How Many Days to Get a Dollar? A Robust and Inclusive Measure of Poverty

Olivier Sterck*

September 21, 2025

Abstract

How has global poverty evolved over the past decades? Mainstream poverty measures fail to provide robust answers because they heavily depend on the selected poverty line. I address this limitation by proposing a new, inclusive poverty measure, where individual poverty is defined as the reciprocal of income. Average poverty is simply the average time needed to get $1. The measure is inclusive, distribution sensitive, decomposable, and aligns with how both experts and the public conceptualize poverty. Using this metric, I find that global poverty declined by 55% since 1990, from about half a day to five hours to get $1.

JEL: D63, I32, O15.

Keywords: Poverty, Poverty line, Focus Axiom, Inequality Aversion.

*University of Oxford and University of Antwerp. Email: olivier.sterck@qeh.ox.ac.uk. I thank Matthew Adler, Francois Bourguignon, Paul Collier, Benoit Decerf, Maya Eden, Francisco Ferreira, James Foster, Dean Jolliffe, Charles Kenny, Talip Kilic, Aart Kraay, Christoph Lakner, Daniel Mahler, Berk Ozler, Paolo Piacquadio, Lant Pritchett, Natalie Quinn, Laurence Roope, and Nishant Yonzan for feedback, suggestions, and encouragements. I also thank seminar and conference participants at the London School of Economics, the Normative Economics and Economic Policy e-seminar, the Conference in Memoriam of Martin Ravallion (Georgetown University), the University of Sheffield, the University of Antwerp, the 11th Annual Christmas Meeting of Belgian Economists, the Ragnar Frisch Centre for Economic Research, FAO's Technical Network on Poverty Analysis, the 2024 CSAE conference, and the 2025 ECINEQ conference for their comments. I also thank all the participants in the surveys. I gratefully acknowledge financial support from the University of Antwerp through a ZAPBOF startkrediet. The survey experiment received Institutional Review Board (IRB) clearance from the Ethics Committee for the Social Sciences and Humanities (EASHW) at the University of Antwerp, under protocol EX_SHW_2023_18_1. This paper is a companion paper to Kraay ⓕ et al. (2025).

1 Introduction

Mainstream poverty measures cannot robustly answer one of the most basic questions about living standards: Has global poverty increased or decreased over the past decades? Figure 1 shows how the poverty rate and headcount have evolved under different poverty lines. Using the World Bank's extreme poverty line of $2.15, poverty appears to have declined dramatically, from affecting 38% of the world's population in 1990 (2 billion people) to 8.5% in 2024 (690 million). By contrast, with higher lines such as the ones proposed by Pritchett (2003), Hickel (2016), or Roser (2024), poverty appears to have stagnated: it has declined only slightly in percentage terms, risen in absolute terms, and remains at levels that suggest a near-complete failure of global anti-poverty programmes. The poverty gap and other measures tell a similarly ambiguous story (Appendix Figure A.1).

This lack of robustness reflects a fundamental limitation of existing measures: their heavy reliance on a specific choice of poverty line (Deaton, 2016). All mainstream poverty metrics rely on the focus axiom, which assumes that only incomes below the poverty line matter (Zheng, 1997). As a result, someone earning $2.16 per day is treated as equally non-poor as someone earning $10, $100, or even $1 million. The focus axiom thus artificially removes billions of low-income individuals from poverty accounting. Given the absence of consensus on where to draw the poverty line (Deaton, 2010; Decerf, 2025), it also creates perverse incentives to select a poverty line that best fits a predetermined narrative (Ravallion, 2012).

A second, equally important limitation of existing measures is the trade-off between intuitiveness and distribution sensitivity. Measures such as the poverty headcount and poverty gap are widely used precisely because they are simple and easy to communicate. But they are not distribution sensitive: they do not give more weight to the poorest of the poor.[1] This issue has been well recognized since the seminal work of Watts (1968) and Sen (1976) and, while many scholars have proposed distribution-sensitive alternatives (Zheng, 1997), these are rarely used in practice because they lack intuitive interpretation and are often too complex to communicate effectively. To date, no poverty measure is both distribution sensitive and easy to understand.

To address these limitations, this paper introduces a new, inclusive measure of poverty that considers the entire income distribution and has excellent properties in terms of interpretability, distribution sensitivity, and decomposability.

[1]The common definition of distribution sensitivity requires satisfying the transfer axiom, which states that poverty should increase following a regressive Pigou-Dalton transfer (Zheng, 1997).

The starting point is an analogy. Virtually everyone would agree that a runner covering 20 kilometers in one hour is twice as fast as one covering only 10 kilometers. Likewise, the second runner is twice as slow. There is no threshold or "slowness line" beyond which these relationships no longer apply: a runner covering 5 kilometers in one hour is twice as slow as one covering 10 kilometers. The same logic holds for other multiples: running at 5 kilometers per hour is three times as slow as running at 15. Of course, when evaluating the speed of a single runner, people may disagree on whether it is "fast" or "slow", depending on their reference point. But when comparing two runners, most would agree on such cardinal relationships. In mathematical terms, speed is the reciprocal of slowness—usually referred to as pace in running.

People have similar intuitions about the measurement of many cardinal variables that range between zero and infinity, including height, distance, and weight. In fact, for many physical quantities, scientists distinguish variables from their reciprocals, for example slowness and speed in seismology, resistance and conductance in electricity, specific volume and density in thermodynamics, or period and frequency in physics.

In this paper, I apply the same logic to derive a new poverty measure, where individual poverty is defined as the reciprocal of income.[2] This definition mirrors reciprocal relationships in physics, and aligns with the intuition that a person A with half the income of B is twice as poor as B and, conversely, B is twice as rich as A. As a result, poverty is a spectrum rather than a binary status. It does not depend on a threshold.

At the aggregate level, for any population of size n, I show that the only aggregate measure of income richness R that satisfies the above logic and is additively decomposable in population subgroups is average income ($\bar{y}$):

$$R = \bar{y} = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{k}, \tag{1}$$

where y_i is individual i's income and k is a constant that determines the unit of measurement. Similarly, the only aggregate measure of income poverty P that satisfies the above logic and is additively decomposable in population subgroups

[2]Consistent with the literature, I use the generic term *income* broadly, to refer to a measure of individual or household wellbeing, recognizing that actual datasets usually combine income and consumption data (see e.g., PIP data base from the World Bank). I use *income*, *income prosperity*, and *income richness* interchangeably. I also use *poverty* and *income poverty* interchangeably.

is:

$$P = \frac{1}{n} \sum_{i=1}^{n} \frac{k}{y_i}, \tag{2}$$

In what follows, I refer to this measure as *average income poverty* or simply *average poverty*, because P represents the simple arithmetic mean of individual poverty functions, where poverty is simply the reciprocal of income, and vice versa.[3]

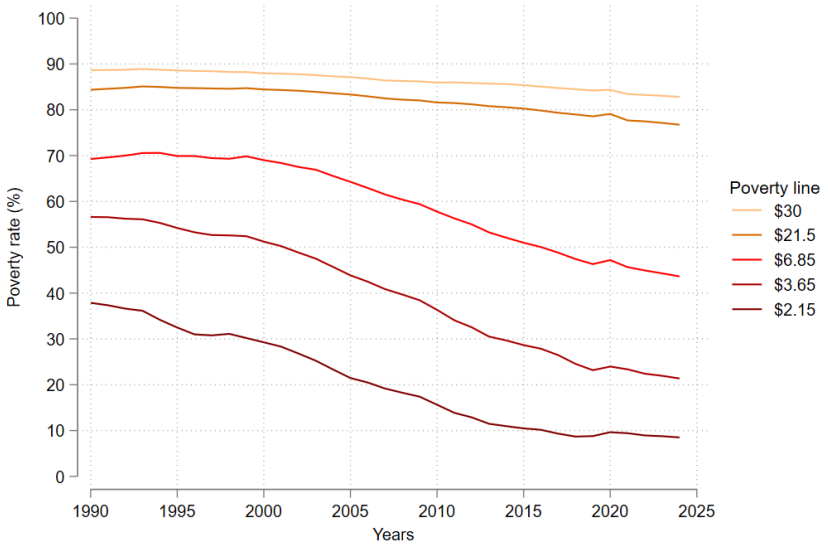
For four reasons, I argue that average poverty is a valuable complement to existing poverty indicators.

First, average poverty has a simple and intuitive interpretation, which stems from the fact that income poverty is the reciprocal of income richness. The unit of income poverty is simply the inverse of the unit of income. If income is measured in dollars per day ($/day), income poverty is expressed in days per dollar (days/$).[4] This framing provides an immediate sense of economic scarcity. For instance, in 2024, people in the Democratic Republic of Congo needed on average one day to get just $1, compared to half a day in Haiti, two hours in China, 85 minutes in the US, and just 25 minutes in Switzerland.

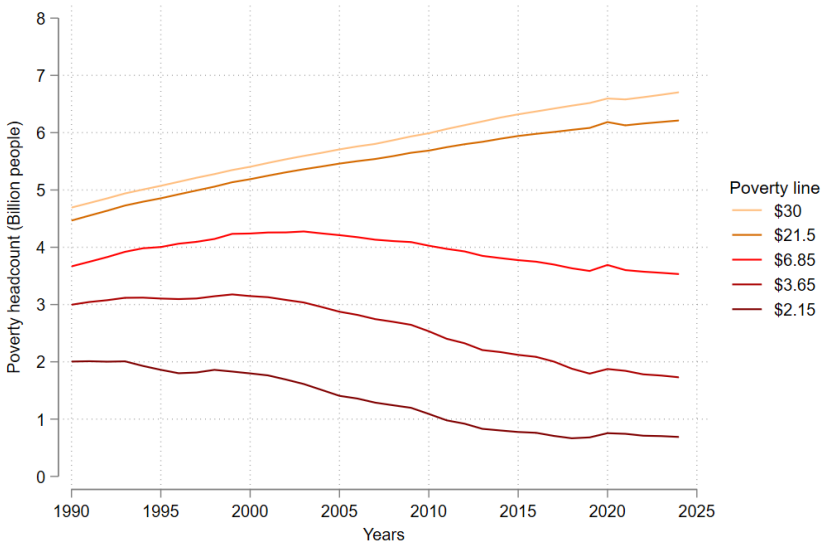
Second, average poverty aligns closely with the way many experts and members of the public perceive poverty. I conducted an online survey involving 248 academics and policymakers who attended presentations of this study, as well as 2,268 participants from Kenya, India, South Africa, and the United States, recruited through an online panel managed by CloudResearch. Participants were asked to compare individuals with varying income levels and to allocate transfers. The survey results reveal two distinct perspectives on poverty. Approximately one-third of respondents broadly adhere to a binary or focused view of poverty, drawing a sharp distinction between the poor and non-poor. In contrast, about half of the respondents have a more continuous or inclusive view of poverty, seeing it as a spectrum independent of strict thresholds. This latter group's responses are consistent with average poverty and the perspective that poverty is a continuous function which is inversely proportional to income. While traditional poverty measures capture only the focused view, average poverty provides a representation of the inclusive view.

[3] In a companion paper with Kraay ⓡ et al. (2025), we show how P can be used to monitor *shared prosperity*—one of the twin objectives of the World Bank—and in that context, we use the term *Prosperity Gap*.

[4] All amounts in $ in this paper are expressed in constant 2017 Purchasing Power Parity dollars ($PPP).



(a) Poverty rate



(b) Poverty headcount

Figure 1: Global poverty rate and headcount over time

Data source: PIP data (World Bank). Income is measured at 2017 $PPP per person per day. Poverty rates are calculated for the World Bank poverty lines of $2.15, $3.65, and $6.85 as well as for Pritchett and Viarengo (2025)'s line of $21.5 and Roser (2024)'s line of $30 per person per day.

Third, average poverty has excellent properties: (1) it is additively decomposable in population subgroups; (2) it is distribution sensitive, fully accounting for the depth and severity of poverty; and (3) its changes can be meaningfully decomposed into average income growth and changes in a new inequality measure, providing a new coherent framework for analyzing Bourguignon (2003)'s Poverty-Growth-Inequality Triangle (see also Kraay ⓡ et al. 2025). This decomposition has no residual term, greatly simplifying Datt and Ravallion (1992)'s decomposition framework. Average poverty is also the first inclusive measure of poverty, accounting for all incomes in the distribution. Inclusivity offers several advantages. Conceptually, it is consistent with the principle of non-satiation, which is central in microeconomic theory and underpins most models of consumer behavior (see, e.g., Mas-Colell et al., 1995). Empirically, there is little evidence of sharp discontinuities in subjective well-being, nutritional status, health, access to services, or income dynamics at commonly used poverty lines (Tella et al., 2003; Pritchett, 2013; Stevenson and Wolfers, 2013; Lindqvist et al., 2020; Killingsworth, 2021; Pritchett, 2024).[5] Empirically, survey results show that most respondents place little weight on the poverty line when comparing incomes or allocating resources among low-income individuals. Their answers are largely consistent with the view that poverty is a continuous function of income. Theoretically, the absence of cut-off implies average poverty generates orderings[6] and comparisons[7] that do not depend on a reference level of income, such as a poverty line.

Fourth, average poverty has a clear normative foundation: minimizing average poverty is equivalent to maximizing an Atkinson social welfare function (SWF) with an inequality aversion parameter of 2 (Atkinson, 1970). This implicit value aligns closely with empirical estimates from the online survey, which suggest average inequality aversion coefficients of 2.11 among experts (95% CI: 1.93-2.30, median = 2) and 2.41 in the general public (95% CI: 2.35-2.47, median = 2.75). The framework can also be extended to accommodate alternative degrees of inequality aversion.

I use average poverty to revisit the question of whether global poverty has increased or decreased over the past decades. The results show a 55% decline in global poverty between 1990 and 2024, driven primarily by rapid income growth in

[5] As discussed below, evidence of satiation only emerges above $150 per day and only for variables that capture emotional well-being (Kahneman and Deaton, 2010; Lindqvist et al., 2020; Killingsworth et al., 2023).

[6] For example, the ranking of countries according to average poverty.

[7] For example, the ratio of average poverty in countries A versus B, or the ratio of average poverty in country A at time t versus $t+1$.

East Asia. In contrast, progress in other regions has been slower and more uneven. Decomposing changes in poverty into growth and inequality components, I find that poverty reduction was due mainly to economic growth rather than changes in inequality.

Reflecting its practical value, the World Bank has adopted P with $z = 25$ as its key indicator for monitoring shared prosperity, one of its two institutional goals (Kraay et al., 2023).

This paper contributes to the literature on poverty measurement, which has traditionally been organized around two core questions (Sen, 1979). The identification question concerns how and where to place the poverty line, dividing the population into the poor and non-poor. The aggregation question asks how to combine individual data into a summary index. Both questions have been the subject of extensive debate. On identification, there is no consensus on how to define global or national poverty lines (Deaton, 2010; Ferreira et al., 2016; Allen, 2017; Decerf, 2025), resulting in a proliferation of lines and substantial variation across countries (Jolliffe et al., 2024). On aggregation, the literature has yet to develop poverty measures that are both intuitive and distribution sensitive. Standard measures such as the poverty headcount, rate, and gap are easy to interpret but ignore the depth and severity of poverty (Sen, 1976), while more sophisticated indices account for distributional concerns but are rarely used in practice due to their complexity (Zheng, 1997).

This paper addresses both the identification and aggregation questions. First, it sidesteps the identification problem entirely by eliminating the need for a poverty line, allowing for consistent comparisons across countries and over time. This contribution relates to Ravallion (1994)'s discussion of whether social welfare should be measured with or without a poverty line. Second, it contributes to the aggregation question by proposing average poverty, a measure with a straightforward interpretation in days per dollar and desirable properties, including distribution sensitivity and additive decomposability. Average poverty is a monotonic transformation of Atkinson (1970)'s SWF with an inequality aversion parameter of 2 (i.e. the harmonic mean).[8] The paper thus contributes to the growing literature

[8]Average poverty P and the Atkinson class $A(\epsilon)$ should be distinguished, given their different interpretations, origins, and properties. The two measures evolve in opposite direction as P aims to measure poverty while $A(\epsilon)$ aims to measure welfare. The Atkinson class is generally not additively decomposable in population subgroups (see Bossert and Weymark (2004), Adler 2011 and Adler 2019 for excellent references on the axioms behind the Atkinson SWF). The main interpretation of the Atkinson SWF, in terms of *equally distributed equivalent income*, is primarily normative as it depends on people agreeing on the functional form of the SWF and on the extent of inequality aversion. By contrast, the interpretation of average poverty is primarily

that uses this SWF—for instance to study targeting (Waldinger, 2021), pro-poor growth (Foster and Székely, 2008), or social mobility (Ray and Genicot, 2023)—by providing a new transformation, justification, and interpretation of this SWF. The paper also introduces a coherent framework for studying poverty, prosperity, and inequality, in line with Bourguignon (2003)'s Poverty-Growth-Inequality Triangle.

