

GOODS AND SERVICES TAX AND ECONOMIC UNCERTAINTY: EVIDENCE FROM INDIA'S MANUFACTURING AND SERVICES SECTORS

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Article History

Received: 2026-07-16

Revised: 2026-09-21

Accepted: 2026-10-12

Published: 2026-10-24

Abstract

The Goods and Services Tax (GST) introduced in July 2017 was a major shift in India's indirect tax regime. It replaced multiple taxes with a single tax structure to increase efficiency, reduce cascading effects and integrate the national market. However, the introduction of GST occurred during a period of high economic policy uncertainty, which raised questions about the overall macroeconomic effects of the reform and whether different sectors would respond differently to uncertainty shocks. This study studies how Economic Policy Uncertainty (EPU) affects sectoral performance in India, focusing on the manufacturing and services sectors before and after the implementation of GST. This study uses monthly time series data from April 2012 to March 2024 and employs a Vector Auto Regression (VAR) framework. The Index of Industrial Production (IIP) and the Nifty Services Sector Index (Nifty_Serv) are used as the main endogenous variables. The Consumer Price Index, call money rate and exchange rate are included as exogenous controls to control for macroeconomic factors that influence sectoral behavior. Impulse Response Functions (IRF) and Granger causality tests are used to measure and analyze the response of each sector to EPU shocks. The quantitative results show that after the implementation of GST, the services sector has a more rapid, larger and more negative reaction to policy uncertainty than prior to the implementation of GST. This is demonstrated by larger fluctuations and longer-lasting negative reactions to uncertainty impulses. On the other hand, during the same period, the manufacturing sector has smaller, delayed and less consistent reactions. Therefore, the results demonstrate that uncertainty is transmitted differently across industries. After the implementation of GST, the services sector is more sensitive and volatile than the manufacturing sector.

Keywords: Goods and Services Tax (GST); Economic Policy Uncertainty (EPU); Vector Auto Regression (VAR); Impulse Response Function (IRF); Index of Industrial Production (IIP); Nifty Services Sector Index.

1. Introduction

The implementation of the Goods and Services Tax (GST) in July 2017 represented a major change in the structure of indirect taxation in India. The goal of GST was to consolidate a fragmented and multi-layered tax system into a single system that would increase tax efficiency, eliminate cascading effects and facilitate cross-border trade. The introduction of GST, however, coincided with the era of high macroeconomic policy uncertainty, thus reigniting the quest to grasp the interaction between major fiscal reforms and other macroeconomic conditions arising from the policy ambiguity. Numerous theoretical and empirical studies have confirmed that policy uncertainty has the potential to affect industrial activity, investment, industrial output and market volatility. Research suggests that uncertainty shocks can result in firms postponing investments and/or changing their pricing and output policies, which can have different impacts on different sectors depending on their sensitivity to regulatory change. Uncertainty associated with reform has been

shown to have an impact on cyclical fluctuations and to be different across sectors, particularly if reforms change compliance costs or other operating costs. From an economic theory perspective, economic uncertainty may lead to differential industry responses, since industries vary with respect to their flexibility and cost structures, as well as their information-processing capacity. The empirical evidence from around the world suggests that sectors have different responses to uncertainty: manufacturing sectors tend to react slowly with production rigidities, while the services sector reacts fast to informational shocks and/or regulatory shocks. In addition, macroeconomic variables, like prices, interest rates and exchange rates, induce uncertainty via the demand, credit and investment channels. These studies offer a tentative picture that the connection between fiscal reforms and uncertainty is flexible and asymmetric between sectors of the economy. The objective of this study is then to investigate the empirical impact of EPU on the manufacturing and services sectors in India pre and post the implementation of GST in India on the basis of a Vector Auto Regression (VAR) framework.

