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How climate-related disasters reshape tax morale in sub-Saharan Africa

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Surviving the storm

How climate-related disasters reshape
tax morale in sub-Saharan Africa

Enrico Nichelatti¹ and Abrams Tagem²

April 2025

Abstract: Climate-related disasters have increased over recent decades, with severe human and economic consequences. While research has examined their macroeconomic effects and impact on households' income and consumption patterns, little attention has been given to their impact on tax morale—taxpayers' intrinsic motivation to comply with tax obligations. This study fills this gap by estimating the impact of climate-related disasters on tax morale in 26 sub-Saharan African countries using Afrobarometer survey data from 2011 to 2021. The analysis considers six climate-related shocks: droughts, earthquakes, extreme temperatures, floods, storms, and wildfires. We hypothesize that the impact of climate-related disasters on tax morale depends on the specific disasters considered, and that these heterogeneous effects work through two key mechanisms: economic inequality and trust in public institutions. First, they can exacerbate inequality by reducing government revenue, increasing economic hardship for vulnerable groups (through loss of livelihoods), and eliciting unequal policy responses from government. Climate-related disasters can also reduce inequality when associated with increased economic hardship for richer households (by destroying their productive assets). Second, tax morale declines when citizens perceive government responses as inadequate or unfair; conversely, it increases if citizens perceive the government to be responding adequately. Logistic regression results confirm this heterogeneity. Droughts, extreme temperatures, floods, and storms reduce tax morale, while earthquakes and wildfires increase it. Incorporating regional heterogeneity shows that the negative effects of disasters on tax morale are more profound in rural areas. Mediation analysis confirms inequality and institutional trust as key transmission channels. These findings underscore the need for inclusive tax policies and effective post-disaster governance to sustain revenue mobilization in sub-Saharan Africa.

Key words: climate-related disasters, economic inequality, logistic regression, sub-Saharan Africa, tax morale

JEL classification: D63, H26, Q54

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1 Introduction

The frequency of natural disasters has increased considerably in the recent past. The intensity of such unplanned events has also been on a steady increase, with devastating human and physical impacts, including the deaths of approximately 40,000 to 50,000 individuals per year. From 2000 to 2017, natural disasters caused a loss of 2 per cent of the world's GDP (Ritchie et al. 2022). Climate change has been espoused as the primary cause of these natural disasters (Kellenberg and Mobarak 2011). Research analysing the impact of climate-related natural disasters at the macro level has shown that natural disasters reduce output and economic growth (Acevedo et al. 2020; Loayza et al. 2012), increase mortality (Carleton and Hsiang 2016), increase food insecurity (Tidiane Ndour et al. 2025), and worsen political outcomes such as violence and civil strife (Miguel and Satyanath 2011). At the micro level, specifically firm level, they have been found to reduce company sales in Zambia (Adu-Ababio et al. 2024), reduce revenue and VAT revenue in Zambia (Adu-Ababio et al. 2024) and Pakistan (Balboni et al. 2023), and reduce corporate taxes paid by energy companies in China (Pan et al. 2024). At the household level, climate-related disasters have been shown to increase consumption volatility in Gambia (Bayo et al. 2024) and increase tax deductions in Australia (Kucuk and Ulubasoglu 2024). However, there is a dearth of scholarship on the impact of climate-related natural disasters on households and individual dynamics in developing countries and regions. Our paper fills this gap by estimating the impact of climate-related disasters on tax morale in sub-Saharan African (SSA) countries.

It is intuitive to imagine that climate-related disasters, with the disruption of productive capacities and loss of livelihoods they create, can easily influence individuals' willingness to comply with their tax obligations. While there is bound to be heterogeneity in the impact—based on the specific kind of climate-related disaster analysed—we posit that climate-related disasters erode tax morale by increasing economic inequality and reducing trust in public institutions. The impact on inequality works in three ways. First, at the general level, climate-related disasters increase inequality by reducing government revenue (Fuje et al. 2023; Mohan and Strobl 2021). Lower government revenue constrains the redistributive capacity of governments, limits investment in disaster-mitigating functions (Taconet et al. 2020), and increases the need for government spending on disaster relief and social safety nets, which is inevitably restricted due to lower government revenue (Deryugina 2017). Second, climate-related disasters result in economic hardship through loss of income and livelihoods, particularly affecting vulnerable households. Third, they result in disproportionate policy responses in the form of temporary, disaster-linked tax relief, typically favouring those taxpayers who were already better off pre-disaster (Kucuk and Ulubasoglu 2024). On the other hand, climate-related disasters can also reduce income inequality by damaging the high-value assets and properties of richer households (Keerthiratne and Tol 2018). The other channel through which climate-related disasters influence tax morale is trust in government, which depends on the government's ability and willingness to manage the post-disaster response through disaster and non-disaster relief (Frost et al. 2025). Confidence in public institutions will be eroded if taxpayers feel that the government's response to a climate-related disaster is inadequate as a result of unmet expectations during the response phase (Appleby-Arnold et al. 2021), ineffective distribution of disaster relief (Francken et al. 2012), and perceived mismanagement of disaster relief or increased avenues for corruption (Frost et al. 2025). Conversely, an effective disaster response may increase trust in government, which reinforces tax morale.

We aim to provide robust evidence on the link between climate-related disasters and tax morale using the fifth, sixth, seventh and eighth waves of the Afrobarometer survey, covering the period 2011–21 for 26 SSA countries. The climate-related disasters considered are droughts, earthquakes, extreme temperatures, floods, tropical storms, and wildfires, with a final model that includes all of these disasters. Applying a baseline logistic regression, we show that climate-related disasters have heterogeneous effects on tax morale in SSA. Droughts, extreme temperatures, floods, and tropical storms are associated with lower tax morale, while earthquakes and wildfires are associated with higher tax morale. The sensitivity analysis has three key themes. First, we show that the results are robust to alternative estimation strategies and the inclusion of various fixed effects. Second, we explore heterogeneity in the relationship based on: (1) level of development, distinguishing between low-income countries and lower-middle-income countries (LICs) and all other countries (non-LICs); and (2) urban–rural differences. The findings show that disasters reduce tax morale more in non-LICs than in LICs, which can be explained by higher government expectations in non-LICs (themselves influenced by inherently higher tax compliance). For the urban–rural dimension, the results show that the negative impact of climate-related disasters is not necessarily stronger in rural areas than in urban areas. This may counteract evidence that climate-related disasters reinforce regional inequalities (with rural areas more vulnerable to climate-related disasters), but we find that urban areas, especially coastal ones, are just as vulnerable to climate-related disasters. Third, we analyse the key channels through which climate-related disasters affect tax morale: economic inequality and trust in public institutions. We find that climate-related disasters widen inequality (by fostering income and consumption losses, widening the wealth gap between the top 10 per cent and the bottom 50 per cent) and erode trust in public institutions.

The paper makes three contributions to the literature. First, by focusing on how climate-related disasters can affect taxpayers' ability to comply with taxes—directly, due to losses of income and livelihood, hence higher economic inequality; and indirectly, through an erosion of trust in public institutions—it provides a more nuanced and direct view of taxpayers' behavioural responses to climate-related disasters. Second, the study incorporates the psychological tax contract theory and slippery slope framework, both of which underscore the importance of trust in authorities and the state as facilitators of tax morale. In this paper, both frameworks work mainly through taxpayers' confidence in public institutions to handle disaster relief and response efforts: if, after a climate shock, individuals do not trust the government to handle disaster relief adequately, or if they perceive disaster support to disproportionately favour certain groups of taxpayers, their willingness to comply with their tax obligations may decrease. Our mediation analysis shows this to be the case: disasters are associated with reduced trust in public institutions.

Third, the paper provides crucial evidence on the climate disaster–tax morale nexus in a developing region. We focus on the SSA region because of its fundamental differences from other developing regions, especially linked to baseline levels of revenue mobilization (or a lack thereof), poverty, inequality, and vulnerability to climate-related disasters (Azzarri and Signorelli 2020). First, the region has lower fiscal space (i.e., lower domestic revenue mobilization) than other developing regions, and hence more pressing revenue mobilization needs (Oppel et al. 2022). Second, it has lower tax morale—low tax morale itself being linked to lower tax-to-GDP ratios—than the Latin American and Asian regions (OECD 2019). Third, it is particularly prone to natural disasters while simultaneously unable to manage the huge economic and social costs (IMF 2016). Fourth, the structural factors which assuage (or exacerbate) the impact of natural disasters are weaker (or stronger) in SSA, including weak adaptation capacity, higher

reliance on climate-sensitive activities, higher levels of absolute poverty, and poor governance (Calderon et al. 2021). Finally, the SSA region is home to some small island developing states (SIDS), which have been shown to be more vulnerable to climate-related disasters (Pelling and Uitto 2001).

The rest of the paper is organized as follows. Section 2 discusses the vast literature on the determinants of tax morale, focusing on studies on tax morale in SSA and on the macroeconomic impact of climate-related disasters, and culminates in a conceptual framework linking climate-related disasters to tax morale. Section 3 presents the data used in the paper while Section 4 introduces the empirical strategy. Section 5 discusses the baseline results, various robustness checks, and the mediation/channel analysis. Sections 6 and 7 provide discussion and conclusions.

