

Article

Does Climate Policy Uncertainty Abate Financial Inclusion? An Empirical Analysis Through the Lens of Institutional Quality and Governance

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Abstract: Environmental sustainability concerns have led to an increased focus on climate finance, resulting in substantial investments to boost financial sector development. However, recently, climate initiatives have encountered multiple policy uncertainties. This study aims to empirically investigate the impact of U.S. climate policy uncertainty (CPU) on Indian financial inclusion, in addition to exploring the moderating role of institutional quality on the aforementioned relationship. To achieve the above objectives, we first constructed two separate indexes for financial inclusion using the weighted method and principal component analysis. Next, to empirically estimate the above relationship, we employed the two-step system-generalized method of moments (Sys-GMM) and the sequential (two-stage) linear panel data model (SELPDM) on the sample data from 2000–2022. The Sys-GMM estimate test validated that climate policy uncertainty negatively influences India's financial inclusion. However, institutional regulation and governance assist in moderating the negative influence of U.S. climate policy uncertainty on Indian financial inclusion initiatives. Furthermore, the study also confirmed that various dimensions of institutional regulation and governance exert a positive and significant effect on financial inclusion. Finally, the study validates that economic growth and technological advancement assist financial inclusion initiatives in India. The study is an original work and offers several policy recommendations.



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1. Introduction

The recent occurrences of climate disruptions and the rise of climate activism have captured the attention of policymakers toward environmental sustainability. In order to advance environmental sustainability and achieve the objectives outlined in the 2015 Paris Agreement, stakeholders have explored several initiatives aimed at enhancing sustainable development goals (SDGs). For example, stakeholders are advocating for environmentally friendly products, adopting sustainable methods, and encouraging technical advancement [1]. The government's policy measures sparked investors' interest in sustainable products, resulting in the development of the green or climate finance market. Green

finance, or climate finance, often refers to financial investments that support projects and initiatives aimed at addressing climate change and promoting environmental sustainability [2]. In addition to diverting funds towards environmental sustainability, green finance or climate finance initiatives also lead in the development of the financial markets. A host of empirical literature posits that green finance or climate finance assists in diverting funds towards capital investments that promote financial sector development [3,4]. Green finance promotes financial sector development by providing alternative investment options, risk management, resilience to economic shocks, regulatory support, hedging against conventional stocks, and financial inclusion [5]. Enhancing financial inclusion is a key focus for emerging and developing economies. Financial inclusion is crucial as it facilitates savings and investment, improves financial literacy, stimulates economic growth, diminishes the informal economy, and aids in curbing corruption [6]. Empirical literature highlights that green finance or climate finance promotes financial inclusion by improving access to capital for Small and Medium Enterprises (SMEs) in emerging markets, improving financial literacy programs associated with green finance, expanding microfinancing for renewable energy technologies, and through fintech solutions in green finance, which significantly improve financial access and literacy for low-income individuals [7]. Most of the existing empirical literature has captured the positive side of climate finance on financial inclusion and financial sector development [2,4]. However, there is no specific literature that has explored how uncertainties in climate or green finance can influence financial inclusion.

Extant studies highlight that there are several reasons for uncertainties in climate finance, for instance, market volatility, investment risk, inadequate coordination among policy formulation, regulatory mechanisms, etc. [8]. Among the aforementioned reasons, one of the most prominent causes of fluctuation in green or climate finance is policy uncertainty [9]. Climate policy uncertainties stem from several interrelated factors that complicate effective climate strategies. Changing governments and partisan divisions often influence political will, resulting in inconsistent policies [2]. Economic considerations also play a crucial role, as policymakers may prioritize short-term growth over long-term sustainability, whereas uncertainties about the costs of transitioning to a low-carbon economy can hamper decisive action [8]. Additionally, technological innovation introduces unpredictability, with emerging technologies presenting investment risks. Scientific uncertainties about complex climate systems and evolving research further complicate policy responses. Existing literature also posits that global disparities in capacities and reliance on voluntary agreements like the Paris Agreement challenge international policy coordination, resulting in climate uncertainty [9]. In addition to the aforementioned reasons, existing literature also claims that changing market dynamics, volatile energy prices, shifts in investment priorities, regulatory complexity, inconsistent standards, public opposition, and equity concerns also create resistance to effective climate policy implementation.

Existing literature indicates that such uncertainties associated with climate policies indirectly influence the financial sector by influencing economic stability, investor confidence, and access to financial resources [8]. The indirect influence of climate policy uncertainty on the financial sector enables us to establish a connection between climate policy uncertainty and financial inclusion. The uncertainty surrounding climate policy heightens the perceived risk associated with investments in specific sectors, especially those susceptible to regulatory shifts, including agriculture, energy, and infrastructure. This situation constrains the flow of capital from developed to developing economies. The decrease in capital inflows impedes the growth of businesses and financial institutions, particularly in sectors such as agriculture, energy, and infrastructure. This situation further exacerbates the challenges faced by individuals and small businesses, especially those located in low-income or rural regions, in obtaining credit and other financial services. Furthermore, in

periods of significant climate uncertainty, it is likely that banks and financial institutions will impose stricter lending criteria or exhibit a decreased willingness to extend credit to riskier segments of the population. This may restrict financial access for individuals and small enterprises, particularly for those who are already financially excluded. Vulnerable groups, such as farmers operating in climate-sensitive areas or households with low income, often encounter significant challenges in accessing loans, insurance, and various financial products. Moreover, existing studies indicate that uncertainty surrounding climate policy frequently results in market volatility, potentially elevating the costs associated with financial products such as loans, insurance, and savings [9]. The fluctuations associated with climate risks can exacerbate the challenges faced by financially excluded populations. Individuals positioned at the margins often encounter significant challenges in accumulating savings, securing asset insurance, or engaging in investment opportunities, primarily attributable to the inherent unpredictability associated with financial products and services. In numerous developing nations, informal financial systems, such as microfinance and community savings groups, play a pivotal role in providing support to populations that are financially excluded. The uncertainty surrounding climate policy has the potential to affect informal systems by introducing instability into the local economy or increasing operational costs for local businesses, subsequently diminishing the resource flow within these informal networks. This may also reduce the capacity of individuals in underserved communities to obtain affordable and reliable financial services.