Literature Review

The dynamics of fiscal reform and macroeconomic outcomes have been a persistent topic in economic literature, especially in developing countries in transition. Policy uncertainty is an important pathway for macroeconomic shocks to ripple through, with large scale policy changes, like indirect tax policy changes, having significant impacts on business expectations, investment decisions and sectoral dynamics. In this environment, uncertainty may affect real activity as well as financial activity by impacting expectations for future economic conditions by firms. Theories about policy uncertainty have their origins in theories about the response of firms to irreversible investment decisions. The uncertainty creates the option value of waiting, with the effect of delaying production adjustments and investment. The first to show that the irreversibility of investments causes firms to defer decisions in uncertain policy environments and to cause cyclical slowdowns was Bernanke (1983). Subsequent elaborations of these concepts reveal that uncertainty has an impact on investment timing, credit allocation, pricing patterns and the speed of industrial activity. Uncertainty and recession can reinforce each other and influence the volatility of output in different sectors as the general macroeconomic literature suggests. In a similar extension, Aizenman and Marion (1991) analyzed 46 developing countries, and concluded that there was a negative relationship between policy uncertainty and GDP growth. Empirical findings from developing economies are often conclusive that policy instability, particularly in the tax and fiscal policy arena, has an impact on capital inflows, industrial productivity, and growth potential. Hermes and Lensink (2001) noted that unstable tax; and fiscal budgetary play an important role in capital flight in developing economies. Later, Bachmann et al. (2010) found that uncertainty and economic downturns feed off each other and intensify cyclical downturns. The vagaries of the regulatory climate appear to have a negative impact on investor confidence and introduce demand and supply side risk. Industries have different degrees of sensitivity to sectoral policy shocks depending on their structural characteristics such as compliance costs, information needs, production inflexibility. Services industries are more sensitive to uncertainty, due to their close relationship to market expectations, whereas manufacturing industries are slower to respond to uncertainty, due to operational matters. Because of the ambiguity of these frameworks, the option value of delaying investments and production adjustments increases, and firms delay production adjustments and investments. Later developments of these ideas show that uncertainty affects interest rates, distribution of credit and the amount of industrial activity. The macroeconomic literature shows that uncertainty and recessions feed on each other, influencing the volatility of output in different sectors and driving business cycles. In the Indian scenario, the impact of uncertainty on important macroeconomic variables like investment, output and performance of the markets has long been demonstrated. Study of the different stages of transition in India suggests that fiscal reforms such as the Goods and Services Tax (GST) have changed the nature of tax compliance structures and pricing mechanisms, adding to the uncertainty. In the light of the sectoral evidence, there is a need to accept that there are asymmetric impacts on different industries; some are more volatile during the implementation of GST. According to Bhagat et al. (2013) the results reveal that policy uncertainty has a negative impact on the important macroeconomic metrics such as GDP and fixed investment. Anand and Tulin (2014) also found that policy uncertainty and loss of business confidence were also important factors, rather than monetary, in explaining the slowdown in investment in India prior to 2013–14. All the results point to the fact that a foreseeable and clear policy setting is vital for investor confidence and continued long-term development. Recent studies indicate that the uncertainty surrounding the implementation of GST persists, having affected

market and industrial behavior, especially in the service industry. The implications of GST for more than just the economy have been subject of recent studies. Vij (2018) discussed administrative challenges and the need for institutional preparedness during implementation, while Shukla and Kushare (2017) the structural aspects of the Goods and Services Tax (GST) were analyzed, and simplification was recommended to enhance compliance. Singh (2017) positioned GST as a game-changing reform for both producers and consumers, though his arguments were largely conceptual. To find out the sectoral asymmetries in the effect of Goods and Service Tax (GST), Chauhan et al. (2019) used non-parametric tests, finding that some sectors saw volatility rise. In a related study, Samantara (2018) considered Impact of GST on the macro-economic variables and recommended for increased stability at the time of transition. Later studies by John & Dhannur (2019) suggest that after the introduction of GST, the policy uncertainty in India has its impact on equity markets and the performance of industries, with the sensitivity of the services sector. Reddy et al. (2019) studied the effect of macroeconomic announcements on the volatility in Financial markets. Together, these studies have established the theoretical basis for the study of uncertainty transmission in post-reform economy. To sum up, it has been observed that the theoretical and empirical literature reviewed confirms that policy uncertainty has a negative impact on investment cycles, sectoral performance and macroeconomic stability, particularly in economies facing significant fiscal transitions. There is, however, sparse evidence to examine these dynamics systematically through econometric modelling in the Indian context of a GST regime.

This study aims to investigate the impact of Economic Policy Uncertainty (EPU) on the manufacturing and services sectors in India during the pre- and post-GST periods by employing a Vector Auto Regression (VAR) approach.

Hypotheses:

H₁: Economic Policy Uncertainty has a significant negative impact on the performance of India's services sector in the post-GST period.

H₂: Economic Policy Uncertainty has no consistent or significant impact on the manufacturing sector following GST implementation.

