Ekonomi, Politika & Finans Araştırmaları Dergisi, 2025, 10(Özel Sayı): 216-234
Journal of Research in Economics, Politics & Finance, 2025, 10(Special Issue): 216-2334
Araştırma Makalesi / Research Article, https://doi.org/10.30784/epfad.1813815

GLOBAL CLIMATE POLICY UNCERTAINTY AND STOCK RETURNS: EMPIRICAL EVIDENCE FROM BIST SECTORAL INDICES

Küresel İklim Politikası Belirsizliği ve Pay Getirileri: BIST Sektör Endekslerinden Kanıtlar

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Keywords:
Global Climate Policy Uncertainty, Stock Markets, Quantile Regression.

JEL Codes: D53, G11, Q54.

Abstract

This study examines the impact of Global Climate Policy Uncertainty (GCPU) on stock market returns in Türkiye at the sectoral level. To this end, the study employs the weekly GCPU Index proposed by Ma et al. (2024) and data for the Borsa Istanbul stock indices covering the period 2000–2023. Quantile regression results reveal not only the extent to which sectors are affected by the global index, but also how climate policy uncertainty influences returns across different market conditions. GCPU exerts a positive and significant effect on energy-intensive electricity sector shares across most market states, whereas the same results emerge in other sectors under different market states. In technology shares, GCPU generates positive effects in lower quantiles (bearish market conditions), while in the chemical, financial, and industrial sectors, such effects emerge in higher quantiles (bullish market conditions). On the other hand, positive and significant relationships are found in the basic metal sector at the top quantile, while similar effects are seen for the services sector at the lowest quantile and middle quantiles. Overall, the results are expected to provide valuable insights for global and local climate-related regulators as well as investors and researchers.

Anahtar Kelimeler:
Küresel İklim Politikası Belirsizliği, Pay Piyasaları, Kantil Regresyon.

JEL Kodları: D53, G11, Q54.

Öz

Bu çalışma küresel iklim politikası belirsizliğinin pay piyasası getirilerine etkisini Türkiye'deki sektörler özelinde incelemektedir. Bu kapsamda iklim politikası belirsizliğini temsilen Ma vd. (2024) tarafından önerilen küresel endeks ve Borsa İstanbul pay endekslerine ilişkin 2000-2023 yıllarını kapsayan haftalık veriler kullanılmıştır. Kantil regresyon sonuçları, sektörlerin küresel endeksten etkilenme derecelerini ortaya koymakla beraber, farklı piyasa durumlarında iklim politikası belirsizliklerinin etkilerini de ortaya çıkarmıştır. Çoğu piyasa koşulu için küresel iklim politikası belirsizliği enerji payları yoğun elektrik sektöründe pozitif ve anlamlı bir etki yaratırken, diğer sektörlerde aynı etkiler farklı piyasa koşullarında ortaya çıkmaktadır. Küresel iklim politikası belirsizliği, teknoloji sektörü paylarında düşük kantillerde (ayı piyasa koşullarında) pozitif etkiler yaratırken, kimya, mali ve sınai sektörde bu etkiler yüksek kantillerde (boğa piyasa koşullarında) görülmektedir. Öte yandan Ana Metal sektöründe en üst kantilde pozitif ve anlamlı ilişkiler bulunurken, benzer etkiler hizmet sektörü için en alt ve orta kantillerde görülmüştür. İlgili sonuçların, küresel ve yerel düzeyde iklim politikalarını yürüten düzenleyicilere, yatırımcılara ve araştırmacılara faydalı olması beklenmektedir.

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Received Date (Makale Geliş Tarihi): 29.08.2025 Accepted Date (Makale Kabul Tarihi): 15.10.2025

1. Introduction

Global momentum toward sustainability has encouraged investors to integrate climate risk into their decision-making and to seek opportunities in green-oriented industries. Especially in the past decade, governments, international organizations, and financial institutions have intensified their efforts to mitigate climate change through a range of regulatory frameworks and market-based instruments. For instance, carbon pricing mechanisms, renewable energy subsidies, emission trading systems, and green financial products have become increasingly widespread and supportive of sustainable investment strategies (Ilhan et al., 2021; Huang et al., 2021; Tedeschi et al., 2024). Although there are many regulations to support a low-carbon transition, rising CPU (Climate Policy Uncertainty) at the global scale poses a considerable obstacle to achieving this goal.

CPU refers to the degree of ambiguity regarding future climate-related actions, regulations, and agreements that can shape investment decisions at both individual and corporate levels. Unexpected shifts in regulations, such as delays in climate legislation, inconsistent policy commitments, or changes in subsidy programs, may weaken investor confidence in green projects and hinder renewable energy initiatives planned to meet international climate goals. Moreover, the CPU may negatively affect economic growth, employment, the adoption of renewable energy, agricultural losses, and public health outcomes. For investors, CPU may also influence financial decisions because of creates climate-related risks that are important for portfolio setup and asset choice between risky and resilient assets. Therefore, abrupt climate policy changes can pose significant risks that influence the pricing of stocks and other financial instruments (Fan et al., 2017; Cepni et al., 2022).

From this view, the study explores the impact of GCPU (Global Climate Policy Uncertainty) on the BIST stock returns using weekly data covering from 2000 to 2023, particularly by analyzing its effects across different sectors. This approach allows us to understand the effects of climate risks in terms of return behaviors of sectors. Current literature indicates that there are only a few studies on Turkish stock markets about the effects of CPU (Irani et al., 2022; Ilgın, 2024; Özkan, 2024). Accordingly, this paper contributes by addressing this gap, with a specific focus on sectoral variations in Borsa Istanbul (BIST). Although the CPU index has been calculated for many developed and emerging markets, there is no CPU index exists for Türkiye. To handle this limitation, this paper utilizes the Global CPU Index (GCPU), proposed by Ma et al. (2024). Furthermore, using a quantile regression (QR) approach, this study further investigates the impact of GCPU on sectoral returns under different market states (bearish, neutral, and bullish).

