Raising the Bar:
A Poverty Line for Global Inclusion

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Abstract. The first of the Sustainable Development Goals adopted by the United Nations in 2015 "End poverty in all its forms everywhere" which implies moving beyond "extreme poverty" to an array of poverty lines. This raises the obvious question: to complement the dollar-a-day (now P$2.15) *lower bound* poverty line, what is the *upper bound* poverty line (GUBPL)? We propose, empirically estimate, and defend a GUBPL based on two criteria. First, the global poverty line is an *absolute* level of material wellbeing and treats the world's people and households equally, not relative to birthplace, residence or citizenship. Second, the distinctive property that separates the standard poverty measures (Foster, Greer, Thorbecke 1984) is gains in household income/consumption above the poverty line count for exactly zero in reducing poverty. Our second criteria is that a GUBPL should be set at a high enough level of income/consumption that zero gains, while not literally true, is a "close enough" approximation. Our two empirical approaches, based on completely different material wellbeing indicators, both suggest a GUBPL in the range of P$19 to P$40 per person per day. This range for a GUBPL is consistent with a variety of considerations, like national poverty lines and achievement of basics and is consistent with the new World Bank "prosperity gap" standard. A GUBPL of P$21.5 has a nice "focal point" appeal as it is exactly ten times the current global lower bound of P$2.15. A poverty line of P$21.5 makes "development as poverty reduction" an inclusive and ambitious global vision, compatible with existing and future development goals.

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Natura non saltum facit (Nature doesn't jump)

Epigraph to Alfred Marhsall's Principle of Economics, 1890

I don't mind poverty analysis, as long as the poverty line is infinity

Angus Deaton (oral tradition)

Introduction

Reducing poverty is a broadly shared goal of the United Nations, multilateral and bilateral development agencies, activists, and philanthropists, a goal proposed by many national governments, and a purpose to which field of development economics hopes to contribute. But without agreement on the range of meanings of "poverty" this apparent broad consensus is mere constructive ambiguity.

The dollar-a-day poverty line (now updated with inflation to P$2.15 in 2017 PPP[3]) was never intended to become *the* poverty line, but only the *lowest* acceptable poverty line (Pritchett 2024). The justification for the dollar-a-day poverty line when first used in the World Bank's World Development Report 1990, was that this was the (rough) average of the national poverty lines adopted by the world's poorest countries (Ravallion, Datt and van de Walle 1991). Few argue that a global poverty line should be lower than the poverty lines of the poorest countries. However, a global poverty line based only on the poverty lines of a few of the poorest countries necessarily implies that nearly all countries have national poverty lines higher than this global lower bound[4] and hence this is a typical, much less, an upper-bound poverty line[5].

At the same time the dollar-a-day standard, often called "extreme poverty," became increasingly popular in development discourse, it was increasingly recognized that this penurious standard could not be the *only* global poverty line (Pritchett 2006; Birdsall and Meyer 2015). For instance, Goal 1 of the 2015 Sustainable Development Goals is: "End poverty in all its forms everywhere." This embrace of "poverty in all its forms" clarified that, at least for the United Nations, the dollar-a-day poverty line was not *the* international poverty line but rather one among many. Similarly, some time ago the World Bank moved to reporting not just dollar-a-day but also two higher poverty lines (the latest levels, in 2017 PPP, are P$2.15, P$3.85 and P$6.85) as well as poverty at national poverty lines. In 2023 the World Bank went further and adopted and reported on a measure of the "prosperity gap" that uses P$25 pppd as the prosperity threshold (Aron et. al. 2024). Once the need for an array of global poverty lines is accepted, this implies there must be a global upper-bound poverty line.

Here we propose a GUBPL based on two criteria.

[3] We use the notation "P$" to indicate dollars adjusted for purchasing power differences across countries so that the same P$ in different countries should buy an equivalent bundle of goods and services.
[4] This is a fact shown in Figure 5.
[5] This is shown in Figure 5 in section II.C.2.

One, the GUBPL should be an *absolute* level of PPP adjusted consumption/income[6] applied to all people irrespective of location. Adopting national poverty lines as a measure of either the level or improvement in poverty implies that the standard used to define whether any individual is "poor" depends on their location and hence people with lower levels of wellbeing are counted as "not poor" because they live in a poor place.

