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Global megatrends and the quest for poverty eradication

Abstract

Global megatrends such as income inequality, climate change, demographic shifts, technological progress, and urbanisation are shaping the future of societies. Yet, their quantitative impacts on development are neither well understood nor established. This paper examines the individual and combined effects of these global forces on poverty, using both cross-section and panel estimation techniques on a global dataset covering the period from 1995 to 2019. Regarding the direct effects, it finds that inequality, urbanization, and technology are the megatrends with a robust impact on poverty in both the long and medium terms. Demographic shifts and climate change have some impact on poverty, but the results depend on the samples and specifications considered. Furthermore, the paper finds that in addition to their direct effects, technology, urbanization, and demographic shifts affect poverty through their interactions with income inequality. Among the controls, per capita income, education, and private credit are significant drivers in the medium term, while per capita income is the only control variable that matters in the long run.

Key words

Poverty, megatrends, inequality, technology, climate change, demography, urbanization.

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1. Introduction

The eradication of poverty is the fundamental public policy challenge of our time. It is central to fostering sustainable development at both the national and global levels. It is also an imperative to achieve the global mantra that no one should be left behind in the development process. This important fact has been acknowledged by the international community as reflected in the decision of world leaders in 2015 to devote the first of the seventeen sustainable development goals (SDG) to ending poverty in all its forms everywhere. The recognition of the pivotal role of poverty eradication in promoting sustained and shared prosperity is also a driving factor in the decision of the international community to devote the first of the six focus areas of the Doha Programme of Action for least developed countries to "Investing in people, eradicating poverty and building capacity."

Over the past few decades, significant progress has been made in reducing global poverty largely due to positive economic developments in China and India. Using the poverty headcount ratio based on the $2.15 a day threshold, the global poverty rate fell from 37.8 per cent in 1990 to 8.4 per cent in 2019.[1] Despite this progress extreme poverty remains high and there are significant challenges to address in several areas. For example, the progress achieved to date has been uneven and poverty is increasingly concentrated in Africa (Table 1).[2] In addition, the economic and social environments in which governments must design and implement policies to combat poverty have become more uncertain due to the following "global megatrends"[3]: climate change, demographic shifts, technological progress, income inequality and urbanisation. These global forces pose serious risks to the quest for sustainable development. For example, if these forces are not well managed and if present trends continue, it is unlikely that goal 1 of the SDG on eradicating poverty will be achieved by the 2030 target date (United Nations 2020). Notwithstanding the risks posed by these megatrends, to the best of our knowledge, there is no econometric study examining the individual effects of megatrends on global poverty (apart from studies on income inequality).

[1] The Covid-19 pandemic has reversed some of the gains achieved in the past few decades. As a result of the pandemic the global poverty rate rose from 8.4 per cent in 2019 to 9.3 per cent in 2020 and then declined to 8.4 per cent in 2022 (World Bank 2022).

[2] In 1990, East Asia and Pacific accounted for about 52.9 per cent of global extreme poverty, South Asia for 28.2 per cent and Sub-Saharan Africa for 13.6 per cent. In 2019, that is after three decades, East Asia and Pacific accounted for only 3.6 per cent of global extreme poverty, South Asia for 24.1 per cent and Sub-Saharan Africa for 60 per cent. Interestingly, unlike the other regions where the number of poor people declined between 1990 and 2019, in Sub-Saharan Africa the number of poor people increased from 271.5 million to 389 million.

[3] Global megatrends refer to macroeconomic, social, and political forces shaping the future of societies with profound impacts on economies.

There is also no study that investigates quantitatively how these forces interact and the effect of these interactions on poverty. Against this backdrop, our paper attempts to address the current lacuna in the literature.

The literature on the drivers of poverty is vast and growing (Cerra et al. 2021; Fosu 2017; Epaulard 2003; Ali and Thorbecke 2000). One class of this literature uses aggregate macroeconomic and social data to examine the determinants of poverty. For example, Le Goff and Singh (2014) examined the relationship between trade openness and poverty using panel data for African countries. They found that the effect of trade openness on poverty depends on the depth of the financial sector, the level of education and the strength of institutions. Similarly, Kpodar and Singh (2011) investigated the link between financial structure and poverty and found that in an environment where institutions are weak bank-based financial systems contribute to poverty reduction. Furthermore, as institutions get stronger market-based financial systems become beneficial for the poor. Another class of the existing literature focuses on the role of sectoral growth in understanding poverty using disaggregated data. Berardi and Marzo (2017) provide a methodology to study the elasticity of poverty with respect to sectoral growth at the country level. They argue that both the composition of growth and its overall intensity matter for the relationship between growth and poverty. In a related paper, Erumban and de Vries (2021) examine the role of structural change in growth and poverty reduction. They found an association between aggregate labour productivity growth and poverty reduction in developing countries. They also found that poverty reduction was associated with structural change and manufacturing productivity growth.

While the papers discussed above have made important contributions to the literature on the drivers of poverty, they do not investigate the effects of global megatrends and their implications for poverty reduction. In this regard, our paper complements and adds value to the extant literature by examining the individual impact of each of these global forces on poverty. Another contribution of the paper is that in addition to examining the individual effects of global megatrends on poverty, we also investigate how they interact with income inequality, and how these interactions affect poverty. This is important because the confluence of these global forces may have an impact that is quite different from their individual effects (Poloz 2022). The third contribution of our paper is that it examines both the medium and long-run drivers of poverty with controls for other potential correlates of poverty identified in the literature, namely: income per capita, education, infrastructure, institutions, trade, macroeconomic instability, and financial development.

The rest of the paper is organised as follows. Section 2 discusses the transmission mechanisms linking the five global megatrends with poverty and examines the bilateral correlation between these forces and a measure of poverty: the poverty headcount ratio. In section 3, we discuss the empirical strategy adopted in our paper together with the variables and data used. In section 4, we present and analyse the results for the baseline regressions, conduct robustness checks, and examine whether there are interaction effects among megatrends. Section 5 contains some concluding remarks.

Table 1
Poverty rates and number of poor at US$2.15 per day poverty line
(By region)

	Poverty headcount ratio (%)		Number of poor people (millions)	
	1990	**2019**	**1990**	**2019**
East Asia and Pacific	65.8	1.1	1 055.5	23.6
Europe and Central Asia	3.2	2.4	15.0	11.8
Latin America and the Caribbean	16.7	4.3	73.2	27.8
Middle East and North Africa	6.1	-	14.0	-
South Asia	49.7	8.5	563	156.3
Sub-Saharan Africa	53.3	35.1	271.5	389.0
Rest of the world	0.5	0.6	4.1	6.7
World	***37.8***	***8.4***	***1 996.2***	***648.1***

Source: Compiled based on data from online annex of World Bank (2022).