This paper provides evidence for the existing literature in the following important ways. First, it focuses on the Turkish stock market, a context that has been rarely examined in prior research, thereby addressing a significant gap in the literature. Second, the study investigates the heterogeneous effects of the GCPU on sectoral stock returns in Borsa Istanbul, offering disaggregated insights at the sectoral level. Third, by employing a quantile regression (QR) analysis, the paper uncovers how the impact of GCPU varies under different market conditions, thus providing both empirical and methodological contributions to the current literature.

The rest of the paper is organized as follows. Section 2 reviews the existing literature on CPU. Section 3 introduces the weekly dataset and outlines the empirical methodology. Section 4 presents the empirical findings. Section 5 concludes the paper.

2. Literature

In this part, the study classifies the research on the influences of Climate Policy Uncertainty according to policy, institutional, and stock market transmission channels. Since sustainability and climate-related risks represent a relatively new paradigm in academic studies, the literature on the link between CPU and stock market performance remains limited. Studies have primarily focused on the measurement of CPU and its components. For example, in a well-known study, Gavriilidis (2021) developed a measure of climate policy uncertainty via textual analysis of news related to climate policies in the United States media. This index contains major developments like new emission legislation, global climate regulations, policy declarations from authorities, and other prominent issues about climate policy. Similarly, Faccini et al. (2023) classified climate-related reports using textual analysis named Latent Dirichlet Allocation (LDA). They found that U.S. stock prices are mostly driven by risks that generated government policies about climate change. In line with these studies, a growing body of research has been conducted to construct CPU indices for various economies, reflecting local regulations and climate commitments (Berestycki et al., 2022; Ma et al., 2023; Lin and Zhao, 2023; Chen et al., 2024). These critical innovations allow researchers to observe shifts in policy uncertainty over time and to analyze market reactions based on climate-related developments. Moreover, the progress of CPU measures also contributes to empirical financial studies that are interested in the effects of climate-related policy shocks on firm-level decisions, stock market reaction, asset pricing, or risk evaluation.

One strand of the common literature includes the studies that investigate the macroeconomic consequences of CPU. For instance, Li and Su (2022) investigated the impact of China's Climate Policy Uncertainty (CCPU) on macroeconomic conditions using a Vector Autoregression (VAR) model with time-varying parameters. Their results indicate that CCPU negatively affects various macroeconomic indicators such as Total Investment Volume (TIV), Industrial Production Index (IPI), and Purchasing Managers' Index (PMI) over the medium and long horizons. Doğan (2023) documented a positive relationship between CPU and the Consumer Price Index in the U.S. from the data covering the period from 1990 to 2021. In a similar manner, Çelik and Doğan (2024), applying the ARDL bounds test, found a positive and significant relationship between economic growth and CPU. Moreover, they emphasized that the total workforce, foreign direct investment, and financial development also exert a significant influence on U.S. economic growth. Apergis et al. (2023) studied how CPU affects tourism economics. They use CPU index and U.S. air-travel data from different regions and find that the CPU is a factor of aviation demand to all regions. A research on global food price volatility, Eissa et al. (2025), focused on the time-varying effects of CPU. They found that the CPU is the key factor in the global food price volatility.

Another strand of the literature, particularly over the past decade, has focused on the climate policy-related risks from an institutional perspective. For example, Lian et al. (2025) investigate the effects of CPU on banks' loan loss provisions. Utilizing data of 63 commercial banks in China, they found that CPU significantly increases banks' loan loss provisions. Other studies on CPU, Fan et al. (2024) found that CPU negatively affects bank value, while Liu et al. (2025) and Tran (2025) reported that CPU influences the earnings management of firms. In another study, Ayed et al. (2024) examined the corporate dividend policy considering CPU and found that dividend payments increase in times of heightened CPU. Similarly, at times of heightened CPU, firms tend to reduce their investment levels (Huang and Sun, 2024), and CPU

has negative effects on firm value (Azimli, 2023). Ren et al. (2022), in a study that relies on a comprehensive data set, examine the link between CPU and Total Factor Productivity (TFP) using the data of 2605 Chinese companies operating in mining, manufacturing, energy production, and supply industries. Empirical evidence from panel regression analysis shows that the CPU has a significantly negative effect on firms’ TFP. Several studies have investigated CPU effects on firm performance through the asset pricing mechanism. For instance, Treepongkaruna et al. (2023) provide evidence that uncertainty-averse investors are willing to pay a premium for stocks that are more sensitive to climate policy uncertainty, resulting in lower expected returns. On the other hand, Huang et al. (2025) examine the cross-sectional link between CPU and expected performance of the Chinese A-share equities manufacturing sector and find that firms with lower CPU betas tend to generate higher annualized returns compared to high-beta firms. Both studies consistently point out that CPU is a priced factor in financial markets.

A large portion of the common literature focuses on the link between CPU and stock market dynamics. These studies are generally conducted on Chinese and U.S. stock markets, as these two countries are the largest carbon emitters globally and play a central role in shaping international climate policy. For instance, in the U.S., even a single policy proclamation or political signal can have an immediate impact on market expectations. In light of this, a comparative study conducted by Xu et al. (2023) to detect how Climate Policy Uncertainty (CPU) affects stock market behavior, focusing on its nonlinear and lagged impacts on returns, volatility, cross-market correlations, and tail dependence in China and the United States. Empirical findings show that the growth of China’s CPU index closely mirrors that of the U.S., and the effects of CPU on stock markets differ significantly between the two countries. Specifically, high CPU in China reduces current returns and generates additional volatility, while in the U.S., it reduces returns in the short run but increases them over the long term. Moreover, the CPU increases volatility and strengthens cross-market dependence between the two countries’ stock markets. Chen and Wang (2025) analyzed the linkage between CPU and China’s stocks using a multilayer network approach. They found that (1) crises increase risk spillovers, (2) network layers respond asynchronously during turmoil, and (3) sectors like industrials and IT often transmit risk, while CPU and financials tend to absorb it. In another study, Chen et al. (2023) investigated the spillover effects of CPU on Chinese stock volatility using the GARCH-MIDAS approach and high-frequency data. Empirical results emphasized that the CPU has a strong effect on stock price volatility in China. Similar results were also observed by Lasisi et al. (2024). They concluded that stock market volatility significantly responds to CPU in the U.S. and U.K. stock markets, while Di Tommaso et al. (2024) reported that CPU has a negative impact on overall stock market indicators such as equity prices and FTSE implied volatility index. Özkan (2024) aimed to detect causal links between CPU and the BIST Food & Beverage Index (XGIDA) using monthly data spanning from 1997 to 2023. Results show that there is a one-way causal link between CPU and the BIST Food & Beverage Index. In a similar study, Pijourlet (2024) finds that CPU has significant effects on sectoral returns using monthly data for ten U.S. industries.