Two, our GUBPL takes seriously the analytic implications of the widely used and reported FGT (Foster, Greer, Thorbecke, 1984) poverty measures. What distinguishes any FGT poverty measure (of which the most popular, if least analytically sound, is the "headcount" measure) from all other of the many distributionally sensitive money-metric measures of wellbeing (e.g. Atkinson or Sen indices or "inequality adjusted income") is that above the poverty line increments to consumption/income count for *exactly* zero in reducing FGT poverty. We therefore estimate a GUBPL by asking: "What is the level of wellbeing at which *exactly zero* is, while not literally true, a 'close enough' approximation to the gains to wellbeing as a development goal?"

Our empirical estimates based on two criteria for an absolute threshold of wellbeing suggest a GUBPL between P$19 and P$40. A GUBPL in this range that has a nice, memorable, focal point, is P$21.5 per person per day. This is exactly 10 times the current dollar-a-day lower bound of P$2.15[7]. Needless to say, adopting a GUBPL ten times higher line radically changes the number of people who are classified as "globally poor" and hence changes completely what "development as poverty reduction" implies as a goal and what is needed to meet that goal.

I) Setting a GUBPL

Our goal is to propose and defend a specific, numeric, GUBPL with four features.

First, we want a GUBPL such that households/people who are not poor by this threshold are nevertheless poor, just with a different adjective. Households who are just above the dollar-a-day threshold might be not counted as "extreme poor"--but they are nevertheless very poor. Households in poor countries who are *not* poor by their national poverty line are nevertheless poor by other national poverty lines and by other reasonable definitions of global poverty. Our goal is a GUBPL such that people who are not poor by this poverty line are poor but are "globally prosperous" or "doing okay" or "doing well."

Two, we want our GUBPL to be defined by *absolute* measures of material wellbeing. The primary objection (as discussed more below in section III.A) to using high income country

[6] The poverty measures reported by the World Bank are based on household survey data. In poorer countries these tend to use consumption expenditures, as reliably measuring income in poorer households that rely on a variety of income generating activities and on production for own consumption is practically difficult while in more advanced countries where labor income is the predominant source of income the national sources tend to measure income. As our focus is on poorer countries we tend to use the term "consumption" but nothing crucial hinges on this distinction and when using World Bank cross-national data we use data using either consumption or income.

[7] For all its many flaws, one feature that facilitated an essentially arbitrary line so popular in the first place must be that *one* (dollar-a-day) is such a memorable number.

poverty lines as the global upper-bound (e.g. Pritchett 2006; Roser 2021, 2024) is that national poverty lines are a mix of absolute and relative wellbeing and, as countries get richer this "relative to others in our country" element of national poverty lines gets larger (Ravallion 2008). While the national poverty lines are an important consideration in measuring poverty, as argued by Roser (2024), using national poverty lines that are changing over time as they are relative to rich country circumstances (European poverty lines are a function of median income) does not create a fixed threshold for measuring progress.

Three, we are aiming to produce a GUBPL that measures "development related" poverty and is actively used by the UN and multilateral, regional, and bilateral development agencies in framing their organizational agendas and goals. The SDGs extend only to 2030 hence the next round of development goal setting will need to consider *development* poverty goals, targets, and measures. We are proposing a GUBPL that can be adopted as a *development* goal, whereas the "poverty in all forms everywhere" is meant to include poverty in rich countries, even that poverty which is not a "development" issue.

Four, since most reported measures of poverty are based on the FGT analytics (e.g. the "headcount" poverty, the poverty gap, the squared poverty gap) we take the unique features of the FGT analytics seriously and propose a poverty line that does not face the severe normative problems of FGT measures which use low-bar poverty lines (Pritchett 2024).

I.A) Analytics of FGT poverty measures and their normative problems

Nearly all estimates of income/consumption poverty reported by major organizations are in the Foster, Greer, Thorbecke (1984) class. Defined on continuous distribution of consumption, f(c), an FGT poverty measure is the integral over the consumption distribution of the weighted gap between consumption and the poverty line (equation 1).

$$1)\ Pov(PL,\alpha) = \int_{-\infty}^{PL} ((PL-c)/PL)^{\alpha} f(c)dc$$

The FGT parameter α measures the "intensity" of the contribution to poverty at any given level of y. At α=0 everyone below the poverty line counts equally and hence this is the "headcount" poverty (and if divided by the population, the headcount poverty rate, or percent in poverty). If α=1 equation 1 produces the "poverty gap" as the average proportionate distance of the income of the poor from the poverty line. At α=2 this is the "severity" or "squared gap" measure of poverty which puts non-linearly increasing weight on those further below the poverty line.