H₃: The transmission of policy uncertainty differs asymmetrically between the services and manufacturing sectors in the post-GST context.

Data and Methodology

The dataset analyzed covers the period from April 2012 to March 2024, including periods before and after the implementation of the Goods and Services Tax (GST) on July 1, 2017. The first draft of the GST legislation was made available to the public on June 14, 2016. Data on the Economic Policy Uncertainty (EPU) Index for India was obtained from www.policyuncertainty.com. Data on the Index of Industrial Production (IIP), call money rate (used as a proxy for short-term interest rates), Consumer Price Index (CPI) and exchange rate were obtained from the Reserve Bank of India's Database on Indian Economy. The Nifty Services Sector Index (Nifty_Serv) was obtained from the National Stock Exchange (NSE) website. A Vector Auto Regression (VAR) model was used for analysis. In this model, EPU, IIP and Nifty_Serv are treated as endogenous variables; whereas CPI, call rate and exchange rate are treated as exogenous variables. The IIP is used as a measure of manufacturing sector output; reflecting both production volume and revenue. Nifty_Serv is used as a proxy for the services sector; reflecting investor sentiment and economic conditions. The main goal of the VAR analysis is to estimate how the performance of industrial and services sectors is affected by index shocks in EPU.

The VAR approach is especially suitable for studying the interdependent dynamics among multiple time series variables. This model allows all endogenous variables to affect each other over time; with these relationships represented by the variance-covariance structure of the residuals. Interrelationships are further analyzed using Impulse Response Function (IRF) analysis; which tracks the dynamic effects of shocks to individual variables within the system. To determine the optimal lag length for the VAR model; three commonly used selection criteria were employed in the R programming environment: Schwarz's Bayesian Information Criterion, Akaike Information Criterion and Hannan-Quinn Criterion. Although these criteria indicated that a lag of one was statistically optimal; the final VAR model was estimated using two lags. This decision was made to better capture dynamic interrelationships and account for potential lagged effects of

shocks; given the macroeconomic context. Each endogenous variable—Economic Policy Uncertainty, Index of Industrial Production and Nifty Services Sector Index—was regressed on its own two lags and the lags of the other endogenous variables. The model also includes three exogenous variables: Consumer Price Index, call rate and exchange rate. The standard form of the VAR equations; with a two-month lag interval for each term; is shown below.

Each lag interval denotes one month.

$EPU = EPU.I1 + IIP.I1 + Nifty_Serv.I1 + EPU.I2 + IIP.I2 + Nifty_Serv.I2 + const + CPI, Call\ Rate, Exchange\ Rate$

$IIP = EPU.I1 + IIP.I1 + Nifty_Serv.I1 + EPU.I2 + IIP.I2 + Nifty_Serv.I2 + const + CPI, Call\ Rate, Exchange\ Rate$

$Nifty_Serv = EPU.I1 + IIP.I1 + Nifty_Serv.I1 + EPU.I2 + IIP.I2 + Nifty_Serv.I2 + const + CPI, Call\ Rate, Exchange\ Rate$

In each equation, the current value of the dependent variable is modeled as a function of its own lagged values, the lagged values of other endogenous variables, and three exogenous macroeconomic indicators.

In each equation; the current value of the dependent variable is modeled as a function of its own lagged values; the lagged values of other endogenous variables; and three exogenous macroeconomic indicators.

Each variable was tested for stationarity using the Augmented Dickey-Fuller test. The detailed results of these tests are presented in the analysis and results section. Subsequently; a Vector Auto Regression (VAR) model was estimated with all relevant variables. If the estimated coefficients were statistically significant; the unrestricted model was retained. When several coefficients were insignificant; a restricted VAR model was developed by removing those terms to increase robustness. Regardless of model specification; multiple diagnostic tests were performed to assess statistical robustness. These included the ARCH-LM test for heteroscedasticity; the serial correlation test for autocorrelation in the residuals; and the Jarque-Bera test for normality of residuals. These assessments verified the model's stability and reliability. Once the model passed diagnostic requirements; it was used to produce orthogonal Impulse Response Functions (IRFs). The IRF method; compared to Forecast Error Impulse Response (FEIR) analysis; provides a better understanding of how endogenous variables respond dynamically to isolated shocks over time; while accounting for contemporaneous correlations among error terms.