2 Climate-related disasters and tax morale

In this section, we discuss how climate-related disasters may affect tax morale in SSA countries. We first review the literature on the determinants of tax morale in SSA countries, then proceed to review the literature on the economic impact of climate-related disasters. Finally, we propose the main channels through which climate-related disasters influence tax morale.

2.1 Tax morale in SSA

In 2022, African countries averaged 16 per cent of GDP in tax revenue, improving from 14.6 per cent between 2012 and 2022 (OECD 2024a). This, however, masked considerable heterogeneity in tax ratios: high-income and upper-middle-income countries such as Seychelles and South Africa presented 25 and 26 per cent of GDP while LICs such as Chad and Democratic Republic of Congo had rates as low as 10 and 8 per cent of GDP (OECD 2024b). Countries are encouraged to boost their revenue mobilization to counter the negative effects of the ‘polycrisis’ they are facing—including growing conflict and political instability within and across countries, crippling debt ratios and debt service burdens, increased spending needs (especially for infrastructure and social spending), surging prices of primary commodities, and the scarring effects of the coronavirus pandemic (Mawejje 2024). These crises erode fiscal capacity and put pressure on already narrow tax bases by lowering tax morale and exacerbating tax evasion (Castañeda 2024).

Research attention to the determinants of tax morale in the SSA region has increased, mostly using Afrobarometer survey data to capture attitudes towards taxation, and demonstrating the importance of behavioural determinants (e.g., deterrence, intrinsic motivations, social norms, and non-pecuniary motives) and institutional factors (e.g., perceived or actual corruption, perceptions of governance, and trust in public institutions) (see Castañeda 2024 for a review). Kamasa et al. (2019) investigate the role played by non-pecuniary factors in tax compliance and morale in SSA countries. The authors conclude that non-pecuniary factors in the form of limited tax knowledge, non-compliance by others, and corruption of tax officials are associated with reductions in the probability of complying with taxes.

Some studies investigate the impact of corruption on tax morale. Jahnke and Weisser (2019) analyse the impact of petty corruption in 29 SSA countries and show that it erodes tax morale, especially in countries and subregions where fewer people are affected by petty corruption. The authors show that the impact of corruption on tax morale works mainly through diminished trust in tax authorities. Boly et al. (2021) investigate the impact of perceived corruption on tax morale in 36 SSA countries. Noting that perceptions of corruption may be endogenous, the authors implement an instrumental variable (IV) strategy by leveraging the ethnicity of the president or head of government as an instrument for perceived corruption in the chief executive's office. They find that heightened perceptions among citizens of corruption in the chief executive's office are associated with lower tax morale. Building on these foregoing studies, further studies find perceptions of governance to be a crucial determinant of tax morale, with heterogeneous impacts across 32 SSA countries (Nichelatti and Hiilamo 2024).

Other scholars examine the relationship between trust in public institutions (including central and local governments as well as tax authorities) and tax morale. OECD (2019) and OECD et al. (2024) show that trust in tax authorities is a crucial determinant of tax morale in Africa. Kouamé (2021) examines the impact of trust on tax morale in four African countries: Algeria, Ghana, Morocco, and Nigeria. The author distinguishes between trust in public institutions (described as vertical trust, comprising confidence in government, parliament, the legal system, the civil service, police, and the education system) and trust in the neighbourhood (described as horizontal trust). An IV strategy is applied that relies on historical data on the slave trade and the literature on the cultural heritage of trust, with the findings demonstrating that both measures of trust are positively associated tax morale in the four countries.

Another part of the literature investigates the fiscal exchange and social fiscal contract hypotheses as the link between service provision and tax morale. Ali et al. (2014) find that tax compliance is associated with the provision of public goods in Kenya, Tanzania, Uganda, and South Africa. Byaro and Kinyondo (2020) find that citizens' trust in government deteriorates, and consequently willingness to pay taxes reduces, if the government provides non-adequate public services. Bodea and LeBas (2016) show that individuals in urban Nigeria who have positive experiences of state service delivery are more likely to believe in an unconditional obligation for citizens to pay taxes. McCulloch et al. (2021), however, find no relationship between service delivery and tax morale in Nigeria; on the other hand, they find that tax morale increases when individuals believe that other people pay taxes, when they encounter fewer instances of bribery, and when they have greater trust in tax officials.

2.2 The economics of climate-related natural disasters

According to the latest World Meteorological Organization (WMO) report, SSA is disproportionately affected by climate change, facing rising temperatures, extreme weather events, and significant socioeconomic challenges. In 2023, the continent experienced one of its warmest years on record, with temperatures rising faster than the global average. Severe heatwaves, droughts, and floods affected agriculture, displaced millions of inhabitants, and caused substantial loss of life and livelihoods, particularly in East and Southern Africa. Sea level rise, particularly around the Red Sea, exacerbated vulnerabilities in coastal and low-lying regions, jeopardizing productivity and growth in those regions

(WMO 2024). Climate-related disasters cost African economies 2–5 per cent of their GDP annually, with adaptation needs projected at US\$30–50 billion per year by 2030. The African Development Bank (AfDB) has shown that the damage costs due to climate disasters range from \$289 to \$440 billion (AfDB 2022). Investments in early warning systems, climate-resilient infrastructure, and disaster preparedness are critical in mitigating these impacts (Sawada and Takasaki 2017).

Climate-related disasters can impact on aggregate economic activity, i.e., output, productivity, and economic growth (and its components). Such disasters result in the disruption of economic activity (especially agricultural production and industrial output) and physical destruction of key infrastructure (such as buildings and transportation and communications networks), which not only reduces economic output but also has devastating impacts on economic growth (Loayza et al. 2012; Nguyen et al. 2025). Dell et al. (2012) show that the impact may vary according to countries' income levels: poorer countries are responsive to rising temperature shocks while richer countries are not, due to the former's over-reliance on climate-sensitive sectors and limited financial resources to counter weather shocks (through both formal and informal insurance mechanisms). In addition, they show that rising temperatures also affect growth by reducing industrial output and fostering political instability in poor countries.¹ Nguyen et al. (2025) analyse the impact of natural disasters on GDP growth and its components, showing temporary impacts on growth. The findings emphasize heterogeneity: advanced economies respond quickly to disasters (offsetting declines in private investment), whereas in non-advanced economies the government response is limited. The findings also show that within-country characteristics are crucial for post-disaster outcomes, as countries with larger fiscal space (fiscal buffers) tend to increase government expenditure more.

Climate-related disasters also have long-lasting social costs, disproportionately impacting poorer households. With SSA home to a large proportion of the world's poor, climate-related disasters have a large social impact by leading to increases in food insecurity (specifically through a decline in the availability, affordability, and quality of food), energy (especially hydropower) shortages, poverty, and inequality (Klomp and Hoogezand 2018; Tidiane Ndour et al. 2025). In response to the shocks, poorer households inevitably resort to damaging coping strategies (such as selling productive assets to satisfy their immediate consumption needs or reducing their food intake) that perpetuate the cycle of poverty, vulnerability, and inequality. A lack of social safety nets—including cash transfers, food programmes, and emergency supplies which help households to mitigate the effects of shocks (Premand and Stoeffler 2022), poor people living in more vulnerable areas with weak housing conditions, credit constraints, and limited insurance—also leaves people more impoverished (Sawada and Takasaki 2017).

The impact of climate-related disasters on domestic revenue mobilization has increasingly been demonstrated. Fuje et al. (2023) show that droughts reduce total government revenue by eroding core tax bases (consumption, domestic production, income, and trade) and destruction of key revenue mobilization infrastructure (which erodes tax administration and enforcement). Adu-Ababio et al. (2024) show that extremely high temperatures and excessive rainfall reduce taxable sales and VAT, the latter

¹ See Xu et al. (2016) for a review of the impact of climate-related disasters on political instability.

specifically by increasing VAT refunds (possibly driven by increases in the prices of inputs). A growing literature focuses on the local fiscal impact of disasters: Jerch et al. (2023) study local government fiscal dynamics after hurricanes and show that hurricanes reduce tax revenues at the municipal level. Climate-related shocks also impact on households' and firms' tax bases. Pan et al. (2024), using data covering the period 2003–21, analyse the impact of natural disasters on the corporate tax burden of energy companies in China. The authors find a robust negative relationship: natural disasters are associated with lower corporate tax burdens, with the effects working mainly through the government reducing the burden on firms in operational distress and those facing financing difficulties. Kucuk and Ulubasoglu (2024) analyse the effects of natural disasters on households' tax patterns in Australia, focusing on tax deductions and tax payable. The authors show that the 2010/11 Queensland floods were associated with higher tax deductions (especially for higher-income taxpayers and for certain items) in disaster-affected areas. Both findings provide insights into how households respond to disasters given potential changes to their financial and economic conditions.

