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Climate Change, Economic Production, Inequality, and Poverty

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Abstract

Climate change is widely understood to be a significant driver of future patterns of human well-being, with numerous studies concluding that climate change will jeopardize the food sources and livelihoods of the poorest and most vulnerable people around the world, reduce economic growth, and increase inequality and poverty. While these relationships are generally accepted in the academic literature, few have quantified the impact of climate change on future levels of poverty across different income thresholds and scenarios. This paper seeks to fill that gap, modeling the impact of climate change on future patterns of human poverty across various thresholds and scenarios by drawing on representative concentration pathway (RCP) scenarios that model alternative patterns of temperature change at a national level using established damage functions operationalized within the International Futures (IFs) tool. We draw on established long-term forecasts of economic growth, inequality, and population change from the shared socioeconomic pathways (SSPs) project, adding them to the IFs integrated assessment model. We use these pathways and the RCP scenarios to build a relationship between changing patterns of country-year temperature change and productivity through "damage functions" established in the literature. In addition to representing the economic growth pathways for these alternative scenarios, we reduce uncertainty by exploring alternative patterns of inequality, operationalized through scenario analysis. Finally, we attempt to incorporate the economic effect of tipping points in addition to RCP scenarios based on model estimates from recent literature.

The climate scenarios estimate that the number of people pushed into extreme poverty—defined by the World Bank as having a purchasing power parity of less than $1.90 per day in 2011 U.S. dollars—ranges from 478,000 to 37 million by 2050 but by 2100 will reduce by 600,000 to an increase of 72 million. Tipping point scenarios further widen the range of impact to 50 to 73 million by 2050 and 31 to 84 million by 2100. The population projected to be pushed into poverty—defined by the World Bank as having a purchasing power parity of less than $3.20 per day in 2011 U.S. dollars—ranges from 4 to 72 million by 2050 but by 2100 will reduce by 650,000 to an increase of 145 million. Tipping point scenarios further widen the range of impact to 110 to 153 million by 2050 and 113 to 260 million by 2100. The number of people projected to be pushed into moderate poverty—defined by the World Bank as having a purchasing power parity of less than $5.50 per day in 2011 U.S. dollars—ranges from 15 to 80 million by 2050 but by 2100 will reduce by 65,000 to an increase of 264 million. Tipping point scenarios further widen the range of impact to 164 to 210 million by 2050 and 353 to 669 million by 2100. As the world's climate continues to change, the share of the population living under each of these poverty thresholds will increase. An RCP6.0 scenario operationalized in IFs projects that by 2100, more than 31 percent of the world population will be living in extreme poverty due to climate change. Another 28 percent are projected to be living in poverty and another 22 percent in moderate poverty.

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GDP	Gross domestic product
IFs	International Futures
RCP	Representative concertation pathways
SDG	Sustainable Development Goal
SSP	Shared Socioeconomic Pathways
UNPD	United Nations Population Division

1. Introduction

Climate change will negatively impact future human well-being in multiple ways, with established research highlighting its effects on conflict (Hendrix 2018), nutrition (Jägermeyr et al. 2021; Leisner 2020), economic activity (Bretschger and Pattakou 2019; Alagidede, Adu, and Frimpong 2016; Tol 2009; Kahn et al. 2021; Newell, Prest, and Sexton 2021; Auffhammer 2018; Waldhoff et al. 2014; Dell, Jones, and Olken 2014), inequality (Burzyński et al. 2019; Dasgupta and Robinson 2022; Espagne, Marx, and Ngo-Duc 2019), mortality (Anderson et al. 2018; Chen et al. 2018; Fang et al. 2013), and poverty (Hallegatte and Rozenberg 2017; Jafino et al. 2020; Ahmed, Diffenbaugh, and Hertel 2009; Azzarri and Signorelli 2020; Thurlow, Zhu, and Diao 2008). While many dimensions of climate change and socioeconomic development have been operationalized, others remain characterized by uncertainty. Understanding how future patterns of climate change interact with future patterns of socioeconomic development to set the stage for human vulnerability and adaptation remains a crucial area of research.

Future challenges to adaptation to climate change are driven both by the future patterns of socioeconomic development and the future severity of climate impacts on socioeconomic development. This manuscript furthers our understanding of future states of socioeconomic development with and without climate effects on human development as measured by the average income of individuals at various thresholds. We forecast future levels of poverty for 183 countries with and without climate effects across various scenarios, highlighting how future adaptive capacity will rest on an understanding of both changing socioeconomic development and climate severity.

Because of the centrality of poverty to global development, this research focuses on future levels and rates of poverty across various income thresholds at the country, regional, and global levels. Extreme poverty—measured as the number of people living on less than $1.90 per day in purchasing power parity in 2011 USD—is the first United Nations Sustainable Development Goal (SDG) and the focus of much academic and policy research (Chandy, Ledlie, and Penciakova 2013; IHME 2019; Moyer et al. 2022). Other poverty thresholds are also important for understanding patterns of human development with $3.20 and $5.50 per day representing two higher levels of income-per-day that also represent people living with acute material needs.

Measures of income or consumption-based poverty are not a panacea for understanding development trends and have previously been criticized. Purchasing power parity measures have been criticized for their inability to comprehensively measure consumption across distinct development contexts (Pogge and Reddy 2005; Ravallion 2008; Allen 2017) and for high levels of measurement uncertainty (Moatsos and Lazopoulos 2021; Moatsos 2016). Various approaches have been proposed to mitigate these measurement challenges, with many researchers focusing on poverty as a multidimensional concept (Alkire and Santos 2013; Bourguignon and Chakravarty 2019; Robles Aguilar and Sumner 2020; Thorbecke 2013) requiring the measurement of consumption power but also factors related to food security, education, health, and inclusive politics. These dimensions of development are highlighted in the work of Sen and Nussbaum (Sen 1999; Nussbaum, Glover, and World Institute for Development Economics Research 1995).

While measures of income or consumption-based poverty are limited, they do provide a useful benchmark for understanding the future adaptive capacity of populations. Recent analysis shows that rising temperatures and increased weather pattern volatility are likely outcomes of current and expected future levels of anthropogenic climate change (Allan et al. 2021). Research also shows that populations most vulnerable to these disruptive changes to current and future climate patterns are those with the fewest resources, a phenomenon that occurs across different dimensions of development. Poverty is a multiplier of the effects of future climate change on human well-being.

Future levels of poverty will be shaped by two broad and interacting trends. First, poverty will be directly impacted by the trajectory of socioeconomic development, particularly by factors related to patterns of economic growth, income distribution, and population change. In a world of greater growth and income distribution and less population growth, future patterns of poverty will be lower relative to alternative scenarios with distinct development outcomes across these variables. Second, climate change will affect the number of people living in poverty across income thresholds. As the planet warms, precipitation patterns will change, food security issues will emerge, weather systems will become more volatile, and productivity will be reduced. That will lead to considerable growth in the number of people living with extreme material want.

Evidence abounds that climate change will have deleterious effects of human poverty, with both ground-up approaches (Hallegatte and Rozenberg 2017) and model-based approaches (Jafino et al. 2020; Ahmed, Diffenbaugh, and Hertel 2009; Thurlow, Zhu, and Diao 2008) reaching similar conclusions. But we have a poor understanding of how climate change is impacting development more broadly (Dickerson, Cannon, and O'Neill 2021). This gap in understanding between micro-level studies that highlight the importance of poverty as a measure of adaptive capacity and the highly likely negative effect of climate change on future poverty broadly motivates this analysis.

This paper implements representative concertation pathways (RCPs) scenarios measuring country-level temperature change within the International Futures (IFs) model. We do this by using RCPs operationalized at a country level to drive changing patterns of economic production through established "damage functions" (Tol 2009; Waldhoff et al. 2014; Diaz and Moore 2017; W. Nordhaus 2018) and by contextualizing these model results with other approaches that use different methodologies to capture dynamics related to temperature change and economic growth (Kahn et al. 2021; Newell, Prest, and Sexton 2021; Burke, Hsiang, and Miguel 2015). We also operationalize the relationship between changing temperature and inequality (Espagne, Marx, and Ngo-Duc 2019; Dasgupta, Emmerling, and Shayegh 2020). The relative dearth of research into temperature effects on future patterns of inequality forms the basis of our uncertainty and scenario framing.

Of the four RCP scenarios operationalized within the IFs system, the range of people projected to be pushed into extreme poverty is 15 to 37 million by 2050 and 2 to 34 million by 2100. The population projected to be pushed into poverty ranges from 30 to 72 million by 2050 and 8 to 103 million by 2100. The number of people pushed into moderate poverty ranges from 33 to 80 million by 2050 and 23 to 264 million by 2100. Advancing climate change will push an increasingly large share of the population under each of these poverty thresholds, with an RCP6.0 scenario operationalized in IFs showing more than 30 percent of the world population will be extremely poor by 2100 because of climate change, 25 percent will be poor, and 18 percent will be moderately poor. The shared socioeconomic pathways (SSP)-RCP scenario combinations also largely support these findings. The four SSP-RCP scenarios conclude that the number of people projected to be pushed into extreme poverty ranges from 478,000 to 23 million by 2050 but by 2100 will reduce by 600,000 to an increase of 72 million. The population projected to be pushed into poverty ranges from 4 to 41 million by 2050 but by 2100 will reduce by 650,000 to an increase of 145 million by 2100. The population projected to be pushed into moderate poverty ranges from 15 to 48 million by 2050 but will reduce by 65,000 to an increase of over 219 million by 2100.

These conclusions raise several important questions. First, when contextualized within other drivers of poverty, they show climate change will be a more limited driver of increases in poverty relative to other pressing challenges, like the COVID-19 pandemic or civil wars. Recent research has shown that the global pandemic increased extreme poverty by 73.9 million in 2020, while the range across all scenarios is 43.5 to 155.0 million (Moyer et al. 2022). Other research projects that between 2022 and 2030 the baseline scenario for the impact of civil wars is an additional 148.2 million, with a projected range of 50.7 to 186.0 million, people living in extreme poverty (Moyer, n.d.). Under that scenario, the effect of climate change on poverty is similar to the effect of COVID-19 on poverty, though it occurs eight decades later. And the effect of civil wars on poverty over the next eight years, under this projection, will be significantly greater than the long-term effect of climate change.

The findings in this report are lower than the only other significant research in this area, a World Bank study that estimates that the number of people pushed into extreme poverty by climate change will be 122 million by 2030 in a worst-case scenario (Hallegatte 2016). The difference in findings is driven by alternative methodologies, with the World Bank report using a micro-simulation approach that shows significant impacts on incomes in the agricultural sector.

This disparity between our findings and Hallegate leads to a number of challenging conclusions. First, the methodology used in this manuscript relies upon well established "damage functions" to drive the impact of changing temperature on economic output. Damage functions have been widely used in literature to understand the economic effects of climate change, though they have met criticism. Some contend that damage function approaches do not adequately capture the effects of changing temperatures on economic output. Others contend that damage function approaches actually overestimate the effects of climate change by neglecting the impact of human adaptation. The inequality relationship used here may also be criticized for not adequately capturing the effects of changing temperature or a broader change in climactic systems and inequality. It may be the case that the study we rely on underestimates or fails to specify how changing temperature will affect the distribution of resources.

More broadly, the methodology used in this report may be inappropriate for evaluating these relationships. Additional research efforts may be needed to better understand how climate change will impact future poverty levels that focus on a) extreme measures of the effect of climate change via heat waves, storms, and other significant disruptions instead of smoothed average effects; and b) pathways in which climate change impacts human well-being that fall outside of temperature change, economic growth, and resource distribution.

2. Background

Temperature change has begun to be used as a gauge for changes in economic outcomes. Increased global temperatures have been linked to effects on economic growth (Dell, Jones, and Olken 2012; Burke, Hsiang, and Miguel 2015; Newell, Prest, and Sexton 2021, 20); annual income (Deryugina and Hsiang 2014); labor productivity and supply (Graff Zivin, Hsiang, and Neidell 2018; Antonelli et al. 2021); human capital (Graff Zivin, Hsiang, and Neidell 2018); demography (Casey et al. 2019); food security (Deschênes and Greenstone 2007; Antonelli et al. 2021); and energy consumption (Isaac and van Vuuren 2009; De Cian and Sue Wing 2019).

Historically, Dell et al. (2012) investigated evidence of temperature shocks on economic growth in the last half century through historical temperature fluctuations within countries to determine their effects on aggregate economic outcomes. Higher temperatures were found to reduce agricultural and industrial output and growth rates and to contribute to political instability (Dell et al. 2012). More specifically, through panel data of 174 countries from 1960 to 2014, Kahn et al. (2021) found that per capita gross domestic product (GDP) growth is adversely affected by persistent changes in temperature, above or below historical norms. The study also found these adverse effects vary with regional temperature, climate conditions, and income levels. Dell et al. (2012) concluded that poorer countries will sustain considerably higher reductions in growth rates. Globally, Kahn et al. (2021) concluded that a persistent increase in average global temperature by 0.04 degrees Celsius per year, in the absence of climate mitigation policies, will reduce world real GDP per capita by more than 7 percent by 2100. If each country's temperature were to rise by 0.04 degrees Celsius annually, GDP is predicted to fall by 13 percent globally by 2100 (Kahn et al. 2021).

Developing countries are more vulnerable to the negative effects of climate change, as rising food and energy prices decrease the ability of poor families to shield against economic and climate shocks. Most families living below or near the poverty line spend much of their household income on food and energy, limiting the amount of money they can set aside for the future (Hallegatte et al. 2014). Policies put in place in response to climate change can deepen these vulnerabilities by restricting land use and increasing the costs of productivity. It is important to study climate changes' effects on poverty because families and regions in developing countries most affected are usually too materially poor to reflect in aggregate figures, such as GDP (Hallegatte et al. 2014).

Dietz and Millner (2015) identify three reasons developing countries are more vulnerable to climate change compared to developed countries: geography, sensitivity, and a lack of adaptative capacity. The geography of developing countries makes them more subject to variability in the availability of water, rising temperatures, and changes in rainfall caused by climate change. That makes developing countries less favorable to economic activity, stunting capital availability and investor confidence and engendering an atmosphere of price volatility. Cevik and Jalles (2020; 2022) found that yields on government bonds are significantly affected by climate change, increasing the probability that developing countries will default on sovereign debt. Sensitivity to climate change stems from the dependance of developing countries on sectors that are reliant on and sensitive to climatic conditions. Dietz and Millner (2015) characterize this to mean that because many families in developing countries are pursuing marginal livelihoods, climate change impacts their ability to save and invest over the long-term and can reduce their labor productivity. Lastly, developing countries are more vulnerable to the negative effects of climate change because of their lack of adaptive capacity, in part attributable to the aforementioned factors, and exacerbated by a lack of savings and access to credit, good governance, infrastructure and information (Dietz and Millner 2015). Consequently, there is interconnectivity between climate change-induced poverty and prices, assets, productivity and opportunities, all of which affect the ability of families and governments to adapt to an increasing number of climate shocks (Hallegatte et al. 2014).

Climate change impacts household consumption patterns and availability, which in turn can influence whether families fall into poverty. Climate change reduces future incomes by depressing productivity and raising costs due to disruptions in economic growth (Taconet, Méjean, and Guivarch 2020). Consumption patterns are altered by the effects of climate changes on the living conditions, purchasing power, and access to public goods and services of families, and their need to redirect their efforts to mitigation and adaptation strategies. Living conditions of the poor can make them additionally vulnerable to the impacts of climate change and its policy shocks through natural disasters, a reduction in ecosystem goods, decreased social protections, and rising energy prices (Hallegatte et al. 2014). Over a 25-year period in the Andhra Pradesh community in India, 14 percent of households in 36 communities escaped poverty, but during that same time, 12 percent of households fell into poverty, leading to a net poverty reduction rate of 2 percent (Hallegatte et al. 2014).

Natural disasters increase the probability of families dropping below poverty thresholds (Hallegatte et al. 2014; Walker et al. 2007; Barbier 2010; Dercon and Christiaensen 2011; 2011). Households' capital accumulation is jeopardized by the destruction of assets through natural disasters such as flooding. With increased asset losses and expenditures, families are prone to saving and investing less, as they are forced to devote more of their resources to everyday survival (Hallegatte et al. 2014). A decrease in investment reduces income growth overall (Haushofer and Fehr 2014). Climate change is also linked to reduced investment in the education, nutrition, and health of children, impacting their future job prospects and overall well-being. The unfortunate conclusion is that climate change impacts the well-being of entire families and can trap families in multi-generational cycles of poverty.

In a poverty rate and determinants study of 379 rural Bangladeshi households, interviewed between 1987–1988 and 2000, when asked to report the causes of their poverty dynamics, approximately 15 percent cited natural disasters and 18 percent cited a loss of natural assets as main reasons for losses in income (Hallegatte et al. 2014). For these reasons, low-income households are often risk averse, pursuing lower-risk, lower-return strategies that perpetuate poverty (Hallegatte et al. 2014).

A study by Ayoo (2022) about poverty reduction strategies in developing countries emphasized the necessity of risk-taking and investment in productive, income-generating activities, but climate change—and the uncertainty it brings—affects how households handle and pursue risk. Natural disasters are a major factor in this uncertainty. In a study of poverty rates and determinants over a 25-year period, 1981–2006, in 36 villages of three districts in the Andhra Pradesh community in India, drought proved an important factor: "All else being the same, the odds of a non-poor household falling into poverty increase more than 15 times when drought is a significant feature of its event history" (Krishna 2006). Among the 12 percent of families in 36 communities in the Andhra Pradesh community in India who fell into poverty, 44 percent cited "drought, irrigation failure, or crop disease" as reasons for their loss in income (Hallegatte et al. 2014). Even if families can increase diversification and reduce risk-taking, the increased volatility and uncertainty brought on by climate change decreases average incomes and income growth (Hallegatte et al. 2014). In addition, most household investments in poor communities are in inflexible assets, creating irreversibility or non-transferability in investment and adding to inability to respond to climate shocks through adaptation and mitigation.

Growing evidence points to the effects of climate change on agricultural productivity, undermining advances in poverty reduction. Poorer families have limited budgets and increasing food prices put them at high risk of falling into poverty. Fluctuations in agricultural production are also linked to poverty. Such fluctuations lower price stability, demand, and supply, which in turn affects household consumption, savings, and labor productivity (Hertel, Burke, and Lobell 2010). A changing climate can reduce crop yields, and climate policies to mitigate greenhouse gas emissions can increase food prices, further harming the poor (Porter et al. 2014). Changes to agricultural productivity also alter global supply chains and create ripple effects on food security, prices, and poverty. Price volatility, while it can benefit sellers, is unpredictable and therefore, also a negative effect of climate change on long-term economic growth and agricultural productivity.

Using disaggregated data on country's household activity within a global trade model (Global Trade Analysis Project), Hertel, Burke, and Lobell (2010) present three scenarios on climate change's effects on agriculture and the resulting impacts on global commodity prices, national economic welfare, and the incidence of poverty. They consider 15 developing countries, analyzing low, medium, and high productivity economic scenarios. They project that in the low productivity scenario—depicting, high crop sensitivity to warming, rapid temperature change, and a lower carbon dioxide (CO_2) fertilization affect— prices for major staples will rise from 10 to 60 percent by 2030, with poverty rates in African and Asia for non-agricultural households rising by 20 to 50 percent and falling by similar rates among agricultural households in Asia and Latin America. The medium productivity economic scenario shows little effect on poverty rates, commodity prices, or cost of living, on average. While the high productivity scenario—depicting, low sensitivity of crops to climate change, relatively slow warming, and high lower CO_2 fertilization affect—lowers commodity prices. Compared with the low productivity scenario, the high productivity scenario poverty rates rose in all the countries in which poverty had fallen and decreased poverty rates in the remaining four countries where poverty had risen, with global poverty rising slightly. This mirroring is primarily dependent upon the composition of poverty populations since higher prices can help agricultural workers, while hurting the urban poor and vis-versa (Hertel, Burke, and Lobell 2010).

The World Bank's *Aftershocks* report of 2018 analyzes how historical natural disasters can inform current and future mitigation and adaptation strategies. *Aftershocks*' chapter on the 2017 Tropical Cyclone *Enawo* in Madagascar showcases the vulnerability of depending upon volatile agricultural prices to escape poverty and the effects of climate change on productivity. From years of consistently rising vanilla prices, farmers had become dependent on the crop, putting all of their resources into its production. In the major growing region of Sava, Madagascar, initial reports of *Enawo*'s destruction reported 90-100 percent of production as lost. The cyclone had completely devastated vanilla production and disrupted the industry globally. To respond, the Malagasy government modeled losses to estimate the economic impact of the cyclone, which allowed the government and farmers to understand the risk of future cyclones to then inform mitigating crop vulnerabilities and diversifying livelihoods. *Enawo* demonstrated how increased demand for an agricultural crop, and the corresponding high prices, can lead to stunted economic growth rates (Phillips et al. 2018).

Climate change affects financial and fiscal stability, decreases long-term growth, and widens income distribution disparities. Effects are dependent on the size and composition of economies and the resilience of physical infrastructure and institutions, all of which contribute to the capacity for mitigation and adaptation to climate change (Cevik and Jalles 2022). Within countries, Islam and Winkel (2017) found that disadvantaged households experience a disproportionate burden of the adverse effects of climate change, which creates greater, subsequent income distribution inequalities. Tol et al. (2004) and Diffenbaugh and Burke (2019) found that low income countries tend to become poorer in the face of climate change, due to geographical and institutional constraints to adapt. King and Harrington (2018) found that tropical regions, with less developed infrastructure and higher base temperatures, are most affected economically by global warming. Colder countries, or higher-latitude regions, can benefit from increased global temperatures, while tropical countries are further disadvantaged (Diffenbaugh and Burke 2019).

That is not to say that higher-latitude countries are not also impacted by rising temperatures. In China, for example, H. Deng et al. (2020) found evidence that rising temperatures have increased household income inequality in urban areas of the country. As temperatures have risen, so have energy costs. Poorer households cannot afford to compensate for rising temperatures by using additional air conditioning. Kjellstrom et al. (a.2009) also studied the effects of increasing temperatures, indoors and out, on working conditions in South African Gold mines, sugar cane agricultural workers in El Salvador and Nicaragua, South India assembly workers in car and truck factories, Northern Vietnam shoe factory workers, and offices and factories without air conditioning in the Southern U.S. states. Albeit situationally specific, workers in these overheated and humid environments are more likely to experience heat stroke and strain, compromising their health, well-being, and labor productivity. Climate change will exacerbate these already existing risks, as Kjellstrom et al. (b.2009) find that many jobs in low and middle income countries necessitate working outdoors, or indoors without air conditioning, with laborers reducing productivity in order to avoid serious heat stroke, exhaustion, and thus, incurring loss of income. Therefore, H. Deng et al. (2020) and Kjellstrom et al. (a. & b. 2009) highlight the different exposure risks associated with climate changes within and among countries, finding the consequences vary in severity between high and low latitude countries. Newell et al.'s (2021) study on historical fluctuations in temperature found that while a rise in temperatures caused statistically significant losses in GDP and agricultural production in poor countries, in rich countries historical fluctuations in temperature did not result in statistically significant effects on the growth of GDP.

In addition to impacting productivity, climate change also has uneven effects on the distribution of resources. The link between the determinates of income inequality and the macroeconomic impacts of climate change has been studied by Harrington, et al., (2016); Mahlstein et al., (2011), and Schleussner et al., (2016). Datt and Ravallion (1998) and Ferreira et al. (2015) both find extensive evidence that macroeconomic instability depresses income growth among the poor, leading to greater income inequality. Studies have also shown inequality to be both positively and negatively affected by fiscal policies and financial development, political regimes and institutional factors, demographic and social characteristics, human capital accumulation and access to entrepreneurial activity, and globalizations' impact on trade openness and investment. There is also literature related to the financial effects of climate change, with Nordhaus (1991;1992) and Cline (1992)'s aggregate damage functions being the principal manner of analyzing climate-economy intersects.

To further investigation into the empirical relationship between climate change and inequality, Cevik and Jalles (2022) found that, between 1955 and 2019, increases in climate change vulnerabilities were positively associated with rising income inequality. The coefficient on climate change vulnerability's effect on income distribution contrasts between developing and developed countries. Climate change vulnerability in developed countries has no statistically significant effect on income distribution, while developing countries' coefficient on climate change vulnerability is seven times greater than that of developed countries. The greater effect of climate change vulnerability on developing countries is partly due to a weaker capacity for climate change adaptation and mitigation, geography and sectoral distribution of economic activity, and the tendency for climate shocks to induce higher wealth and income losses in low income countries. Although subject to a higher degree of uncertainty, Cevik and Jalles (2022) also found that increased climate resilience is associated with lower income inequality.

3. Methodology

To study the future effect of climate change on poverty we model future patterns of economic production, income distribution, and population change for 186 countries from 2017 to 2100. We do this using multiple existing modeling tools and outputs that include SSPs (O'Neill et al. 2017), RCPs (van Vuuren et al. 2011a), and International Futures (IFs) (B. B. Hughes 2019a) integrated assessment model. Two main pathways in this analysis cut across the modeling approaches described here. The first is from changing patterns of temperature to economic growth through a damage function. The second is from changing patterns of temperature change to inequality. The final output of this analysis is 27 scenarios forecasting national levels and rates of poverty for 186 countries from 2017-2100. Further uncertainty is framed in the Appendix.

Table 1: Scenarios used in this analysis.

Scenario Name	Damage Function	Economic Forecast	Inequality Forecast	Demographic Forecast	Poverty Module
IFs No-Climate Change	None	IFs Model (Hughes 2019)	IFs Model (Hughes 2019)	IFs Model (Hughes 2019)	IFs Model (Hughes 2019)
IFs Climate Change (RCP 2.6, 4.5, 6.0, 8.0)	Nordhaus DICE* Model	IFs Model (Hughes 2019)	IFs Model (Hughes 2019)	IFs Model (Hughes 2019)	IFs Model (Hughes 2019)
SSP1-5 No-Climate Change	None	Dellink et al. (2017)	Rao et al. (2016)	KC and Lutz (2017)	IFs Model (Hughes 2019)
SSP1-5 Climate Change (RCP 2.6, 4.5, 6.0, 8.0)	Nordhaus DICE Model	Dellink et al. (2017)	Rao et al. (2016)	KC and Lutz (2017)	IFs Model (Hughes 2019)

*DICE = Dynamic Integrated Climate-Economy Model

The scenarios used in this analysis are described in Table 1. We use a modeling strategy that begins with the IFs modeling platform because it dynamically represents development as an integrated system (key model assumptions are described below), connecting systems of economic growth, inequality, demographics, and poverty. Two scenarios from the IFs model form the backbone of this analysis by comparing a future global poverty scenario with and without the effects of climate change (more on the operationalization of those assumptions below).

