

## Climate change challenges for firms and workers: Opportunities for sustainable and inclusive growth

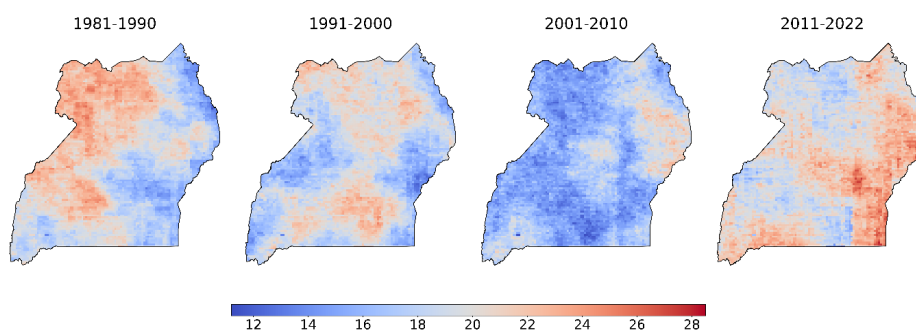
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- Climate change has increased the frequency of extreme weather events in Uganda.
- Among formal firms in urban areas, extreme rainfall has significant adverse effects on firm sales, particularly in consumer-oriented service sectors.
- The impact of extreme rainfall is most severe for young firms, while older firms appear more resilient, mitigating weather shocks by diversifying their customer base.
- Climate change can exacerbate gender inequality, as women are more likely to work in the subsistence sector, which is highly vulnerable to climate shocks.

## Introduction

One of the most significant consequences of climate change is the growing intensity and frequency of *extreme weather events*. While a decline in rainfall and a series of droughts were observed in the northern region during the 1990s and 2000s, there has been an increase in high-intensity precipitation across the country in the recent decade (World Bank, 2021). Figure 1 shows the changing patterns in the average number of extreme rain days. When comparing daily total precipitation from 1981 to 2022 in each area, the most intense rainfall events are concentrated in the period from 2011 to 2022, particularly in eastern Uganda. The country experienced the highest frequency of extreme precipitation between 2018 and 2020, with an average of 24.6 days of extreme rain per year, a significant increase from the 18.4-day average between 1981 and 2010. As a result, *floods and landslides associated with extreme rainfalls have surged*, and the disaster risks are expected to continue rising.

**Figure 1: Average number of extreme rain days per year**



Source: Reinicke and Tateishi (2024) using the Climate Hazards Group InfraRed Precipitation with Station data (CHIRPS). Extreme rain days are defined as when daily total precipitation exceeds the mean + 2 standard deviations in each grid cell for 1981 – 2022. Each grid cell is 5 x 5km<sup>2</sup>.

This policy note highlights the challenges that *climate change poses for firms and workers and offers potential policy remedies to these issues*. Tackling these challenges requires integrating climate resilience into both business practices and workforce management. By enhancing adaptive capacities, promoting sustainable practices, and fostering collaboration between firms and workers, Uganda can unlock economic opportunities and promote inclusive growth. This report focuses on two underexplored areas of climate change research: (i) the impact of extreme weather shocks on non-agricultural firms and (ii) the asymmetric exposure to climate shocks between men and women.

## The effect of the extreme weather events on firms and workers: Overview

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Climate change poses significant challenges for firms and workers across various sectors. In *agriculture*, unpredictable weather patterns — such as droughts and floods — reduce crop yields, disrupt supply chains, and cause income losses for farmers. This sector's vulnerability has widespread effects, particularly for businesses and workers reliant on agricultural exports. In Uganda, climate-related risks account for over 67% of agricultural risks, a situation worsened by the fact that fewer than 2% of farming households practise irrigation (Tumwine et al., 2019). Similarly, the *fishing industry* is affected by rising water temperatures, leading to reduced fish stocks. Additionally, changes in weather patterns and loss of biodiversity deter tourists, negatively impacting business revenues and employment in the *tourism sector*.

In *manufacturing*, heavy rainfall can directly cause damage to production facilities and reduce labour productivity. Firms may also be exposed to negative shocks through their domestic production networks when suppliers fail to deliver inputs (Balboni et al. 2024; Rentschler et al., 2021). Moreover, urban areas frequently experience flash floods during extreme rainfall, as drainage systems are not catching up with the city's expansion. *Climate change increases operational costs for firms*, requiring investment in infrastructure repairs and adaptation, while workers, especially in climate-sensitive sectors, face job losses and income instability. Thus, disruptions from climate change are not limited to the agricultural sector, and it is crucial to examine the impact on non-agricultural firms and workers to gain a more comprehensive understanding of the economic losses.

