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African Poverty: Influence of Climate Change and Inequality Since the 1990s

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Abstract: Despite steady GDP growth since the 1990s, extreme poverty in Africa remains prevalent due to environmental degradation and multidimensional inequality. This paper examines how inequality and climate change aggravate poverty in African countries, particularly in the Democratic Republic of Congo, Nigeria, and Niger. This paper discusses the effects of the Gini coefficient and multidimensional poverty index on perpetuating a cycle of poverty in these underdeveloped countries. By implementing several varied scenarios, this paper demonstrates how severe weather events generate economically challenging situations for these countries to cope with. The high reliance on agricultural production led to increased migration and food insecurity, denying those below the poverty line access to resources. It underscored that both climate change and poverty hindered the propensity for these African countries to escape from the 'poverty trap', despite equilibrium GDP growth. This paper provides two additional contributions beyond existing literatures. First, it disaggregates inequality into different dimensions for the government's economic decision-making. Second, through Africa's extreme weather, it offers a focused examination of how climate change has constrained economic resources.

Keywords: African Poverty, Inequality, Climate Change.

1. Introduction

Deepening poverty is mainly shaped by the increasing inequality and exacerbating climate change, which undermine the ability of underdeveloped countries to recover. An unofficial representation of poverty is inequality multiplied by risk [1]. Whereas inequality encompasses factors such as wealth and social status, risk refers to hazards and vulnerabilities.

The focus of this investigation will be how climate change and inequality aggravate poverty in Africa, especially in Democratic Republic of the Congo (DRC), Nigeria, and Niger. Large parts of Africa are categorised as 'always poor', and many have been living in extreme poverty for centuries [2]. This paper aims to provide insights into why these African countries remain poor, and how climate change and inequality are the primary factors that push them into a cycle of poverty [2].

Surprisingly, the extreme poverty ratio had been decreasing over the past 20 years due to relatively sustained growth [3]. In fact, many non-monetary aspects of poverty have been improving. Since the end of the 1990s, African countries have experienced a sharp real GDP growth, averaging around 5% every year [3]. In addition, there is a 4% increase in the adult literacy rate and no systematic increase in the child mortality rate.

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The two metrics for analysing inequality impacts are the multidimensional poverty index and the Gini index. This reveals why impoverished countries remain in such situations for decades. The significance of this paper is to highlight the role of researching inequality, a non-time variant factor, and climate change, a time variant factor on how poverty is distributed across Africa.

The distributional impact of climate change could be demonstrated by the fact that increasing temperatures hinder economic growth by reducing crop yields. The metrics used to demonstrate effects of climate change on poverty will be the panel fixed model. The panel fixed model interprets how agricultural production and temperature fluctuations.

2. Inequality

Regarding inequality, past research stated that the top 10% in Africa held an income share of just below 60% [4]. This exacerbates the wealth gap between the rich and the poor, leading to hunger and malnutrition. Indeed, data collected by the World Bank in 2015 suggested that all continents, except Africa, experienced a significant decrease in poverty.

2.1. Multidimensional Poverty Index

MPI stands for the multidimensional poverty index, which measures the deprivations experienced by the poor and the disadvantaged [5]. It is a proportional representation of the extent to which various factors influence poverty. The MPI ranges from 0 to 1; a higher MPI value indicates a greater influence of multiple factors on the increase in poverty [5].

Nigeria has an MPI value of 0.175 and Niger has an MPI value of 0.601[5]. When comparing the proportions of access to electricity, drinking water, and education, Nigeria and Niger exhibit remarkable values. For example, access to electricity is 7.6% in Nigeria compared to 7.9% in Niger, and access to drinking water is 5.6% in Nigeria compared to 5.8% in Niger [5]. However, Nigeria faces the challenges of feeding the 83 million people living below the poverty line [6]. The poverty line is defined as earnings of $2.15 per day [7]. In most regions of Nigeria, limited resource capacities hinder access to electricity and drinking water [8]. Additionally, the country restricts its economic integration, creating significant trading barriers with other nations, reducing its market size and global exposure.

2.2. Wealth Inequality

Inequality is arguably both a consequence and a driver of poverty. Africa not only experience the second highest inequality rate in the world, but the lack of inclusive economic and political institutions creates persistent barriers for the poor to recover. The growth incidence curve measures the annualized growth rate of per capita income for every 1% increase. The pro-poor segment experiences a growth rate of around 3.05, whilst the mean is at 3.35 [3]. The overall incidence curve is increasing, suggesting a widening distribution of income and resources. However, the trade-off between economic growth and equality could not be explained in simple terms.