To more broadly frame uncertainty associated with this analysis we rely upon three SSP series. The SSPs are a set of socioeconomic scenario narratives that frame five alternative futures characterized by alternative assumptions about future challenges to mitigation and adaptation of climate change. The optimistic scenario has few challenges to mitigation and adaptation and is characterized by sustainable and inclusive development (SSP1), while the pessimistic scenario has high challenges to mitigation and adaptation and is characterized by conflict and scarcity (SSP3). The scenario with significant challenges to adaptation but few challenges to mitigation is characterized by high within and across-country inequality (SSP4) while the future path with high challenges to mitigation and few challenges to adaptation is characterized by massive fossil fuel-led growth (SSP5). SSP2 is characterized by moderate challenges framed as a "middle-of-the-road" scenario. We use three SSP series in this analysis focused on economic growth (Dellink et al. 2017), inequality (Rao et al. 2019), and demographic change (Kc and Lutz 2017).

Figure 1: Modeling approach used in this manuscript.

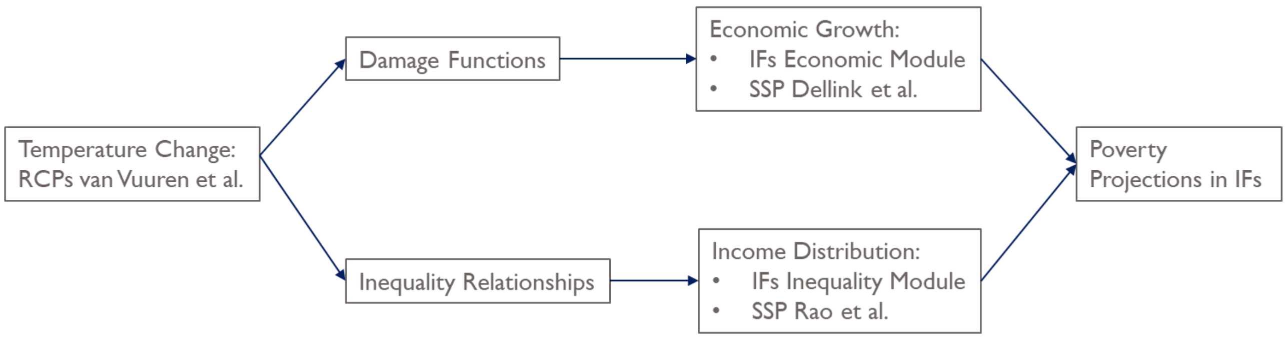
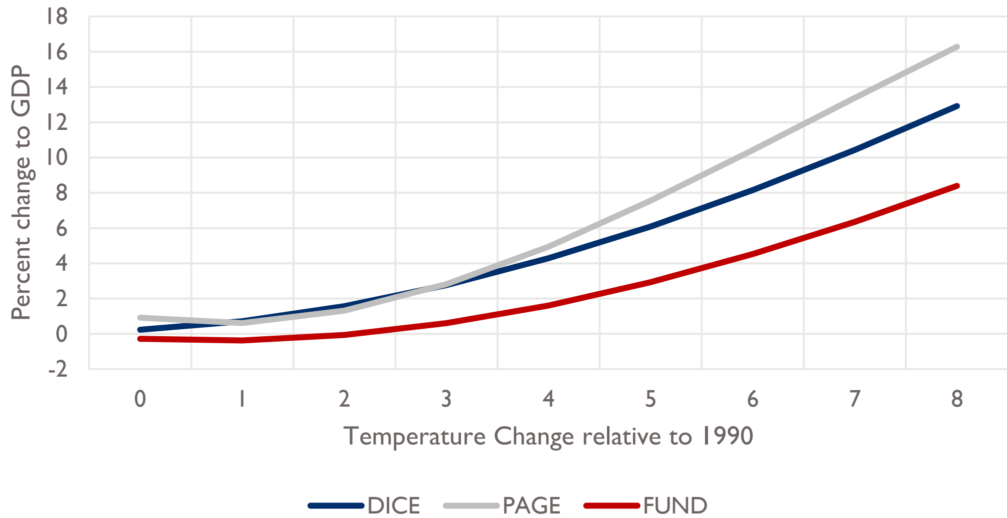


Figure 1 presents another perspective on the modeling relationships used in this paper. Both the IFs and SSP scenarios are created by first using RCP forecasts of average country-level temperature change relative to 1990 values across four scenarios that represent different values for radiative forcing (van Vuuren et al. 2011a). These alternative scenarios form the starting point of this analysis and are represented on the left. The RCP temperature forecasts drive two alternative relationships, one that captures the effects of changing temperatures on overall levels of productivity and another that captures the relationship between changing temperature and the Gini coefficient for income inequality.

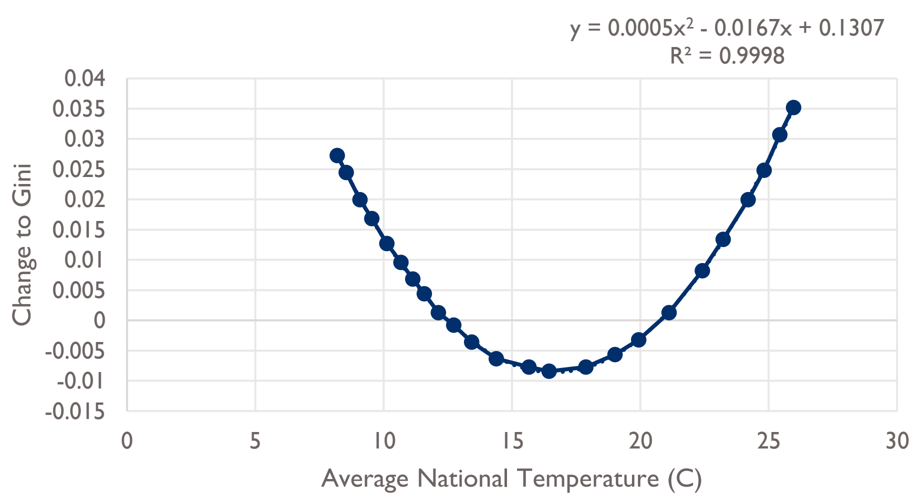
Damage functions establish a relationship between changing patterns of temperature relative to 1990 levels and overall economic output operationalized on a country basis. Three main models have established damage functions: the Dynamic Integrated Climate-Economy Model (DICE), Policy Analysis of the Greenhouse Effect (PAGE), and Climate Framework for Uncertainty, Negotiation and Distribution (FUND) (Diaz and Moore 2017). These functions are intended to capture a broad range of climate effects in a single relationship and have been widely used to assess climate financing and the economic cost of future climate change. These relationships are developed from micro studies on the effects of multiple pathways on economic production (Tol 2009). Figure 2 highlights the relationship between changing patterns of temperature and economic production using various damage function approaches. For this working paper we take the quadratic relationships outlined in the DICE model (W. Nordhaus 2018). This relationship shows a non-linear increase in climate effects driven by changing temperature. The effect of this damage function in IFs is to proportionally reduce the annual flow of value-add measured across six sectors. More information on the IFs model is included below.

Figure 2: DICE, FUND, and PAGE relationships between temperature change and reduced GDP (from Diaz).



We add these inequality effects in our base model by establishing a relationship between changing temperature and the Gini coefficient for household inequality in the IFs system. Dasgupta et al. (2020) estimated a non-linear relationship between mean temperatures and inequality (Dasgupta et al. 2020). The model measured the relationship on a district, household, and individual level for South Africa, based on data from 1990 to 2016. Dasgupta et al. (2020) found that cold-country temperature countries experience productivity increases and inequality decreases until the Gini optimum of 11 degrees Celsius is reached, at which point productivity continues to increase at the expense of rising inequality until reaching a threshold of 13 degrees Celsius. Temperatures above 13 degrees Celsius yield declining growth rates and inequality rising at faster rates (Dasgupta et al. 2020). Since South Africa is hotter than the global average, its optimal temperature is estimated to be approximately 15.6 degrees Celsius, and the individual optimal temperature for household income per capita growth is estimated to be 16.8 degrees Celsius.

Figure 3: Dasgupta et al. (2020) relationship between average temperature and the Gini coefficient.



In addition to the steps outlined above, we rely on the SSP scenarios forecasting long-term patterns of economic growth, inequality, and demographic change to provide a context for broadly framing uncertainty associated with these forecasts and demographic headcounts by country and region. These scenarios are exogenously imposed on the IFs system and marginal effects from changing patterns of temperature through productivity can override these scenarios to isolate the climate-to-poverty effects.

These relationships, SSP, and RCP projections are operationalized within the IFs system, a fully integrated model that connects systems representing agriculture, climate, conflict, demographics, education, energy, gender, governance, health, infrastructure, international relations, and technology related sub-modules and has been developed over many decades by a team led by Barry Hughes (2019b). Descriptions of the key model elements included in this manuscript have been previously published and document representation of the probability of civil war onset (B. B. Hughes et al. 2014; Joshi, Hughes, and Sisk 2015), economic growth (B. B. Hughes and Narayan 2021; Burgess et al. 2022; B. B. Hughes 2019b), inequality (B. B. Hughes 2019b), demographics (B. B. Hughes 2019b), and levels of poverty (B. B. Hughes et al. 2009; Moyer et al. 2022).

IFs includes a recursive dynamic computable general equilibrium model structure to forecast long-term patterns of economic growth (B. B. Hughes 2019b; B. B. Hughes and Narayan 2021; Moyer et al. 2022; Burgess et al. 2022). It is structured with a Cobb-Douglas production function (1928), Solow residual (1956), and six capital sectors along with labor by skill level both initialized using GTAP data (Global Trade Analysis Project 2018). All financial flows are tracked following a social accounting matrix (SAM) (Keuning and de Ruuter 1988) which includes an input-output table (Adam 1995).

$$GDP_{c,t} = \sum^{S}[CDA_{c,s,t=1} * TEFF_{c,s} * CAPUT_{c,s} * KS_{c,s}{}^{AlphaS_{c,s}} * LABS_{c,s}{}^{(1-AlphaS_{c,s})}]$$

Where TEFF, KS, LABS and CAPUT are sector specific values of total factor productivity, capital, labor and capacity utilization. CDA is a scaling factor computed in the base year to make model computations consistent with historical data. Subscript c is country, s is economic sector, t is time (Moyer et al. 2022).

IFs forecasts the Gini coefficient for income inequality to capture trends in long-term patterns of the distribution of resources within countries. The approach computes the area under the equality curve (Gastwirth 1972) where the x axis measures the portion of population and y the portion of income. It uses two categories of labor broken down by skill and initialized using GTAP data (Global Trade Analysis Project 2018). The household earned income levels are calculated in the SAM and are driven by the labor share of value added across the six sectors represented in the production function. The formulation modifies earned income to calculate disposable income by augmenting or decrementing the former by government transfers for welfare and pensions, taxation income (consumption tax as well as pension tax), remittances, and returns on household investment.

$$GINIDOM_{c,t} = F(HHINCDIS_{c,t,ls}, HHPOP_{c,t,ls})$$

Where GINIDOM is the domestic Gini coefficient for income inequality, HHINCDIS is household disposable income and HHPOP is the household size. Subscript c is country, t is time, and ls is labor by skill level.

The poverty module (Moyer et al. 2022; B. B. Hughes et al. 2009) uses inputs from the economic growth and inequality modules. IFs forecasts poverty by first taking disposable income, described above, and allocating it to either consumption or savings driven by three factors. First, the model adjusts the consumption/savings ratio based on long-term changing patterns of country development. As GDP per capita of countries rise countries slowly increase their share of savings relative to consumption. Next, the model adjusts consumption and savings shares in response to changing demographic age structure because both young and old consume a larger share of disposable income than the working-age population. Finally, the model adjusts patterns of consumption/savings based on signals sent from sectoral prices and interest rates. Both signals are driven by equilibrating mechanisms connected to underlying inventory stocks.

The demographic module in IFs is a standard cohort component model using data from the United Nations Population Division (UNPD) (2019). Fertility is driven by levels of infant mortality, contraception use, GDP per capita, and average levels of education (B. B. Hughes 2019b). Forecasts include 21 mortality categories by age and sex driven by both multiple and cause specific distal and proximate drivers (B. Hughes et al. 2011; B. B. Hughes et al. 2011; Sellers 2020). Migration assumptions are exogenously imposed from UNPD medium variant projections.

Finally, the IFs model uses a structural approach to estimate poverty rates at different per capita household consumption levels (represented in inflation and purchasing power-adjusted currency) that draw on a log-normal distribution of household income, (Bourguignon 2004; Shorrocks and Wan 2008). Base poverty rate values are initialized using data from PovcalNet (World Bank 2021), which are originally survey based. Changes in the Gini coefficient for household income affect the horizontal shape of the commonly log-normal distribution of household income (B. B. Hughes et al. 2009 see Chapter 4). Levels of household income and consumption are changed by dynamics of the economic module and are described above.

We represent the effect of changing temperatures on future patterns of economic production through co-called “damage functions” (Bretschger and Pattakou 2019; Tol 2009; Diaz and Moore 2017; W. Nordhaus 2018; Neumann et al. 2020; Wouter Botzen and van den Bergh 2012).

4. The Effect of Climate Change on Productivity and Poverty

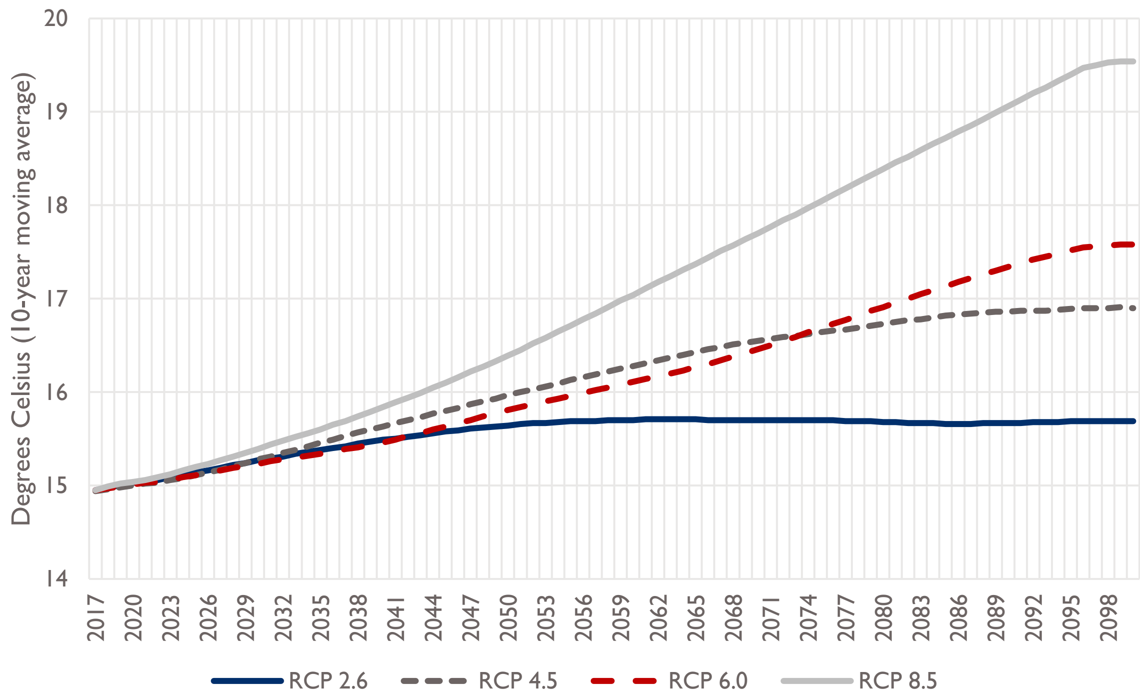
This section of the report introduces the baseline behavior of the scenarios used in this analysis. It begins by introducing the RCP scenarios as they are operationalized within the IFs model. Next, it introduces the core scenario behavior for different SSPs as well as the IFs model, all excluding the effect of climate change. The core scenarios used in this report are GDP per capita (Dellink et al. 2017), the Gini coefficient for income inequality (Rao et al. 2019), and population (Kc and Lutz 2017). Finally, the baseline poverty scenarios (Moyer et al. 2022) are introduced.

Baseline Behavior

Figure 4 shows the baseline behavior for temperature change taken from RCP modeling efforts (van Vuuren et al. 2011b). RCP2.6 shows the slowest increase in global temperature from an average global temperature of around 15 degrees centigrade to 15.6 by mid-century, remaining flat through the end of the time horizon. Next, RCP4.5 shows a more rapid increase in average global temperature, growing from 15 degrees to 16 degrees by mid-century and then increasing to 16.9 degrees by the end of the century. RCP6.0 also shows growth through mid-century though less rapid than RCP4.5 in the first half, reaching 15.8 degrees by 2050. This scenario shows an increase in global average temperature to 17.6

degrees by the end of the century. RCP8.5 is the most pessimistic model, showing an increase of global temperature to 16.4 degrees by 2050, growing to 19.5 degrees by the end of the century—a 30.7 percent increase in global average temperature over that time horizon.

Figure 4: RCP scenarios in IFs (2.6, 4.0, 6.5, 8.0) for average global temperature from 2017 to 2100 using a 10-year moving average.



The core SSP and IFs base case scenarios are introduced in this section, starting with GDP per capita measured at purchasing power parity (Figure 5). Scenarios with greater challenges to adaptation show much lower long-term development trajectories, with SSP3 and SSP4 seeing increases in GDP per capita starting at $16,000 in 2017 and growing to between $32,000 and $54,000 by the end of the century. The "middle-of-the-road" scenario (SSP2) is more optimistic in its growth trajectory, increasing to $90,000 per capita by the end of the century. Scenarios with fewer challenges to adaptation reflect much more optimistic development pathways, with SSP1 showing economic development of $124,000 per capita by the end of the century and SSP5 showing growth to $205,000 by the end of the time horizon.

The IFs base case scenario is less optimistic, reflecting long-term growth patterns closer to SSP scenarios that have high challenges to adaptation in the face of climate change. The IFs scenario grows GDP per capita to the level of SSP3 by the middle of the time horizon and SSP4 by the end of the time horizon. This reflects assumptions about long-term low growth in high income countries that reduces the convergence ceiling of economic growth potential among low income countries (Burgess et al. 2022).

Figure 5: SSP scenarios in IFs without a climate effect for global GDP per capita at a constant 2011 US$ from 2017 to 2100.

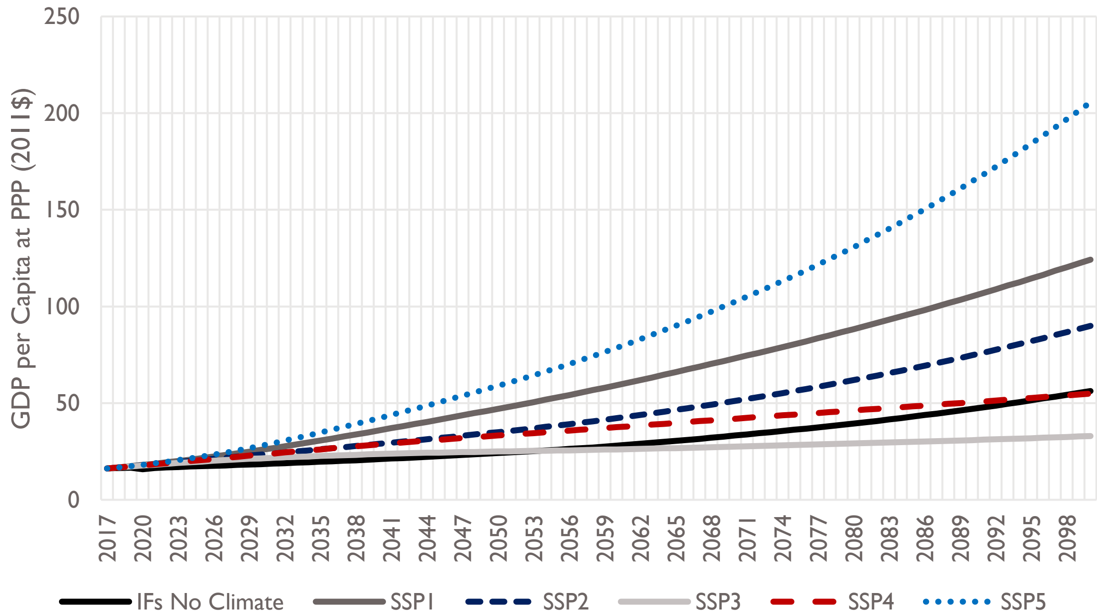
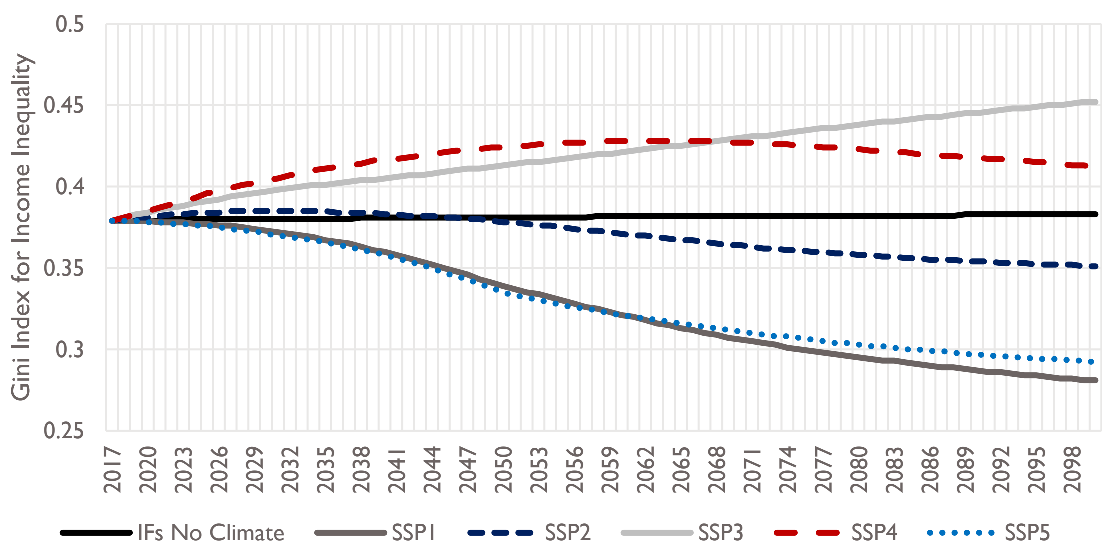


Figure 6 shows the baseline behavior of the Gini coefficient for income inequality across scenarios used in this analysis. SSPs with greater challenges to adaptation show the most significant increases in income inequality, growing across time. The "middle-of-the-road" scenario (SSP2) begins with a similar distribution to IFs base case scenario but then diverges and becomes more equal. SSP scenarios with fewer challenges to adaptation show a decrease in future income inequality and the IFs base case scenario models a world of changing income inequality that remains flat across time.

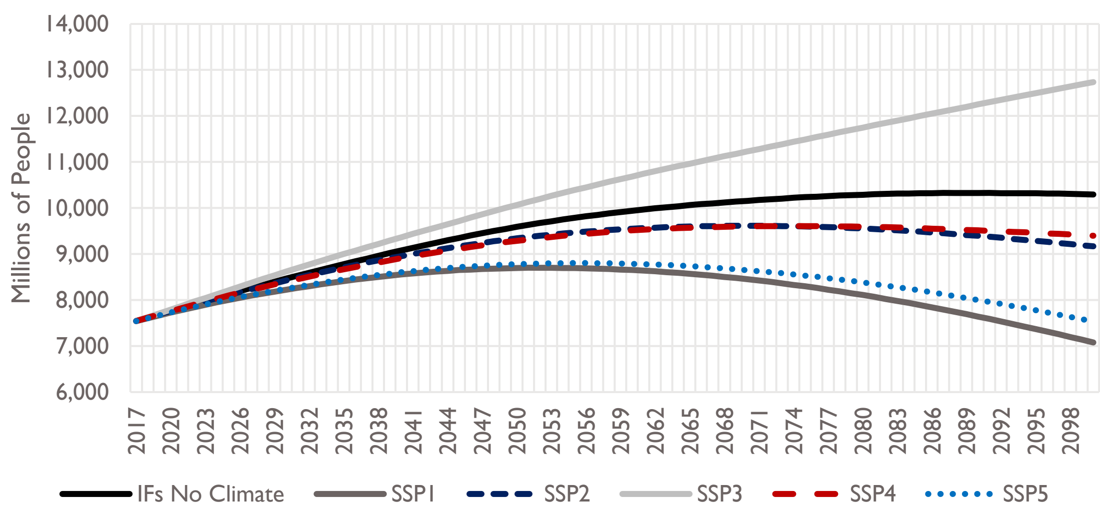
Figure 6: SSP scenarios in IFs without a climate effect for global Gini Index from 2017 to 2100.



Population is another important driver of the future level of poverty, with scenarios showing higher population levels increasing the likelihood of larger impoverished populations driven by various factors (Figure 7). SSP3, which models a world of high challenges to both adaptation and mitigation, shows the largest increase in population overtime, growing to 12.7 billion by 2100. SSP2 and SSP4, which model a world characterized by "middle-of-the-road" development and unequal development, show population growth that peaks in mid-century at 9.3 billon and falls to 9.1 (SSP2) and 9.3 (SSP4) billion by the end of the century. Scenarios with low challenges to adaptation project lower population distributions, with a peak of 8.7 billion by mid-century and a decline in overall population to 7.5 (SSP5) and 7.0 billion (SSP1).

The IFs base case scenario projections on future population growth fall between the most pessimistic SSP and more middle-of-the road projections. The IFs population projection grows throughout the century, though at a diminishing rate, to reach 10.2 billion by 2100.