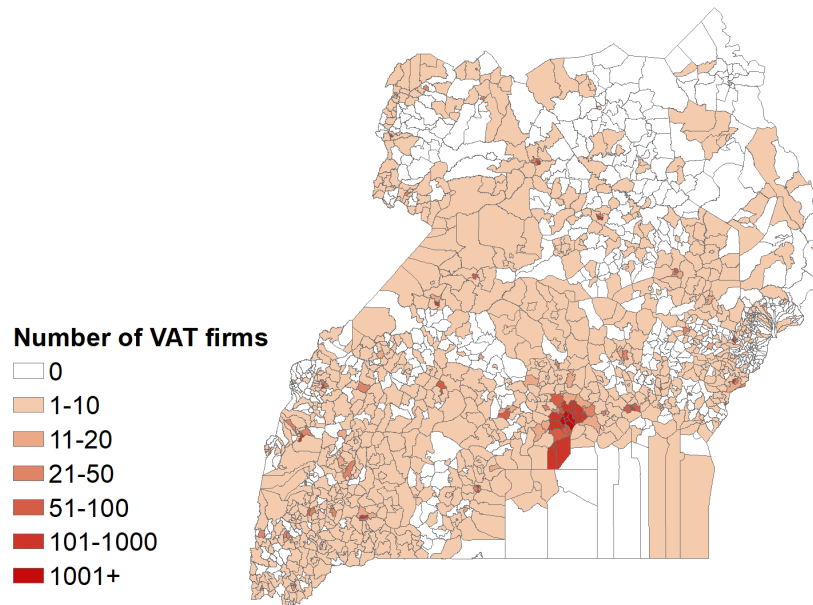
## Detailed analyses of the effects of extreme rainfall on firms in the service sector

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To explore the effect of extreme rain on non-agricultural firms, Reinicke and Tateishi (2024) analysed the firm transaction records from the Uganda Revenue Authority (URA). The study focused on 30,355 formally registered firms, of which 37% are in the wholesale/retail sector and 39% are in the service sector. It is important to note that the analysis only accounts for relatively large firms in urban areas and is unlikely to capture the impact on informal household enterprises, as the data includes only formally registered firms. The study analysed the Value-Added-Tax (VAT) returns from January 2013 to October 2022 to measure firm sales and transaction values. Figure 2 shows the distribution of the VAT-

registered firms. There is a high concentration of firms in cities and urban areas, and notably, 64% of the firms we study are located in Kampala<sup>1</sup>.

**Figure 2: Distribution of VAT-registered firms**



Source: Reinicke and Tateishi (2024).

The authors measure the extreme rainfall in the corresponding period from 2013 to 2022. They use hourly precipitation records at a fine grid resolution, which were converted into a measure of daily rainfall at the subcounty level. The number of extreme rain days per month is defined as deviations from the average in each subcounty. It is worth noting that this measure of extreme rainfall is more frequent and less severe than flooding, and may serve as a proxy for flash floods, including minor ones.

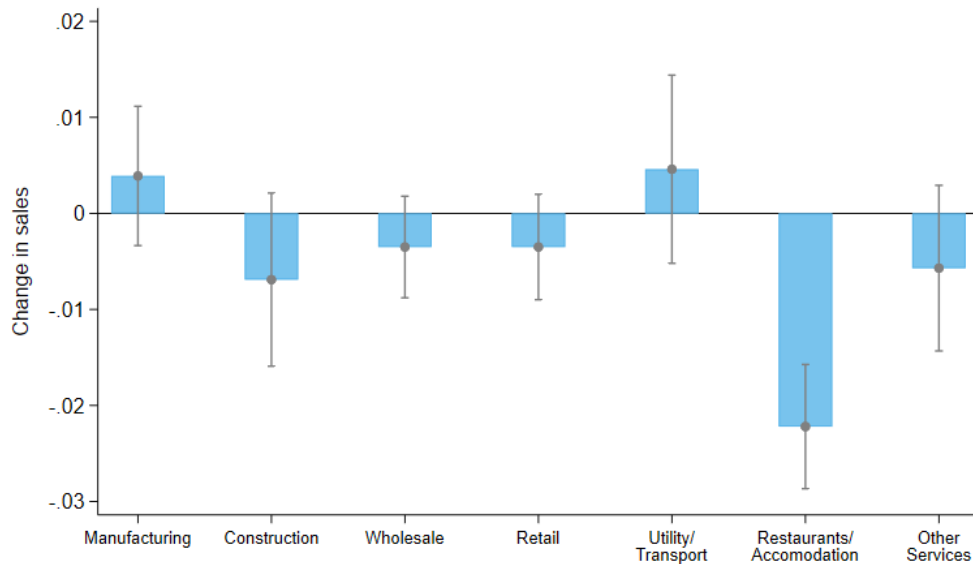
The study analysed the effects of extreme rainfalls on firm performance, measured by monthly sales. Figure 3 presents the direct effects of extreme rainfall by sectors when a firm experiences an additional day of extreme rain in a given month. The effects are negative for most sectors, with restaurants and accommodation sectors experiencing the strongest impact. These sectors are likely heavily dependent on final consumers. In addition to these direct impacts on firms, the authors also estimate the shocks occurring to firms' customers. The analysis of transaction records shows that shocks can propagate through firm linkages. When customers are negatively affected, their immediate suppliers also experience reduced sales, which implies that firms in unaffected areas can still be indirectly disrupted. Altogether, these findings point to demand shocks;