Given the aforementioned rationale, the present study seeks to explore how climate policy uncertainty in the United States influences financial inclusion in India. The present study investigates how climate policy uncertainty in the United States influences financial inclusion in India, considering India's significant economic interdependence and interconnected financial markets. India's diverse financial landscape, characterized by a large informal sector and a substantial population lacking access to formal services, makes it crucial to understand the global dynamics at play [10]. The U.S., a major contributor to climate finance, and India, one of the largest recipients, are both committed to addressing climate change, adding a critical lens to the analysis [11]. Additionally, India's vulnerability to climate change necessitates financial inclusion for climate resilience, making this relationship vital to explore. India's susceptibility to climate change is evidenced by the increasing occurrence of extreme weather phenomena such as floods, droughts, and heatwaves, which directly affect its agriculture, infrastructure, and livelihoods, especially those of marginalized communities. Financial inclusion plays a pivotal role in enhancing climate resilience, as it provides communities with access to savings, insurance, and credit resources. Enhanced financial instruments enable individuals to engage in climate-resilient practices, safeguard their assets, and effectively recuperate from climate-related disturbances. Moreover, the provision of inclusive financial services has the potential to empower small farmers, entrepreneurs, and rural households in their efforts to adapt to climate risks, thus ensuring that these groups possess the necessary resources to manage changing conditions and mitigate long-term vulnerability. Both nations are signatories to international climate agreements, and examining how U.S. policy uncertainty impacts compliance and funding mechanisms can provide insights into global climate governance. Climate policies in the United States also shape global investor sentiment, influencing investment attitudes toward India, which is important for understanding broader trends in financial inclusion. Previous empirical literature suggests a connection between climate finance and financial inclusion [2,3], further emphasizing the relevance of this study for policymakers. Finally, addressing social equity challenges in both countries and filling the research gap regarding the impact of U.S. climate policy uncertainty on India's financial inclusion highlights the significance of this investigation. In addition to the previously mentioned contribution, this

study, to the best of the authors' knowledge, is the only one that empirically investigates the impact of U.S. climate uncertainty on financial inclusion in India. Thus, it significantly contributes to our understanding of how climate uncertainty in developed economies can influence financial inclusion in developing countries. Furthermore, the study delves into the ways in which institutional and governance factors moderate the impact of climate uncertainties on financial inclusion, thereby bringing a fresh perspective to the existing literature and enhancing the study's novelty. Furthermore, the study utilizes multiple proxies and integrates two distinct methodologies to construct a financial inclusion index, providing fresh perspectives on methodological innovation.

The study is organized as follows: Section 2 highlights the review of existing literature and theoretical background. Section 3 depicts the methodology and variable selection. Section 4 explains the analysis and discussion, and finally, the last segment showcases the concluding remarks.

2. Literature Review and Theoretical Arguments

Multiple studies have explored the influence of climatic uncertainties on various economic aspects. Nevertheless, there is a scarcity of studies investigating the effect of uncertainty in climate policy on the financial industry. This section offers a thorough examination of prevalent studies on the relationship between uncertainty in climate policy and financial subsystems. We categorize the literature into three sections, each focusing on the impact of climate policy on the banking system, financial development and regulation, and financial instruments.

2.1. Climate Policy Uncertainty and Banking Interaction

Dai and Zhang [12] conducted a recent investigation into the relationship between climate policy uncertainty and the risk-taking capacity of banks, focusing specifically on Chinese commercial banks. The findings indicate that the CPU mitigates both passive and active risks while simultaneously elevating the risk of bank insolvency. In a similar vein, Xu et al. [13] examined the impact of CPU on bank liquidation across a sample of 387 commercial banks in China, ultimately concluding that elevated CPU levels correlate with an increased likelihood of bank liquidation. In summary, the CPU diminishes bank profitability; conversely, it exerts a detrimental effect on the liability side. Ren et al.'s study [14], which explored the impact of CPU on corporate debt, aligns with these findings. The research encompassed a sample of Chinese non-listed companies and revealed that CPU mitigates corporate debt as a result of financial constraints. This indicates that an elevated CPU negatively impacts credit availability for non-listed Chinese firms, ultimately affecting the profitability of the banking sector.

2.2. Climate Policy Uncertainty and Financial Regulation and Development

In the realm of financial regulation and development, Shahbaz et al. [15] employed rigorous econometric techniques to empirically analyze the relationship between CPUs, carbon emissions, and financial regulations in Russia. The findings suggest that CPUs positively influence carbon emissions, while robust financial regulation aids in reducing carbon emissions. This suggests that robust regulation of the financial sector is essential to navigate significant uncertainties associated with climate policy. The study by Azam et al. [16], which examined the impact of financial policy and development on climate change, aligns with the results. The research findings indicate that financial policy is essential in addressing climate change risk, highlighting that both climate change risk management and financial policy are significant factors influencing financial development in a sample of 42 countries. Olasehinde-Williams et al. [17] conducted a study that supported the previously mentioned

conclusions by investigating the correlation between CPU and sustainable investments. The findings indicate that CPU contributes to heightened investment volatility, prompting the need for policymakers to prioritize regulatory frameworks aimed at alleviating the negative effects of CPU on sustainable investments. Hunjra et al. [16] conducted a recent study that explored the correlation between climate risk and the development of the financial sector. The study focused on 42 developing economies and found that the presence of policy uncertainty negatively impacts the advancement of the financial sector.

2.3. Climate Policy Uncertainty and Interaction with Financial Instruments

In addition to investigating the influence of CPU on financial development and regulation, a few scholars have also examined its impact on financial instruments. For instance, Xu et al. [13] explored the interconnection between CPU and stock market returns in China and the U.S. and concluded that high uncertainty decreases stock market returns in China and the U.S. Hoque et al. [18] also reported similar findings, examining the impact of U.S. CPU on energy stocks, renewable energy stocks, and carbon futures. The author confirms that U.S. CPU transmits negative shocks to the energy and renewable energy stocks, and carbon futures act as a safe haven against such disturbances. Tedeschi et al. [19] reported similar findings, investigating the relationship between CPU and European financial markets. They concluded that high CPU significantly impacts financial indexes, leading to a decrease in returns on clean energy stocks due to heightened climate risk. A study by Alharbey et al. [20] looked into how predictable climate policy uncertainty is when it comes to sectoral renewable energy stocks. They found evidence of different levels of predictability when it comes to sectoral renewable energy stocks. Similarly, Gau et al. [21] investigated the nonlinear impact of six global CPU peaks on global oil and gas prices, concluding that there is a significant nonlinear relationship between all six global CPU peaks and oil and gas prices. In continuation of the above studies, a few researchers have also attempted to explore the association between climate uncertainty and foreign investments. For instance, Noailly et al. [22] examined how increased levels of environmental policy uncertainty influence investments in low-carbon economies and outlined that high environmental policy uncertainty reduces firm-level investments in new startups.

