Global Climate Change and the African Concerns: the effect of temperature on the African Economy

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Introduction

Climate change pose quantifiable threats to different functions within the global system, including economies. The impact is found to disproportionately affect spatiality (Burke et al., 2015). For example, rich economies are projected to fare better, while poorer ones are poised to be susceptible and vulnerable. Africa is classified in the latter, despite contributing a paltry 3% to global emissions (IPCC, 2022a, 9-4; AfDB, 2022a).

Climate change realities like rise in temperature and sea levels, varied precipitation as well as weather events and shocks (IPCC, 2007), open up possibilities for inquiring into its potential economic impacts. It is upon this background that this study seeks to investigate the relationship between temperature and economic growth in Africa, situating it within a global perspective while also accounting for potential heterogeneity in the relationship.

Data & Method

Climate data (primarily Temperature and Precipitation) were extracted from the Climate Research Unit of the University of East Anglia (Harris et al., 2020).

GDPpercapita country-level macroeconomic indicators from the World Development Indicator database of the World Bank (World Bank, 2023).

54 countries
1960 – 2020

Following Burke et al. (2018), the relationship between income and climate change is analyzed using a fixed effect panel regression estimation:

$$Y_{it} = \beta_1 T_{it} + \beta_2 T_{it}^2 + \beta_3 P_{it} + \beta_4 P_{it}^2 + \beta_5 X'_{it} + \mu_i + \nu_t + \varepsilon_{it}$$

Results

The relationship between temperature and income growth is graphically presented in Figure 1 and Table 1. In the table, we have 5 different specifications. The first 3 are a global estimate, while the last two are the effect on Africa. In the 3rd specification, we have a global effect that takes into consideration continental peculiarities.

Figure1: Scatterplot showing the relationship between income and temperature for the African continent.

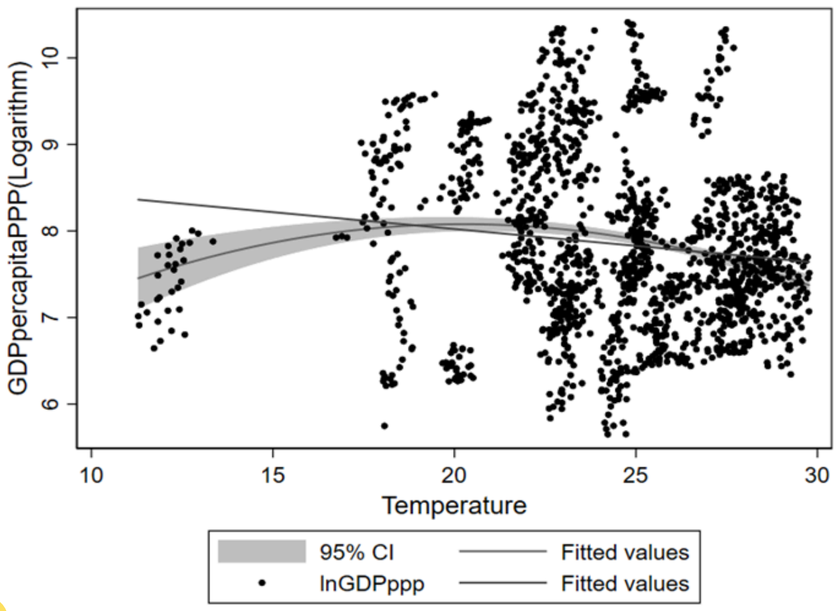

Table 1: Regression estimates for the global sample and Africa.

	(1) World	(2) World	(3) World	(4) Africa	(5) Africa
Temp	0.0167***	0.0167***	0.0122*	-0.0053	0.0016
	(0.0061)	(0.0061)	(0.0068)	(0.0330)	(0.0324)
Temp_sq	-0.0004**	-0.0004**	-0.0004*	0.0001	0.0000
	(0.0002)	(0.0002)	(0.0002)	(0.0008)	(0.0008)
Precip		-0.0057	-0.0023		0.0452
		(0.0144)	(0.0144)		(0.0435)
Precip_sq		0.0014	0.0009		-0.0075
		(0.0035)	(0.0035)		(0.0165)
Constant	-0.3901***	-0.3874***	-0.1241	0.0083	-0.1391
	(0.0563)	(0.0544)	(0.0755)	(0.3637)	(0.3622)
Observations	5347	5347	5347	1510	1510
R squared	0.386	0.386	0.430	0.299	0.300
Optimum	20.84	20.69	16.10	23.90	-29.35

Model specifications include country, year, and time fixed effects as well country time trends (linear and quadratic). In addition, specification (3) includes a continent-yr fixed effect as defined in the World Development Indicator database. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$ and standard error are clustered at the country level.

Conclusion

Climate change is a complex phenomenon, and understanding its economic implications for socioeconomic issues is paramount in adapting and mitigating its consequences.

Our research established some important insights: the temperature-income relation exhibits non-linearity, estimates are significant for the global sample; meanwhile, the estimates are insignificant in the case of Africa. As such, an important area of further research would be to analyse the climate change impact on specific macroeconomic segments of the economy that are vulnerable. In another specification using the logarithm of GDP/capita (growth), we were able to detect a negative impact of temperature rise.

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