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Climate disasters and annual inflation: International evidence from OECD countries

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Abstract: Climate-related disasters have become increasingly frequent and severe, raising concerns regarding their potential macroeconomic consequences, particularly their influence on inflation dynamics. This study investigates whether climate disasters significantly affect annual consumer price inflation across OECD countries during the period 2000–2024. Using an unbalanced panel dataset comprising 941 country-year observations from 38 OECD economies, the analysis employs a comprehensive panel-data framework, including pooled ordinary least squares, fixed-effects, random-effects, and two-way fixed-effects models with country-clustered robust standard errors. Climate disasters are measured using both occurrence indicators (floods, storms, droughts, extreme temperature events, and wildfires) and disaster severity, represented by the logarithm of reported economic damage. The Hausman specification test supports the use of the fixed-effects estimator, indicating the presence of unobserved country-specific heterogeneity. Across all model specifications, neither aggregate disaster severity nor individual disaster categories exhibit statistically significant effects on annual inflation after controlling for country and year fixed effects. These findings suggest that advanced OECD economies possess sufficient institutional resilience, effective policy responses, and diversified economic structures to mitigate the inflationary consequences of climate-related shocks. The study contributes to the growing literature on climate economics by providing cross-country evidence that the macroeconomic impact of climate disasters on aggregate annual inflation is limited within developed economies. Future research should investigate higher-frequency data, sector-specific price dynamics, and additional macroeconomic controls to further examine the transmission mechanisms linking climate disasters and inflation.

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1. Introduction

Climate change has become one of the most pressing global challenges of the twenty-first century, with the increasing frequency and intensity of climate-related disasters posing substantial risks to economic stability. Extreme weather events such as floods, storms, droughts, wildfires, and heatwaves disrupt agricultural production, damage infrastructure, interrupt supply chains, and reduce industrial output, thereby generating significant macroeconomic consequences. Beyond their direct economic losses, these disasters have increasingly been recognized as important drivers of inflation through supply-side disruptions, higher production costs, food shortages, and increased reconstruction demand (Cevik & Gwon, 2024; Chavleishvili & Moench, 2025; Jackson, 2024).

Recent empirical evidence suggests that climate-related disasters can create upward pressure on consumer prices, although the magnitude and persistence of these effects vary across countries and disaster types. Beirne et al., (2024), using data for the Euro Area, found that weather-related disasters increase inflation in the short run, primarily through supply-side channels, while disproportionately affecting expenditure categories that account for a larger share of low-income households' consumption. Similarly, Qi et al., (2025) demonstrated that climate risk significantly increases inflation in the short term through higher food prices and monetary policy responses, whereas Li et al., (2023) identified rising energy demand as an important mechanism linking climate change to inflation. Country-specific studies also support these findings. For example, Narayan et al., (2026) reported that cyclones, droughts, and heavy rainfall substantially increase inflation in Fiji, while Romero and Naranjo-Saldarriaga (2024) showed that weather-related shocks significantly influence both realized inflation and inflation expectations in Colombia.

The inflationary consequences of climate-related disasters have important implications for monetary policy and macroeconomic management. Climate-induced supply shocks challenge conventional inflation-targeting frameworks because central banks have limited ability to offset inflation generated by disruptions to production and distribution networks (Cantelmo et al., 2024; Kabundi et al., 2026). Furthermore, increasing disaster frequency may amplify inflation volatility, complicate inflation expectations, and reduce the effectiveness of traditional monetary policy instruments (Chavleishvili & Moench, 2025; Yalçınkaya et al., 2026). These challenges are expected to become increasingly important as climate change intensifies over the coming decades. Despite the growing literature, several research gaps remain. Existing studies primarily focus on individual countries, specific regions such as the Euro Area, or particular climate indicators including temperature anomalies, droughts, or rainfall. Comparatively little evidence is available on whether observed climate-related disasters systematically influence annual consumer price inflation across OECD countries using internationally comparable disaster data. Given that OECD economies differ substantially in their economic structures, institutional resilience, and exposure to climate risks, cross-country evidence is essential for understanding the broader macroeconomic consequences of climate disasters and informing effective policy responses.