The literature on climate uncertainty reveals a complex interaction with various financial subsystems. Studies on banking indicate that CPU heightens insolvency risk and reduces profitability, as seen in recent research on Chinese banks. Financial regulation research highlights that while robust financial regulations can mitigate the negative effects of CPU on carbon emissions, CPU itself tends to exacerbate investment volatility and impact financial stability. Findings on financial instruments suggest that high CPU negatively affects stock market returns, especially in energy sectors, and induces significant fluctuations in oil and gas prices. Moreover, the CPU's adverse impact extends to foreign investments, deterring investments in low-carbon technologies. Overall, the aforementioned literature review highlights that there are several studies (see Dai and Zhang [12], Tedeschi et al. [19], and Hunjra et al. [16]) that indirectly link and conclude that CPU has a detrimental impact on investments, banking sector efficiency, stock market returns, and overall financial sector development. However, to the best of the authors' knowledge, no specific study has examined the impact of U.S. CPU on financial inclusion. In line with the above literature gap and taking inferences from the below-mentioned theoretical background, we attempt to explore the impact of U.S. CPU on Indian financial inclusion. Additionally, we also contribute to the existing literature by exploring the influence of institutional regulation and governance on the aforementioned relationship.

2.4. Theoretical Background

The aforementioned literature review explains an indirect association between CPU, investments, banking sector efficiency, stock market returns, and overall financial sector development. To establish a theoretical foundation between climate policy uncertainty and financial inclusion initiatives in an emerging economy, we draw on the following theoretical background: First, we take inferences from the economic policy uncertainty theory; economic policy uncertainty refers to any kind of uncertainty surrounding government actions, policies, and decisions that influence the economy. When economic policies are uncertain, it becomes difficult for businesses, investors, and consumers to predict the future, which can lead to reduced investment, lower consumer confidence, and slower economic growth. Existing literature asserts that climate policy uncertainty, a specific form of economic policy uncertainty, arises when governments lack clarity about the rules and actions they will implement to tackle climate change [12]. Climate-related uncertainty encompasses unpredictable weather patterns, natural disasters, and long-term shifts in climate change policy, which can significantly impact investment outcomes, especially in industries like agriculture, energy, real estate, and infrastructure. Such climate uncertainty, especially in developed economies such as the U.S., can lead to capital outflows and a decline in foreign direct investment and portfolio investment, especially in developing countries like India. This is attributed to the increased perceived risk of investments, as stated in the economic policy uncertainty theory. This, in turn, can limit the lending capabilities of banks, particularly in vulnerable sectors like agriculture, small and medium enterprises, and low-income households. This undermines the stability and expansion of financial institutions in India, thereby restricting the availability of financial services.

The financial market integration theory further supports this by explaining how disruptions in developed markets, such as the U.S., can have spillover effects on emerging markets. These disruptions can impact capital flows, exchange rates, and credit availability in the global financial system. In particular, a decrease in foreign capital inflows leads to higher borrowing costs, especially for climate-sensitive sectors. This increase in the cost of credit exacerbates financial exclusion by making it more difficult for vulnerable sectors to access affordable financial services. Moreover, the credit risk associated with climate change stemming from uncertainties surrounding global carbon pricing, regulatory changes, and sustainability efforts further compounds the problem. Financial institutions in India are likely to adopt more risk-averse strategies in response to these uncertainties, which may result in a contraction of credit, particularly for sectors that require substantial investment in climate resilience. This increased credit risk puts small-scale farmers, rural entrepreneurs, and other climate-sensitive sectors at particular risk of exclusion from financial services. Foreign exchange rate fluctuations, often influenced by U.S. policy uncertainties, can also contribute to financial exclusion. These fluctuations may increase the cost of imports and trigger inflationary pressures in India, which, in turn, can further limit credit availability, particularly for SMEs and low-income individuals who are already financially vulnerable [13]. Additionally, the unpredictability of U.S. climate policy may impede the development of green finance initiatives, such as climate-resilient loans and green bonds. The delayed progress in these areas hinders the financing of sustainable infrastructure and climate-adaptive agricultural practices, exacerbating financial exclusion in sectors that are already vulnerable to climate-related risks. In summary, U.S. CPU has the potential to directly impact financial inclusion in India by reducing investment flows, increasing credit risk, stalling green finance initiatives, elevating borrowing costs, and increasing credit risk, all of which could potentially restrict access to and usage of financial services. Therefore, referring to the aforementioned theoretical rationale and the existing

literature gap, we attempt to explore the impact of U.S. climate policy uncertainty on the financial inclusion initiatives in India.

3. Data Methodology and Variable Description

In the present study, to accomplish the aforementioned objectives, we have referred to the following proxies. We have referred to the newly constructed climate policy uncertainty index for measuring the U.S. climate policy uncertainty. The CPU index is created through the analysis of media coverage and policy papers to detect and measure conversations regarding uncertainty in climate policy. Climate policy keywords are identified and evaluated using text-mining and natural language processing algorithms from the eight leading US newspapers, i.e., the Boston Globe, Chicago Tribune, Los Angeles Times, Miami Herald, New York Times, Tampa Bay Times, USA Today, and the Wall Street Journal. An index score is generated by aggregating the frequency and context of these keywords, which serves as a measure of policy uncertainty. Moreover, we have referred to six proxies for measuring financial inclusion, i.e., bank branches per one lakh adults, bank branches per 1000 km², ATMs per one lakh adults, ATMs per 1000 km², bank deposit percentage of GDP, and outstanding loan percentage of GDP. Furthermore, for better understanding, we have categorized the above six measures of financial inclusion into two broad dimensions, i.e., financial access and financial usage. Financial access highlights the availability and reach of financial services by including the following four proxies, i.e., bank branches per one lakh adults, bank branches per 1000 km², ATMs per one lakh adults, and ATMs per 1000 km². The inclusion of bank branches and ATMs per one lakh adults explains the physical infrastructure of the banking system, which is essential for the availability of financial services. The existing literature claims that bank branches facilitate access to essential financial services such as savings accounts, loans, and other formal financial products, which play a crucial role in improving financial access, especially in underserved rural and remote areas [6,10]. Similarly, the number of ATMs per 100,000 adults and per 1000 km serves as a crucial measure of the self-service availability of financial services. Automatic teller machines are effective tools for providing banking services to populations, especially where providing physical branches is not cost-effective. The expansion in ATMs can be directly correlated with access to cash and primary banking facilities, hence reducing financial exclusion [14]. We have included both bank branches per one lakh adults and per 1000 km² and ATMs per one lakh adults and per 1000 km² because it assists in capturing both the availability and the geographical distribution of banks and ATMs, which are critical for confirming that banking services are easily accessible to populations in both urban and rural areas. Furthermore, we have included the remaining two proxies of financial inclusion, namely bank deposits as a percentage of GDP and outstanding loans as a percentage of GDP, within the financial usage dimension. Bank deposits as a percentage of GDP are one of the most widely used measures of financial inclusion. Higher deposits denote a higher percentage of the population in the formal financial system, thus reflecting confidence in and access to banking services [10]. The existing literature posits that higher deposit volumes are often correlated with enhanced financial inclusion and greater economic stability [6,14]. Moreover, outstanding loans, as a percentage of GDP, explain credit utilization in the formal economic system. Increased levels of outstanding loans as a percentage of GDP demonstrate financial intermediation, thereby enhancing the accessibility of credit for households and businesses. The existing literature posits that a higher ratio is often associated with increased financial usage, as businesses and individuals are more likely to rely on credit to finance consumption and investment activity [4]. In addition to the aforementioned explanation, existing studies also claim the above measure as some of the most widely used measures of financial inclusion.

