annual

average of the market-wide volatility index (VIX) obtained from www.nseindia.com. VIX is computed from monthly data and is based on the NIFTY Index Option prices. Both GDP growth and VIX are measured from April of year t-1 to March of year t. Lastly, we include two dummy variables for capturing the effect of the global financial crisis (CRISIS) and the effect of elections (ELECTION). CRISIS equals one for the years ended March 2008 and 2009, and zero otherwise. Durnev (2010) documents that firms around the world lower their investment levels during national election years. Consistent with this idea, we include ELECTION, a dummy that equals one for the years ended March 2004 and 2009, and zero otherwise. Our panel regressions account for firm fixed effects and standard errors are adjusted for heteroscedasticity and autocorrelation within each firm.

Table 4 reports the panel regression results. EPU has a negative and statistically significant effect on CAPEX; its t-statistic is -5.94. To provide an economic interpretation, we also report results with log-transformed values of CAPEX and EPU. The coefficient on log of EPU is -0.31 and its t-statistic is -4.65. Thus, a 10% increase in EPU is associated with a 3% drop in CAPEX. Because the average CAPEX for our sample (not tabulated) is 6.5%, this suggests that EPU has an economically important impact on CAPEX of Indian firms. As expected, MB, OCF, and GDP growth are all positively and significantly related to CAPEX. Interestingly, we find that CAPEX was on average higher by 0.011% in India during the global financial crisis. For a sample of global firms, Durnev (2010) reports that the impact of election years on investment ranges from -0.01% to -0.28%. For India, CAPEX was lower, on average, during the two election years (2004 and 2009) with the election effect equaling 0.01%, confirming the Durnev (2010) findings.

As a robustness check, we also estimate industry-level CAPEX regressions. We replace firm-level data for CAPEX / Assets, MB, and OCF with average values of CAPEX/Assets, MB, and OCF for each industry-year and retain the other independent variables from the firm-level regressions. Industry is defined based on the NIC code obtained from PROWESS. We include industry effects and account for heteroscedasticity and autocorrelation within each industry. The advantage of this specification is that standard errors are not contaminated by firm-level cross-correlations. The right panel of table 4 confirms the findings from the firm-level results. EPU is negatively and significantly related to Industry level CAPEX. In the log-version of the model,

the coefficient on EPU is -0.276, implying that a 10% increase in EPU is associated with a 2.7% decline in industry capital expenditure rates.

5. Cross-country Cumulative Impulse Responses of Economic Policy Uncertainty

As an additional analysis, we also examine whether EPU across counties affect each other. Figure 6 presents time series plots of monthly EPU values for India, the US, and China, and Europe. Monthly data for US EPU and China EPU are from www.policyuncertainty.com. Beginning 2008, India, China, and the US experience significant increase in EPU.

Given that China and US are India's largest trading partners, we examine whether EPU of these countries influences India's EPU, and vice-versa. To do so, we estimate VAR (6) models of (a) India EPU and US EPU and (b) India EPU and China EPU. Figure 7 plots the four impulse response functions from these models. The two plots at the top of Figure 7 document the relation between EPU shocks in US and India. India's EPU increases for six months subsequent to a shock to US EPU before leveling off; US EPU peaks at eight months after a shock to Indian EPU. In terms of magnitude, the peak response for both countries is about 7.8 points to a one-standard deviation increase to each other's EPU (Indian EPU standard deviation = 40 points; US EPU standard deviation is 44 points). In terms of statistical significance, the two-standard error intervals indicate that the Indian response to US EPU shocks is significance for eight months. Interestingly, the EPU response of US to an increase in Indian EPU remains significant for twenty-two months.

Turning to the Indo-Chinese policy uncertainty relations, the bottom two plots in Figure 7 indicate that the one standard deviation impact of an increase in Chinese EPU on Indian EPU peaks at five months and is 2.5 units at that point. Thus, policy uncertainty in India is more sensitive to shocks in the US economy compared to those in China. In contrast, Indian EPU impact on Chinese EPU impulse response is larger. It peaks at 14.6 units at six months and remains statistically significant for 14 months.

One possible explanation for the differences in EPU impulse response functions could be the ratio of a country's exports to GDP (scaled exports). For example if a significant part of country A's GDP is exported to country B, then country B's EPU will impact its own demand and the GDP of country A. Conversely, if country A does not export a significant part of its GDP to country B, then country B's EPU will not impact the GDP of country A. During the last ten

years India's scaled exports to the US is about twice as large as its scaled exports to China; this could potentially cause Indian EPU to be more sensitive to US EPU shocks compared to China EPU shocks.

6. Summary and Conclusions

Economic and political commentators in India have repeatedly noted their concern about the recent slow-down in the Indian economy. Several recent papers have provided evidence that increase in the economic policy uncertainty (EPU) has played a significant role in the slow-down and the increase in unemployment in the US. In this paper, we construct a measure of economic policy uncertainty for India and study its impact on the Indian economy. We find Indian GDP and Indian fixed investment are negatively related to EPU in India. More importantly, the economic magnitudes of these relations are quite significant. For example, if the economic uncertainty in India were to decrease today to the level observed in 2005, India's GDP growth would increase by 0.56%, and fixed investment growth would increase by 1.36%. Additionally, we document a negative correlation between the Bombay Stock Exchange (BSE) index and EPU in India, and a positive relation between the corporate cost of capital and EPU. Furthermore, these correlations are stronger during the recent financial crisis (2008-2009).