Accordingly, this study investigates the relationship between climate-related disasters and annual consumer price inflation across OECD countries using panel data analysis. By providing international evidence from advanced economies, this research contributes to the emerging literature on climate-induced inflation and offers insights for policymakers seeking to maintain price stability under increasing climate uncertainty. This will lead to our first research question:

RQ1: Do climate-related disasters significantly influence annual consumer price inflation in OECD countries?

2. Literature Review and Theoretical Background

2.1 Climate Disasters as a Source of Inflationary Pressure

Climate-related disasters have increasingly been recognized as important drivers of macroeconomic instability, particularly through their influence on consumer prices. Economic theory suggests that disasters such as floods, storms, droughts, and extreme temperature events reduce productive capacity, disrupt transportation and supply chains, lower agricultural output, and increase reconstruction demand. These simultaneous supply- and demand-side shocks create upward pressure on inflation, especially in the short run. Consequently, climate change is no longer viewed solely as an environmental challenge but also as a significant macroeconomic risk affecting price stability and monetary policy (Chavleishvili & Moench, 2025; Jackson, 2024). Recent empirical evidence largely supports this theoretical mechanism. Using a panel structural vector autoregression model for the Euro Area, Beirne et al., (2024) found that weather-related disasters significantly increase inflation, although the effects are temporary. Their findings indicate that supply-side disruptions dominate the inflationary response and disproportionately affect expenditure categories representing larger shares of low-income households' budgets. Similarly, Qi et al., (2025) reported that climate risk increases inflation primarily through rising food prices and monetary policy adjustments, while Li et al., (2023) identified higher energy demand as another important transmission mechanism linking climate change and inflation.

2.2 Evidence from Country-Specific and Regional Studies

A growing number of country-level studies further demonstrate that climate-related disasters generate inflationary pressures, although the magnitude varies across economies and disaster types. Narayan et al., (2026) found that cyclones, droughts, and excessive rainfall substantially increase monthly inflation in Fiji while having relatively limited effects on output, suggesting that climate disasters primarily operate as supply-side shocks. Likewise, Romero & Naranjo-Saldarriaga, (2024) showed that weather-related shocks significantly influence both realized inflation and inflation expectations in Colombia, highlighting the importance of climate risks for monetary policy decisions. Cross-country evidence also supports these findings. Zhang, (2023) reported that climate risks significantly affect inflation dynamics across BRICS economies, although the effects differ by country. Similarly, Kabundi et al., (2026) showed that adverse climate shocks increase inflation in both advanced and developing economies, with droughts exerting the strongest inflationary effects through higher food prices. These findings collectively suggest that climate-related disasters are becoming increasingly important determinants of inflation across diverse economic environments.

2.3 Climate Disasters, Supply Chains, and Food Price Inflation

One of the primary mechanisms through which climate-related disasters affect inflation is the disruption of production and distribution systems. Extreme weather events interrupt agricultural production, transportation infrastructure, logistics networks, and manufacturing activities, leading to shortages of essential goods and rising production costs. Cevik & Gwon, (2024) demonstrated that weather anomalies disrupt global supply chains across major economies, generating inflationary pressures that differ according to countries' exposure to supply-chain vulnerabilities. Similarly, Kunawotor et al., (2022) found that droughts and floods increase both headline inflation and food price inflation in African economies through reduced agricultural production. Marwa et al., (2025) further showed that climate change negatively affects food security by increasing food price inflation and reducing agricultural productivity. These studies suggest that food markets represent one of the principal transmission channels through which climate-related disasters influence overall inflation.

2.4 Climate Risks and Monetary Policy

The growing importance of climate-induced inflation has attracted increasing attention from central banks and monetary authorities. Unlike conventional demand-driven inflation, climate-related inflation often originates from supply-side shocks that monetary policy cannot easily offset. Consequently, central banks face difficult trade-offs between maintaining price stability and supporting economic activity following climate disasters. Cantelmo et al., (2024) argue that inflation targeting remains the welfare-optimal monetary policy framework despite increasing climate risks, although central banks should avoid accommodating disaster-induced inflation. Conversely, Chavleishvili & Moench, (2025) show that climate disasters significantly increase inflation volatility and upside inflation risk, suggesting that standard macroeconomic models underestimate the uncertainty generated by climate shocks. Yalçınkaya et al., (2026) further demonstrate that temperature shocks have persistent effects on both realized and expected inflation in the United States, emphasizing the need for climate risks to be incorporated into monetary policy frameworks.