2. Transmission mechanisms linking global megatrends to poverty

Income inequality

The economic literature suggests that inequality has both direct and indirect consequences for poverty reduction (Bourguignon 2004; Marrero and Servén 2022). The direct effect emanates from the fact that for any given growth rate, a worsening of income distribution will increase poverty. And the indirect effect arises from the idea that inequality can increase poverty by inhibiting growth through the following mechanisms: credit market imperfections; social conflicts; and redistributive democracy. When there are credit market imperfections in an economy poor people cannot borrow to either exploit investment opportunities or offer their children a good education. In this context, inequality results in underutilization of a country's potential and retards growth (Bourguignon 2004). Another channel through which inequality harms growth is that it fosters social and political instability which is not conducive to investment and growth in an economy (Ferreira et al. 2022). Inequality can also reduce growth in a democratic society because it increases the likelihood of adoption of redistribution policies which would have to be financed through higher taxes thereby reducing growth (Alesina and Rodrik 1994). While the mechanisms discussed above imply that inequality is bad for growth, it is worth noting that there is also a related literature suggesting that inequality can foster growth based on the notion that the rich have a higher marginal propensity to save than the poor and so inequality increases savings thereby facilitating investment and growth (Ferreira et al. 2022).

Climate change

A major channel through which climate change affects poverty is by reducing agricultural production and growth (Hallegatte et al. 2016). By increasing the frequency of extreme weather events and natural hazards (such as heat waves, drought, and flooding) climate change has a negative effect on agricultural productivity and production with dire consequences for vulnerable populations who depend on agriculture for their livelihoods (United Nations 2020). Climate induced increases in prices, natural disasters and health problems can also push people into poverty as well as reduce the ability of the poor to escape poverty thereby increasing the poverty rate. Consequently, climate change can have a significant negative impact on poverty, particularly in developing economies that do not have the resources and capacity to mitigate and adapt to the associated risks.

Demographic shifts

The world is experiencing a significant slowdown in population growth rates and shifts in population age structures (World Bank 2016; United Nations 2020). In the developed countries, an increase in life expectancy coupled with low fertility rates have resulted in an increase in the proportion of older people (aged 65 and above) in the population. It is well-known that as people get older their ability to carry out normal daily activities declines, and they will have to rely on the working age population for care and other needs. Consequently, a changing age structure that increases the proportion of older people in the population will increase the dependency ratio, raise the burden on the working population, and increase poverty. In contrast to the developed countries, in the developing countries the demographic transition is associated with an increase in the working age population, which represents a demographic dividend and an opportunity to raise living standards thereby reducing poverty.

Technological progress

Technological innovation is an important source of productivity growth and job creation, particularly in new sectors and industries. But it also creates winners and losers in an economy and so could have both positive and negative impacts on poverty. For example, if technological change is labour-augmenting the overall impact is likely to be poverty-reducing but if it is labour-saving the overall impact is likely to be poverty-increasing. In addition to the factor-bias of technological change, the speed of technological change also matters in determining the ultimate impact it could have on poverty in an economy (Korinek and Stiglitz 2017). When technological change occurs at a slow pace, the potential disruption in the labour market will be less but when the pace of technological change is fast, it transforms labour markets rapidly and induces structural shifts in economies that could result in significant job losses in old sectors and industries. In this context, the impact on poverty will depend on how exposed the poor are to industries and sectors that are contracting as well as on how easy it is for the poor to transition into new growth sectors and industries resulting from technological changes. It will also depend on whether technological change is accompanied with skills development and training measures as well as redistribution policies geared towards cushioning the potential negative impact on the poor.

Urbanization

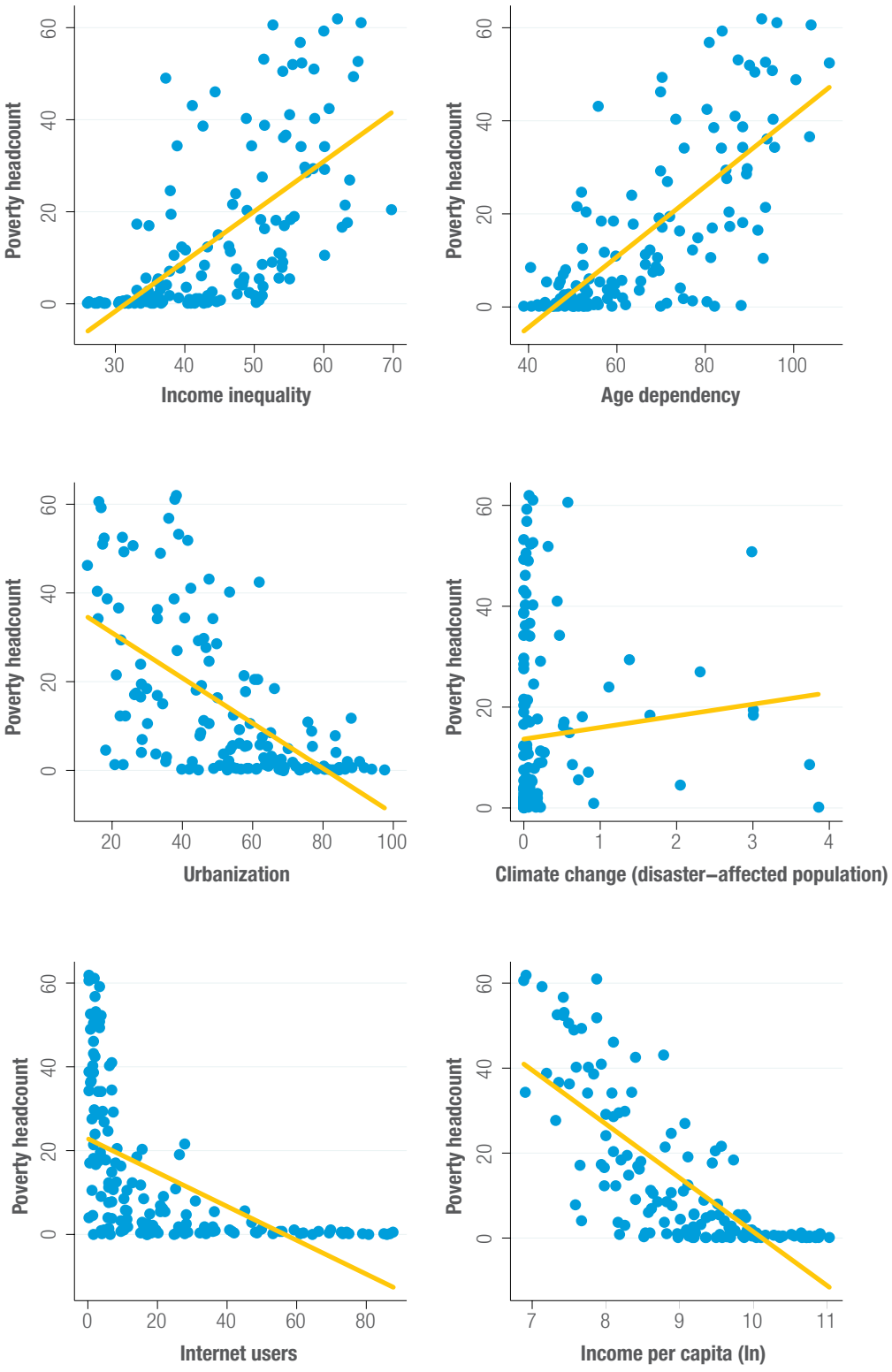
Urbanization involves an increase in the urban share of the total population of a country and arises principally from four sources: a natural increase in urban population, rural-urban migration, reclassification of cities, and international migration (United Nations 2020). Urbanization can have an impact on poverty through different mechanisms. For example, migration of people from rural to urban areas can increase both the urban wage in the formal sector and the rural wage (due to higher agricultural productivity) thereby reducing poverty. It can also contribute to the accumulation of human and physical capital thereby fostering growth and creating the basis for poverty reduction (Ha et al. 2021). Historically, urbanization in the advanced economies was triggered and driven by industrialization which is an important engine of growth, job creation and poverty

reduction (Gollin et al. 2016). However, in some developing countries, particularly in Africa, urbanization is associated with rapid growth of informal sector, slum formations and homelessness. In this context, although urbanization can play a positive role in poverty reduction and the development process, it can also be a source of increases in poverty if it takes place without industrial development and creation of decent jobs.