In the literature, studies on financial markets have not only focused on traditional stock markets, but also explored the influence of CPU on fossil and renewable-related asset channels. Among the studies, Tedeschi et al. (2024) analyzed the time-varying effects of CPU on stock market and clean energy indices using a Bayesian TVP-VAR model. They find that financial indices are significantly affected by CPU shocks. Clean energy stocks exhibit positive returns, while those on traditional energy stocks decrease in response to heightened climate risk. Empirical

results also indicate that COVID-19 represents a significant structural break in CPU dynamics. Similarly, Ren et al. (2023), using monthly data and time-varying causality tests, examined the effect of CPU on traditional and green market indices. They utilized crude oil, UK natural gas, and Rotterdam coal data to represent traditional assets, while S&P Global Clean Energy Index, S&P Green Bond Index, and ECX EUA carbon prices were employed to represent green assets. Results imply that there is a significant dynamic causal link between CPU and each series, with these relationships strengthening during periods of major climate actions. Siddique et al. (2023) investigated the influence of CPU on fossil, renewable, and low-carbon energy markets using the monthly data on fossil-based energy commodity futures and renewable energy instruments. Their findings reveal that CPU exerts a considerable inverse effect on most fossil energy futures returns, while renewable and low-carbon assets are affected positively. Iqbal et al. (2024) studied asymmetric effects of the daily Chinese CPU on the various energy-related assets such as Carbon emission allowance prices (CEA), clean energy stock index (CN), environmental, social, and governance (ESG) stock index, and gas oil stock index (GAS) using the NARDL framework. The main results of the model illustrated that a higher Chinese CPU reduces CEA prices, while no significant effect is found on CN and GAS stock prices. In contrast, Chinese CPU causes an increase in ESG stock prices in the long term.

There are also studies in the literature examining whether CPU has a predictive power for future returns or volatility of various asset classes. For instance, He and Zhang (2022) examined the predictive role of CPU for share returns in the crude oil sector. Their findings indicate that CPU is a predictor of future stock returns. Furthermore, based on in-sample and out-of-sample results, CPU proves to be more efficient in forecasting the future stock returns of the oil industry compared to other uncertainty indicators or oil industry-specific factors. In a similar study on forecasting, Lv and Li (2023) tested the predictive power of CPU on Chinese sectoral stock returns volatility using data from various sector indices between 2009 and 2022. Their results show that CPU has strong predictive ability for volatility dynamics of different sectors such as energy, materials, industrials, consumer discretionary, health care and utility. They also noted that during low volatility periods, the CPU becomes a more effective factor for predicting sectoral volatility. Ghani et al. (2024) also reveal that the CPU can predict U.S. stock market volatility, while Liu et al. (2023) found that the CPU has predictive ability for future commodities. Another study conducted by Liang et al. (2022). They tested the forecasting performance of CPU and eight other uncertainty indices in explaining the long-term volatility of the World Renewable Energy Index. Their results prove that the CPU index is a more efficient tool compared to other uncertainty measures for predicting renewable energy index volatility. Lastly, Ding et al. (2025) revealed that CPU predicts cryptocurrency volatilities with superior forecasting performance.

This review highlights the current literature on climate policy uncertainty. Although there are studies focusing on the effects of CPU on stock markets from a sectoral perspective (Lv and Li, 2023; Pijourlet, 2024; Özkan, 2024), the evidence for the Turkish market remains extremely limited. To date, no study has addressed the effects of CPU on BIST stock returns on a sectoral basis. Therefore, this study will fill the gap in the literature by observing the effects of global climate-related activities on Turkish sectoral returns. These approaches also contribute to investment decisions or portfolio allocation amid climate policy risks.

3. Data and Methodological Design

This study employs the weekly form of the GCPU index developed by Ma et al. (2024), in addition to BIST sectoral stock market data spanning from 2000 to 2023. Although many countries have their own Climate Policy Uncertainty indices, there is no such index that exists for Türkiye. Given this shortcoming, the paper utilizes the GCPU to analyze the effects of climate-related risks on different sectors of the Turkish stock market. The construction of the GCPU index follows the methodology proposed by Baker et al. (2016) and U.S. U.S.-based keyword framework of Gavriilidis (2021).

As emphasized by Ma et al. (2024), building a vocabulary for GCPU poses challenges due to linguistic diversity, as most searches are conducted in the local language of each newspaper. To address this, Ma et al. (2024) incorporate climate policy reports from the Intergovernmental Panel on Climate Change (IPCC) and national environmental agencies, drawing inspiration. Following Engle et al. (2020), they expand the vocabulary and ensure contextual relevance across countries. They also consult with native experts in climate policy to determine related keywords for different countries. Following these steps, they designed the final GCPU.