In this study; the IRF analysis assesses how the Index of Industrial Production and the Nifty Services Sector Index respond over time to unexpected changes in the Economic Policy Uncertainty index. This method allows for a detailed understanding of the direction and timing of these responses. To supplement the findings from the IRF analysis; Granger causality tests were performed to determine the directional relationships among the variables.

Analysis and Results

Before constructing the VAR model, all variables were assessed for stationarity.

Variables were differenced, if necessary, to make them stationary to conduct the time series analysis. Each of the time series was tested for stationarity using an augmented Dickey-Fuller (ADF) test. These results are shown in Table 1.

Table: 1. Augmented Dickey-Fuller Test Results

Variable	t-Statistic	Critical Value (1%)	Critical Value (5%)	Critical Value (10%)	p-Value	ADF Conclusion
CALL_RATE	-9.115706	-3.469933	-2.878829	-2.576067	0.0000	Stationary at level (Reject H_0 at 1%)
CPI	-7.842597	-3.478547	-2.882590	-2.578074	0.0000	Stationary at level (Reject H_0 at 1%)
EPU	-10.782700	-3.477487	-2.882127	-2.577827	0.0000	Stationary at level (Reject H_0 at 1%)
EXCHANGE_RATE	-12.496330	-3.476805	-2.881830	-2.577668	0.0000	Stationary at level (Reject H_0 at 1%)

						at 1%)
IIP	-16.677450	-3.476805	-2.881830	-2.577668	0.0000	Stationary at level (Reject H ₀ at 1%)
NIFTY_SERVICE	-12.953830	-3.476805	-2.881830	-2.577668	0.0000	Stationary at level (Reject H ₀ at 1%)

Note: Author's calculations using E-views

The Augmented Dickey-Fuller (ADF) test was used to determine the stationarity of each time series.

Table: 2. VAR Estimation Results

Estimation results for equation EPU:

Variable	Coefficient	Std. Error	t-Statistic	Significance
EPU(-1)	-0.379299	0.08591	-4.41527	***
EPU(-2)	-0.193312	0.08397	-2.30211	**
IIP(-1)	-0.003117	0.00281	-1.10740	-----
IIP(-2)	0.000491	0.00255	0.19281	-----
NIFTY_SERVICE(-1)	-1.056998	0.51003	-2.07243	**
NIFTY_SERVICE(-2)	-0.930240	0.48373	-1.92306	*
CALL_RATE	-0.106836	0.55971	-0.19088	-----
CPI	0.136851	0.60149	0.22752	-----
EXCHANGE_RATE	1.456238	1.39026	1.04746	-----
C (Constant)	0.016964	0.02481	0.68372	-----

Note: Author's calculations using E-views

Estimation results for equation IIP:

Variable	Coefficient	Std. Error	t-Statistic	Significance
EPU(-1)	-7.163282	2.57879	-2.77777	***
EPU(-2)	2.538730	2.52071	1.00715	-----
IIP(-1)	-0.305864	0.08448	-3.62035	***
IIP(-2)	-0.217677	0.07640	-2.84914	***
NIFTY_SERVICE(-1)	64.533940	15.3104	4.21504	***
NIFTY_SERVICE(-2)	-13.091450	14.5209	-0.90156	-----
CALL_RATE	19.975810	16.8018	1.18891	-----
CPI	-31.314770	18.0560	-1.73431	*
EXCHANGE_RATE	10.587610	41.7337	0.25369	-----
C (Constant)	0.632215	0.74482	0.84881	-----

Note: Author's calculations using E-views

Estimation results for equation NIFTY_SERVICE:

Variable	Coefficient	Std. Error	t-Statistic	Significance
EPU(-1)	0.000824	0.01653	0.04983	-----
EPU(-2)	0.002124	0.01616	0.13149	-----
IIP(-1)	0.000571	0.00054	1.05508	-----
IIP(-2)	0.000719	0.00049	1.46840	-----
NIFTY_SERVICE(-1)	-0.124661	0.09812	-1.27045	-----
NIFTY_SERVICE(-2)	-0.002016	0.09306	-0.02166	-----
CALL_RATE	-0.233922	0.10768	-2.17234	**
CPI	0.010258	0.11572	0.08865	-----
EXCHANGE_RATE	-0.206302	0.26747	-0.77131	-----
C (Constant)	0.012724	0.00477	2.66561	***

Note: Author's calculations using E-views

Note: *** p < 0.01, ** p < 0.05, * p < 0.10, ----- not significant

The VAR estimation indicates that policy uncertainty (EPU) is significantly affected by its own lagged values and by developments in the services sector. Industrial production (IIP) experiences negative effects from lagged EPU, its own previous performance, and changes in the services sector. In contrast; the Nifty Services Index is largely unaffected by most lagged variables; except for the call rate; which exerts a significant negative influence. These findings show that the industrial sector is more sensitive to economic uncertainty than the services sector. Because there were several statistically insignificant coefficients; a restricted VAR model was used for subsequent analysis using Impulse Response Functions.