Having discussed the transmission mechanisms through which the global megatrends could be linked to poverty, it would be interesting to examine whether there is any bilateral association between each of the megatrends and poverty indicators in the data, noting that correlations in themselves do not imply causality. Figure 1 presents the bilateral correlations between the poverty headcount ratio and selected variables of interest in the cross-section of countries, with data averaged over the period 1995 to 2019. The data indicates that income inequality, the age dependency ratio (a measure of demographic shifts) and the share of population affected by climate-related natural disasters (a measure of climate change) are positively associated with the poverty headcount ratio. The correlation coefficients are 0.64 (inequality), 0.74 (demographic shifts), and 0.09 (climate change).[4] By contrast, the share of the urban population in total population (a proxy for urbanization) and the percentage of the population using the internet (a proxy for technological change) are negatively associated with the poverty headcount ratio, with correlation coefficients equal to -0.61 and -0.54 respectively. In addition, the poverty headcount is strongly negatively correlated with income per capita, with a correlation coefficient of -0.76.

[4] One possible reason for this low correlation between climate change and poverty in the data is that although global extreme poverty is heavily concentrated in Africa, most of those affected by natural disasters are in Asia and the Pacific (UNFPA 2018). Furthermore, climate change has multiple dimensions (United Nations 2020), and it is difficult to capture the different dimensions in one indicator.

Figure 1
Bivariate correlations of poverty with selected variables



Note: Each dot is the median for a country over the period 1995-2019.

3. Estimation approach

The empirical strategy we adopt is two-fold. First, we examine the empirical relationship between global megatrends and poverty using cross-section data, which can be interpreted as representing the long-run effects of these megatrends on poverty. Second, we take advantage of the panel structure of the data by estimating panel regressions which provide insights into the medium-run impacts of these megatrends on poverty. We estimate the panel regressions using the fixed effects approach, which permits us to control for time invariant country characteristics and time effects thereby mitigating omitted variable bias. While the fixed effects approach accounts for omitted variable bias, it does not control for potential reverse causality. To mitigate the risk of reverse causality in the fixed-effects model, we also conduct estimations using lagged, rather than contemporaneous, values of all regressors (see Blotevogel et al. 2022).[5]

Empirical specification

We begin our empirical investigation of the relationship between global megatrends and poverty by estimating a cross-section poverty regression as specified in Equation (1).

$$Poverty_i = \lambda + \alpha' M_i + \beta' X_i + \varepsilon_i \quad (1)$$

where subscript i denotes country, $Poverty_i$ is a measure of poverty in country i, M_i is a vector containing country-level indicators of the five megatrends of interest in this study (inequality, urbanization, demographic shift, climate change, and technological progress), and α is a vector of respective coefficients on the megatrends. X_i is a vector of control variables (income, education, trade policy, access to credit, macroeconomic instability, and institutions), and β is a vector of coefficients on the controls. λ is a constant and ε_i is an error term.

In addition to Equation (1), we also estimate the following panel regression[6] by fixed effects:

$$Poverty_{it} = \alpha' M_{it} + \beta' X_{it} + \mu_i + \gamma_t + \varepsilon_{it} \quad (2)$$

[5] We also tried estimation by System GMM, but the estimates were highly unstable and imprecise, particularly when the variables are in non-log form, reflecting in part the weak instrument problem.

[6] See for example Dollar and Kraay (2004).

where subscripts i and t indicate, respectively, country and time (5-year periods). $Poverty_{it}$ is an indicator of poverty in country i at time t. The vector M_{it} captures five global megatrends (inequality, urbanization, demographic shift, climate change, and technological progress) and α is a vector of their respective coefficients. contains control variables (income, education, trade policy, access to credit, macroeconomic instability, and institutions) and β is the vector of their coefficients. Time invariant country characteristics (or country fixed effects) are captured by μ_i, γ_t is a time effect and ε_{it} is an error term. We first use a contemporaneous specification, and then a specification with all regressors lagged by one period (representing 5 years) to mitigate the risk of reverse causality (Blotevogel et al. 2022).

In section 2 we provided an explanation of the mechanisms through which the five global megatrends could affect poverty and discussed the expected signs. Consequently, in this section we simply discuss the choice of the control variables included in the regressions and their expected signs. Our choice of the control variables is guided by the literature and data availability. Income per capita is one of the variables we include to control for the level of economic development with the expectation that a higher level of development is associated with less poverty. Income is also an important control variable because the literature suggests that economic growth is a major driver of changes in poverty, with higher growth expected to decrease poverty for a given income distribution (Bourguignon 2004). The literature also suggests that an increase in human capital or education decreases the incidence of poverty through, for example, enhancing job prospects and making it easier to earn decent wages (Rahman 2013). Trade is another variable that has been widely discussed as a potential driver of poverty although theoretically its impact is ambiguous (Le Goff and Singh 2014): on the one hand greater openness increases consumer choice and provides access to larger markets for agricultural goods produced in sectors where the poor are heavily concentrated. On the other hand, more openness increases competition and reduces the bargaining power of unskilled labour relative to skilled labour and capital. Furthermore, tariff liberalization may result in loss of tariff revenues impacting poverty through this channel. Macroeconomic instability as reflected in inflation or inflation volatility is expected to increase poverty by reducing the real wage and income of the poor (Epaulard 2003). Financial development is expected to reduce poverty by, for example, making it possible for the poor to borrow against future earnings and to invest. It can also reduce poverty by making it easier for households to manage risks (Kpodar and Singh 2011). Institutions are also considered to play an important role in poverty alleviation, with poor quality institutions expected to increase poverty through, for example, reducing labour and capital productivity and creating poverty traps (Tebaldi and Mohan 2010).