This paper is part of a broader research agenda on simple, interpretable, and distribution-sensitive measures of welfare, poverty, and inequality, which contributes to the Beyond-GDP literature (Stiglitz et al., 2009; Fleurbaey and Blanchet, 2013; Stiglitz et al., 2018). Two companion papers develop complementary aspects of this agenda. In Kraay ⓡ et al. (2025), we propose an axiomatic framework for simplicity in welfare measurement and show that R and P are the unique measures satisfying certain simplicity and ethical principles. We also show how P can be applied to monitor shared prosperity, one of the twin goals of the World Bank, and discuss practical data challenges, such as income mismeasurement in the lower tail. It is the background paper that led to the adoption of the measure by the World Bank. In Moramarco and Sterck (2025), we characterize the class of inequality measures that are both multiplicatively decomposable in within- and between-group components and additively subgroup decomposable. The central member of this class is the inequality measure associated with average poverty, complementing the present paper's focus on poverty measurement.

A further contribution of this paper is to estimate inequality aversion, both among experts and the general public. With discounting, the degree of inequality aversion is probably the most important parameter in normative and welfare economics. Yet surprisingly few papers attempted to estimate this parameter (Clark and d'Ambrosio, 2015) and the few existing attempts focused on samples in high-income countries (Amiel et al., 1999; Johansson-Stenman et al., 2002; Pirttilä and Uusitalo, 2010). This paper provides new estimates from diverse settings, and shows that the implied degree of inequality aversion in average poverty aligns closely with observed preferences.

The framework presented in this paper can have interesting applications beyond the literature on aggregate measures of poverty and welfare. In applied econometrics, individual or household poverty k/y_i can be a useful variable in empirical analyzes. The inverse transformation is concave (as the log transformation). As a result, this transformation is useful to capture impacts at the bottom of the income distribution and reduce the importance of outliers at the top of the distribution. In impact evaluations, individual poverty can be a useful out-

descriptive, in terms of days per dollar.

come variable when programs or shocks are expected to impact the bottom of the income distribution. Average treatment effect estimates have the advantage of being directly and meaningfully interpretable in terms of days per dollar. More generally, while this paper focused on the measurement of income prosperity and poverty, the framework and formulas can be directly transposed to the (aggregate) measurement of other quantities and their reciprocal, not only in economics but also in other sciences.

The paper is organized as follows. In Section 2, I use an axiomatic approach to derive the measure of average income and average poverty described in Equations (1) and (2), respectively. I discuss the interpretation and properties of average poverty in Section 3 and 4, respectively. In Section 5, I describe the survey experiment I conducted to assess general views on poverty and inequality aversion and describe results. In Section 6, I use the new measure to answer the question of how poverty evolved over the past decades. In Section 7, I examine different pathways to generalize the new measure, and Section 8 concludes.

2 Axiomatic derivation

I use an axiomatic approach to derive the cardinal measures of average income and average poverty described in Equations (1) and (2), respectively. I focus on a population of size n with an income distribution $Y = (y_1, ..., y_n)$, with $y_i > 0$ for all i in $1, ...n$. The population can be divided into m subgroups according to some characteristic of interest (e.g. regions within a country). I denote n_j the population size of subgroup j and Y_j the vector of incomes in the subgroup j, with $n = n_1 + n_2 + ... + n_j$, and $Y = (Y_1, Y_2, ..., Y_m)$.

The main theorem in this paper builds of four axioms. First, I rely on the well-known Decomposability Axiom proposed by Foster et al. (1984), which ensures subgroup consistency (Foster and Shorrocks, 1991). Then, the Proportionality Axiom (A2) and Inverse Proportionality axiom (A3) generalize the running analogy used in the introduction and the intuition that, if a person A has half the income of B, then B is twice as rich as A and, conversely, A is twice as poor as B. These axioms will determine the functional form of the indices. The Normalization Axiom (A4) defines the unit of measurement of the indices, in terms of a constant k.

(A1) Decomposability Axiom: A measure $M(Y, k)$ is additively decomposable in population subgroups if, for every population and partition into subgroups,

the following is true: $M(Y,k) = \sum_{j=1}^{m} \frac{n^j}{n} M(Y^j,k)$.

(A2) Proportionality Axiom: For every income y_i and y_j, $M(y_i,k) = \delta M(y_j,k)$ with $\delta = y_i/y_j$.

(A3) Inverse Proportionality axiom : For every income y_i and y_j, $M(y_i,k) = \delta M(y_j,k)$ with $\delta = y_j/y_i$.

(A4) Normalization: For every population of size n, if $Y = (k,...k)$ then $M(Y,k) = 1$.

These four axioms are combined to uniquely characterize the measures R and P defined in the introduction.

Theorem 2.1. *An index $M(Y,k)$ satisfies Decomposability (A1), Proportionality (A2), and (A4) Normalization if and only if:*

$$M(Y,k) = R = \bar{y} = \frac{1}{n}\sum_{i=1}^{n}\frac{y_i}{k},$$

An index $M(Y,k)$ satisfies Decomposability (A1), Inverse Proportionality (A3), and (A4) Normalization if and only if:

$$M(Y,k) = P = \frac{1}{n}\sum_{i=1}^{n}\frac{k}{y_i},$$

Proof. For the necessary part of the theorem, Decomposability (A1) implies that $M(Y,k) = 1/n \sum_{i=1}^{n} f(y_i,k)$ for some individual poverty function f of the individual income y_i and the reference level of income k (Foster and Shorrocks, 1991). Proportionality (A2) implies that $f(y_i,k)$ is homogeneous of degree 1 in y_i: $f(y_i,k) = g(k)\ y_i$. Inverse Proportionality (A3) implies that $f(y_i,k)$ is homogeneous of degree -1 in y_i: $f(y_i,k) = h(k)/y_i$. Normalization (A4) implies $g(k) = 1/k$ and $h(k) = k$.

For the sufficiency part of the theorem, it is straightforward that R satisfies A1, A2, and A4; and that P satisfies A1, A3 and A4.

■

This Section focused on the measurement of average income and average poverty, but the axioms and theorem can be easily applied to any finite population and quantity $x \in]0, +\infty[$.

3 Interpretation

Average poverty has a clear interpretation and simple units, stemming directly from the fact that income poverty is the reciprocal of income prosperity. The unit of measurement of a reciprocal is simply the inverse of the unit of the original measure. For instance, as speed is defined as distance traveled per unit of time (e.g., km/h or miles/h), slowness is measured as a unit of time divided by a unit of distance. In running for example, pace is the reciprocal of speed and is usually measured in minutes per kilometer or mile.

The unit of income poverty is therefore the inverse of the unit of income which, in the literature on poverty, is typically expressed in dollars per day. If the constant k is set as 1, average poverty is expressed in days per dollar. It is the average number of days needed to get one dollar.

For instance, using data from the World Bank's PIP database, I estimate that in 2024, people in the Democratic Republic of Congo needed one full day on average to earn just \$1, highlighting the country's extreme destitution. In comparison, the average time needed to get \$1 was half day in Haiti, 2 hours in China, 85 minutes in the US, and only 25 minutes in Switzerland.

The constant k can fixed at another level to change the units of average income and average poverty. For example, to aid interpretation, k can be selected to represent a meaningful reference level of income such as a poverty or prosperity standard.[9] Note that k is just a scaling factor, implying that changing k has no impact on rankings and comparisons. For simplicity, I use $k = 1$ in the remainder of the paper.

4 Properties

The measure P occupies a unique position among existing poverty and welfare measures (Figure 2). Like traditional poverty measures, it decreases as incomes

[9] In the companion paper by Kraay ⓡ et al. (2025), we examine an alternative interpretation of P, which focuses on growth and prosperity: P is the average factor by which individual incomes must be multiplied to attain the reference level of income k. Setting k as a prosperity standard equal to \$25, we propose P as a new indicator of shared prosperity.

rise. Yet, unlike them, it is *inclusive*, accounting for all incomes in the distribution. Inclusivity is typical of welfare measures and of many inequality measures, but in sharp contrast with existing poverty measures, which have traditionally imposed the focus axiom. P is the first poverty measure to adopt this inclusive approach.

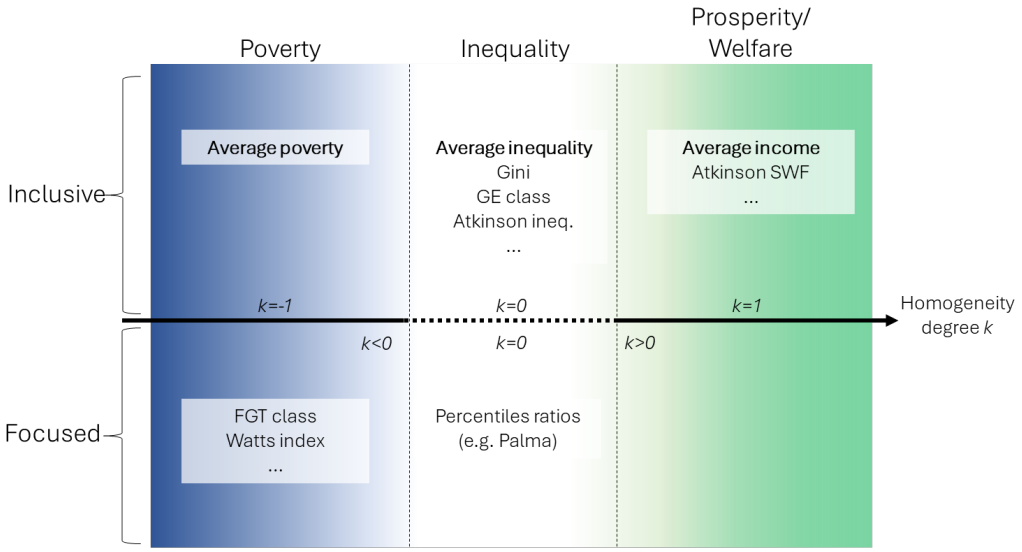


Figure 2: Framework on inclusive and focused measures of income poverty, inequality, and prosperity

Average poverty has excellent properties. First, by construction, it is additively decomposable in population subgroups (Axiom A1). Decomposability is a crucial property because it allows to understand how poverty aggregates across different segments of society. When a poverty measure is additively decomposable, the overall poverty level can be broken down into contributions from different subgroups, such as regions, gender, or income groups. Such decomposition may shed light on disparities between subgroups and differential trends, enabling policymakers to target interventions effectively. Decomposability also implies subgroup consistency, meaning that changes that occur in subgroups are consistently reflected at the global level (Foster and Shorrocks, 1991). Except for the poverty measure introduced by Sen (1976), most poverty measures are additively decomposable.

Second, average poverty is distribution sensitive because it gives more weight to changes that take place at the bottom of the income distribution. The simplest definition of distribution sensitivity requires P to satisfy both the Monotonicity and Transfer axioms (Zheng, 1997). The Monotonicity axiom dictates that P should increase when an individual's income decreases. The transfer axiom states that P should increase following a regressive transfer. It is straightforward that average poverty satisfies these two axioms. By contrast, neither the poverty head-

count nor the poverty gap is distribution sensitive because they do not satisfy the Transfer axiom.

A more demanding definition of distribution sensitivity also requires P to satisfy the Transfer Sensitivity axiom, which asserts that P should assign greater importance to transfers taking place lower in the distribution of incomes (Kakwani, 1980). Average poverty also satisfies this more demanding definition.

I generalize the definitions of distribution sensitivity beyond transfer sensitivity, keeping the same notation as in Section 2. Zheng (1997) shows that, if a measure $M(Y,k)$ is decomposable and its underlying individual poverty function $f(y_i,k)$ is continuously differentiable (C^1), then the Monotonicity axiom is equivalent to having $\frac{\partial f}{\partial y_i} < 0$. Similarly, if $M(Y,k)$ is decomposable and $f(y_i,k)$ is twice-continuously differentiable (C^2), the Transfer axiom is equivalent to having $\frac{\partial^2 f}{\partial {y_i}^2} > 0$. Going one step further, if $M(Y,k)$ is decomposable and $f(y_i,k)$ is C^3, the Transfer Sensitivity axiom is equivalent to having $\frac{\partial^3 f}{\partial {y_i}^3} < 0$. In each step, the "derivative of the previous step" changes sign to reflect the fact that higher priority is given to changes that take place at the bottom of the distribution. I extend this sequence and define s-th degree sensitivity. If $M(Y,k)$ is decomposable and $f(y_i,k)$ is s times continuously differentiable (C^s), then $M(Y,k)$ satisfies s-th degree sensitivity if $\frac{\partial^s f}{\partial {y_i}^s}$ is negative when s is an odd number, and positive when s is an even number. It is straightforward that average poverty satisfies s-th degree sensitivity for s approaching infinity.[10]

A third key property of average poverty is that it can be meaningfully decomposed into average income and a new inequality measure (Kraay ⓡ et al., 2025), which itself has excellent properties and an intuitive interpretation. As discussed by Sen (1976), the inequality measure corresponding to P is obtained by replacing k by average income $\bar{y}$ in Equation (2):

$$P(Y,k) = \frac{I(Y)}{R(Y,k)} \qquad \text{with} \qquad I(Y) = P(Y,\bar{y}) = \frac{1}{n}\sum_{i=1}^{n}\frac{\bar{y}}{y_i}. \tag{3}$$

I refer to this measure as the *average inequality ratio* or simply *average inequality*, as $I(Y)$ is a simple arithmetic mean of inequality ratios.

The formulas for R, P, and I are interconnected, sharing a common structure characteristic of decomposable measures. It is straightforward that $I(Y) = P(Y,\bar{y})$ and $R(Y,k) = 1/P(\bar{y},k)$. The three indicators differ in their degrees of homogene-

[10]The class of measures proposed by Chakravarty (1983) also exhibits this property, but it is scarcely used because it lacks an intuitive interpretation.

ity: $R(Y,k) = \bar{y}$ is homogeneous of degree 1, P of degree - 1, and I of degree 0. The trio of measures forms a policy-relevant dashboard with strong properties and intuitive interpretations, which can be used to monitor income prosperity, poverty, and inequality in line with Bourguignon (2003)'s Triangle. Unlike Datt and Ravallion (1992)'s decomposition framework, this decomposition has the advantage of being exact, without residual term.

The inequality measure $I(Y)$ has unique properties. It can be interpreted intuitively, unlike many other inequality indices. I focus here on two original interpretations. $I(Y)$ is the average number of days needed to get average income. For instance, the inequality measure in the US was 4.9 in 2024, meaning that US inhabitants need on average about five days to get the average income. The inequality measure is also the expected ratio between the incomes of two randomly selected individuals.[11] For example, pick two individuals randomly in the US, then the expected ratio of their income is 4.9 (but only 1.4 if you do the same in Switzerland, where inequality is much lower). The inequality measure $I(Y)$ satisfies key axioms in the measurement of inequality, including Scale Invariance, Transfer, and Transfer Sensitivity.[12] The inequality measure $I(Y)$ allows for an exact (multiplicative) decomposition into within-group and between-group inequality components, as well as an exact additive decomposition in subgroups. These decomposition properties are further examined in the companion papers by Kraay ⓡ et al. (2025) and Moramarco and Sterck (2025).[13] They can for instance be used to split global inequality into contributions coming from different regions or countries and thereby relate global and local inequality trends.

A fourth interesting property of average poverty directly follows from the absence of poverty line: the measures of average income and average poverty generate orderings (i.e. rankings) and comparisons that are robust to the choice of refer-

[11] This interpretation is related to Sen's interpretation of the Gini coefficient as the expected income gap between two randomly chosen individuals, standardized by the mean income. When calculating the expected ratio of incomes, the random selection is done with replacement, with the first income selected in the numerator and the second one in the denominator (i.e. not always putting the highest income in the numerator). In the context of shared prosperity measurement, Kraay ⓡ et al. (2025) focus on a third interpretation of $I(Y)$: it is the average factor by which incomes must be multiplied to reach average income.

[12] Among well-known inequality indices, only the Atkinson inequality index and some members of General entropy class (for $\alpha < 2$) satisfy the Transfer and Transfer Sensitivity axioms (Shorrocks and Foster, 1987). The Palma ratio and other indices based on quantiles do not satisfy the Transfer axiom and the Gini index does not satisfy the Transfer Sensitivity axiom.

[13] Only the members of the class of General Entropy indices can also be easily decomposed into within-group and between-group inequality (the decomposition is additive) (Shorrocks, 1984). However, General Entropy indices are typically regarded as difficult to interpret and hence rarely used in practice.

ence level of income k.[14] Indeed, k serves as a simple scaling factor in Equations (1) and (2), impacting only the measurement unit of $R(Y,k)$ and $P(Y,k)$. For example, if we compare average poverty in contexts A and B, where A and B can be two different countries or period of time, we have:

$$\frac{P(Y^A,k)}{P(Y^B,k)} = \frac{n^B}{n^A}\frac{\sum_{i=1}^{n^A}\frac{1}{y_i^A}}{\sum_{i=1}^{n^B}\frac{1}{y_i^B}} \tag{4}$$

which does not depend on k. As a result, comparisons in ratio or percentage terms and rankings do not depend on the scaling factor k.[15]

So, which k should be preferred? It depends on the perspective. If the focus is on poverty, a low value of k may be appropriate, and selecting $k = 1$ to express poverty in days per \$ is a natural choice. If instead the objective is to study prosperity and growth, a higher value of k may be preferred. This is the choice we make in Kraay ⓡ et al. (2025), where P is interpreted as the average factor by which incomes need to be multiplied to reach \$25. This is also the focus of the World Bank, which adopted P as its new indicator to monitor *Shared Prosperity*, one of its twin objectives. More importantly, whether $k = 1$, 2.15, or 25, or another value does not affect rankings and trends in P, just as expressing average income in dollars, cents, or thousands of dollars does not affect rankings and trends in $\bar{y}$.