The definition of FGT poverty implies that, for any given poverty intensity parameter (α), the reduction to poverty from consumption gains to households above the poverty line is *exactly* zero.

$$2)\ \left.\frac{dPov(PL,\alpha)}{dc}\right|_{c} = 0, \forall c > PL$$

This aspect of FGT poverty measures is a feature and a bug. It is a feature as this discrete, lexicographic, lack of trade-off between gains above and below the line makes it: (i) easy to produce estimates of the number or proportion of poor, as opposed to money-metric

wellbeing measures and (ii) this discreteness puts special emphasis on the wellbeing of only those below the poverty line.

But this feature is also a bug. FGT measures have two empirically counter-factual implications, each of which creates highly problematic normative implications.

Problem one: empirically, *there is no line* (Pritchett 2013). Nature has some lines. Water undergoes a phase transition from solid to liquid at 0 degrees Celsius (at standard atmospheric pressures). However, for poverty lines, Alfred Marshall is right that "nature does not jump." No one has ever provided evidence that *any* mapping from *any* measure of wellbeing (subjective or objective measures of deprivation or material conditions) to consumption "jumps" in either level (the wellbeing function is discontinuous in consumption) or has a "kink" (the wellbeing as a function of consumption has discontinuous derivatives or any order)[8]. Any poverty line, as distinct magnitude of consumption, necessarily separates people who are essentially observationally equivalent[9].

The normative issue of using poverty lines when in fact there no line is that FGT poverty measures treat people that are (very nearly) alike as if they were (very) different. For instance, in calculating the benefits of targeting, transfers to households that one penny/rupee/rupiah below some arbitrary line are treated as "good" and "poverty reducing" and "well targeted" and transfers to households one penny/rupee/rupiah above the line as "leakage" or not "poverty reducing" which is "bad" even though by any sensible theoretical or empirically grounded measure of wellbeing the benefits of a transfer to households just marginally on either side of a poverty line are nearly identical (e.g. Skoufias and Coady 2007)[10].

[8] There is another, mathematically more complex, sense of there being a "line" at the poverty line. It might be the case that the dynamics of future income change above or below some line such that there are "poverty traps" below a certain level of income. However, two points. One, "poverty trap dynamics" have never been used (or even proposed) as the empirical basis for any of the currently used poverty lines. Intuitively, the likelihood that a poverty line set in standard ways (e.g., around nutritional standards) that have nothing whatsoever to do with poverty traps would happen to also be the poverty line at which poverty traps are relevant is small, even for a set of measure zero. Two, the very large movements of the same households into and out of poverty over time -even adjusting for measurement error- (e.g., Jalan and Ravallion (1998) for China, Sudarno, Suryahadi, and Pritchett (2000) in Indonesia, Glewwe and Hall (1994), Narayan, Pritchett and Kapoor (2009) in 17 study sites, etc.) is inconsistent with the view that all, or even nearly all, people experiencing a spell of poverty at the standard poverty lines are also in a poverty trap dynamic.

9 There might be come confusion because there are often tables and graphs with comparisons of objective wellbeing outcomes (e.g. child malnutrition) or subjectively assessed wellbeing (e.g. life satisfaction) between the "poor" and the "nonpoor" that do show very large differences. But large gaps in wellbeing between poor and non-poor as category averages are just an artefact of large differences in average consumption/income between the categories and any monotone function of wellbeing wrt to consumption. These certainly do not imply that at the margin there are large differences between poor and nonpoor.

[10] This is not just an artefact of headcount measures ($\alpha=0$) but is true with any α, as above the poverty line the marginal contribution to poverty from consumption gains are positive and hence even if gains to poverty reduction of those just below the poverty line are small relative to those far from the poverty line,

Problem two: empirically satiation in subjective or material wellbeing happens (if at all) only at very high levels of income/consumption, but income gains to households just above the poverty line are treated as *exactly* zero gain to poverty reduction (at this is true at any FGT parameter α).