We retrieved the data for all the proxies of financial inclusion from the International Monetary Fund's financial access survey. Using the above measure, we constructed the composite index of financial inclusion using two distinct methodologies: the weighted method from Bekele's [23] and principal component analysis (PCA). Finally, as these proxies are on different scales, we used the min–max criteria (please refer to Equation (1) to construct a common series from 0–1). Higher values denote greater financial inclusion.

$$x_{ij} = \frac{a_{ij} - \min_{ij}}{\max_{ij} - \min_{ij}} \quad (1)$$

In the above Equation (1), a_{ij} is the actual value of indicator i of dimension j ; $\min_{ij}$ is the minimum value of the indicator, whereas $\max_{ij}$ is the maximum value of the indicator. Then, we calculated the weight of each indicator by dividing the Coefficient of Variation (CV) by the composite CV of all the indicators, which can be explained as follows:

$$w_{ij} = \frac{CV_j}{\sum_{j=1}^n CV_j}$$

In the above equation, CV_j is the coefficient of variation for indicator j (for a given dimension i and n is the total number of indicators), meaning that each weight is measured by the relative variation of that indicator to the total variation across all indicators. The CV of each indicator is calculated by the ratio of its standard deviation to its mean i.e., $CV_j = \frac{\sigma_j}{\mu_j}$. Moreover, the weights are normalized, and the sum of $\sum w_i = 1$.

We refer to the following formula to construct a separate index of Access and Usage (please refer to Equation (2)).

$$FI_j = 1 - \frac{\sqrt{w_1^2(1 - x_{1j})^2 + w_2^2(1 - x_{2j})^2 + \dots + w_{ij}^2(1 - x_{ij})^2}}{\sqrt{w_1^2 + w_2^2 + \dots + w_i^2}} \quad (2)$$

Here, FI_j represents the proxies of either access or usage. Finally, after constructing separate indexes of access and usage of financial services, we also constructed a common index of FI_I by employing the following formula (please refer to Equation (3)).

$$FI_I = 1 - \frac{\sqrt{w_1^2(1 - FI_1)^2 + w_2^2(1 - FI_2)^2}}{\sqrt{w_1^2 + w_2^2}} \quad (3)$$

Here, w_1 represents the financial access index, and w_2 denotes the financial usage index. In order to penalize large deviations more proportionately, w is included in quadratic form. This non-linear approach, unlike a linear approach, can enhance the sensitivity of the index to larger deviations [24].

Finally, to measure the moderating variables, i.e., institutional quality and governance, we refer to the six institutional quality and governance indicators provided by the World Bank, which include political stability, rule of law, control of corruption, voice and accountability, regulatory quality, and governance. Additionally, we also included economic growth and technological advancement as control variables. Economic growth is measured as a change in real GDP, whereas technological advancement is measured by the number of mobile subscriptions per 100 people. To ensure data consistency and avoid data constraints, we collected annual data from 2000 to 2022 for all explanatory and outcome variables.

Model Specification

In the current study, we used the following baseline equation to represent the independent and dependent variables.

$$FIn_t = \sum (CPU, IQ, Cn)_t \quad (4)$$

where FIn denotes the aggregate of the financial inclusion index, CPU is the climate policy uncertainty index, IQ denotes the composite institutional index, and Cn refers to the control variables. In order to stabilize the data and remove the issue of outliers, we converted all the variables into their natural log forms (please refer to Equation (2)).

$$LnFIn_t = \alpha_0 + \beta_1 LnCPU_t + \beta_2 LnIQ_t + \beta_3 LnCn_t + \lambda_t + \varepsilon_t \quad (5)$$

Here, Ln represents the natural log form; α and β are the coefficient and the parameters; and ε_t is the error term.

Moreover, to examine the moderating role of institutional quality on the nexus of climate policy uncertainty and financial inclusion, we referred to the following baseline equation.

$$LnFIn_t = \alpha_0 + \beta_1 LnCPU_t + \beta_2 LnIQ_t + \beta_3 LnCPU_t \times LnIQ_t + \beta_4 LnCn_t + \lambda_t + \varepsilon_t \quad (6)$$

where $\beta_3 LnCPU_t \times LnIQ_t$ explains the moderating variable.

To estimate the aforementioned relationship, we utilized the two-step system generalized method of moments (SYS-GMM) proposed by Arellano and Bond [24] and further improved by Blundell and Bond [25]. We utilized two SYS-GMM models for the following rationales: Firstly, it offers a reliable approximation and eliminates the issue of endogeneity. Furthermore, this technique offers dependable estimations when there is a restricted time period, and finally, it is also appropriate for a constrained number of variables and observations. Prior research highlights that the two-step system generalized method of moments can occasionally encounter the issue of unadjusted standard error [26]. Thus, the linear panel model proposed by Kripfganz [27] is estimated using sequential/two-stage (GMM) estimation, which serves as a robustness test. Furthermore, the Hansen J-test, as well as the AR(1) and AR(2) tests, are utilized to evaluate the soundness and the over-identifying restriction of the instrument (please refer to Equation (4) used for Sys-GMM estimation

$$LnFIn_t = \alpha_0 + \beta_1 LnCPU_t + \beta_2 LnFIn_{t-1} + \beta_3 LnIQ_t + \beta_4 LnCn_t + \lambda_t + \varepsilon_t \quad (7)$$

4. Empirical Analysis and Discussion

Before proceeding with the model estimation, we first demonstrated the descriptive statistics of the dependent and independent variables. We used financial access and usage proxies to construct the financial inclusion index, as previously discussed.