We corroborate our macro-level findings with evidence from panel regressions of firm-level capital expenditure rates on EPU and control variables. Our results suggest that a 10% increase in EPU is associated with a 3% drop in investment rates. We find similar results when we estimate these regressions with industry-level data. Thus, economic policy uncertainty significantly slows down investment at the economy, industry, and firm levels.

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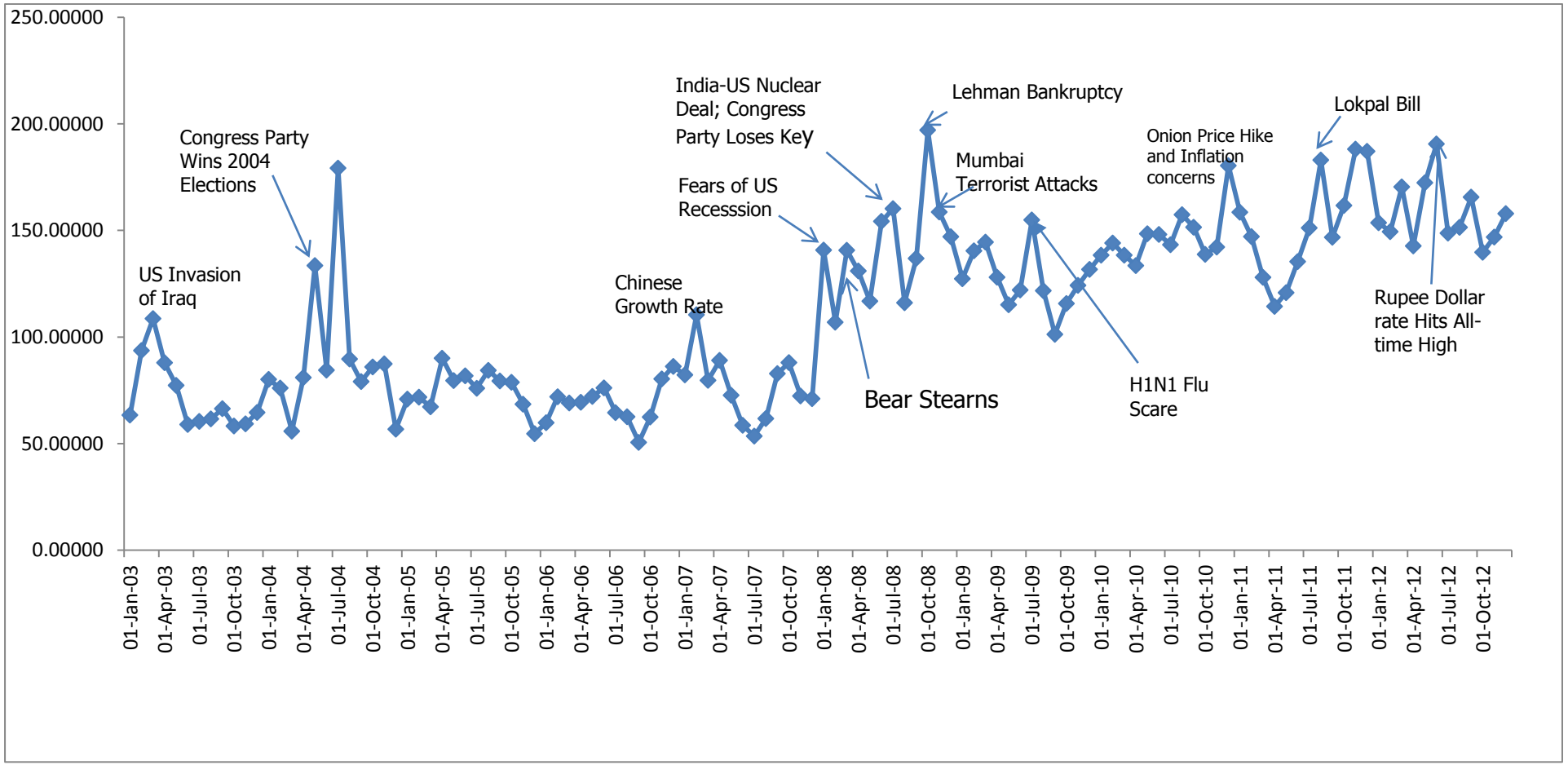
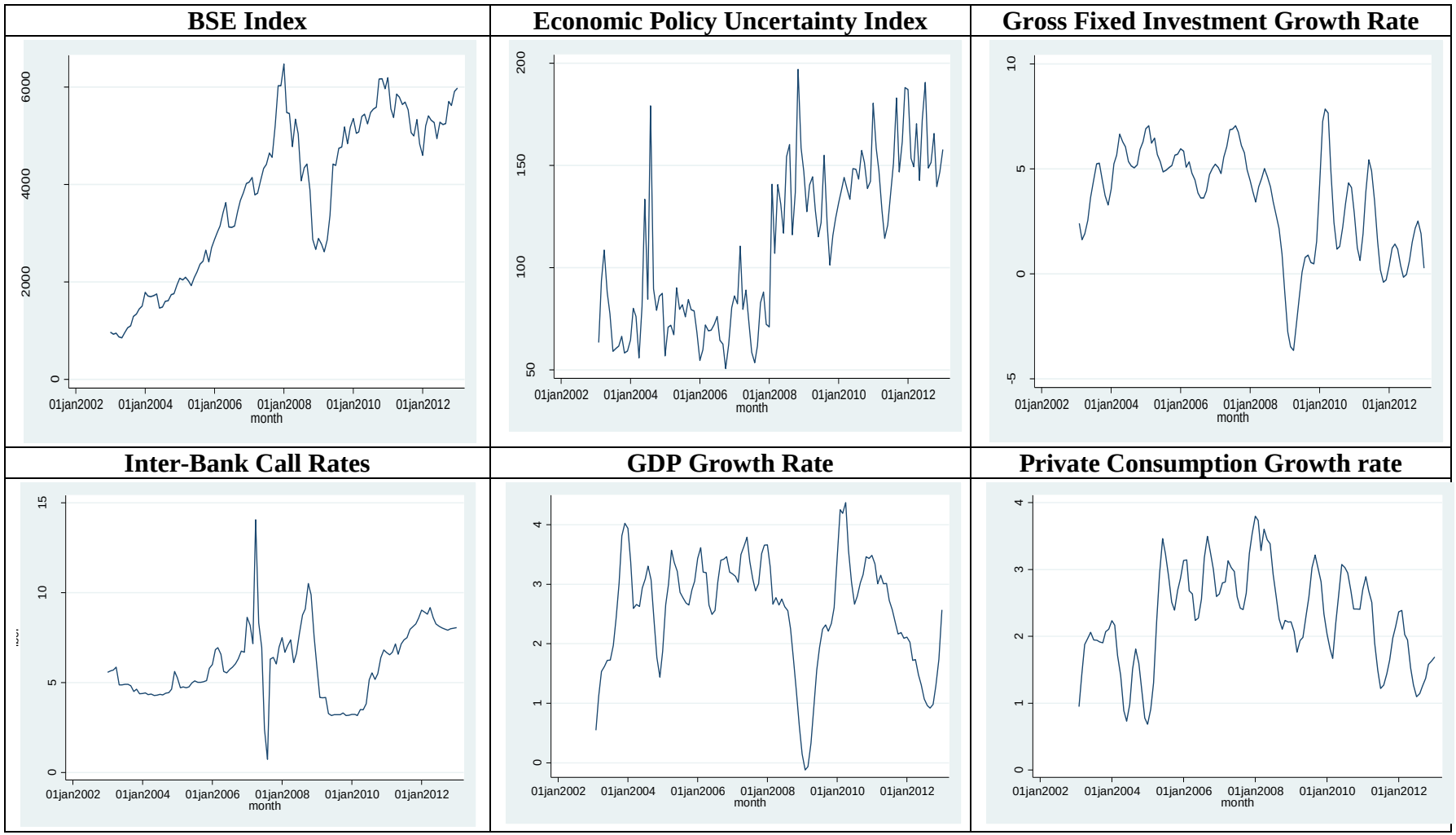
Figure 1. Economic Policy Uncertainty (EPU) Index for India, 2003 – 2012