Data sources and variable definitions

The main measure of poverty, the dependent variable, used in our empirical analyses is the poverty headcount ratio. However, we also used the poverty gap in the section where we conducted robustness checks. The two poverty indicators are sourced from the World Development Indicators (WDI) database of the World Bank, and the indicators are based on the latest poverty threshold of 2.15$ a day (2017 PPP).[7] As is common in the empirical literature, we measure income inequality by the Gini coefficient of pre-tax income sourced from the cross-country comparable companion dataset developed by UNU-WIDER (2022). In the robustness checks, we also use the Palma ratio from UNU-WIDER as an alternative to the Gini coefficient, while recognising that it only captures the tails rather than the entire income distribution. Our income measure is GDP per capita obtained from the WDI. Urbanization is measured by the share of urban population in total population sourced from the WDI and by the share of urban surface in the total surface obtained from FAO (2022). Demographic shift is captured by the age dependency ratio, i.e. the ratio of people younger than 15 and older than 64 to the working age population (those aged 15-64). The demographic shift variable is from the WDI. Climate change is measured by the share of population affected by climate-related natural disasters (including droughts, floods and extreme temperature events) and value of all economic losses due to such disasters, with both measures being obtained from the Emergency Events Database EM-DAT (CRED 2023). Technology is proxied by the share of internet users or, alternatively, the number of mobile subscriptions, both indicators are from the WDI. Among controls we include: education measured by the average years of schooling sourced from Barro and Lee (2013); government effectiveness sourced from the Worldwide Governance Indicators (Kaufmann, Kraay, and Mastruzzi 2011); tariff rate obtained from the UNCTADStat database; as well as credit to private sector and inflation, both from the WDI. The detailed definitions and sources of all variables used in the analyses are provided in Table A1 of the Annex.

The resulting dataset covers 116 countries, including 76 developing nations, listed in Table A3 of the Annex. Data availability, particularly for indicators related to technology and institutions, permits going back as far as 1995. The dataset stops at 2019 to exclude the impact of the COVID-19 pandemic. The database thus spans 25 years. For the panel data estimations, we aggregate data into 5-year periods, following the approach typical in the growth and poverty studies as it smoothens business cycle fluctuations. Furthermore, aggregation helps to balance the dataset, particularly indicators derived from household surveys that are not available at yearly intervals. To reduce the impact of outliers, we use median values in aggregation of dependent variables and regressors and remove the top 5% of poverty observations. To test for the sensitivity of the choice of the aggregation method, we undertake estimations based on mean values and provide the results in the robustness checks section. Inflation volatility is calculated for each country as the standard deviation of inflation within five-year periods. Further details on the data are provided in the Annex, with Table A2 showing the summary statistics and Table A4 the correlations.

[7] In September 2022, the World Bank updated the global poverty lines following the release of new purchasing power parities (PPPs). Consequently, there was a change in the extreme poverty thresholds from $1.90 to $2.15 per day.

4. Regression results

Long-run determinants of poverty

In Table 2, we present the results of the cross-section estimation of Equation (1) by ordinary least squares (OLS), corresponding to the long-run determinants of poverty. The estimations were carried out for the full sample (column 1) and for the sample of developing countries (column 2). Among the five global megatrends considered, income inequality, urbanization, and age dependency ratio (demographic shifts) are found to be robust drivers of poverty in the long run. On average, a one-unit increase in the Gini coefficient corresponds to a 0.515 unit increase in the poverty headcount ratio, and a one unit increase in age dependency corresponds to a 0.484 unit increase in poverty. Similarly, a one unit increase in technology corresponds to a 0.205 increase in poverty. In contrast to inequality and age dependency, urbanization decreases poverty, with a one unit increase in urbanization leading to a 0.235 unit decrease in poverty. In the developing countries sample, the sign and the magnitude of coefficients is like that of the full sample, except for technology which is not statistically significant. The only control variable that matters in the long run is income per capita. As expected, income per capita has a statistically significant negative relationship with poverty in both the full and developing countries samples.

Another issue that we explore in this section is whether there are interactions among the megatrends and how these interactions affect poverty. In investigating this, our focus is on interactions between income inequality on the one hand and the remaining megatrends on the other. This focus on interactions with inequality reflects the fact that it is the only megatrend identified in economic theory as a major source of changes in poverty (Bourguignon 2004). In this regard, it would be interesting to know whether the other megatrends interact with this crucial source of changes in poverty. To do so we include in Equation (1) interaction terms to estimate, sequentially, a joint impact of income inequality with urbanization, income inequality with age dependency, income inequality with climate change, and finally, income inequality with technology. In columns 3, 4, 5 and 6 of Table 2, we present the results of these estimations with interaction effects. They indicate that urbanization and technology affect poverty both directly and indirectly – through their interactions with income inequality. The coefficients on the interaction terms are negative and statistically significant, implying that interacting urbanization and technology respectively with income inequality dampens the poverty increasing effect of inequality. By contrast, neither the interaction with age dependency nor climate change is statistically significant in the regressions.

Table 2
Cross-section regressions

Dep. var.: Poverty headcount	Full sample	Developing countries	Full sample with interactions			
	(1)	(2)	(3)	(4)	(5)	(6)
Income inequality	0.515***	0.628***	1.443***	0.106	0.551***	0.747***
	(0.124)	(0.155)	(0.266)	(0.324)	(0.131)	(0.163)
Urbanization	-0.235***	-0.245***	0.648***	-0.245***	-0.239***	-0.194***
	(0.067)	(0.089)	(0.192)	(0.067)	(0.067)	(0.065)
Age dependency	0.484***	0.473***	0.293***	0.203	0.484***	0.390***
	(0.083)	(0.102)	(0.099)	(0.269)	(0.083)	(0.092)
Climate change (disaster-affected population)	-1.346	-1.121	-1.782	-1.212	5.980	-1.746
	(1.236)	(1.445)	(1.206)	(1.304)	(5.056)	(1.222)
Technology	0.205**	0.224	0.123*	0.171**	0.202**	0.636***
	(0.081)	(0.139)	(0.071)	(0.074)	(0.082)	(0.164)
Income per capita (ln)	-2.624**	-2.961*	-6.116***	-0.787	-2.700**	-3.240***
	(1.233)	(1.712)	(1.388)	(1.826)	(1.235)	(1.226)
Education	-0.823	-1.169	-0.839	-0.807	-0.824	-0.757
	(0.622)	(0.746)	(0.566)	(0.617)	(0.623)	(0.609)
Tariff rate	-0.0713	-0.0119	-0.230	-0.0523	-0.116	-0.116
	(0.269)	(0.309)	(0.261)	(0.274)	(0.276)	(0.256)
Private credit	-0.00418	-0.00478	-0.00139	0.00129	-0.00806	0.0122
	(0.022)	(0.042)	(0.019)	(0.020)	(0.023)	(0.020)
Inflation volatility	0.0407	0.0539	0.00999	0.0357	0.0402	0.0397*
	(0.025)	(0.088)	(0.017)	(0.023)	(0.025)	(0.023)
Government effectiveness	1.064	1.947	0.850	0.314	1.483	0.714
	(2.227)	(2.971)	(2.067)	(2.407)	(2.280)	(2.176)
Urbanization # Income inequality			-0.0182***			
			(0.004)			
Age dependency # Income inequality				0.00680		
				(0.006)		
Climate change # Income Inequality					-0.165	
					(0.119)	
Technology # Income inequality						-0.0141***
						(0.004)
Observations	116	76	116	116	116	116
R2	0.87	0.88	0.89	0.87	0.87	0.88

Note: Robust standard errors in parentheses: * p<0.1, ** p<0.05, *** p<0.01. Cross-section estimated by OLS.