In order to analyze the effects of weekly GCPU on stock markets, the study adopts a quantile regression (QR) approach. First, QR helps to provide robust results by cutting back systematic errors often observed in traditional regression approaches, particularly during market downturns. Second, instead of relying on general market states, QR allows us comparable insights into the link between climate risk and financial markets. Therefore, the study includes all sectors that can be consistently matched with weekly GCPU values over the common sample period (2000–2023) to ensure synchronized and comparable observations. BIST Sectoral indices, which are inactive or could not be consistently aligned with the GCPU, were excluded from the dataset to maintain the integrity of the analysis.

The GCPU data used in this study are obtained from the database provided by Ma et al. (2024). The weekly stock market data of BIST sectoral indices are retrieved from Refinitiv (2025). Table 1 provides insight into the variables of the study.

Table 1. Key Variables

Variable	Name	Relevance	Short Form
Independent Variable	Global Climate Policy Uncertainty Index	Index measures global uncertainty ambient climate-related policy decisions. Building via textual analysis of international news sources, index captures the frequency of terms related to climate, policy, and uncertainty (Ma et al., 2024).	GCPU
Dependent Variables	BIST Electricity Index	The electricity sector may be directly affected by climate policies, particularly due to its reliance on traditional energy sources and growing integration of renewable sources. Instruments such as carbon taxes, emissions trading, and incentives can make the index sensitive to policy uncertainty.	XELKT
	BIST Chemical Petrol Plastic	This index is associated with environmental problems such as toxic waste and greenhouse emissions, generally subject to restrictive regulations. Uncertainty in future climate policies may influence compliance costs, gains, and investment motivation.	XKMYA

Table 1. Continued

Dependent Variables	BIST Electricity Index	The electricity sector may be directly affected by climate policies, particularly due to its reliance on traditional energy sources and growing integration of renewable sources. Instruments such as carbon taxes, emissions trading, and incentives can make the index sensitive to policy uncertainty.	XELKT
	BIST Chemical Petrol Plastic	This index is associated with environmental problems such as toxic waste and greenhouse emissions, generally subject to restrictive regulations. Uncertainty in future climate policies may influence compliance costs, gains, and investment motivation.	XKMYA
	BIST Basic Metal	Steel and aluminum industries are major carbon emitters and energy consumers. Climate-related attempts in worldwide can affect competitiveness and trade activity, making this sector vulnerable to climate policy uncertainty.	XMANA
	BIST Services	The environmental footprint of the services sector is relatively limited compared to carbon intensive sectors. However, certain parts of sector such as transportation, tourism, and logistics may expose to climate related regulations and operational risks.	XUHIZ
	BIST Financials	Although financial institutions have no direct emissions, they can still be affected through their investments in carbon-intensive sectors. In addition, climate finance regulations and ESG disclosure requirements may increase their exposure to transition risks and changing investor behavior.	XUMALI
	BIST Industrials	This broad category contains diverse manufacturing sub-sectors with varying energy usage and emission levels. As pressures for environmental regulations and energy transition increase, the sector is likely to more sensitive to shifts in global climate policy and regulatory factors.	XUSIN
	BIST Technology	The technology sector has low direct emissions yet it can incur notably energy costs via data centers, servers, or cloud services. Moreover, it contributes climate related innovations. These two aspects make it important for exploring the impacts of policy uncertainty.	XUTEK
Control Variables	USD/TRY	The exchange rate reflects a common risk channel that conveys the effects of global and domestic market conditions to stock performance. In many countries, exchange rate movements are seen as an indicator of risk appetite and general market-wide shocks that simultaneously affect stock market sectors. To isolate the specific impact of GCPU on sectoral stock performance, the exchange rate return ($/₺) is added to the QR model as a control variable.	EXCR
	Volatility Index	The volatility index is a widely used indicator of global investor sentiment and reflects volatility expectations in U.S. stock markets using derivatives data. Including VIX as a control variable helps to one can understand to broad market risk and shocks, making it possible to identify the specific impact of GCPU on sectoral returns.	VIX

Ma et al. (2024) developed the GCPU index using three alternative aggregation methods: (1) GDP at current prices, (2) GDP adjusted for purchasing power parity (PPP), and (3) equal weighting. Their CPU index is designed based on data from twelve countries, which are Australia, Brazil, Canada, China, France, Germany, India, Japan, Korea, South Africa, the United Kingdom, and the United States. Most of these countries are classified as developed or major emerging economies. At this stage, it is important to select the version that best captures GCPU for a country like Türkiye, which is not part of the core but remains globally integrated. Countries such as the U.S., China, and Germany are central in shaping climate policies and determining their worldwide

implications. In addition, these countries have the greatest effect on economically integrated countries like Türkiye.

Therefore, a GCPU weighted by the relative size of these major economies provides a more reliable indicator for detecting the effects of global climate policies on Turkish sectoral stocks. Consequently, this study uses the weekly GCPU data weighted by GDP at current prices in logarithmic form. Subsequently, weekly returns of the price series are calculated using the following formula:

$$\boldsymbol{r_t} = ln(P_t) - ln(P_{t-1}) = ln(P_t/P_{t-1}) \quad (1)$$

where, r_t indicates the return of the sectoral price indices in week t. P_t and P_{t-1} represent the stock price of the indices in week t and week $t-1$, respectively. Table 2 reports the descriptive statistics of the variables together with the results of unit root tests to assess their stationarity properties.