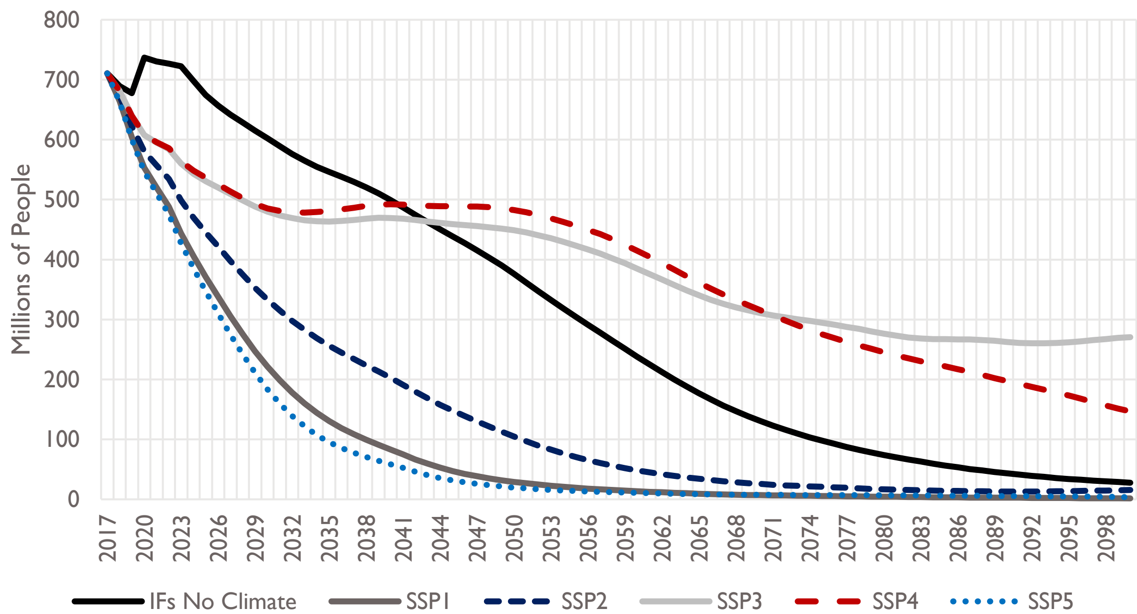
Figure 7: SSP scenarios in IFs without a climate Population.



The global no-climate poverty projections are shown in Figure 8. Here, SSP scenarios with greater challenges to adaptation show higher levels of overall poverty than scenarios with fewer challenges to adaptation, declining from 710 million in 2017 to 448 million (SSP3) and 482 million (SSP4) by mid-century and then further to 270 million (SSP3) and 146 million (SSP4) by the end of the century. SSP2, reflecting middle-of-the-road development assumptions, shows a significant reduction in poverty across time, declining to 104 million by mid-century and 15 million by 2100. Scenarios with few challenges to adaptation show even more rapid declines in the population living in extreme poverty, decreasing to 29 million (SSP1) and 19 million (SSP5) by mid-century and 1.5 million (SSP1) and 3.4 million (SSP5) by the end of the time horizon.

The IFs base case scenario shows significantly different behavior, reflecting different assumptions in the above drivers. First, the IFs scenario includes the effect of COVID-19 in its base case, increasing the number of people in poverty from 710 million to 737 million in the early years of the pandemic. Next, the IFs base case is driven by more pessimistic assumptions about short-term GDP growth as well as more pessimistic assumptions about short-term population growth relative to other SSP scenarios. The IFs projection shows persistently higher poverty than other SSPs for the first half of this century, eventually passing SSP3 and SSP4 projections, but reduces to approximately 376 million people living on less than $1.90 per day by mid-century. This scenario declines through the end of the century and projects 27 million people in extreme poverty by the end of the time horizon.

Figure 8: SSP scenarios in IFs without a climate effect for global population living on less than $1.90 per day from 2017 to 2100.



Climate Effects on Development

This section evaluates the outcomes of our model runs across different key drivers of poverty as well as poverty itself. We begin by comparing how climate scenarios are impacting the long-term development of economic production/consumption, the Gini coefficient for inequality, and poverty by region and income group.

Table 2 shows the cumulative impact of climate change across SSPs in GDP measured at market exchange rates (in 2011 US$). In a world of low radiative forcing and sustainable development (SSP1 RCP2.6) climate change will reduce economic output by $23.4 trillion by mid-century and US$187.6 trillion by 2100. In a "middle-of-the-road" scenario, coupling SSP2 assumptions and RCP4.5 assumptions, the economic cost of climate change is $26.3 trillion by mid-century and $429.9 trillion by the end of the century. In worlds of increased challenges to climate change the effect is less, reflecting more pessimistic assumptions about no-climate GDP growth. SSP3, a world of high challenges to both adaptation and mitigation in the face of climate change, sees a reduction in total GDP by the end of the century of $276.5 trillion when coupled with RCP6.0. SSP4 sees an even more significant reduction when compared with RCP6.0 with a cumulative reduction in GDP of $343.2 trillion. The greatest reduction occurs in the SSP with the largest economic production, SSP5. When coupled with RCP8.5, SSP5 sees a reduction of $1,853.0 trillion through the end of the century. The IFs model results show less overall impact on GDP because the long-term growth forecast is more pessimistic than most SSP scenarios. In RCP2.6, IFs projects a reduction in total economic activity of $92.2 trillion, in RCP4.5 a reduction of $291.9 trillion, in RCP6.0 a reduction of $338.9 trillion, and in RCP8.5 a reduction of $804.0 trillion.

Table 2: The effect of climate on global economic growth. Measured in trillions of 2011 US$ at market exchange rates, all tables measure the cumulative differences between RCP scenarios and No-Climate scenarios.

World	**2030**	**2050**	**2070**	**2100**
SSP1 RCP2.6	-$2.2	-$23.4	-$75.2	-$187.6
SSP2 RCP4.5	-$2.1	-$26.3	-$109.1	-$429.9
SSP3 RCP6.0	-$1.6	-$15.9	-$61.4	-$276.5
SSP4 RCP6.0	-$1.6	-$18.2	-$75.8	-$343.2
SSP5 RCP8.5	-$2.3	-$42.3	-$272.2	-$1,853.0
IFs RCP2.6	-$0.4	-$10.3	-$35.5	-$92.2
IFs RCP4.5	-$0.5	-$15.7	-$72.8	-$291.9
IFs RCP6.0	-$0.4	-$10.5	-$54.9	-$338.9
IFs RCP8.5	-$0.7	-$21.1	-$128.6	-$804.0

As a share of GDP, the various SSP and RCP combinations paint a broad range of possible economic futures depending on assumptions about future temperature change and economic growth (Table 3). In the highest temperature change scenario—RCP8.5—total economic production/consumption is reduced by 6.3 percent by 2100 compared with the most optimistic scenario where economic production/consumption is reduced by approximately 0.5 percent from mid-century to 2100.[1] The IFs base case results show a spread of impact that ranges from –0.42 percent of GDP by 2100 in the lowest carbon emission projection (RCP2.6) to –7.37 percent impact in a worst-case scenario (RCP8.5). Regionally, in the "middle-of-the-road" scenario SSP2-RCP4.5 the largest reductions in economic activity by the end of the century occur in Southern Asia, followed by sub-Saharan Africa and the Middle East and North Africa, a reflection of assumptions about each region's economic potential (see Appendix). The largest economic reduction for the same scenario by economic grouping occurs in lower-middle income countries followed by upper-middle income and high income countries (see Appendix).

Table 3: The effect of climate on global economic growth as percent of GDP measured in trillions of 2011 US$ at market exchange rates.

World	**2030**	**2050**	**2070**	**2100**
SSP1 RCP2.6	-0.25%	-0.54%	-0.58%	-0.51%
SSP2 RCP4.5	-0.26%	-0.87%	-1.45%	-1.90%
SSP3 RCP6.0	-0.20%	-0.65%	-1.35%	-3.10%
SSP4 RCP6.0	-0.20%	-0.63%	-1.23%	-2.96%
SSP5 RCP8.5	-0.27%	-1.05%	-2.64%	-6.36%
IFs RCP2.6	-0.12%	-0.50%	-0.55%	-0.42%
IFs RCP4.5	-0.15%	-0.82%	-1.55%	-1.88%
IFs RCP6.0	-0.11%	-0.61%	-1.31%	-2.99%

[1] A recent white paper released by the White House examined the macroeconomic risks associated with climate forecasts at different RCP levels (site). These studies project a decrease in global GDP in 2100 for an RCP8.5 scenario ranging from 1 percent to 23 percent (Newell et al 2021; Burke et al 2015). Our forecast for RCP8.5 scenarios projects a 6.3 percent to 7.6 percent decrease in global GDP, well within the range of other studies in this area

World	2030	2050	2070	2100
IFs RCP8.5	-0.21%	-1.24%	-3.31%	-7.37%

The impact of the SSP RCPs on the future distribution of income inequality, with the range of outcomes in 2050 spanning from an increase of 0.0011 points on a 0–1 point scale for SSP1-RCP2.6 to a high of 0.002 for all other scenarios, represent an increase of 0.316 percent to 0.697 percent globally. By 2100 this further increases from a low of 0.0022 in SSP1-RCP2.6 to a high of 0.014 in SSP5-RCP8.5, representing an increase of 0.774 percent to 4.625 percent. In the IFs, the Gini coefficient increases by 0.0013 by 2050 driven by RCP2.6 and up to 0.004 driven by RCP8.5, representing 0.341 percent to 1.05 percent. By 2100, the increase in Gini is 0.0023 in RCP2.6 and 0.025 in RCP8.5, representing an increase of 0.601 percent to 6.527 percent. The regions with the greatest increase in the Gini driven by change in temperature by the end of the century in the "middle-of-the-road" scenario SSP2-RCP6.0 are sub-Saharan Africa and Southern Asia followed by Southeast Asia, and then Latin America and the Caribbean (see Appendix). The largest increase in Gini for the same scenario by economic groupings occurs in low-middle income countries followed by low income countries (see Appendix).

Table 4: The effect of climate on the global Gini Index. Measures the absolute difference between RCP scenarios and No-Climate scenarios.

World	2030	2050	2070	2100
SSP1 RCP2.6	0.0002	0.0011	0.0018	0.0022
SSP2 RCP4.5	0	0.002	0.004	0.006
SSP3 RCP6.0	0	0.002	0.004	0.011
SSP4 RCP6.0	0	0.002	0.004	0.01
SSP5 RCP8.5	0	0.002	0.006	0.014
IFs RCP2.6	0.0002	0.0013	0.0021	0.0023
IFs RCP4.5	0	0.002	0.005	0.007
IFs RCP6.0	0.001	0.002	0.005	0.011
IFs RCP8.5	0.001	0.004	0.011	0.025

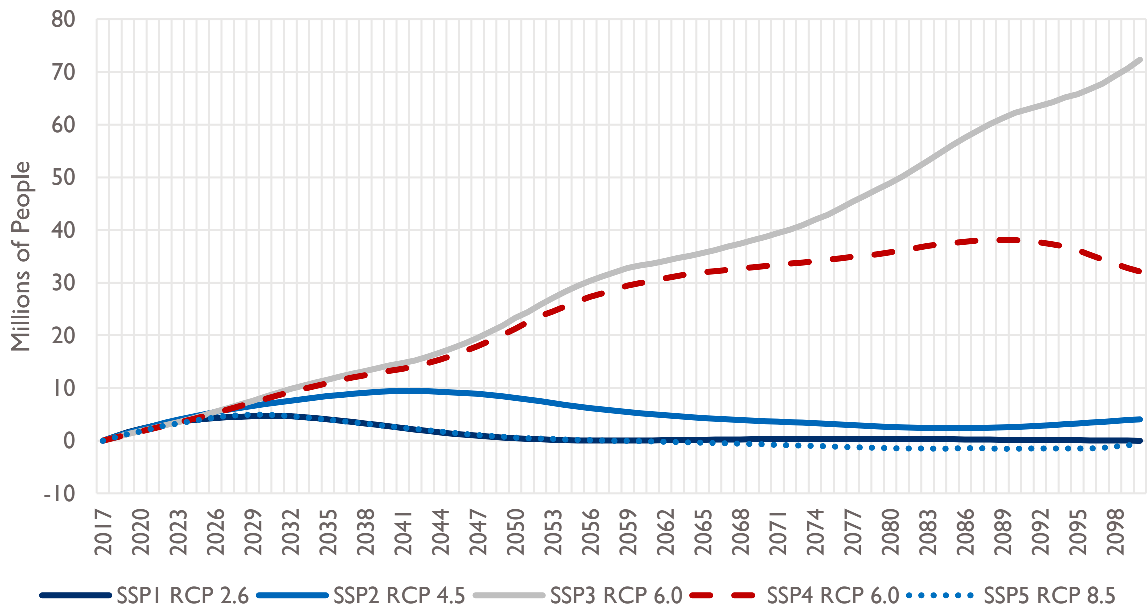
Table 5: The effect of climate on the global Gini Index measured as percent difference between RCP scenarios and No-Climate scenarios.

World	2030	2050	2070	2100
SSP1 RCP2.6	0.06%	0.32%	0.58%	0.77%
SSP2 RCP4.5	0.09%	0.49%	1.13%	1.79%
SSP3 RCP6.0	0.12%	0.43%	0.99%	2.38%
SSP4 RCP6.0	0.11%	0.37%	0.91%	2.53%
SSP5 RCP8.5	0.10%	0.70%	1.93%	4.63%
IFs RCP2.6	0.05%	0.34%	0.55%	0.60%
IFs RCP4.5	0.00%	0.52%	1.31%	1.83%
IFs RCP6.0	0.26%	0.52%	1.31%	2.87%
IFs RCP8.5	0.26%	1.05%	2.88%	6.53%

Climate Effects on Poverty

Based on the methodology, baseline and scenario model results described above, the effect of changing temperature on productivity and inequality is to increase poverty at $1.90, $3.20, and $5.50 income thresholds for all tested scenarios through 2050 and for scenarios with less socioeconomic development and more significant climate change through 2100. The greatest increases in poverty for SSP scenarios for the population living on less than $1.90 is the combination of SSP3—a world of significant challenges to adaptation and mitigation—and RCP6.0, with an additional 72.3 million people pushed into poverty by the end of the century. This scenario is followed closely by SSP4—a world characterized by inequality—coupled with RCP6.0, pushing an additional 32.1 million people into poverty by 2100 measured as less than $1.90 per day.

Figure 9: Climate-attributable global population living on less than $1.90 per day for SSPs by RCPs.

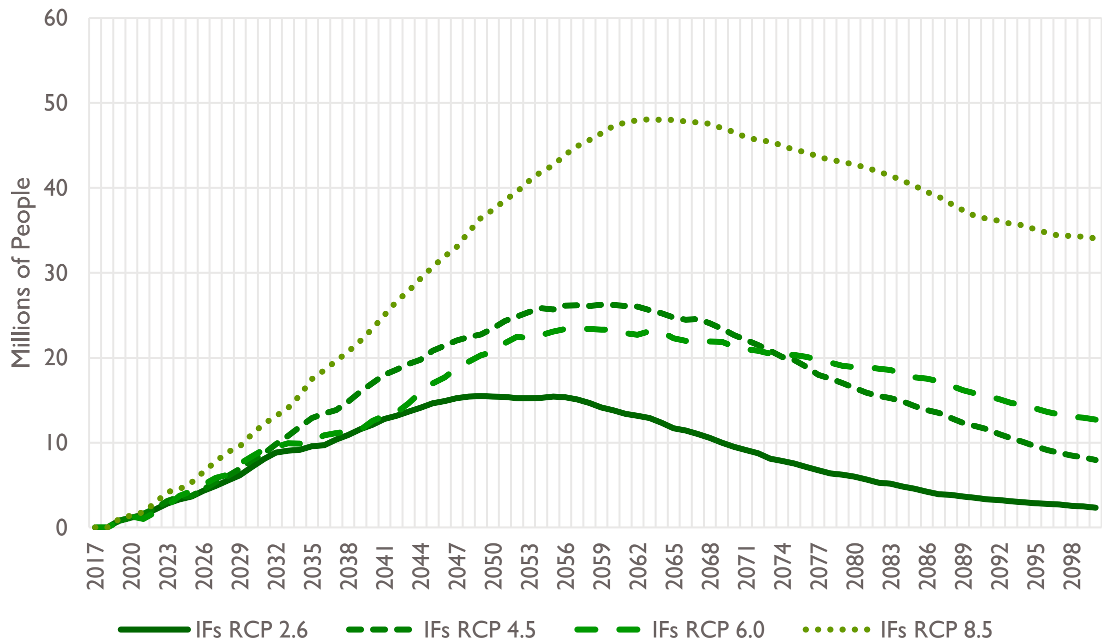


The SSP/RCP combination from our core set that pushes the greatest number of people into poverty is SSP3-RCP6.0. On a regional basis, this scenario pushes an additional 4.3 million people into extreme poverty by 2030 in sub-Saharan Africa, the region that experiences the largest increases from 2030-2070. Over this period and following the logic of this scenario, an additional 13.6 million people are pushed into poverty by 2050, 19.5 million by 2070, and 19 million by 2100. The region hit second hardest in terms of the number of people pushed into extreme poverty is Southern Asia, which sees an increase in extreme poverty through 2030 of 3.2 million people followed by 7.7 million by 2050, 15 million by 2070, and 46.9 million by 2100. Other regions that experience growth in poverty driven by climate change in this scenario include the Latin America and the Caribbean which sees an increase of 6.5 million people by 2100, Southeast Asia which sees an increase of 1.1 million by 2100, and the Middle East and North Africa which sees an increase of 1.6 million by 2100.

The greatest increase in extreme poverty driven by SSP3-RCP6.0 is among lower-middle income countries, which see an increase of 5.6 million by 2030, 15.5 million by 2050, 26.9 million by 2070, and 59.3 million by 2100. The next largest increase occurs in low income countries, which show an increase of 2.2 million people by 2030, 6.9 million by 2050, 9.7 million by 2070, and 8.7 million by 2100. Upper-middle income countries also see an increase, though at lower levels, with the extreme poverty population increasing by 1.7 million by 2050 and 6.8 million by 2100. High income countries see a reduction of extremely poor people in this scenario.

The IFs scenario results show the greatest increase in the number of people living on less than $1.90 per day in RCP8.5, with an additional 37.4 million people living on less than $1.90 per day by 2050 and 60 million by 2100. IFs-RCP6.0 leads to an additional 21.6 million pushed into poverty, while IFs-RCP4.5 pushes an additional 12 million people into extreme poverty by 2100. IFs-RCP2.5 pushes an additional 15.4 million into poverty by mid-century and 2.3 million into poverty by 2100.

Figure 10: Climate-attributable global population living on less than $1.90 per day for IFs by RCPs.



At higher poverty thresholds the number of people pushed into poverty also increases. SSP3-RCP6.0 leads to an additional 145.7 million people pushed into poverty as measured as those living on less than $3.20 per day. SSP4-RCP6.0 leads to an additional 88.6 million people pushed into poverty by 2100. SSP2-RCP4.5—a "middle-of-the-road" scenario leads to an additional 26 million people pushed under the $3.20 per day threshold by 2050 and an additional 15.7 million by 2100. The IFs results show 72.4 million people living on less than $3.20 per day by 2050 in an RCP8.5 world and 46.7 million in an RCP4.5 world, 39.8 million in an RCP6.0 world, and 30.3 million in an RCP2.6 world. By 2100, RCP8.5 operationalized in IFs shows over 103 million pushed into poverty followed by RCP6.0 (41.6 million), RCP4.5 (26.5 million) and RCP2.6 (8 million).

Figure 11: Climate-attributable global population living on less than $3.20 per day for SSPs by RCPs.

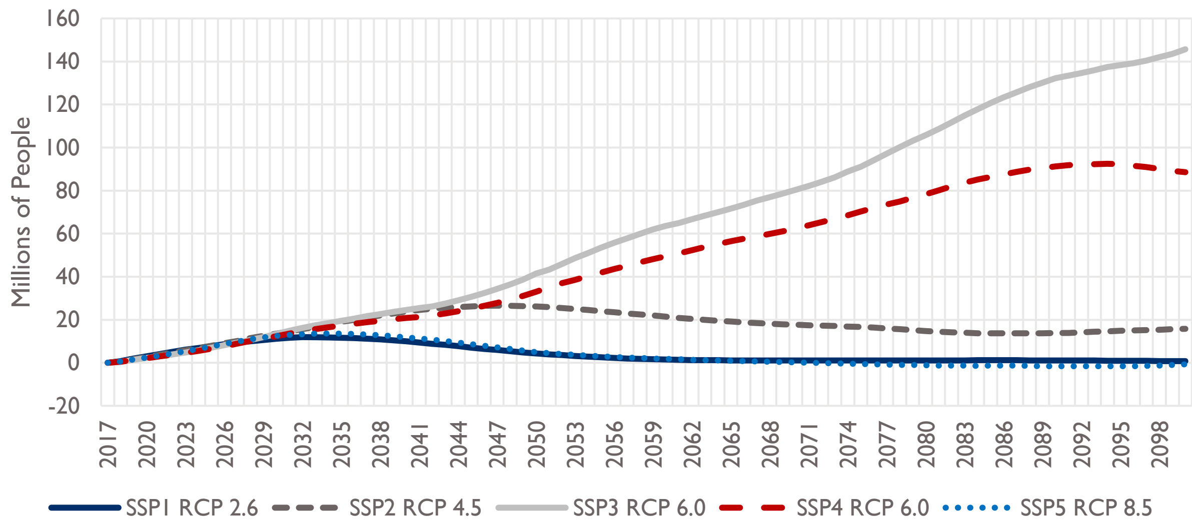
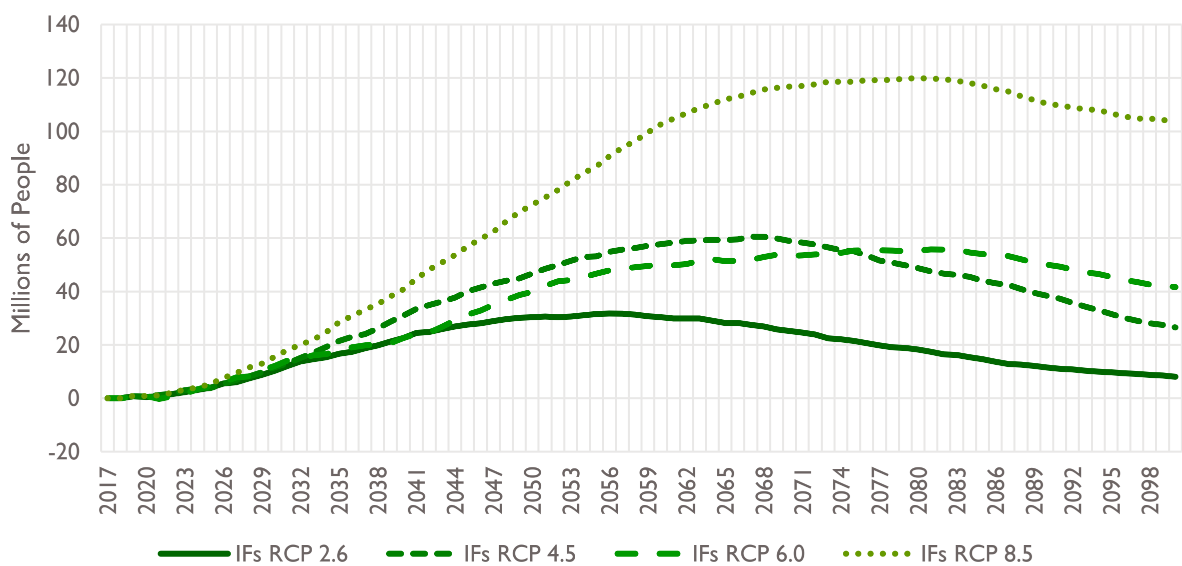


Figure 12: Climate-attributable global population living on less than $3.20 per day for IFs by RCPs.



SSP3-RCP6.0 pushes an additional 219.2 million people into poverty as measured as those living on less than $5.50 per day by 2100 followed by SSP4-RCP6.0, which leads to an additional 160.9 million people under this threshold by 2100. SSP2-RCP4.5 leads to an additional 15.9 million people in extreme poverty by the middle of the century and 2.3 million more people living on less than $5.50 per day by 2100. The number of people pushed into more moderate poverty using the IFs model results grows to 80.4 million by 2050 in RCP8.5. This is followed by RCP4.5 (52 million), RCP6.0 (43 million) and RCP2.6 (32 million). By 2100 the number of people pushed into poverty measured by the under $5.50 per day income threshold grows to 264.4 million in RCP8.5 followed by 113.8 million in RCP6.0, 74.3 million in RCP4.5, and 23 million in RCP2.6.

Figure 13: Climate-attributable global population living on less than $5.50 per day for SSPs by RCPs.

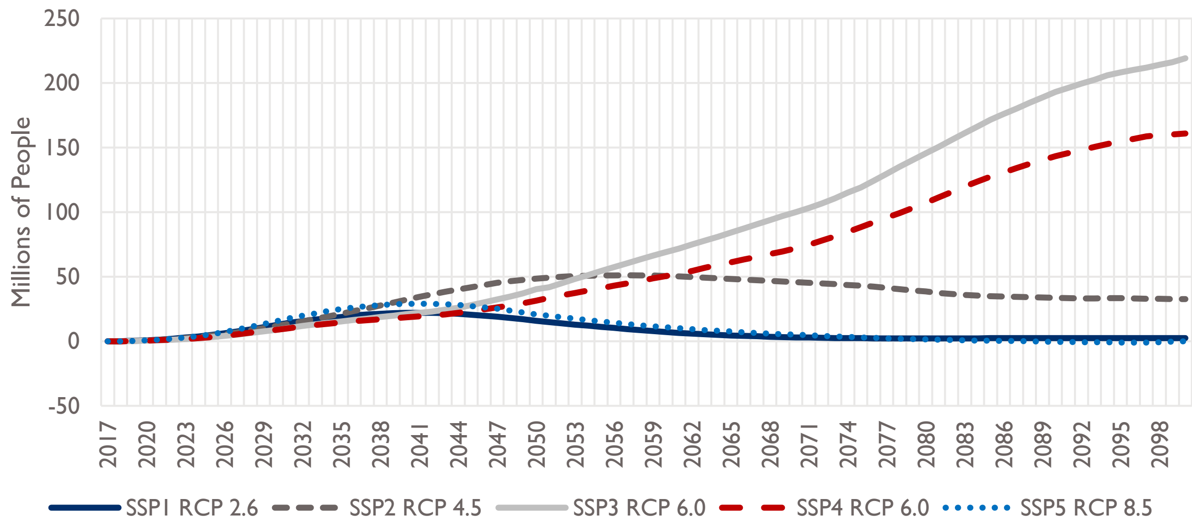
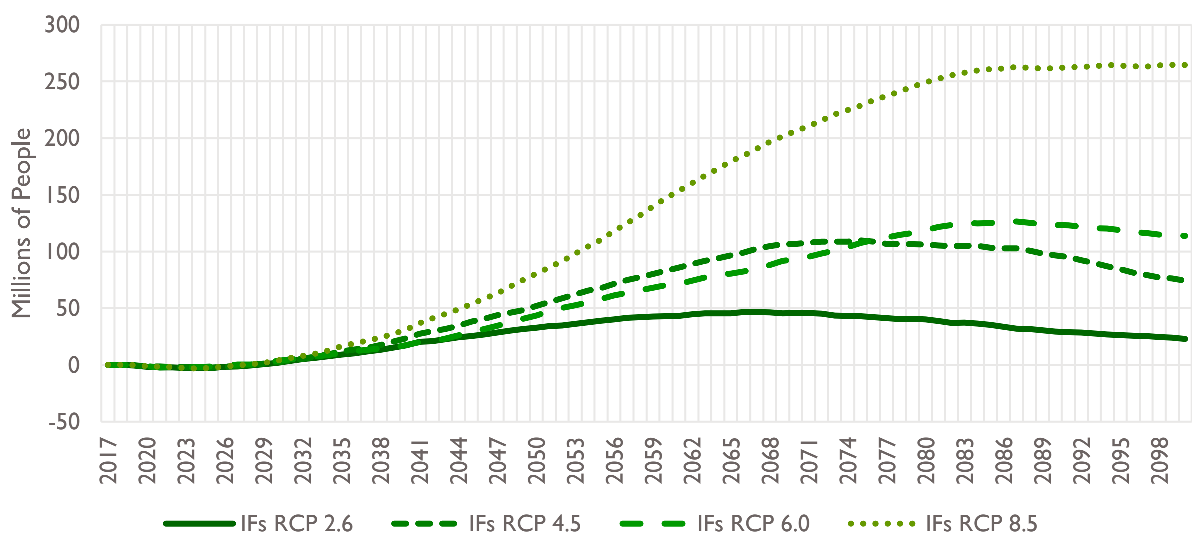


Figure 14: Climate-attributable global population living on less than $5.50 per day for IFs by RCPs.