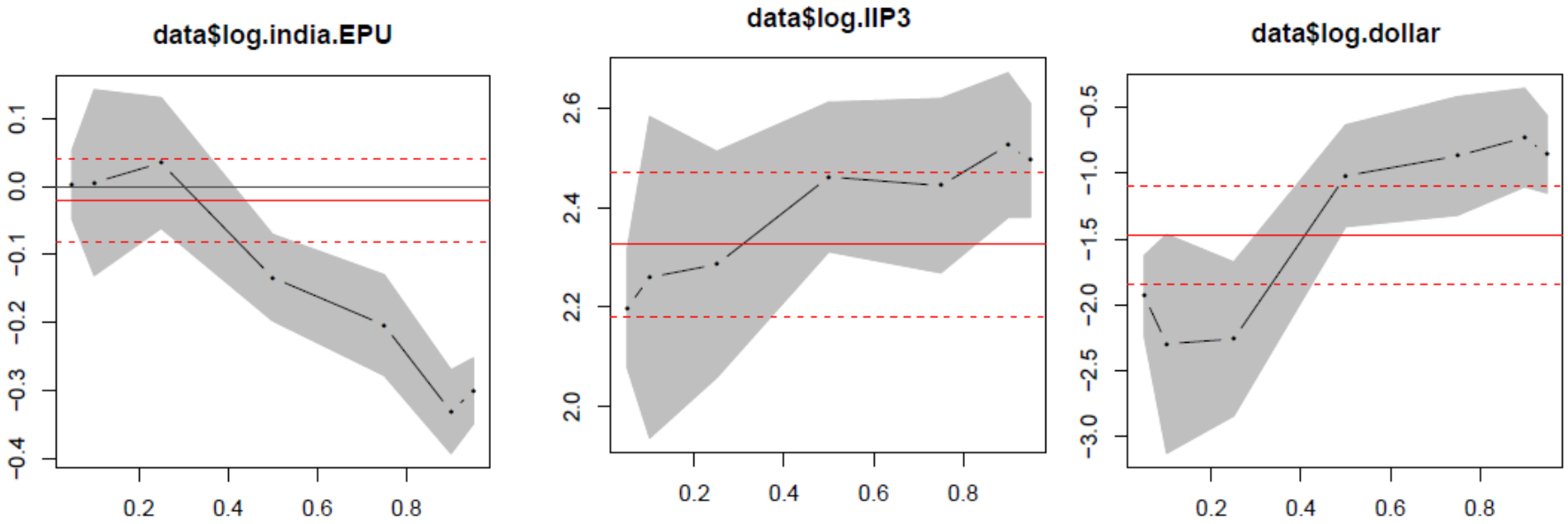
Index of policy-related economic uncertainty consists of two components: (a) monthly count of newspaper articles containing words such as uncertain, uncertainty, economic, or economy, as well as policy relevant terms (scaled by the total number of articles) and (b) the inter-quartile range on one year ahead monthly forecasts related to inflation and budget balance. We remove monthly fixed effects from both components and then normalize each component by its own standard deviation prior to January 2011. We combine the components using weights of 2/3 on the news-based policy uncertainty index and 1/6 on the forecast dispersion measures for inflation and budget balance. Further details are in section 2.