Table 2. Descriptive Statistics

	GCPU	XELKT	XKMYA	XMANA	XUHIZ	XUMALI	XUSIN	XUTEK	EXCR	VIX
Mean	4.420	0.002	0.004	0.004	0.003	0.003	0.004	0.003	0.003	19.780
Median	4.491	0.003	0.005	0.006	0.005	0.005	0.006	0.006	0.001	17.545
Maximum	5.932	0.354	0.253	0.245	0.242	0.319	0.211	0.280	0.420	79.130
Minimum	1.287	-0.351	-0.206	-0.255	-0.351	-0.315	-0.257	-0.311	-0.351	9.140
Std. Dev.	0.677	0.049	0.043	0.051	0.039	0.050	0.038	0.050	0.029	8.676
Skewness	-0.818	-0.446	-0.163	-0.417	-0.647	-0.205	-0.686	-0.415	2.574	2.257
Kurtosis	4.057	10.837	6.122	5.870	11.56	7.838	8.067	8.252	62.766	11.262
J&B	193.0	3163.0	501.0	454.2	3810.2	1198.8	1401.0	1437.8	182926.9	4506.7
Prob.	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Observation	1220	1220	1220	1220	1220	1220	1220	1220	1220	1220
ADF (C&T)	-8.11***	-33.48***	-34.31***	-34.31***	-33.98***	-22.86***	-33.23***	-22.30***	-17.82***	-6.71***
PP (C&T)	-34,95***	-33,64***	-34,32***	-34,39***	-33,98***	-35,06***	-33,30***	-33,57***	-40.37***	-6.35***

Note: *** indicates statistical significance at the 1% level.

Table 2 provides summary statistics for weekly GCPU and stock returns over the 2000–2023 period, along with the results of the Jarque-Bera test for normality and unit root tests. The findings indicate that the variables are not normally distributed, suggesting the presence of outliers in the time series. This, in turn, justifies the use of quantile regression as a more robust approach, given the inflexibility of traditional models in handling such deviations. All variables are also found to be stationary at the level when both trend and intercept are included. Figure 1 illustrates the time series graphs of the variables used in the study.

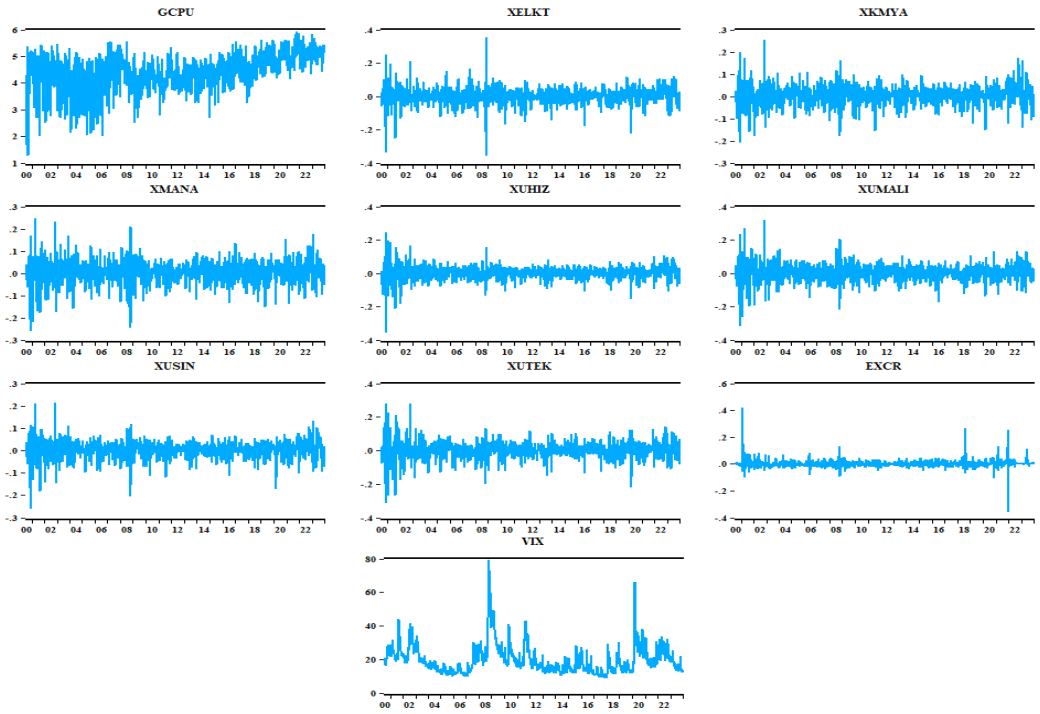

Figure 1. Time Series Plots of Variables

To determine the effect of GCPU on Turkish sectoral stock returns under different market regimes, this study employs a quantile regression approach. Quantile regression estimates the link between independent variables and certain quantiles of the dependent variable, without imposing distributional assumptions in the error terms. It is especially advantageous when classical assumptions such as homoscedasticity are violated or when the focus is on the tails of the distribution (Waldmann, 2018). Furthermore, it is well-suited for time series containing outliers. Quantile regression focuses on specific parts (quantiles) of the conditional distribution of the dependent variable, and estimates how explanatory variables affect different points (e.g., the median or the tails) of that distribution. The general form of QR model in this study is described by the following equation:

$$Q_{R_{i,t}}(\tau|X) = \alpha_i(\tau) + \gamma_i(\tau)GCPU_t + \beta_i(\tau)EXCR_t + \eta_i(\tau)VIX_t \quad (2)$$

where $Q_{R_{i,t}}(\tau|X)$ denotes the conditional quantile of the weekly stock market returns for sector i at quantile level τ. $R_{i,t}$ represents the weekly stock returns of sector i. The coefficient $\gamma_i(\tau)$ captures the effect of the $GCPU_t$ index on sectoral returns at the τ^{th} quantile. $\beta_i(\tau)$ reflects the impact of the weekly exchange rate return, while η_i measures the sensitivity of sectoral returns to the volatility index. Both control variables are included in the model to separate the effect of GCPU from general market-wide risk factors. To examine the impact of GCPU on Turkish sectoral returns within various market states, this study considers multiple quantiles of each sector's return distribution. Relying on weekly data, the variables are specified without lags, allowing us to observe immediate market responses.

4. Empirical Results

The study focuses on the effects of GCPU on Turkish sectoral stock returns. The sample consists of 1220 weekly observations for each variable. Quantile regression is robust to heteroscedasticity, but to be on the safe side, this study applies bootstrap standard errors using the XY-pair resampling technique to ensure reliable outputs. Results are reported in Table 3. According to the results, GCPU has a significant and positive effect on Turkish sectoral returns across different quantiles. This effect also varies between lower and upper quantiles in certain sectors.