Medium-run determinants of poverty

Table 3 presents results of the estimation of Equation 2 using panel data and the fixed effects approach. Our data covers 25 years aggregated into 5-year periods. In this context, the results can be interpreted as medium-run determinants of poverty. In the regressions reported in columns 1 and 2 we include country fixed effects that capture all time-invariant country characteristics. In these specifications we assume that the five global megatrends already account for global shocks and thus we do not include time fixed effects. To test for this assumption, in column 3 we explicitly include time fixed effects. Finally, in column 4 we lag all regressors by one period (5 years) with the aim of mitigating potential reverse causality.

In both the full sample (column 1) and the developing countries sample (column 2), the medium-run determinants of poverty include three megatrends, namely income inequality, urbanization, and technology, as well as the following controls: per capita income, education, private credit, and inflation volatility. In the developing countries sample and in the regression which includes time fixed effects (column 3) we also identify a statistically significant poverty increasing impact of climate change. The results presented so far account for omitted variables bias but do not address the problem of potential endogeneity of the regressors due, for example, to simultaneity or reverse causality. Ideally, we will need external instruments to account for the endogeneity of the regressors. However, as is well known, finding valid external instruments is not always possible (Durlauf et al. 2005). Researchers often get around this problem by using System GMM which relies on internal instruments. In our paper, we do not rely on the System GMM approach because the estimates we obtain using this procedure, when the variables are expressed in non-log form, is highly unstable and imprecise, reflecting a weak instrument problem. Given this constraint, our preference was to estimate Equation 2 using the fixed effects technique but with lagged values of all regressors to minimize the risk of reverse causality. The results of the estimations, presented in Table 3, indicate that we continue to identify the statistically significant impact of inequality, urbanization, and technology on poverty. Among control variables, income per capita and private credit remain statistically significant, both with negative coefficients. Turning to the magnitude of the impact of megatrends on poverty, a one-unit increase in income inequality increases poverty headcount by 0.632 units, a one-unit increase in urbanization leads to a decrease in poverty headcount by 0.779 units, and a one-unit increase in our technology indicator leads to a 0.187 unit increase in poverty (column 4).

Table 3
Panel regressions
(Fixed effects)

Dep. var.: Poverty headcount	Full sample	Developing countries	Full sample with time FE	Full sample with lagged regressors
	(1)	(2)	(3)	(4)
Income inequality	0.422*	0.595**	0.454*	0.632**
	(0.227)	(0.242)	(0.234)	(0.306)
Urbanization	-0.635***	-0.679***	-0.578***	-0.779***
	(0.179)	(0.231)	(0.178)	(0.260)
Age dependency	-0.0318	-0.212	-0.0505	0.122
	(0.101)	(0.142)	(0.104)	(0.194)
Climate change (disaster-affected population)	0.231	0.314*	0.262*	0.228
	(0.149)	(0.177)	(0.146)	(0.290)
Technology	0.158***	0.259***	0.196***	0.187***
	(0.029)	(0.062)	(0.045)	(0.035)
Income per capita (ln)	-16.96***	-18.54***	-15.76***	-11.93***
	(3.021)	(4.374)	(3.455)	(2.908)
Education	-2.878***	-5.611***	-2.318**	-1.995
	(0.949)	(1.594)	(0.903)	(1.258)
Tariff rate	-0.0316	-0.106	-0.0866	0.153
	(0.144)	(0.167)	(0.151)	(0.192)
Private credit	-0.0396**	-0.0850*	-0.0378**	-0.0617***
	(0.016)	(0.049)	(0.016)	(0.021)
Inflation volatility	0.102***	0.0896***	0.0904***	0.0207
	(0.027)	(0.029)	(0.031)	(0.081)
Government effectiveness	1.547	3.063	0.799	2.841
	(1.999)	(2.884)	(1.994)	(2.500)
Fixed effects	Country	Country	Country, time	Country
Observations	340	204	340	231
R2	0.94	0.93	0.94	0.95

Note: Robust standard errors in parentheses: * p<0.1, ** p<0.05, *** p<0.01. Fixed effects model; data aggregated into 5-year periods. The regressors in column (4) are lagged by one period.

Robustness checks

In this section, we undertake three sets of robustness checks using: alternative measures of megatrends, a different aggregation method, and an alternative measure of poverty. The results of these robustness checks are presented in Table 4. Column 1 contains the results of the first robustness check in which we replace the Gini coefficient with the Palma ratio, i.e. the share of income of the top 10% earners divided by the share of income of the bottom 40% earners (Cobham, Schlögl, and Sumner 2016) to measure income inequality. The coefficient for the Palma ratio is not statistically significant (Table 4 column 1), while all other coefficients remain like those in the baseline regression (Table 3 column 4). This may be partially explained by the fact that the Palma ratio focuses on the tails of the income distribution and does not capture all aspects of the distribution as is the case with the Gini coefficient. In column 2, we used the share of the urban area in total surface area, instead of the share of the urban population in total population, as an alternative measure of urbanization. We do not find a statistically significant relation between the size of urban areas and the poverty headcount, while the rest of the coefficient remain like those of the baseline model. In column 3, we report results in which we split the age dependency ratio into its two components, young and old. Age dependency (young) refers to the share of persons younger than 15 in the working age population (those aged 15-64), while age dependency (old) is the share of persons older than 64 in the working age population. The analysis shows that the impact of age dependency on poverty is driven by older people. This may explain why the total age dependency is not significant in our baseline fixed effects specification and in the cross-country regressions where age dependency is interacted with income inequality. In column 4, we replace the share of population affected by climate-related disasters by a measure of material damage caused by such disasters. The coefficient on this climate change indicator remains insignificant. Regarding technology, the robustness check involved using mobile phone subscriptions instead of internet users as an indicator of technological change. The results (reported in column 5) are like that of the baseline specification.

All preceding results are based on the dataset where aggregation from yearly data to 5-year periods is done using median values – to have a consistent and unbiased way of dealing with outliers. In column 6, we change the aggregation method and use mean values. The results are quantitatively and qualitatively similar to the baseline specification. The final robustness check involved using the poverty gap (which captures the depth of poverty) rather than the poverty headcount ratio (which is the proportion of the population below the poverty line) as our measure of poverty. Column 7 indicates that the results are like those of the baseline specification using the poverty headcount ratio, except for one control variable which turned from weakly significant to non-significant. Overall, the robustness checks confirm that the megatrends, including inequality, urbanization, and technology have significant impacts on poverty in the medium term.