2.5 Research Gap

Although the literature increasingly recognizes the relationship between climate-related disasters and inflation, several important limitations remain. First, many studies focus on individual countries or specific regions, limiting the generalizability of their findings. Second, previous research often examines monthly inflation, inflation expectations, temperature anomalies, or climate risk indices rather than observed climate-related disaster occurrences. Third, relatively few studies investigate annual consumer price inflation across OECD countries using internationally comparable disaster databases over extended periods. Therefore, evidence on whether climate-related disasters systematically influence annual consumer price inflation across OECD economies remains limited. This study addresses this gap by employing panel data for OECD countries and internationally comparable disaster records from the EM-DAT database to examine the macroeconomic relationship between climate-related disasters and annual inflation. By focusing on advanced economies and multiple disaster types, this research contributes to the growing literature on climate economics and provides evidence relevant for monetary authorities and policymakers facing increasing climate uncertainty.

3. Materials and Methods

3.1 Data

This study employs an unbalanced panel dataset comprising 38 OECD countries over the period 2000–2024, resulting in 941 country-year observations. The sample includes all OECD member countries for which complete information on annual inflation and climate disaster indicators is available. The use of OECD countries provides a relatively homogeneous institutional and economic environment while allowing substantial variation in climate-related disasters across countries and over time. The dependent variable is annual consumer price inflation (CPI), measured as the annual percentage change in the Consumer Price Index. Inflation data capture realized price dynamics and serve as an indicator of macroeconomic price stability. Climate disaster information is obtained from the Emergency Events Database (EM-DAT) maintained by the Centre for Research on the Epidemiology of Disasters (CRED). The database provides internationally harmonized information on the occurrence and impacts of natural disasters. Five major climate-related disaster categories are considered: floods, storms, droughts, extreme temperature events, and wildfires. Binary indicators equal one if at least one event of the corresponding disaster type occurred within a country during a given year and zero otherwise.

To capture disaster severity, two continuous measures are constructed. The first is the total reported economic damage associated with climate disasters, while the second measures the total affected population. Because both variables exhibit highly right-skewed distributions, they are transformed using the natural logarithm as follows:

$$\begin{aligned} Log\_Damage &= \ln(1 + Total\_Damage) \\ Log\_Affected &= \ln(1 + Total\_Affected) \end{aligned} \tag{1}$$

The logarithmic transformation reduces the influence of extreme observations while preserving country-year observations with zero reported disaster losses.

3.2 Variables

Table 1 summarizes the variables used in the empirical analysis.

Table 1. Variables and definitions.

Variable	Definition	Measurement
Inflation	Annual consumer price inflation	Annual CPI growth (%)
Log_Damage	Disaster severity	ln(1 + total economic damage)
Log_Affected	Disaster severity	ln(1 + affected population)
Flood	Flood occurrence	Dummy (1 = event occurred)
Storm	Storm occurrence	Dummy (1 = event occurred)
Drought	Drought occurrence	Dummy (1 = event occurred)
Extreme Temperature	Extreme temperature occurrence	Dummy (1 = event occurred)
Wildfire	Wildfire occurrence	Dummy (1 = event occurred)

3.3 Econometric Methodology

The empirical analysis proceeds in several stages to examine whether climate disasters influence annual inflation in OECD countries. First, descriptive statistics are reported to summarize the distribution of the variables. Pearson and Spearman correlation coefficients are subsequently calculated to evaluate pairwise relationships among the variables. Potential multicollinearity is assessed using the Variance Inflation Factor (VIF), where values below five indicate the absence of serious multicollinearity. The baseline empirical model is specified as

$$Inflation_{it} = \alpha + \beta Disaster_{it} + \varepsilon_{it}$$

where $Inflation_{it}$ denotes annual inflation in country $i$during year t, $Disaster_{it}$ represents the climate disaster variable of interest, and $\varepsilon_{it}$is the stochastic error term.
The analysis begins with pooled ordinary least squares (OLS) estimation to provide a benchmark comparison. However, because pooled estimation ignores country-specific heterogeneity, panel estimators are subsequently employed. The one-way fixed-effects model is estimated as