Stevenson and Wolfers (2013) reject the "satiation" hypothesis with both country and individual data at levels of income far beyond any proposed poverty line (including our proposed GUBPL). In fact, they show that the gains to national average self-reported wellbeing from increases in average incomes do not fall to zero at *any* observed level of income and, if anything, the opposite, and the gains to self-assessed wellbeing from a given (log) change in income are *higher* in richer countries. They show that for the 25 largest countries in the Gallup data the relationship between individually self-reported life satisfaction and household income is linear in natural log income up to household income as high as $64,000, which, for a household of four would be P$44 per person per day. Deaton and Kahneman (2010) use daily Gallup data from the USA to show that there is no satiation in "life evaluation" even at the very high levels of income in the USA data (for "emotional wellbeing" there is satiation only at a household income of $75,000).

Two normative issues arise from using poverty lines which are far below any plausible level of satiation in subjective or objective measures of wellbeing.

One, FGT poverty measures violate the *monotonicity* or *Strong Pareto* condition (roughly that, in an aggregated measure of wellbeing over N households/people, if one household/person is better off and no others are worse off, then the aggregate measure of measure of wellbeing across the N people should increase). This condition is considered an axiom of social welfare measures, hence Angus Deaton's epigraphic quip that poverty is acceptable for welfare analysis only if the poverty line is infinity.

Two, FGT poverty measures treat households that are very different as if they were alike. For instance, gains to a household just above the poverty line counts for zero in poverty reduction, which is exactly the same as the gains to a billionaire. In any continuous measure of subjective or objective wellbeing with declining marginal gains of wellbeing wrt to consumption this would not be true. The consumption gains to the "just not poor" household should count for more in measuring economic progress than the gains to a billionaire. So, while there has been increasing attention to country's economic inequality, FGT poverty measures are affected only by the inequality in consumption of those below the poverty line and ignore entirely inequality of outcomes between those above the poverty line.

I.B) Are the highest of the current poverty lines high enough?

Choosing a poverty line can be technically rationalized, but ultimately is a choice about words. Poverty is a social construct. Any poverty line creates a binary between "poor by this line" and "not poor by this line" even though the underlying measures of income and of

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the ratio of gains of those below and above the poverty line is infinitely large as the gains above the poverty line are zero.

wellbeing are continuous. We are not taking issue with dollar-a-day as the *lowest* acceptable global poverty line or that this line defines words like global *extreme* poverty (or the "poorest of the poor" or "destitute" or equivalents). But it is widely acknowledged that this penurious poverty line cannot be the *only* global poverty line. The pressing question is whether the currently used "high" poverty lines, such as that used by the World Bank of P$6.85, are really high enough, in two senses.

First, do the current conventional "high" poverty lines really reverse the inclusion/exclusion logic of the dollar-a-day line? The rhetorical use of the P$2.15 poverty line is to generate urgency around poverty action by including in the category of extreme poverty *only* those experiencing serious deprivation. However, this feature necessarily creates the bug of massive *exclusion* of many people with very low levels of material wellbeing from the category of poverty. "Extreme poverty" includes very few people who are "not poor" (low error of false inclusion) but billions of people who are legitimately classified as "poor" by some other legitimate and justifiable poverty line are not counted as poor (high error of false exclusion).

We seek a GUBPL with the opposite tension. An GUBPL that divides the world's population into "globally poor" and "prosperous" (while acknowledging, of course with various additional gradations within each category, so the "extreme poor" are part of the "global poor" and the "rich" are part of the prosperous) potentially includes many people who are "not poor" into the "global poor" (potentially large error of false inclusion) but there is confidence that those above the poverty line are not poor (small error of false exclusion). The analogy to standard errors is obvious, a point estimate less two standard errors produces a small likelihood the true value is less that this lower limit, but implies a large probability the true value is higher. The upper limit of a confidence interval, say a point estimate plus two standard errors, has the opposite risks of error.

Second, are the current high poverty lines high enough that the normative issues are tolerably small? Is treating people just above the GUBPL as having zero benefit in global poverty reduction actually "close enough" (even though this assumption of "poverty satiation" does not correspond literally to objective or subjective wellbeing)? Similarly, is treating those just above the GUBPL line and those in the middle class of rich countries middle class as the same contribution to development progress "close enough"?