2.3 Multilevel effects of tax morale

The main mechanism through which climate-related disasters influence tax morale is by altering post-disaster economic inequality. The impact of climate-related disasters on inequality has been studied at the macroeconomic level (see Dang et al. 2024 for a review). Vignoboul (2025), for 114 countries over the period 1995–2004, shows that hurricanes increase income inequality, but the effects depend on countries' development levels. Paglialunga et al. (2022) provide evidence that climate-related disasters increase within-country inequality, especially where a large proportion of workers are in agriculture, while Yamamura (2015) shows that natural disasters increase income inequality in the short run but not in the long run. Gilli et al. (2024) estimate the impact of climate disasters on within-country income distribution (by decile) and show that individuals in the first decile (i.e., the poorest individuals) suffer the most from climate shocks. Contrarily, Keerthiratne and Tol (2018) provide empirical evidence that natural disasters reduce income inequality in Sri Lanka by destroying the most productive assets of richer households (poorer households, conversely, have irregular incomes and limited assets and so do not have as much to lose from natural disasters). We postulate three ways through which climate-related disasters can erode tax morale by worsening inequality.

First, at the broad macroeconomic level, climate-related disasters place a significant burden on state capacity by reducing government revenues, such as by destroying key tax bases; disrupting tax collection systems, which weakens administration and enforcement; and increasing under-reporting and non-compliance (Fuje et al. 2023; IMF 2018). Lower government revenues not only constrain the redistributive capacity of governments (World Bank 2022) but also result in under-investment in key disaster-mitigating and preparation functions, such as adaptation and resilience (Taconet et al. 2020). Also at the macroeconomic level, climate-related disasters, through destruction of infrastructure and disruption of economic production, result in increased prices of essential goods for poorer households that depend on the local market—e.g., food and energy prices—which erode purchasing power and increase the cost of living, exacerbating inequality (Kabundi et al. 2022; Mukherjee and Ouattara 2021).

Second, climate-related disasters result in economic hardship which disproportionately affects more vulnerable groups and poorer households, with high initial inequality exacerbating post-disaster inequality (Winsemius et al. 2018). Additionally, higher degrees of vulnerability and exposure to climate-related disasters are strongly correlated with existing patterns of income inequality (David et al. 2025). Such disasters result in damage to essential infrastructure, slowed production, supply chain disruptions, a general loss of livelihoods, and a surge in distress-driven migration. These result in income losses, increased informal sector activities, and reduced revenue, negatively impacting households' tax compliance. These losses are more accentuated in agriculture- and tourism-dependent regions, as well as for vulnerable groups who see an erosion of their limited assets (reducing their economic mobility and further entrenching inequality).

Third, policy measures in response to climate-related disasters may favour taxpayers who were inherently better off pre-disaster, exacerbating inequality. To assuage the impacts of shocks, governments grant temporary tax relief to disaster-stricken households and companies in disaster-stricken regions—in the form of tax holidays and exemptions, deferrals, reduced tax rates for essential goods and services, and tax deductions—to reduce their tax burdens (Kucuk and Ulubasoglu 2024; Pan et al. 2024). Kucuk and Ulubasoglu (2024) show that higher-income individuals benefit most from tax deductions—especially gifts and donations, as well as work-related travel expenses (which must be earned by employees and businesses). Pan et al. (2024) show that larger energy companies (in terms of firm size and market share) benefit most from tax relief after natural disasters. As with standard tax relief measures, taxpayers need to have a certain level of income/consumption to benefit from the tax relief measures, with higher-income taxpayers benefiting more. In addition, these tax reliefs become entrenched and politically difficult to repeal, especially if disaster-affected taxpayers expect continued tax relief.

The other mechanism through which climate-related disasters influence tax morale is a change in trust in public institutions. Two theoretical advancements underpin the importance of trust as a core determinant of tax morale: the psychological tax contract theory (Feld and Frey 2007) and the slippery slope framework (Kirchler et al. 2008). The psychological tax contract theory argues that tax morale depends on state institutions (especially economic institutions), government policy, and tax authorities' behaviour *vis-à-vis* taxpayers (Feld and Frey 2007). Feld and Frey (2007) show that tax morale is higher when the psychological tax contract is stronger, and the contract is stronger when taxpayers have more confidence in governments' responsiveness. The slippery slope framework explains taxpayer behaviour as a dynamic interaction between two key dimensions: trust in authorities and the power of authorities. Trust in authorities, however, is what shapes voluntary compliance (i.e., tax morale), and it has been shown to be a core determinant of tax morale.

The impact of trust in public institutions as a mediating factor tends to be based on the government's ability or willingness to handle the post-disaster response and recovery. First, inadequate or poor government responses to climate-related disasters significantly erode trust in public institutions (Bechtel and Hainmueller 2011), potentially reducing tax morale. The inadequacy of disaster response may be a result of perceived mismanagement of disaster relief, misappropriation, or corruption, which exacerbate the impact of natural disasters (Cevik and Jalles 2023a; Wenzel 2021); poor disaster relief co-ordination across government agencies; and disparities in disaster recovery efforts which create perceptions of inequity. All of these factors undermine public trust by hampering the state's capacity to deliver disaster

relief resources to people in need (Nikolova and Marinov 2017; Yamamura 2014). Second, perceptions of reciprocity also greatly impact trust, and hence tax morale. Since climate-related disasters increase the need for public support, trust can be eroded if disaster relief disproportionately favours certain groups of taxpayers (itself fostering inequality), with such perceived inequities weakening the social contract between taxpayers and the state. An erosion of trust can also stem from the personal experiences of taxpayers and unmet expectations during the recovery phase (Appleby et al. 2021).²

3 Data

The study aims to respond to the following research questions:

1. Do climate-related disasters affect tax morale in sub-Saharan Africa?
2. Does economic inequality and trust in public institutions exacerbate the impact of natural disasters on tax morale in sub-Saharan Africa?

For the analysis, data on 26 SSA countries covering the period 2011–21 were used. The countries are Benin, Botswana, Burkina Faso, Cabo Verde, Cameroon, Ghana, Guinea, Kenya, Lesotho, Liberia, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Senegal, Sierra Leone, South Africa, Sudan, Tanzania, Togo, Uganda, Zambia, and Zimbabwe.³ The data were obtained from three different sources: the Afrobarometer survey (Afrobarometer 2015, 2016, 2019, 2022), which covers 2011–21; EM-DATA (CRED 2024); and the World Inequality Database (World Inequality Lab 2024). Other Afrobarometer survey rounds were not included due to inconsistencies in some major variables. The original Afrobarometer survey comprises between 34 and 36 African countries (depending on the survey round), some of which were excluded from our analysis due to insufficient data or for geographical reasons (i.e., they are not in SSA).

Rounds 5, 6, 7, and 8 of the Afrobarometer survey were used (see Table A1). Following previous research on tax compliance and morale in SSA (e.g., Ali et al. 2014; Nichelatti and Hiilamo 2024), we used an indirectly phrased question to capture tax morale (Q38C of the survey), minimizing the risk of respondents perceiving an implication of ‘wrongdoing’. In the questionnaire, participants indicated their level of agreement with the following statement: ‘Tax authorities always have the right to make people pay taxes’. Individuals are considered to have a non-compliant attitude if they select ‘strongly disagree’, ‘disagree’, or ‘neither agree nor disagree’, and a compliant attitude if they choose ‘agree’ or ‘strongly agree’. This question is consistently included across all four survey rounds, unlike other taxation-related

² There are, however, situations whereby the misappropriation of disaster response, while not associated with reduced trust, may be associated with increased incumbent support through clientelism (Gallego 2018) and increased government spending (Bechtel and Hainmueller 2011), increasing the probability of re-election.

³ Country names are spelled based on the World Bank’s income classification for the study’s sample period.

questions that are either added or discontinued. In addition, variables on trust, public service provision, education, age, and gender were added.

Afrobarometer also provides information at the household and individual level on various sociodemographic and economic dimensions, including education, age, gender, living in urban areas, and trust. Since data on income are unavailable, an indicator of economic condition was constructed using a proxy means test, following the method developed by Justesen and Bjørnskov (2014) and subsequently applied by Jahnke and Wisser (2019) and Nichelatti and Hiilamo (2024). This proxy measures material deprivation based on how often, in the past year, respondents or their families lacked the following necessities: (a) sufficient food, (b) access to clean water, (c) medicines or medical treatment, (d) fuel for cooking, and (e) cash income. Responses were recorded on a five-point scale ranging from 'never' to 'always'. Higher scores indicate greater material deprivation, while lower scores suggest better living conditions with fewer instances of lacking necessities.

To measure trust in various public institutions, taxpayers were asked to say how much confidence they have in the organization. Responses include 'not at all', 'just a little', 'somewhat', and 'a lot'. The trust variable is an aggregated average derived from individuals' level of trust in various institutions, including the president, parliament, electoral commission, elected local government councils, ruling political party, opposition political parties, police, army, and courts of law. To construct the variable, the values for each of these trust indicators were summed and then divided by nine, i.e. the total number of indicators. Trust is expected to have a positive impact on tax morale (Besley and Dray 2024; Kouamé 2021) and is shown as a key channel through which petty corruption impacts tax morale (Jahnke and Weisser 2019).

Facilities is a binary variable indicating the presence of key public services within easy walking distance. A value of 0 means that none of the listed facilities (post office, school, police station, health clinic, market stalls) are available nearby, while a value of 1 indicates that at least one of these facilities is present. Age is a continuous variable, representing respondents' self-reported age. Education indicates the highest level of education completed. The urban variable identifies whether the respondent lives in an urban or a rural area (0 corresponds to the former, 1 to the latter). Gender is a binary variable: 0 indicates male while 1 indicates female.