$$Inflation_{it} = \alpha_i + \beta Disaster_{it} + \varepsilon_{it} \tag{2}$$

where $\alpha_i$captures all time-invariant country-specific characteristics that may influence inflation, such as institutional quality, monetary policy frameworks, and structural economic differences. A random-effects specification is also estimated for comparison,

$$Inflation_{it} = \alpha + \beta Disaster_{it} + u_i + \varepsilon_{it}, \tag{3}$$

where u_i denotes the country-specific random effect assumed to be uncorrelated with the explanatory variables. The choice between the fixed-effects and random-effects estimators is determined using the Hausman specification test. The null hypothesis states that the random-effects estimator is consistent and efficient. Rejection of the null hypothesis indicates that the country-specific effects are correlated with the explanatory variables, thereby supporting the use of the fixed-effects estimator. Following the Hausman test, the preferred specification is a two-way fixed-effects model, which simultaneously controls for both country-specific and year-specific effects:

$$Inflation_{it} = \alpha_i + \lambda_t + \beta Disaster_{it} + \varepsilon_{it} \tag{4}$$

where λ_t represents year fixed effects that capture global shocks common to all OECD countries, including international commodity price fluctuations, financial crises, and pandemic-related disruptions. Several model specifications are estimated. The first examines aggregate disaster severity using logged disaster damage. The second replaces disaster severity with individual disaster-type indicators (floods, storms, droughts, extreme temperature events, and wildfires). The final specification simultaneously includes disaster occurrence indicators and logged disaster damage to distinguish between the occurrence and severity of climate disasters. To account for heteroskedasticity and serial correlation within countries, country-clustered robust standard errors are employed in all two-way fixed-effects regressions.

3.4 Model Specifications

Five econometric models are estimated sequentially:

Model 1: Fixed Effects

$$Inflation_{it} = \alpha_i + \beta_1 LogDamage_{it} + \varepsilon_{it} \tag{5}$$

Model 2: Random Effects

$$Inflation_{it} = \alpha + \beta_1 LogDamage_{it} + u_i + \varepsilon_{it} \tag{6}$$

Model 3: Two-Way Fixed Effects

$$Inflation_{it} = \alpha_i + \lambda_t + \beta_1 LogDamage_{it} + \varepsilon_{it} \tag{7}$$

Model 4: Two-Way Fixed Effects with Disaster Types

$$\begin{aligned} Inflation_{it} = \alpha_i + \lambda_t + \beta_1 Flood_{it} + \beta_2 Storm_{it} + \beta_3 Drought_{it} \\ + \beta_4 ExtremeTemperature_{it} + \beta_5 Wildfire_{it} + \varepsilon_{it} \end{aligned} \tag{8}$$

Model 5: Two-Way Fixed Effects with Disaster Severity

$$\begin{aligned} Inflation_{it} = \alpha_i + \lambda_t + \beta_1 LogDamage_{it} + \beta_2 Flood_{it} + \beta_3 Storm_{it} \\ + \beta_4 Drought_{it} + \beta_5 ExtremeTemperature_{it} + \beta_6 Wildfire_{it} + \varepsilon_{it} \end{aligned} \tag{9}$$

This section should provide sufficient detail to enable the study to be replicated. Authors should clearly describe the research design, data sources, variables, sampling procedures, analytical methods, software used, and any assumptions or limitations relevant to the methodology.

4. Results

4.1 Descriptive Statistics

Table 2 presents the descriptive statistics for the variables used in the analysis based on 941 country-year observations from 38 OECD countries between 2000 and 2024. The average annual inflation rate is 3.37%, with a median of 2.37%, indicating that inflation remained relatively moderate across most OECD economies during the sample period. However, the maximum inflation rate of 72.31% and the high values of skewness (7.42) and kurtosis (75.08) reveal the presence of several extreme inflationary episodes, primarily driven by a small number of country-year observations. The climate disaster variables also exhibit considerable variation. Floods (40.6%) and storms (39.3%) are the most frequently recorded disasters, followed by extreme temperature events (27.4%), while droughts are relatively rare, occurring in only 4.3% of the observations. The logged measures of disaster damage and affected population have median values of zero, indicating that many country-year observations experienced either no reported disaster losses or no affected population, while the logarithmic transformation reduces the influence of exceptionally large disaster events. Overall, the descriptive statistics indicate substantial variation in both inflation and climate disaster indicators across countries and over time, providing an appropriate basis for the subsequent panel data analysis.