While the number of impoverished people grows as we climb the poverty-income ladder, the proportion of the population in poverty due to climate change as a share of total poverty tells a different story. The graphs below show SSP3-RCP6.0 and the IFs-RCP6.0 scenarios for the population living on less than $1.90, $3.20, and $5.50 per day as a share of the total populations living under those income thresholds from 2017–2100. In the SSP-RCP combination scenarios, the percentage of the population living on less than $1.90 per day attributable to climate change grows from 5 percent in 2050 to 21 percent by 2100. In the IFs simulation, that share grows from 5 percent in 2050 to over 31 percent by 2100. The climate-attributable percent of the population living on less than $3.20 per day also grows across time and reaches 15 percent by 2100 in SSP3-RCP6.0 and 28 percent in the IFs operationalization. The climate-attributable share of the population living on less than $5.50 per day increases to 10 percent by 2100 in SSP3-RCP6.0 and 22 percent in the IFs simulation.

Figure 15: Climate-attributable percent of impoverished people ($1.90, $3.20, $5.50 levels) for SSP3 RCP6.0.

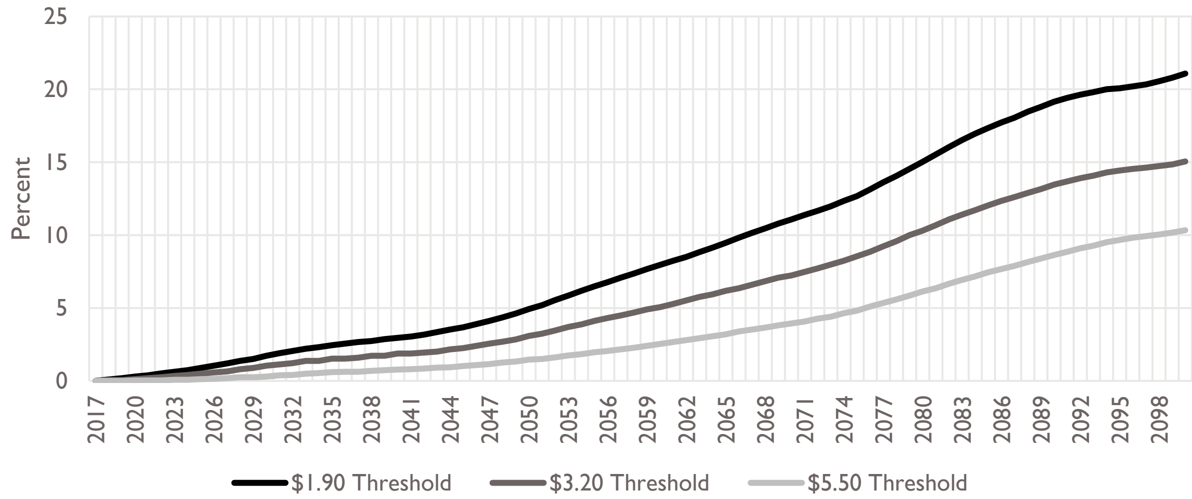
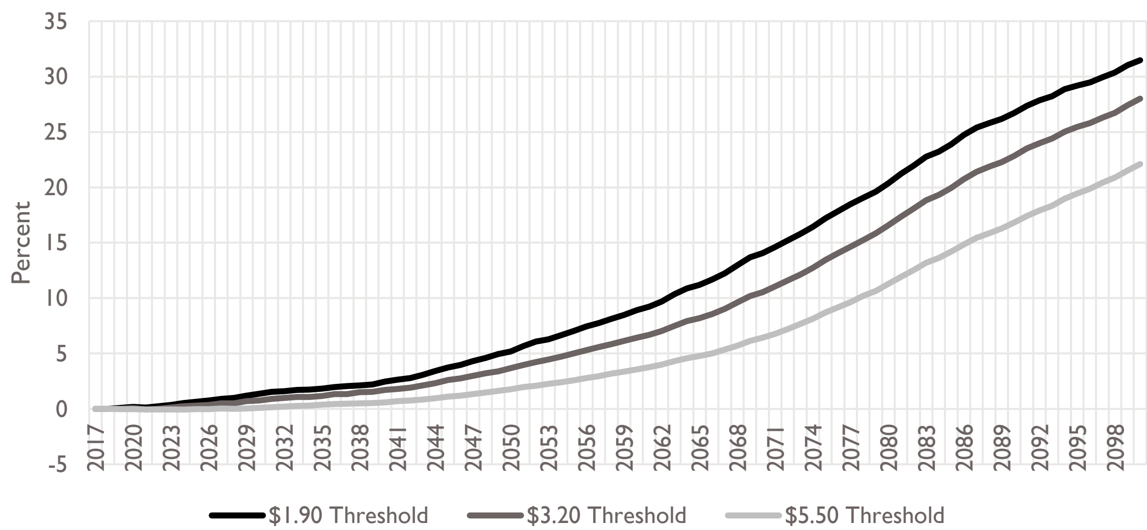


Figure 16: Climate-attributable percent of impoverished people ($1.90, $3.20, $5.50 levels) for IFs RCP6.0.



Effects of Tipping Points

While climate change is forecasted to impact development through economic losses and heightened poverty, the effect may escalate even further if climate tipping points are surpassed. The science behind tipping points is marked with uncertainty, however, model estimations of the economic impact of tipping points have been conducted (Dietz et al. 2021). In this section we present climate tipping point scenarios that forecasts the increased potential of climate to affect global development.

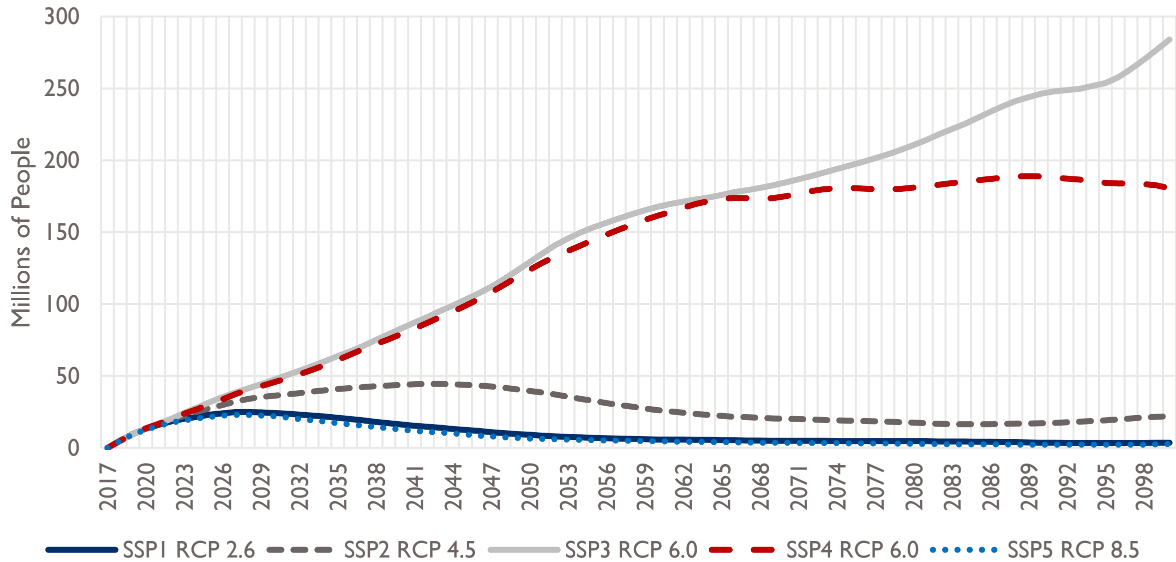
The tipping point scenarios for SSP/RCP combinations depict a large range of impact on global GDP (Table 6). In the "middle-of-the-road" scenario SSP2-RCP4.5 global GDP is reduced 26.5 percent by the end of the century. In SSP3-RCP6.0, a world of significant challenges to adaptation and mitigation, surpassing tipping points reduces global GDP 30.7 percent by the end of the century. Tipping points in IFs RCP scenarios show similar effects with reductions in global GDP across all scenarios by the end of the century. The greatest reduction in global GDP occurs in a world with high temperature change, IFs RCP8.5, with a 30.2 percent reduction by 2100. This scenario is followed by IFs RCP6.0 (-26.9 percent), IFs RCP4.5 (-26 percent), and IFs RCP2.6 (-24.9 percent). The impact of tipping points increases with higher temperatures highlighting the significance of mitigation on future economic development. Relative to climate scenarios, the effect of tipping points further reduces GDP by 25 percent on average across all SSP/IFs RCP combinations.

Table 6. The effect of climate tipping points on global economic growth as percent of GDP measured in trillions of 2011 US$ at market exchange rates.

World	**2030**	**2050**	**2070**	**2100**
SSP1 RCP2.6	-4.3%	-10.6%	-16.5%	-25.4%
SSP2 RCP4.5	-4.5%	-11.7%	-17.8%	-26.5%
SSP3 RCP6.0	-4.6%	-12.0%	-19.6%	-30.7%
SSP4 RCP6.0	-4.5%	-11.4%	-17.9%	-28.2%
SSP5 RCP8.5	-4.3%	-11.0%	-18.2%	-29.8%
IFs RCP2.6	-0.8%	-5.7%	-12.9%	-24.9%
IFs RCP4.5	-0.8%	-6.0%	-13.7%	-26.0%
IFs RCP6.0	-0.8%	-5.8%	-13.5%	-26.9%
IFs RCP8.5	-0.9%	-6.4%	-15.3%	-30.2%

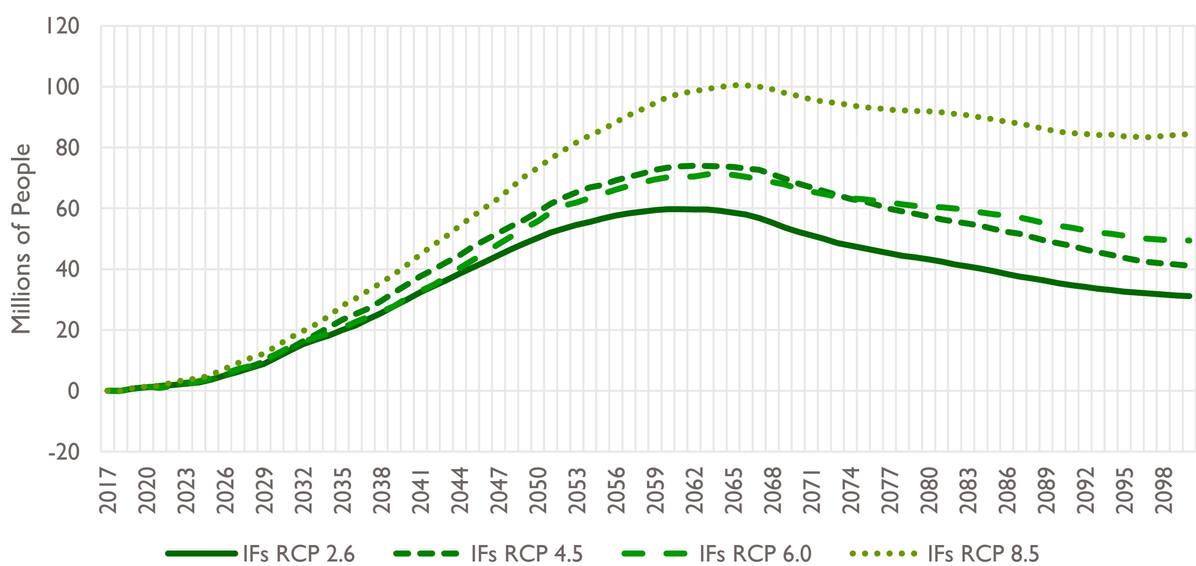
Climate tipping points are projected to have a significant impact on extreme poverty for all SSP/RCP combinations (Figure 17). The largest impact occurs in SSP3-RCP6.0 where 284 million people are pushed into extreme poverty by the end of the century. Second to this scenario is SSP4-RCP6.0 which sees an additional 180.6 million people pushed in extreme poverty followed by SSP2-RCP4.5 (22.1 million), SSP1-RCP2.6 (3.5 million), and SSP5-RCP8.5 (2.6 million). These forecasts show a significant impact on extreme poverty if tipping points are surpassed in a world with high challenges to adaptation (SSP3 and SSP4). Relative to SSP/RCP climate scenarios, tipping points are forecasted to push an additional 3 to 211 million people into extreme poverty by the end of the century.

Figure 17. Climate tipping points attributable global population living on less than $1.90 per day for SSPs by RCPs.



A similar story is true for IFs RCP combinations with tipping points considered (Figure 18). Across all scenarios extreme poverty is projected to increase with a peak around mid-century followed by a decline out to 2100. The largest impact is seen in a world of high temperature change, IFs RCP8.5, as 84 million people are pushed into extreme poverty by the end of the century. This scenario is followed by IFs RCP6.0 (49.5 million), IFs RCP4.5 (41 million), and IFs RCP2.6 (31 million). Relative to IFs RCP climate scenarios, tipping points are projected to push an additional 28 to 50 million people into extreme poverty.

Figure 18. Climate tipping points attributable global population living on less than $1.90 per day for IFs RCPs.



Operationalized within the IFs RCP and SSP/RCP scenarios, the impact of tipping points increases across each poverty level (Table 7). Out of all SSP/RCP combinations, the "middle-of-the-road" scenario SSP3-RCP6.0 shows the highest impact on poverty at the $3.20 threshold pushing 614.9 million people into poverty by the end of the century. This scenario is followed by SSP4-RCP6.0 (456.8 million), SSP2-RCP4.5 (67 million), SSP1-RCP2.6 (6.7 million), and SSP5-RCP8.5 (4.6 million). Relative to SSP/RCP climate scenarios, tipping points are projected to further increase poverty by 4 to 469 million people. In the IFs tipping point scenarios, RCPs with greater temperature increases result in a higher effect on poverty. IFs RCP8.5 shows the greatest impact of tipping points as 260.6 million are pushed into poverty by the end of the century. The impact of tipping points reduces as RCPs decrease, IFs RCP6.0 pushes 167.4 million into poverty by 2100 and is followed by IFs RCP4.5 (143.3 million) and IFs RCP2.6 (113.2 million). Relative to IFs RCP climate scenarios, tipping points are projected to further increase poverty by 105 to 157 million people.

The population of people living under moderate poverty ($5.50 per day) also increases with tipping points operationalized (Table 7). The range of impact for SSP/RCP combinations shows that surpassing tipping points pushes 13.5 million to over 1 billion people into poverty by the end of the century. Relative to SSP/RCP climate scenarios, tipping points push an additional 9 to 841 million people into moderate poverty. The range of impact in IFs RCP combinations with tipping points projects that 353.4 to 669.2 million people are pushed into moderate poverty by 2100. Relative to IFs RCP climate scenarios, tipping points push an additional 330 to 404 million people into moderate poverty by the end of the century.

Table 7. The effect of climate tipping points on global poverty ($3.20 and $5.50) measured in millions as the difference between climate tipping point scenarios and no-climate scenarios.

	$3.20		**$5.50**	
	2050	**2100**	**2050**	**2100**
SSP1 RCP2.6	28.4	6.7	94.1	13.5
SSP2 RCP4.5	119.1	67.0	252.1	141.3
SSP3 RCP6.0	267.4	614.9	362.9	1061.0
SSP4 RCP6.0	221.9	456.8	274.8	876.4
SSP5 RCP8.5	20.1	4.6	72.3	9.1
IFs RCP2.6	110.1	113.2	164.7	353.4
IFs RCP4.5	126.9	143.3	183.1	423.7
IFs RCP6.0	119.8	167.4	174.9	475.8
IFs RCP8.5	152.9	260.6	210.2	669.2

Tipping point scenarios have shown an even wider range of potential impact that climate could have on global development. Although tipping points are mostly misunderstood, our scenarios highlight the significance of furthering research in this area as the potential effects of tipping points could be the difference between eradicating extreme poverty by 2100 or perpetuating extreme forms of poverty into the next century. With reductions in GDP of up to 30 percent and increases in extreme poverty of up to 284 million people, tipping points have the potential to considerably derail progress on global development if they are surpassed. As more research is conducted to better understand the relationship of tipping points and how they interact with each other, future development analyses must consider the potential impact of surpassing these critical climate limits.

5. Discussion

The model results presented here tell a complicated story about the relationship between temperature change, economic production, and income distribution. While the effect of climate change is indeed significant on the future distribution of poverty, our research shows that socioeconomic development will have a significant impact on poverty in addition to the impact of temperature change alone. The methodology used here shows that the impact of climate change on the distribution of poverty will build slowly over time. In the worst-case climate scenarios for the most extreme measure of poverty (under $1.90 per day), 72 million people are pushed into poverty relative to a world of no-climate change by the end of the century. This number grows to 284 million people when tipping points are accounted for. The long-term effect of socioeconomic change is significant in shaping future poverty thresholds as extremely high growth scenarios, even those coupled with extremely high temperature change (SSP5-RCP8.5), show the elimination of extreme poverty before mid-century.

To contextualize these findings, these scenarios show a similar level of poverty increases to research analyzing the effect of COVID-19 on extreme poverty in 2020–21 (Moyer et al. 2022) and are significantly dwarfed when compared with the effect of intrastate conflict on poverty over the next decade (Moyer n.d.). Contextualizing the long-term effect of climate change on poverty produces results that show that climate change will increase the number of people living in extreme poverty by 2100 at a similar level to recent estimates for increases to extreme poverty due to COVID-19. Furthermore, studies of the future impact of civil wars on extreme poverty show that, over the next eight years, they will account—even in very pessimistic scenarios—for a greater number of extremely poor than climate change will by the end of the century (Moyer 2023).

These results may be surprising considering the significant research focused on raising awareness of the importance of climate change mitigation to reduce the effects of climate change. Numerous studies demonstrate that dramatic changes to how energy and economic systems operate are needed to put the earth on a more sustainable path. The cost of these climate mitigation efforts will bring additional costs, including increases in the price of food and energy, that will impact the poor and most vulnerable.

This report has significant implications for methodologies attempting to study the relationship between climate change and human development. First, the approach used here relies upon smoothed effects—we start with average temperature change and damage functions that use smoothed relationships between average temperature and GDP reductions as a share of GDP, and then filter them through a large integrated assessment model focused on average annual drivers and outputs. But climate change has been shown to have significant effects on extreme events—effects that may be much more significant than their average effects. Significant heat waves may not move average annual temperature values very much, but they have particularly strong effects on populations subjected to temporarily extreme conditions. Recent flooding in Pakistan is another example of how average effects as modeled through general integrated assessment models may be poor at capturing tipping points and other threshold changing outcomes. The effect of climate change on extreme events is very broad and includes known events (oceanic heatwaves, heatwaves, mega storms, etc.) as well as theorized effects that are difficult to model (changing oceanic currents, atmospheric patterns, etc.).

Another important implication for the study of climate change impacts on human well-being relates to the causal pathways by which climate change will likely affect future outcomes. The pathway explored in this report focuses on how average changing temperatures will impact economic production and inequality. While damage functions are intended to be comprehensive in their representation of the effect of climate change on economic production, they are a single relationship that is, at best, a significant abstraction of the impacts of changing temperature on economies suited for specific purposes. Instead of relying upon abstract relationships, modeling efforts that explore the effect of climate change on human development should focus on causal pathways established to build up a broad foundation of knowledge about how future climate change is likely to impact human well-being.

A final implication for future studies relates to the use of income-based poverty measures of purchasing power parity as an adequate measure of human development or well-being. Income-based measures suffer from both conceptual and empirical limitations. Conceptually, income-based poverty is an incomplete measure of human well-being. To get a wholistic sense of how populations are faring in their daily lives, studies must capture a broad range of measures of health, education, safety, inclusion, and community. Empirically, purchasing power parity measures of income have also been criticized for what they miss and how they capture temporal trends.

6. Conclusion

This working paper has taken a logical approach to estimating the future effect of climate change on poverty over longer time horizons than had previously been studied. To do so, the study used scenarios, model relationships, and models already in existence, relying on average temperature change to estimate the impact of climate on the economy and inequality. The findings suggest that the effects of climate change on poverty may be more muted than other global challenges and that if the goal is to reduce poverty, high-cost policy interventions to mitigate the effects of climate change may create more harm than good. Our findings suggest that policy interventions should instead target socioeconomic development, especially in regions already experiencing high levels of poverty and inequality and sub-Saharan Africa and South Asia.

But while that conclusion is a worthy starting point for further research, the method used to arrive at this conclusion is incomplete. It smooths variability in temperature and does not account for the dynamic range of impact that climate change could have on future development. Further research is needed to arrive at a more reasonable estimate of the impact of climate change on poverty. Suggested areas for future investigation include the influence of extreme weather events, carbon dioxide fertilization, and tipping points. While our research has attempted to incorporate potential effects of tipping points on the economy (Dietz et al. 2021), this field of research is defined by uncertainty and therefore requires further research to understand how surpassing these critical limits could impact future development. Alternative pathways of climate change-to-poverty should be explored using tools that represent more climate extremes and a broader set of impacts stemming from changing temperature, precipitation, storm surge, and other factors intended to be included in damage functions, like those used in DICE. However, these factors may be too stylized and simplistic for use, a finding that is supported by other critiques of the damage function literature (Pindyck 2013).

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Appendix

Figure 19: GDP per capita for all scenarios.

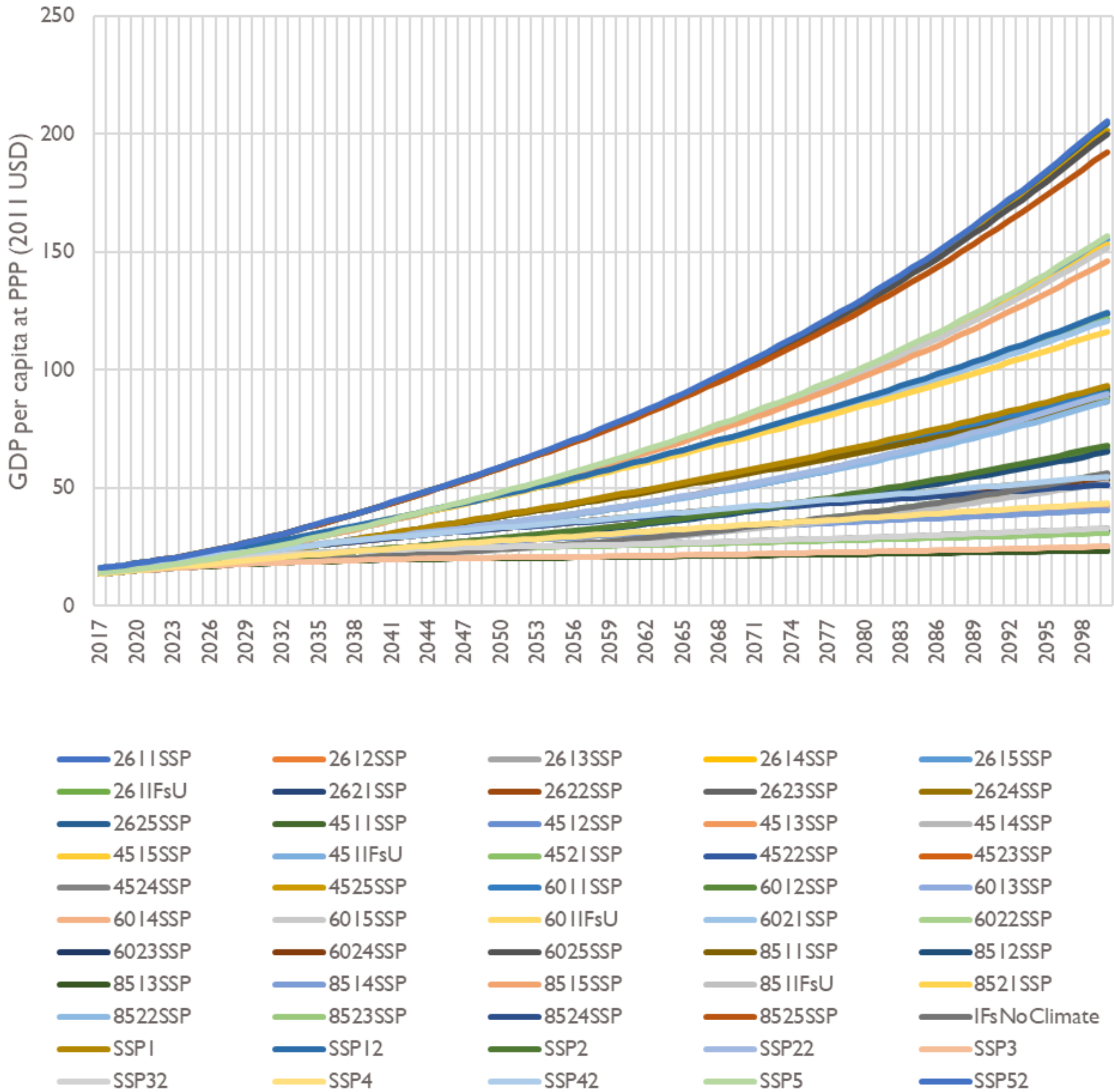

Table 8: Table for all scenarios of GDP per capita by decade.