To conclude this section, I briefly discuss the advantages and disadvantages of measuring poverty with or without a poverty line. There are conceptual and empirical arguments.

Conceptually, not using a line is consistent with the principles of non-satiation and diminishing marginal utility, which are central in microeconomic theory and underpins most models of consumer behavior (see, e.g., Mas-Colell et al., 1995). Thresholds can be justified, for example if they have scientific or practical implications. Borrowing an example from Pritchett (2013), thresholds are for example

[14] To emphasize the importance of this property, I quote the late Ravallion (1999), who asserted that *"The most important reason for measuring poverty is probably not the need for a single number for some place and date, but rather to make a poverty comparison."* In the same article, he also argued that, because *"a certain amount of arbitrariness is unavoidable in defining any poverty line in practice, one should be particularly careful about how the choices made affect the poverty comparisons, for these are generally what matter most to the policy implications."*

[15] By contrast, poverty measures that rely on the focus axiom generate comparisons and orderings that often depend on the choice of poverty line. This problem is well-known and scholars have proposed to apply tests of stochastic dominance to determine whether poverty comparisons and orderings are robust or not to the choice of poverty line and poverty measure (Atkinson, 1987; Ravallion, 1999). While mathematically rigorous, these tests are rarely used in practice because quite complex and often inconclusive (Blackburn, 1994; Duclos et al., 2006).

justified when studying temperature, which exhibit different lines. One of them is at 0 degrees Celsius, below which water is solid and above which water is liquid. When it comes to fever, the line is very different, around 37.5 degrees Celsius.

By contrast, there is little evidence of discontinuity or sharp non-linearity around the extreme poverty line of the World Bank or other lines, including in relation with subjective well-being, nutritional status, health, access to services, or income dynamics (Pritchett, 2013, 2024).[16] Empirical studies consistently find no evidence of satiation in the relationship between income and life satisfaction across a wide range of income levels (Tella et al., 2003; Stevenson and Wolfers, 2013; Lindqvist et al., 2020; Killingsworth, 2021), and while some evidence of a satiation point exists for emotional well-being, it only emerges at very high income levels, above $150 per day, that are irrelevant for poverty measurement (Kahneman and Deaton, 2010; Lindqvist et al., 2020; Killingsworth et al., 2023). As expressed by Watts (1968), a pioneer in poverty research, *"Poverty is not really a discrete condition. One does not immediately acquire or shed the afflictions we associate with the notion of poverty by crossing any particular income line. The constriction of choice becomes progressively more damaging in a continuous manner."*

Conceptually, it is also useful to push further the parallel between income prosperity and poverty. When calculating average income, the most widely-used aggregate measure of income prosperity, low incomes are not excluded simply because they are too small or because they do not contribute meaningfully to the measure. There is no "prosperity line" that determines which incomes should be included or excluded from the calculation. All incomes, even the lowest, are considered when calculating average income. Other welfare or prosperity measures and many inequality measures are also inclusive, considering all incomes. Similarly, when assessing poverty, it may not be justified or needed to focus on low incomes.

The absence of thresholds ensures that poverty comparisons and rankings are robust. Similarly, the absence of a "prosperity line" ensures that average income comparisons are invariant to the choice of units.

Empirically, the next section shows that most experts and members of the general public do not believe poverty abruptly ends just above a poverty line. When faced with a choice, the majority prefer to raise the income of the poorer of two individuals, even when doing so does not minimize standard poverty measures.

To be sure, I do not to claim that poverty lines and the focus axiom should be

[16] See also Adler (2011) for a critique of the focus axiom in the context of well-being measurement and Adler (2019) for a critique of *sufficientist* Social Welfare Functions that use thresholds.

rejected in all circumstances. The speed analogy is again useful. Speeding tickets are typically based on thresholds which may vary depending on the circumstances (e.g. within a city or on a motorway). In some context, having thresholds may therefore be justified, often for normative or practical reasons. However, when describing a runner's performance in a marathon, average speed and pace (slowness) are the relevant measures to use, without imposing any specific threshold. Depending on the context and objectives, one might prefer a binary reasoning (too fast or not) or consider the full distribution of the variable of interest. Both types of reasoning can be sometimes combined: speeding tickets are typically given above a certain speed, but the amount might vary depending on the "gap".

Drawing from this analogy, it becomes less contentious to assert that the focus axiom is neither necessary nor sufficient for constructing a poverty measure. Its relevance depends on the specific purpose and context in which it is applied. While thresholds can serve practical purposes—such as helping development agencies determine eligibility for cash transfers—there are other contexts where an inclusive measure like average poverty may prove more relevant, because it is distribution-sensitive and it takes into account the entire income distribution, without relying on potentially arbitrary thresholds.

5 Empirical support

I ran survey experiments among experts and the general public to understand how people conceptualize poverty. The survey of experts targeted 245 participants to talks I gave at the University of Sheffield (N=32), the University of Ghent (N=63), the Ragnar Frisch Centre for Economic Research (N=14), FAO's Technical Network on Poverty Analysis (N=34), and the University of Oxford (N=102).[17] An email with a link to the survey was sent to potential participants a few days before each talk. To maximize response rates and quality, the questionnaire included only seven questions, which are described in Table A.1 in the Appendix. The median respondent took 5 minutes to complete the survey.

The survey among the general public targeted 2,762 participants in Kenya, India, South Africa and the US. Participants were recruited from an online panel accessed through Cloudresearch.[18] Out the 2,762 targeted participants, 494 re-

[17] Questions to assess the extent of inequality aversion were not asked to participants at the University of Sheffield (N=32) and the University of Ghent (N=63), implying that the sample size for that analysis is reduced to N=147.

[18] I initially targeted 500 valid participants per country but Cloudresearch oversampled participants in some countries.

spondents (18%) are excluded from the analysis because they failed an attention check question.[19] The sample used in the analysis therefore includes 2,268 participants. The questionnaire had 13 questions (see Appendix Table A.1), including five questions on demographics that are used to assess how responses vary with observables and thereby provide a basic evaluation of external validity. A note in the consent form explained that some of the decisions taken by participants would be randomly chosen to be applied in practice. The median respondent took 8 minutes to complete the questionnaire.

Several elements of the questionnaire were randomized. First, the ordering of possible answers was randomized. Second, different question parameters were randomly assigned to different respondents. Some of these variations affected whether the respondents' decisions could impact the number of people below and above the poverty line. The analysis of these random variations provides useful information on the extent to which respondents account for the poverty line when taking their decision. Finally, about a quarter of participants in the general public survey did not receive information about the level of the poverty line.[20] All amounts were expressed in $ in the survey of experts and in local currency units in the general public surveys.[21]

[19]The attention check question is a very simple question with an unambiguous answer: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below $2.5 per day per person. Individual A earns $1 per day while individual B earns $3 per day. Which statement is consistent with how you think about poverty?"*. Possible answers, provided in a random order, were: (1) A and B earn the same amount, (2) A earns $1 per day, (3) A earns $2 per day, (4) B earns $1 per day, and (5) B earns $2 per day. The participants who failed the attention check question were significantly faster and also 25 percentage points more likely to provide at least one unusual answer to other questions, where unusual answers are defined as answers provided by less than 10% of respondents. This justifies their exclusion.

[20]For three quarter of the sample, the phrasing was: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below $2.5 per day per person."*. For a quarter of the sample, the sentence did not include a reference to the level of the poverty line: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below a certain level."*

[21]In the expert survey and the main US survey, the poverty line was set at $2.5 which, at the time of the survey, was approximately equivalent to the World Bank's $2.15 extreme poverty line expressed in current dollars. In Kenya, all amounts were multiplied by 40 and the poverty line was set at 100 Kenyan Shillings (KSh), which was approximately equal to the World Bank's $2.15 extreme poverty line expressed in Kenyan Shillings. In India, all amounts were multiplied by 20 and the poverty line was set at 50 rupees, which was approximately equal to the World Bank's $2.15 extreme poverty line expressed in rupees, and to India's urban poverty line. In South Africa, all amounts were multiplied by 20 and the poverty line was set at 50 Rands, which was approximately equal to the World Bank's $6.85 poverty line for upper-middle income countries, and to South Africa's upper-bound poverty line.

5.1 Inverse proportionality

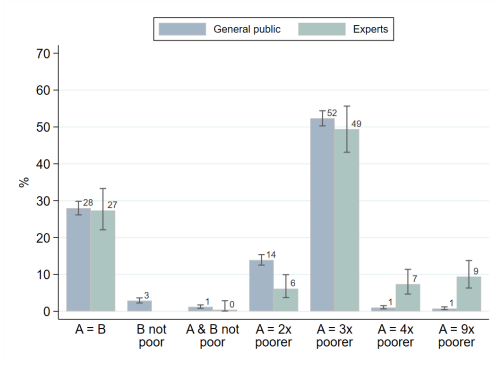
Average poverty directly stems from the Inverse Proportionality axiom (A3). Conceptually, this axiom is consistent with how other physical quantities and their reciprocal are measured. Empirically, I find evidence supporting this axiom in the results of the survey experiment. A substantial proportion of participants think about poverty in ways that align with the Inverse Proportionality axiom and the notion of average poverty.

The first question of the survey was: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below $2.5 per day per person. Individual A earns $0.5 per day while individual B earns $1.5 per day. Which statement is consistent with how you think about poverty?"* Seven possible answers were proposed to respondents, in random order:

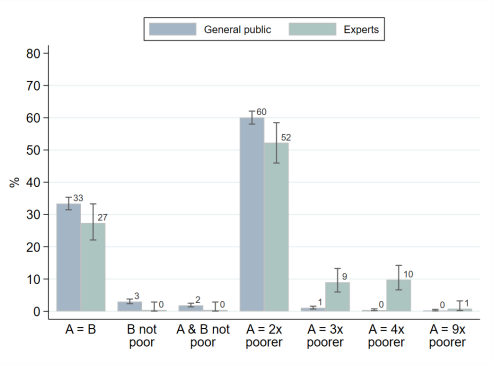
(1) A and B are equally poor
(2) A is poor and B is not poor
(3) Both A and B are not poor
(4) A is approximately 2 times poorer than B
(5) A is approximately 3 times poorer than B
(6) A is approximately 4 times poorer than B
(7) A is approximately 9 times poorer than B

The answers (1), (4), and (6) are consistent with the poverty headcount, the poverty gap, and the squared poverty gap, respectively. These are the most widely used poverty measures, which are part of the Foster-Greer-Thorbecke class (Foster et al., 1984). The answer (5) is consistent with average poverty and the Inverse Proportionality axiom .

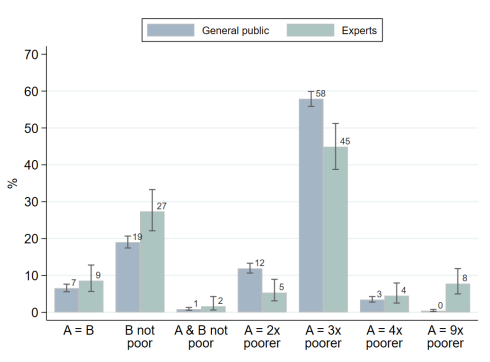
Results are shown in Figure 3(a). About a quarter of respondents replied that *"A and B are equally poor"*, in line with the headcount view of poverty. Only 14 and 6 percent of participants in the general public and expert samples replied that *"A is approximately 2 times poorer than B"*, in line with the poverty gap view of poverty. Very few respondents replied that *"A is approximately 4 times poorer than B"*, which corresponds to the squared poverty gap measure. The most commonly selected answer was that *"A is approximately 3 times poorer than B"*. This response aligns with the Inverse Proportionality axiom , which is the foundation of average poverty. About 52 percent of the general public sample and 49 percent of the sample of experts selected this answer. Results are qualitatively similar in the different countries (Appendix Figures A.4 to A.6).



(a) A earns \$0.5 and B earns \$1.5 per day



(b) A earns \$1 and B earns \$2 per day



(c) A earns \$1 and B earns \$3 per day

Figure 3: Survey results: views on poverty

Data source: survey data, with participants from Kenya (N=569), India (N=581), South Africa (N=629), the US (N=489), and the survey of experts (N=245). The question was: *"The World Bank determined that it is impossible for a person or family to meet basic needs below an income of \$2.5 a day per person. A earns \$X and B earns \$Y per day. Which statement is consistent with how you think about poverty."* Possible answers, whose order was randomized, are: (1) A and B are equally poor, (2) A is poor and B is not poor, (3) Both A and B are not poor, (4) A is approximately 2 times poorer than B, (5) A is approximately 3 times poorer than B, (6) A is approximately 4 times poorer than B, and (7) A is approximately 9 times poorer than B.

Results are very similar if parameters are changed. In a second version of the question, individual A earns \$1 and individual B earns \$2 per day. A majority respondents in each sample selected that *"A is two times poorer than B"*, which is consistent with the Inverse Proportionality axiom and average poverty (Figure 3(b)). Less than a third of participants reported that *"A and B are equally poor"* in line with the poverty headcount. Very few respondents replied that *"A is approximately 3 times poorer than B"* or *"A is approximately 9 times poorer than B"*, which are the answers that are consistent with the poverty gap and squared poverty gap.

In fact, even if B's income is above the poverty line, many answers are consistent with the new measure. In a third version of the question, individual A earns \$1 and individual B earns \$3 per day. This time, respondents who think

with the poverty headcount in mind should answer that *"A is poor and B is not poor"*. About 19 percent of respondents from the general public sample and 27 percent of experts selected this answer. The most frequent answer was again the one that is consistent with average poverty. About 58 percent of respondents from the general public sample and 45 percent of experts replied that *"A is three times poorer than B"*.

Results are robust to experimental modifications. A random subset of participants in the general public survey did not receive information about the level of the poverty line. If anything, results are stronger with this sub-sample (Figure A.7). Similar results are also obtained if all amounts in the questions are scaled up by a factor 10 or 20 (Figure A.8), indicating that the Inverse Proportionality axiom is relevant even for amounts significantly exceeding the extreme poverty line. I also note that observable characteristics of participants in the general public survey were only weakly correlated with their responses, except for gender (Appendix Table A.3).[22] About 52 percent of the sample self-identified as female, which is very close to the percentage of female in the general population. This suggests gender and other socio-demographic variables are unlikely to drive the results. More generally, the fact that similar results emerge across very diverse samples, including the expert survey and general public samples from multiple countries, indicates that sample composition is not driving the findings.

Overall, two views on poverty appear to coexist.[23] On the one hand, approximately a third of respondents provided answers predominantly aligned with the poverty headcount or poverty gap, reflecting a binary or focused view of poverty. These respondents use the poverty line as a clear-cut threshold to classify individuals as either poor or non-poor. On the other hand, about half of the participants gave answers primarily consistent with average poverty and the view that poverty is a continuous function, inversely proportional to income.

5.2 Poverty with or without a line

Empirically, results from the online survey suggest that only a minority of respondents appear to attach some importance to information on the poverty line when comparing incomes or allocating resources between low-income individuals.

[22] Questions on personal characteristics were not asked in the expert survey.

[23] Respondents are classified as having a binary or focused view if at least two out of three of their answers align with the poverty headcount or poverty gap measures. Conversely, respondents are considered consistent with average poverty if at least two out of three of their answers align with the Inverse Proportionality axiom .

I highlight four pieces of evidence from the survey.

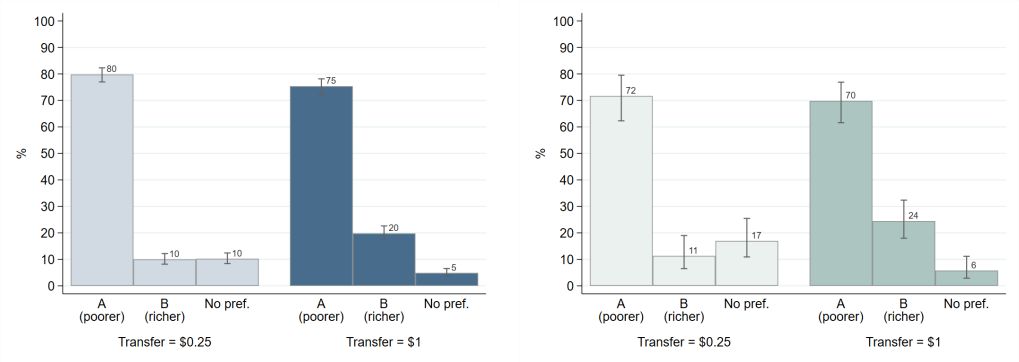
The analysis of the first question above shows that only 19 percent of the general public sample and 27 percent of experts provided answers that are consistent with the focus axiom, stating that *"A is poor and B is not poor"* if their daily incomes are \$1 and \$3, respectively (Figure 3). This percentage drops to just 6 percent among general public respondents who were not informed about the poverty line value (Appendix Figure A.7). This indicates that participants generally do not consider the extreme poverty line in their judgments unless explicitly prompted.