Table 2. Descriptive Statistics of the Variables (OECD Countries, 2000–2024)

Variable	Obs.	Mean	Std. Dev.	Min	25th P	Median	75th P	Max	Skewness	Kurtosis
Inflation	941	3.365	5.261	-4.448	1.264	2.370	3.754	72.309	7.415	75.078
Log_Damage	941	5.173	6.660	0.000	0.000	0.000	12.565	19.385	0.606	-1.454
Log_Affected	941	4.258	4.754	0.000	0.000	0.000	8.459	18.260	0.507	-1.233
Flood	941	0.406	0.491	0.000	0.000	0.000	1.000	1.000	0.384	-1.857

Storm	941	0.393	0.489	0.000	0.000	0.000	1.000	1.000	0.438	-1.812
Drought	941	0.043	0.202	0.000	0.000	0.000	0.000	1.000	4.543	18.675
Extreme Temperature	941	0.274	0.446	0.000	0.000	0.000	1.000	1.000	1.014	-0.974

Notes: Inflation represents annual consumer price inflation (CPI). Log_Damage and Log_Affected are natural logarithmic transformations of total disaster-related economic damage and affected population, respectively. Flood, Storm, Drought, and Extreme Temperature are binary indicators equal to one if at least one event occurred in a given country-year.

4.2 Correlation Analysis and Multicollinearity

Figure 1 provides a visual representation of the Pearson correlation matrix among annual inflation, climate disaster indicators, and disaster severity measures. Overall, the heatmap reveals relatively weak correlations between annual inflation and the climate-related variables. The largest positive correlation involving inflation is observed for floods (0.088), whereas storms exhibit a weak negative association (–0.065). These low coefficients suggest that simple pairwise relationships between climate disasters and inflation are limited, highlighting the need for panel regression models that account for country-specific heterogeneity and common time effects.

Among the explanatory variables, the strongest relationship is observed between logged disaster damage and logged affected population (0.631), indicating that disasters generating greater economic losses typically affect larger populations. Flood occurrence is also moderately associated with both logged disaster damage (0.544) and logged affected population (0.739), reflecting the substantial economic and social consequences commonly associated with flood events. Correlations among the remaining disaster indicators are generally weak to moderate, suggesting that each disaster type captures a distinct dimension of climate risk.

Taken together, the correlation matrix indicates that pairwise relationships among the explanatory variables remain well below levels that would typically raise concerns regarding multicollinearity. This visual evidence is consistent with the subsequent Variance Inflation Factor analysis, which confirms that multicollinearity is not a significant issue in the regression models.

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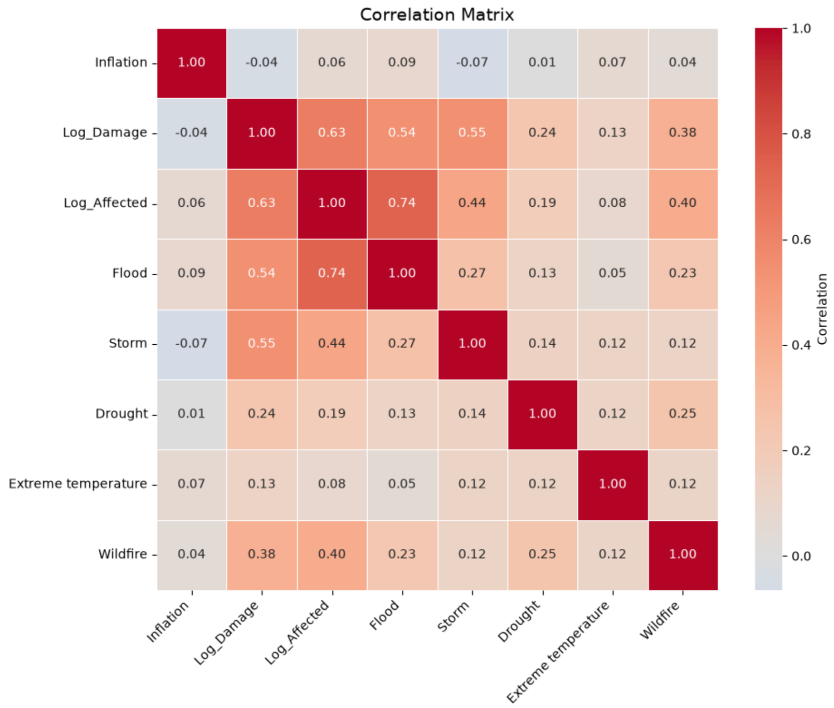