Figure 1 shows a simulated log-normal distribution of consumption/income[11] per person per day (in 2017 PPP) for four countries: Ethiopia, Pakistan, Indonesia, and Denmark.[12] The graph is in absolute P$ units (not in natural logs) in order to illustrate just how huge the gaps in absolute consumption/income *between* countries really are (which natural log scales compress). Three facts are readily apparent

[11] The choice of parameters for the simulation of the log normal distribution based on the existing data on the actual distributions is described in the Simulation Appendix.
[12] In the World Bank classification these are low, lower-middle, upper-middle, and high-income countries.

One, as is now pretty much agreed, the dollar-a-day (P$2.15) standard cannot be *the* central goal that defines development, as thankfully, there has been so much progress on this measure that only a small fraction of the population is in extreme poverty, even in quite poor countries that still face enormous development challenges, like Pakistan. In our simulated log-normal distribution extreme poverty is only 12.5% in Pakistan[13]. It cannot be that "development is about poverty reduction" when poverty is measured such that consumption/incomes gains to households in the *13th percentile* (!?) in Pakistan do not reduce poverty. Moreover, dollar-a-day treats consumption gains to households at the 13th percentile in Pakistan, who are globally very, very poor, and households at the 95th percentile in Denmark, who are globally quite rich, as *exactly* the same. This is normatively not just unreal, it is surreal.

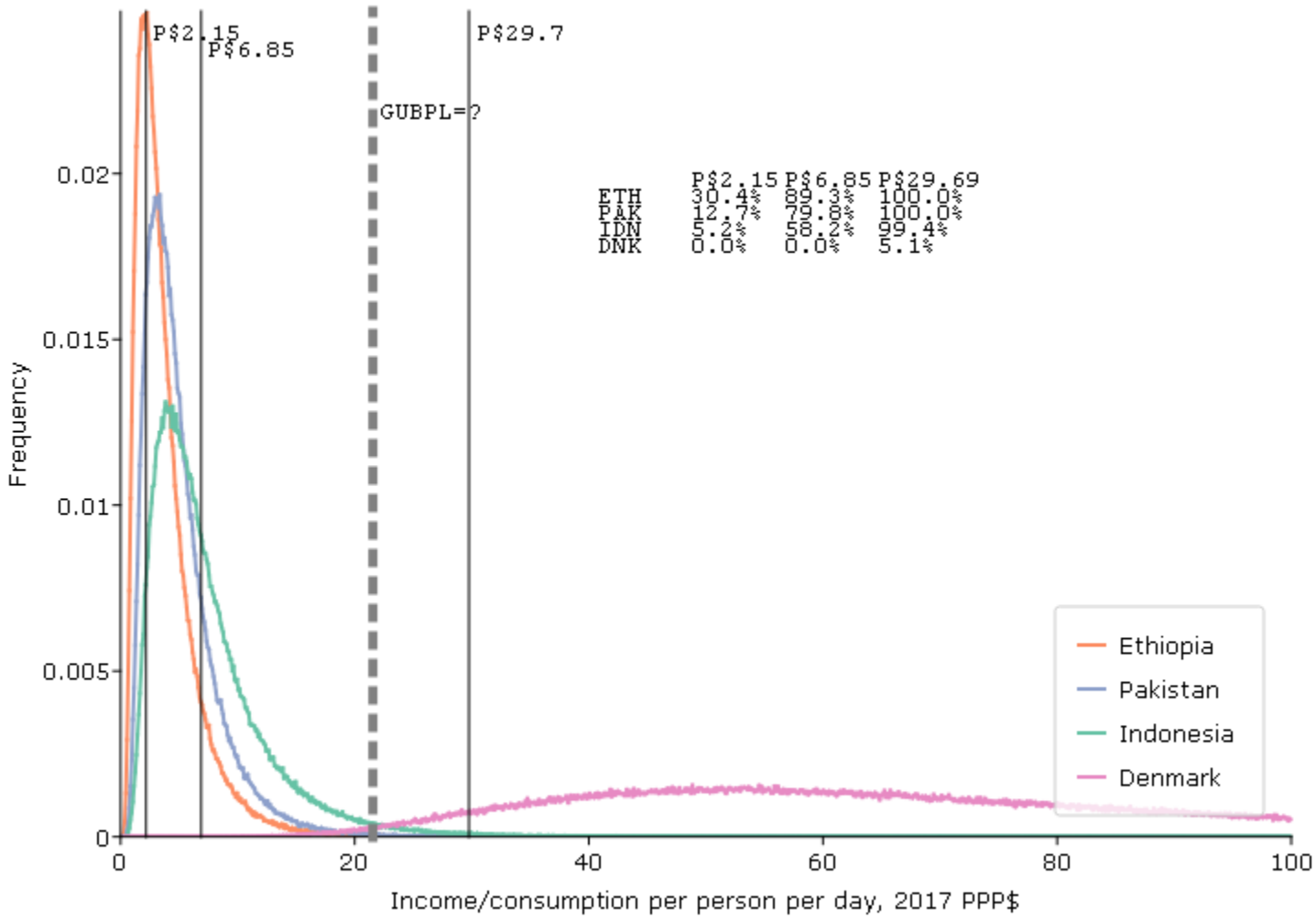
Two, at the national poverty line of an advanced industrial country like Denmark (P$29.7), nearly everyone in developing countries, even in "upper middle income" countries like Indonesia, is poor. While of course there are citizens in poor countries who are in the "global super-rich" category of millionaires or billionaires, nevertheless the "poor of the rich" have much higher incomes than the statistically "rich of the poor." The average income of the bottom 10th percentile Dane (P$24) is *twice* as high as the average consumption of households in the top decile (90th-100th) in Pakistan (P$12.7). The income of the top decile in Pakistan is absolutely further below the Danish lowest decile (P$24-P$12.7=P$11.3) than it is above the Pakistani lowest decile (P$12.7-P$2.10=P$10.6). Generally, the rich of poor countries are poorer than the poor of the rich countries by more than they are richer than the poor of their own country[14]. Low bar poverty lines necessarily focus only on the inequality among the poor rather than massive inequality across countries.