Using the EM-DAT dataset, we constructed six disaster-related variables which capture the total number of the same type of climate-related disaster experienced by an individual before their interview date within the same calendar year. Natural disasters were recorded if they met at least one of the following criteria: (a) 10 or more people reported killed; (b) 100 or more people reported affected; (c) declaration of a state of emergency; and (d) call for international assistance (CRED and IRSS 2023). The specific disasters considered include droughts, earthquakes, extreme temperatures, floods, tropical storms, and wildfires. The variable of interest captures the intensity and frequency (persistence) of exposure to a climate-related disaster rather than its mere occurrence, allowing for more nuanced analysis of impacts on tax morale. For instance, an individual may have experienced multiple or extensive floods or droughts in a

single year, and this is likely to have a different impact on tax morale compared with a single isolated event.⁴

This choice of the approach to computing disaster variables rests on three main considerations. First, it ensures simplicity and ease of interpretation while minimizing measurement error, particularly when compared with composite indices like those in EM-DAT, which may be built on reporting inconsistencies or methodological assumptions. Second, it prioritizes intensity and frequency over simple incidence of a climate-related disaster. The number of disasters and the disruptions they cause likely have a stronger influence on tax morale than their mere occurrence. Repeated or severe events can shape public perceptions of neglect and government capacity and responsiveness (or a lack thereof), especially when citizens question the adequacy of disaster preparedness and response. Third, it enhances cross-country comparability. Unlike continuous or index-based measures, disaster counts are less susceptible to differences in national reporting systems, data quality, or resource constraints—factors that are especially relevant in data-scarce contexts such as SSA.

Two indicators for economic inequality were selected from the World Inequality Database: the Gini index and the top 10/bottom 50 income ratio. Both indicators are calculated on pre-tax national income for the whole adult population. The Gini index is the most widely used measure of overall inequality. It incorporates various facets of inequality, including income, wealth, and consumption inequality, and provides a broad perspective on income disparities. It ranges from 0 to 1, with higher values indicating higher inequality. The top 10/bottom 50 income ratio captures structural inequality by comparing the share of national income held by the top 10 per cent of the population with that of the bottom 50 per cent. If the ratio widens after a climate-related disasters, this means that richer households are better off compared with others (worsening inequality). Conversely, a reduction in the ratio will demonstrate that the those who are better off are more affected by climate disasters (Keerthiratne and Tol 2018). In addition, both measures can be used to delineate the impact of climate-related disasters across various income groups and quintiles, which can be useful in assessing the effectiveness of redistribution policies post-disaster.

Table 1 presents descriptive statistics on climate-related disaster variables. The mean values suggest that floods and droughts are the most frequent (78 and 37 per cent), while extreme temperatures and wildfires are less common (less than 1 per cent and 2 per cent, respectively). Earthquakes are also extremely infrequent. The variable *Shocks_number* (which indicates the occurrence of one or more climate-related disasters in a region) shows that individuals experienced an average of 1.57 climate-related disasters, with a maximum of four. Table 2 summarizes key socioeconomic variables, highlighting that 53 per cent of individuals have access to government facilities, while the average wealth score is

⁴ The EM-DAT dataset reports climate-related disasters at the national or regional level. To link this information to individual-level data from Afrobarometer, we merged the two datasets based on geographical region and interview date. Specifically, we assigned a disaster event to an individual if it occurred in the same region where the individual resided, and if the disaster occurred before the interview date but within the same calendar year. This procedure allowed us to construct a measure of disaster exposure at the individual level, based on the spatial and temporal alignment of events.

0.51 on a scale of 0 to 5. The mean age is 37.10 years and 60 per cent of respondents reside in urban areas. Table 3 presents the mean Gini coefficients and the top 10/bottom 50 income ratio for the 26 SSA countries between 2011 and 2021. The highest income inequality is observed in South Africa (0.74) and Mozambique (0.70), while the lowest Gini values are found in Guinea (0.51) and Mali (0.55). The top 10/bottom 50 ratio highlights substantial disparities, with South Africa (52.28) and Zambia (37.37) showing the highest concentration of income among the top 10 per cent. In contrast, Guinea (11.41) and Burkina Faso (18.57) exhibit lower inequality levels, indicating a more balanced income distribution.

Table 1: Descriptive statistics—natural disasters

| Variable | Observations | Mean | Std dev. | Min. | Max. |
|------------------|--------------|--------|----------|------|------|
| Drought | 151,342 | 0.4825 | 0.8548 | 0 | 5 |
| Earthquake | 151,342 | 0.0082 | 0.1115 | 0 | 2 |
| Ext. temperature | 151,342 | 0.0097 | 0.0981 | 0 | 1 |
| Flood | 151,342 | 3.0644 | 3.6182 | 0 | 18 |
| Storm | 151,342 | 0.5586 | 1.3122 | 0 | 10 |
| Wildfire | 151,342 | 0.0461 | 0.3543 | 0 | 4 |
| Multiple shocks | 151,342 | 4.1696 | 4.5298 | 0 | 19 |

Note: the maximum represents the number of a given natural disaster experienced by an individual before but during the same year as the interview.

Source: authors' calculations based on data sources stated in Section 3.

Table 2: Descriptive statistics—main variables

| Variable | Mean | Median | Std dev. | Min. | Max. | Observations |
|-------------|-------|--------|----------|------|------|--------------|
| Tax morale | 0.15 | 0 | 0.35 | 0 | 1 | 145,319 |
| Trust | 0.12 | 0 | 0.26 | 0 | 1 | 125,069 |
| Facilities | 0.53 | 0.6 | 0.30 | 0 | 1 | 147,414 |
| Ec. status | 0.51 | 0 | 1.21 | 0 | 5 | 151,433 |
| Age | 37.10 | 34 | 14.71 | 18 | 115 | 150,459 |
| Education | 3.37 | 4 | 2.20 | 0 | 9 | 150,668 |
| Urban/rural | 0.60 | 1 | 0.48 | 0 | 1 | 151,168 |
| Gender | 0.5 | 1 | 0.5 | 0 | 1 | 151,168 |

Source: authors' calculations based on data sources stated in Section 3.

Table 3: Mean of Gini and top 10/bottom 50 by country, 2011–21

| Country | Gini | Top 10/bottom 50 |
|--------------|------|------------------|
| Benin | 0.61 | 20.28 |
| Botswana | 0.71 | 39.17 |
| Burkina Faso | 0.60 | 18.57 |
| Cabo Verde | 0.61 | 19.82 |
| Cameroon | 0.62 | N/A |
| Ghana | 0.60 | 19.76 |
| Guinea | 0.51 | 11.41 |
| Kenya | 0.60 | 18.53 |
| Lesotho | 0.62 | 22.91 |
| Liberia | 0.54 | 13.63 |
| Malawi | 0.65 | 24.09 |
| Mali | 0.55 | 14.24 |
| Mauritius | 0.58 | 16.68 |
| Mozambique | 0.70 | 34.03 |
| Namibia | 0.74 | 50.28 |
| Niger | 0.56 | 15.00 |
| Nigeria | 0.54 | 13.87 |
| Senegal | 0.58 | 17.12 |
| Sierra Leone | 0.56 | 14.96 |
| South Africa | 0.74 | 52.28 |
| Sudan | 0.55 | 14.25 |
| Tanzania | 0.60 | 18.95 |
| Togo | 0.60 | 20.10 |
| Uganda | 0.62 | 20.74 |
| Zambia | 0.70 | 37.37 |
| Zimbabwe | 0.63 | 23.35 |

Source: authors' calculations based on data sources stated in Section 3.

4 Empirical model

4.1 Baseline regression analysis

While the willingness to voluntarily comply with taxes—tax morale—is primarily an individual behaviour, it can be significantly influenced by national-level factors, such as natural disasters. To explore how natural disasters, a country-level variable, impact tax morale, an individual-level outcome, it is crucial to incorporate the behavioural interaction between collective events and personal attitudes. Variations in tax morale may arise from broader societal and institutional contexts, where country-level characteristics such as the occurrence of climate-related disasters serve as catalysts. These events influence individual attitudes towards tax morale through two key mechanisms: income inequality and trust in public institutions.

A multilevel modelling approach provides a robust framework to analyse the dynamics between climate-related disasters and tax morale (Belmonte et al. 2018; Lago-Peñas and Lago-Peñas 2010). By structuring the analysis to group individuals within countries, this approach enables the simultaneous examination of individual-specific characteristics (e.g., age, gender, education, income, and urban or rural residence) and country-level variables.

The study applies a robust logistic regression analysis controlling by country, region, and year to investigate the effects of natural disasters on tax morale in SSA. A total of six models were built. A crucial prerequisite for establishing causation is proving temporal order, which verifies that the cause comes before the observed result. This lessens the possibility of confounding from reverse causality (or concurrent occurrences). The Afrobarometer and EM-DAT datasets respectively provide the interview date and the date of each climate-related disaster, which enable us to keep only those climate-related disasters that took place earlier in the same year as the interview. This approach allows us to count the number of natural disasters—both of the same type and of different types—that an individual experienced in the same year as the interview, but only those that occurred before the interview date.