Figure 1. Pearson Correlation Matrix of Inflation and Climate Disaster Variables

Note: The heatmap presents Pearson correlation coefficients among annual inflation, disaster severity measures, and climate disaster indicators for the OECD sample covering 2000–2024. Darker shades indicate stronger positive correlations, while lighter shades represent weaker associations.

Table 3 reports the Variance Inflation Factor (VIF) statistics used to evaluate potential multicollinearity among the explanatory variables. All VIF values are substantially below the commonly accepted threshold of 5, with the highest value observed for logged affected population (VIF = 3.026). Logged disaster damage (VIF = 2.194) and flood occurrence (VIF = 2.385) also exhibit relatively low values, while the remaining variables have VIF statistics close to one. These results indicate that multicollinearity is not a concern in the estimated models. Although logged disaster damage and logged affected population are conceptually related measures of disaster severity, their correlation is insufficient to create instability in the coefficient estimates. Therefore, the explanatory variables can be included in the regression models without compromising the reliability or precision of the estimated parameters.

Table 3. Variance Inflation Factors

Variable	VIF
Log_Damage	2.194
Log_Affected	3.026
Flood	2.385
Storm	1.556
Drought	1.101
Extreme temperature	1.035
Wildfire	1.336

Note: The constant term is omitted because its VIF is not used for assessing multicollinearity.

4.3 Panel Regression Results

Table 4 presents the panel regression estimates examining the relationship between climate disasters and annual inflation across OECD countries. The analysis begins with one-way fixed-effects and random-effects specifications before proceeding to the preferred two-way fixed-effects models that control for both country-specific and year-specific heterogeneity. The fixed-effects model indicates that logged disaster damage has a positive but statistically insignificant effect on annual inflation ($\beta = 0.008$, $p = 0.771$). Similarly, the random-effects estimator produces a positive coefficient ($\beta = 0.031$, $p = 0.227$), although the effect likewise fails to reach conventional significance levels. The Hausman specification test strongly rejects the null hypothesis that the random-effects estimator is consistent ($\chi^2 = 6.326$, $p = 0.012$), indicating that country-specific effects are correlated with the explanatory variables. Consequently, the fixed-effects estimator is selected as the preferred modelling framework for the remainder of the analysis.

To account for global macroeconomic shocks affecting all OECD countries simultaneously, a two-way fixed-effects model incorporating both country and year effects is estimated. After controlling for these unobserved effects, logged disaster damage remains positively associated with annual inflation ($\beta = 0.035$), but the relationship remains statistically insignificant ($p = 0.139$). This finding suggests that aggregate disaster severity does not independently explain cross-country variation in annual inflation once persistent country characteristics and common time effects are removed. The analysis is subsequently extended by replacing the aggregate damage measure with individual climate disaster indicators. None of the disaster categories exhibits a statistically significant relationship with annual inflation. Floods display a positive coefficient ($\beta = 0.727$, $p = 0.334$), indicating that flood years are associated with higher inflation on average, although the effect is not statistically distinguishable from zero. Storms produce a small negative coefficient ($\beta = –0.116$, $p = 0.382$), while extreme temperature events similarly show no measurable impact ($\beta = –0.144$, $p = 0.696$). Wildfires exhibit a positive but statistically insignificant coefficient ($\beta = 0.927$, $p = 0.234$). Among all disaster types, droughts consistently generate the largest negative coefficient ($\beta = –0.727$, $p = 0.151$), although this estimate remains statistically insignificant. The relatively small number of drought observations within the sample likely limits statistical power and contributes to the wider confidence intervals observed for this variable.