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
2611SSP	$13.89	$21.79	$29.79	$38.18	$47.05	$56.92	$67.50	$79.34	$92.52
2612SSP	$13.81	$19.68	$23.99	$28.54	$33.80	$40.28	$47.92	$56.96	$67.54
2613SSP	$13.70	$17.94	$19.52	$20.35	$20.97	$21.83	$22.78	$23.82	$25.07
2614SSP	$13.78	$19.67	$23.87	$27.40	$30.66	$33.97	$37.05	$40.10	$43.23
2615SSP	$13.93	$23.67	$35.08	$47.84	$62.43	$79.98	$100.60	$125.50	$155.40
261IFsU	$16.19	$18.45	$20.96	$24.02	$27.85	$33.05	$39.23	$46.81	$56.02
2621SSP	$16.19	$25.74	$35.79	$46.83	$58.95	$72.73	$87.77	$104.70	$123.60
2622SSP	$16.19	$23.34	$28.83	$34.83	$41.95	$50.86	$61.55	$74.37	$89.51
2623SSP	$16.19	$21.42	$23.55	$24.85	$25.92	$27.34	$28.94	$30.71	$32.78
2624SSP	$16.19	$23.33	$28.53	$33.06	$37.32	$41.72	$45.93	$50.19	$54.63
2625SSP	$16.19	$27.89	$42.13	$58.68	$78.14	$101.90	$129.90	$163.90	$204.50
4511SSP	$13.89	$21.79	$29.76	$38.08	$46.81	$56.43	$66.75	$78.28	$91.21
4512SSP	$13.81	$19.68	$23.97	$28.47	$33.63	$39.94	$47.38	$56.19	$66.58
4513SSP	$13.70	$17.94	$19.50	$20.30	$20.86	$21.64	$22.52	$23.49	$24.71
4514SSP	$13.78	$19.67	$23.84	$27.33	$30.50	$33.67	$36.62	$39.54	$42.59
4515SSP	$13.93	$23.67	$35.05	$47.71	$62.11	$79.30	$99.49	$123.80	$153.10
451IFsU	$16.19	$18.45	$20.93	$23.95	$27.70	$32.76	$38.79	$46.19	$55.24
4521SSP	$16.19	$25.74	$35.76	$46.71	$58.66	$72.13	$86.82	$103.30	$121.90
4522SSP	$16.19	$23.34	$28.80	$34.74	$41.74	$50.44	$60.88	$73.40	$88.26
4523SSP	$16.19	$21.42	$23.53	$24.78	$25.79	$27.11	$28.62	$30.30	$32.32
4524SSP	$16.19	$23.33	$28.51	$32.97	$37.13	$41.36	$45.41	$49.51	$53.83
4525SSP	$16.19	$27.89	$42.09	$58.53	$77.75	$101.00	$128.50	$161.70	$201.70
6011SSP	$13.89	$21.81	$29.80	$38.17	$46.93	$56.60	$66.78	$77.97	$90.46
6012SSP	$13.81	$19.69	$24.01	$28.53	$33.71	$40.05	$47.40	$55.97	$66.02
6013SSP	$13.70	$17.95	$19.53	$20.34	$20.91	$21.70	$22.52	$23.40	$24.49
6014SSP	$13.78	$19.68	$23.88	$27.39	$30.57	$33.77	$36.63	$39.38	$42.21
6015SSP	$13.93	$23.69	$35.10	$47.82	$62.26	$79.53	$99.53	$123.30	$151.80
601IFsU	$16.19	$18.45	$20.97	$23.99	$27.76	$32.83	$38.72	$45.89	$54.63
6021SSP	$16.19	$25.75	$35.81	$46.81	$58.80	$72.33	$86.86	$103.00	$120.90
6022SSP	$16.19	$23.36	$28.84	$34.82	$41.84	$50.58	$60.90	$73.12	$87.55
6023SSP	$16.19	$21.43	$23.57	$24.84	$25.85	$27.19	$28.63	$30.18	$32.05
6024SSP	$16.19	$23.34	$28.55	$33.05	$37.22	$41.48	$45.42	$49.30	$53.36
6025SSP	$16.19	$27.91	$42.15	$58.66	$77.94	$101.30	$128.60	$161.10	$200.00
8511SSP	$13.89	$21.79	$29.73	$37.98	$46.50	$55.71	$65.32	$75.75	$87.00
8512SSP	$13.81	$19.69	$23.98	$28.47	$33.59	$39.82	$47.03	$55.42	$65.19
8513SSP	$13.70	$17.94	$19.49	$20.24	$20.72	$21.36	$22.02	$22.71	$23.54
8514SSP	$13.78	$19.67	$23.82	$27.26	$30.29	$33.23	$35.81	$38.22	$40.54
8515SSP	$13.93	$23.67	$35.02	$47.59	$61.69	$78.28	$97.35	$119.80	$146.00

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
851IFsU	$16.19	$18.44	$20.92	$23.86	$27.45	$32.25	$37.79	$44.42	$52.27
8521SSP	$16.19	$25.73	$35.73	$46.59	$58.28	$71.22	$85.01	$100.10	$116.40
8522SSP	$16.19	$23.35	$28.82	$34.75	$41.70	$50.30	$60.46	$72.44	$86.51
8523SSP	$16.19	$21.42	$23.51	$24.72	$25.62	$26.76	$28.00	$29.32	$30.82
8524SSP	$16.19	$23.32	$28.48	$32.89	$36.88	$40.83	$44.42	$47.87	$51.28
8525SSP	$16.19	$27.88	$42.05	$58.38	$77.24	$99.74	$125.80	$156.60	$192.50
IFsNoClimate	$16.19	$18.47	$21.02	$24.12	$27.99	$33.22	$39.41	$47.01	$56.25
SSP1	$13.92	$21.90	$29.98	$38.48	$47.44	$57.39	$68.04	$79.94	$93.23
SSP12	$16.19	$25.80	$35.93	$47.07	$59.29	$73.14	$88.24	$105.20	$124.20
SSP2	$13.85	$19.78	$24.15	$28.76	$34.08	$40.61	$48.30	$57.39	$68.06
SSP22	$16.19	$23.40	$28.94	$35.01	$42.20	$51.15	$61.89	$74.75	$89.96
SSP3	$13.74	$18.02	$19.65	$20.51	$21.14	$22.01	$22.96	$24.00	$25.27
SSP32	$16.19	$21.47	$23.65	$24.98	$26.07	$27.50	$29.10	$30.87	$32.96
SSP4	$13.81	$19.76	$24.02	$27.62	$30.92	$34.26	$37.35	$40.42	$43.58
SSP42	$16.19	$23.38	$28.65	$33.23	$37.54	$41.97	$46.19	$50.46	$54.92
SSP5	$13.97	$23.79	$35.31	$48.21	$62.95	$80.64	$101.40	$126.50	$156.60
SSP52	$16.19	$27.96	$42.30	$58.99	$78.59	$102.40	$130.60	$164.70	$205.60

Table 9: Regional table with GDP percentage difference.

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Middle East & Northern Africa	2030	-0.299%	-0.274%	-0.258%	-0.255%	-0.295%
	2050	-0.629%	-0.956%	-0.77%	-0.743%	-1.15%
	2070	-0.593%	-1.523%	-1.661%	-1.433%	-3.022%
	2100	-0.521%	-2.069%	-3.347%	-3.251%	-7.421%
Oceania	2030	-0.205%	-0.205%	-0.119%	-0.118%	-0.204%
	2050	-0.397%	-0.582%	-0.41%	-0.407%	-0.802%
	2070	-0.469%	-1.005%	-0.926%	-0.93%	-2.031%
	2100	-0.464%	-1.459%	-2.012%	-2.117%	-5.142%
Southeast Asia	2030	-0.163%	-0.194%	-0.167%	-0.154%	-0.2%
	2050	-0.308%	-0.56%	-0.492%	-0.375%	-0.7%
	2070	-0.35%	-0.937%	-0.944%	-0.743%	-1.711%
	2100	-0.314%	-1.258%	-1.776%	-1.777%	-4.112%
Southern Asia (India+)	2030	-0.214%	-0.294%	-0.292%	-0.293%	-0.24%
	2050	-0.442%	-0.991%	-0.774%	-0.778%	-0.958%
	2070	-0.53%	-1.47%	-1.485%	-1.189%	-2.519%
	2100	-0.486%	-1.986%	-3.8%	-2.744%	-6.319%
Latin America & Caribbean	2030	-0.253%	-0.251%	-0.25%	-0.212%	-0.274%
	2050	-0.466%	-0.755%	-0.704%	-0.578%	-0.913%
	2070	-0.521%	-1.22%	-1.377%	-1.046%	-2.307%
	2100	-0.485%	-1.671%	-2.598%	-2.463%	-5.846%

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
sub-Saharan Africa	2030	-0.217%	-0.285%	-0.257%	-0.259%	-0.261%
	2050	-0.417%	-0.796%	-0.699%	-0.702%	-0.93%
	2070	-0.457%	-1.243%	-1.422%	-1.396%	-2.332%
	2100	-0.433%	-1.648%	-2.823%	-3.198%	-5.714%

Figure 20: All scenarios for the Gini coefficient.

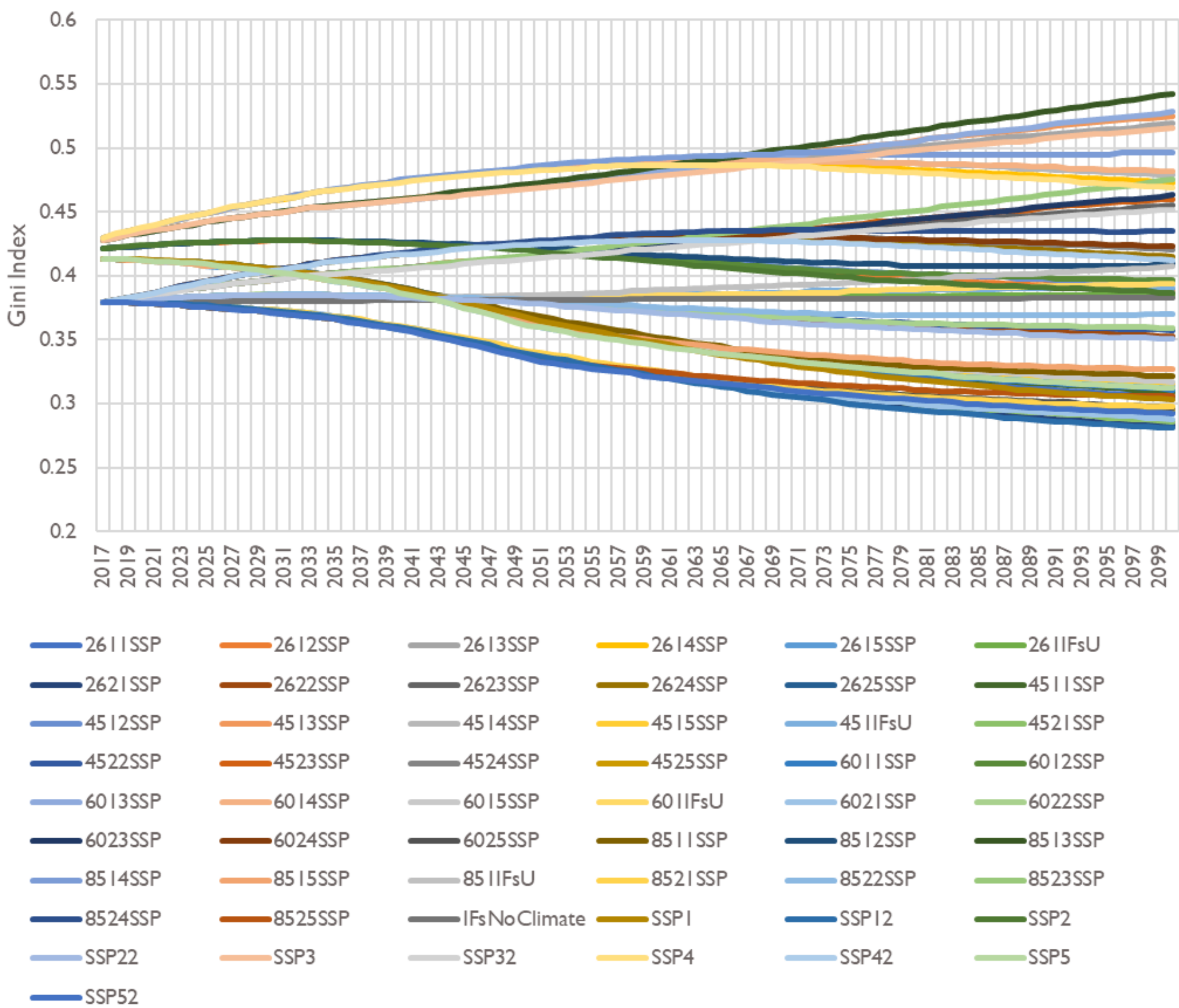

Table 10: All scenarios for the Gini coefficient by decade.

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
2611SSP	0.413	0.406	0.391	0.368	0.349	0.332	0.32	0.312	0.305
2612SSP	0.421	0.428	0.426	0.421	0.412	0.404	0.398	0.393	0.389
2613SSP	0.428	0.449	0.459	0.47	0.48	0.491	0.501	0.51	0.519
2614SSP	0.43	0.459	0.474	0.483	0.488	0.488	0.483	0.478	0.473
2615SSP	0.413	0.403	0.388	0.362	0.346	0.335	0.326	0.318	0.313
261IFsU	0.379	0.38	0.381	0.382	0.383	0.384	0.385	0.385	0.385
2621SSP	0.379	0.373	0.36	0.34	0.323	0.308	0.297	0.289	0.283
2622SSP	0.379	0.385	0.384	0.38	0.373	0.366	0.36	0.356	0.353
2623SSP	0.379	0.397	0.406	0.414	0.423	0.432	0.441	0.448	0.455
2624SSP	0.379	0.404	0.417	0.425	0.43	0.429	0.425	0.42	0.415
2625SSP	0.379	0.372	0.358	0.336	0.322	0.312	0.304	0.298	0.293
4511SSP	0.413	0.406	0.391	0.369	0.35	0.335	0.324	0.316	0.309
4512SSP	0.421	0.428	0.426	0.421	0.414	0.407	0.401	0.398	0.394
4513SSP	0.428	0.449	0.46	0.471	0.482	0.494	0.506	0.516	0.525
4514SSP	0.43	0.459	0.474	0.484	0.49	0.491	0.488	0.484	0.479
4515SSP	0.413	0.403	0.388	0.363	0.348	0.337	0.328	0.322	0.316
451IFsU	0.379	0.38	0.382	0.384	0.385	0.387	0.388	0.39	0.39
4521SSP	0.379	0.374	0.36	0.34	0.324	0.31	0.3	0.293	0.286
4522SSP	0.379	0.386	0.384	0.38	0.374	0.368	0.363	0.36	0.357
4523SSP	0.379	0.397	0.406	0.415	0.425	0.435	0.444	0.453	0.46
4524SSP	0.379	0.404	0.417	0.426	0.431	0.432	0.429	0.425	0.42
4525SSP	0.379	0.372	0.359	0.336	0.323	0.314	0.307	0.301	0.296
6011SSP	0.413	0.406	0.391	0.368	0.35	0.334	0.323	0.317	0.311
6012SSP	0.421	0.428	0.426	0.421	0.414	0.406	0.401	0.399	0.397
6013SSP	0.428	0.449	0.459	0.47	0.482	0.493	0.505	0.517	0.528
6014SSP	0.43	0.459	0.474	0.484	0.489	0.49	0.488	0.485	0.482
6015SSP	0.413	0.403	0.388	0.362	0.347	0.336	0.328	0.322	0.317
601IFsU	0.379	0.381	0.382	0.383	0.385	0.387	0.389	0.392	0.394
6021SSP	0.379	0.374	0.36	0.34	0.324	0.309	0.3	0.293	0.288
6022SSP	0.379	0.386	0.384	0.38	0.374	0.367	0.363	0.361	0.359
6023SSP	0.379	0.398	0.406	0.415	0.424	0.434	0.444	0.454	0.463
6024SSP	0.379	0.404	0.417	0.426	0.431	0.431	0.429	0.426	0.423
6025SSP	0.379	0.372	0.359	0.336	0.323	0.313	0.306	0.301	0.297
8511SSP	0.413	0.406	0.391	0.37	0.352	0.338	0.329	0.325	0.322
8512SSP	0.421	0.428	0.426	0.422	0.416	0.411	0.408	0.408	0.409
8513SSP	0.428	0.449	0.46	0.472	0.485	0.499	0.514	0.528	0.542
8514SSP	0.43	0.459	0.475	0.485	0.492	0.496	0.495	0.495	0.496
8515SSP	0.413	0.403	0.388	0.364	0.349	0.34	0.333	0.329	0.327

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
851IFsU	0.379	0.381	0.383	0.385	0.389	0.393	0.397	0.402	0.408
8521SSP	0.379	0.374	0.361	0.341	0.326	0.313	0.305	0.3	0.298
8522SSP	0.379	0.386	0.384	0.381	0.376	0.371	0.369	0.369	0.37
8523SSP	0.379	0.397	0.406	0.416	0.427	0.439	0.451	0.463	0.475
8524SSP	0.379	0.404	0.418	0.427	0.433	0.436	0.435	0.435	0.435
8525SSP	0.379	0.372	0.359	0.337	0.325	0.317	0.311	0.308	0.306
IFsNoClimate	0.379	0.38	0.381	0.381	0.382	0.382	0.382	0.383	0.383
SSP1	0.413	0.406	0.39	0.367	0.348	0.331	0.319	0.31	0.303
SSP12	0.379	0.373	0.36	0.339	0.321	0.306	0.295	0.287	0.281
SSP2	0.421	0.428	0.425	0.42	0.411	0.402	0.396	0.391	0.387
SSP22	0.379	0.385	0.383	0.378	0.371	0.364	0.358	0.354	0.351
SSP3	0.428	0.449	0.459	0.468	0.478	0.488	0.498	0.507	0.516
SSP32	0.379	0.397	0.405	0.413	0.421	0.43	0.438	0.445	0.452
SSP4	0.43	0.459	0.473	0.482	0.486	0.485	0.481	0.475	0.469
SSP42	0.379	0.404	0.417	0.424	0.428	0.427	0.423	0.418	0.412
SSP5	0.413	0.403	0.387	0.361	0.345	0.334	0.324	0.317	0.312
SSP52	0.379	0.371	0.358	0.335	0.321	0.311	0.303	0.297	0.292

Figure 21: All scenarios for $1.90 headcount.

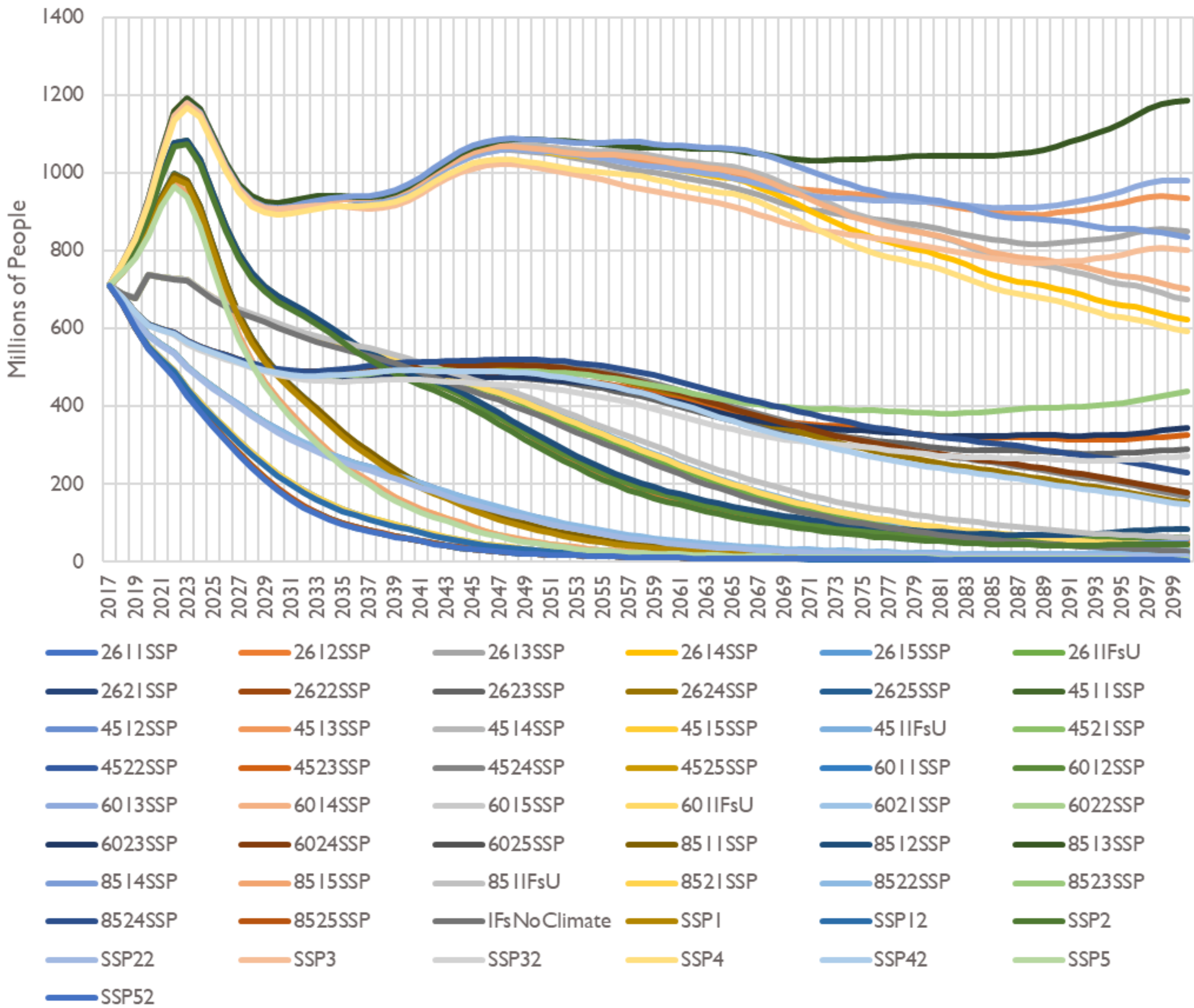

Table 11: All scenarios for $1.90 headcount by decade.

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
2611SSP	710.5	485.5	213.6	84.91	34.64	16.14	9.722	6.386	3.825
2612SSP	710.5	681.6	482.7	311.9	165.6	94.9	59.14	45.99	50.09
2613SSP	710.5	920.7	951.6	1,052	993.8	911.5	861	818.3	849
2614SSP	710.5	907	958.5	1,057	1,014	917.8	797.2	702.2	621.1
2615SSP	710.5	418.2	146.2	48.21	20.81	12.02	9.297	7.117	5.555
261IFsU	710.5	609.4	511	391.4	251.7	139.8	79.96	46.81	29.97
2621SSP	710.5	225.9	85.79	29.47	13.47	7.218	4.666	2.834	1.572
2622SSP	710.5	339.3	209.8	110.4	51.28	27.15	17.6	13.57	16.81
2623SSP	710.5	488.4	483.9	469	407.5	332.6	296.4	280.8	288.7
2624SSP	710.5	493.3	505.7	501.1	435.3	333.7	259.3	207.2	152.8

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
2625SSP	710.5	187.5	59.7	19.78	10.48	7.187	6.125	4.893	2.956
4511SSP	710.5	486.1	215.6	86.56	35.76	16.76	9.776	6.267	3.674
4512SSP	710.5	682.4	486.6	318.2	172.9	102.7	66.27	53.54	58.99
4513SSP	710.5	921.7	957.7	1,067	1,023	959.7	925.3	896.6	933.5
4514SSP	710.5	907.9	964	1,069	1,038	956.7	843.8	755.5	673.3
4515SSP	710.5	418.8	147.6	49.08	21.17	11.97	8.907	6.609	5.007
451IFsU	710.5	610.2	515.9	399.4	264.1	152.9	90.41	55.29	35.58
4521SSP	710.5	226.3	86.63	29.91	13.66	7.207	4.464	2.593	1.421
4522SSP	710.5	339.9	211.9	112.9	53.58	29.24	19.37	15.51	19.78
4523SSP	710.5	489	488	477.9	423.8	356.9	325.8	315.9	324.5
4524SSP	710.5	493.9	509.6	509.4	450	354.3	280.7	228.6	169.3
4525SSP	710.5	187.9	60.25	19.92	10.44	6.957	5.628	4.362	2.858
6011SSP	710.5	485.5	213.5	85.46	35.36	16.62	9.761	6.252	3.646
6012SSP	710.5	681.7	482.4	313.9	170.4	100.3	65.98	55.36	63.49
6013SSP	710.5	920.9	951.2	1,056	1,012	944.6	924.1	917.3	978.2
6014SSP	710.5	907.2	958.3	1,061	1,029	945.4	843.7	771.2	701.8
6015SSP	710.5	418.3	146.1	48.52	21.05	11.99	8.873	6.507	4.811
601IFsU	710.5	610.6	511.5	396.6	261.2	151.6	92.88	59.14	40.32
6021SSP	710.5	225.9	85.8	29.6	13.58	7.219	4.444	2.548	1.379
6022SSP	710.5	339.4	209.8	111.2	52.76	28.55	19.22	15.99	21.38
6023SSP	710.5	488.4	483.7	471.9	418.2	349.3	325.2	324.6	342.9
6024SSP	710.5	493.3	505.5	503.7	444.8	348.8	281	235.1	178.9
6025SSP	710.5	187.6	59.76	19.83	10.46	7.027	5.604	4.234	2.82
8511SSP	710.5	487.2	217.7	89.07	37.61	18	10.39	6.648	3.948
8512SSP	710.5	683.4	489.2	324.6	182.1	113.3	78.25	69.15	83.71
8513SSP	710.5	923.2	963.4	1,085	1,064	1,033	1,043	1,068	1,185
8514SSP	710.5	909.3	969.1	1,085	1,071	1,016	931.9	876.5	834.5
8515SSP	710.5	419.8	149.3	50.47	21.88	12.18	8.772	6.388	4.732
851IFsU	710.5	613.2	522.3	413.3	285.2	176.8	116.7	80.02	61.67
8521SSP	710.5	227	87.51	30.57	14.04	7.38	4.466	2.547	1.452
8522SSP	710.5	340.6	213.4	115.4	56.42	32.23	22.78	20.34	29.12
8523SSP	710.5	490.3	492.1	489.3	447.2	394.9	382.3	396.5	437.1
8524SSP	710.5	495.1	513.4	520	471.2	387.4	324.7	282.8	230.2
8525SSP	710.5	188.5	60.85	20.19	10.51	6.854	5.31	4.039	2.832
IFsNoClimate	710.5	602.3	498.9	376	237.9	130.3	73.98	43.33	27.63
SSP1	710.5	475.8	205.4	80.81	33.03	15.18	9.071	5.475	2.985
SSP12	710.5	221.2	83.08	28.99	13.44	6.947	4.376	2.669	1.57
SSP2	710.5	669.3	466.9	296.3	154.5	87.53	54.23	41.87	45.41
SSP22	710.5	333	202.5	104.7	48.36	25.53	16.76	12.92	15.7
SSP3	710.5	906.1	928.2	1,013	947.1	862	811.3	770.2	800.4

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
SSP32	710.5	480	469.4	448.7	384.9	310.6	276.3	262.4	270.6
SSP4	710.5	892.7	936.5	1,025	976.1	878.7	761.1	670.7	591.8
SSP42	710.5	485.4	492.2	482.5	414.9	315.6	245.3	197.1	146.7
SSP5	710.5	409.7	140.5	46.13	20.39	12.19	9.707	7.598	6.144
SSP52	710.5	183.6	58.14	19.6	10.61	7.574	6.72	5.571	3.452

Figure 22: All scenarios marginal effect of climate change on poverty $1.90 headcount measured in millions.