For the BIST Electricity sector, which largely comprises stocks of fossil and renewable energy firms, the GCPU shows a significant positive effect at the 15th to the 80th quantile and the 95th quantile. From a quantile regression perspective, this pattern indicates that the impact of GCPU on Turkish electricity stocks is almost uniform across the return distribution. Specifically, the persistent positive effect between the 15th and 70th quantiles further implies that during neutral to moderately favorable market conditions, global climate uncertainty continues to serve as a supportive factor for Turkish energy stocks’ performance. However, the absence of statistical significance in the upper tails of the return distribution indicates that in strong bullish markets, the marginal influence of climate policy uncertainty becomes less pronounced except for the last quantile.

In the BIST Chemical, Petroleum, and Plastic sector (XKMYA), the GCPU only has a strong and significant positive effect in the middle and upper quantiles (from 55th to 85th). From this standpoint, this finding implies that GCPU is fruitful in the sector during strengthening bullish market conditions. In such periods, investors may anticipate that heightened climate-related policy actions such as regulations, carbon pricing, or taxation advantages for cleaner production could increase demand for innovative materials, alternative energy inputs, or adaptation technologies therein the sector. The weak or insignificant effects in the lower and middle quantiles suggest that under neutral or bearish market conditions, the BIST Chemical sector performance is less sensitive to climate policy uncertainty.

The GCPU exerts a negative effect on stock returns up to the 45th quantile; however, no significant effect is observed across these quantiles in the BIST Basic Metal (XMANA) sector. This suggests that during bearish or relatively weak market conditions, heightened GCPU exerts downward pressure on basic metal returns, possibly due to concerns over stricter emission regulations, increased production costs, or reduced global demand for energy-intensive commodities. Since this sector is highly integrated with global markets, its response is broadly consistent with international evidence, reflecting its vulnerability to global demand shocks and climate-related regulatory risks. The only strongly significant positive effect was observed at the 95th quantile may point out that GCPU is perceived less as a risk and more as a sign of future structural demand for metals driven by global green transition policies.

Table 3. Model Results

Quantile	XELKT	XKMYA	XMANA	XUHIZ	XUMALI	XUSIN	XUTEK
0,05	0.005272	0.007018	0.005406	**0.010144****	0.005145	0.001913	**0.014347***
	(0.84)	(1.39)	(0.70)	(2.18)	(0.83)	(0.32)	(1.87)
0,10	0.005289	0.003285	-0.001124	0.002064	0.000740	0.004484	**0.007576***
	(1.59)	(0.91)	(-0.29)	(0.42)	(0.19)	(1.39)	(1.67)
0,15	**0.009554*****	**0.004490***	-0.000457	0.001474	0.001331	0.002048	**0.008166****
	(3.88)	(1.79)	(-0.16)	(0.53)	(0.42)	(0.74)	(2.28)
0,20	**0.010330*****	0.003808	-0.001785	0.003417	0.002217	0.002253	**0.007649****
	(4.96)	(1.64)	(-0.64)	(1.37)	(0.75)	(1.03)	(2.21)
0,25	**0.008304*****	0.002564	-0.001539	0.002383	0.003193	0.002591	**0.006071***
	(3.32)	(1.19)	(-0.63)	(1.15)	(1.21)	(1.08)	(1.88)
0,30	**0.008505*****	0.002665	-0.001457	0.002945	**0.003635***	0.000333	**0.006021****
	(3.50)	(1.21)	(-0.51)	(1.50)	(1.93)	(0.14)	(2.07)
0,35	**0.006311*****	0.002809	-0.001255	0.002564	0.003343	0.000404	**0.005343***
	(2.59)	(1.31)	(-0.50)	(1.24)	(1.48)	(0.19)	(1.87)
0,40	**0.006095*****	0.001622	-0.002073	**0.003092****	0.003532	0.001478	0.002724
	(2.91)	(0.79)	(-0.85)	(2.07)	(1.57)	(0.73)	(1.10)
0,45	**0.005272*****	**0.003268***	-0.001295	**0.003154****	**0.004254***	0.001695	**0.003177***
	(2.77)	(1.66)	(-0.53)	(2.17)	(1.95)	(1.14)	(1.71)
0,50	**0.004945*****	**0.004203****	0.001463	**0.003789****	**0.003826***	0.001744	**0.004265****
	(2.65)	(2.76)	(0.66)	(2.54)	(1.72)	(1.15)	(2.39)
0,55	**0.005402*****	**0.005015*****	**0.003326****	**0.004274*****	**0.004278****	0.002150	0.002844
	(2.97)	(3.34)	(2.01)	(2.72)	(2.08)	(1.46)	(1.54)
0,60	**0.005877*****	**0.005937*****	**0.003935***	**0.003125***	**0.005025*****	**0.002986****	0.002852
	(3.22)	(4.20)	(1.96)	(1.70)	(3.02)	(2.21)	(1.33)
0,65	**0.005585*****	**0.005338*****	**0.004708***	0.001894	**0.005347*****	**0.004023****	0.000922
	(2.99)	(2.98)	(1.93)	(1.05)	(3.08)	(2.45)	(0.35)
0,70	**0.006429*****	**0.006491*****	0.002934	0.002112	**0.004306****	**0.003584****	0.002054
	(3.17)	(3.19)	(1.21)	(1.23)	(2.22)	(2.16)	(0.77)
0,75	**0.005213****	**0.005894*****	0.003319	**0.003444***	**0.005069****	**0.004310*****	0.001953
	(2.18)	(3.05)	(1.36)	(1.70)	(2.35)	(2.81)	(0.79)
0,80	**0.005265****	**0.005872*****	0.003137	0.002460	0.003067	**0.003955****	0.002252
	(2.15)	(2.60)	(1.19)	(1.44)	(1.08)	(2.28)	(0.99)
0,85	0.003576	**0.006382*****	0.004297	0.001625	0.004523	**0.004359****	0.002995
	(1.18)	(2.09)	(1.51)	(0.77)	(1.49)	(2.19)	(1.11)
0,90	0.004125	**0.005646****	0.005234	0.004017	**0.006324****	0.003898	**0.006079****
	(0.94)	(2.14)	(1.38)	(1.54)	(2.07)	(1.54)	(2.04)
0,95	**0.009492***	0.006221	**0.011299*****	0.004227	0.005129	**0.008765*****	0.008187
	(1.85)	(1.39)	(2.78)	(1.44)	(1.26)	(2.75)	(1.56)