Three, for the poorer countries absolutely small differences in the poverty line make for very large differences in estimated headcount poverty rates. The difference between the World Bank's low poverty line, P$2.15 and the "high" poverty line, P$6.85 is only P$4.70, which an absolutely small amount compared to, say, the difference in average income between Denmark, at P$66 versus Pakistan at P$5, of P$61. Yet, in these simulated distributions in Indonesia the P$2.15 poverty rate is only 5.2 percent yet at P$6.85, just P$4.70 higher (P$1715 a year), the headcount poverty rate is 59.2 percent, implying that more than half of the consumption distribution in Indonesia lies within a range of only P$4.70. For reference, in Denmark the difference in consumption per day between the first and second decile (the smallest difference across deciles) is P$12, which is P$4,395 per year.

[13] This is much higher than the World Bank reported figure of only 4.9 percent due to their estimate of the left tail distribution and our log-normal approximation.

[14] Dani Rodrik (2007) points out this fact is not well known and when asked, most people get this wrong. Moreover, when people are told the facts about income differences they often then doubt the data—specifically they doubt the adjustments for PPP are adequately accounting for how much better "the rich" have it in poor countries—rather than doubt their opinion. Pritchett and Spivack (2013) show that PPP-free comparisons of standards of living produce nearly identical differences in estimates of the gap between the "rich of the poor" and the "poor of the rich."

Figure 1: Illustration of the distribution of consumption/income across countries and the implications of various poverty lines for estiamtes of headcount poverty rates



Source: Author's calculations with World Bank PIP data.

Notes: Each country distribution is a simulated log normal distribution of 500,000 observations with log normal parameters chosen as described in Section II.B.

This leads to the questions: (i) is there is an empirical method for estimating a GUBPL? and (ii) does that method produce a GUBPL nearer the current "high" poverty line of P$6.85?

The analytics of our approach is illustrated in Figure 2a. We start from an (entirely hypothetical) empirical, descriptive relationship between a measure of material wellbeing (MWB) and consumption expenditures. We assume a parameterized exponential functional form (equation 3):

$$3)\ MWB = 1 - e^{-\theta c}$$

where the parameter θ determines how sharply concave the MWB(c) function is, as its slope is:

$$4)\ \frac{dMWB}{dc} = \theta * e^{-\theta c}$$

And the second derivative is:

$$5)\ \frac{dMWB}{dc} = -\theta^2 * e^{-\theta c}$$

The larger the parameter θ the more curvilinear the MWB(c) function (as θ gets large MWB(c) looks more and more like a right angle).