4.1. Descriptive Analysis

Table 1 illustrates that the average number of bank branches per one lakh adults and per 1000 km² in India is 11.66 and 36.01, respectively. These numbers are significantly lower than the global averages of 29.97 and 39.13. Moreover, in terms of ATMs, the average number per one lakh adults and per 1000 km² is 13.70 and 44.57, respectively, which is again significantly lower than the global average of 51.89 and 49.52. In addition to the global averages, India's mean score for financial access proxy is lower than that of several emerging economies, such as China, Russia, Brazil, and others. This implies that India has low financial access; however, if we look at the recent trends in the number of bank branches and ATMs in India, the data show a significant improvement over the years.

Moving on to the financial usage proxy, the descriptive statistics reveal that the mean score of bank deposit percentage of Gross Domestic Product (GDP) and outstanding loan percentage of GDP in India is 59.95 and 44.58, respectively. When compared to the global averages (bank deposit percentage of GDP is 69.41 and outstanding loan percentage of GDP is 61.27), the mean score of bank deposit percentage of GDP and outstanding loan percentage of GDP is low in India, which implies low financial usage (the global mean scores are retrieved from the World Bank and global economic database).

Table 1. Descriptive properties.

Variables	Mean	Median	Minimum	Maximum
CPU	125.19	104.63	38.09	346.61
FIn (Financial Inclusion Index *)	0.138	0.129	0.014	0.524
Financial Access:				
Number of bank branches per one lakh adults	11.66	11.40	8.82	14.56
Number of ATMs per one lakh adults	13.70	15.18	2.28	24.64
Number of bank branches per 1000 km ²	36.01	34.54	22.76	50.72
Number of ATMs per 1000 km ²	44.57	46.93	5.93	87.74
Financial Usage:				
Deposits with bank percentage of GDP	59.95	61.64	47.42	70.74
Outstanding loans from bank percentage of GDP	44.58	46.51	27.62	53.04
IQ (Institutional Quality Index)	−0.006	0.007	−0.345	0.535
RL (rule of law)	0.003	−0.034	−0.092	−0.210
GE (government effectiveness)	0.039	0.031	−0.198	0.389
RQ (regulatory quality)	−0.298	−0.301	−0.519	−0.088
PS (political stability)	−1.048	−1.028	−1.289	−0.558
CC (control of corruption)	−0.428	−0.398	−0.635	−0.302
VA (voice and accountability)	0.371	0.351	0.051	0.461
GDP (gross domestic product)	6.123	7.489	−6.642	8.462
TA (mobile subscription)	2276.57	2346.96	35.98	5008.21

* Author-created; Financial Inclusion Index constructed using the proxies of financial access and financial Usage; 0–1 is the range for low to high financial inclusion.

According to descriptive statistics, the mean score of climate policy uncertainty in the United States is 125.19, which is higher than the global CPU, i.e., 122.19, retrieved from policyuncertainty.com. Furthermore, in reference to the institutional quality index, the mean score of institutional quality dimensions in India is rule of law (0.003), government effectiveness (0.039), regulatory quality (−0.29), political stability (−1.04), control of corruption (−0.428), and voice and accountability (0.37). Finally, in terms of the control variables, i.e., economic growth and technological advancements, the mean scores are 6.12 and 2276.57, which, when equal to the global averages, denotes stable economic growth and decent technological advancement.

4.2. Correlation Analysis

After discussing the stochastic properties, we advanced with correlation analysis. Table 2 depicts the correlation relationship between the dependent and the independent variables. The correlation matrix confirms a negative association between US CPU and Indian financial inclusion, meaning that climate policy uncertainty exerts a negative in-

fluence on financial inclusion in India. Moreover, the correlation analysis also validates a positive association between financial inclusion and all the dimensions of institutional quality and governance. It implies that institutional quality helps to improve inclusive finance. Furthermore, Table 2 validates that the control variables, i.e., economic growth and technological advancement, also have a positive impact on financial inclusion.

Table 2. Correlation analysis.

	FIn	CPU	IQ	RL	GE	RQ	PS	CC	VA	GDP	TA
FIn	1										
CPU	−0.453 **	1									
IQ	0.634 **	−0.593 **	1								
RL	0.356 **	0.124	0.384 **	1							
GE	0.359 **	−0.495 **	0.586 **	0.432 **	1						
RQ	0.481 **	−0.463 **	0.548 **	0.384 **	0.532 **	1					
PS	0.482 **	−0.329 **	0.308 **	0.582 **	0.623 **	0.518 **	1				
CC	0.143 **	0.112	0.498 **	0.409 **	0.538 **	0.392 **	0.573 **	1			
VA	0.081 **	0.053	0.124 **	0.128 **	0.213 **	0.198 **	0.281 **	0.319 **	1		
GDP	0.693 **	−0.385 **	0.692 **	0.635 **	0.523 **	0.522 **	0.632 **	0.485 **	0.098 *	1	
TA	0.382 **	0.374 *	0.223 **	0.118 **	0.295 **	0.213 **	0.312	0.118	0.014	0.593 **	1
VIF	3.145	4.225	4.194	5.242	3.565	2.456	4.672	5.203	3.482	2.490	4.295
TL	0.342	0.452	0.249	0.456	0.324	0.567	0.328	0.234	0.318	0.275	0.434

Note: *, ** denotes a 1 and 5 percent significance level.

Empirical literature necessitates confirming multicollinearity among the variables; to this extent, we also estimated the Variance Inflation Factor (VIF) and the tolerance level of the variables under consideration. Previous empirical literature concludes that if the VIF level is less than 10 and the tolerance level is more than 0.1, we can confirm the absence of multicollinearity [28]. The estimated results in Table 2 confirm the absence of a multicollinearity issue, allowing us to proceed with our model estimation.

Prior to discussing the outcome of Sys-GMM, we also estimated the stationarity properties of the series by employing an Augmented Dicky Fuller Fisher-type unit root test. Extant literature does not necessitate the confirmation of unit root; however, to avoid spurious estimates, we estimated the data stationarity. The unit root test (please refer to Table 3) confirms the absence of unit root in the regressors at a one percent significance level.

Table 3. Augmented Dicky Fuller Fisher-type unit root test.