In the second question of the survey, participants could allocate additional income either to individual A, who earns \$1 a day, or to individual B, who earns \$2 a day.[24] The amounts—either \$0.25 or \$1 per day—were randomly assigned. By design, participants allocating the \$1-a-day transfer had the possibility to push B above the poverty line, but not those assigned to the \$0.25-a-day transfer. Results in Figure 4 show that more than 70 percent of respondents allocate the additional income to the poorest individual, even if they have the possibility to push the richest individual above the line. This is true in both samples as well as across countries (Appendix Figure A.9). Less than 20 percent of answers are consistent with either the headcount or poverty gap views of poverty, which rely on the focus axiom.[25] Results are even stronger among participants who were not informed about the value of the poverty line (Appendix Table A.5).

The third question was similar, except that the amounts that could be allocated to A and B were different (the question and parameters are described in Tables A.1 and A.2). About half of the trade-offs involved the possibility to push B, the richest individual, above the poverty line. In Table A.4, I exploit the random assignment of parameters to assess the extent to which responses are impacted by this possibility. Results show that participants from the general public and expert samples are only 7.3 and 17 percentage points more likely to allocate the additional income to the richest individual, B, if the question involves the possibility to push her above the line. Interestingly, this effect is largely driven by respondents whose

[24] The question was phrased as follows: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below \$2.5 per day per person. Individual A earns \$1 per day while individual B earns \$2 per day. You have the possibility to increase the income of one of these two individuals by \$X per day. To which individual do you give the money to reduce poverty?"*.

[25] Participants seeking to minimize the poverty headcount should be indifferent if they can allocate \$0.25 per day, but give the money to B if they can allocate \$1 per day. Participants seeking to minimize the poverty gap should be indifferent if they can allocate \$0.25 per day, but give the money to A if they can allocate \$1 per day.



(a) General public sample (b) Experts

Figure 4: Survey results: allocation of resources

Data source: survey data, with participants from Kenya (N=428), India (N=438), South Africa (N=489), the US (N=369), and the survey of experts (N=245). Participants who did not get information on the level of the poverty line are excluded. The question was: *"An individual A earns $1 per day while individual B earns $2 per day. You have the possibility to increase the income of one of these two individuals by $X per day. To which individual do you give the money to reduce poverty?"* The amount X was randomly assigned as 0.25 or 1. Possible answers, whose order was randomized, are: (1) Individual A, (2) Individual B, (3) I have no preference.

responses to Question 1 were consistent with the headcount view of poverty (Table A.4, Columns 2 and 4). Most respondents do not push B above the line when given the possibility to do so.

In the fourth question, which was only asked in the general public sample, respondents were invited to provide a qualitative assessment of A and B's incomes. The income of A was set at $2.4, just below the poverty line, while the income of B was randomly assigned as $2.6, $3, $4, or $5, that is, above the line. Figure 5 shows that only a minority of respondents think B is not poor when her income $2.6 or $3. Slightly more than half of respondents reply that B is not poor when her income is $4 or $5. However, if the level of the poverty line is not provided, less than a quarter of respondents think B is not poor, whatever the assigned income. The results from this question suggest a majority of respondents think poverty is a spectrum, which does not suddenly stops above $2.5.

Overall, the survey results indicate potential for a more inclusive measure of poverty that does not rely on the focus axiom.

5.3 Inequality aversion

Poverty measures can inform policy decisions. In such cases, the social welfare function (SWF) underlying the measure should reflect the preferences of individuals or governments in contexts such as redistributing resources. It is straightforward that minimizing average poverty is mathematically equivalent to maximizing

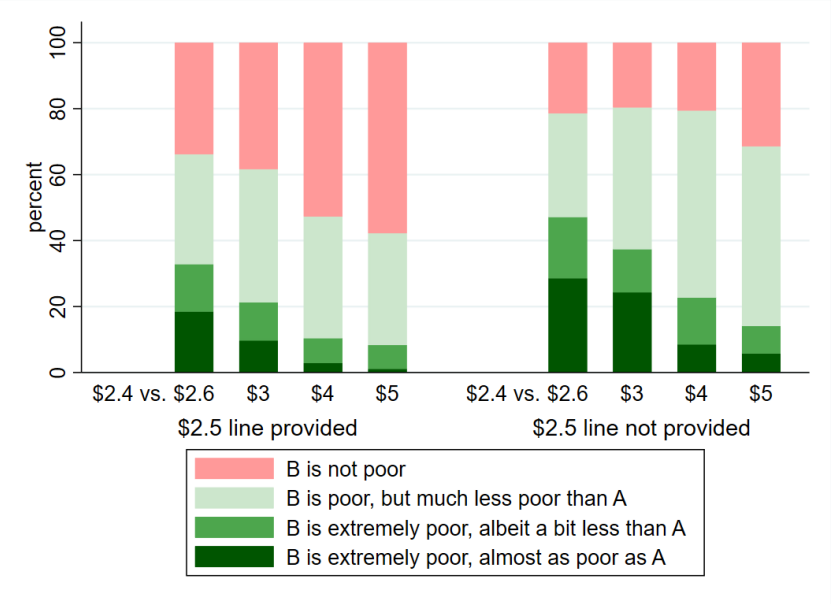


Figure 5: Qualitative comparisons of individual A who is just below the poverty line and B who is above the poverty line

Data source: survey data, with participants from Kenya (N=569), India (N=581), South Africa (N=629) and the US (N=489) (no data from the sample of experts). The question was: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below $2.5 per day per person. Individual A earns $2.4 per day while individual B earns $X per day. Which statement is consistent with how you think about poverty?"* The amount X was randomly assigned as 2.6, 3, 4, or 5. About a quarter of the sample did not get information about the level of the poverty line. Possible answers, whose order was randomized, are: (1) B is extremely poor, almost as poor as A, (2) B is extremely poor, albeit a bit less than A, (3) B is poor, but much less poor than A, (4) B is not poor.

the Atkinson SWF with an inequality aversion coefficient of 2 (Atkinson, 1970):[26]

$$\min \; P(Y,k) \quad \Leftrightarrow \quad \max \; A(\epsilon) = \left(\frac{1}{n}\sum_{i=1}^{n} y_i^{1-\epsilon}\right)^{1/(1-\epsilon)} \quad \text{and} \quad \epsilon = 2, \tag{5}$$

A relevant question is whether $\epsilon = 2$ is a reasonable parameter value for inequality aversion. Does it broadly corresponds to how experts and the general public would make decisions, for instance when allocating aid?

The axiomatic literature typically points to values above 1 or 2 when deriving the level of inequality aversion consistent with core equity principles (Fleurbaey and Michel, 2001; Del Campo et al., 2024). In the context of pro-poor growth, Foster and Székely (2008) also argue that ϵ should be 2 or higher to ensure sufficient sensitivity at the lower end of the income distribution.

The experimental literature on inequality aversion is limited, with the only estimates coming from high-income countries and based on trade-offs involving

[26] Equivalently, minimizing average poverty is equivalent to maximizing a utilitarian SWF with iso-elastic utility functions and a CRRA of 2.

relatively high levels of income. Two experimental approaches have been employed. In leaky bucket experiments, participants decide whether to tax a wealthier individual to transfer a certain amount to a poorer individual, but the process entails administrative costs. Meanwhile, wage-distribution experiments prompt respondents to choose between two hypothetical societies with different income distributions, under a veil of ignorance (Harsanyi, 1955). Estimated median values of ϵ are below 0.5 in leaky-bucket experiments (Amiel et al., 1999; Pirttilä and Uusitalo, 2010) and above 2 in wage-distribution experiments (Johansson-Stenman et al., 2002; Pirttilä and Uusitalo, 2010).[27] I argue that the leaky bucket experiment may underestimate inequality aversion because it fails to distinguish inequality aversion from aversion to taxation, government inefficiency, and loss aversion.

I use the data from the online surveys to provide new estimates of inequality aversion. I extend the literature by providing estimates from developing and developed countries and from experts, by focusing on trade-offs that are around the extreme poverty line of the World Bank, and by carefully framing the question to avoid mixing up inequality aversion with other dimensions.

The general phrasing of the question was: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below \$2.5 per day per person. Individual A earns \$1 per day while individual B earns \$X per day. You have two options to reduce poverty. 1) You can increase the daily income of A by \$Y. 2) You can increase the daily income of B by \$k. Which option would you implement to reduce poverty?* Each participant had to answer three questions with this phrasing and different parameters. Depending on answers, respondents followed different pathways to narrow down their individual degree of inequality aversion. The parameters and pathways are described in Table A.2 and Figure A.3.

Results are shown in Figure 6. The average estimate of ϵ is 2.11 among experts (95% CI:1.93-2.30, median=2) and 2.41 among general public participants (95% CI: 2.35-2.47, median = 2.75). For the general public, the average estimates vary by country, ranging from 2.14 in Kenya to 2.71 in South Africa. I find some evidence that more educated participants are less averse to inequality (Appendix Table A.5).[28] The average estimate of ϵ is 2.34 for participants with a bachelor

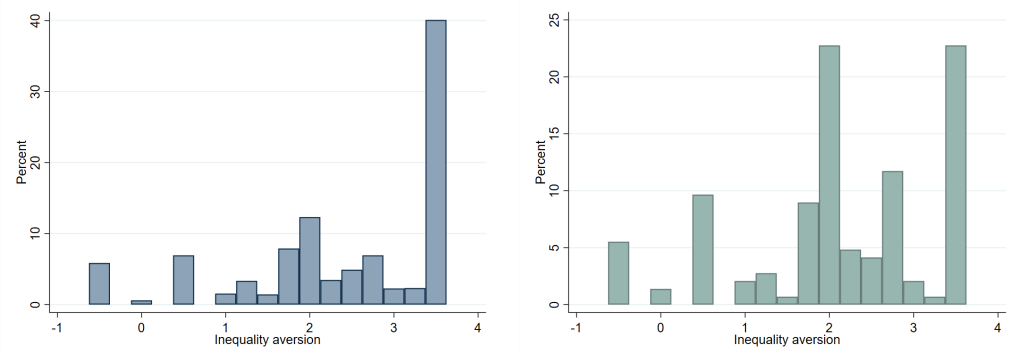
[27] Using macroeconomic calibration methods, Kot and Paradowski (2022) find a mean of 1.92 and a median of 1.85. Estimates from taxation data usually fall between 1 and 2 (Del Campo et al., 2024).

[28] The general public sample is highly educated, with 13 years of education on average. This suggests estimates of the degree of inequality aversion may be higher in representative samples.

degree or higher, 2.22 for respondents with at least a master's degree, and 2.12 for the few respondents with a PhD degree. The latter estimates align closely with those derived from the expert survey. Other demographic characteristics do not predict inequality aversion.

As a robustness check, I also tested four other versions of the question, which were randomly assigned to a subset of US participants (these observations are excluded from the main analysis). The first version emphasized that taxation is used to redistribute income, as in original leaky-bucket experiments. In line with the findings of Pirttilä and Uusitalo (2010). The average estimate of ϵ is significantly lower with this phrasing, around 1.13. The second version only revealed the final distribution of incomes, as in wage-distribution experiments. Results are not significantly different with this latter phrasing. In the third and fourth versions, all amounts in the questionnaire were multiplied by 10 or 20. Results are not statistically different from the benchmark version, which is consistent with Atkinson (1970)'s assumption of *constant relative inequality aversion*.

Overall, the degree of inequality aversion of average poverty appears to be relatively consistent with how people would allocate cash assistance to the poor, highlighting the policy relevance of this new measure. Nearly all respondents exhibit aversion to inequality both below and across the poverty line, in line with the new measure. By contrast, measures lacking distribution sensitivity—such as the widely used poverty headcount and poverty gap—may be comparatively less relevant for guiding policy.



(a) General public sample (b) Experts

Figure 6: Survey results: inequality aversion

Data source: survey data, with participants from Kenya (N=412), India (N=430), South Africa (N=472), the US (N=357), and the survey of experts (N=145). The figures focus on participants assigned to the benchmark phrasing of the question Q3 as described in Table A.1. The parameters of the question are described in Table A.2. Figure A.3 shows the different pathways that participants could follow depending on their answers. Respondents who were indifferent in all questions are excluded.

5.4 Robustness

The framing of questions and the use of online survey samples may influence participants' responses. Several observations, however, provide reassurance regarding the robustness of the findings.

On framing, the consistency of responses across the four main questions suggests that the findings are not driven by how any single question was framed. Results do not depend on the order of answers, which was randomized, and they are similar if information on the value of the poverty line is not provided.

On framing as well, the survey experiment primarily focused on trade-offs involving low incomes given the focus on poverty. However, in the US survey, I also tested how responses vary when all values are scaled up by a factor of 10 or 20 (Appendix Figure A.8). Remarkably, two-thirds of respondents still perceive A as being three times poorer than B when they earn \$10 versus \$30, or \$20 versus \$60, suggesting that the Inverse Proportionality axiom holds for a majority even with higher income levels. Moreover, estimates of inequality aversion are not statistically different when larger amounts are considered, aligning with Atkinson (1970)'s assumption of *constant relative inequality aversion*. Together, these findings suggest that average poverty remains a relevant metric even for incomes well above the World Bank's extreme poverty line.

On sampling, the composition of samples is unlikely to drive results, as similar patterns appear across diverse populations, including the expert sample and the general public samples from Kenya, India, South Africa, and the United States. Within the general public sample, observable socio-demographic characteristics are only weakly correlated with participants' answers, suggesting that sample composition is unlikely to drive the results.

Of course, alternative phrasing or different samples might yield somewhat different distributions of responses. However, the precise percentages are not the focus. The survey aims to show that there is meaningful support for an inclusive measure of poverty that can complement focused measures. This conclusion holds even if the share of supportive responses were considerably smaller.

6 How has global poverty evolved since 1990?

How has poverty evolved over the past decades? To answer this question, I use data from the Poverty and Inequality Platform (PIP) of the World Bank, which provides income distributions for 218 countries between 1990 and 2024. Income is

measured in $ per day (in 2017 $PPP), and average poverty is measured in days per $ ($k = 1$).

Like all distribution-sensitive poverty measures, average poverty is sensitive to mismeasurement at the lower end of the income distribution. This parallels the sensitivity of average income and top-sensitive inequality measures to misreporting of high incomes (Piketty et al., 2022; Yonzan et al., 2022; Flachaire et al., 2023).[29] Following Kraay ⓡ et al. (2025), I bottom-code the income distribution at $0.25.[30] This affects very few observations: with the 2024 data, only 0.02 percent of observations have to be bottom-coded because they are below $0.25.

Figure 7 shows how average poverty evolved globally, exploiting the decomposition properties of the measure to compare contributions from different regions. The figure shows that average poverty fell by approximately 55% between 1990 and 2024, from just under half a day to get one dollar to roughly 5 hours.

This sharp reduction in average poverty was primarily driven by poverty in East Asia being divided by 6. By contrast, the contribution of sub-Saharan Africa increased by 10% over the same period. While average poverty in sub-Saharan Africa decreased from 0.72 to 0.49 days per dollar between 1990 and 2024 (-32%), population increased by 146%—much more than in other regions—implying that the contribution of sub-Saharan Africa to global poverty increased (Appendix Figure A.2).

Figure 8 depicts average poverty and average income for the 218 countries in the PIP database in 2024. In the poorest countries—Madagascar, South Sudan, Mozambique, and DR Congo—people need one day on average to get just $1. At the other end of the distribution, people living in Belgium, Luxembourg, the Netherlands, and Switzerland need less than 30 minutes to get $1.

For a given average income, countries that are further up on the figure are more unequal. For instance, the US and Switzerland have about the same average income, about $83 per person per day. Yet, average poverty in the US is 3.4 times higher than in Switzerland (85 versus 25 minutes per $) because inequality is much higher in the US than in Switzerland (4.9 versus 1.4 days to get mean income). Similarly, Morocco and South Africa have similar average incomes, around $12 per person per day. However, average poverty is 2.2 times higher in South Africa than in Morocco (7.3 versus 3.3 hours per $) because inequality is much higher in

[29] See also Ravallion (2003) and Deaton (2005) on mismeasurement of survey data.

[30] To address implausibly low or zero incomes, Kraay ⓡ et al. (2025) propose to bottom-code values below $0.25 per day, which is the minimum cost across countries of the least expensive bundle providing 2,330 calories (kcal) per day. They show the issue is limited to a small proportion of observations and results are robust to using other thresholds.