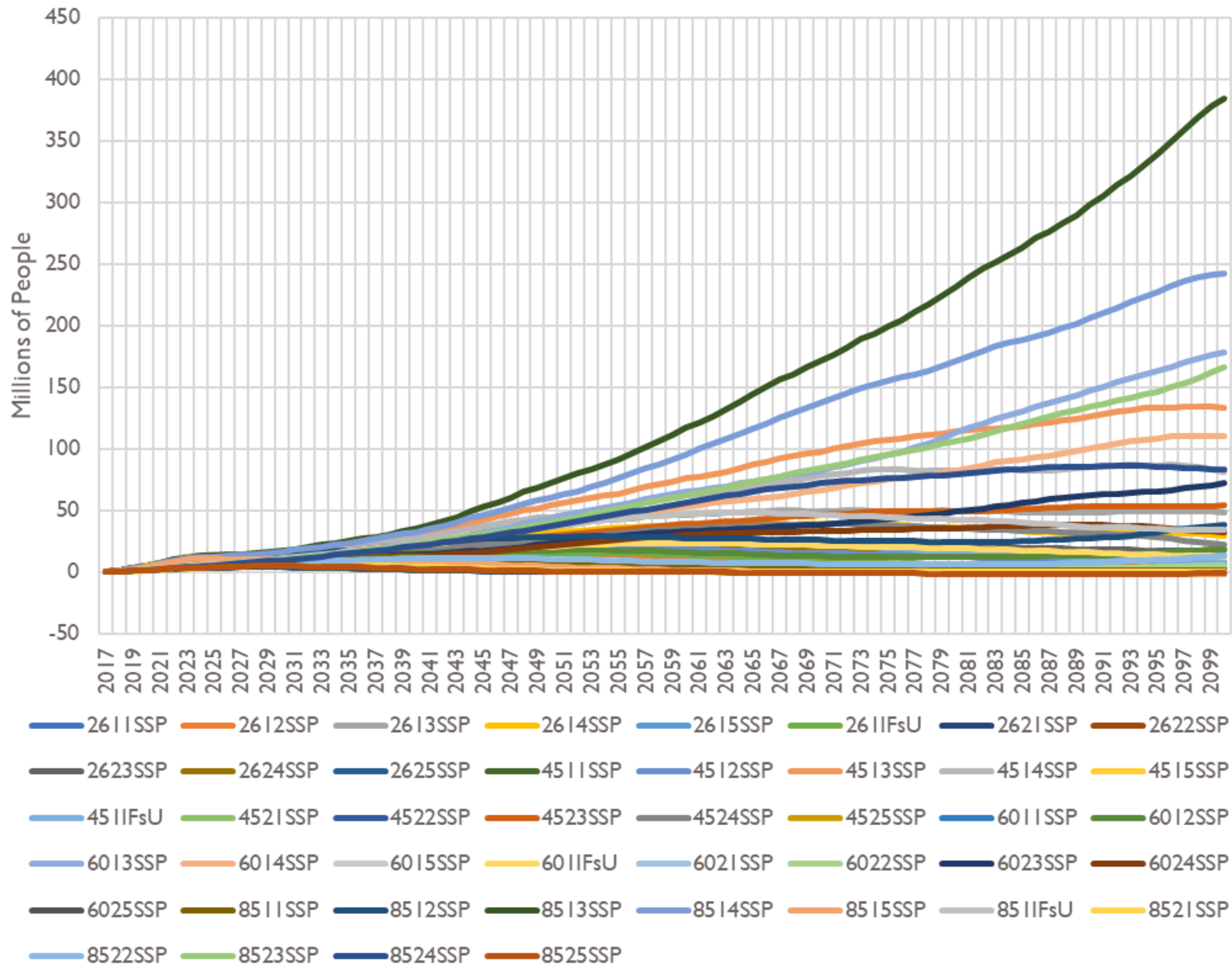

Table 12: All scenarios marginal effect of climate change on poverty at $1.90 headcount measured in millions.

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
2611SSP	0	9.7	8.2	4.1	1.61	0.96	0.651	0.911	0.84
2612SSP	0	12.3	15.8	15.6	11.1	7.37	4.91	4.12	4.68
2613SSP	0	14.6	23.4	39	46.7	49.5	49.7	48.1	48.6
2614SSP	0	14.3	22	32	37.9	39.1	36.1	31.5	29.3
2615SSP	0	8.5	5.7	2.08	0.42	-0.17	-0.41	-0.481	-0.589
261IFsU	0	7.1	12.1	15.4	13.8	9.5	5.98	3.48	2.34
2621SSP	0	4.7	2.71	0.48	0.03	0.271	0.29	0.165	0.002
2622SSP	0	6.3	7.3	5.7	2.92	1.62	0.84	0.65	1.11
2623SSP	0	8.4	14.5	20.3	22.6	22	20.1	18.4	18.1
2624SSP	0	7.9	13.5	18.6	20.4	18.1	14	10.1	6.1
2625SSP	0	3.9	1.56	0.18	-0.13	-0.387	-0.595	-0.678	-0.496
4511SSP	0	10.3	10.2	5.75	2.73	1.58	0.705	0.792	0.689
4512SSP	0	13.1	19.7	21.9	18.4	15.17	12.04	11.67	13.58
4513SSP	0	15.6	29.5	54	75.9	97.7	114	126.4	133.1
4514SSP	0	15.2	27.5	44	61.9	78	82.7	84.8	81.5
4515SSP	0	9.1	7.1	2.95	0.78	-0.22	-0.8	-0.989	-1.137
451IFsU	0	7.9	17	23.4	26.2	22.6	16.43	11.96	7.95
4521SSP	0	5.1	3.55	0.92	0.22	0.26	0.088	-0.076	-0.149
4522SSP	0	6.9	9.4	8.2	5.22	3.71	2.61	2.59	4.08
4523SSP	0	9	18.6	29.2	38.9	46.3	49.5	53.5	53.9
4524SSP	0	8.5	17.4	26.9	35.1	38.7	35.4	31.5	22.6
4525SSP	0	4.3	2.11	0.32	-0.17	-0.617	-1.092	-1.209	-0.594
6011SSP	0	9.7	8.1	4.65	2.33	1.44	0.69	0.777	0.661
6012SSP	0	12.4	15.5	17.6	15.9	12.77	11.75	13.49	18.08
6013SSP	0	14.8	23	43	64.9	82.6	112.8	147.1	177.8
6014SSP	0	14.5	21.8	36	52.9	66.7	82.6	100.5	110
6015SSP	0	8.6	5.6	2.39	0.66	-0.2	-0.834	-1.091	-1.333
601IFsU	0	8.3	12.6	20.6	23.3	21.3	18.9	15.81	12.69
6021SSP	0	4.7	2.72	0.61	0.14	0.272	0.068	-0.121	-0.191
6022SSP	0	6.4	7.3	6.5	4.4	3.02	2.46	3.07	5.68
6023SSP	0	8.4	14.3	23.2	33.3	38.7	48.9	62.2	72.3
6024SSP	0	7.9	13.3	21.2	29.9	33.2	35.7	38	32.2
6025SSP	0	4	1.62	0.23	-0.15	-0.547	-1.116	-1.337	-0.632
8511SSP	0	11.4	12.3	8.26	4.58	2.82	1.319	1.173	0.963
8512SSP	0	14.1	22.3	28.3	27.6	25.77	24.02	27.28	38.3
8513SSP	0	17.1	35.2	72	116.9	171	231.7	297.8	384.6
8514SSP	0	16.6	32.6	60	94.9	137.3	170.8	205.8	242.7

Scenario	2017	2030	2040	2050	2060	2070	2080	2090	2100
8515SSP	0	10.1	8.8	4.34	1.49	-0.01	-0.935	-1.21	-1.412
851IFsU	0	10.9	23.4	37.3	47.3	46.5	42.72	36.69	34.04
8521SSP	0	5.8	4.43	1.58	0.6	0.433	0.09	-0.122	-0.118
8522SSP	0	7.6	10.9	10.7	8.06	6.7	6.02	7.42	13.42
8523SSP	0	10.3	22.7	40.6	62.3	84.3	106	134.1	166.5
8524SSP	0	9.7	21.2	37.5	56.3	71.8	79.4	85.7	83.5
8525SSP	0	4.9	2.71	0.59	-0.1	-0.72	-1.41	-1.532	-0.62

Table 13: The cumulative effect of climate on economic growth by region. Measured in trillions of 2011 US$ at market exchange rates between RCP scenario and No-Climate scenario.

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Middle East & Northern Africa	2030	-$0.16	-$0.15	-$0.12	-$0.13	-$0.16
	2050	-$1.72	-$1.97	-$1.47	-$1.59	-$3.06
	2070	-$5.42	-$8.77	-$6.27	-$7.37	-$20.88
	2100	-$13.25	-$36.90	-$31.53	-$39.64	-$143.00
Oceania	2030	-$0.03	-$0.03	-$0.02	-$0.02	-$0.03
	2050	-$0.22	-$0.25	-$0.14	-$0.18	-$0.42
	2070	-$0.66	-$0.90	-$0.50	-$0.79	-$2.51
	2100	-$1.59	-$3.30	-$1.81	-$3.53	-$18.08
Southeast Asia	2030	-$0.07	-$0.08	-$0.06	-$0.06	-$0.09
	2050	-$1.00	-$1.21	-$0.81	-$0.76	-$2.11
	2070	-$3.73	-$5.74	-$3.49	-$3.50	-$15.35
	2100	-$9.94	-$24.10	-$15.39	-$17.22	-$101.20
Southern Asia (India +)	2030	-$0.13	-$0.14	-$0.13	-$0.13	-$0.13
	2050	-$2.17	-$3.15	-$1.65	-$2.10	-$4.57
	2070	-$9.92	-$16.85	-$7.64	-$10.29	-$42.67
	2100	-$31.62	-$83.68	-$46.50	-$50.00	-$345.40
Latin America & Caribbean	2030	-$0.17	-$0.16	-$0.14	-$0.13	-$0.17
	2050	-$1.57	-$1.83	-$1.37	-$1.32	-$2.76
	2070	-$4.90	-$7.26	-$5.40	-$5.22	-$16.71
	2100	-$12.18	-$28.15	-$22.74	-$23.80	-$102.70
sub-Saharan Africa	2030	-$0.06	-$0.07	-$0.05	-$0.05	-$0.07
	2050	-$1.04	-$1.32	-$0.73	-$0.68	-$2.40
	2070	-$6.01	-$8.76	-$4.38	-$3.49	-$28.46
	2100	-$26.02	-$62.44	-$34.37	-$24.06	-$332.00

Table 14: The cumulative effect of climate on economic growth by World Bank income group. Measured in trillions of 2011 US$ at the difference in market exchange rates between RCP scenario and No-Climate scenario.

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Low Income	2030	-$0.02	-$0.02	-$0.02	-$0.02	-$0.02
	2050	-$0.45	-$0.45	-$0.25	-$0.21	-$0.95
	2070	-$2.95	-$3.65	-$1.63	-$1.14	-$12.97
	2100	-$13.81	-$29.08	-$14.39	-$8.00	-$163.10
Low-Middle Income	2030	-$0.21	-$0.23	-$0.20	-$0.20	-$0.23
	2050	-$3.65	-$4.99	-$2.68	-$3.17	-$7.49
	2070	-$16.48	-$27.22	-$13.50	-$15.83	-$70.37
	2100	-$53.85	-$141.60	-$85.72	-$83.98	-$605.60
Upper-Middle Income	2030	-$0.88	-$0.80	-$0.64	-$0.63	-$0.88
	2050	-$10.76	-$10.50	-$6.94	-$7.63	-$18.59
	2070	-$32.57	-$41.73	-$25.28	-$30.08	-$105.20
	2100	-$68.73	-$141.50	-$101.90	-$125.50	-$541.80
High Income	2030	-$1.11	-$1.02	-$0.73	-$0.76	-$1.14
	2050	-$8.55	-$10.33	-$5.99	-$7.17	-$15.32
	2070	-$23.17	-$36.49	-$20.96	-$28.78	-$83.75
	2100	-$51.23	-$117.80	-$74.48	-$125.70	-$543.00

Table 15: The effect of climate on the regional Gini Index. Measures the absolute difference between RCP scenarios and No-Climate scenarios.

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Middle East & Northern Africa	2030	0.001	0.001	0.001	0.001	0.001
	2050	0.003	0.004	0.003	0.003	0.005
	2070	0.004	0.007	0.006	0.007	0.013
	2100	0.003	0.009	0.012	0.014	0.027
Oceania	2030	0.002	0.002	0.001	0.001	0.002
	2050	0.003	0.004	0.003	0.003	0.006
	2070	0.004	0.007	0.007	0.007	0.012
	2100	0.004	0.01	0.013	0.013	0.025
Southeast Asia	2030	0.003	0.002	0.002	0.002	0.003
	2050	0.005	0.006	0.005	0.005	0.008
	2070	0.006	0.01	0.008	0.008	0.017
	2100	0.007	0.013	0.016	0.016	0.032
Southern Asia (India +)	2030	0.003	0.002	0.002	0.002	0.003
	2050	0.005	0.007	0.005	0.005	0.01
	2070	0.006	0.011	0.009	0.008	0.02
	2100	0.006	0.014	0.017	0.016	0.039
	2030	0.002	0.002	0.002	0.002	0.003

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Latin America & Caribbean	2050	0.005	0.006	0.005	0.005	0.008
	2070	0.005	0.01	0.008	0.008	0.016
	2100	0.005	0.012	0.016	0.016	0.033
sub-Saharan Africa	2030	0.002	0.003	0.002	0.002	0.003
	2050	0.005	0.007	0.006	0.006	0.009
	2070	0.006	0.011	0.01	0.01	0.019
	2100	0.007	0.014	0.019	0.019	0.037

Table 16: The effect of climate on the Gini Index of World Bank income groups. Measures the absolute difference between RCP scenarios and No-Climate scenarios.

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Low Income	2030	0.002	0.002	0.002	0.002	0.002
	2050	0.004	0.006	0.005	0.005	0.008
	2070	0.006	0.01	0.008	0.008	0.017
	2100	0.008	0.012	0.016	0.016	0.034
Low-Middle Income	2030	0.002	0.002	0.002	0.002	0.003
	2050	0.005	0.007	0.005	0.005	0.009
	2070	0.006	0.011	0.009	0.009	0.019
	2100	0.006	0.014	0.018	0.017	0.037
Upper-Middle Income	2030	-0.0014	-0.0012	-0.001	-0.001	-0.001
	2050	-0.0025	-0.0026	-0.0018	-0.002	-0.003
	2070	-0.0022	-0.003	-0.0019	-0.0022	-0.004
	2100	-0.0018	-0.0024	-0.0012	-0.001	-0.001
High Income	2030	-0.002	-0.002	-0.002	-0.002	-0.003
	2050	-0.004	-0.005	-0.004	-0.004	-0.006
	2070	-0.005	-0.008	-0.006	-0.007	-0.011
	2100	-0.005	-0.009	-0.008	-0.009	-0.017

Table 17: Marginal effect of climate change on poverty $3.20 headcount measured in millions by decade.

		IFs RCP4.5	SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Middle East and Northern Africa	2030	0.553	0.398	0.478	0.455	0.382	0.389
	2070	2.685	0.057	0.52	2.543	1.948	0.057
	2100	1.272	0	0.016	4.553	3.798	0
Oceania	2030	0.044	0.035	0.042	0.039	0.039	0.038
	2070	0.156	0.005	0.03	0.144	0.159	0.005
	2100	0.06	0.001	0.011	0.135	0.225	0.001
Southeast Asia	2030	1.476	0.886	1.057	1.1	0.987	0.728
	2070	4.05	0.52	0.181	3.641	2.995	0.126
	2100	1.622	0.05	0.008	5.153	5.95	0.004

		IFs RCP4.5	SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Southern Asia (India +)	2030	7.49	5.438	7.116	7.677	6.978	5.744
	2070	13.09	0.036	11.04	34.64	17.88	0.206
	2100	1.564	0	15.69	80.78	16.78	0.003
Latin America and Caribbean	2030	1.25	0.906	1.071	1.181	1.065	0.924
	2070	5.381	0.05	1.188	5.86	2.544	0.034
	2100	3.769	0.001	0.476	11.36	2.915	0.003
sub-Saharan Africa	2030	2.261	4.144	4.635	3.759	3.633	5.304
	2070	34.08	0.889	6.012	36	40.02	1.108
	2100	18.37	1.068	0.976	47.88	65.99	0.219
World	2030	11.62	11.17	13.58	13.36	12.29	12.48
	2070	58.91	1.009	17.68	80.36	62.42	0.141
	2100	26.49	0.729	15.74	145.7	88.65	-0.657

Table 18: The effect of climate on regional population living on less than $1.90 per day measured in millions. Measures the absolute difference between RCP scenarios and No-Climate scenarios.

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Middle East & Northern Africa	2030	0.172	0.221	0.22	0.206	0.188
	2050	0.071	0.319	0.612	0.566	0.055
	2070	0.003	0.057	1.403	1.239	0.002
	2100	0	0	1.591	0.752	0
Oceania	2030	0.022	0.026	0.026	0.027	0.02
	2050	0.007	0.027	0.058	0.067	0.006
	2070	0.002	0.014	0.066	0.074	0.003
	2100	0	0.007	0.059	0.091	0
Southeast Asia	2030	0.404	0.249	0.343	0.337	0.116
	2050	0.263	0.118	0.672	0.764	0.039
	2070	0.255	0.049	0.967	1.327	0.049
	2100	0.005	0.001	1.125	2.409	0
Southern Asia (India +)	2030	0.912	1.942	3.194	2.814	0.957
	2050	0.004	1.746	7.703	5.342	0.044
	2070	0	1.976	15.04	5.682	0.003
	2100	0	4.803	46.93	5.154	0
Latin America & Caribbean	2030	0.446	0.567	0.68	0.625	0.448
	2050	0.123	0.682	1.659	1.11	0.093
	2070	0.011	0.493	3.291	1.4	0.006
	2100	0	0.171	6.498	1.472	0
	2030	3.184	4.403	4.312	4.309	3.661
	2050	0.526	6.16	13.59	14.65	1.106

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
sub-Saharan Africa	2070	0.415	2.117	19.52	26.04	0.325
	2100	0.291	0.239	19.04	28.65	0.043

Table 19: The effect of climate on the population of World Bank income groups living on less than $1.90 per day measured in millions. Measures the absolute difference between RCP scenarios and No-Climate scenarios.

		SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Low Income	2030	1.931	2.319	2.287	2.286	1.903
	2050	0.13	3.057	6.963	7.49	0.46
	2070	0.567	0.832	9.738	12.71	0.214
	2100	0.289	0.054	8.702	12.75	0.033
Low-Middle Income	2030	2.695	4.416	5.687	5.311	2.959
	2050	0.671	5.178	15.51	13.88	0.672
	2070	0.07	3.203	26.96	21.66	0.078
	2100	0.001	4.894	59.37	24.38	0
Upper-Middle Income	2030	0.484	0.624	0.729	0.661	0.5
	2050	0.185	0.783	1.727	1.081	0.202
	2070	0.047	0.644	3.436	1.323	0.091
	2100	0.006	0.254	6.871	1.324	0.01
High Income	2030	-0.397	-0.411	-0.333	-0.353	-0.423
	2050	-0.508	-0.884	-0.925	-1.19	-0.739
	2070	-0.412	-0.969	-1.454	-2.53	-1.104
	2100	-0.294	-1.126	-2.627	-6.323	-0.663

Table 20. The effect of climate tipping points on the global population living at each poverty threshold ($1.90, $3.20, $5.50). Measures the absolute difference between RCP Tipping Point scenarios and No-Climate scenarios in millions.

		$1.90	$3.20	$5.50
SSP1 RCP2.6	2030	24.32	61.29	101.10
	2050	9.11	28.42	94.07
	2070	4.95	9.62	26.00
	2100	3.54	6.72	13.45
SSP2 RCP4.5	2030	36.26	82.46	116.60
	2050	39.71	119.10	252.10
	2070	20.33	73.29	195.40
	2100	22.08	67.02	141.30
SSP3 RCP6.0	2030	47.44	93.94	117.00
	2050	129.30	267.40	362.90
	2070	184.60	425.70	667.20
	2100	284.00	614.90	1061.00

		$1.90	$3.20	$5.50
SSP4 RCP6.0	2030	45.60	86.24	107.30
	2050	123.90	221.90	274.80
	2070	175.00	359.90	508.90
	2100	180.60	456.80	876.40
SSP5 RCP8.5	2030	21.98	58.01	99.54
	2050	6.56	20.13	72.27
	2070	3.51	6.83	20.40
	2100	2.66	4.61	9.13
IFs RCP2.6	2030	11.01	18.46	12.72
	2050	50.24	110.10	164.70
	2070	52.29	147.30	319.50
	2100	31.15	113.20	353.40
IFs RCP4.5	2030	11.82	19.73	13.29
	2050	58.82	126.90	183.10
	2070	68.14	185.70	382.30
	2100	41.11	143.30	423.70
IFs RCP6.0	2030	12.26	20.25	14.27
	2050	55.73	119.80	174.90
	2070	66.47	179.10	368.00
	2100	49.48	167.40	475.80
IFs RCP8.5	2030	14.88	23.79	14.66
	2050	73.30	152.90	210.20
	2070	96.96	251.60	485.60
	2100	84.47	260.60	669.20

Table 21: Marginal effect of climate change on poverty $5.50 headcount measured in millions.

		IFs RCP4.5	SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Middle East and Northern Africa	2030	0.637	0.864	0.886	0.732	0.696	0.833
	2070	5.925	0.282	1.562	5.199	1.677	0.429
	2100	4.522	0.01	0.232	10.18	5.749	0.007
Oceania	2030	0.029	0.035	0.04	0.033	0.032	0.043
	2070	0.253	0.008	0.076	0.235	0.23	0.007
	2100	0.183	0.002	0.012	0.3	0.442	0.001
Southeast Asia	2030	1.613	1.526	1.867	1.62	1.465	1.735
	2070	9.097	0.549	1.033	7.158	3.77	0.199
	2100	6.015	0.279	0.045	12.28	7.855	0.024
Southern Asia (India +)	2030	3.271	7.561	7.397	5.917	6.033	8.836
	2070	43.06	0.863	26.57	43.09	31.74	2.852
	2100	14.6	0.01	29.77	97.04	43.95	0.107

		IFs RCP4.5	SSP1 RCP2.6	SSP2 RCP4.5	SSP3 RCP6.0	SSP4 RCP6.0	SSP5 RCP8.5
Latin America and Caribbean	2030	1.711	1.721	1.837	1.822	1.645	1.829
	2070	9.133	0.273	3.029	9.9	4.302	0.26
	2100	8.176	0.008	1.476	19.88	5.191	0.021
sub-Saharan Africa	2030	-0.012	2.573	2.284	1.41	1.293	3.834
	2070	41.38	1.812	15.47	40.57	34.75	3.123
	2100	41.23	2.597	2.951	88.65	105.6	0.844
World	2030	2.451	12.56	11.8	8.936	8.858	15.66
	2070	106.7	3.031	45.84	99.9	72.09	5.05
	2100	74.3	2.38	32.59	219.2	160.9	-0.065

Table 22: Base case GDP per capita measured in thousands of 2011 US$.