Figure 2a illustrates our method: (a) choose an measure of material wellbeing, (b) we estimate the empirical relationship between that measure and a measure of household income/wealth, (c) we choose a threshold of material wellbeing that constitutes being out of "global poverty", (d) the level of household consumption at which non-poor threshold level of MWB is reliably reached, that is, where not the average but "nearly all" households reach the MWB poverty threshold, is our estimate of the GUBPL.

Figure 2a illustrates that assuming θ=.074 and a MWB prosperity threshold of .8 (on a global zero to 1 scale) generates a GUBPL of P$21.5 as the endogenous outcome.

Figure 2a also illustrates that if a poverty line is chosen exogenously, for instance P$6.85, then *both* the level the MWB achieved households at the poverty line *and* the marginal gains of MWB from incremental consumption at the poverty line are endogenous. With the hypothetical MWB(c,θ) shown and assuming θ=.074, then P$6.85 produces MWB at only 40% of the global maximum and dMWB/dc is, while declining, is still very high, .65 (normed to be 1 at c=1).

The normative issues FGT poverty measures (that households with nearly identical consumption are counted differently and that households with very different income are treated exactly alike) are very severe at the P$6.85 poverty line when θ=.074. The household just above the P$6.85 poverty line has very sharply increasing MWB in c (65% of that of the very poor household at c=P$1) but the FGT measures treat those gains at zero value to poverty reduction. Consumption gains to a household at P$60 per day and a person at P$6.86 are both treated as zero in reducing poverty even though the wellbeing gains at P$60 are very near zero but the gains at P$6.86 are much nearer to those at consumption of P$1/day (=1 by construction) than they are to those at P$60.

Figure 2a conveys three important understandings about poverty lines.

One, for any given mapping from household consumption/income to wellbeing (subjective or objective material conditions), the lower an exogenously chosen poverty line the more severe the normative issues with FGT poverty measures become.

For instance, a common way of setting a low-bar poverty line is the "food energy intake" method, which establishes a food poverty line as the food expenditures needed to achieve at given caloric intake from a given bundle of food consumption and then adding to that food poverty line an allowance for non-food necessities (e.g., Ravallion 1998, Pradhan et al 2001). But this "food energy intake" method neither guarantees that households above this poverty line do not suffer from child malnutrition nor that gains in consumption just above the poverty line are not important to reducing child malnutrition. The Demographic and Health Survey (DHS) reports children malnutrition measures, say the fraction more than two standard deviations below reference weight for age, by wealth quintiles. The fraction of children weight for age malnourished in the middle quintile (40^{th}-60^{th} percentile) of the wealth distribution--which are households well above the dollar-a-day poverty line--is 22.2% in Ethiopia, 20.2% in Nigeria, and 15% in Pakistan. Vollmer et al 2017 show that all DHS countries with data from 2010-2014 the fraction of children under 3 in the middle quartile (50^{th}-75^{th} percentile) of the DHS wealth index that were malnourished by the Comprehensive Index of Anthropometric Failure measure was 40%. So "not poor" by a food energy intake poverty line does not reliably imply a lack of child malnutrition.

This example is illustrative that the normative issues with FGT poverty measured as at exogenously chosen poverty lines can be very severe as: (i) households with high levels of child malnutrition are counted as "not poor" and hence their income gains, which lead to lower child malnutrition count, for zero in measuring poverty reduction and (ii) households that are non-poor by a low poverty line but who have malnourished children are treated exactly the same in measuring poverty progress as rich households in rich countries (e.g. the top decile in Denmark).

If achieving levels of important measures of wellbeing—such as low child malnutrition, low child mortality, access to water and sanitation, education opportunities—is a goal of poverty reduction then the actual empirical association between these indicators and consumption needs to drive the choice of the poverty line.

Second, our method is not a magic wand that makes the hard issues involved in defining a social construct like "global poverty" disappear. In setting a poverty line one still has to choose which dimensions material wellbeing are to be included in a measure of what level(s) of those indicators of those dimensions of wellbeing counts as sufficient for a household to be out of poverty. But this approach does provide an empirical check on assumptions that are otherwise left implicit. In particular we can contrast the estimated gains from consumption/income for material wellbeing (dMWB/dc) against the FGT assumption that normatively relevant poverty reduction stops completely at an assumed poverty line.