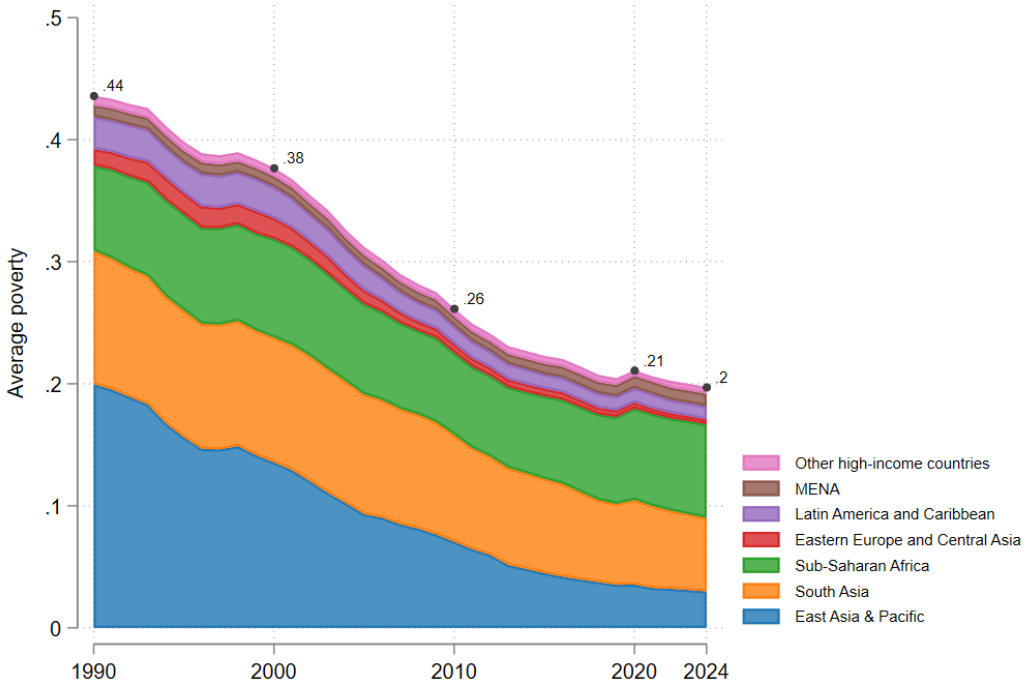


Figure 7: Average poverty by region

Data source: PIP data (World Bank). Income is measured at 2017 $PPP per person per day and the distribution is bottom coded at $0.25 (see Kraay ⓡ et al. 2025 for a discussion). Average poverty P is calculated with $k = 1$; It can therefore be interpreted as the average number of days needed to get $1.

South Africa than in Morocco (3.6 versus 1.6 days to get mean income).

Why has global poverty declined? I use the decomposition properties of average poverty to study whether poverty reductions were driven by economic growth or inequality reductions.

Figure 9 illustrates the trends in average poverty, income, and inequality over time. Figure 9(a) identifies a strong (negative) relationship between growth in average income and growth in average poverty. Between 1990 and 2024, most countries experienced both income growth and a reduction in average poverty (bottom right quadrant). For instance, in China, average income grew by almost 7 percent annually, while average poverty declined by approximately 6 percent per year, on average.

However, average poverty increased in a few countries over the same period. In fragile states such as Syria, Yemen, Zimbabwe, and South Sudan, this increase was primarily driven by declining average incomes (top left quadrant). By contrast, for a few countries like the United States and Italy, the rise in average poverty was driven by growing income inequality, which outpaced income growth.

In comparison, the relationship between average poverty and inequality is less

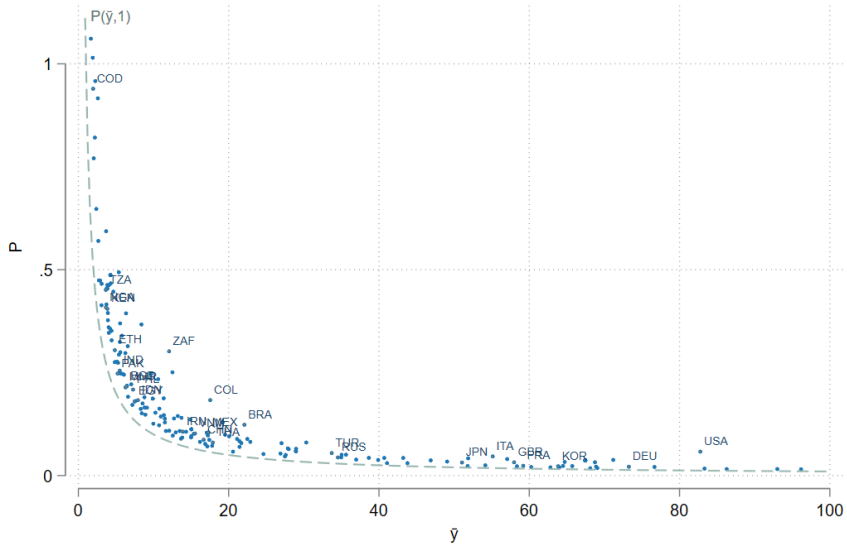


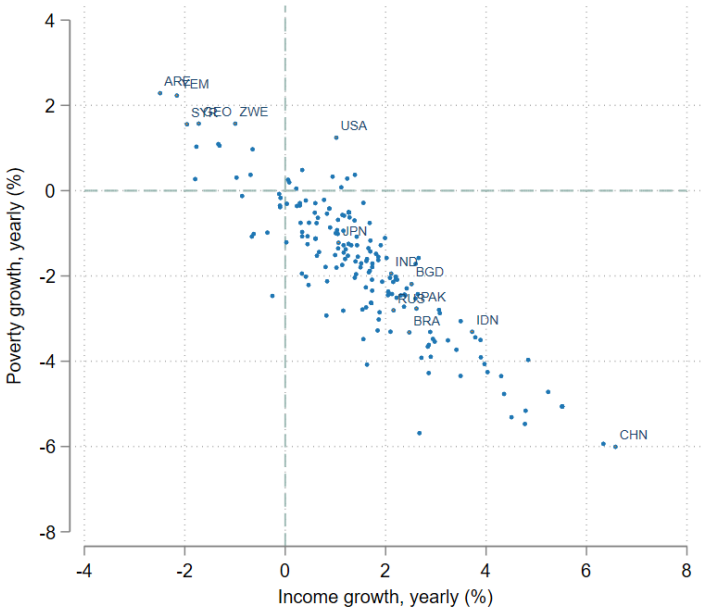
Figure 8: Average poverty and average income in 2024 in 218 countries

Data source: PIP data (World Bank). Income is measured at 2017 $PPP per person per day and the distribution is bottom coded at $0.25 (see Kraay ⓣ et al. 2025 for a discussion). Average poverty P is calculated with $k = 1$; It can therefore be interpreted as the average number of days needed to get $1. Average income $R = \bar{y}$ is measured in $ per day. The green dashed line represents $P(\bar{y}, 1)$ that is, average poverty if income were equally distributed; It is the minimum possible value of P for given (y). Country codes are shown when the population size is above 50 million.

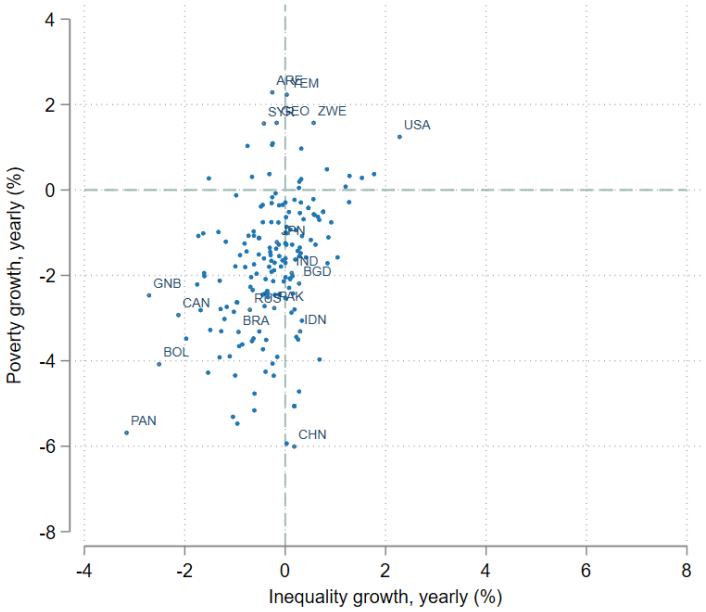
salient, as shown in Figure 9(b). This weaker relationship reflects the fact that inequality changed relatively little compared to income over the period. Average inequality growth was closer to 0 and less dispersed (mean = -0.1 percent, s.d. = 0.8) than average income growth (mean = 1.5 percent, s.d. = 1.5). Using the decomposition method of Hoeffler and Sterck (2022), I estimate that 78% of the variation in average poverty was explained by changes in average income, and only 21% by changes in inequality. Over the past decades, income growth was the primary driver of poverty reductions.

7 Generalizations and sensitivity

In this section, I develop two generalizations of the new framework proposed in this paper. First, I generalize average poverty for different degrees of inequality aversion. Second, I examine how individual poverty—and more generally the inverse transformation—can be used in applied work.



(a) Poverty and income growth (1990-2024)



(b) Poverty and inequality growth (1990-2024)

Figure 9: Average yearly growth rates in average poverty, average income, and inequality between 1990 and 2024, in 218 countries

Data source: PIP data (World Bank). Income is measured at 2017 $PPP per person per day and the distribution is bottom coded at $0.25 (see Kraay ⓡ et al. 2025 for a discussion). This figure does not depend on k. Average yearly growth rates are calculated as $g_x = exp[(log(x_{2024}) - log(x_{1990}))/34] - 1$.

7.1 Inequality aversion $\neq$ 2

Average poverty implicitly assumes a degree of inequality aversion ϵ equal to 2. Average income, on the other hand, assumes no inequality aversion ($\epsilon = 0$). It is straightforward to generalize the formulas in Equations (1) and (2) to allow for different degrees of inequality aversion:

$$M^{\epsilon}(Y,k) = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{y_i}{k}\right)^{1-\epsilon}. \tag{6}$$

When $\epsilon > 1$, $M^{\epsilon}(Y,k)$ is a measure of poverty that is additively decomposable and satisfies s-th degree sensitivity for s approaching infinity. As ϵ increases, the index becomes more sensitive to the poorest incomes. Only M^0 and M^2 have a straightforward interpretation and intuitive units. M^0 is average income and M^2 is average poverty. Other members of this class are less likely to be relevant for policy.

It is straightforward that the members of this class also generate comparisons and orderings that are independent of the choice of k, which is just a scaling factor. I formalize this idea in an axiom and demonstrate that Equation (6), with $\epsilon > 1$, defines the class of additively decomposable poverty measures that satisfy monotonicity and generate comparisons and orderings that are independent of the choice of reference level of income.

(A5) Comparison Invariance Axiom: For every reference levels of income k and k' and any income distributions X and Y, $\frac{M(X,k)}{M(Y,k)} = \frac{M(X,k')}{M(Y,k')}$.

(A6) Monotonicity: If X is obtained from Y by decreasing the income of an individual, then $M(X,k) > M(Y,k)$.

Theorem 7.1. *The only indices satisfying Decomposability (A1), Normalization (A4), Comparisons Invariance (A5), and Monotonicity (A6) are defined in Equation (6) for $\epsilon > 1$.*

Proof. For the necessary part of the theorem, I note that Decomposability (A1) implies that $M(Y,k) = 1/n\sum_{i=1}^{n} f(y_i,k)$ for some individual poverty function f of the individual income y_i and the reference level of income k (Foster and Shorrocks, 1991). Decomposability (A1) also implies Scale Invariance, which means that $f(y_i,k) = l(y_i/k)$ (Foster and Shorrocks, 1991). Comparisons Invariance (A5) further implies that $f(y_i,k) = g(y_i)h(k)$. For $n = 1$, we therefore have that

$f(y_1, k) = g(y_1)h(k) = l(y_1/k)$. Aczél (1966) shows that the solutions to this equation takes the form: $g(y_1) = a{y_1}^c$ and $h(k) = bk^{-c}$ and $l(y_1/k) = ab(y_1/k)^c$. Normalization (A4) implies $ab = 1$ while Monotonicity (A6) implies $c < 0$. This establishes the necessity part of the theorem.

For the sufficiency part of the theorem, it is straightforward that $M^\epsilon(Y, k)$ satisfies A1, A4, A5, and A6 when $\epsilon > 1$.

■

7.2 Individual income poverty and inverse transformation

In applied econometrics, a variable capturing individual or household poverty k/y_i can be a useful complement to a variable measuring individual or household income y_i. Because the inverse transformation is concave, considering individual or household poverty is best suited to identify effects that are taking place at the bottom of the income distribution and reduce the importance of outliers at the top of the distribution. This transformation is therefore particularly relevant for impact evaluations of anti-poverty programmes. Thanks to its intuitive unit, in days per dollar, results are easily interpretable and meaningful.

The inverse transformation can also be applied to other quantities, including consumption (e.g. calorie intake, value of consumption), expenditures, distance, speed, height, weight and many other quantities that range from 0 (excluded) to infinity. This transformation may prove particularly useful for researchers interested to explore effects that are likely to take place at the bottom of the variable distribution. Applications on food insecurity and calories intake are provided by Bruni and Sterck (2025a,b) when studying the impacts of humanitarian aid cuts and delays.

In fact, the inverse transformation is somewhat similar to the log-transformation that is prevailing in applied work. In impact evaluations with a discrete treatment, the log-transformation has however one limitation that is often ignored. It requires calculating $e^\beta - 1$ to be (only approximately) interpretable in percentage terms, especially when impacts are large or heterogeneous. Using the inverse transformation allows a more direct interpretation of results. For variables such household expenditures or consumption, impacts can also be interpreted in welfare terms given the link with the Atkinson SWF discussed above.

8 Conclusion

Credible and intelligible measures of poverty are needed to inform policymakers, donors, and the public about living conditions and needs at the bottom of the income distribution and monitor progress towards national and international goals. Rigorously measuring poverty is also essential to indicate which people, regions, or countries should receive attention first. As put by Schultz (1980) in his Nobel Lecture: *"Most of the people in the world are poor, so if we knew the economics of being poor we would know much of the economics that really matters."*

This paper introduced a new measure, average poverty, which is grounded in the intuitive principle that a person A with half the income of B is twice as poor as B. In mathematical terms, this implies that poverty is the reciprocal of income. Average poverty has a simple interpretation with intuitive units: it is the average number of days needed to get one dollar.

Average poverty has interesting properties, being distribution sensitive and additively decomposable in population subgroups. Moreover, the measure generates comparisons and orderings that are independent from the (difficult) choice of a reference level of income. Changes in average poverty can be decomposed into income growth and shifts in inequality, offering a policy-relevant framework—a dashboard—that connects poverty, living standards, and inequality. Data requirements are limited, permitting practical and immediate use.

I used this new measure to revisit the question of global poverty trends since 1990. The results show a 55% decline in global average poverty between 1990 and 2024, largely driven by rapid income growth in East Asia. Progress elsewhere has been more modest and uneven. Decomposition reveals that poverty reduction has been driven primarily by growth, with changes in inequality playing a secondary role.

The framework and formulas presented in this article can be easily applied to study other quantities and their reciprocals. This versatility extends not only within economics but also to other scientific domains.

References

Aczél, J. (1966). *Lectures on functional equations and their applications*. Academic Press.

Adler, M. (2011). *Well-being and fair distribution: beyond cost-benefit analysis*. Oxford University Press.

Adler, M. D. (2019). *Measuring social welfare: An introduction*. Oxford University Press, USA.

Allen, R. C. (2017). Absolute poverty: When necessity displaces desire. *American Economic Review 107*(12), 3690–3721.

Amiel, Y., J. Creedy, and S. Hurn (1999). Measuring attitudes towards inequality. *Scandinavian Journal of Economics 101*(1), 83–96.

Atkinson, A. B. (1970). On the measurement of inequality. *Journal of Economic Theory 2*(3), 244–263.

Atkinson, A. B. (1987). On the measurement of poverty. *Econometrica*, 749–764.

Blackburn, M. L. (1994). International comparisons of poverty. *American Economic Review 84*(2), 371–374.

Bossert, W. and J. A. Weymark (2004). Utility in social choice. In *Handbook of utility theory: Volume 2 extensions*, pp. 1099–1177. Springer.

Bourguignon, F. (2003). The growth elasticity of poverty reduction: explaining heterogeneity across countries and time periods. *Inequality and growth: Theory and policy implications 1*(1), 1–26.

Bruni, V. and O. Sterck (2025a). The welfare and general-equilibrium impacts of aid cuts. *SSRN Working Paper 5270846*.

Bruni, V. and O. Sterck (2025b). The welfare and market effects of delays in humanitarian assistance. *SSRN Working Paper 5190878*.

Chakravarty, S. R. (1983). A new index of poverty. *Mathematical Social Sciences 6*(3), 307–313.

Clark, A. E. and C. d'Ambrosio (2015). Attitudes to income inequality: Experimental and survey evidence. In *Handbook of income distribution*, Volume 2, pp. 1147–1208. Elsevier.

Datt, G. and M. Ravallion (1992). Growth and redistribution components of changes in poverty measures: A decomposition with applications to brazil and india in the 1980s. *Journal of development economics 38*(2), 275–295.

Deaton, A. (2005). Measuring poverty in a growing world (or measuring growth in a poor world). *Review of Economics and Statistics 87*(1), 1–19.

Deaton, A. (2010). Price indexes, inequality, and the measurement of world poverty. *American Economic Review 100*(1), 5–34.