A total of seven models were built. The first five models analyse the impact of specific natural disasters on tax morale, each focusing on a distinct type of natural disaster: drought (Model 1), earthquake (Model 2), extreme temperature (Model 3), floods (Model 4), storms (Model 5), and wildfires (Model 6). The seventh model examines the combined effects of experiencing two or multiple natural disasters on tax morale. Equation 1 represents the baseline of the study.

$$P(Y_{ikt}) = \frac{\exp(\beta_0 + \beta_1 \mu_k + \beta_2 \lambda_t + \beta_3 \mu_k \lambda_t + \beta_4 \mu_k^2 + \beta_5 \lambda_t^2 + \mu_k + \lambda_t)}{1 + \exp(\beta_0 + \beta_1 \mu_k + \beta_2 \lambda_t + \beta_3 \mu_k \lambda_t + \beta_4 \mu_k^2 + \beta_5 \lambda_t^2 + \mu_k + \lambda_t)} \quad (1)$$

The following control variables were added to the baseline: facilities, proxy economic condition, age, gender, education, urban/rural. The model was controlled by country, region, and year to account for unobserved heterogeneity and time-specific effects.⁵

4.2 Mediation analysis

The mediation analysis investigates the relationship between a climate-related disaster (X) and tax morale (Y), accounting for multiple mediating variables: economic inequality (M_1), access to facilities (M_2), and trust in institutions (M_3). The analysis is conducted using a structural equation model (SEM). The total effect of the natural disaster on tax morale is captured in Equation (2). In addition to the direct effect, the disaster indirectly influences tax morale through economic inequality, facilities, and trust in institutions. Equation (3) models the mediators' effects on tax morale, while Equations (4) and (5) capture the effects of the disaster on economic inequality and facilities, respectively. Equation (6) estimates the relationship between all three mediators and trust in institutions, which also acts as a sequential mediator. Although access to facilities is included in the model as a control pathway, we do not examine its specific effects in the mediation analysis. This framework enables decomposition of effects to capture: the total effect of the disaster on tax morale; the effect of inequality on tax morale; the effect of inequality on trust; and the indirect effect of disasters on tax morale via inequality and trust in institutions. Equations (2) to (6) together define the structural model:

$$Y = i_1 + cX + \varepsilon_1 \quad (2)$$

$$Y = i_2 + c'X + b_1M_1 + b_2M_2 + b_3M_3 + \varepsilon_2 \quad (3)$$

$$M_1 = i_3 + a_1X + \varepsilon_3 \quad (4)$$

$$M_2 = i_4 + a_2X + \varepsilon_4 \quad (5)$$

$$M_3 = i_5 + d_1M_1 + d_2M_2 + a_3X + \varepsilon_5 \quad (6)$$

The mediation analysis is conducted separately for each type of natural disaster and for a combined measure that accounts for whether a country experienced two or more natural disasters, as specified in the seventh baseline logistic regression model.

⁵ Where Y = tax morale, i = individual, k = country, t = date of the interview, I = natural disaster, II = trust in government, III = presence of facilities, μ = country fixed effects, and λ = year fixed effects.

5 Results

5.1 Baseline analysis

Table 4 presents the results of the seven logistic regression models. (Figure A1 in the appendix shows the number of natural disasters per region between 2011 and 2021). For all seven models the number of observations is 108,579 and the average R-squared 0.56.

Table 4: Logistic regression—baseline

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|--|----------|----------|----------|----------|----------|----------|----------|
| Climate disaster | −0.12*** | 1.03*** | −0.50*** | −0.01*** | −0.15*** | 0.31*** | −0.02*** |
| Trust | 1.72*** | 1.67*** | 1.67*** | 1.68*** | 1.65*** | 1.68*** | 1.69*** |
| Facilities | −0.11*** | −0.14*** | −0.12*** | −0.12*** | −0.13*** | −0.10** | −0.11** |
| Age | 0.00* | 0.00** | 0.00** | 0.00* | 0.00** | 0.00** | 0.00* |
| Education | 0.13*** | 0.14*** | 0.14*** | 0.13*** | 0.14*** | 0.14*** | 0.13*** |
| Urban | −0.06** | −0.08*** | −0.08*** | −0.08*** | −0.08*** | −0.08*** | −0.08** |
| Gender | −0.07** | −0.06** | −0.06** | −0.07** | −0.06** | −0.06** | −0.07** |
| Proxy economic condition | 0.03*** | 0.04** | 0.02** | 0.02** | 0.01 | 0.02** | 0.02** |
| Control by region | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by country | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by year | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 |
| R-squared | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 | 0.72 |
| VIF test | 2.52 | 2.42 | 2.47 | 2.57 | 2.50 | 2.47 | 2.63 |
| Link test | | | | | | | |
| $_hat$ p-value | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| $_hatsq$ p-value | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Chi ² p-value | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |
| Classification accuracy test (% correctly specified) | 89.62 | 89.66 | 89.58 | 89.58 | 89.66 | 89.66 | 89.61 |

Note: VIF test is the variance inflation factor test; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on data sources stated in Section 3.

The results demonstrate considerable heterogeneity: the sign and magnitude of effects vary by disaster type. This is unsurprising, since the interactions of these disasters with structural and institutional factors determine the magnitude of their impact (IMF 2016). Droughts, extreme temperatures, floods, and storms are associated with lower tax morale while earthquakes and wildfires are associated with higher tax morale. The seventh model indicates that the cumulative experience of natural disasters also has a negative influence on tax morale. The negative effects for droughts and extreme temperatures are

unsurprising and match other empirical findings in the literature (Adu-Ababio et al. 2024; Fuje et al. 2023). In the SSA context, extreme temperature is easily associated with extreme heat and can itself be a proxy for droughts. Droughts typically disrupt agricultural production—a major source of livelihood in SSA countries—which pushes people towards financial strain and economic hardship, increases inequality, and ultimately reduces tax morale. Extreme temperatures are typically associated with heat exhaustion, strokes, and syncope, which reduce productivity and result in increased health costs (Moyo et al. 2023). In addition, within the context of low income for the most vulnerable populations, taxpayers will rather manage their health needs than comply with tax payments, eroding tax morale. Storms also significantly erode tax morale by destroying key infrastructure necessary for tax collection, as well as halting economic production in key tax bases, jeopardizing revenue mobilization (Mohan and Strobl 2021). Floods display similar destructive characteristics to tropical storms, driving the most vulnerable populations into severe hardship. In addition, they are particularly devastating to tax morale because while their incidence can be exogenous, their compounding effects are largely preventable through effective government intervention (such as the building of dams). Delayed or inadequate government responses to the above erode trust in public institutions, reducing tax morale.

Trust in institutions is consistently and positively associated with tax morale across all models, with coefficients between 1.65 and 1.72 suggesting that higher levels of trust in institutions increase the likelihood of morale, matching findings in the literature (Besley and Dray 2024; Kouamé 2021). Access to government facilities has a small, albeit negative, effect, with coefficients ranging from -0.10 to -0.14 . Education is positively associated with tax morale, with coefficients between 0.13 and 0.14, reinforcing the idea that higher levels of education promote tax adherence (Jahnke and Weisser 2019). Age consistently shows a consistent positive, albeit small, impact across all models, concurring with the literature, which provides evidence that older taxpayers are more compliant with taxes. Gender is negatively associated with tax morale, with coefficients between -0.06 and -0.07 , indicating that men and women may exhibit differing levels of morale. The urban/rural residence variable reveals that people living in urban areas tend to have lower tax morale compared with those who live in rural areas, possibly reflecting the fact that taxpayers in urban areas can punish governments for not meeting expectations by resisting taxes. The variable used as a proxy for income is positively associated with tax morale, indicating that when people are wealthier, their tax morale may increase. The seventh model continues to show a negative impact of disasters on morale, supporting the findings in relation to some of the first six models (specifically models 2–5]).

5.2 Robustness checks

The baseline estimations were subjected to a battery of robustness tests. First, we applied probabilistic regression and linear probability regression as direct alternatives to the logistic regression (see Tables A2 and A3). The core findings do not change. Second, we incorporated country fixed effects into the logistic regression to address unobserved country-specific factors that may be crucial to the disaster–tax morale nexus (e.g., initial levels of tax capacity and compliance, governance, and the prevailing economic structure). Table A4 shows that the main results are robust. Third, we did the same with region fixed effects and the findings are similar (Table A5).

5.3 Heterogeneity

We aim to ascertain the robustness of the primary findings to differences in some observable characteristics. Two key dimensions are explored here: (1) heterogeneity by level of development; (2) and urban–rural heterogeneity.