Table 4
Sensitivity analyses
(Using model with lagged regressors)

	Dep. var.: Poverty headcount						Poverty gap
	Alternative measures of megatrends					Alternative aggregation	
	(1)	(2)	(7)	(6)	(5)	(6)	(7)
Income inequality (Gini)		0.801**	0.623**	0.618**	0.655*	0.529*	0.289**
		(0.373)	(0.266)	(0.308)	(0.393)	(0.293)	(0.128)
Urbanization (population)	-0.894***		-0.876***	-0.785***	-0.702**	-0.774***	-0.336***
	(0.306)		(0.268)	(0.256)	(0.280)	(0.233)	(0.096)
Age dependency (total)	0.136	0.197		0.0927	0.272	0.0644	-0.00529
	(0.201)	(0.180)		(0.199)	(0.194)	(0.162)	(0.072)
Climate change (disaster-affected population)	0.166	0.299	0.188		0.164	-0.207	0.0818
	(0.320)	(0.288)	(0.294)		(0.294)	(0.299)	(0.103)
Technology (internet users)	0.180***	0.174***	0.151***	0.186***		0.212***	0.0701***
	(0.037)	(0.040)	(0.028)	(0.035)		(0.039)	(0.015)
Income per capita (ln)	-11.88***	-15.62***	-13.03***	-11.95***	-10.63**	-15.86***	-4.014***
	(2.850)	(4.137)	(2.880)	(3.088)	(4.116)	(3.171)	(1.098)
Education	-2.141*	-2.799**	-2.397*	-1.999	-0.851	-3.016**	-0.722
	(1.209)	(1.374)	(1.299)	(1.258)	(1.131)	(1.167)	(0.519)
Tariff rate	0.154	0.110	0.200	0.178	0.176	-0.124	0.0241
	(0.186)	(0.181)	(0.183)	(0.199)	(0.187)	(0.079)	(0.055)
Private credit	-0.0497**	-0.0581**	-0.0553***	-0.0596***	-0.0007	-0.0587***	-0.0244***
	(0.019)	(0.023)	(0.020)	(0.020)	(0.020)	(0.022)	(0.008)
Inflation volatility	0.0389	0.0238	0.0281	0.0161	-0.0252	0.0244	0.0113
	(0.075)	(0.085)	(0.082)	(0.083)	(0.085)	(0.075)	(0.031)
Government effectiveness	2.669	3.282	3.013	2.757	3.878	1.835	0.477
	(2.607)	(2.514)	(2.544)	(2.479)	(2.638)	(2.440)	(0.972)
Income inequality (Palma ratio)	1.465						
	(1.558)						
Urbanization (urban areas)		0.173					
		(1.417)					
Age dependency (young)			-0.0327				
			(0.221)				
Age dependency (old)			1.057***				
			(0.359)				
Climate change (disaster-related damage)				0.0179			
				(0.071)			
Technology (mobile subscriptions)					0.0403*		
					(0.021)		
Observations	231	229	231	231	231	231	231
R2	0.95	0.95	0.95	0.95	0.94	0.96	0.94

Note: Robust standard errors in parentheses: * p<0.1, **p<0.05, ***p<0.01. Full sample, fixed effects model, controlling for country fixed effects; data aggregated into 5-year periods; all regressors are lagged by one period.

Interactions of megatrends

Our final point of interest is to identify whether income inequality interacts with other megatrends in the medium run and how these interactions affect poverty. To this end, we run four additional regressions where we sequentially add an interaction term to our baseline fixed effects model with lagged regressors, namely the interaction of inequality with urbanization, inequality with age dependency, inequality with climate change, and inequality with technology. We find that in the medium term inequality affects poverty directly, and also indirectly, through its interactions with urbanization and age dependency. Urbanization mitigates the poverty-increasing effect of income inequality (Table 5, column 1) while age dependency amplifies it (column 2). The interactions between income inequality and climate change (column 3) and income inequality and technology (column 4) are not statistically significant in our sample and estimation approach.

To summarize, the following points can be made from all regression results. First, there is a fundamental relation between poverty, inequality, and growth: poverty decreases with a more equal distribution of income and higher income per capita.[8] Second, global megatrends are important drivers of poverty. Income inequality, urbanization and technology are robust determinants of poverty both in the long and medium run. The total age dependency ratio is significant in the long run, and the old age dependency is significant in the medium run, both with poverty increasing impact. Climate change is significant only in some fixed effects specifications. Third, global megatrends interact with income inequality, creating additional effects on poverty. Urbanization and technology dampen the poverty increasing effect of income inequality while an increase in age dependency amplifies it. Finally, the results on the control variables underscore the importance of education, financial development, and macroeconomic stability for poverty eradication.

[8] These results are consistent with the theoretical literature. For example, economic theory indicates that most changes in poverty can be accounted for by changes in income and the changes in the distribution of income (Bourguignon 2004; Datt and Ravallion 1992).

Table 5
Panel regressions with lagged regressors and interactions of megatrends

Dep. var.: poverty headcount	(1)	(2)	(3)	(4)
Income inequality	2.493***	-0.752	0.617*	0.620**
	(0.356)	(0.511)	(0.313)	(0.305)
Urbanization	1.021***	-0.571**	-0.848***	-0.801***
	(0.354)	(0.227)	(0.277)	(0.251)
Age dependency	0.114	-0.645	0.114	0.147
	(0.174)	(0.428)	(0.195)	(0.204)
Climate change (disaster-affected population)	0.178	0.228	3.568	0.230
	(0.235)	(0.264)	(2.155)	(0.294)
Technology	0.116***	0.172***	0.192***	0.0904
	(0.027)	(0.030)	(0.036)	(0.100)
Income per capita	-10.37***	-14.65***	-12.68***	-11.89***
	(3.054)	(3.079)	(3.079)	(2.853)
Education	-1.879	-2.020	-1.773	-2.147*
	(1.143)	(1.235)	(1.189)	(1.285)
Tariff rate	0.213	0.102	0.142	0.155
	(0.171)	(0.202)	(0.197)	(0.185)
Private credit	-0.0180	-0.0474***	-0.0652***	-0.0538**
	(0.018)	(0.017)	(0.021)	(0.022)
Inflation volatility	0.0720	0.0334	0.0149	0.0316
	(0.072)	(0.076)	(0.081)	(0.083)
Government effectiveness	2.046	2.557	2.834	2.621
	(2.156)	(2.472)	(2.486)	(2.426)
Urbanization # Income inequality	-0.0394***			
	(0.006)			
Age dependency # Income inequality		0.0181**		
		(0.007)		
Climate change (disaster-affected population) # Income inequality			-0.0836	
			(0.055)	
Technology # Income inequality				0.00279
				(0.003)
Observations	231	231	231	231
R2	0.96	0.95	0.95	0.95

Note: Robust standard errors in parentheses: * p<0.1, **p<0.05, ***p<0.01. Full sample, fixed effects model, controlling for country fixed effects; data aggregated into 5-year periods, all regressors are lagged by one period.

5. Conclusions

Poverty eradication remains the main development challenge facing the international community. And this challenge has been exacerbated by global megatrends such as income inequality, climate change, demographic shifts, technological progress, and urbanization. This paper examines the effects of these global forces on poverty in the long and medium terms using a large global dataset covering the period from 1995 to 2019. It finds that in the long run, income inequality, urbanization, the age dependency ratio and technology are the global megatrends with a statistically significant impact on poverty in the full sample. In the developing countries sample, income inequality, urbanization and age dependency are robust long-run determinants of poverty. The findings also suggest that in addition to the direct effects of megatrends, in the long run poverty is affected by the interaction of income inequality with urbanization and technology. Both interactions have a negative effect, i.e. they dampen the direct poverty increasing effect of income inequality. Regarding the control variables, income per capita is the only robust determinant of poverty in the long run.