Table: 3. Results of VAR Residual Serial Correlation LM Test

H₀₁: No serial correlation at lags 1 to h

Lag	LRE* stat	df	Prob.	Rao F-stat	df	Prob.
1	18.42011	9	0.0306	2.084862	(9, 306.8)	0.0306
2	35.03728	18	0.0094	1.9995	(18, 348.4)	0.0094
3	57.13558	27	0.0006	2.21268	(27, 351.1)	0.0006

Source: Authors' Own Compilation

Table: 4. Results of VAR Residual Heteroskedasticity Joint Test

(Levels and Square)

H₀₂: There is no existing ARCH effect up to order q in the residuals E_t)

Chi-sq	df	Prob.
288.1938	108	0

Source: Authors' Own Compilation

Table: 5. Results of VAR Residual Heteroskedasticity Tests, Individual Component

Dependent	R-squared	F(18,122)	Prob.	Chi-sq(18)	Prob.
res1*res1	0.06544	0.474592	0.9644	9.226977	0.9543
res2*res2	0.956558	149.2412	0	134.8747	0
res3*res3	0.054086	0.387546	0.9881	7.626167	0.9837
res2*res1	0.407925	4.669719	0	57.51741	0
res3*res1	0.094037	0.70352	0.8021	13.25924	0.7759
res3*res2	0.413301	4.774621	0	58.27547	0

Source: Authors' Own Compilation

Table: 6. Results of VAR Residual Normality Tests Cholesky Orthogonalization

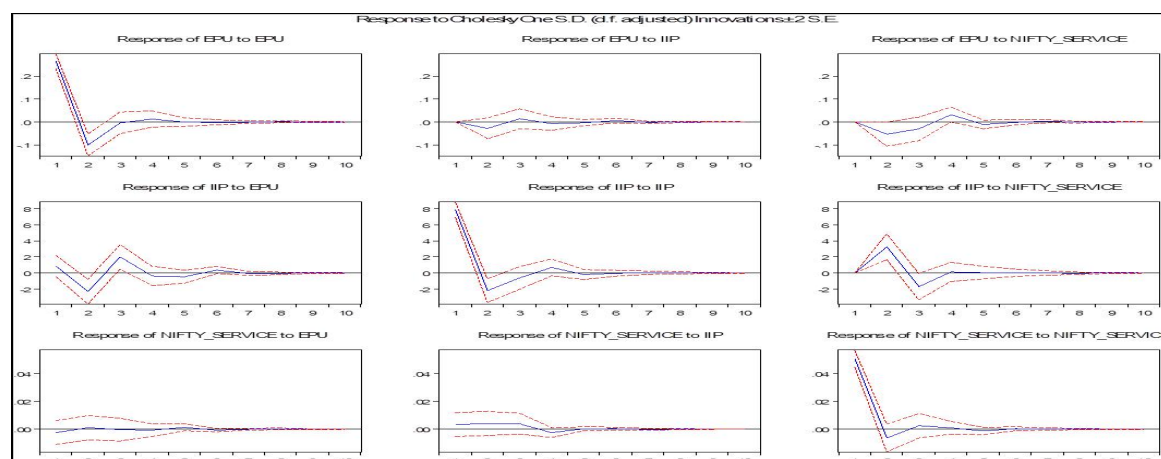
H₀₃: Residuals are normally distributed.