The final specification simultaneously incorporates disaster occurrence indicators and logged disaster damage to distinguish between the occurrence and severity of climate events. The estimated coefficient for logged disaster damage decreases to 0.020 ($p = 0.208$), while the coefficients for the disaster-type indicators remain broadly unchanged. None of the explanatory variables achieves statistical significance, suggesting that neither the occurrence nor the economic severity of climate disasters exerts an independent influence on annual inflation in OECD countries over the study period. Overall, the regression evidence is remarkably consistent across alternative specifications. Although the estimated coefficients vary modestly in magnitude, the direction and statistical significance of the results remain stable. The findings therefore suggest that annual inflation in OECD economies is primarily driven by broader macroeconomic conditions rather than by direct climate-disaster shocks. This result is consistent with the institutional resilience of advanced economies, where effective monetary policy, insurance mechanisms, fiscal interventions, and diversified supply chains may mitigate the inflationary pressures associated with climate-related disasters.

Table 4. Panel Regression Results: Climate Disasters and Annual Inflation in OECD Countries

Variables	(1) FE	(2) RE	(3) TWFE	(4) TWFE: Disaster Types	(5) TWFE: Full Model
Log Damage	0.0080	0.0314	0.0347	–	0.0195
	(0.0276)	(0.0260)	(0.0234)		(0.0155)
Flood	–	–	–	0.7270	0.6459
				(0.7528)	(0.7702)
Storm	–	–	–	-0.1157	-0.1995
				(0.1322)	(0.1609)
Drought	–	–	–	-0.7273	-0.7735
				(0.5055)	(0.5103)
Extreme Temperature	–	–	–	-0.1435	-0.1505
				(0.3669)	(0.3661)
Wildfire	–	–	–	0.9268	0.8589
				(0.7776)	(0.7929)
Country Fixed Effects	Yes	No	Yes	Yes	Yes
Year Fixed Effects	No	No	Yes	Yes	Yes
Clustered SE	No	No	Yes	Yes	Yes
Observations	941	941	941	941	941
Within R^2	0.0001	-0.0007	-0.0010	0.0011	-0.0008

Notes: Robust standard errors are reported in parentheses. Models (3)–(5) employ two-way fixed effects with country-clustered standard errors. The Hausman specification test ($\chi^2 = 6.326$, $p = 0.012$) supports the use of the Fixed Effects estimator over the Random Effects estimator.

5. Discussion

The present study examined whether climate-related disasters significantly influence annual consumer price inflation across 38 OECD countries during the period 2000–2024. Using a sequence of panel-data estimators, including fixed effects, random effects, and two-way fixed-effects models, the empirical analysis consistently found no statistically significant relationship between climate disaster indicators and annual inflation. This finding remained robust regardless of whether disasters were measured by aggregate economic damage, individual disaster categories, or a combination of occurrence and severity measures.

The absence of statistically significant effects should not be interpreted as evidence that climate disasters are economically irrelevant. Instead, the results suggest that climate-related shocks may not generate persistent annual inflationary pressures in advanced OECD economies once country-specific characteristics and common macroeconomic shocks are appropriately controlled for. Advanced economies generally possess well-developed institutional frameworks, diversified production systems, comprehensive insurance markets, and effective fiscal and monetary policy mechanisms that help absorb temporary supply disruptions caused by natural disasters. Consequently, although climate disasters may temporarily increase prices in specific sectors, these effects may dissipate before becoming reflected in annual aggregate inflation.

The comparison of alternative panel estimators provides additional methodological insights. While pooled ordinary least squares produced a negative but statistically insignificant coefficient for disaster damage, both fixed-effects and random-effects estimators generated positive coefficients. The Hausman specification test demonstrated that country-specific effects are correlated with the explanatory variables, supporting the use of the fixed-effects estimator.

This result highlights the importance of controlling for unobserved heterogeneity when analysing macroeconomic relationships across countries. Ignoring permanent institutional and structural differences may produce biased estimates and misleading conclusions.