The findings of the paper indicate that in the medium term, income inequality, urbanization and technology are the global megatrends with a robust impact on poverty. Regarding climate change, there is modest evidence that it increases poverty, but the results depend on the measurement and specifications considered and so are not robust. The age dependency ratio of older people (above 65) to the working age population is a significant poverty determinant, but not that of younger people (below 15). The paper provides evidence that in the medium term, income inequality affects poverty directly and, in addition, indirectly, through its interactions with urbanization and age dependency. Urbanization mitigates the poverty increasing effect of income inequality while age dependency amplifies it. Among the control variables, income per capita, education and private credit are significant drivers of poverty in the medium term, all with a poverty decreasing impact.

A key policy implication that has emerged from the empirical results and analyses of this paper is that finding a long-term and durable solution to the challenge of eradicating poverty requires addressing two interrelated issues: boosting income per capita and reducing income inequality. This conclusion is in line with the triangular relationship between poverty, inequality and growth identified by Bourguignon (2004). Furthermore, it underscores the fact that growth is a necessary but not a sufficient condition for poverty eradication and so the growth process must be made more inclusive than in the past to ensure that it has sustained and desired impact on poverty. Some of the policies that can foster growth and boost income per capita include demand-side policies, such as fiscal incentives that enhance consumer spending and business investment and foster employment creation.

Investment in education and skills and the provision of infrastructure, and other types of supply side policies, are also needed to boost growth and per capita incomes.

Regarding reducing inequality, this can be done through, for example, the adoption of more progressive income tax systems and putting more emphasis on capital than on labour taxes, which will increase the share of labour in national income and ensure a more equitable functional distribution of post-tax income than in the past. Broadening the tax base in developing countries to cover properties and inheritances better than is currently the case, is another policy option open to governments to achieve a more equitable distribution of income and wealth. Governments can also reduce inequality through provision of social safety nets to cushion the impact of shocks on the poor and enable them to better participate in input and product markets. The poor, particularly in developing countries, neither have the resources nor the capacity to withstand shocks and so providing them access to social protection systems can be a very effective way of increasing their labour market participation rates and ensuring that they can benefit from opportunities that are created in the growth and development process.

Another policy implication of the findings of this paper is that global megatrends have consequences for the achievement of the sustainable development goal of eradicating poverty in all its form and everywhere. While, in general, some megatrends (income inequality, urbanization, and technological progress) emerged as more robust drivers of poverty than the others (age dependency and climate change), each of the megatrends was identified as a driver in either the long run or the medium run, indicating that these global forces do have a role to play in combatting poverty and should be closely monitored. In this context, there is the need for urgent action to harness the potential benefits of these global forces while minimizing their risks. For example, governments can maximize the benefits and minimize the risks posed by technological progress by promoting skills development and training to facilitate transition of workers from declining to growing industries. They can also reduce the risks posed by technological progress by enhancing access of vulnerable groups to new technology and incentivising firms to adopt labour-augmenting technologies. With respect to urbanization, a very useful policy measure to make it contribute positively to poverty reduction in developing countries is to ensure that it goes hand in hand with productive transformation of economies thereby creating decent jobs and laying the foundation for sustained and inclusive development. To this end, it would be desirable for governments in developing countries to strengthen efforts to foster human and physical capital development, induce product and export diversification, and maintain political and macroeconomic stability to enhance domestic productive capacities and private sector development. Efforts should also be made to lift the constraints to poverty reduction imposed by the burden of age dependency through, for example, increasing government funding for nursing homes and social services, ensuring that the retirement age at the national level reflects global standards, and rewarding unpaid (care and volunteer) work by seniors.

Regarding climate change, some of the policy options to reduce its harmful effect on poverty and development include the introduction of carbon pricing, particularly in developed and emerging economies, which will create an incentive for firms to reduce carbon emissions and generate revenue that the government can use to provide critical social services and utilities that benefit the poor. But there is also the need for governments, individuals, and firms in both developed and developing economies to adopt more sustainable consumption and production patterns. By changing behaviour through, for example, more responsible consumption and production, reducing waste, and embracing recycling, all stakeholders can make a substantial contribution to addressing climate change and the quest for poverty eradication.[9]

The final policy implication of the findings of this paper, arising from the existence of interaction effects and trade-offs in policies to address the challenges posed by global megatrends, is the need for a holistic and coordinated approach to policy design and implementation rather than dealing with each of the forces in isolation. Often governments, for example, attempt to address the challenges posed by income inequality and technological progress without fully recognising that these global trends are linked and that addressing them involves trade-offs. Addressing one megatrend without taking the others into account will not yield optimal results because the impact of these forces is not limited to their individual effects but also involves an interaction effect which may dampen or magnify the direct effect. In this context, they need to be addressed in a coherent and coordinated manner through, for example, jointly integrating them into national development strategies, budgets, and plans.

[9] We recognize that some of these policies may be challenging to implement, particularly in developing countries faced with poor governance challenges. Nevertheless, as has been articulated in the literature, this challenge is not insurmountable and can be overcome if there is political will on the part of governments (see, for example, Noman et al. 2012, and Carothers and de Gramont 2011).

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Annex

Table A1
Sources of data and definition of variables

Category	Variable name in regressions tables	Variable definition and unit of measurement	Source, domain
DEPENDENT VARIABLE			
Poverty	Poverty headcount	Poverty headcount ratio at $2.15 a day (2017 PPP) (% of population)	World Development Indicators (WDI), World Bank, https://data.worldbank.org/
	Poverty gap*	Poverty gap at $2.15 a day (2017 PPP) (%)	WDI
MEGATRENDS			
Income distribution	Income inequality (Gini coefficient)	Gini coefficient of market (gross) income, standardized	World Income Inequality Database (WIID), UNU-WIDER, https://www.wider.unu.edu/data
	Income inequality (Palma ratio)*	Palma ratio of market (gross) income, i.e., the ratio of the top 10% income share to the bottom 40% income share	WIID
Urbanization	Urban population	Urban population (% of total population)	WDI
	Urban surface*	Artificial surfaces including urban and associated areas (% of total area)	Land cover, FAOSTAT, Food and Agriculture Organization, http://www.fao.org/faostat/en/#data/LC Total area from WDI
Demographic shift	Age dependency (total)	Age dependency ratio (% of working-age population)	WDI
	Age dependency (old)*	Age dependency ratio, old/above age 64 (% of working-age population)	WDI
	Age dependency (young)*	Age dependency ratio, young/below age 15 (% of working-age population)	WDI

Climate change	Disaster-affected population	The annual average percentage of the population that is affected (injured, left homeless or displaced) by natural disasters classified as either droughts, floods, or extreme temperature events	Emergency Events Database (EM-DAT), CRED https://www.emdat.be/ Population from WDI
	Disaster-related damage*	Value of all economic losses directly or indirectly due to natural disasters classified as either droughts, floods, or extreme temperature events, in the year of occurrence of the disaster (% of GDP)	EMDAT, CRED GDP from WDI
Technology	Internet users	Individuals using the Internet (% of population)	WDI
	Mobile subscriptions*	Mobile cellular subscriptions (per 100 people)	WDI
CONTROLS			
Income level	Income per capita	GDP per capita, PPP (constant 2017 international $)	WDI
Education	Education	Average years of total schooling (15-64)	Barro & Lee (2013) (version 3.0, 2021 September) http://www.barrolee.com/
Trade policy	Tariff rate	Applied tariff rate, weighted average (%)	UNCTADStat, United Nations Conference on Trade and Development https://unctadstat.unctad.org
Access to finance	Private credit	Domestic credit to private sector (% of GDP)	WDI
Macro-economic instability	Inflation volatility	Standard deviation of inflation (consumer prices, annual %) for each country and 5-year period	WDI
Institutions	Government effectiveness	Government effectiveness, index (higher number means more effectiveness)	Worldwide Governance Indicators http://info.worldbank.org/governance/wgi/

Note: Variables marked with an asterisk are used as alternative measurements in robustness checks.