Deaton, A. (2016). Measuring and understanding behavior, welfare, and poverty. *American Economic Review 106*(6), 1221–1243.

Decerf, B. (2025). On the properties of the two main types of global poverty lines. *Journal of Development Economics 173*, 103396.

Del Campo, S., D. Anthoff, and U. Kornek (2024). Inequality aversion for climate policy. *Review of Environmental Economics and Policy 18*(1), 96–115.

Duclos, J.-Y., D. Sahn, and S. D. Younger (2006). Robust multidimensional spatial poverty comparisons in Ghana, Madagascar, and Uganda. *The World Bank Economic Review 20*(1), 91–113.

Ferreira, F. H., S. Chen, A. Dabalen, Y. Dikhanov, N. Hamadeh, D. Jolliffe, A. Narayan, E. B. Prydz, A. Revenga, P. Sangraula, et al. (2016). A global count of the extreme poor in 2012: data issues, methodology and initial results. *The Journal of Economic Inequality 14*(2), 141–172.

Flachaire, E., N. Lustig, and A. Vigorito (2023). Underreporting of top incomes and inequality: A comparison of correction methods using simulations and linked survey and tax data. *Review of Income and Wealth 69*(4), 1033–1059.

Fleurbaey, M. and D. Blanchet (2013). *Beyond GDP: Measuring Welfare and Assessing Sustainability*. Oxford: Oxford University Press.

Fleurbaey, M. and P. Michel (2001). Transfer principles and inequality aversion, with an application to optimal growth. *Mathematical Social Sciences 42*(1), 1–11.

Foster, J., J. Greer, and E. Thorbecke (1984). A class of decomposable poverty measures. *Econometrica*, 761–766.

Foster, J. E. and A. F. Shorrocks (1991). Subgroup consistent poverty indices. *Econometrica*, 687–709.

Foster, J. E. and M. Székely (2008). Is economic growth good for the poor? tracking low incomes using general means. *International Economic Review 49*(4), 1143–1172.

Harsanyi, J. C. (1955). Cardinal welfare, individualistic ethics, and interpersonal comparisons of utility. *Journal of Political Economy 63*(4), 309–321.

Hickel, J. (2016). The true extent of global poverty and hunger: questioning the good news narrative of the millennium development goals. *Third World Quarterly 37*(5), 749–767.

Hoeffler, A. and O. Sterck (2022). Is chinese aid different? *World Development 156*, 105908.

Johansson-Stenman, O., F. Carlsson, and D. Daruvala (2002). Measuring future grandparents' preferences for equality and relative standing. *The Economic Journal 112*(479), 362–383.

Jolliffe, D., D. G. Mahler, C. Lakner, A. Atamanov, and S. K. Tetteh-Baah (2024). Poverty and prices: Assessing the impact of the 2017 ppps on the international poverty line and global poverty. *The World Bank Economic Review*, lhae035.

Kahneman, D. and A. Deaton (2010). High income improves evaluation of life but not emotional well-being. *Proceedings of the national academy of sciences 107*(38), 16489–16493.

Kakwani, N. (1980). On a class of poverty measures. *Econometrica*, 437–446.

Killingsworth, M. A. (2021). Experienced well-being rises with income, even above $75,000 per year. *Proceedings of the National Academy of Sciences 118*(4), e2016976118.

Killingsworth, M. A., D. Kahneman, and B. Mellers (2023). Income and emotional well-being: A conflict resolved. *Proceedings of the National Academy of Sciences 120*(10), e2208661120.

Kot, S. M. and P. Paradowski (2022). The atlas of inequality aversion: theory and empirical evidence on 55 countries from the luxembourg income study database. *EQUILIBRIUM Quarterly Journal of Economics and Economic Policy 17*, 261–316.

Kraay, A., C. Lakner, B. Ozler, B. Decerf, D. M. Jolliffe, O. Sterck, and N. Yonzan (2023). The prosperity gap: A proposed new indicator to monitor shared prosperity. *World Bank Blogs*.

Kraay ⓡ, A., C. Lakner, B. ⓡ Özler, B. ⓡ Decerf, D. ⓡ Jolliffe, O. ⓡ Sterck, and N. ⓡ Yonzan (2025). A simple decomposable distribution sensitive welfare index. *Working Paper (Latest version, Original version)*.

Lindqvist, E., R. Östling, and D. Cesarini (2020). Long-run effects of lottery wealth on psychological well-being. *The Review of Economic Studies 87*(6), 2703–2726.

Mas-Colell, A., M. D. Whinston, J. R. Green, et al. (1995). *Microeconomic theory*, Volume 1. Oxford university press New York.

Moramarco, D. and O. Sterck (2025). A new class of decomposable inequality measures. *SSRN Working Paper 5220560*.

Piketty, T., E. Saez, and G. Zucman (2022). Twenty years and counting: Thoughts about measuring the upper tail. *The Journal of Economic Inequality 20*(1), 255–264.

Pirttilä, J. and R. Uusitalo (2010). A 'leaky bucket' in the real world: estimating inequality aversion using survey data. *Economica 77*(305), 60–76.

Pritchett, L. (2003). Who is not poor? Proposing a higher international standard for poverty. *Center for Global Development Working Paper* (33).

Pritchett, L. (2013). *Extreme Poverty Is Too Extreme*. Center for Global Development Blog Post.

Pritchett, L. (2024). 'dollar a day' poverty was a development mileage marker, not the destination. *Working Paper*.

Pritchett, L. and M. Viarengo (2025). Raising the bar: A poverty line for global inclusion. *SSRN Working Paper 5261760*.

Ravallion, M. (1994). Measuring social welfare with and without poverty lines. *The American Economic Review 84*(2), 359–364.

Ravallion, M. (1999). *Poverty comparisons: a guide to concepts and methods*. Number LSM88. The World Bank.

Ravallion, M. (2003). Measuring aggregate welfare in developing countries: How well do national accounts and surveys agree? *Review of Economics and Statistics 85*(3), 645–652.

Ravallion, M. (2012, 11). Poverty lines across the world. In *The Oxford Handbook of the Economics of Poverty*. Oxford University Press.

Ray, D. and G. Genicot (2023). Measuring upward mobility. *American Economic Review 113*(11), 3044–3089.

Roser, M. (2024). We need a new global measure for poverty. *The New York Times Sept. 24, 2024*.

Schultz, T. W. (1980). Nobel lecture: The economics of being poor. *Journal of Political Economy 88*(4), 639–651.

Sen, A. (1976). Poverty: An ordinal approach to measurement. *Econometrica*, 219–231.

Sen, A. (1979). Issues in the measurement of poverty. *The Scandinavian Journal of Economics 81*(2), 285–307.

Shorrocks, A. F. (1984). Inequality decomposition by population subgroups. *Econometrica: Journal of the Econometric Society*, 1369–1385.

Shorrocks, A. F. and J. E. Foster (1987). Transfer sensitive inequality measures. *The Review of Economic Studies 54*(3), 485–497.

Stevenson, B. and J. Wolfers (2013). Subjective well-being and income: Is there any evidence of satiation? *American Economic Review 103*(3), 598–604.

Stiglitz, J. E., J.-P. Fitoussi, and M. Durand (2018). *Beyond GDP: Measuring What Counts for Economic and Social Performance*. OECD.

Stiglitz, J. E., A. Sen, and J.-P. Fitoussi (2009). *Report by the Commission on the Measurement of Economic Performance and Social Progress*. Paris: Commission on the Measurement of Economic Performance and Social Progress.

Tella, R. D., R. J. MacCulloch, and A. J. Oswald (2003). The macroeconomics of happiness. *Review of Economics and Statistics 85*(4), 809–827.

Waldinger, D. (2021). Targeting in-kind transfers through market design: A revealed preference analysis of public housing allocation. *American Economic Review 111*(8), 2660–2696.

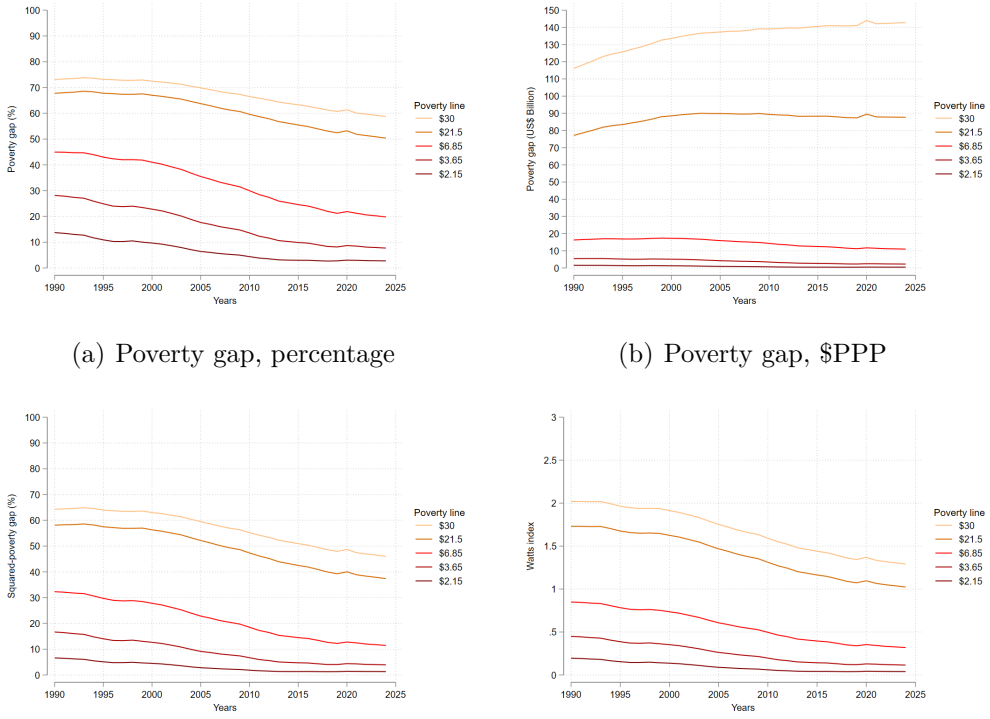
Watts, H. W. (1968). An economic definition of poverty in moynhihan, dp (edit.) on understanding poverty.

Yonzan, N., B. Milanovic, S. Morelli, and J. Gornick (2022). Drawing a line: Comparing the estimation of top incomes between tax data and household survey data. *The Journal of Economic Inequality 20*(1), 67–95.

Zheng, B. (1997). Aggregate poverty measures. *Journal of Economic Surveys 11*(2), 123–162.

Supplemental Appendix

A Global Poverty - Additional Figures



(a) Poverty gap, percentage

(b) Poverty gap, $PPP

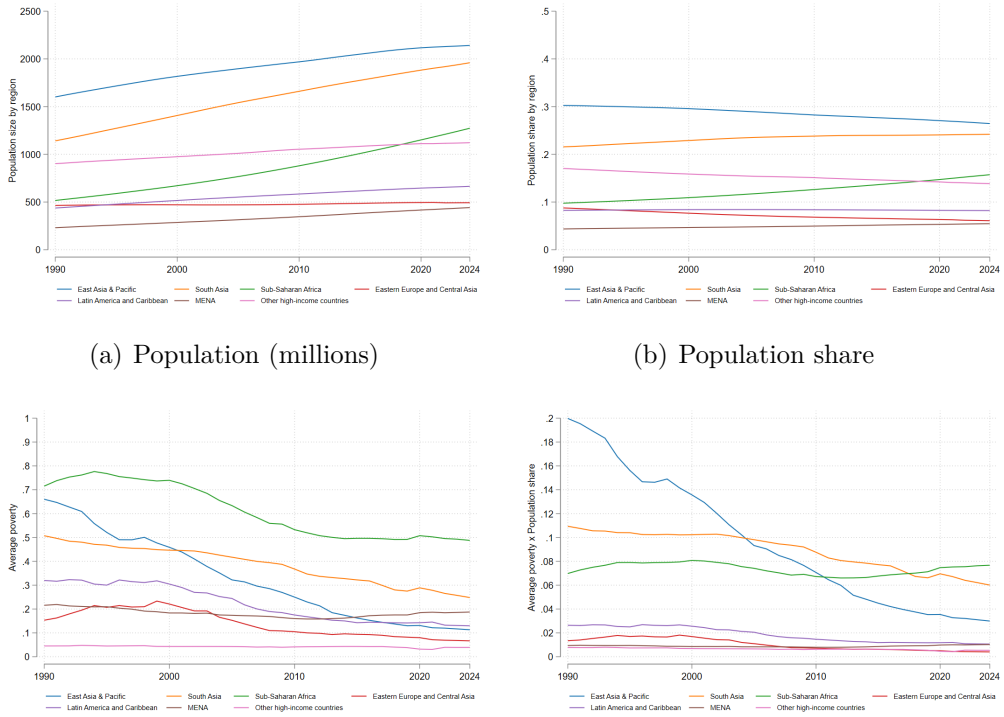
(c) Squared poverty gap, percentage

(d) Watts index

Figure A.1: Global poverty over time

Data source: PIP data (World Bank). Income is measured at 2017 $PPP per person per day. Poverty indices are calculated for the World Bank poverty lines of $2.15, $3.65, and $6.85 as well as for Pritchett and Viarengo (2025)'s line of $21.5 and Roser (2024)'s line of $30 per person per day.

B Questionnaire



(a) Population (millions)

(b) Population share

(c) Average poverty

(d) Average poverty × population share

Figure A.2: Average poverty and population, by region

Data source: PIP data (World Bank). Income is measured at 2017 $PPP per person per day.

Table A.1: Survey Questions

#	Question	Variations	Rand.	Answers	Sample: General public	Sample: Experts
(Q1)	The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below \$2.5 per day per person. Individual A earns \$X while individual B earns \$Y per day. Which statement is consistent with how you think about poverty.	(Q1.a) $X = 0.5$, $Y = 1.5$ (Q1.b) $X = 1$, $Y = 2$ (Q1.c) $X = 1$, $Y = 3$	1 1 1	(1) A and B are equally poor (2) A is poor and B is not poor (3) Both A and B are not poor (4) A is approximately 2 times poorer than B (5) A is approximately 3 times poorer than B (6) A is approximately 4 times poorer than B (7) A is approximately 9 times poorer than B	Yes	Yes
(Q2)	The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below \$2.5 per day per person. Individual A earns \$1 per day while individual B earns \$2 per day. You have the possibility to increase the income of one of these two individuals by \$X per day. To which individual do you give the money to reduce poverty?	(Q2.a) $X = 0.25$ (Q2.b) $X = 1$	1/2 1/2	(1) Individual A (2) Individual B (3) I have no preference	Yes	Yes
(Q3)	The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below \$2.5 per day per person. Individual A earns \$1 per day while individual B earns \$X per day. You have two options to reduce poverty. 1) You can increase the daily income of A by \$Y. 2) You can increase the daily income of B by \$k. Which option would you implement	See Table A.2 and Figure A.3	3	(1) Option 1 (2) Option 2 (3) I have no preference	Yes	Yes*
(Q4)	The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below \$2.5 per day per person. Individual A earns \$X per day while individual B earns \$Y per day. Which statement is consistent with how you think about poverty?	(Q4.a) $X = 2.4$, $Y = 2.6$ (Q4.b) $X = 2.4$, $Y = 3$ (Q4.c) $X = 2.4$, $Y = 4$ (Q4.d) $X = 2.4$, $Y = 5$	1/4 1/4 1/4 1/4	(1) B is extremely poor, almost as poor as A (2) B is extremely poor, albeit a bit less than A (3) B is poor, but much less poor than A (4) B is not poor	Yes	No
(Q5)	The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below \$2.5 per day per person. Individual A earns \$1 per day while individual B earns \$3 per day. Which statement is consistent with how you think about poverty?		1	(1) A and B earn the same amount (2) A earns \$1 per day (3) A earns \$2 per day (4) B earns \$1 per day (5) B earns \$2 per day	Yes	No
(Q6)	How old are you?		1	*Integer*	Yes	No
(Q7)	What is the highest level of education you successfully completed?		1	(1-12) Grade 1-12 (13) Associate or technical degree (14) Bachelor's degree (15) Master's or professional degree (16) Doctoral degree (PhD)	Yes	No
(Q8)	How many people live in your household?		1	*Integer*	Yes	No
(Q9)	In a typical month, what is the disposable income of your household, after paying taxes?		1	*Integer*	Yes	No

* These questions were not asked to participants at the University of Sheffield (N=32) and at the University of Ghent (N=63). In the expert and US surveys, all amounts were expressed in \$. In Kenya, all amounts were multiplied by 40 and expressed in Kenyan shillings (KSh). In India and South Africa, all amounts were multiplied by 20 and expressed in rupees and rands, respectively.