Among the individual climate disaster categories, droughts consistently exhibited the largest negative coefficient, although statistical significance was not achieved. One possible explanation is that drought events are relatively uncommon within the OECD sample, limiting the available within-country variation and reducing statistical power. Furthermore, the agricultural sectors of many OECD economies represent a relatively small share of total economic output, while food imports and international trade may mitigate domestic supply shortages arising from drought conditions. Consequently, drought-induced production losses may have only limited effects on aggregate consumer prices. Floods and wildfires produced positive coefficients throughout the estimated models, whereas storms and extreme temperature events generated negative coefficients. Nevertheless, none of these relationships reached conventional significance levels. These findings suggest that different types of climate disasters may affect economic sectors differently, but their aggregate influence on national inflation remains limited within developed economies. Public infrastructure investment, disaster-response policies, and efficient supply-chain management may substantially reduce the transmission of localized disaster shocks into nationwide inflationary pressures.

The results also indicate that disaster severity, measured by logged economic damage, does not independently explain annual inflation once disaster occurrence and fixed effects are considered simultaneously. Although larger disasters naturally generate greater economic losses, these losses do not necessarily translate into sustained inflation. In many OECD countries, reconstruction spending, insurance compensation, fiscal transfers, and credible monetary policy may prevent temporary supply disruptions from evolving into broader inflationary episodes. Overall, the findings contribute to the growing literature on climate economics by suggesting that the macroeconomic consequences of climate disasters may differ substantially between developed and developing economies. While previous studies frequently report inflationary effects of climate shocks in countries characterized by weaker institutions and greater dependence on agriculture, the present results imply that OECD countries possess sufficient economic resilience to absorb many climate-related disturbances without generating persistent increases in annual consumer price inflation.

Nevertheless, several limitations should be acknowledged. First, annual data may mask short-term inflationary responses that occur immediately following major disaster events. Second, the analysis focuses exclusively on OECD countries and therefore may not be generalizable to emerging or developing economies where climate disasters often have more severe macroeconomic consequences. Third, inflation is influenced by numerous macroeconomic factors, including monetary policy, energy prices, exchange rates, and aggregate demand conditions, which were not explicitly incorporated into the present specifications. Future research could extend the analysis by introducing additional macroeconomic control variables, higher-frequency data, and dynamic panel estimators to investigate both the short-run and long-run transmission mechanisms through which climate disasters influence inflation.

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6. Conclusion

This study investigated the relationship between climate disasters and annual consumer price inflation across 38 OECD countries over the period 2000–2024 using panel-data econometric techniques. A comprehensive empirical framework was implemented, including descriptive statistics, correlation analysis, multicollinearity diagnostics, pooled ordinary least squares estimation, fixed-effects and random-effects models, the Hausman specification test, and two-way fixed-effects estimators with country-clustered standard errors. The empirical findings consistently indicate that neither aggregate disaster severity nor individual climate disaster types exert a statistically significant effect on annual inflation within the OECD sample. The Hausman specification test confirmed that fixed-effects estimation is the appropriate modelling framework, emphasizing the importance of accounting for unobserved country-specific heterogeneity. Furthermore, the inclusion of both country and year fixed effects demonstrates that the estimated relationships remain robust after controlling for common macroeconomic shocks affecting all OECD countries.

From a policy perspective, the results suggest that advanced economies possess sufficient institutional resilience, fiscal capacity, and monetary policy credibility to prevent climate-related disasters from generating persistent annual inflationary pressures. While natural disasters undoubtedly impose substantial human and economic costs, their effects on aggregate price dynamics appear to be effectively mitigated through existing economic and policy mechanisms within OECD countries. The study contributes to the literature by providing one of the few cross-country panel analyses examining the relationship between multiple climate disaster categories and annual inflation across developed economies over a twenty-five-year period. Unlike studies focusing on individual countries or single disaster events, the present analysis simultaneously evaluates disaster occurrence and disaster severity within a unified panel-data framework while accounting for both country-specific and time-specific heterogeneity.

Although no statistically significant relationship was identified, this finding is itself an important contribution. It suggests that the macroeconomic effects of climate disasters cannot be generalized across countries and that institutional quality, disaster preparedness, and policy responses likely play critical roles in moderating inflationary pressures following extreme climate events. Future research should investigate whether climate disasters exert stronger effects on sector-specific prices, food inflation, producer prices, or inflation persistence rather than aggregate annual consumer price inflation. Additionally, incorporating macroeconomic control variables, dynamic panel estimators, and higher-frequency monthly or quarterly data would provide a more comprehensive understanding of the channels through which climate-related shocks influence inflation dynamics.

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