First, we created a binary variable with the value 0 for LICs and 1 for non-LICs, then we interacted it with the respective climate-disaster variables. While the sample includes only SSA countries, there is still some heterogeneity in core factors that influence tax morale. LICs have lower tax-to-GDP ratios and narrow tax bases, less developed tax administrations, weaker institutional frameworks, and limited trust, all of which contrive to erode tax morale and compliance more in these countries (Junquera-Varela et al. 2017; Tagem and Morrissey 2023). The results reported in Table 5 reaffirm our assertion about heterogeneity by level of development. Climate-related disasters influence tax morale in LICs exactly as they do in Table 4, showing that in the context of income levels, the baseline effects may be driven by the impact in LICs. The coefficient of interest—the interaction term—offers insight into differences between the two groups of countries. For droughts, the coefficient is positive, suggesting that disasters reduce tax morale less in non-LICs, which may be due to more efficient disaster response and relief efforts—itsself linked to stronger state capacity and larger fiscal buffers (Nguyen et al. 2025). For all other climate-related disasters (including the combined model), the interaction term is negative, suggesting that climate-related disasters reduce tax morale more in non-LICs. Since non-LICs have inherently higher pre-disaster levels of compliance, they have higher expectations of their governments in terms of government services (including disaster relief) pre- and post-disaster. If government response to these climate-related disasters is seen as inadequate, citizens easily resist paying taxes, especially if their expectations are unmet (Appleby et al. 2021).

Second, we created a dummy variable to incorporate regional heterogeneity, taking a value of 0 for urban areas and 1 for rural areas, and interacted it with the climate-disaster variables. There are fundamental differences between urban and rural areas in terms of income-generating activities, vulnerability to climate-related disasters, disaster response infrastructure and preparedness, government services, and financing. In addition, urban areas have more formal employment, and hence more formal tax systems (David et al. 2025; Zhou et al. 2022). Table 6 shows that the negative effects are not particularly pronounced in rural areas (they are only significant for two models). Floods reduce tax morale more in rural areas, while wildfires reduce tax morale less in rural areas. This may not be surprising, given that wildfires tend to be localized and can easily be countered with effective prevention, while eliciting swifter and co-ordinated government responses (see Section 6). For floods, the stronger effect in rural areas concurs with the evidence that rural communities are more vulnerable to disasters because of the predominance of employment in climate-sensitive sectors such as agriculture, limited access to government services, and poor housing conditions in areas more prone to disasters (David et al. 2025; Di Falco et al. 2024).

Table 5: Logistic regression—interaction with income-level dummy

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|
| Climate disaster | -0.15*** | 1.18*** | -0.46*** | -0.01 | -0.10*** | 0.33*** | -0.01*** |
| Income level dummy | -0.77*** | -0.21*** | -0.24*** | 0.09* | -0.05 | -0.21*** | -0.05 |
| Interaction term | 0.87*** | -1.60*** | 0.02 | -0.08*** | -0.15*** | -0.77*** | -0.05*** |
| Trust | 1.72*** | 1.67*** | 1.68*** | 1.66*** | 1.62*** | 1.68*** | 1.66*** |
| Facilities | -0.07* | -0.14*** | -0.13*** | -0.15*** | -0.12*** | -0.09** | -0.13*** |
| Age | 0.00*** | 0.00*** | 0.00*** | 0.00*** | 0.00*** | 0.00*** | 0.00** |
| Education | 0.14*** | 0.14*** | 0.14*** | 0.14*** | 0.14*** | 0.14*** | 0.14*** |
| Urban | -0.05 | -0.08*** | -0.09*** | -0.09*** | -0.09*** | -0.09*** | -0.09*** |
| Gender | -0.06** | -0.06** | -0.06** | -0.06** | -0.06** | -0.06** | -0.06** |
| Proxy economic condition | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Control by region | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by county | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by year | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 |
| R ² | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 | 0.72 |

Note: ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

Table 6: Logistic regression—interaction with region dummy

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|
| Climate disaster | -0.12*** | 1.12*** | -0.39* | 0.01 | -0.18*** | 0.27*** | -0.02*** |
| Urban | -0.06* | -0.07** | -0.08*** | -0.02 | -0.11*** | -0.09*** | -0.04 |
| Interaction term | 0.00 | -0.17 | -0.17 | -0.02*** | 0.05** | 0.06 | -0.01 |
| Trust | 1.72*** | 1.67*** | 1.67*** | 1.69*** | 1.64*** | 1.68*** | 1.69*** |
| Facilities | -0.11** | -0.14*** | -0.12*** | -0.11** | -0.12*** | -0.10** | -0.11** |
| Age | 0.00* | 0.00** | 0.00** | 0.00* | 0.00** | 0.00** | 0.00* |
| Education | 0.13*** | 0.14*** | 0.14*** | 0.13*** | 0.14*** | 0.14*** | 0.13*** |
| Gender | -0.07** | -0.06** | -0.06** | -0.07** | -0.06** | -0.06** | -0.07** |
| Proxy economic condition | 0.03*** | 0.02** | 0.02** | 0.02** | 0.01 | 0.02** | 0.02** |
| Control by region | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by country | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by year | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 |
| R ² | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 | 0.56 | 0.72 |

Note: ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

5.4 Mediation analysis

We argued in Section 2 that climate-related disasters reduce tax morale by increasing economic inequality and eroding trust in public institutions. To measure inequality, we use two variables: the Gini index and the top 10/bottom 50 ratio. These variables are described in the data section.

Tables 7 and 8 present the results of the mediation analysis examining the impact of climate-related disasters on inequality, trust, and tax morale. First, the results show that all climate-related disasters increase inequality in all cases, except wildfires, which reduce both measures of inequality. These positive effects on inequality show that climate-related disasters amplify disparities between high- and low-income groups by increasing loss of livelihoods for the latter; increase post-disaster inflation; create disproportionate access to recovery resources for the better-off groups (e.g., financial reserves insurance and access to government response policies like tax relief); and increase structural inequality, since the better-offs can invest in disaster-resilient infrastructure and due to the entrenchment of downward mobility for the bottom 50 per cent.

Table 7: Mediation analysis with the Gini index

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|--|----------|----------|----------|----------|----------|----------|----------|
| Total effect of disaster on Gini index | 0.02*** | 0.04*** | 0.05*** | 0.00*** | 0.02*** | -0.01*** | 0.00*** |
| Total effect of Gini index on tax morale | -0.29*** | -0.31*** | -0.27*** | -0.26*** | -0.24*** | -0.27*** | -0.24*** |
| Total effect of Gini index on trust | -0.38*** | -0.32*** | -0.29*** | -0.29*** | -0.27*** | -0.30*** | -0.28*** |
| Indirect effect of disaster on tax morale (via Gini index) | 0.01*** | -0.02*** | -0.01 | -0.00 | -0.00 | 0.00 | 0.00*** |

Note: ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

Table 8: Mediation analysis with the top 10/ bottom 50 ratio

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|---|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| Total effect of disaster on ratio | 2.78*** | 8.71*** | 12.69*** | 0.42*** | 2.97*** | -0.98*** | 0.64*** |
| Total effect of ratio on tax morale | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** |
| Total effect of ratio on trust | -0.002*** | -0.000*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** | -0.001*** |
| Indirect effect of disaster on tax morale (via ratio) | 0.001*** | -0.004*** | 0.003*** | 0.000*** | 0.001*** | -0.000*** | 0.000*** |

Note: ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

Second, the results also show that the measures of inequality reduce tax morale, and we argue that this works through inequality fostering taxpayer dissatisfaction and social mistrust (Gustavsson and Jordahl 2008), both of which encourage tax resistance and can even result increase tax evasion (Islam et al. 2018). Third, increased inequality is associated with reduced trust for both measures of inequality. This is concurrent with the literature, which shows that increased inequality reduces trust in public institutions by eroding social trust, reducing cohesion between individuals and political rulers, and increasing perceptions of unfairness (Barone and Mocetti 2015; Palmisano and Sacchi 2024). Fourth, the negative indirect effects suggest that rising inequality, driven by climate shocks, weakens tax revenue. While the effect is small, its significance across models highlights the persistent role of inequality in shaping fiscal outcomes.

6. Discussion

The results from the analysis show that climate-related disasters generally have a negative effect on tax morale in SSA, largely due to the exacerbation of economic inequality and the erosion of trust in public institutions. Droughts, extreme temperatures, floods, and storms typically disrupt livelihoods and amplify income disparities, which in turn result in reduced tax morale. However, earthquakes and wildfires show a positive relationship with tax morale, which could be attributed to quicker disaster response and a more equitable distribution of disaster relief resources. These two types of disasters tend to be more localized in nature than others such as droughts or storms, affecting smaller areas or specific communities. This can lead to a more concentrated and co-ordinated response, fostering a sense of shared experience and fairness in the distribution of resources, which can in turn increase trust in public institutions and positively influence tax morale. The mediation analysis further reveals that the exacerbating of inequality and a decline in trust are key mechanisms linking natural disasters to decreased tax morale, with the public's dissatisfaction with the government's disaster response intensifying these effects.

Three country examples are presented here to put the validity of our empirical findings into context. Two of the countries, Kenya and Benin, are chosen based on their rank on the Notre Dame Global Adaptation Initiative (ND-GAIN) vulnerability index, which measures a country's exposure, sensitivity, and ability to adapt to the negative impact of natural disasters (lower values indicate higher vulnerability). Both countries rank highly on the index: Kenya ranked 135th and Benin 170th out of 187 in 2022 (ND-GAIN 2024). The other country, South Africa, ranks much lower on the vulnerability index (71st) but is included because it has the highest tax-to-GDP ratio of all countries in the sample but also considerably higher income inequality (see Table 3). This implies that citizens may have stronger expectations of state capacity and service delivery, which in turn could influence how climate-related disasters affect tax morale. In such a context, the public might be more sensitive to perceived government performance during crises. Finally, all three countries have introduced climate change legislation—in the form of disaster management policies and acts—to institutionalize accountability and responsiveness to climate-related disasters.