	Inverse Chi-Square	Inverse Normal	Inverse Logit-T	Modified Inverse Chi-Square
FIn	1845.00 ***	−32.32 ***	−11.04 ***	39.43 ***
CPU	3482.00 ***	−19.92 ***	−32.11 ***	33.41 ***
IQ	2375.00 ***	−42.18 ***	−28.38 ***	35.81 ***
RL	4859.00 ***	−14.78 ***	−43.18 ***	38.23 ***
GE	2845.00 ***	−58.38 ***	−23.18 ***	41.08 ***
RQ	6830.00 ***	−15.42 ***	−14.32 ***	58.41 ***
PS	5281.00 ***	−76.21 ***	−38.21 ***	28.32 ***
CC	6829.00 ***	−59.20 ***	−53.84 ***	19.43 ***
VA	4824.00 ***	−27.13 ***	−48.12 ***	12.29 ***
GDP	3193.00 ***	−42.24 ***	−58.32 ***	78.17 ***
TA	4929.00 ***	−34.18 ***	−19.37 ***	31.34 ***

Note: *** denotes a 10 percent significance level.

4.3. Regression Analysis

After verifying the unit root, we finally proceeded with the Sys-GMM results analysis. The estimated results in Table 4 confirm that U.S. climate policy uncertainty has a negative and significant impact on financial inclusion in India. A one percent increase in US climate policy uncertainty reduces financial inclusion in India by 0.127 percent. The uncertainty surrounding climate policy in the United States has a negative influence on financial inclusion in India through various interconnected factors. Due to climate uncertainty in the U.S., global financial market volatility increases, leading international investors to withdraw from emerging nations such as India due to perceived risk, thus limiting financial resources [29,30]. Empirical literature also highlights that the lack of clarity in U.S. climate policy discourages foreign direct investment (FDI) by creating an unpredictable investment climate, limiting economic prospects and hindering access to financial services [30]. Moreover, changes in the United States' climate policy have the potential to alter global trade patterns and commodity prices, thereby impacting sectors that heavily rely on exports or imports. Notably, India is one of the major trading partners of the U.S. Hence, fluctuations in commodity and trade patterns have a severe impact on Indian foreign loan debt servicing capability and Indian businesses' income patterns, which consequently hinder banking efficiency and financial inclusion prospects. Moreover, an elevated perception of risk and higher capital costs lead to greater borrowing expenses for both Indian enterprises and individuals. Additionally, fluctuations in currency and inflation caused by changes in U.S. climate policies make financial services less accessible, hence further restricting financial inclusion [31]. The above justification strengthens our empirical outcomes and is in line with the studies by Cen and liu [32] and Sullivan and Zhang [33].

In addition to the above outcome, the Sys-GMM estimate further demonstrates that institutional variables and their various dimensions, like the rule of law, regulatory quality, government effectiveness, political stability, voice and accountability, and control of corruption, have a favorable and substantial influence on financial inclusion in India. Most of the Sys-GMM models have a positive coefficient sign, which substantiates that institutional quality and its dimension have a positive impact on financial inclusion. It infers that institutional quality and governance assist in improving financial inclusion. Extant literature highlights that institutional quality assists financial inclusion through various channels. For instance, Beck et al. [34] emphasize that rules of law contribute to financial inclusion by ensuring a just and transparent legal system, which in turn fosters confidence in financial institutions. Additionally, efficient regulations foster a stable and predictable environment for financial activities. Similarly, Claessens and Laeven [35] show that well-designed regulatory frameworks enhance financial stability and expand access to financial services by reducing systemic risks and barriers to entry. Likewise, as per the World Bank [36], effective government institutions are critical for creating an inclusive financial environment by ensuring that financial policies are well-implemented and accessible. In India, government effectiveness can drive financial inclusion by enhancing public service delivery and creating favorable conditions for financial institutions. Furthermore, political stability, voice, and accountability reduce the likelihood of sudden changes in financial policies and ensure active public involvement in overseeing their effective implementation. Additionally, effective control against corruption ensures the optimal utilization of financial resources and the equitable delivery of financial services. These dimensions collectively ensure financial stability and assist in improving overall financial inclusion. These outcomes are consistent with the studies by Mishra and Sharma [37] and Ayyagari and Demirgüç-Kunt [38].

Table 4. Climate policy uncertainty, financial inclusion, and the moderating role of institutional quality.

Variables	(1)	(2)	(3)	(4)	(5)
FIn	0.294 *** (2.56)	0.375 ** (3.85)	0.423 ** (3.12)	0.389 ** (4.19)	0.582 ** (3.46)
CPU			−0.127 *** (−2.13)		
CPU × IQ		0.091 *** (1.12)			
IQ	0.056 *** (2.19)	0.012 *** (3.09)	0.047** (3.15)	0.063 *** (2.13)	0.082 *** (4.18)
RL	0.063 *** (3.14)	0.072 *** (2.43)	0.012 *** (2.46)	0.084** (3.15)	0.061 ** (2.45)
GE	0.042 *** (1.13)	0.023 *** (2.56)	0.052 *** (3.34)	0.042 *** (4.13)	0.032 *** (2.14)
RQ	0.043 ** (3.18)	0.025 *** (2.95)	0.054 ** (4.14)	0.032 *** (2.85)	0.061 ** (4.09)
PS	0.027 ** (1.38)	0.034 *** (4.24)	0.063 *** (2.89)	0.041 *** (3.19)	0.072 ** (3.19)
CC	0.041 *** (3.24)	0.023 *** (3.63)	0.032 *** (2.19)	0.042 *** (4.28)	0.054 ** (3.45)
VA	0.012 *** (2.13)	0.009 *** (2.47)	0.013 *** (2.48)	0.022 *** (5.24)	0.027 ** (4.13)
GDP	0.078 ** (3.13)	0.028 ** (2.48)	0.092 ** (3.57)	0.056 ** (3.28)	0.064 ** (5.28)
TA	0.012 ** (2.04)	0.016 ** (3.18)	0.004 ** (2.48)	0.019 ** (3.43)	0.032 ** (3.28)
Wald	89.12 **	78.03 **	67.23 **	74.67 **	89.35 **
Hansen J	0.213	0.286	0.265	0.135	0.313
AR(1)	0.000	0.000	0.000	0.000	0.000
AR(2)	0.424	0.528	0.482	0.289	0.4532

Source: Authors' own creation; ***, ** are 1%, and 5%, significance levels, respectively.