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Afghanistan	$2.06	$2.40	$2.99	$3.97	$5.53	$7.84	$10.83	$14.17	$17.72
Albania	$12.77	$15.73	$18.87	$23.91	$30.18	$37.72	$51.06	$70.40	$89.44
Algeria	$11.74	$11.29	$11.79	$12.52	$13.79	$14.82	$15.50	$16.64	$18.78
Angola	$7.31	$6.85	$8.23	$10.26	$12.67	$15.76	$19.78	$24.94	$30.04
Argentina	$23.60	$23.66	$25.78	$28.08	$30.40	$32.89	$35.86	$39.87	$45.03
Armenia	$12.12	$15.33	$19.64	$24.70	$29.54	$37.70	$49.46	$63.76	$81.33
Australia	$48.40	$56.21	$64.53	$74.19	$84.23	$96.93	$110.9	$126.8	$144.1
Austria	$54.17	$56.70	$59.38	$64.38	$71.23	$81.50	$92.96	$104.4	$117.1
Azerbaijan	$14.12	$16.04	$19.68	$23.11	$26.45	$31.22	$36.06	$44.59	$57.88
Bahamas	$35.91	$35.16	$36.08	$39.16	$43.55	$49.19	$58.16	$70.85	$86.17
Bahrain	$47.71	$44.37	$44.32	$42.54	$41.76	$45.78	$51.83	$58.62	$67.56
Bangladesh	$4.90	$7.37	$9.63	$12.36	$15.38	$18.80	$23.21	$29.20	$36.03
Barbados	$15.80	$17.28	$19.74	$23.69	$30.35	$42.20	$59.04	$80.64	$105.4
Belarus	$18.36	$18.74	$21.00	$23.76	$27.93	$34.37	$43.11	$56.59	$73.81
Belgium	$50.44	$56.74	$63.09	$71.46	$80.76	$91.59	$102.9	$116.0	$129.9
Belize	$7.14	$7.38	$8.96	$11.35	$14.47	$18.71	$25.20	$36.15	$52.88
Benin	$3.05	$4.18	$5.75	$8.43	$12.57	$18.80	$27.34	$39.20	$53.71
Bhutan	$11.14	$11.19	$11.84	$12.78	$14.02	$16.12	$19.34	$25.35	$35.92
Bolivia	$8.42	$9.13	$10.95	$13.56	$16.82	$21.19	$27.92	$38.61	$52.95
Bosnia and Herzegovina	$13.75	$17.69	$23.44	$30.47	$40.69	$54.76	$73.08	$94.19	$116.9
Botswana	$15.95	$18.24	$22.66	$28.84	$37.72	$50.43	$66.26	$83.67	$102.8
Brazil	$14.52	$15.75	$17.53	$19.51	$21.41	$23.30	$25.57	$28.92	$33.49
Brunei Darussalam	$60.99	$58.31	$55.55	$52.84	$50.20	$49.37	$49.68	$51.00	$53.52
Bulgaria	$21.47	$26.28	$29.48	$32.01	$35.40	$40.43	$47.40	$54.26	$63.37
Burkina Faso	$2.04	$2.73	$3.67	$5.14	$7.41	$10.55	$14.25	$18.34	$22.72
Burundi	$0.77	$0.88	$1.06	$1.40	$2.06	$3.23	$5.11	$7.95	$11.56
Cabo Verde	$6.64	$7.61	$9.03	$10.89	$13.24	$16.33	$20.65	$27.64	$38.97

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Cambodia	$3.93	$5.36	$7.38	$10.34	$14.10	$18.78	$24.92	$33.13	$43.41
Cameroon	$3.67	$4.21	$4.95	$6.11	$7.77	$9.98	$12.59	$15.50	$18.61
Canada	$48.32	$52.49	$57.92	$65.24	$72.83	$81.17	$90.26	$101.7	$114.3
Central African Republic	$0.91	$1.19	$1.49	$2.02	$3.02	$4.60	$6.98	$10.38	$14.67
Chad	$1.59	$1.77	$2.25	$3.11	$4.67	$7.13	$10.48	$14.82	$19.73
Chile	$24.41	$26.75	$29.19	$32.06	$35.21	$41.46	$49.33	$58.92	$70.25
China	$14.24	$21.23	$28.45	$36.77	$46.62	$60.76	$76.67	$93.16	$110.8
Colombia	$14.17	$16.06	$17.72	$19.52	$21.48	$23.82	$26.82	$31.56	$38.13
Comoros	$3.03	$3.38	$3.98	$5.03	$6.60	$8.82	$11.69	$15.28	$19.73
Congo	$4.24	$4.48	$6.15	$8.58	$12.41	$18.50	$26.71	$37.93	$53.24
Congo, Dem. Republic of the	$1.06	$1.60	$2.67	$4.72	$8.35	$13.52	$18.61	$23.36	$27.63
Costa Rica	$20.35	$23.74	$28.52	$35.19	$43.30	$53.38	$65.95	$81.65	$98.40
Cote D'Ivoire	$4.83	$6.61	$8.62	$11.62	$15.72	$21.03	$27.77	$36.55	$46.21
Croatia	$27.15	$34.21	$39.72	$47.09	$56.69	$68.75	$81.63	$95.53	$110.4
Cuba	$21.60	$19.92	$21.35	$23.97	$27.11	$31.49	$37.96	$48.66	$63.22
Cyprus	$38.29	$42.21	$45.98	$52.04	$59.89	$73.79	$89.32	$105.0	$121.5
Czech Republic	$33.11	$35.67	$37.54	$39.44	$44.55	$52.19	$59.71	$68.10	$79.51
Denmark	$55.36	$66.21	$76.91	$92.12	$108.5	$127.2	$147.2	$168.2	$190.5
Djibouti	$4.91	$6.56	$8.81	$11.33	$14.02	$16.33	$18.45	$21.56	$25.30
Dominican Republic	$16.74	$21.76	$27.22	$33.48	$41.67	$50.33	$59.25	$70.36	$83.45
Ecuador	$11.62	$11.51	$12.55	$13.76	$14.84	$16.21	$18.13	$20.97	$25.59
Egypt	$11.01	$13.28	$16.03	$19.44	$23.50	$27.97	$32.19	$36.91	$43.99
El Salvador	$8.45	$9.89	$11.99	$14.23	$16.27	$18.27	$21.11	$25.67	$32.60
Equatorial Guinea	$22.55	$14.94	$17.65	$21.81	$26.03	$30.70	$35.07	$40.89	$47.26
Eritrea	$1.11	$1.69	$2.91	$5.93	$12.71	$21.41	$31.61	$44.89	$59.38
Estonia	$33.82	$42.42	$56.19	$70.43	$86.01	$104.6	$121.0	$138.2	$157.7
Eswatini	$8.41	$10.46	$14.15	$19.61	$27.98	$39.78	$51.23	$64.31	$81.18
Ethiopia	$2.02	$2.98	$4.35	$6.67	$10.05	$14.60	$19.79	$25.23	$29.59
Fiji	$13.43	$14.54	$18.13	$23.17	$29.88	$39.47	$50.05	$64.11	$81.34
Finland	$47.57	$52.10	$56.50	$63.09	$71.67	$82.94	$96.22	$113.0	$131.3
France	$44.58	$47.82	$50.17	$54.28	$61.22	$70.19	$80.38	$92.74	$107.3
Gabon	$15.01	$15.02	$16.54	$18.76	$22.35	$28.10	$35.54	$44.57	$54.42
Gambia	$2.07	$2.73	$3.48	$4.89	$6.85	$9.61	$12.86	$16.54	$20.84
Georgia	$13.59	$18.14	$22.50	$27.17	$32.96	$41.64	$53.66	$66.39	$81.46
Germany	$53.07	$54.17	$58.29	$64.83	$72.69	$84.04	$97.44	$112.0	$128.9
Ghana	$5.12	$6.45	$8.64	$12.06	$17.23	$25.00	$35.18	$47.31	$59.59
Greece	$28.60	$32.40	$35.02	$39.46	$48.08	$58.60	$70.72	$84.75	$100.4
Grenada	$16.22	$17.97	$22.48	$27.80	$33.59	$42.97	$54.56	$71.51	$93.79
Guatemala	$8.32	$9.85	$11.77	$14.10	$16.35	$18.62	$21.24	$24.45	$28.61

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Guinea	$2.42	$3.04	$3.68	$4.68	$5.99	$7.64	$9.61	$11.81	$13.96
Guinea Bissau	$1.93	$2.21	$2.71	$3.58	$5.08	$7.69	$11.42	$16.19	$23.58
Guyana	$12.01	$75.11	$96.70	$108.1	$117.5	$126.6	$135.8	$145.7	$155.7
Haiti	$3.15	$3.09	$3.55	$4.34	$5.54	$7.24	$9.51	$12.38	$15.50
Honduras	$5.56	$6.54	$8.13	$10.29	$12.99	$16.35	$21.01	$28.63	$40.41
Hong Kong	$59.84	$71.35	$89.02	$101.9	$114.6	$130.9	$144.0	$154.8	$168.9
Hungary	$29.50	$36.91	$42.07	$49.13	$57.61	$68.46	$78.58	$87.40	$97.30
Iceland	$55.64	$72.67	$89.70	$108.7	$127.8	$149.0	$170.0	$193.2	$218.1
India	$6.18	$8.36	$11.00	$14.29	$18.09	$22.67	$28.93	$38.04	$50.18
Indonesia	$10.94	$12.97	$14.38	$15.86	$17.67	$20.06	$22.91	$26.21	$31.00
Iran	$15.88	$16.15	$17.60	$17.92	$18.53	$20.63	$23.26	$26.48	$32.67
Iraq	$10.53	$11.82	$14.82	$18.93	$23.76	$29.01	$36.19	$47.06	$61.70
Ireland	$77.75	$134.70	$156.30	$173.70	$190.90	$204.20	$214.50	$223.90	$230.60
Israel	$39.12	$52.97	$66.53	$82.29	$99.89	$118.2	$135.4	$154.5	$176.6
Italy	$41.58	$44.17	$47.10	$52.47	$60.88	$72.24	$84.54	$98.71	$114.1
Jamaica	$9.60	$9.80	$10.79	$12.29	$14.04	$16.44	$20.36	$26.44	$35.32
Japan	$41.44	$45.56	$48.06	$51.72	$57.57	$66.88	$78.58	$92.27	$108.8
Jordan	$10.00	$10.93	$11.93	$13.05	$14.62	$16.51	$18.31	$20.94	$24.88
Kazakhstan	$24.86	$28.88	$35.01	$40.79	$46.50	$55.57	$61.92	$68.78	$76.82
Kenya	$4.20	$5.44	$6.95	$9.32	$12.81	$16.95	$21.59	$28.24	$36.37
Korea, Dem. People's Republic	$2.17	$2.34	$2.62	$3.22	$4.14	$5.58	$7.97	$11.85	$18.02
Korea, Republic of	$40.96	$51.77	$61.19	$74.96	$91.35	$110.6	$131.9	$155.4	$181.0
Kosovo	$10.44	$12.92	$15.89	$19.65	$24.49	$31.50	$42.32	$56.98	$75.64
Kuwait	$50.86	$45.63	$41.03	$36.16	$33.00	$30.88	$28.36	$26.21	$25.53
Kyrgyzstan	$5.05	$5.19	$5.95	$7.05	$8.47	$10.46	$12.85	$15.85	$20.10
Lao People's Dem. Republic	$7.26	$9.41	$13.53	$19.57	$28.36	$39.71	$55.28	$74.09	$94.95
Latvia	$28.67	$36.38	$47.11	$63.90	$84.02	$107.8	$128.9	$148.1	$168.9
Lebanon	$15.95	$9.31	$9.58	$11.59	$14.91	$17.62	$20.17	$23.02	$27.11
Lesotho	$2.67	$2.88	$3.53	$4.55	$6.08	$8.18	$10.73	$13.71	$17.47
Liberia	$1.56	$1.72	$2.12	$2.98	$4.58	$7.22	$10.69	$14.83	$19.20
Libya	$23.47	$21.50	$22.34	$23.90	$26.67	$29.79	$33.59	$41.21	$53.74
Lithuania	$33.76	$45.22	$60.44	$79.13	$97.27	$117.0	$133.3	$147.8	$163.1
Luxembourg	$115.00	$117.60	$116.40	$116.70	$118.40	$121.60	$122.50	$122.80	$122.10
Macedonia, North	$15.71	$18.07	$21.36	$25.53	$30.79	$38.58	$51.48	$68.49	$87.46
Madagascar	$1.58	$1.83	$2.40	$3.33	$4.81	$6.74	$8.65	$10.75	$12.79
Malawi	$1.47	$1.77	$2.35	$3.37	$5.13	$7.70	$10.77	$14.34	$18.12
Malaysia	$26.66	$29.98	$33.74	$37.51	$41.49	$48.29	$58.27	$70.46	$83.92
Maldives	$18.06	$18.93	$20.09	$20.53	$20.53	$22.36	$25.12	$28.92	$34.91

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Mali	$2.25	$2.55	$2.99	$3.79	$5.22	$7.42	$10.29	$13.86	$17.89
Malta	$43.56	$64.32	$84.75	$98.35	$108.7	$124.8	$138.1	$152.2	$169.0
Mauritania	$5.11	$5.56	$6.05	$6.81	$8.23	$10.35	$13.20	$16.60	$21.13
Mauritius	$21.42	$22.98	$25.08	$28.92	$34.13	$41.45	$54.63	$71.86	$89.98
Mexico	$19.72	$18.88	$19.66	$20.74	$22.00	$23.47	$25.21	$27.48	$31.18
Micronesia	$3.49	$3.65	$4.62	$6.23	$8.40	$11.37	$15.81	$23.05	$34.19
Moldova, Republic of	$11.65	$14.46	$17.95	$21.37	$25.10	$30.27	$35.65	$44.15	$57.88
Mongolia	$11.37	$13.95	$18.13	$23.37	$29.45	$39.38	$53.53	$72.27	$92.27
Montenegro	$19.68	$22.70	$26.46	$31.77	$38.94	$52.11	$69.59	$90.45	$113.5
Morocco	$7.31	$8.00	$9.07	$10.36	$12.07	$14.42	$17.28	$21.10	$27.59
Mozambique	$1.28	$1.57	$2.13	$3.23	$5.02	$7.59	$10.38	$13.55	$16.94
Myanmar	$4.23	$4.39	$4.94	$5.48	$6.10	$6.96	$8.14	$9.57	$11.13
Namibia	$10.17	$10.65	$14.08	$20.18	$29.57	$42.07	$55.26	$71.97	$91.98
Nepal	$3.57	$4.50	$5.41	$6.70	$8.47	$10.73	$13.94	$18.41	$24.93
Netherlands	$55.09	$63.83	$71.34	$82.77	$94.50	$106.4	$118.9	$132.3	$146.0
New Zealand	$42.22	$50.79	$58.20	$68.42	$79.64	$93.08	$107.2	$123.6	$140.3
Nicaragua	$6.00	$6.30	$6.95	$7.59	$8.42	$9.60	$11.04	$12.84	$15.09
Niger	$1.16	$1.65	$2.25	$3.28	$4.98	$7.49	$10.71	$14.36	$17.97
Nigeria	$5.19	$5.52	$6.74	$8.66	$11.66	$15.58	$19.93	$25.67	$32.21
Norway	$64.05	$74.91	$82.31	$93.08	$106.70	$123.00	$140.50	$160.00	$180.00
Oman	$33.31	$30.52	$31.07	$29.91	$29.25	$31.99	$36.21	$44.13	$55.71
Pakistan	$5.09	$6.03	$7.21	$8.98	$11.33	$14.01	$16.64	$19.69	$23.32
Palestine	$6.40	$6.84	$8.59	$11.54	$15.30	$19.74	$25.49	$34.05	$45.48
Panama	$30.45	$33.00	$37.59	$42.07	$48.81	$57.00	$67.20	$79.28	$91.22
Papua New Guinea	$4.29	$4.91	$5.95	$7.47	$9.42	$11.75	$14.39	$17.33	$20.58
Paraguay	$12.59	$13.64	$15.55	$17.73	$19.97	$22.66	$25.91	$30.73	$38.39
Peru	$12.51	$13.96	$15.80	$17.77	$20.10	$22.88	$26.27	$31.91	$40.62
Philippines	$8.12	$9.97	$12.33	$15.35	$18.82	$22.98	$28.51	$36.96	$48.18
Poland	$30.06	$37.00	$43.85	$52.56	$63.51	$77.79	$91.25	$103.9	$117.6
Portugal	$33.04	$36.56	$39.16	$44.99	$54.01	$65.67	$79.29	$94.61	$111.3
Puerto Rico	$34.36	$49.89	$67.77	$87.82	$106.40	$121.70	$138.10	$156.00	$171.90
Qatar	$91.74	$91.16	$98.16	$93.90	$85.03	$89.20	$92.22	$94.40	$92.84
Romania	$27.14	$34.22	$39.25	$44.34	$52.45	$62.37	$71.50	$79.84	$88.97
Russian Federation	$25.93	$26.93	$30.04	$32.75	$34.92	$38.63	$44.56	$52.34	$63.24
Rwanda	$1.98	$2.98	$4.42	$6.84	$10.36	$14.75	$20.26	$28.00	$37.62
Samoa	$6.49	$6.75	$8.13	$10.12	$12.96	$16.52	$20.71	$27.34	$37.77
Sao Tome and Principe	$3.95	$4.78	$6.24	$8.48	$12.05	$16.17	$19.93	$24.80	$31.38
Saudi Arabia	$47.31	$47.89	$47.86	$47.71	$49.52	$53.59	$56.26	$59.44	$63.78
Senegal	$3.20	$4.53	$6.25	$8.78	$12.47	$17.61	$24.03	$32.90	$44.79

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Serbia	$16.61	$21.55	$26.32	$32.05	$39.18	$52.22	$70.86	$89.08	$108.1
Seychelles	$28.12	$32.38	$36.15	$40.84	$49.23	$59.95	$69.62	$81.11	$96.12
Sierra Leone	$1.63	$1.86	$2.22	$2.88	$4.01	$5.81	$8.20	$11.10	$14.39
Singapore	$95.31	$112.50	$123.90	$133.00	$140.70	$151.90	$160.70	$165.00	$168.20
Slovakia	$30.06	$33.41	$36.36	$38.59	$43.00	$49.96	$56.79	$64.32	$73.57
Slovenia	$36.51	$44.49	$52.51	$61.59	$75.49	$93.28	$110.4	$128.4	$148.4
Solomon Islands	$2.66	$2.80	$3.70	$4.92	$6.79	$9.54	$13.03	$16.95	$21.50
Somalia	$1.08	$1.40	$1.93	$3.26	$5.87	$10.19	$15.94	$22.73	$30.88
South Africa	$13.86	$13.76	$15.00	$16.54	$18.23	$20.71	$23.49	$27.26	$33.82
Spain	$39.53	$41.07	$42.44	$44.62	$50.01	$58.42	$68.09	$79.68	$94.32
Sri Lanka	$12.58	$12.16	$13.75	$15.90	$19.00	$23.06	$28.22	$36.58	$49.47
St. Lucia	$14.93	$16.02	$17.88	$19.77	$21.59	$23.74	$27.22	$32.77	$40.07
St. Vincent and the Grenadines	$13.10	$15.55	$18.54	$22.13	$26.94	$33.34	$41.13	$52.42	$67.69
Sudan	$4.60	$4.40	$5.01	$5.99	$7.35	$9.09	$10.89	$13.18	$15.83
Sudan South	$1.54	$1.95	$2.41	$3.12	$4.28	$6.28	$9.26	$13.81	$20.24
Suriname	$18.28	$16.05	$17.03	$19.11	$22.12	$25.96	$30.70	$38.21	$50.94
Sweden	$51.95	$61.54	$72.05	$84.01	$97.14	$114.10	$131.80	$151.40	$173.10
Switzerland	$69.10	$76.29	$82.73	$91.08	$101.90	$116.30	$130.60	$145.70	$163.10
Syrian Arab Republic	$4.44	$4.28	$5.08	$6.18	$7.90	$9.20	$10.22	$11.89	$13.93
Taiwan	$37.21	$48.02	$57.05	$65.85	$75.67	$87.90	$101.7	$114.3	$128.4
Tajikistan	$3.25	$4.48	$6.17	$8.52	$11.65	$15.91	$21.82	$30.99	$45.49
Tanzania	$2.53	$3.30	$4.48	$6.35	$9.27	$13.55	$19.12	$26.50	$35.58
Thailand	$17.42	$18.71	$20.16	$22.11	$24.78	$28.46	$33.54	$40.74	$49.39
Timor-Leste	$3.18	$4.56	$6.05	$8.30	$12.15	$17.20	$23.46	$32.37	$44.56
Togo	$2.01	$2.77	$3.89	$5.80	$8.90	$13.60	$19.44	$26.90	$36.19
Tonga	$6.47	$6.81	$7.66	$8.93	$10.88	$13.35	$16.38	$21.02	$29.18
Trinidad and Tobago	$27.28	$27.99	$32.42	$37.53	$46.35	$58.21	$71.74	$86.31	$102.7
Tunisia	$11.23	$10.98	$12.21	$13.95	$16.25	$19.74	$24.34	$31.02	$42.09
Turkey	$25.20	$31.41	$37.27	$44.66	$53.42	$62.32	$71.96	$82.50	$92.97
Turkmenistan	$14.21	$16.66	$21.48	$27.55	$35.07	$45.65	$57.35	$70.62	$86.53
Uganda	$2.08	$2.77	$4.08	$5.99	$9.39	$14.00	$18.81	$24.76	$31.88
Ukraine	$11.86	$8.70	$9.12	$9.52	$9.91	$11.19	$12.18	$13.29	$14.62
United Arab Emirates	$67.18	$73.44	$73.53	$64.54	$52.73	$53.40	$58.51	$64.84	$70.03
United Kingdom	$46.37	$48.15	$51.05	$55.67	$62.16	$71.24	$81.47	$93.87	$107.8
United States of America	$59.91	$69.36	$78.55	$89.06	$99.90	$111.30	$123.60	$137.20	$152.80
Uruguay	$23.01	$27.64	$36.95	$51.12	$66.51	$84.08	$101.3	$120.3	$140.7
Uzbekistan	$6.84	$9.01	$11.60	$14.72	$18.53	$24.26	$32.90	$45.90	$64.45

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Vanuatu	$3.08	$3.40	$4.54	$6.35	$8.75	$11.92	$16.18	$22.44	$31.91
Venezuela, Bolivarian Republic	$11.63	$5.00	$5.08	$5.93	$7.39	$8.84	$9.93	$10.65	$10.87
Viet Nam	$9.00	$12.70	$16.23	$20.23	$25.21	$32.97	$44.01	$58.41	$77.89
Yemen	$2.31	$2.34	$2.84	$3.62	$4.76	$6.40	$8.61	$11.71	$15.51
Zambia	$3.49	$3.97	$4.89	$5.98	$7.72	$10.41	$13.33	$16.66	$20.80
Zimbabwe	$2.42	$2.80	$3.84	$5.40	$7.82	$11.12	$14.65	$18.45	$24.72

Table 23: Base Case Gini Coefficient.

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Afghanistan	0.454	0.454	0.454	0.454	0.454	0.454	0.454	0.454	0.454
Albania	0.332	0.332	0.332	0.332	0.332	0.332	0.332	0.332	0.332
Algeria	0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.276	0.276
Angola	0.513	0.513	0.513	0.513	0.513	0.513	0.513	0.513	0.513
Argentina	0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411
Armenia	0.336	0.336	0.336	0.336	0.336	0.336	0.336	0.336	0.336
Australia	0.344	0.344	0.344	0.344	0.344	0.344	0.344	0.344	0.344
Austria	0.297	0.297	0.297	0.297	0.297	0.297	0.297	0.297	0.297
Azerbaijan	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266	0.266
Bahamas	0.4013	0.4013	0.4013	0.4013	0.4013	0.4013	0.4013	0.4013	0.4013
Bahrain	0.3642	0.3642	0.3642	0.3642	0.3642	0.3642	0.3642	0.3642	0.3642
Bangladesh	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324	0.324
Barbados	0.3655	0.3655	0.3655	0.3655	0.3655	0.3655	0.3655	0.3655	0.3655
Belarus	0.254	0.254	0.254	0.254	0.254	0.254	0.254	0.254	0.254
Belgium	0.274	0.274	0.274	0.274	0.274	0.274	0.274	0.274	0.274
Belize	0.533	0.533	0.533	0.533	0.533	0.533	0.533	0.533	0.533
Benin	0.478	0.478	0.478	0.478	0.478	0.478	0.478	0.478	0.478
Bhutan	0.374	0.374	0.374	0.374	0.374	0.374	0.374	0.374	0.374
Bolivia	0.446	0.446	0.446	0.446	0.446	0.446	0.446	0.446	0.446
Bosnia and Herzegovina	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Botswana	0.533	0.533	0.533	0.533	0.533	0.533	0.533	0.533	0.533
Brazil	0.533	0.533	0.533	0.533	0.533	0.533	0.533	0.533	0.533
Brunei Darussalam	0.4192	0.4192	0.4192	0.4192	0.4192	0.4192	0.4192	0.4192	0.4192
Bulgaria	0.404	0.404	0.404	0.404	0.404	0.404	0.404	0.404	0.404
Burkina Faso	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353
Burundi	0.386	0.386	0.386	0.386	0.386	0.386	0.386	0.386	0.386
Cabo Verde	0.424	0.424	0.424	0.424	0.424	0.424	0.424	0.424	0.424
Cambodia	0.4566	0.4566	0.4566	0.4566	0.4566	0.4566	0.4566	0.4566	0.4566
Cameroon	0.466	0.466	0.466	0.466	0.466	0.466	0.466	0.466	0.466
Canada	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333	0.333

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Central African Republic	0.562	0.562	0.562	0.562	0.562	0.562	0.562	0.562	0.562
Chad	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433
Chile	0.444	0.444	0.444	0.444	0.444	0.444	0.444	0.444	0.444
China	0.385	0.385	0.385	0.385	0.385	0.385	0.385	0.385	0.385
Colombia	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497	0.497
Comoros	0.453	0.453	0.453	0.453	0.453	0.453	0.453	0.453	0.453
Congo	0.489	0.489	0.489	0.489	0.489	0.489	0.489	0.489	0.489
Congo, Dem. Republic of the	0.421	0.421	0.421	0.421	0.421	0.421	0.421	0.421	0.421
Costa Rica	0.483	0.483	0.483	0.483	0.483	0.483	0.483	0.483	0.483
Cote D'Ivoire	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415	0.415
Croatia	0.304	0.304	0.304	0.304	0.304	0.304	0.304	0.304	0.304
Cuba	0.4238	0.4238	0.4238	0.4238	0.4238	0.4238	0.4238	0.4238	0.4238
Cyprus	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314
Czech Republic	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Denmark	0.287	0.287	0.287	0.287	0.287	0.287	0.287	0.287	0.287
Djibouti	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416	0.416
Dominican Republic	0.422	0.422	0.422	0.422	0.422	0.422	0.422	0.422	0.422
Ecuador	0.447	0.447	0.447	0.447	0.447	0.447	0.447	0.447	0.447
Egypt	0.315	0.315	0.315	0.315	0.315	0.315	0.315	0.315	0.315
El Salvador	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Equatorial Guinea	0.5105	0.5105	0.5105	0.5105	0.5105	0.5105	0.5105	0.5105	0.5105
Eritrea	0.4519	0.4519	0.4519	0.4519	0.4519	0.4519	0.4519	0.4519	0.4519
Estonia	0.304	0.304	0.304	0.304	0.304	0.304	0.304	0.304	0.304
Eswatini	0.546	0.546	0.546	0.546	0.546	0.546	0.546	0.546	0.546
Ethiopia	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35	0.35
Fiji	0.367	0.367	0.367	0.367	0.367	0.367	0.367	0.367	0.367
Finland	0.274	0.274	0.274	0.274	0.274	0.274	0.274	0.274	0.274
France	0.316	0.316	0.316	0.316	0.316	0.316	0.316	0.316	0.316
Gabon	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38	0.38
Gambia	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359
Georgia	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379	0.379
Germany	0.319	0.319	0.319	0.319	0.319	0.319	0.319	0.319	0.319
Ghana	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435	0.435
Greece	0.344	0.344	0.344	0.344	0.344	0.344	0.344	0.344	0.344
Grenada	0.4205	0.4205	0.4205	0.4205	0.4205	0.4205	0.4205	0.4205	0.4205
Guatemala	0.483	0.483	0.483	0.483	0.483	0.483	0.483	0.483	0.483
Guinea	0.337	0.337	0.337	0.337	0.337	0.337	0.337	0.337	0.337
Guinea Bissau	0.507	0.507	0.507	0.507	0.507	0.507	0.507	0.507	0.507
Guyana	0.451	0.451	0.451	0.451	0.451	0.451	0.451	0.451	0.451