Figure 2. Time Series of Key Economic Indicators for India



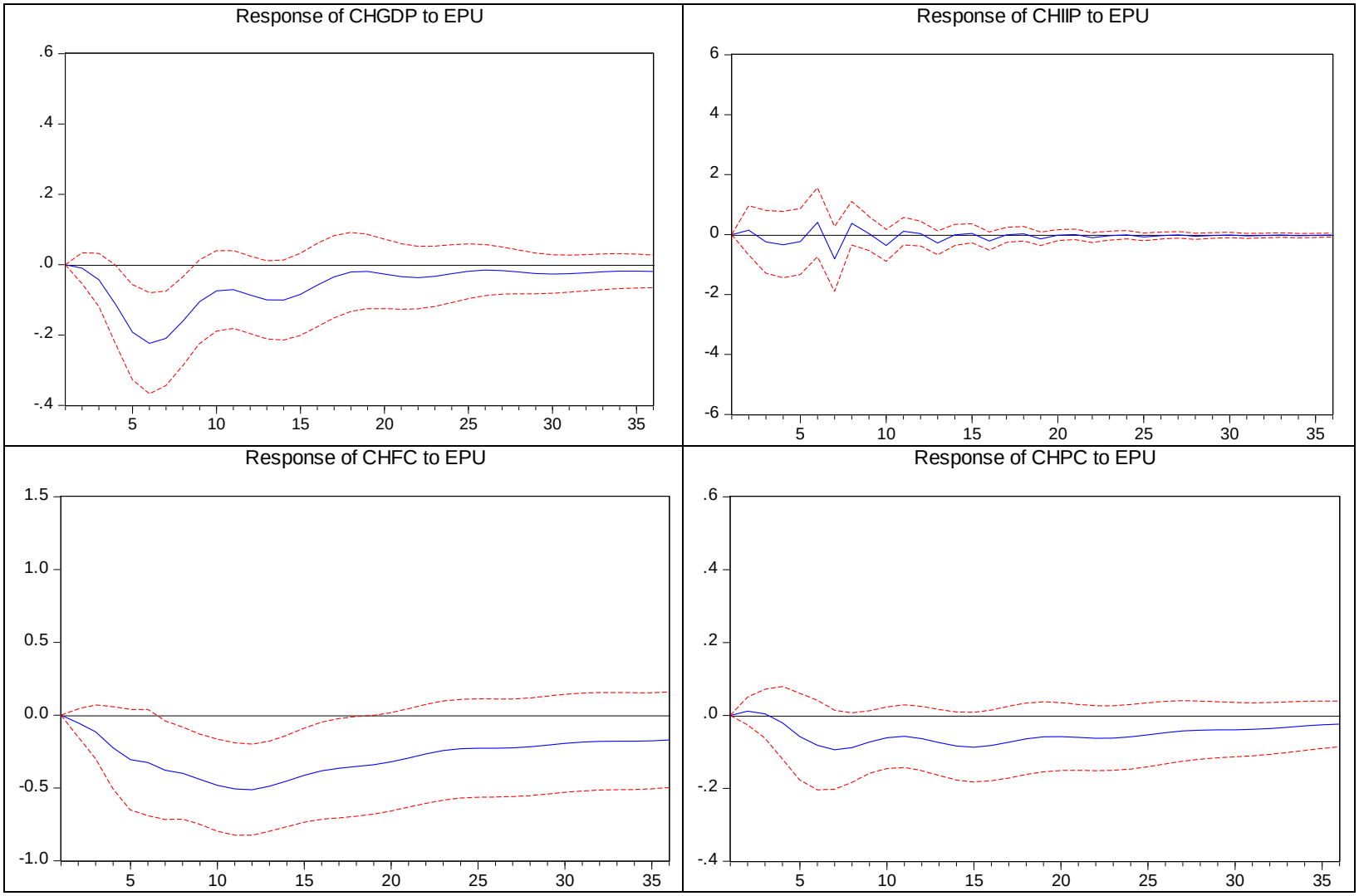
Monthly data for the Bombay Stock Exchange Sensex Index (BSE) are from www.bseindia.com. Inter-Bank call rates (IBCR) are from Reserve Bank of India's web site: http://dbie.rbi.org.in. The construction of the Economic Policy Uncertainty Index (EPU) is described under Figure 1. Quarterly data for growth in GDP (CHGDP), growth in Fixed Investment (CHFI), and growth in Private Consumption (CHPC) are from Central Statistical Organization, India. We use the cubic spline interpolation method to convert quarterly data of CHGDP, CHFI, and CHPC into monthly data.

Figure 3. Quantile Regressions of the Log of BSE Index on EPU, IIP, and EXCH



The x-axis of the left-most graph shows the quantile of the BSE Index for which the regression has been run (5th, 10th, 25th, 50th, 75th, 90th, and 95th). The dots = "." in the plot indicate the estimated values of the parameters at the different quantiles. The grey shaded areas mark the 95% credible intervals. The solid black line indicates the constant line at 0. The solid red line indicates the average value of the parameter estimate. Similar plots are provided for the effect of the Index of Industrial production and dollar-rupee rate on the log of the BSE Index (middle and right-most plots).