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<sup>1</sup> Firm location is available up to the subcounty level; There are 1,520 subcounties with an average size of 100 km<sup>2</sup>.

extreme rainfall negatively affects local consumers and firms, reducing their purchases and causing adverse effects on the firms from which they buy.

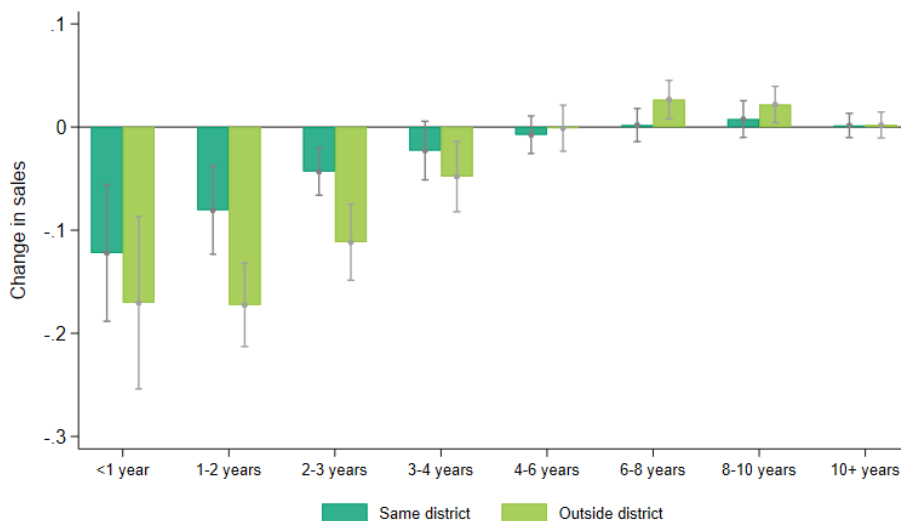
**Figure 3: Distribution of VAT-registered firms**



Source: Reinicke and Tateishi (2024).

Further analysis explored how extreme weather events interact with firm growth. Figure 4 shows the effect by firm age, showing that *young firms experience significant reductions in sales both within and outside their district, whereas older firms are less affected*. In fact, older firms increase their sales outside of their district in the event of extreme rainfall, and they do so by increasing the number of buyers. While further analysis is required to identify the adaptation mechanism, the results suggest that older firms can mitigate the impact by leveraging a diverse customer base when their local buyers are affected by weather shocks. Younger firms may lack the capacity to employ such mitigation strategies, underscoring the importance of policy support for vulnerable firms.

Figure 4: Direct effect of extreme rainfall on monthly sales by firm age



Source: Reinicke and Tateishi (2024).

## Asymmetric effect of climate change on men and women

Using household survey data for 16 Sub-Saharan African (SSA) countries between 2005 and 2020, Gemici et al. (2024) find that about 80% of the working population in their sample are engaged in low-pay own-account work or unpaid family farm or business work.<sup>2</sup> These income-generating activities represent the subsistence sector in SSA with *over 75% of subsistence workers being employed in agriculture and fishing; with trade, particularly retail, being the second most common activity (5-20% across countries)*. As mentioned above, these sectors are highly vulnerable to extreme weather events both due to their direct effect on agricultural output and the indirect effect through customer demand in local economies. In contrast, less than one-fifth of wage jobs are in agriculture, offering more income stability. These population figures highlight the scale of the problem that low-income countries face due to climate change.