Kenya's development prospects face significant risks due to the growing frequency of natural disasters, a huge majority of which are driven by extreme weather conditions, particularly floods and droughts.

UNDRR (2024) estimates show that each year, approximately 3 to 4 million people in Kenya are impacted by both natural and human-driven hazards, with strong consequences for income-generating activities. Over the past three decades, droughts have become more frequent and intense, causing a dramatic rise in the number of people affected (IMF 2016). The agriculture sector has been hit hardest, resulting in food insecurity and loss of livelihoods, particularly in arid and semi-arid lands. As climate change persists, the most vulnerable populations will continue to endure chronic food shortages and economic hardship (Huho and Magalavai 2010). In addition, climate-change-induced events such as flooding continue to jeopardize the reliable and efficient functioning of infrastructure services, leading to significant socioeconomic disruptions (Njogu 2021).

In recent years, floods have become increasingly frequent and damaging in Benin (Lokonon 2016). Bonou et al. (2017) show that a 1 per cent increase in the duration of floods is associated with a 0.40 per cent decline in agricultural income. During the severe floods of 2012, farmers reported an estimated 1.44 per cent reduction in agricultural income compared with scenarios with less intense flooding, while a 1 per cent rise in cultivated land affected by flooding led to an approximate 0.27 per cent income loss. Furthermore, Bonou et al. (2024) provide evidence that floods have exacerbated poverty, particularly among rural households. Their findings show that affected farmers faced declining incomes and rising expenditures, increasing their vulnerability to poverty. This impact is especially pronounced in remote areas with limited infrastructure and among female-headed and large households.

Climate change could cost South Africa at least 1.5 per cent of its GDP, potentially rising above 3 per cent if tourism losses are included (Turpie et al. 2002). The most significant impacts are on non-market sectors—biodiversity, natural resource use, and health—rather than traditional market sectors such as agriculture. These damages are difficult to mitigate, especially biodiversity loss and the decline of resources vital to rural livelihoods. Adaptation may be costly or unfeasible (given other government expenditure priorities), suggesting that the long-term economic burden could be even higher (Turpie et al. 2002).

In 2017, Kenya implemented the National Disaster Risk Management Policy (NDRMP) to significantly lower the risks posed by both natural and human-induced disasters. The policy is aimed at minimizing associated losses across social, economic, and environmental sectors by promoting a comprehensive, multi-hazard disaster risk management framework (UNDRR 2024). Benin introduced national legislation—the Climate Change Act—in 2018 to counter the negative effects of climate change and stipulate provisions to increase the resilience of living communities (UNDP 2018). South Africa has made significant progress in establishing a climate change governance framework, including stakeholder engagement and a mix of policy instruments. However, its implementation has been inconsistent due to institutional fragmentation, overlapping mandates, and limited capacity at subnational levels. Despite these challenges, the adoption of policies such as the Disaster Management Amendment Act (DMAA) in 2015 has marked a significant step towards strengthening climate resilience (Averchenkova et al. 2019).

To assess whether this policy shapes citizens' perceptions about responses to climate-related disasters, we introduced a policy variable to capture the introduction of climate change legislation in these countries. We create a dummy variable which takes a value of 0 for the years before the introduction of legislation

and 1 afterwards and interacted the dummy variable with the number of climate-related disasters experienced. This approach allows us to evaluate whether the association between natural disasters and tax morale changes after the introduction of climate change legislation. Based on the period pre- and post-introduction, Kenya experienced only droughts and floods, while Benin experienced only floods. South Africa experienced each type of climate-related disaster during the sample period.

Table 9 presents separate linear probabilistic regressions focusing on droughts and floods for Kenya (columns 1 and 2 respectively) and floods for Benin (column 3). The results show that in the absence of the relevant policy, both droughts and floods are negatively associated with tax morale in Kenya, suggesting that exposure to these shocks weakens individuals' willingness to pay taxes (concurrent with the baseline results). However, the positive and statistically significant interaction term suggests that the government's institutionalization of the responsiveness of disaster response policies (through introduction of the NDRMP) may be associated with increased trust in institutions, significantly mitigating the negative impact of disasters on tax morale. Column 3 shows that while the floods reduced tax morale pre-legislation, the legislation itself does not moderate the impact of climate-related disasters on tax morale.

Table 9: Linear regression—Benin and Kenya

| Variables | [1] | [2] | [3] |
|--------------------------|----------|----------|----------|
| Natural disaster | −0.04*** | −0.04*** | −0.02*** |
| Interaction term | 0.06*** | 0.09*** | 0.03 |
| Trust | 0.069*** | 0.51*** | 0.27*** |
| Facilities | 0.12*** | 0.05*** | 0.02 |
| Age | 0.00* | 0.00 | 0.00 |
| Education | 0.02*** | 0.01*** | 0.01*** |
| Urban | 0.02*** | 0.00 | −0.01 |
| Gender | −0.01 | −0.01** | −0.01 |
| Proxy economic condition | 0.07*** | 0.04*** | 0.06** |
| Control by region | Yes | Yes | Yes |
| N | 6,986 | 6,986 | 6,986 |
| R-squared | 0.57 | 0.51 | 0.29 |

Note: Model 1 (drought) and model 2 (flood) are for Kenya while model 3 (flood) is for Benin; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

Following the same approach used for Kenya and Benin, we investigate the effects of the introduction of the DMAA on the relationship between climate-related disasters and tax morale in South Africa. Table 10 shows that all of the climate-related disasters—including earthquakes and wildfires—are associated with reduced tax morale prior to the introduction of the DMAA, while the positive and significant interaction term suggests that the introduction of the DMAA significantly moderates the impact of climate-related disasters on tax morale.

Table 10: Linear regression—South Africa

| Variable | [1] | [2] | [3] | [4] | [5] | [6] |
|--------------------------|----------|----------|----------|----------|----------|---------|
| Climate disaster | −0.05*** | −0.04*** | −0.04*** | −0.01*** | −0.01*** | −0.03** |
| Interaction term | 0.05*** | 0.05*** | 0.05*** | 0.01*** | 0.01*** | 0.08*** |
| Trust | 0.81*** | 0.83*** | 0.83*** | 0.81*** | 0.81*** | 0.83*** |
| Facilities | 0.02** | 0.01 | 0.01 | 0.02** | 0.02** | 0.01 |
| Age | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Education | 0.01*** | 0.01*** | 0.01*** | 0.01*** | 0.01*** | 0.01*** |
| Urban | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Gender | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| Proxy economic condition | 0.11*** | 0.11*** | 0.11*** | 0.11*** | 0.11*** | 0.11*** |
| Control by region | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 6,606 | 6,606 | 6,606 | 6,606 | 6,606 | 6,606 |
| R-squared | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 | 0.45 |

Note: ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

These findings suggest that institutionalizing government responsiveness to climate-induced shocks, in the form of disaster risk management policies and climate change acts—provides taxpayers with a statutory mechanism through which they can hold their governments accountable. This is fundamental to establishing and building trust in government institutions, itself very important for tax morale.

7 Conclusion

This study investigates the impact of climate-related natural disasters on tax morale in SSA. Using individual-level data from the Afrobarometer survey covering 26 SSA countries from 2011 to 2021, we employ a logistic regression framework to examine the effects of different types of natural disasters—specifically droughts, earthquakes, extreme temperatures, floods, storms, and wildfires—on tax morale. Our results provide strong evidence that climate-related disasters negatively affect tax morale, with variations in magnitude depending on the type of disaster. The most severe effects are observed for droughts and extreme temperatures, while wildfires and earthquakes also contribute to declining tax morale, though to a lesser extent. The findings remain robust across alternative estimation methods and sensitivity analyses.

Beyond the direct effect of disasters on tax morale, we explore two key mechanisms through which these events may influence taxpayers' willingness to comply with tax obligations: economic inequality and trust in public institutions. Our mediation analysis provides evidence that natural disasters exacerbate economic inequality, widening the gap between the wealthiest and the most vulnerable populations. This increase in inequality, in turn, negatively impacts tax morale. Additionally, our findings suggest that climate-related disasters erode trust in public institutions, particularly when government responses to disasters are perceived as inadequate or biased towards certain groups. When citizens lose confidence in

the state's ability to provide relief and recovery support equitably, their willingness to comply with tax obligations may diminish.

The study contributes to the literature by providing empirical evidence on the nexus between climate shocks and tax compliance behaviour. Our findings underscore the need for policy-makers to integrate disaster resilience into tax policy and revenue mobilization strategies. Strengthening public trust through transparent and equitable post-disaster responses, coupled with policies aimed at mitigating inequality, could help to sustain tax morale even in the wake of increasing climate-related shocks. Future research could explore the long-term effects of repeated exposure to disasters on tax morale and examine whether certain institutional frameworks can mitigate the negative impact of climate-related disasters on tax compliance.