Source: Authors' Own Compilation

Component	Jarque-Bera	df	Prob.
1	12.78057	2	0.0017
2	399.5722	2	0
3	270.3694	2	0
Joint	682.7222	6	0

Diagnostic evaluation of the VAR model yields important insights into the statistical adequacy of its estimates. The serial correlation LM test (Table 3) detects autocorrelation at all three lag levels, with p-values below 0.05, thereby rejecting the null hypothesis of no serial correlation. This finding suggests that the model residuals are not independently distributed over time, which could reduce the efficiency of the VAR estimates. This result indicates that the model residuals are not independent through time, which may result in less efficient VAR estimates. The heteroskedasticity joint test (Table 4) also fails to accept the null hypothesis that there are no ARCH effects, since the p-value is equal to zero, indicating the presence of

heteroskedasticity in the residuals. The results of analysis of individual component heteroskedasticity test (Table 5) show that the second component (res2) has significant heteroscedastic behavior in both variance (res2^2) and cross-products with other residuals indicating the presence of volatility clustering. To verify the normality of the residuals, the Jarque-Bera statistic was used in the normality test (Table 6) and it shows that all residuals are not normally distributed with all p-values well below 5%. In total, the diagnostic results provide a possible reason for model specification problems and indicate the importance of remaining cautious when interpreting the VAR estimates. There may be other specifications that yield more reliable inference, like robust standard errors or structural VAR modeling.



The impulse response analysis shows the effect of changes in the Economic Policy Uncertainty (EPU) index on the Index of Industrial Production (IIP) and the Nifty Services Sector Index. The effect of IIP on EPU shocks reveals no immediate effect, only a delayed response, which is manifested by a slight rise around the second month and then a decrease in the third month. A similar trend is observed in the fourth month, as there is a short increase followed by a decrease, showing oscillatory dynamics with no clear trend. The fluctuations indicate that uncertainty about policy in the period of analysis did not seem to have a consistent or significant impact on industrial activity. The opposite is true of the Nifty Services Sector Index, though. The first negative trend will be immediate, and there will be a slight recovery in the third month with a negative trend after the 5th month. This suggests the level of uncertainty is higher for the services sector, especially in terms of any major policy shift, such as the Goods and Services Tax (GST) implementation. The negative response indicates that the uncertainty in implementation of the GST negatively affected the performance of service sector as compared to manufacturing sector which was represented by the IIP.

Table: 7. Results of the VAR Granger Causality and Block Exogeneity Wald Test

Dependent variable: EPU

Excluded	Chi-sq	df	Prob.
IIP	1.519779	2	0.4677
NIFTY_SERVICE	7.546797	2	0.023
All	10.90594	4	0.0276

Given a p-value of 0.0276, the null hypothesis is rejected at the 5% significance level. This result indicates that the joint lagged values of IIP and Nifty_SERVICE Granger-cause changes in EPU. When considered separately, IIP does not Granger-cause EPU ($p = 0.4677$), as the null hypothesis cannot be rejected. In contrast, Nifty_SERVICE significantly Granger-causes EPU ($p = 0.023$), demonstrating that past values of the service sector index have a predictive influence on economic policy uncertainty. These results indicate that movements in the service sector exert greater influence on uncertainty during the period under study, whereas industrial production (IIP) has a limited or insignificant causal impact on EPU within the model's lag structure.

Table: 8. Correlation Table

Variable	EPU	IIP	Nifty Serv
EPU	1	-0.5097	-0.4129
IIP	-0.5097	1	0.0193
Nifty Serv	-0.4129	0.0193	1

The correlation matrix indicates a negative relationship between Economic Policy Uncertainty and both the Index of Industrial Production and the Nifty Services Sector Index, suggesting that higher policy uncertainty is generally associated with lower industrial and services sector performance.

Conclusion

This study studies the effect of the Goods and Services Tax on sectoral performance in India by studying the dynamic relationship between economic policy uncertainty; industrial output; and the services sector. The empirical findings indicate that GST-related uncertainty had a significant negative effect on the services sector; whereas its effect on the manufacturing sector was weak and inconsistent. This demonstrates distinct sectoral sensitivities to policy changes. The study's primary contribution is the use of a restricted VAR framework with impulse response analysis to distinguish the temporal transmission of uncertainty across sectors; providing greater insights than traditional causality tests. The results have important theoretical implications by demonstrating that uncertainty affects sectors asymmetrically and managerial implications by emphasizing the need for clear communication and advance preparedness among service-oriented industries during major policy transitions. The analysis is limited by diagnostic issues such as serial correlation and heteroskedasticity; as well as the use of aggregate indices that may mask intra-sector variation. Future research should address these limitations by using structural VAR or GARCH-based models; incorporating sector-level disaggregated data; and studying how firm-level characteristics moderate the effects of policy uncertainty.

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