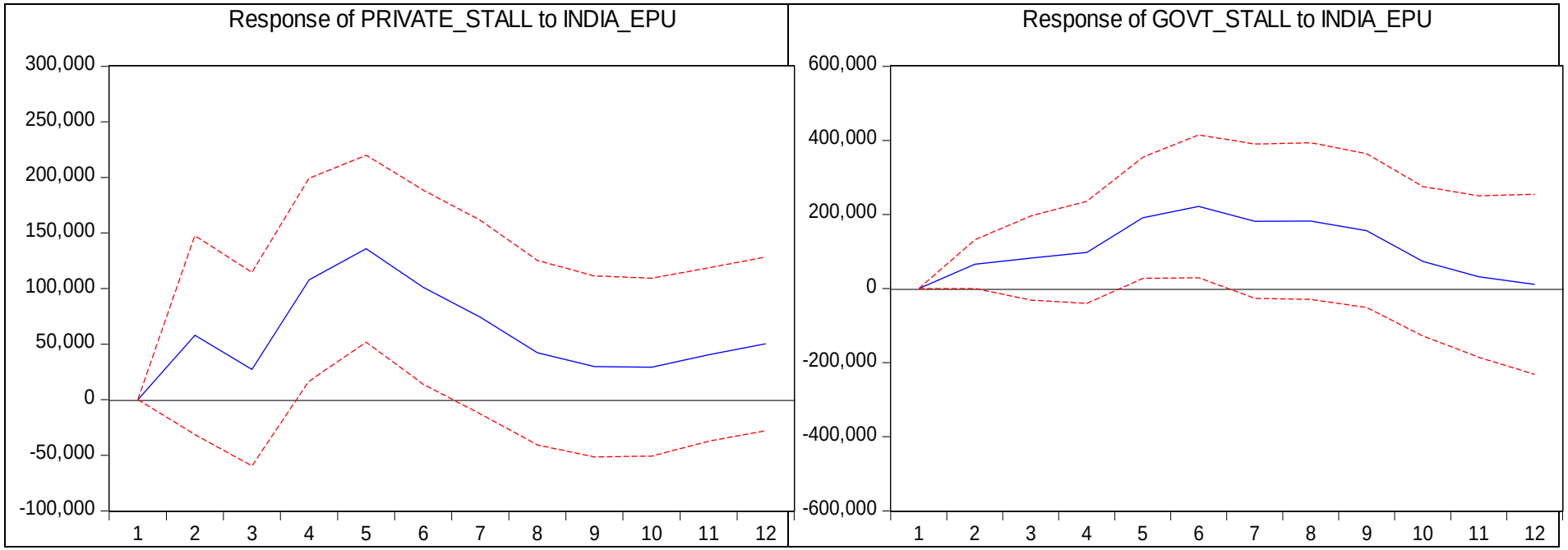
Figure 4: VAR (6) Models: Impulse Response Functions of GDP Growth (CHGDP), IIP Growth (CHIIP), Gross Fixed Investment Growth (CHFC), and Private Consumption Growth (CHPC) to an innovation in India EPU



The figure shows the impulse response of GDP Growth (CHGDP), IIP Growth (CHIIP), Gross Fixed Investment Growth (CHFC), and Private Consumption Growth (CHPC) to a one-standard deviation increase in Economic Policy Uncertainty (EPU). Impulse response functions are

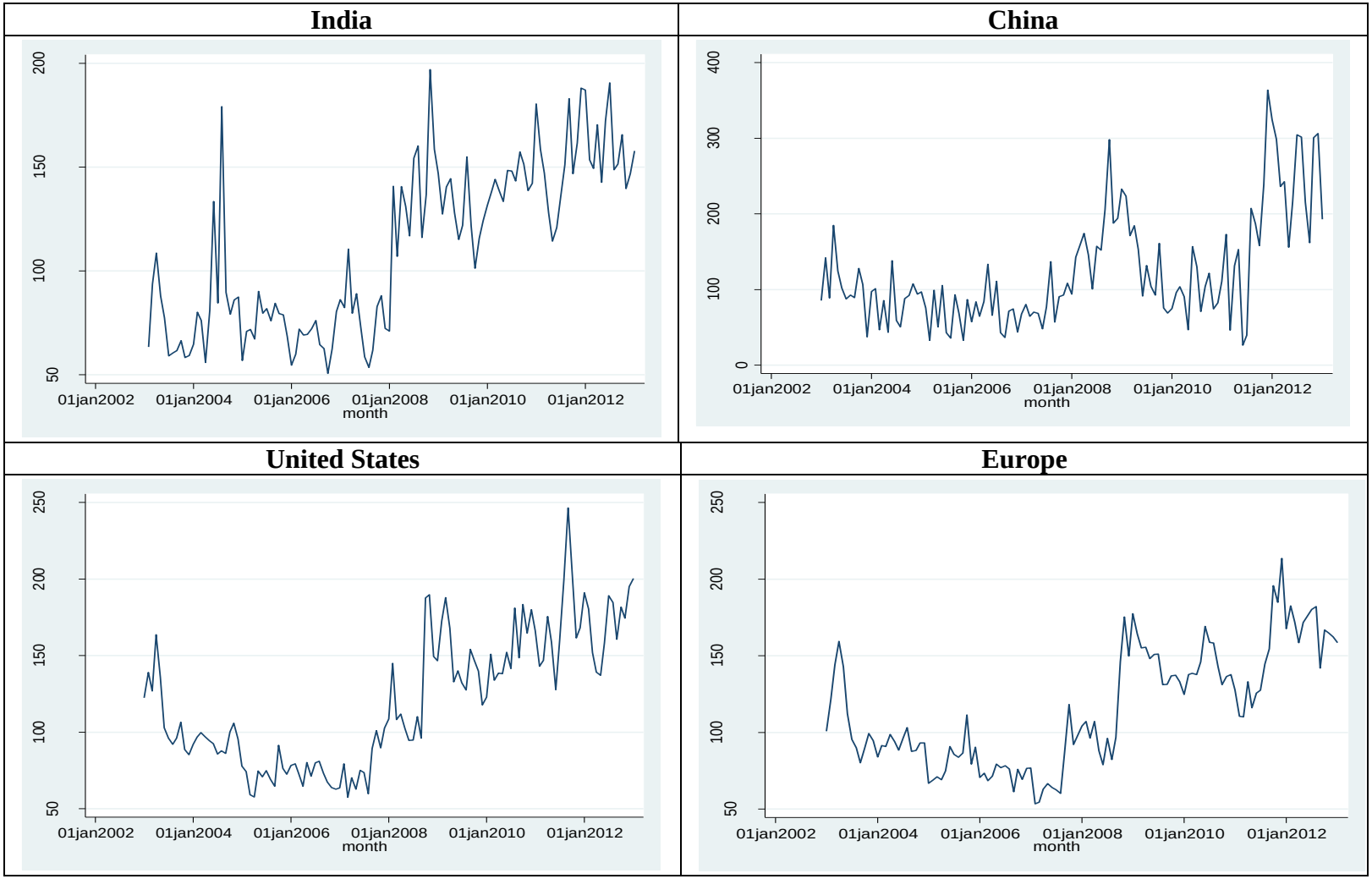
based on VAR(6) models of EPU and each of the four measures of macro-economic performance. The blue line represents the mean estimate and the red lines are plus/minus two standard error bands about the impulse responses. The horizontal axis is in months.