We agree also with some of the conclusions formulated by Cevik and Jalles (2023b). Income inequality must be a key consideration in the design of climate change mitigation and adaptation policies. Traditional cost–benefit analyses for climate adaptation tend to favour wealthier populations, as the poor often live in more vulnerable areas. Similarly, mitigation policies such as carbon taxes and the removal of fossil-fuel subsidies should be designed equitably, with compensatory measures such as direct cash transfers to offset energy price increases for low-income households. Only by addressing income inequality directly in policy-making can we protect vulnerable groups and ensure the fair distribution of climate change costs.

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Appendix

Table A1: Variable definitions

| Name | Label | Source | Question | Codes |
|-------------------|---------------------------|---------------|---|----------------------------------|
| Taxes | Tax morale | Afrobarometer | For each of the following statements, please tell me whether you disagree or agree: The tax authorities always have the right to make people pay taxes. | 0 'do not agree' 1 'agree' |
| Shock_1,2,3,4,5,6 | Natural disaster | EM-DAT | N/A | 0 'not occurred' 1 'occurred' |
| Trust | Trust in government | Afrobarometer | How much do you trust each of the following, or haven't you heard enough about them to say: The President/Prime Minister? Parliament? The Electoral Commission? Metropolitan, Municipal or District Assembly? The Ruling Party? Opposition Political Parties? Police? Army? Courts of law? | 0 'do not trust' 1 'trust' |
| Facilities | Public services provision | Afrobarometer | Are the following facilities present in the primary sampling unit/enumeration area, or within easy walking distance: - Post office? - School? - Police station? - Health clinic? - Market stalls? | 0 = no, 1 = yes, |
| Age | Age | Afrobarometer | How old are you? | 0–115 |

| | | | | |
|--------------|------------------|---------------|---|---|
| Education | Education | Afrobarometer | What is the highest level of education you have completed? | 0 'no formal schooling' 1 'informal schooling only (including Koranic schooling)' 2 'some primary schooling' 3 'primary school completed' 4 'intermediate school or some secondary school/high school' 5 'secondary school/high school completed' 6 'post-secondary qualifications, other than university e.g. a diploma or degree from a polytechnic or college' 7 'some university' 8 'university completed' 9 'post-graduate' |
| Wealth score | Proxy income | Afrobarometer | Over the past year, how often, if ever, have you or anyone in your family: Gone without enough food to eat? Gone without enough clean water for home use? Gone without medicines or medical treatment? Gone without enough fuel to cook your food? Gone without a cash income? | 0 'never', 'just once or twice' 1 'several times', 'many times', 'always' |
| Urban | Urban/rural area | Afrobarometer | N/A | 0 'urban' 1 'rural' |
| Gender | Gender | Afrobarometer | Respondent's gender | 0 'male' 1 'female' |

Source: authors' construction based on sources stated in column 3.

Table A2: Probabilistic regression

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|
| Climate disaster | -0.06*** | 0.59*** | -0.30*** | -0.01*** | -0.08*** | 0.17*** | -0.01*** |
| Trust | 1.02*** | 0.99*** | 0.99*** | 1.00*** | 0.98*** | 1.00*** | 1.00*** |
| Facilities | -0.07*** | -0.08*** | -0.07*** | -0.06*** | -0.08*** | -0.06** | -0.07*** |
| Age | 0.00** | 0.00** | 0.00** | 0.00** | 0.00*** | 0.00*** | 0.00** |
| Education | 0.07*** | 0.07** | 0.07*** | 0.07*** | 0.08*** | 0.07*** | 0.07*** |
| Urban | -0.04** | -0.05*** | -0.05*** | -0.05*** | -0.05*** | -0.05*** | -0.04*** |
| Gender | -0.04** | -0.04** | -0.03** | -0.04** | -0.03** | -0.03** | -0.03** |
| Proxy economic condition | 0.02*** | 0.02*** | 0.02*** | 0.02*** | 0.01** | 0.02*** | 0.02*** |
| Control by region | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by country | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by year | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 |
| R-squared | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 | 0.57 |

Note: ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

Table A3: Linear probabilistic regression

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|--------------------------|----------|---------|----------|----------|----------|---------|----------|
| Climate disaster | -0.02*** | 0.12*** | -0.04*** | -0.00*** | -0.00*** | 0.02*** | -0.00*** |
| Trust | 0.51*** | 0.51*** | 0.51*** | 0.51*** | 0.51*** | 0.51*** | 0.51*** |
| Facilities | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 |
| Age | 0.00*** | 0.00*** | 0.00*** | 0.00 | 0.00*** | 0.00*** | 0.00*** |
| Education | 0.01*** | 0.01*** | 0.01*** | 0.01*** | 0.01*** | 0.01*** | 0.01*** |
| Urban | -0.01*** | 0.01*** | 0.01*** | 0.01*** | 0.01*** | 0.01*** | 0.01*** |
| Gender | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 |
| Proxy economic condition | 0.04*** | 0.05*** | 0.05*** | 0.05*** | 0.05*** | 0.05*** | 0.05*** |
| Control by region | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by year | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 |
| R-squared | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |

Note: ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

Table A4: Logistic regression—income-level group fixed effects

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|
| Climate disaster | −0.04*** | 0.38*** | 0.08 | 0.01** | −0.04** | 0.05 | 0.01 |
| Trust | 0.75*** | 0.75*** | 0.74*** | 0.74*** | 0.74*** | 0.74*** | 0.74*** |
| Facilities | 0.02 | 0.02 | 0.02 | 0.02 | 0.01 | 0.02 | 0.02 |
| Age | 0.00*** | 0.00*** | 0.00*** | 0.00*** | 0.00*** | 0.00*** | 0.00*** |
| Education | 0.11*** | 0.11*** | 0.11*** | 0.11*** | 0.11*** | 0.11*** | 0.11*** |
| Urban | −0.02 | −0.02 | −0.03 | −0.03 | −0.03 | −0.03 | −0.03 |
| Gender | −0.11*** | −0.11*** | −0.11*** | −0.11*** | −0.11*** | −0.11*** | −0.11*** |
| Proxy economic condition | −0.05*** | −0.05*** | −0.05*** | −0.05*** | −0.05*** | −0.05*** | −0.05*** |
| Income group FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 |
| R-squared | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 | 0.26 |

Note: FE refers to fixed effects; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

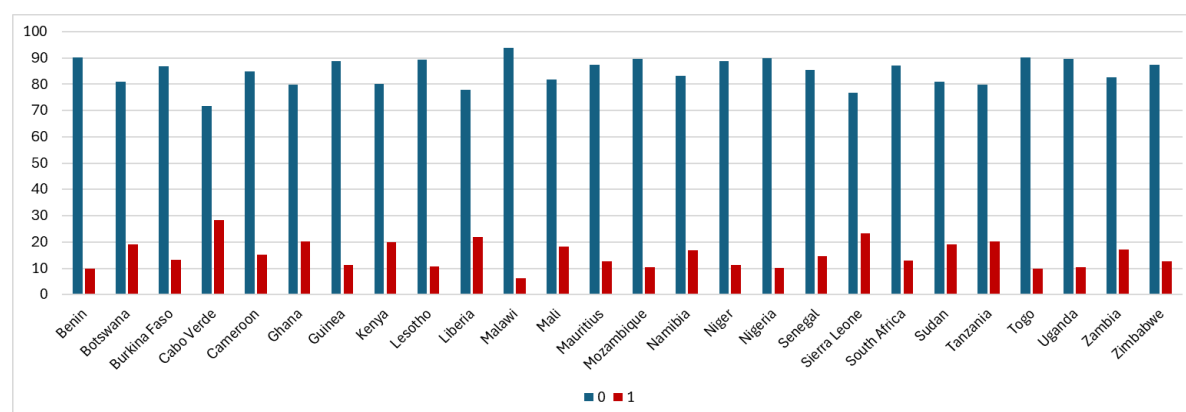
Table A5: Logistic regression—region fixed effects

| Variable | [1] | [2] | [3] | [4] | [5] | [6] | [7] |
|--------------------------|----------|----------|----------|----------|----------|----------|----------|
| Climate disaster | 1.47*** | −4.89*** | −1.54*** | −0.51*** | −5.36*** | −5.09*** | −0.47*** |
| Trust | 0.69*** | 0.69*** | 0.69*** | 0.69*** | 0.69*** | 0.69*** | 0.69*** |
| Facilities | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| Age | 0.00** | 0.00** | 0.00** | 0.00** | 0.00** | 0.00*** | 0.00*** |
| Education | 0.12*** | 0.12*** | 0.12*** | 0.12*** | 0.12*** | 0.12*** | 0.12*** |
| Urban | −0.02 | −0.02 | −0.02*** | −0.02*** | −0.02*** | −0.02*** | −0.02*** |
| Gender | −0.11*** | −0.11*** | −0.11*** | −0.11*** | −0.11*** | −0.11*** | −0.11*** |
| Proxy economic condition | −0.04*** | −0.04*** | −0.04*** | −0.04*** | −0.04*** | −0.04*** | −0.04*** |
| Region FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by country | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Control by year | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| N | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 | 108,579 |
| R-squared | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 | 0.66 |

Note: FE refers to fixed effects; ***, **, and * denote statistical significance at 1, 5, and 10% levels, respectively.

Source: authors' construction based on sources stated in Section 3.

Figure A1: Tax morale by country (mean)



Source: authors' illustration based on own calculations.