Note: *, **, and *** denotes statistical significance of GCPU at the 0.1, 0.05 and 0.01 level, respectively. t statistics are in parenthesis

For the BIST Services sector (XUHIZ), the GCPU has a positive and significant effect on returns in certain quantiles, particularly under bearish market conditions (5th quantile) and moderate market conditions (40th to 55th quantile). This behavior suggests that GCPU may support sectoral returns across varying market states. The mixed structure of this sector may also cause offsetting effects, as some sub-industrials could benefit from climate-related actions, while others might be adversely affected. Hence, the result likely discloses the combined influence of heterogeneous sectoral responses in the index rather than a uniform reaction across all services-related firms.

BIST Financial sector (XUMALI), on the other hand, GCPU generates a significant positive effect on stock returns, mainly in the middle to upper quantiles. This suggests that under moderate to bullish market conditions, investors may view GCPU as manageable or even as an opportunity. Thus, this response seems to depend on market conditions, with stronger effects when markets are neutral or favorable.

In the BIST Industrial sector (XUSIN), the GCPU has almost no significant effect in the lower quantiles. The effects become more explicit at the upper quantiles, with positive and significant coefficients from the 60th to 85th and 95th quantiles. This pattern observed from QR, suggests that during moderately strong to bullish market conditions, raising GCPU tends to support BIST industrial sector returns, indicating expectations of potential higher demand for industrial goods and infrastructure projects associated with climate adaptation and mitigation. In contrast, under weaker market conditions, GCPU does not play a role to determining industrial stock returns.

For the BIST Technology sector (XUTEK), the GCPU shows a positive and significant effect in the lower and middle quantiles, indicating that under bearish or moderately stressed market conditions, climate policy uncertainty boosts technology stocks, likely because of investor perception of the sector as innovative and adaptable to shifting regulatory landscapes. However, the effect weakens and becomes insignificant in mid quantiles and in the upper quantiles (55th to 85th). This suggests that in strong bullish markets, climate policy uncertainty does not turn into additional gains for technology stocks, and may even be viewed as a limiting factor on growth expectations. Figure 2 illustrates the results for each sector index.

Figure 2 visualizes the results from quantile regression, where the blue line symbolizes the estimated quantile coefficients, and the orange line represents the bootstrap confidence intervals. The horizontal axis denotes the quantiles, while the vertical axis denotes the coefficients. Accordingly, confidence intervals do not include zero; the effects at those quantiles are statistically significant. In general, the empirical evidence supports the thought proposed in the research, demonstrating that GCPU exerts heterogeneous effects across sectors in Borsa Istanbul. Thus, each sector exhibits distinct reactions, highlighting the importance of considering sectoral sensitivities when assessing the financial implications of CPU.

Figure 2. Quantile Estimates

Figure 3 presents the quantile regression results for all sectors simultaneously with a comprehensive overview. Marked lines in the graph illustrate how GCPU impact differs across different quantiles for each sector, highlighting positive effects as well as their statistical significance. This visual summary enables comparison for sectoral sensitivities to climate policy uncertainty and makes it easier to identify which sector returns react more strongly under bearish, neutral, and bullish market conditions.

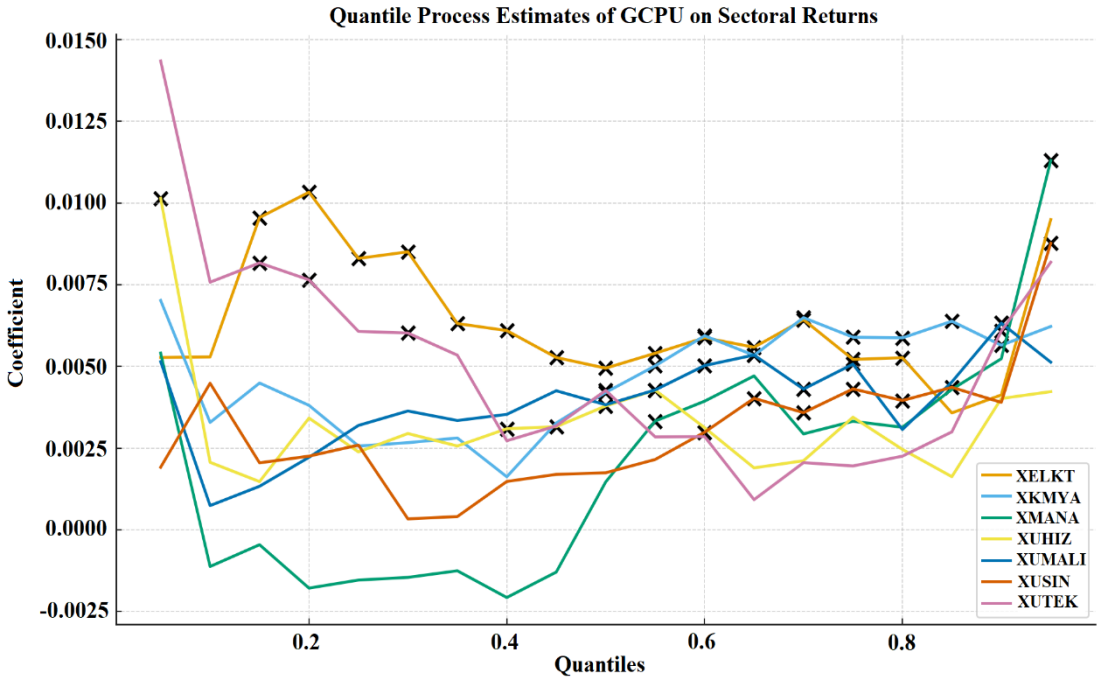

Figure 3. Quantile Process Estimates of GCPU on Sectoral Returns
Note: The × symbol indicates statistical significance at the 1% and 5% level at different quantiles.