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Haiti	0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411
Honduras	0.494	0.494	0.494	0.494	0.494	0.494	0.494	0.494	0.494
Hong Kong	0.4153	0.4152	0.4152	0.4152	0.4152	0.4152	0.4153	0.4153	0.4153
Hungary	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306	0.306
Iceland	0.261	0.261	0.261	0.261	0.261	0.261	0.261	0.261	0.261
India	0.357	0.357	0.357	0.357	0.357	0.357	0.357	0.357	0.357
Indonesia	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381	0.381
Iran	0.408	0.408	0.408	0.408	0.408	0.408	0.408	0.408	0.408
Iraq	0.295	0.295	0.295	0.295	0.295	0.295	0.295	0.295	0.295
Ireland	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314
Israel	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39	0.39
Italy	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359	0.359
Jamaica	0.455	0.455	0.455	0.455	0.455	0.455	0.455	0.455	0.455
Japan	0.329	0.329	0.329	0.329	0.329	0.329	0.329	0.329	0.329
Jordan	0.337	0.337	0.337	0.337	0.337	0.337	0.337	0.337	0.337
Kazakhstan	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275	0.275
Kenya	0.408	0.408	0.408	0.408	0.408	0.408	0.408	0.408	0.408
Korea, Dem. People's Republic	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904	0.3904
Korea, Republic of	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314	0.314
Kosovo	0.29	0.2898	0.2898	0.2898	0.2899	0.2899	0.2899	0.2899	0.29
Kuwait	0.3662	0.3662	0.3662	0.3662	0.3662	0.3662	0.3662	0.3662	0.3662
Kyrgyzstan	0.273	0.273	0.273	0.273	0.273	0.273	0.273	0.273	0.273
Lao People's Dem. Republic	0.388	0.388	0.388	0.388	0.388	0.388	0.388	0.388	0.388
Latvia	0.356	0.356	0.356	0.356	0.356	0.356	0.356	0.356	0.356
Lebanon	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318	0.318
Lesotho	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449	0.449
Liberia	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353
Libya	0.3736	0.3736	0.3736	0.3736	0.3736	0.3736	0.3736	0.3736	0.3736
Lithuania	0.373	0.373	0.373	0.373	0.373	0.373	0.373	0.373	0.373
Luxembourg	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345	0.345
Macedonia, North	0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342
Madagascar	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426	0.426
Malawi	0.447	0.447	0.447	0.447	0.447	0.447	0.447	0.447	0.447
Malaysia	0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411	0.411
Maldives	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
Mali	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33	0.33
Malta	0.292	0.292	0.292	0.292	0.292	0.292	0.292	0.292	0.292
Mauritania	0.326	0.326	0.326	0.326	0.326	0.326	0.326	0.326	0.326
Mauritius	0.368	0.368	0.368	0.368	0.368	0.368	0.368	0.368	0.368

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Mexico	0.454	0.454	0.454	0.454	0.454	0.454	0.454	0.454	0.454
Micronesia	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401	0.401
Moldova, Republic of	0.259	0.259	0.259	0.259	0.259	0.259	0.259	0.259	0.259
Mongolia	0.327	0.327	0.327	0.327	0.327	0.327	0.327	0.327	0.327
Montenegro	0.385	0.385	0.385	0.385	0.385	0.385	0.385	0.385	0.385
Morocco	0.395	0.395	0.395	0.395	0.395	0.395	0.395	0.395	0.395
Mozambique	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54	0.54
Myanmar	0.307	0.307	0.307	0.307	0.307	0.307	0.307	0.307	0.307
Namibia	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591	0.591
Nepal	0.328	0.328	0.328	0.328	0.328	0.328	0.328	0.328	0.328
Netherlands	0.285	0.285	0.285	0.285	0.285	0.285	0.285	0.285	0.285
New Zealand	0.3605	0.3605	0.3605	0.3605	0.3605	0.3605	0.3605	0.3605	0.3605
Nicaragua	0.462	0.462	0.462	0.462	0.462	0.462	0.462	0.462	0.462
Niger	0.343	0.343	0.343	0.343	0.343	0.343	0.343	0.343	0.343
Nigeria	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351
Norway	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27	0.27
Oman	0.3677	0.3677	0.3677	0.3677	0.3677	0.3677	0.3677	0.3677	0.3677
Pakistan	0.316	0.316	0.316	0.316	0.316	0.316	0.316	0.316	0.316
Palestine	0.337	0.337	0.337	0.337	0.337	0.337	0.337	0.337	0.337
Panama	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499	0.499
Papua New Guinea	0.419	0.419	0.419	0.419	0.419	0.419	0.419	0.419	0.419
Paraguay	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485	0.485
Peru	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433	0.433
Philippines	0.423	0.423	0.423	0.423	0.423	0.423	0.423	0.423	0.423
Poland	0.297	0.297	0.297	0.297	0.297	0.297	0.297	0.297	0.297
Portugal	0.338	0.338	0.338	0.338	0.338	0.338	0.338	0.338	0.338
Puerto Rico	0.3595	0.3595	0.3595	0.3595	0.3595	0.3595	0.3595	0.3595	0.3595
Qatar	0.3917	0.3917	0.3917	0.3917	0.3917	0.3917	0.3917	0.3917	0.3917
Romania	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Russian Federation	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372	0.372
Rwanda	0.437	0.437	0.437	0.437	0.437	0.437	0.437	0.437	0.437
Samoa	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387	0.387
Sao Tome and Principe	0.563	0.563	0.563	0.563	0.563	0.563	0.563	0.563	0.563
Saudi Arabia	0.3678	0.3678	0.3678	0.3678	0.3678	0.3678	0.3678	0.3678	0.3678
Senegal	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403
Serbia	0.362	0.362	0.362	0.362	0.362	0.362	0.362	0.362	0.362
Seychelles	0.321	0.321	0.321	0.321	0.321	0.321	0.321	0.321	0.321
Sierra Leone	0.357	0.357	0.357	0.357	0.357	0.357	0.357	0.357	0.357
Singapore	0.3853	0.3853	0.3853	0.3853	0.3853	0.3853	0.3853	0.3853	0.3853
Slovakia	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Slovenia	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Solomon Islands	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371	0.371
Somalia	0.368	0.368	0.368	0.368	0.368	0.368	0.368	0.368	0.368
South Africa	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63	0.63
Spain	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347	0.347
Sri Lanka	0.393	0.393	0.393	0.393	0.393	0.393	0.393	0.393	0.393
St. Lucia	0.512	0.512	0.512	0.512	0.512	0.512	0.512	0.512	0.512
St. Vincent and the Grenadines	0.4354	0.4354	0.4354	0.4354	0.4354	0.4354	0.4354	0.4354	0.4354
Sudan	0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342	0.342
Sudan South	0.441	0.441	0.441	0.441	0.441	0.441	0.441	0.441	0.441
Suriname	0.579	0.579	0.579	0.579	0.579	0.579	0.579	0.579	0.579
Sweden	0.288	0.288	0.288	0.288	0.288	0.288	0.288	0.288	0.288
Switzerland	0.327	0.327	0.327	0.327	0.327	0.327	0.327	0.327	0.327
Syrian Arab Republic	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375
Taiwan	0.2662	0.2661	0.2661	0.2661	0.2661	0.2661	0.2661	0.2661	0.2662
Tajikistan	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34	0.34
Tanzania	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405	0.405
Thailand	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365	0.365
Timor-Leste	0.287	0.287	0.287	0.287	0.287	0.287	0.287	0.287	0.287
Togo	0.431	0.431	0.431	0.431	0.431	0.431	0.431	0.431	0.431
Tonga	0.376	0.376	0.376	0.376	0.376	0.376	0.376	0.376	0.376
Trinidad and Tobago	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403	0.403
Tunisia	0.328	0.328	0.328	0.328	0.328	0.328	0.328	0.328	0.328
Turkey	0.414	0.414	0.414	0.414	0.414	0.414	0.414	0.414	0.414
Turkmenistan	0.408	0.408	0.408	0.408	0.408	0.408	0.408	0.408	0.408
Uganda	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428	0.428
Ukraine	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
United Arab Emirates	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
United Kingdom	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351	0.351
United States of America	0.412	0.412	0.412	0.412	0.412	0.412	0.412	0.412	0.412
Uruguay	0.395	0.395	0.395	0.395	0.395	0.395	0.395	0.395	0.395
Uzbekistan	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353	0.353
Vanuatu	0.376	0.376	0.376	0.376	0.376	0.376	0.376	0.376	0.376
Venezuela, Bolivarian Republic	0.448	0.448	0.448	0.448	0.448	0.448	0.448	0.448	0.448
Viet Nam	0.357	0.357	0.357	0.357	0.357	0.357	0.357	0.357	0.357
Yemen	0.367	0.367	0.367	0.367	0.367	0.367	0.367	0.367	0.367
Zambia	0.571	0.571	0.571	0.571	0.571	0.571	0.571	0.571	0.571
Zimbabwe	0.443	0.443	0.443	0.443	0.443	0.443	0.443	0.443	0.443

Table 24: Base Case poverty $1.90 headcount measured in millions.

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Afghanistan	11.92	14.65	14.96	13.34	8.765	3.775	1.801	1.035	0.612
Albania	0.037	0.019	0.012	0.003	0.001	0	0	0	0
Algeria	0.136	0.207	0.124	0.029	0.006	0.003	0.002	0.001	0.001
Angola	13.61	17.12	17.55	19.9	21.95	16.94	10.14	7.027	6.093
Argentina	0.195	0.208	0.135	0.087	0.066	0.053	0.041	0.023	0.012
Armenia	0.026	0.013	0.004	0.001	0	0	0	0	0
Australia	0.123	0.083	0.047	0.028	0.018	0.01	0.006	0.003	0.001
Austria	0.028	0.019	0.012	0.006	0.004	0.003	0.002	0.001	0.001
Azerbaijan	0.001	0	0	0	0	0	0	0	0
Bahamas	0	0.0009	0.0012	0.0006	0.0003	0.0002	0.0001	0	0
Bahrain	0	0.0013	0.0004	0.0002	0.0002	0.0002	0.0002	0.0001	0.0001
Bangladesh	18.38	5.004	2.366	0.826	0.257	0.087	0.026	0.006	0.001
Barbados	0.017	0.014	0.011	0.006	0.002	0.001	0	0	0
Belarus	0.003	0.006	0.002	0	0	0	0	0	0
Belgium	0.015	0.008	0.005	0.002	0.001	0.001	0	0	0
Belize	0.051	0.076	0.101	0.063	0.032	0.021	0.013	0.005	0.001
Benin	5.34	5.146	4.383	2.909	1.474	0.613	0.253	0.08	0.026
Bhutan	0.012	0.031	0.028	0.021	0.015	0.008	0.003	0.001	0
Bolivia	0.646	0.604	0.402	0.283	0.179	0.09	0.038	0.012	0.004
Bosnia and Herzegovina	0.002	0.007	0.001	0	0	0	0	0	0
Botswana	0.308	0.41	0.345	0.217	0.118	0.07	0.036	0.014	0.006
Brazil	9.183	7.186	4.881	3.457	2.915	2.631	2.098	1.407	0.926
Brunei Darussalam	0	0.0001	0	0.0001	0.0001	0.0001	0.0001	0	0
Bulgaria	0.097	0.037	0.018	0.013	0.008	0.005	0.003	0.002	0.001
Burkina Faso	7.37	4.974	3.449	1.824	0.463	0.104	0.03	0.006	0.002
Burundi	8.476	10.58	12	13.76	11.12	4.346	1.087	0.218	0.056
Cabo Verde	0.015	0.015	0.009	0.006	0.003	0.001	0	0	0
Cambodia	3.883	2.254	1.395	0.764	0.365	0.169	0.071	0.025	0.008
Cameroon	5.814	6.065	6.112	5.897	4.26	2.446	1.466	0.871	0.496
Canada	0.091	0.086	0.083	0.057	0.035	0.022	0.014	0.008	0.004
Central African Republic	3.326	3.914	4.585	4.651	3.551	2.295	1.359	0.745	0.406
Chad	6.134	6.793	6.875	5.796	2.655	1.045	0.361	0.098	0.029
Chile	0.053	0.048	0.035	0.024	0.017	0.01	0.006	0.003	0.001
China	5.595	0.367	0.044	0.012	0.004	0.001	0	0	0
Colombia	1.97	1.389	1.227	1.008	0.729	0.516	0.369	0.247	0.149
Comoros	0.152	0.183	0.193	0.167	0.103	0.054	0.028	0.013	0.005
Congo	2.073	2.281	1.529	1.131	0.721	0.297	0.086	0.023	0.006
Congo, Dem. Republic of the	59.14	59.36	36.49	13.95	3.197	0.744	0.219	0.078	0.034

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Costa Rica	0.052	0.031	0.019	0.011	0.005	0.003	0.001	0	0
Cote D'Ivoire	6.09	3.847	2.781	1.699	0.892	0.33	0.104	0.029	0.01
Croatia	0.022	0.003	0.001	0.001	0	0	0	0	0
Cuba	0.183	0.123	0.112	0.055	0.035	0.023	0.012	0.005	0.002
Cyprus	0.0004	0.0019	0.0026	0.0013	0.0005	0.0001	0	0	0
Czech Republic	0	0.006	0.003	0.001	0	0	0	0	0
Denmark	0.008	0.002	0.001	0	0	0	0	0	0
Djibouti	0.161	0.08	0.037	0.019	0.01	0.006	0.004	0.001	0.001
Dominican Republic	0.073	0.029	0.014	0.007	0.003	0.002	0.001	0	0
Ecuador	0.541	0.467	0.369	0.32	0.282	0.247	0.178	0.089	0.041
Egypt	2.866	1.747	0.912	0.371	0.132	0.056	0.025	0.009	0.003
El Salvador	0.122	0.088	0.055	0.031	0.017	0.01	0.004	0.001	0
Equatorial Guinea	0.013	0.029	0.02	0.015	0.012	0.008	0.005	0.003	0.002
Eritrea	1.403	1.464	0.933	0.164	0.012	0.002	0.001	0	0
Estonia	0.004	0.002	0	0	0	0	0	0	0
Eswatini	0.322	0.274	0.222	0.16	0.095	0.051	0.03	0.017	0.008
Ethiopia	27.93	13.34	6.12	1.645	0.231	0.03	0.005	0.001	0
Fiji	0.002	0.002	0.001	0	0	0	0	0	0
Finland	0.004	0.004	0.003	0.002	0.001	0	0	0	0
France	0.009	0.055	0.047	0.033	0.019	0.01	0.005	0.002	0.001
Gabon	0.07	0.02	0.015	0.02	0.007	0.002	0.001	0	0
Gambia	0.224	0.124	0.07	0.029	0.008	0.002	0	0	0
Georgia	0.199	0.08	0.034	0.019	0.007	0.002	0.001	0	0
Germany	0	0.065	0.044	0.024	0.016	0.009	0.005	0.002	0.001
Ghana	3.708	2.581	1.787	0.886	0.293	0.09	0.025	0.006	0.002
Greece	0.094	0.064	0.04	0.019	0.01	0.006	0.002	0.001	0
Grenada	0.006	0.003	0.002	0.001	0.001	0	0	0	0
Guatemala	1.253	1.154	0.984	0.724	0.523	0.391	0.284	0.181	0.109
Guinea	2.936	1.786	1.283	0.673	0.361	0.162	0.055	0.016	0.005
Guinea Bissau	1.174	1.383	1.49	1.503	1.194	0.688	0.379	0.202	0.089
Guyana	0.038	0	0	0	0	0	0	0	0
Haiti	2.808	3.529	3.658	3.398	2.218	1.318	0.784	0.394	0.198
Honduras	1.661	1.593	1.39	1.086	0.765	0.505	0.3	0.14	0.054
Hong Kong	0	0.015	0.006	0.003	0.002	0.001	0.001	0	0
Hungary	0.058	0.016	0.008	0.002	0.001	0	0	0	0
Iceland	0.0001	0.0002	0	0	0	0	0	0	0
India	139.1	48.57	19.68	7.063	2.459	0.792	0.211	0.039	0.007
Indonesia	11.79	5.313	3.69	2.845	2.035	1.19	0.599	0.304	0.152
Iran	0.274	0.309	0.194	0.17	0.131	0.067	0.027	0.011	0.003
Iraq	0.464	0.135	0.021	0.002	0	0	0	0	0

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Ireland	0.006	0	0	0	0	0	0	0	0
Israel	0.02	0.008	0.003	0.001	0	0	0	0	0
Italy	0.86	0.642	0.445	0.271	0.152	0.09	0.054	0.029	0.015
Jamaica	0.054	0.08	0.077	0.053	0.033	0.02	0.009	0.003	0.001
Japan	0.928	0.765	0.68	0.431	0.268	0.099	0.043	0.017	0.006
Jordan	0.021	0.007	0.004	0.004	0.002	0.001	0.001	0	0
Kazakhstan	0.004	0.003	0	0	0	0	0	0	0
Kenya	17.6	14.08	11.57	7.297	3.226	1.465	0.729	0.291	0.103
Korea, Dem. People's Republic	8.165	7.537	8.696	3.26	2.151	1.13	0.309	0.065	0.01
Korea, Republic of	0.127	0.034	0.007	0.001	0	0	0	0	0
Kosovo	0.008	0.024	0.008	0.001	0	0	0	0	0
Kuwait	0	0.002	0.001	0.002	0.003	0.004	0.006	0.01	0.012
Kyrgyzstan	0.067	0.109	0.094	0.042	0.01	0.002	0	0	0
Lao People's Dem. Republic	0.661	0.346	0.138	0.04	0.009	0.002	0	0	0
Latvia	0.015	0.006	0.002	0	0	0	0	0	0
Lebanon	0.124	0.79	0.851	0.281	0.156	0.153	0.118	0.05	0.03
Lesotho	0.583	0.881	0.871	0.617	0.318	0.174	0.1	0.044	0.017
Liberia	2.095	3.005	2.873	2.001	0.643	0.136	0.035	0.007	0.001
Libya	0.034	0.05	0.007	0.006	0.003	0.002	0.001	0	0
Lithuania	0.029	0.009	0.003	0.001	0	0	0	0	0
Luxembourg	0.0016	0.0006	0.0004	0.0002	0.0003	0.0003	0.0006	0.0007	0.0007
Macedonia, North	0.095	0.109	0.069	0.031	0.01	0.003	0.001	0	0
Madagascar	19.55	22.45	22.89	20.52	12.92	7.411	4.718	2.671	1.681
Malawi	12.43	14.14	14.4	11.88	6.292	3.019	1.57	0.754	0.361
Malaysia	0.002	0.023	0.013	0.006	0.003	0.002	0.001	0	0
Maldives	0.022	0.039	0.039	0.025	0.02	0.014	0.008	0.004	0.001
Mali	8.276	8.624	9.213	8.078	3.348	1.044	0.328	0.075	0.018
Malta	0.0007	0.0001	0	0	0	0	0	0	0
Mauritania	0.279	0.294	0.25	0.216	0.093	0.029	0.009	0.002	0
Mauritius	0.003	0.008	0.01	0.003	0.001	0.001	0	0	0
Mexico	2.4	2.711	2.63	2.439	2.185	1.874	1.488	1.103	0.797
Micronesia	0.017	0.048	0.037	0.019	0.008	0.003	0.001	0	0
Moldova, Republic of	0.002	0.007	0.001	0	0	0	0	0	0
Mongolia	0.016	0.006	0.001	0	0	0	0	0	0
Montenegro	0.006	0.009	0.005	0.002	0.001	0	0	0	0
Morocco	0.25	0.166	0.11	0.064	0.029	0.012	0.005	0.002	0
Mozambique	17.82	22.28	22.48	21.01	11.62	5.77	4.311	2.647	1.547
Myanmar	0.728	0.247	0.075	0.069	0.069	0.024	0.004	0.001	0
Namibia	0.353	0.515	0.382	0.218	0.125	0.07	0.042	0.021	0.01

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Nepal	1.649	0.878	0.561	0.218	0.052	0.012	0.002	0	0
Netherlands	0.032	0.009	0.005	0.001	0.001	0	0	0	0
New Zealand	0	0.002	0.001	0.001	0	0	0	0	0
Nicaragua	0.137	0.108	0.088	0.098	0.071	0.037	0.023	0.012	0.006
Niger	9.375	6.236	3.936	1.874	0.398	0.056	0.01	0.002	0
Nigeria	78.95	93.33	93.41	83.45	55.15	26.33	11.13	4.643	1.945
Norway	0.013	0.005	0.003	0.002	0.001	0	0	0	0
Oman	0	0.006	0.002	0.001	0.001	0.001	0	0	0
Pakistan	4.859	2.82	2.126	1.086	0.288	0.073	0.029	0.011	0.003
Palestine	0.042	0.093	0.057	0.01	0.002	0.001	0	0	0
Panama	0.104	0.071	0.051	0.043	0.034	0.022	0.012	0.006	0.004
Papua New Guinea	2.22	1.196	0.842	0.897	0.416	0.214	0.123	0.056	0.025
Paraguay	0.07	0.047	0.031	0.025	0.019	0.012	0.007	0.003	0.002
Peru	1.076	0.706	0.445	0.372	0.294	0.196	0.119	0.059	0.024
Philippines	5.569	4.217	2.874	1.57	0.861	0.449	0.197	0.066	0.02
Poland	0.128	0.023	0.007	0.002	0.001	0	0	0	0
Portugal	0.042	0.022	0.014	0.006	0.003	0.001	0	0	0
Puerto Rico	0	0.0004	0.0001	0	0	0	0	0	0
Qatar	0	0.001	0	0	0	0	0	0	0
Romania	0.604	0.26	0.143	0.078	0.05	0.026	0.013	0.007	0.004
Russian Federation	0.063	0.081	0.029	0.026	0.025	0.014	0.005	0.002	0.001
Rwanda	6.729	5.971	4.45	2.304	0.937	0.414	0.163	0.045	0.014
Samoa	0.0011	0.0009	0.0005	0.0003	0.0001	0	0	0	0
Sao Tome and Principe	0.074	0.1	0.114	0.087	0.052	0.036	0.03	0.019	0.011
Saudi Arabia	0	0.008	0.004	0.001	0.001	0.001	0.001	0.001	0.001
Senegal	4.738	3.725	2.462	1.26	0.443	0.139	0.048	0.012	0.002
Serbia	0.477	0.183	0.081	0.034	0.015	0.005	0.001	0	0
Seychelles	0.0009	0.0012	0.0012	0.0007	0.0001	0	0	0	0
Sierra Leone	3.294	3.832	4.357	3.985	1.873	0.537	0.169	0.046	0.011
Singapore	0	0.001	0	0	0	0	0	0	0
Slovakia	0.072	0.031	0.014	0.006	0.004	0.002	0.001	0	0
Slovenia	0	0.0002	0	0	0	0	0	0	0
Solomon Islands	0.157	0.146	0.109	0.096	0.037	0.009	0.003	0.001	0
Somalia	6.041	9.568	9.725	2.975	0.68	0.121	0.02	0.003	0
South Africa	10.86	12.52	12.38	11.98	11.09	9.525	8.033	6.39	4.652
Spain	0.321	0.209	0.123	0.08	0.057	0.035	0.017	0.007	0.003
Sri Lanka	0.18	0.145	0.087	0.047	0.021	0.008	0.003	0.001	0
St. Lucia	0.008	0.008	0.007	0.006	0.004	0.003	0.002	0.001	0.001
St. Vincent and the Grenadines	0.009	0.007	0.005	0.004	0.002	0.001	0	0	0

Country	2017	2030	2040	2050	2060	2070	2080	2090	2100
Sudan	4.171	5.45	3.864	2.216	1.12	0.513	0.26	0.105	0.038
Sudan South	9.241	11.14	10.2	7.093	5.72	3.689	1.994	0.912	0.297
Suriname	0.11	0.087	0.056	0.046	0.036	0.026	0.019	0.011	0.005
Sweden	0.025	0.011	0.005	0.002	0.001	0	0	0	0
Switzerland	0	0.005	0.004	0.002	0.001	0.001	0	0	0
Syrian Arab Republic	5.915	9.604	6.874	3.905	2.197	1.649	1.511	1.219	0.632
Taiwan	0	0.001	0	0	0	0	0	0	0
Tajikistan	0.248	0.079	0.018	0.005	0.001	0	0	0	0
Tanzania	26.85	21.87	15.71	9.826	4.092	1.136	0.325	0.093	0.021
Thailand	0.021	0.022	0.01	0.007	0.005	0.002	0.001	0	0
Timor-Leste	0.262	0.245	0.103	0.025	0.003	0	0	0	0
Togo	3.688	3.478	2.855	1.66	0.607	0.182	0.061	0.018	0.004
Tonga	0.0007	0.0023	0.0025	0.0017	0.0006	0.0004	0.0002	0	0
Trinidad and Tobago	0.004	0.004	0.002	0.001	0	0	0	0	0
Tunisia	0.028	0.058	0.042	0.012	0.005	0.002	0.001	0	0
Turkey	0.112	0.035	0.015	0.006	0.003	0.001	0.001	0	0
Turkmenistan	0.078	0.003	0	0	0	0	0	0	0
Uganda	17.08	14.73	10.73	6.527	1.855	0.478	0.181	0.064	0.018
Ukraine	0.01	0.306	0.039	0.017	0.011	0.008	0.004	0.002	0.001
United Arab Emirates	0	0.006	0.002	0.001	0.001	0.001	0	0	0
United Kingdom	0.137	0.189	0.177	0.097	0.066	0.049	0.03	0.014	0.007
United States of America	3.249	3.023	2.895	1.92	1.005	0.788	0.752	0.543	0.335
Uruguay	0.002	0.002	0.001	0	0	0	0	0	0
Uzbekistan	4.058	1.947	1.11	0.516	0.162	0.049	0.01	0.001	0
Vanuatu	0.042	0.049	0.026	0.015	0.005	0.001	0	0	0
Venezuela, Bolivarian Republic	4.199	12.54	10.96	10.25	8.495	5.732	3.957	2.433	2.233
Viet Nam	1.774	0.31	0.062	0.02	0.006	0.001	0	0	0
Yemen	13.14	17.35	16.58	13.31	9.308	5.204	2.282	0.76	0.25
Zambia	9.851	10.87	10.14	11.35	10.62	7.097	5.718	4.465	2.843
Zimbabwe	4.821	4.739	3.499	2.344	1.149	0.454	0.201	0.091	0.03