4.4. Moderating Variable Analysis

Moving to the moderating variable, the Sys-GMM estimate confirms that institutional quality moderates the negative impact of U.S. CPU on financial inclusion in India. The empirical estimate reveals that a one percent increase in the moderating variable, i.e., CPU × IQ, reduces the negative impact of U.S. CPU and increases financial inclusion by 0.091 percent. This implies that a robust institutional quality is essential to alter the negative impact of climate policy uncertainty on financial inclusion in India. Institutional quality can moderate the negative impact of U.S. CPU on financial inclusion in India through several mechanisms. For instance, a high level of institutional quality, especially in regulatory frameworks and government effectiveness, can create a more stable and predictable environment for financial institutions. Effective regulatory standards decrease the likelihood of systemic hazards, hence providing a safeguard against external uncertainties like changes in U.S. climate policies. India can offset the negative impacts of international policy uncertainties on financial markets and inclusion by implementing stable and effective policies. Furthermore, a strong institutional framework characterized by resilient legal frameworks and efficient anti-corruption measures improves the capacity of financial institutions to handle risks. Existing literature suggests that improved governance in terms of corruption control and a robust legal framework are associated with increased efficiency in financial markets [39]. In India, the presence of robust institutions helps mitigate the impact of market volatility caused by uncertainties in U.S. climate policy, ensuring the stability of financial operations and continued access to financial services. In addition, efficient administration and stability in politics can bolster investor trust, which is vital in times

of uncertainty regarding global climate policies. Previous research indicates that robust institutional frameworks promote investor confidence, hence reducing the adverse effects of global financial concerns on domestic markets [40]. For India, this means that having strong institutional quality helps mitigate the impacts of uncertainties in U.S. climate policy by ensuring that investor confidence and financial stability are maintained. Institutions that possess a strong voice and responsibility enable the implementation of financial policies that are more responsive and inclusive. It suggests that enhanced voice and responsibility result in more effective policy execution, which can promote financial inclusion even in the face of global challenges. Efficient governance in India can guarantee the continued strength of financial inclusion initiatives, even in the face of external policy disruptions. To summarize, the presence of robust institutional quality in India helps mitigate the negative impacts of unclear climate policies in the United States on financial inclusion. This can be achieved by guaranteeing stability in regulations, upgrading risk management practices, boosting investor confidence, and promoting inclusive financial policies. These findings are consistent with the studies by Dafermos et al. [41] and Khan et al. [40].

Finally, in context to the control variables, the Sys-GMM estimate confirms that economic growth and technological advancement promote financial inclusion in India. The positive coefficient sign at the five percent level of significance substantiates the claim that economic growth and technological advancement promote financial inclusion. Economic growth assists financial inclusion by providing the overall resources required for the implementation of financial inclusion initiatives; likewise, technological advancement measured through mobile subscriptions provides necessary financial access for simple dissemination of financial services and hence contributes to financial inclusion. These findings are consistent with Chu's [42] study. Lastly, we conducted certain diagnostic tests to confirm the robustness of the model. Hansen J's significant value, along with AR(1) and AR(2), validates the accurate specification of the model. AR(1) indicates the presence of first-order autocorrelation, whereas AR(2) indicates the absence of second-order autocorrelation, which validates the robustness of the model.

4.5. Alternative Measurement of Financial Inclusion

We investigated the effect of uncertainty in climate policy on financial inclusion. To ensure accuracy, as already discussed, we re-evaluated the above relationship using a principal component analysis approach to construct a financial inclusion index. Based on the work of Ahamed and Mallick [43] and Tram et al. [44], we used the two-step PCA to create a financial inclusion index. We used the same six underlying instruments and split them into two different dimensions based on financial access and financial usage, as explained in Section 3. We calculated the index of financial access based on the number of bank branches and Automatic Teller Machines (ATMs) per one lakh adults and per 1000 km². Similarly, we constructed financial usage by factoring in bank deposits and outstanding loan percentages related to economic growth. Finally, we once again used principal component analysis to create a composite financial inclusion index that incorporates both financial access and financial usage. Tables 5 and 6 display the estimated results after incorporating the new index constructed using principal component analysis. The alternative proxy estimate reveals a similar outcome (please refer to Table 5). Table 5 validates that climate policy uncertainty has a negative impact on financial inclusion; a one percent increase in climate policy uncertainty decreases financial inclusion by −0.134 percent. On the other hand, institutional quality assists in improving financial inclusion. The positive and significant coefficients across all dimensions of institutional quality validate the positive impact of institutional quality on financial inclusion. In relation to the moderating variables, the alternative proxy for financial inclusion produces comparable results, concluding

that the moderating variables mitigate the negative impact on the U.S. Consumer Price Index and enhance financial inclusion in India. A one percent increase in moderating variables improves financial inclusion by 0.054 percent. Finally, the control variables also confirm that economic growth and technological advancement increase financial inclusion. These findings are consistent with the research conducted by Sullivan and Zheng [33] and Meneses Cerón et al. [45]. In addition to the aforementioned estimates, diagnostic tests such as the Hansen J test, AR(1), and AR(2) also confirm the reliability of the estimate.

Table 5. Climate policy uncertainty, financial inclusion, and the moderating role of institutional quality (using an alternative proxy to measure financial inclusion).

Variables	(1)	(2)	(3)	(4)	(5)
FIn	0.273 ** (2.93)	0.382 ** (4.25)	0.483 ** (3.44)	0.273 ** (3.84)	0.478 ** (2.58)
CPU		−0.134 ** (−3.19)			−
CPU × IQ		0.054 ** (1.12)			
IQ	0.075 ** (2.19)	0.083 ** (3.41)	0.042 ** (4.29)	0.041 ** (2.17)	0.091 ** (3.84)
RL	0.032 ** (3.28)	0.042 ** (4.23)	0.038 *** (3.24)	0.023 ** (3.58)	0.052 ** (4.28)
GE	0.017 ** (2.34)	0.043 ** (2.48)	0.073 ** (3.17)	0.038 *** (2.98)	0.063 ** (3.58)
RQ	0.042 ** (4.12)	0.038 ** (3.18)	0.075 ** (4.28)	0.064 ** (2.48)	0.051 ** (3.28)
PS	0.034 ** (2.89)	0.058 *** (3.28)	0.041 ** (4.18)	0.052 ** (3.18)	0.023 ** (2.48)
CC	0.031 *** (2.48)	0.039 ** (2.89)	0.053 *** (4.29)	0.042 ** (3.18)	0.050 ** (3.95)
VA	0.011 *** (3.18)	0.012 ** (3.18)	0.031 *** (3.87)	0.032 ** (4.18)	0.018 ** (4.18)
GDP	0.034 ** (3.23)	0.048 ** (3.24)	0.044 ** (2.18)	0.073 ** (3.73)	0.063 ** (4.82)
TA	0.012 ** (2.18)	0.018 ** (3.98)	0.021 ** (3.58)	0.028 * (3.48)	0.038 ** (4.18)
Wald	92.09 **	84.42 **	78.42 **	82.54 **	89.42 **
Hansen J	0.274	0.312	0.341	0.189	0.424
AR(1)	0.000	0.000	0.000	0.000	0.000
AR(2)	0.374	0.478	0.572	0.328	0.392

Source: Authors' own creation; ***, **, and * are 1%, 5%, and 10% significance levels, respectively.