According to Figure 3, as expected, the GCPU has the strongest impact the electricity sector, which includes both fossil and renewable energy firm stocks traded in Borsa Istanbul. Its effect on the BIST electricity sector index (XELKT) is positive at the 1% and 5% levels in many quantiles. These results suggest that climate policy uncertainty enhances BIST electricity sectoral returns, especially under normal market conditions. Interestingly, its influence seems to peak during bearish or bullish states. Such findings suggest that investors perceive the BIST electricity sector as a potential beneficiary of policy uncertainty, likely because of its direct link with renewable energy and transition-related expectations. GCPU also has a positive effect on both the BIST Chemical and BIST Industrial sectors at upper quantiles, meaning that climate policy uncertainty enhances sectoral returns exclusively during extreme bullish market conditions. This pattern may indicate investors’ perception of which sector could benefit from rising input costs or shifting demand dynamics associated with policy uncertainty, but only when overall market sentiment is highly optimistic. On the other side, in bearish market states, BIST Basic Metal and BIST Financial indices are not statistically affected by GCPU. The BIST Technology sector is also positively affected by GCPU at lower quantile levels, whereas the BIST Services sector shows the same response at middle quantiles.

These findings offer an understanding of market conditions and investor behavior while also highlighting the linkages between global policies on climate change and the Turkish stock market. According to the results, GCPU has limited effects in many sectors in terms of returns, especially during bearish states. One possible explanation might be that the dominance of other factors arising from extreme conditions, such as the 2007-08 global crisis and the Covid-19 pandemic. Furthermore, the analysis spanning 2000 to 2023 reveals the sensitivities of different sectors to GCPU, providing valuable insights for portfolio allocation and risk assessments by individual investors.

5. Conclusion

This paper analyzes the effects of GCPU on weekly stock returns of Borsa Istanbul using the data from 2000 to 2023. The study focuses on BIST sectoral indices due to their potential sensitivity to GCPU, and results point out that GCPU has significant effects on BIST sectoral returns. Quantile regression analysis shows that the effects of GCPU vary across sectors and different market states. Specifically, all sectors generally exhibit positive responses to GCPU across different market states. Results also show that the effect of GCPU is heterogeneous across market conditions, with specific sectors reacting more steadily to climate policy shocks and others showing sensitivity that depends on the current market state.

The interpretation of the results for the BIST Electricity (XELKT) sector is important, given that the index comprises both fossil and renewable energy shares. Although many renewable energy companies have conducted IPOs in Türkiye in recent years, fossil energy shares still constitute a large portion of the BIST Electricity Index. The effect of GCPU on energy stocks is significant and positive in almost all market states. Consequently, these results appear to diverge from the studies in the literature (Siddique et al., 2023; Di Tommaso et al., 2024; Iqbal et al., 2024; Tedeschi et al., 2024), particularly with respect to the Turkish stock market. Chemicals (XKMYA) and Industrials (XUSIN) also exhibit similar patterns in their responses to GCPU. Technology (XUTEK), on the other hand, is the most positively affected sector by GCPU, especially in times of bearish market conditions, a finding that closely parallels Pijourlet (2024) with regard to behavioral patterns of U.S. technology shares. Similarly, the Financial (XUMALI) and Services (XUHIZ) sectors show comparable dynamics under moderate market states. This finding is in line with Alharbey and Ben-Salha (2024), who argue that climate policy uncertainty has little effect during periods of sharp market swings but tends to play a more noticeable role when markets remain relatively stable in terms of stock returns. GCPU has a negative effect on Basic Metal (XMANA) returns in the lower quantiles, although this effect is statistically insignificant; conversely, in the highest quantile, GCPU shows a strong positive and significant effect on sectoral stock returns, which also differs from the previous literature.

To summarize, the empirical analysis shows that the GCPU influence is present in the Borsa Istanbul across different sectors and market states, even though controlling for common risk channels. In this context, using weekly stock market data structured in accordance with GCPU for a long period, results are consistent with the long-term patterns documented by Xu et al. (2023).

The findings of this study carry several implications for both retail and institutional investors, policy makers, and researchers by shedding light on how sectors are exposed to climate policy risks. For instance, effective portfolio allocation and risk management strategies should take into account these sector-specific sensitivities to climate policy uncertainty at the global level. Policy makers can also enhance transparency and predictability to reduce regulatory uncertainty and bolster investor confidence, especially in the climate-sensitive sectors. The findings obtained for Türkiye reveal that climate policy uncertainty at the global level exhibits different dynamics compared to the results of developed markets. Therefore, the results offer insights into global integration, local climate policies, and the composition of sectoral indices for Türkiye.

The study is limited to the absence of the CPU index created for Türkiye, as well as focusing solely on Turkish stock market returns. Future research could explore the firm-level data,

incorporating local CPU indices, or examine interactions with other financial assets. Researchers may also attempt to construct a CPU index specific to Türkiye. Besides, whether the effects of climate policy uncertainty on stock markets change across major events such as financial crises, health crises, or recent energy shocks may important research field. Finally, exploring the effects of climate-related risks on stock market volatility represents a promising avenue for future research.

Declaration of Research and Publication Ethics

This study which does not require ethics committee approval and/or legal/specific permission, complies with the research and publication ethics.

Researcher's Contribution Rate Statement

I am a single author of this paper. My contribution is 100%.

Declaration of Researcher's Conflict of Interest

There is no potential conflicts of interest in this study.

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