Therefore, questions arise regarding whether all parts of Africa confront similar levels of inequality and how poverty rate could be affected by these widening wealth gaps [1]. Inequality inevitably generates systematic barriers, such as barriers to education and employment, for marginalized communities. These barriers prevent underdeveloped countries from reaping potential benefits. When these challenges accumulate, they act as negative ‘compound interests’ against the marginalized country. This fuels a cycle of poverty consisting of low wages, reduced productivity, and high unemployment, leading inescapably to hunger.

The Gini coefficient generally measures wealth inequality that assesses income distribution [9]. The Gini coefficient corresponds with the Lorenz Curve, which could be represented by the formula

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A/A+B. It assumes a perfect diagonal line, sometimes referred to as the 'line of equality', is where income is distributed perfectly.

Niger has a Gini index of 0.33 whilst Congo has a Gini index of 0.45 [10]. If portrayed on the Lorenz curve, the curves would be distant from the 'equality line'.

Congo, with the highest extreme poverty rate in the world, has three out of four people living below $1.9 per day [7]. The country experiences just over 40% of school attendance rate and 70% of the workforce is employed in agriculture.

Niger experiences similar leverages of inequality. Around half of the country's income is generated from livestock and agriculture. In fact, the nation's economy functions similarly to that of Congo. Agriculture contributes to 40% of Niger's GDP and over 75% of employment [11]. The heavy reliance on agriculture prompts inequality. The lack of income diversification makes it nearly impossible to stimulate long-term economic growth. The corporate tax rate in Niger fluctuates around 30% [9]. This leads to the situation where upper middle-income population experiences worse poverty than those relying on agriculture. There are no social groups within the Nigerien economy that consistently experience steady marginal profits, which limits the incentives to invest in welfare programs.

A typical Kuznets curve is when the curve has an increasing gradient, the whole society is worse off [12]. This theory was popularized by Simon Kuznets, who thought that when labours move to urbanized areas, competition increases, and wages decrease [13]. However, at the turning point, social welfare takes over and encourages mobility in the economy. In Niger's case, this curve has an extremely steep gradient, as the country's GDP per capita is only 4% of the world's average [11]. Therefore, one could argue reversely that the economy of Niger does not conform to the Kuznets curve; rather, a small increase in real GDP causes a large jump in income inequality [12]. To draw up, the extreme poverty that over half of the Niger population undergoes could be largely attributed to insufficient distribution of wealth and resources.

2.3. Educational Inequality

Half of the population in Niger is under the age of 14 [14]. Among them, over 60% of teenagers fail to attend school [14]. The low literacy rates in Niger directly impact the extent of its poverty gap, which affects how income is redistributed within the economy. Empirical research suggested that any form of education mitigate income inequality, acting as a prerequisite for long-term economic growth [15]. As a source of inequality, educational attainment can be a key determinant for wages and a scale of employment opportunities [15]. Many argue that equal educational opportunities at the primary and secondary level could substantially reduce the level of inequality in society.

As imaginary as the theories proposed, Niger faces some realistic barriers to accessing qualified education. The failure to address obstacles such as climate, hunger, and insecurity has resulted in Niger ranking last on the United Nations Education Index. Whilst many argued that education is the solution to alleviating poverty, the government only allocated 13% of its budget to education. An intriguing phenomenon is that Niger obtains one of the highest school attendance rates and years of schooling in the MPI [5]. However, the MPI value is merely a relative measure that reflects the broader economic institution within the country [5]. Niger also suffers from a lack of sufficient electricity, housing, and other essential resources.

2.4. Spatial Inequality and Gender Inequality

Spatial Inequality refers to the uneven distribution of income across different geographical regions within a country.

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In the previous two cases mentioned, spatial inequality plays an important role in magnifying poverty. In Nigeria, the inability for government to offer employment to its citizens and the weak entrepreneurial prospects meant that their capital accumulation is minimized. The key effect is that the spatial inequality widens because of a stagnant economic growth. A recent study on spatial inequality in the DRC presents a model to demonstrate the effects of income inequality on the economy. There are two key findings through this investigation. Firstly, income inequality in DRC has also sparked the highest gender-inequality index among some of the worst-performing African countries [16]. Secondly, the vulnerability of DRC is higher than both Nigeria and Niger. Over 20% of the population lives under multidimensional poverty risks [16]. This situation implies that any identified event, such as armed conflict, inflation, could exacerbating the existing refugee crisis. In Niger, nearly half of the male population could read and write, while only 30% of women attain the same level of literacy in adulthood [14]. The already low literacy rate is aggravated by gender disparity and inequality.