Table A2
Summary statistics

	N	Mean	SD	Min	Max
Poverty headcount	340	9.70	14.94	0.00	61.00
Poverty gap	340	3.16	5.25	0.00	26.70
Income inequality	340	42.08	10.57	23.03	72.95
Income inequality (Palma ratio)	339	2.54	1.75	0.77	14.14
Urbanization	340	60.29	20.21	11.83	97.96
Urbanization (urban areas, % of total surface)	340	1.12	1.53	0.01	8.52
Age dependency	340	58.77	15.48	36.03	106.50
Age dependency (young)	340	44.13	21.55	17.86	101.54
Age dependency (old)	340	14.64	8.75	3.12	39.53
Climate change (disaster-affected population)	340	0.84	4.11	0.00	59.77
Climate change (disaster-related damage)	340	0.46	5.33	0.00	93.71
Technology	340	37.08	30.18	0.00	97.12
Technology (mobile subscriptions)	340	81.43	45.41	0.00	177.59
Income per capita	340	21 204	19 307	1 075	114 543
Education	340	8.99	2.76	1.30	13.27
Tariff rate	340	5.68	4.88	0.09	40.69
Private credit	340	60.38	45.22	0.19	188.63
Inflation volatility	340	2.77	6.93	0.14	113.45
Government effectiveness	340	0.26	0.94	-1.49	2.23

Note: Sample corresponds to the panel regression with country fixed effects on the full sample, with variables aggregated into 5-year averages.

Table A3
Countries included in the regressions

Albania	**Haiti**	**Pakistan**
Algeria	**Honduras**	**Panama**
Armenia	Hungary	**Papua New Guinea**
Australia	Iceland	**Paraguay**
Austria	**India**	**Peru**
Bangladesh	**Indonesia**	**Philippines**
Belgium	**Iran (Islamic Republic of)**	Poland
Belize	Ireland	Portugal
Benin	Israel	Romania
Bolivia (Plurinational State of)	Italy	Russian Federation
Botswana	**Jamaica**	**Rwanda**
Brazil	Japan	**Senegal**
Bulgaria	**Jordan**	Serbia
Cameroon	**Kazakhstan**	**Sierra Leone**
Canada	**Kenya**	Slovakia
Chile	**Korea, Republic of**	Slovenia
China	**Kyrgyzstan**	**South Africa**
Colombia	**Lao People's Dem. Rep.**	Spain
Congo	Latvia	**Sri Lanka**
Costa Rica	**Lesotho**	**Sudan**
Croatia	**Liberia**	Sweden
Cyprus	Lithuania	Switzerland
Czechia	Luxembourg	**Tajikistan**
Côte d'Ivoire	**Malaysia**	**Tanzania, United Republic of**
Denmark	**Maldives**	**Thailand**
Dominican Republic	**Mali**	**Togo**
Ecuador	**Mauritania**	**Tonga**
Egypt	**Mauritius**	**Tunisia**
El Salvador	**Mexico**	**Turkey**
Estonia	Moldova, Republic of	**Uganda**
Fiji	**Mongolia**	Ukraine
Finland	**Morocco**	**United Arab Emirates**
France	**Myanmar**	United Kingdom
Gabon	**Namibia**	United States of America
Gambia	**Nepal**	**Uruguay**
Germany	Netherlands	**Viet Nam**
Ghana	**Nicaragua**	**Zambia**
Greece	**Niger**	**Zimbabwe**
Guatemala	Norway	

Note: Developing countries are marked in bold, based on the Standard Country or Area Codes for Statistical Use (M49) of the United Nations Statistics Division, as of December 2021 (https://unstats.un.org/unsd/methodology/m49/).

Table A4
Correlations

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)
(1) Poverty headcount	1.00																		
(2) Poverty gap	0.98	1.00																	
(3) Income inequality (Gini)	0.66	0.66	1.00																
(4) Income inequality (Palma ratio)	0.64	0.65	0.91	1.00															
(5) Urbanization (urban population)	-0.60	-0.51	-0.41	-0.32	1.00														
(6) Urbanization (urban areas)	-0.36	-0.33	-0.49	-0.39	0.38	1.00													
(7) Age dependency ratio (total)	0.76	0.72	0.61	0.53	-0.52	-0.36	1.00												
(8) Age dependency ratio (young)	0.78	0.73	0.73	0.63	-0.61	-0.49	0.94	1.00											
(9) Age dependency (old)	-0.58	-0.52	-0.74	-0.61	0.58	0.58	-0.55	-0.80	1.00										
(10) Climate change (disaster-affected population)	0.21	0.22	0.19	0.23	-0.23	-0.11	0.12	0.15	-0.17	1.00									
(11) Climate change (disaster-related damage)	0.03	0.02	-0.02	-0.03	-0.04	-0.05	0.05	0.06	-0.07	-0.01	1.00								
(12) Technology (internet users)	-0.59	-0.54	-0.62	-0.52	0.62	0.51	-0.57	-0.71	0.74	-0.16	-0.09	1.00							
(13) Technology (mobile subscriptions)	-0.53	-0.50	-0.42	-0.36	0.40	0.36	-0.51	-0.58	0.52	-0.10	-0.12	0.74	1.00						
(14) Income per capita	-0.54	-0.49	-0.64	-0.50	0.65	0.55	-0.51	-0.67	0.74	-0.15	-0.05	0.75	0.44	1.00					
(15) Education	-0.74	-0.67	-0.70	-0.56	0.62	0.47	-0.76	-0.85	0.74	-0.17	-0.04	0.73	0.54	0.68	1.00				
(16) Tariff rate	0.50	0.44	0.47	0.36	-0.45	-0.39	0.51	0.60	-0.58	0.06	-0.01	-0.60	-0.57	-0.51	-0.64	1.00			
(17) Private credit	-0.47	-0.43	-0.45	-0.35	0.50	0.35	-0.53	-0.61	0.57	-0.10	-0.07	0.63	0.39	0.68	0.57	-0.44	1.00		
(18) Inflation volatility	0.16	0.14	0.15	0.12	-0.14	-0.11	0.13	0.16	-0.17	0.01	0.13	-0.17	-0.15	-0.18	-0.11	0.12	-0.17	1.00	
(19) Government effectiveness	-0.54	-0.49	-0.62	-0.48	0.65	0.52	-0.55	-0.69	0.73	-0.17	-0.03	0.71	0.36	0.87	0.69	-0.53	0.74	-0.23	1.00

Note: Sample corresponds to the panel regression with country fixed effects on the full sample, with variables aggregated into 5-year averages.


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