In addition, Gemici et al. (2024) suggest that *climate shocks can exacerbate gender inequality*, which remains one of the biggest challenges in African countries<sup>3</sup>. Their analysis shows that *women, and especially married women, are more likely to work in the subsistence sector than men, making them more vulnerable to extreme weather events*. In Uganda, the share of wage employees is one third among men and only 13% among women (further dropping to 9% for

<sup>2</sup> The evidence cited in this section is an output from a project funded by the UK Foreign, Commonwealth & Development Office (FCDO) and the Institute of Labor Economics (IZA) within the G<sup>2</sup>LM|LIC Programme. The views expressed are not necessarily those of FCDO or IZA.

<sup>3</sup> See “African Gender and Development Index Regional Synthesis Report: Measuring Gender Equality and Women’s Empowerment in Africa”, United Nations Economic Commission for Africa, Addis Ababa, Ethiopia, 2017.

married women). Moreover, even when women work for wages, they typically earn less than men with similar qualifications.

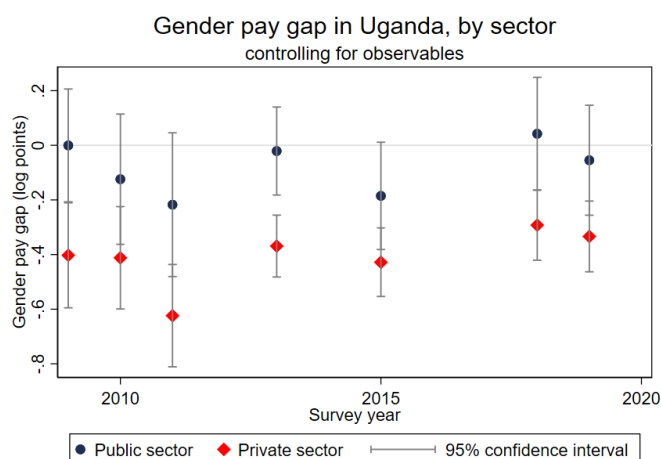
**Figure 5: Estimated marginal effect for the probability of working in paid employment (left panel) and in the public sector (right panel), by gender and marital status**



Source: Gemici et al. (2024).

Within wage employment, there are large differences between public and private sectors. Even though the former sector tends to pay higher wages and provide greater job stability to both men and women, public sector employment is particularly attractive to married women. Figure 5 shows that the negative wage employment gap on the left is completely reversed on the right with *married women being more likely to work in the public sector compared to both single women and men*. Moreover, Figure 6 shows that the public sector pays more equal wages for men and women than private companies do (note that the data include formal and informal private firms and households). These results suggest that *the public sector plays a key role in providing women with secure jobs and equal pay*, helping reduce gender gaps and protecting women against income shocks.

**Figure 6: Average difference in pay between men and women among employees in the private and public sector in Uganda, controlling for demographics**



Source: Gemici et al. (2024).

## Policy recommendations

- 1) Extreme weather poses significant challenges for non-agricultural firms in urban areas. While policy responses to the adverse effects of climate change typically focus on the agriculture sector due to its vulnerability to weather shocks, our research demonstrates that climate change also affects non-farm sectors. Expanding governmental support to the non-agricultural sectors is a crucial step in developing inclusive climate change policies.
- 2) Supporting young firms in the service sectors is particularly important in the event of extreme weather shocks. Uganda's urban areas have a high concentration of service sector firms. Our findings indicate that the negative impacts are more pronounced in consumer-oriented services and young firms. Firm vulnerability to irregular weather events threatens private sector development, and government support is essential to foster firm growth.
- 3) Improving infrastructure to enhance urban firms' resilience to weather shocks has the potential to prevent substantial economic losses. Our findings show that even relatively minor and frequent events can significantly affect firms in urban areas through a reduction in local demand. Policymakers should consider further investment in resilient infrastructure that allows businesses to continue operations during heavy rainfall. Some of these efforts are already underway in the form of improved drainage systems. Our research highlights the importance of such measures for local business operations.
- 4) More flexible work policies are needed to enable women to move from subsistence to paid employment. Women are more vulnerable to climate change and environmental shocks, as they are more likely to be employed in the subsistence sector, particularly in agriculture, and in more precarious jobs



than men. One of the reasons why women tend to work in self-employment is that it allows them to combine work with childcare.

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