As observed in Nigeria, Niger, and Congo, inequality drives vulnerability and conflict, resulting in millions of malnourished populations. Wealth inequality combines with health disparities, welfare issues, and gender inequality, creating an invisible trap for people to escape poverty. Furthermore, human capital accumulation is insufficient in these underdeveloped economies, so they struggle to boost the federal budget. Therefore, smaller countries like Niger cannot rely on an improving economy or gradually enlarging resources and budget to help its malnourished population [17]. They must invest largely in factors such as education which promotes ability to reduce wealth gap and promote long-term economic growth.

3. Climate Change

The ever-increasing rate of rising global temperature and the economic consequences of climate change have sparked heated debates around how to minimise its damage to poverty [18].

Countries like Congo have an underdeveloped economy and rely primarily on hunting and farming. Most of the Congolese population live just above the poverty line. When natural disasters occur, many millions more lose their food sources and homes, making economic recovery increasingly difficult.

When discussing about the impacts of climate change, the focus of this paper is on how natural disasters and global warming altered the distribution of poverty. They form the fundamentals to a collapsing economy. Whilst considering the poverty equation, the ‘risk factor’ is categorized under climate change. Climate change represents significant hazards, resulting in a highly vulnerable economy, where agricultural productivity is heavily reliant on [19].

The panel fixed model states that there is a linear relationship between temperature, annual precipitation, location, and years, which aggregates to poverty. This model omits any variable bias, and controls the time-variant factors, such as precipitation, that affects poverty. These time-variant factors also include technology or labour productivity, which could influence poverty in the long term [20].

4. Continental Crisis

Climate change is one of these heterogenous factors which vary from country to country. For example, economies heavily reliant on agriculture suffer the most, and people with fewer resources have a lower adaptive capacity to respond to the severe weather. Consequently, people in poverty who experience extreme weather events often become part of invisible statistics as they are so minimal [17]. All these factors aggregate to a rising continental crisis.

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4.1. Global Warming

At first glance, increasing temperature and inadequate rainfall may seem to result only in reduced crop yields and a relatively slow growth in real GDP. However, increasing temperature could adversely impact human capital and labour productivity, as employees may experience heat stress when they are working.

Initially, as temperatures start to rise, crop yield might improve. However, once temperatures exceed the optimal range, crop yields decline dramatically. This situation creates a cycle of reduced income for farmers who owns a small share of land [20]. When supply of crop yields is decreasing, food prices reach a higher equilibrium. This exacerbates the level of food insecurity within countries that are already economically vulnerable.

The ability of human labour to work is diminished as equally as there are lack of sufficient cooling indoors. The decreasing cognitive function hinders their capabilities to complete their work hours efficiently and excise rational reasoning. The decline in labour productivity leads to a decreasing accumulation of human capital, which is predicted to push millions of people in Africa into poverty in the next decades. This corresponds to the panel model, which indicates that labour productivity relates closely to both temperature rise and overall poverty. To prove this, the panel fixed model demonstrated that with every degrees Celsius increase, the global poverty increased by 9.1% [21].

4.2. Extreme Poverty

DRC mainly suffers from chronic poverty. Chronic poverty is individuals or households that endure lifelong deprivations and passes it on to their children [22]. This can be typically inferred to the poverty cycle, where the poor remain in the poverty trap [2]. In a poverty trap, there are little incentives for workers to gain extra income, as they either lose their benefit payments or having to pay higher taxes.

The Congolese population, especially children, experiences long term exposure to water and soil pollution. DRC is the home to the second largest tropical rainforest in the world and accounts for around 13% of the world's hydroelectric power [23]. Like Niger, nearly half of the Congolese population are under the age of 14 [23].

In DRC, more than 26 million people face severe food insecurity. Simultaneously, climate change 'fuels' the stagnant agricultural production and drives internal migration within the country. In 2022, DRC experienced 5.2 million internally displaces persons (IDP), which rose to 6.8 million in 2024 [10]. Internally displaced persons measure the migration occurrence inside a nation [24]. This value proves to be the highest IDP in Africa, suggesting a significant seasonal shift in climate, leading to mass migration. Primarily, the new arrivals elevated tension, as the locals must compete with them for scarce resources. The new region where immigrants migrate to often receives unchanged social and economic support from the government. This meant few individuals have successfully achieved their initial goal of escaping climate-induced poverty.