Figure 5. VAR (6) Models: Impulse Response Functions of Cost of Stalled Projects (Private and Government Sector) to an innovation in India EPU



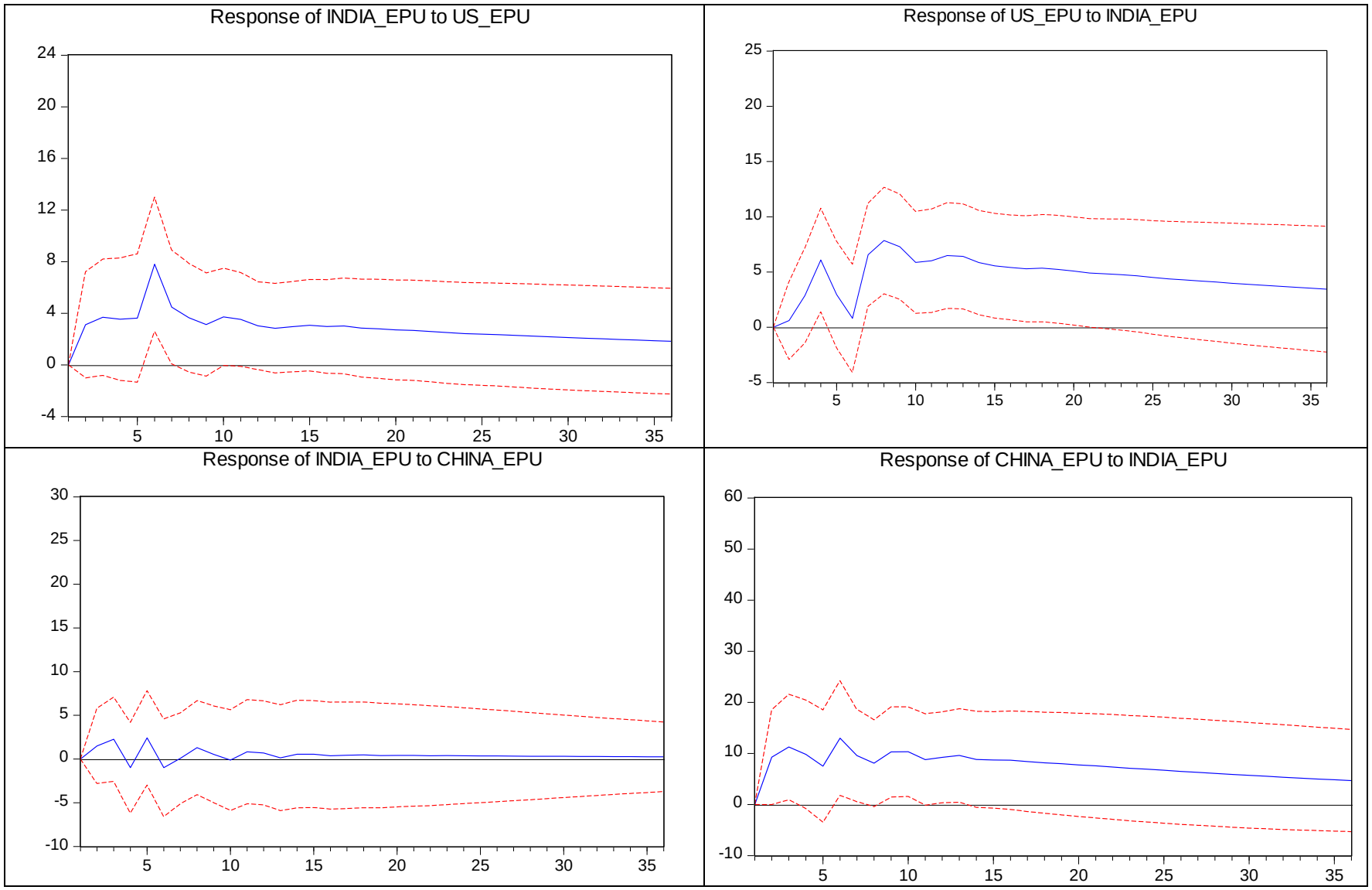
The figure shows the impulse response of cost of stalled projects in the private sector and government sector to a one-standard deviation increase in Economic Policy Uncertainty (EPU). Impulse response functions are based on VAR(6) models of EPU and each of the two measures of stalled projects costs. The blue line represents the mean estimate and the red lines are plus/minus two standard error bands about the impulse responses. The horizontal axis is in quarters. The data on cost of stalled projects are from the CAPEX database of the Centre for Monitoring Indian Economy Pvt. Ltd (CMIE). Costs are measured in millions of Rs.