Table A.2: Inequality aversion questions (Q2 and Q3): parameters

Variation	A (poorest)			B (richest)			ϵ if indifferent
	Initial income	Transfer	Income if gets transfer	Initial income	Transfer	Income if gets transfer	
V0a	1	1	2	2	1	3	0
V0b	1	0.25	1.25	2	0.25	2.25	0
V1a	1	0.2	1.2	1.5	0.3	1.8	1
V1b	1	0.5	1.5	2	1	3	1
V1c	1	0.5	1.5	1.5	0.75	2.25	1
V2a	1	0.25	1.25	1.25	0.35	1.6	1.5
V2b	1	0.5	1.5	1.5	1	2.5	1.5
V2c	1	0.2	1.2	1.3	0.3	1.6	1.5
V3a	1	0.5	1.5	1.5	1.5	3	2
V3b	1	0.2	1.2	1.2	0.3	1.5	2
V3c	1	0.2	1.2	1.5	0.5	2	2
V4a	1	0.25	1.25	1.25	0.5	1.75	2.5
V4b	1	0.5	1.5	1.5	3.5	5	2.5
V4c	1	0.25	1.25	1.5	1	2.5	2.5
V5a	1	0.3	1.3	1.3	1	2.3	3
V5b	1	0.4	1.4	1.4	5.6	7	3
V5c	1	0.25	1.25	1.5	2	3.5	3

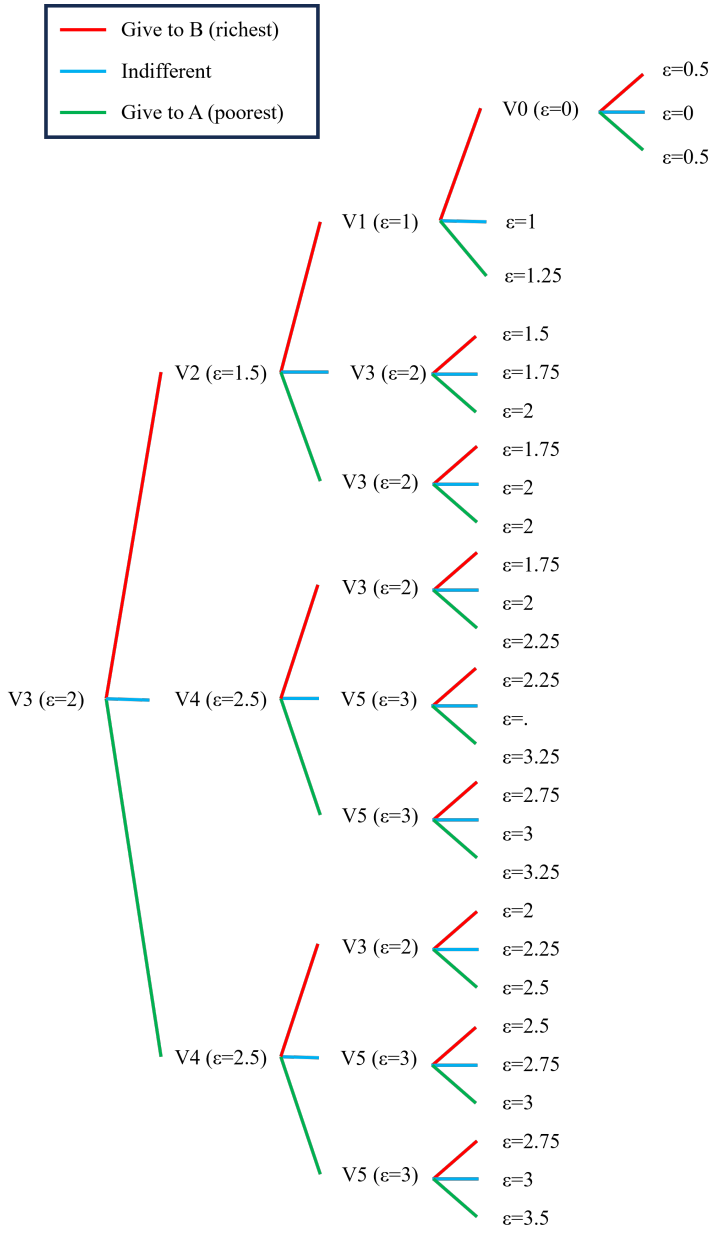
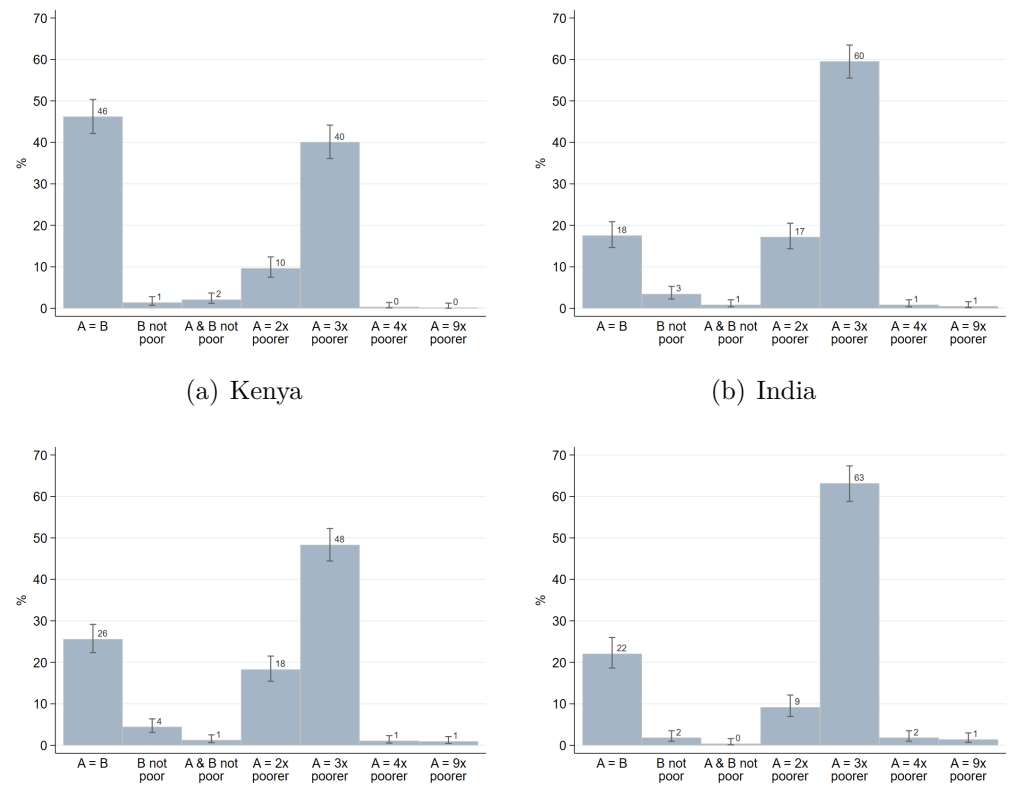


Figure A.3: Inequality aversion questions (Q2 and Q3): pathways and resulting ϵ

The different versions and associated parameters are described in Table A.2. Each respondent was asked one version of Q3 and three versions of Q4. The questions followed the pathways described in this figure. Within each version (V0-V5), the sub-versions a,b,c were randomized.

C General public survey: additional figures



(a) Kenya

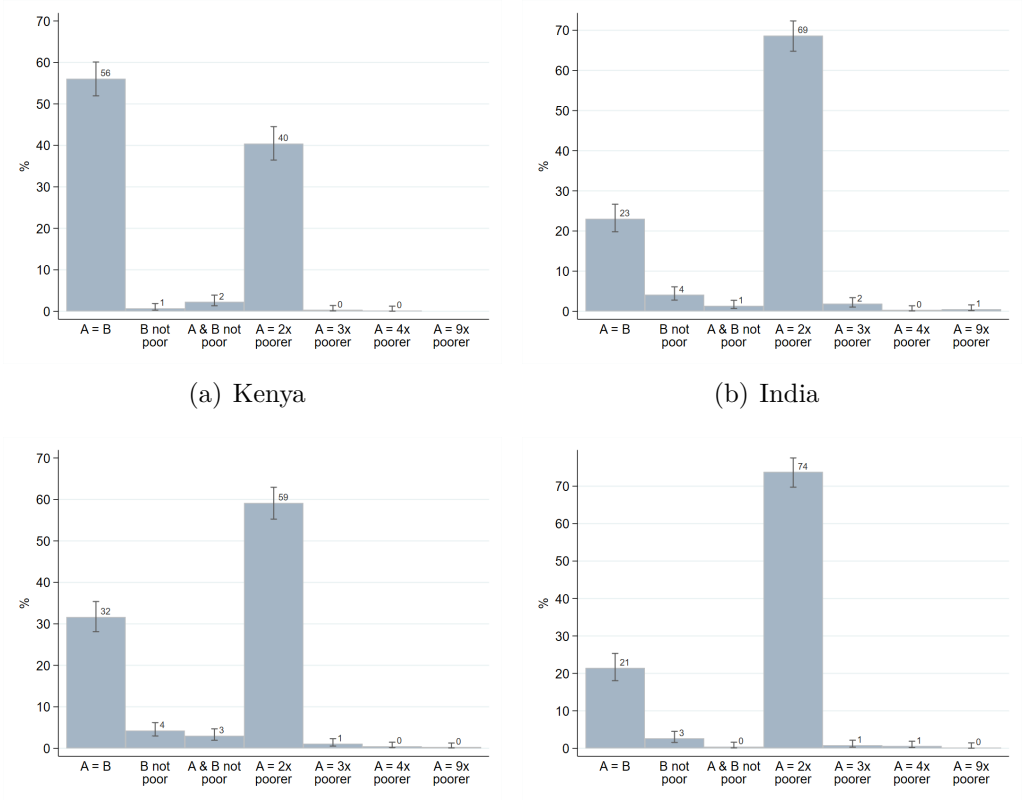
(b) India

(c) South Africa

(d) US

Figure A.4: Survey results: views on poverty, by country (Question 1.a)

Data source: survey data, with participants from Kenya (N=569), India (N=581), South Africa (N=629) and the US (N=489). The question was: *"The World Bank determined that it is impossible for a person or family to meet basic needs below an income of $2.5 a day per person. A earns $0.5 and B earns $1.5 per day. Which statement is consistent with how you think about poverty."* Possible answers, whose order was randomized, are: (1) A and B are equally poor, (2) A is poor and B is not poor, (3) Both A and B are not poor, (4) A is approximately 2 times poorer than B, (5) A is approximately 3 times poorer than B, (6) A is approximately 4 times poorer than B, and (7) A is approximately 9 times poorer than B. All amounts were expressed in local currency units as described in Section 5.

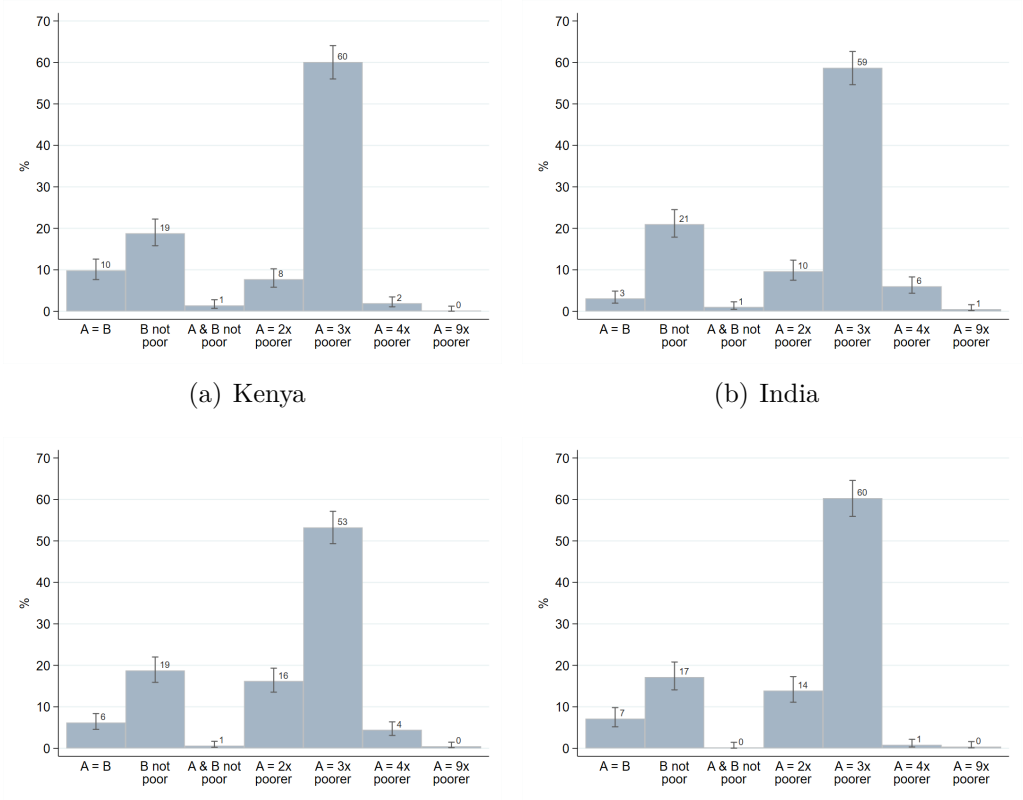


(a) Kenya (b) India

(c) South Africa (d) US

Figure A.5: Survey results: views on poverty, by country (Question 1.b)

Data source: survey data, with participants from Kenya (N=569), India (N=581), South Africa (N=629) and the US (N=489). The question was: *"The World Bank determined that it is impossible for a person or family to meet basic needs below an income of $2.5 a day per person. A earns $1 and B earns $2 per day. Which statement is consistent with how you think about poverty."* Possible answers, whose order was randomized, are: (1) A and B are equally poor, (2) A is poor and B is not poor, (3) Both A and B are not poor, (4) A is approximately 2 times poorer than B, (5) A is approximately 3 times poorer than B, (6) A is approximately 4 times poorer than B, and (7) A is approximately 9 times poorer than B. All amounts were expressed in local currency units as described in Section 5.



(a) Kenya

(b) India

(c) South Africa

(d) US

Figure A.6: Survey results: views on poverty, by country (Question 1.c)

Data source: survey data, with participants from Kenya (N=569), India (N=581), South Africa (N=629) and the US (N=489). The question was: *"The World Bank determined that it is impossible for a person or family to meet basic needs below an income of $2.5 a day per person. A earns $1 and B earns $3 per day. Which statement is consistent with how you think about poverty."* Possible answers, whose order was randomized, are: (1) A and B are equally poor, (2) A is poor and B is not poor, (3) Both A and B are not poor, (4) A is approximately 2 times poorer than B, (5) A is approximately 3 times poorer than B, (6) A is approximately 4 times poorer than B, and (7) A is approximately 9 times poorer than B. All amounts were expressed in local currency units as described in Section 5.

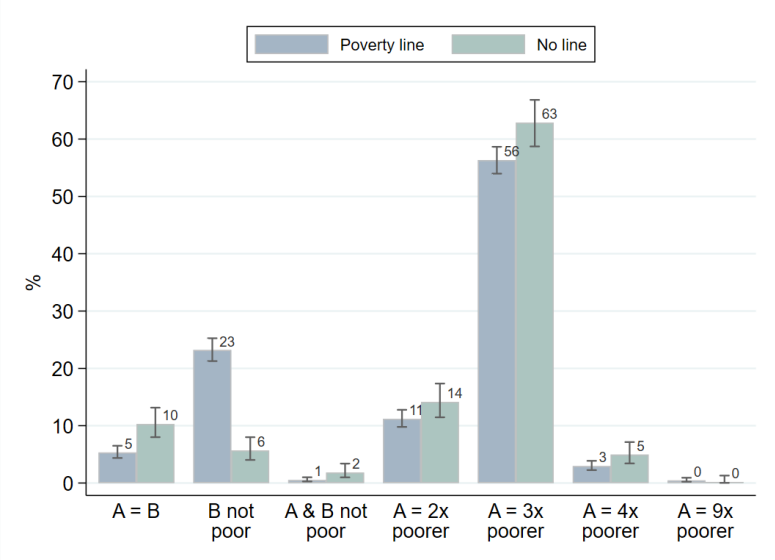
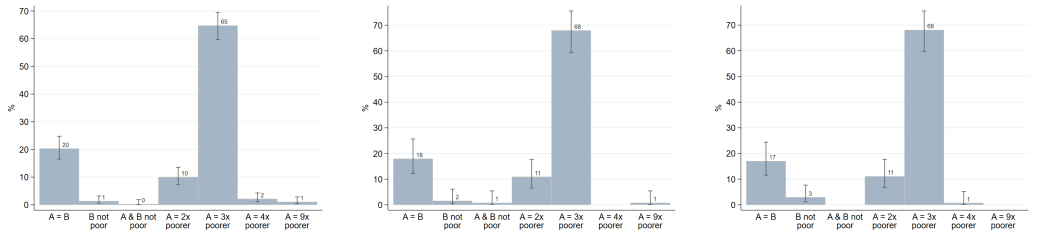


Figure A.7: Survey results: views on poverty, with and without information on the poverty line (Question 1.c)

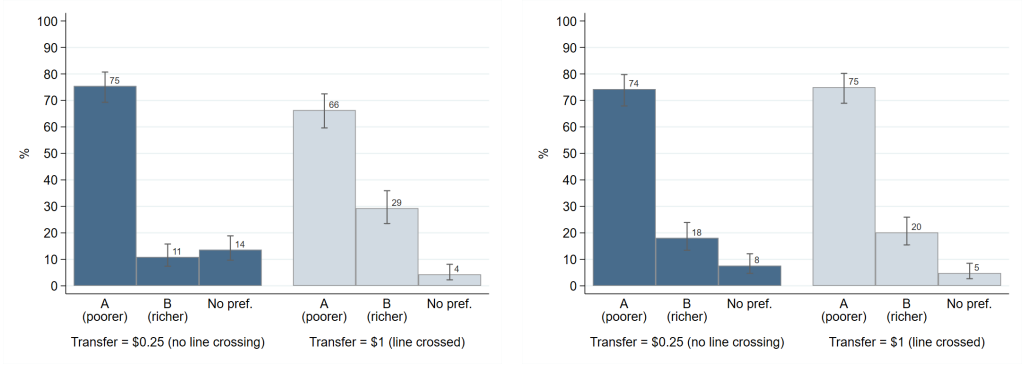
Data source: survey data, with participants from Kenya (N=569), India (N=581), South Africa (N=629) and the US (N=489). For about three quarter of participants, the question was: *"The World Bank determined that it is impossible for a person or family to meet basic needs below an income of $2.5 a day per person. A earns $1 and B earns $3 per day. Which statement is consistent with how you think about poverty."* For a quarter of the sample, the first sentence did not include the reference to the level of the poverty line: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below a certain level."*. Possible answers, whose order was randomized, are: (1) A and B are equally poor, (2) A is poor and B is not poor, (3) Both A and B are not poor, (4) A is approximately 2 times poorer than B, (5) A is approximately 3 times poorer than B, (6) A is approximately 4 times poorer than B, and (7) A is approximately 9 times poorer than B. All amounts were expressed in local currency units as described in Section 5.