Finally, we also employed the SELPDM model as a robustness estimate. This model is best suited for measuring the precision of estimates when working with proportional data and applying logarithmic transformations [46]. It aids in improving model fit, stabilizing variance, and providing reliable error estimates, all of which are critical for accurate data analysis and interpretation. Table 6 depicts the results of the Ordinary Least Square (OLS) and the SELPDM models. The results include both the financial inclusion index, i.e., financial inclusion constructed using the weighted method, and the financial inclusion index constructed using principal component analysis. The results validate the above outcomes and confirm that U.S. climate policy uncertainty has a detrimental impact on financial inclusion in India. As per the weighted average index, a one percent increase in CPU decreases financial inclusion by −0.034 (OLS) and −0.045 (SELPDM), and as per the PCA index, a one percent increase in CPU decreases financial inclusion by −0.038 (OLS) and −0.041 (SELPDM), thus validating the negative impact of U.S. CPU on financial

inclusion in India. Institutional quality, on the other hand, mitigates this adverse effect and helps enhance financial inclusion. The results also validate that rule of law, voice and accountability, political stability, control of corruption, government effectiveness, and regulatory norms have a positive influence on financial inclusion initiatives in India. Furthermore, the diagnostic test ensures that our estimates are consistent.

Table 6. Robustness tests.

		OLS	SELPDM	OLS	SELPDM
		Financial Inclusion		Financial Inclusion Alternative Proxy	
Dependent Variable					
FIn		0.287 ** (3.28)	0.484 ** (3.19)		
FIn				0.323 ** (3.18)	0.482 ** (4.18)
Independent Variables:					
CPU		−0.034 ** (−2.18)	−0.045 ** (−3.48)	−0.038 ** (−2.34)	−0.041 ** (−6.34)
CPU × IQ		0.023 ** (3.18)	0.042 * (4.24)	0.031 ** (5.12)	0.063 ** (2.19)
IQ		0.038 ** (3.28)	0.043 ** (4.09)	0.034 ** (3.58)	0.059 ** (4.28)
RL		0.018 ** (1.24)	0.009 ** (3.18)	0.018 ** (3.18)	0.034 ** (4.18)
GE		0.017 ** (2.48)	0.028 *** (3.18)	0.021 ** (3.18)	0.034 ** (4.19)
RQ		0.003 *** (2.18)	0.023 *** (4.18)	0.054 *** (4.28)	0.062 *** (4.18)
PS		0.031 ** (2.13)	0.048 ** (5.28)	0.038 ** (2.48)	0.018 ** (3.18)
CC		0.009 *** (2.18)	0.012 *** (2.18)	0.019 *** (2.58)	0.022 *** (3.13)
VA		0.010 *** (3.33)	0.009 *** (3.18)	0.017 *** (3.18)	0.013 *** (2.18)
GDP		0.073 ** (2.13)	0.068 ** (4.28)	0.056 ** (3.18)	0.063 ** (5.28)
TA		0.011 ** (3.18)	0.041 ** (4.45)	0.052 ** (4.28)	0.069 ** (4.15)
Constant		0.341 ** (2.38)	2.488 ** (4.52)	0.424 ** (3.82)	4.022 ** (4.28)
Hansen J	Prob-value		0.424		0.532
AR (1)	Prob-value		0.000		0.000
AR (2)	Prob-value		0.453		0.577

Note: Authors' calculations; t-values are shown in the brackets; ***, **, * denote significance levels at 1%, 5%, and 10%.

5. Conclusions and Policy Recommendations

The growing concern for environmental sustainability has drawn significant attention to climate finance, resulting in the channeling of sufficient investments among developing economies, which in turn has boosted financial development and financial outreach activities. However, due to policy polarization and inconsistent international agreements, climate initiatives have recently faced numerous uncertainties. In this quest, the present study aimed to examine the impact of U.S. climate policy uncertainty on financial inclusion in India. This was achieved by incorporating two distinct indexes of financial inclusion, which were constructed by including the dimensions of financial access and usage, along with the inclusion of newly constructed U.S. climate policy uncertainty. Additionally, the study

also aimed to explore the moderating impact of institutional quality and governance on the aforementioned relationships. In light of the above objectives, the study offers the following findings. First, the Sys-GMM estimate indicates that U.S. climate policy uncertainty has a negative impact on financial inclusion, as evidenced by both indexes of financial inclusion. Second, the empirical estimate reveals that the six dimensions of institutional quality and governance, i.e., rule of law, control of corruption, political effectiveness, regulatory authority, voice and accountability, and political stability, exert a positive influence on financial inclusion in India. Third, the study concludes that institutional quality and governance, when considered in the context of the moderating variable, mitigate the negative impact of U.S. climate policy uncertainty on financial inclusion in India. Finally, in context to the control variables, the study indicates that economic growth and technological advancement improve financial inclusion in India. The alternative methodologies employed, specifically the SELPDM test as a robustness assessment, also produce comparable results.

In light of the aforementioned outcomes, the study offers the following policy recommendations. As it is evident that U.S. climate policy uncertainty negatively pushes financial inclusion in India, it is recommended that policymakers keep a close watch on international climate uncertainties and accordingly adjust financial inclusion initiatives in order to make the Indian financial system more resilient to international climate uncertainties. For instance, stakeholders must adopt risk management measures and develop innovative financial products and services to mitigate risks associated with climate policy uncertainty. This may encompass policy-resistant insurance or investments. Promoting a diverse array of financial instruments and services is crucial for reducing reliance on external economic factors and enhancing resilience against policy uncertainties. Furthermore, it is imperative for authorities to integrate financial inclusion strategies with climate-related objectives. This can aid financial services in adapting to climate policy alterations and promoting sustainable financial sector development. Policymakers must also develop a robust and sound institutional and governance framework by encouraging anti-corruption measures, developing robust regulatory bodies, strengthening the rule of law, and integrating political and governance effectiveness. Stakeholders must enhance the institutional quality framework by emphasizing robust and uniform financial service legislation, which can boost trust in financial institutions and encourage participation among marginalized groups. Furthermore, it is crucial to implement adequate policy measures that promote sound and stable economic growth while also prioritizing technological advancements, as these factors significantly enhance financial inclusion in India. Consequently, focusing on these areas could enable Indian policymakers to foster a financial sector that is more inclusive, resilient, and institutionally robust.

The current study examines the impact of climate policy uncertainty on financial inclusion in India, offering potential directions for further investigation. Future investigations could explore the impact of climate policy uncertainty on India's green index or conduct a comparative analysis to examine how climate uncertainty influences financial inclusion in both developed and developing economies.

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