Figure 6. Comparison of Time Series of Economic Policy Uncertainty Indexes: India, China, US, and Europe



The construction of the Economic Policy Uncertainty Index is described under Figure 1. The details for the construction of the economic policy uncertainty index for US, China, and Europe are reported in http://www.policyuncertainty.com

Figure 7. VAR (6) Models: Impulse Response Functions of India EPU to and on US EPU and China EPU



We estimate VAR(6) models of EPU for two country pairs: India and the US, and India and China. The top two graphs show the impulse response of EPU of India to a one-standard deviation increase in the EPU of US and vice-versa. Similarly the bottom two graphs show the impulse responses of India's EPU to China's EPU, and vice-versa. The blue line represents the mean estimate and the red lines are plus/minus two standard error bands about the impulse responses. The horizontal axis is in months.

Table 1. Descriptive Statistics (Monthly data)

	Mean	Median	Max	Min.	Std. Dev.	# of obs.
Economic Policy Uncertainty Index (EPU)	110.93	112.42	197.08	50.60	40.02	120
% Change in EPU (CHEPU)	3.00%	1.74%	112.17%	-49.96%	22.88%	119
BSE Index (BSE)	3808.91	4079.10	6469.48	852.78	1653.071	121
% Change in BSE Index (CHBSE)	1.85%	1.59%	31.29%	-25.97%	8.04%	120
Inter Bank Call Rate (IBCR)	5.98%	5.79%	14.07%	0.73%	1.98%	121
Index of Industrial Production (IIP)	283.11	294.81	407.63	174.00	63.11	121
% Change in IIP (CHIIP)	0.75%	0.36%	14.94%	-14.11%	5.78%	120
GDP	4049.78	3695.60	7762.51	1918.33	1580.41	111
GDP Growth rate (CHGDP)	1.30%	1.61%	11.39%	-11.03%	5.33%	110
Gross Fixed Investment Growth Rate (CHFI)	3.55%	4.15%	7.86%	-3.64%	2.50%	120
Private Consumption Growth Rate (CHPC)	2.28%	2.27%	3.80%	0.68%	0.73%	120
Rupee-Dollar Rate (EXCH)	46.06	45.52	56.03	39.37	3.56	121
% Change in Rupee-Dollar Rate (CHEXCH)	0.13%	-0.16%	6.79%	-4.27%	1.98%	120

The construction of the Economic Policy Uncertainty Index (EPU) is described under Figure 1. Monthly data for the Bombay Stock Exchange Sensex Index (BSE) are from www.bseindia.com. Monthly Inter-Bank Call Rates (IBCR), Index of Industrial Production (IIP), and Rupee-Dollar Rates (EXCH) are from Reserve Bank of India's web site: http://dbie.rbi.org.in. Quarterly data for growth in GDP, growth in Fixed Investment, and growth in Private Consumption are from Central Statistical Organization, India. We use the cubic spline interpolation method to convert quarterly data into monthly data. All change series are computed as percentage changes between adjacent months.

Table 2. Univariate Correlations

	EPU	CHEPU	BSE	CHBSE	IBCR	IIP	CHIIP	GDP	CHGDP	CHFI	CHPC	EXCH
EPU												
CHEPU	0.300											
BSE	0.519	-0.022										
CHBSE	-0.345	-0.323	-0.053									
IBCR	0.263	0.033	0.270	-0.258								
IIP	0.726	-0.030	0.902	-0.175	0.335							
CHIIP	-0.019	-0.059	0.035	0.061	0.127	0.146						
GDP	0.777	-0.035	0.825	-0.157	0.319	0.951	0.054					
CHGDP	0.030	0.013	0.070	0.058	0.111	0.118	0.647	0.100				
CHFI	-0.556	0.044	-0.188	0.012	-0.062	-0.402	0.036	-0.477	0.006			
CHPC	-0.056	-0.065	0.415	0.041	0.177	0.247	0.075	0.093	0.103	-0.054		
EXCH	0.409	-0.082	-0.162	0.028	-0.044	0.129	0.053	0.312	0.054	-0.672	-0.336	
CHEXCH	0.351	0.162	-0.001	-0.471	0.241	0.118	0.114	0.129	0.095	-0.229	-0.011	0.198

The construction of the Economic Policy Uncertainty Index (EPU) is described under Figure 1. Monthly data for the Bombay Stock Exchange Sensex Index (BSE) are from www.bseindia.com. Monthly Inter-Bank Call Rates (IBCR), Index of Industrial Production (IIP), and Rupee-Dollar Rates (EXCH) are from Reserve Bank of India's web site: http://dbie.rbi.org.in. Quarterly data for growth in GDP, growth in Fixed Investment, and growth in Private Consumption are from Central Statistical Organization, India. We use the cubic spline interpolation method to convert quarterly data into monthly data. All change series are computed as percentage changes between adjacent months.