(a) Benchmark amounts (b) Amounts multiplied by 10 (c) Amounts multiplied by 20

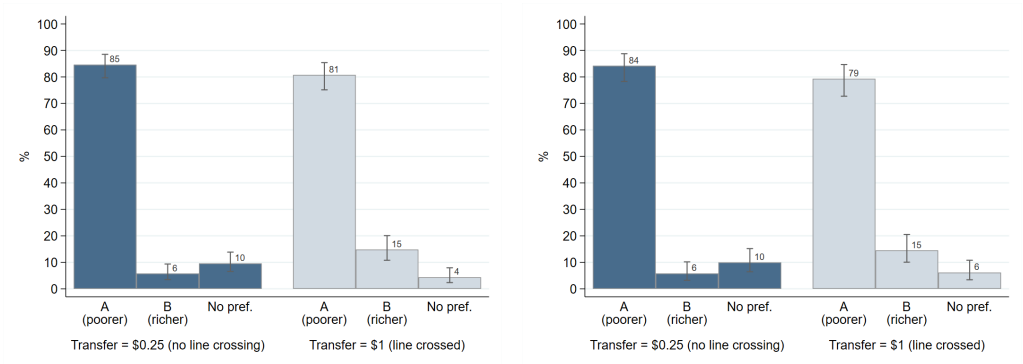
Figure A.8: Survey results: views on poverty in the US (Question 1.a)

Data source: survey data, with participants from the US. The benchmark question was: *"The World Bank determined that it is impossible for a person or family to meet basic needs below an income of $2.5 a day per person. A earns $0.5 and B earns $1.5 per day. Which statement is consistent with how you think about poverty."* For some randomly selected participants, all amounts were multiplied by 10 or 20. Possible answers, whose order was randomized, are: (1) A and B are equally poor, (2) A is poor and B is not poor, (3) Both A and B are not poor, (4) A is approximately 2 times poorer than B, (5) A is approximately 3 times poorer than B, (6) A is approximately 4 times poorer than B, and (7) A is approximately 9 times poorer than B. All amounts were expressed in local currency units as described in Section 5.



(a) Kenya

(b) India

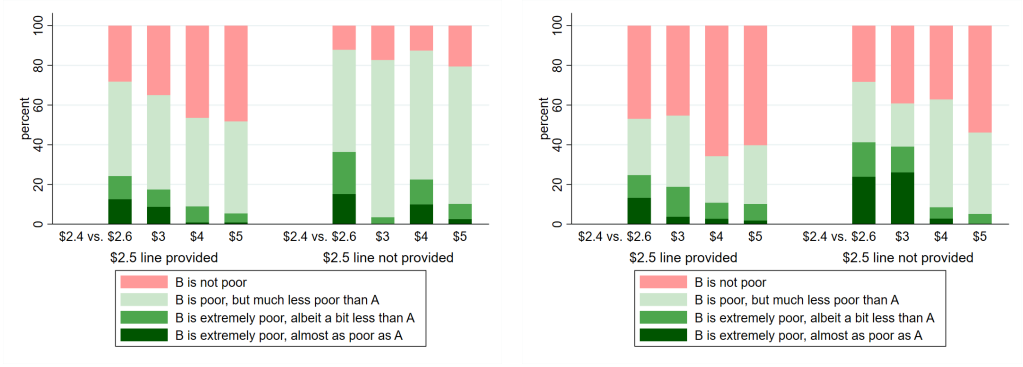


(c) South Africa

(d) US

Figure A.9: Survey results: allocation of resources

Data source: survey data, with participants from Kenya (N=428), India (N=438), South Africa (N=489) and the US (N=369). Participants who did not get information on the level of the poverty line are excluded. The question was: *"An individual A earns $1 per day while individual B earns $2 per day. You have the possibility to increase the income of one of these two individuals by $X per day. To which individual do you give the money to reduce poverty?"* The amount X was randomly assigned as 0.25 or 1. Possible answers, whose order was randomized, are: (1) Individual A, (2) Individual B, (3) I have no preference. All amounts were expressed in local currency units as described in Section 5.



(a) Kenya

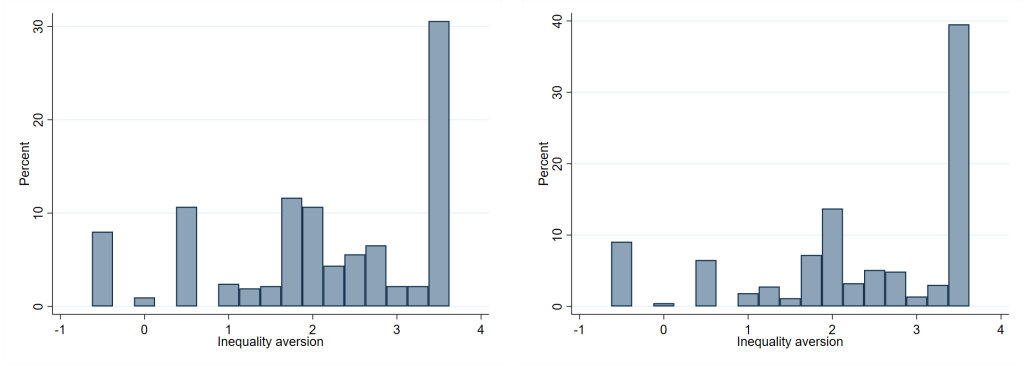
(b) India

(c) South Africa

(d) US

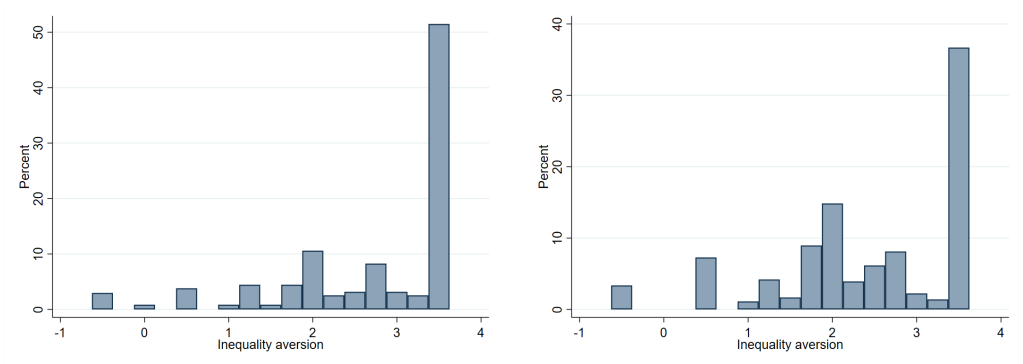
Figure A.10: Qualitative comparisons of individual A who is just below the poverty line and B who is above the poverty line, by country

Data source: survey data, with participants from Kenya (N=569), India (N=581), South Africa (N=629) and the US (N=489). The question was: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below $2.5 per day per person. Individual A earns $2.4 per day while individual B earns $X per day. Which statement is consistent with how you think about poverty?"* The amount X was randomly assigned as 2.6, 3, 4, or 5. About a quarter of the sample did not get information about the level of the poverty line. Possible answers, whose order was randomized, are: (1) B is extremely poor, almost as poor as A, (2) B is extremely poor, albeit a bit less than A, (3) B is poor, but much less poor than A, (4) B is not poor. All amounts were expressed in local currency units as described in Section 5.



(a) Kenya

(b) India



(c) South Africa

(d) US

Figure A.11: Survey results: inequality aversion, by country

Data source: survey data, with participants from Kenya (N=412), India (N=430), South Africa (N=472) and the US (N=357). The figures focus on participants assigned to the benchmark phrasing of the question Q3 as described in Table A.1. The parameters of the question are described in Table A.2. Figure A.3 shows the different pathways that participants could follow depending on their answers. Respondents who were indifferent in all questions are excluded.

D Robustness checks

Table A.3: Robustness tests for question 1

	Question 1.a =1 if answer is A = 3x poorer		Question 1.b =1 if answer is A = 2x poorer		Question 1.c =1 if answer is A = 3x poorer	
	(1)	(2)	(3)	(4)	(5)	(6)
Age	-0.0000868	-0.0000752	-0.000110	-0.000108	0.0000891	0.0000908
	(0.000115)	(0.000115)	(0.000111)	(0.000111)	(0.000115)	(0.000115)
Female	-0.0814***	-0.0819***	-0.0573***	-0.0574***	-0.0846***	-0.0847***
	(0.0214)	(0.0214)	(0.0207)	(0.0207)	(0.0215)	(0.0214)
Education years	0.00643	0.00660	0.00506	0.00521	-0.00389	-0.00328
	(0.00751)	(0.00750)	(0.00726)	(0.00726)	(0.00754)	(0.00751)
Household size	-0.0103	-0.00992	-0.00315	-0.00291	-0.00931	-0.00874
	(0.00677)	(0.00677)	(0.00655)	(0.00655)	(0.00680)	(0.00678)
Income (log+1)	0.0102	0.0103	0.000692	0.000593	0.00193	0.00143
	(0.00688)	(0.00688)	(0.00665)	(0.00666)	(0.00691)	(0.00689)
Survey duration (log)	0.00646	0.00893	-0.00530	-0.00399	-0.00128	0.00325
	(0.0202)	(0.0202)	(0.0195)	(0.0196)	(0.0203)	(0.0203)
Random order answers (d2)		0.0268		0.0200		0.0854***
		(0.0256)		(0.0248)		(0.0256)
Random order answers (d3)		-0.0133		0.0119		0.0630**
		(0.0253)		(0.0245)		(0.0254)
No poverty line		0.0517**		0.0257		0.0641***
		(0.0241)		(0.0233)		(0.0241)
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2262	2262	2262	2262	2262	2262
R^2	0.042	0.045	0.070	0.071	0.012	0.020

Data source: survey data, with participants from Kenya (N=569), India (N=581), South Africa (N=629) and the US (N=489). Question 1 is *"The World Bank determined that it is impossible for a person or family to meet basic needs below an income of $2.5 a day per person. A earns $X and B earns $Y per day. Which statement is consistent with how you think about poverty."*. Possible answers were: (1) A and B are equally poor, (2) A is poor and B is not poor, (3) Both A and B are not poor, (4) A is approximately 2 times poorer than B, (5) A is approximately 3 times poorer than B, (6) A is approximately 4 times poorer than B, and (7) A is approximately 9 times poorer than B. In Columns (1) and (2), $X = 0.5$ and $Y = 1.5$ and the dependent variable is a dummy equal to 1 if the participant selected the answer (5). In Columns (3) and (4), $X = 1$ and $Y = 2$ and the dependent variable is a dummy equal to 1 if the participant selected the answer (4). In Columns (5) and (6), $X = 1$ and $Y = 3$ and the dependent variable is a dummy equal to 1 if the participant selected the answer (5). Three different orderings of answers were randomly assigned: [1,2,3,4,5,6,7], [4,5,6,7,1,2,3], and [1,4,5,6,7,2,3]. The second ordering is identified by the binary variable "Random order answers (d2)". The third ordering is identified by the binary variable "Random order answers (d3)". For a quarter of participants (randomly selected), the introductory sentence did not include information on the level of the poverty line: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below a certain level."*. These respondents are identified using the dummy variable *"No poverty line"*. Country fixed effects are included in all regressions. Standard errors in parentheses. Significance levels are indicated by * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.4: Impact of possibility to push B above the poverty line k in Questions 2 and 3

	Dependent variable = 1 if gives to B (richest)			
	General public		Experts	
	(1)	(2)	(3)	(4)
B can cross z	0.0732***	0.0238	0.170***	0.0741
	(0.0139)	(0.0157)	(0.0434)	(0.0469)
# Answers consistent with headcount	0.0407***	0.0142**	0.0658***	0.00579
	(0.00508)	(0.00650)	(0.0159)	(0.0212)
Interaction		0.0562***		0.125***
		(0.0101)		(0.0312)
Observations	6896	6896	678	678
R^2	0.171	0.175	0.216	0.235

Data source: survey data, focusing on participants who were informed about the level of the poverty line. I use data from Questions 2 and 3, which are described in Table A.1. One observation corresponds to one answer provided by a participant. The dependent variable is equal to 1 if the participant decides to allocate the money to B (the richest individual). The variable *"B can cross k"* identify questions for which the respondent had the possibility to push B above the poverty line k (see Table A.2). The variable *"# Answers consistent with headcount"* counts the number of answers to (Q1) that are consistent with the headcount view of poverty (Q1.a=1, Q1.b=1, Q1.c=2). The variable "Interaction" is an interaction term between these two variables. In all regressions, I include fixed effects identifying questions with similar underlying ϵ and I control for the leakage rate and a dummy identifying questions for which the respondent could not fully close the income gap by giving money to A. Standard errors in parentheses. Significance levels are indicated by * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table A.5: Robustness tests for questions 2, 3, and 4

	Question 2 =1 if answer is Individual A		Question 3 Inequality aversion (θ)		Question 4 =1 if answer is B is not poor	
	(1)	(2)	(3)	(4)	(5)	(6)
Age	-0.0000248	-0.0000219	0.000307	0.000323	0.0000140	-0.00000657
	(0.0000940)	(0.0000936)	(0.000273)	(0.000272)	(0.000114)	(0.000112)
Female	0.0321*	0.0312*	0.0339	0.0361	0.0157	0.0165
	(0.0175)	(0.0174)	(0.0516)	(0.0514)	(0.0212)	(0.0208)
Education years	-0.0112*	-0.0109*	-0.0410**	-0.0408**	0.00228	0.00203
	(0.00614)	(0.00611)	(0.0180)	(0.0179)	(0.00744)	(0.00730)
Household size	-0.00271	-0.00172	-0.00573	-0.00313	0.0109	0.00859
	(0.00554)	(0.00552)	(0.0163)	(0.0163)	(0.00671)	(0.00659)
Income (log+1)	0.00311	0.00260	-0.0194	-0.0196	0.00994	0.0102
	(0.00563)	(0.00560)	(0.0166)	(0.0165)	(0.00682)	(0.00669)
Survey duration (log)	0.0181	0.0203	0.00351	0.00772	0.0499**	0.0455**
	(0.0165)	(0.0165)	(0.0489)	(0.0487)	(0.0200)	(0.0197)
Random order answers (d1)		0.0168		-0.0683		-0.0138
		(0.0167)		(0.0494)		(0.0200)
No poverty line		0.0872***		0.265***		-0.217***
		(0.0196)		(0.0579)		(0.0234)
Cross poverty line		-0.0313*				
		(0.0168)				
Country fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Observations	2262	2262	2193	2193	2262	2262
R^2	0.015	0.026	0.029	0.039	0.028	0.064

Data source: survey data. Questions 2, 3, and 4 are defined in Table A.1. In Columns (1) and (2), the dependent variable is a dummy equal to 1 if the participant selected the answer *"Individual A"*. Participants who were randomly assigned to the amount $1 are identified using the dummy variable *" Cross poverty line"*. In Columns (3) and (4), the dependent variable is the measure of inequality aversion introduced in Section 5.3. In Columns (5) and (6), the dependent variable is a dummy equal to 1 if the participant reported that the individual above the poverty line, B, is not poor. In all questions, for a quarter of participants (randomly selected), the introductory sentence did not include information on the level of the poverty line: *"The World Bank has determined that it is impossible for a person to meet their basic needs if they have an income below a certain level."*. These respondents are identified using the dummy variable *"No poverty line"*. The order of answers was randomized, with two possible orderings for each question (identified by the binary variable "Random order answers (d1)"). Country fixed effects are included in all regressions. Standard errors in parentheses. Significance levels are indicated by * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.