Although both Niger and the DRC have minimal coastlines along the Atlantic Ocean, neighboring coastal countries often migrate to these countries. This influx places pressure on the economies of countries like the DRC, which has limited resources and livelihood opportunities. The concentration of people at the 'poverty hotspots' worsens constrained territory and access to economic reforms.

4.3. Natural Disasters

Natural hazards and global warming posed great threats to agricultural production in Niger. Only a small proportion of households could effectively mitigate the effects of climate change on their income and productivity stability. Unsurprisingly, rural areas suffer a greater degree of damage due to climate change as they obtain over 80% of extreme poverty population [25]. Droughts and erratic

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rainfall often lead to crop and livestock losses. Most of the year, it endures hot, humid climate [26]. However, from June to August, the rainy season comes and sudden change in climate aggravates crop growth and seasonal flooding damage crop fields [26].

In 2011, the Sahel region experienced a significant drought that impacted all countries from Senegal to Sudan. This drought heightened the vulnerability of households and exacerbated food insecurity [27].

Through extensive research, scientists predicted the future climate variability in Niger. Firstly, they proposed that heat waves will intensify and the difference between maximum and minimum temperatures will widen [28]. This will deepen droughts and rainfalls that already led to disrupted agricultural production [28]. As a fact, this will lead to numerous additional hazards, such as the loosening of soil, water availability, and food insecurity.

As of DRC's case, natural disasters frequently reduce habitable space. In 2022, in the region of Kinshasa, thundering rain caused 120 deaths, along with severe flooding and landslide that destroyed schools, infrastructures, houses, and many more [29]. The Uvira flood in 2020 impacted 80000 people and killed a few dozen [30]. When assess the consequences of these natural disasters, it is common to highlight the number of deaths, the destruction of habitats, and others. However, through the Uvira flood, cholera spreads throughout the region. Cholera is a drastic bacterium disease which is transmitted through contaminated waterbodies or food. The Uvira flood led to outbreaks and exponential increase in cholera-related deaths from 2021 to 2023, exacerbating mortality rates and inevitably extreme poverty.

5. Conclusion

This paper discusses how inequality and climate change exacerbate poverty in the DRC, Nigeria, and Niger. These African countries suffer from chronic poverty that cannot be removed in the short term. The usage of MPI indicates a worsening state of poverty, where large proportions of the population experience multiple different factors that hinder its economic growth, making them less likely to escape the 'poverty hotspot'. The cycle of poverty created through these multidimensional factors aggravates the overall economy. As the poor get poorer, their ability to sustain livelihoods and make rational decisions diminishes.

Inequality could be dissected, as mentioned, into different sectors. Models such as the Lorenz curve and the growth incidence curve show how the poor differentiate from the pro-poor in terms of economic growth. The wealth gap between the rich and the poor is exacerbated further through income inequality. In another case, educational inequality hinders equal access to high quality education. These barriers to education shape the quality of economic institutions and policies, potentially diminishing living standards in society. Notably, in the cases of Congo and Niger, limited budgets and insufficient resources will prolong efforts to provide abundant schools and equal job opportunities. In the long run, governments will find policymaking increasingly challenging due to the economic divergence between the rich and the poor.

Furthermore, climate change is an unpredictable factor that magnifies poverty. In the long run, it is inevitable that climate change will have increasingly severe effects on agricultural production and directly cause the loss of habitation. With global temperatures rising by around 0.2 degrees Celsius per year, it will have extreme effects on crop yield and human labour, causing migration and food insecurity. This indicates that the entire economic framework in Africa could be disrupted, if climate phenomena such as droughts and floods occur more frequently. These findings emphasized the importance of seeking alternative solutions for civilians to generate wealth.

This paper provides two additional contributions beyond existing literatures. First, it disaggregates inequality into different sectors to better analyse the impact of each type of inequality on the government's economic decision-making. Second, it presents multiple historical scenarios of extreme

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weather in Africa, offering a focused examination of how climate change has constrained economic resources.

To conclude, inequality and climate change, in their various dimensions, exacerbate poverty the most and prevent the poor from ascending to higher income levels and gaining more inclusive access to abundant resources. The tendency of these two factors leads to a greater distribution of poverty and makes them undeniable components of sustained poverty in Africa.

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