Table 3. Key Economic Indicators and Economic Policy Uncertainty (EPU)

Panel A: Dependent Variable: Log BSE Index

	(1)		(2)		(3)		(4)	
	Coef.	**t-stat.**	**Coef.**	**t-stat.**	**Coef.**	**t-stat.**	**Coef.**	**t-stat.**
Log EPU	-0.27	-3.05	-0.37	-3.83	-0.20	-2.40	-0.33	-2.93
Log IIP	2.54	16.93	2.12	11.60	2.51	16.18	2.15	10.60
Log Dollar-Rupee rate	-1.28	-7.37	-1.43	-6.91	-1.31	-6.98	-1.40	-6.66
Log CP Index			0.69	2.74			0.60	2.03
Crisis Dummy					1.16	3.75	0.79	2.16
Log EPU × Crisis Dummy					-0.56	-3.74	-0.37	-2.07
# of obs.		120		120		120		120
Adjusted R^2		90.8%		91.6%		91.3%		91.7%

Panel B: Dependent Variable: Change in Log BSE Index

	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Log EPU	-0.09	-3.52	-0.10	-3.57	-0.07	-3.93	-0.08	-3.51
Log IIP	0.03	0.92	0.02	0.42	0.01	0.29	0.002	-0.05
Log Dollar-Rupee rate	0.07	1.95	0.10	2.08	0.08	1.88	0.10	1.91
Inflation			0.001	1.01			0.001	0.81
Crisis Dummy					0.70	2.75	0.69	2.58
Log EPU × Crisis Dummy					-0.33	-2.76	-0.33	-2.60
# of obs.		120		120		120		120
Adjusted R^2		12.6%		11.0%		16.3%		16.3%

Panel C: Dependent Variable: Inter Bank Call Rates

	Levels		Log levels	
	Coef.	t-stat.	Coef.	t-stat.
EPU	0.02	2.66	0.34	2.33
Crisis Dummy	-6.15	-2.81	-2.18	-2.59
EPU × Crisis Dummy	0.04	2.72	0.98	2.53
Change in CPI	4.22	6.43	0.09	0.33
# of obs.		120		120
Adjusted R^2		16.1%		14.5%

The construction of the Economic Policy Uncertainty Index (EPU) is described under Figure 1. Monthly data for the Bombay Stock Exchange Sensex Index (BSE) are from www.bseindia.com. Monthly Inter-Bank Call Rates (IBCR), Index of Industrial Production (IIP), and Rupee-Dollar Rates (EXCH) are from Reserve Bank of India's web site: http://dbie.rbi.org.in. * means significant at the 1% level of significance, and ** means significant at the 5% level of significance, and *** means significance at the 10% level. All t-statistics are based on Newey-West standard errors.

Table 4. Effect of EPU on Annual Capital Expenditures Deflated by Total Assets

	Firm-level Regressions				Industry-level Regressions			
Dependent Variable:	CAPEX / Assets		Log (CAPEX/ Assets)		CAPEX / Assets		Log (CAPEX/ Assets)	
	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.	Coef.	t-stat.
Intercept	0.035	1.36	-3.30	-5.07	0.102	2.52	-2.18	-2.22**
EPU	-0.0002	-5.94*			-0.0003	-3.93*		
LOG (EPU)			-0.311	-4.65*			-0.276	-2.72*
MB (t-1)	0.003	5.16*	0.042	5.37*	0.0001	0.47	-0.003	-0.047
OCF	0.035	3.93*	0.451	2.80*	0.023	1.23	0.179	0.52
GDP Growth	0.003	9.66*	0.073	10.59*	0.004	7.65*	0.087	8.01*
VIX	0.002	1.10	0.045	1.85***	-0.003	-1.22	-0.024	-0.65
Crisis Dummy	0.011	5.50*	0.203	5.87*	0.011	3.16*	0.218	3.51*
Election Dummy	-0.010	-6.25	-0.146	-5.07*	-0.008	-3.38*	-0.098	-2.36**
Adjusted R-squared		6.97%		7.50%		5.92%		5.66%
# of obs		9,085		8,451		2118		2061

The sample consists of all NSE listed firms for the years 2002-2012 that have a March fiscal year end and with data for all regression variables on PROWESS. We exclude firm-years in which a firm changed its fiscal year and firm-years for which sales equals zero. For the firm-level regressions, the dependent variable is capital expenditure for year t (CAPEX) deflated by end of year t total assets, or its logarithmic value. CAPEX is the sum of purchases of fixed assets and changes in the balance of Capital Work in progress. The construction of the Economic Policy Uncertainty Index (EPU) is described under Figure 1. Because firm-level data on capital expenditure (CAPEX) is available only at the annual level, we compute the average EPU for each of the years 2012-2013 (years are defined in terms of April-March 12 month periods). MB is the ratio of Market Capitalization to Shareholder's Equity at the beginning of year t. OCF is year t operating cash flow from operations deflated by year total assets. Annual GDP growth is from the Central Statistical Organization. The Crisis dummy equals one for the years ended March 2008 and 2009, and zero otherwise. Election Dummy equals one for the years ended March 2004 and 2009, and zero otherwise. VIX is the annual

average volatility index computed from monthly data; it is based on the NIFTY Index Option prices and is obtained from http://www.nseindia.com. For industry level regressions, we replace firm-level data for CAPEX / Assets, MB, and OCF with average values of CAPEX/Assets, MB, and OCF for each industry-year. Data for CAPEX, total assets, MB, and OCF are from the PROWESS Database of the Centre for Monitoring Indian Economy Private Limited (CMIE). Industry is defined based on the NIC code obtained from PROWESS. Firm-level (Industry-level) regressions include firm (industry) fixed effects and standard errors are adjusted for clustering by firm (industry). * means significant at the 1% level of significance, and ** means significant at the 5% level of significance, and *** means significance at the 10% level.