Alternatively, instead of choosing the level of material wellbeing of 80% of the maximum to define the poverty line we could choose "what is the threshold value of dMWB/dc

that is 'close enough' to zero?" Figure 2a shows that if we chose .10 as the dMWB/dc threshold (where this is normed to equal 1 at c=P$1) the implied poverty line would be P$32.0 and the level of MWB at that poverty line would be .91[15].

The third insight from the combination of Figures 2a and 2b is that any given indicator of material wellbeing will have different curvature (parameterized in this graph as θ, but our empirical work below allows for much greater flexibility in the non-linearity in the association). The estimated empirical association is just a standard budget expansion path for any given indicator (or combination of indicators), which could be "any use"/ "access" (e.g., use of electricity), level of consumption (e.g., food consumption), and/or wellbeing outcomes (e.g., child malnutrition). Figure 2b shows that there exists a value of θ such that this material wellbeing method, using the same threshold for global poverty of 80% of highest level, would endogenously produce P$6.85 as the GUBPL. Whether a proposed poverty line is consistent with people at that poverty line reliable achieving an adequate standard of living is an empirical question.

[15] One could also choose a poverty line as the higher of the line at which MWB is "high enough" or the marginal gains (dMWB/dc) are "low enough."

Figure 2a: Illustrating a method of choosing a poverty line as the level of consumption/income at which a given level of material wellbeing is reliably achieved

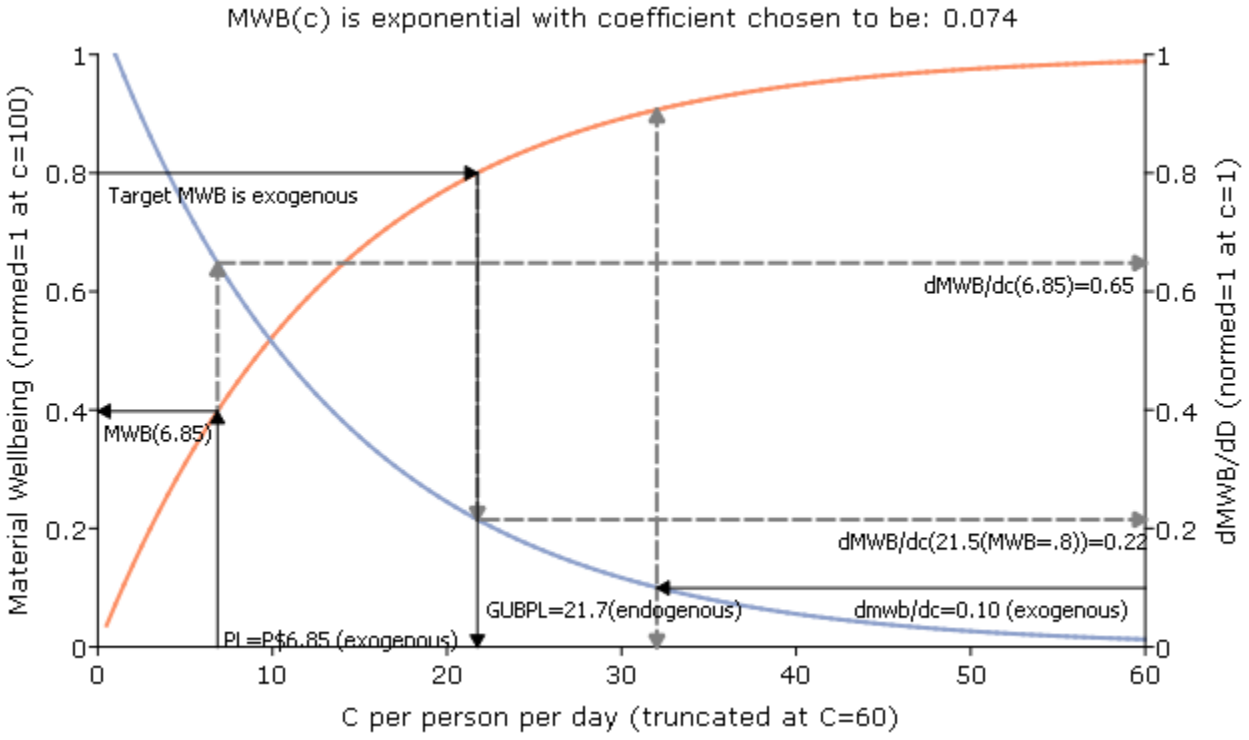
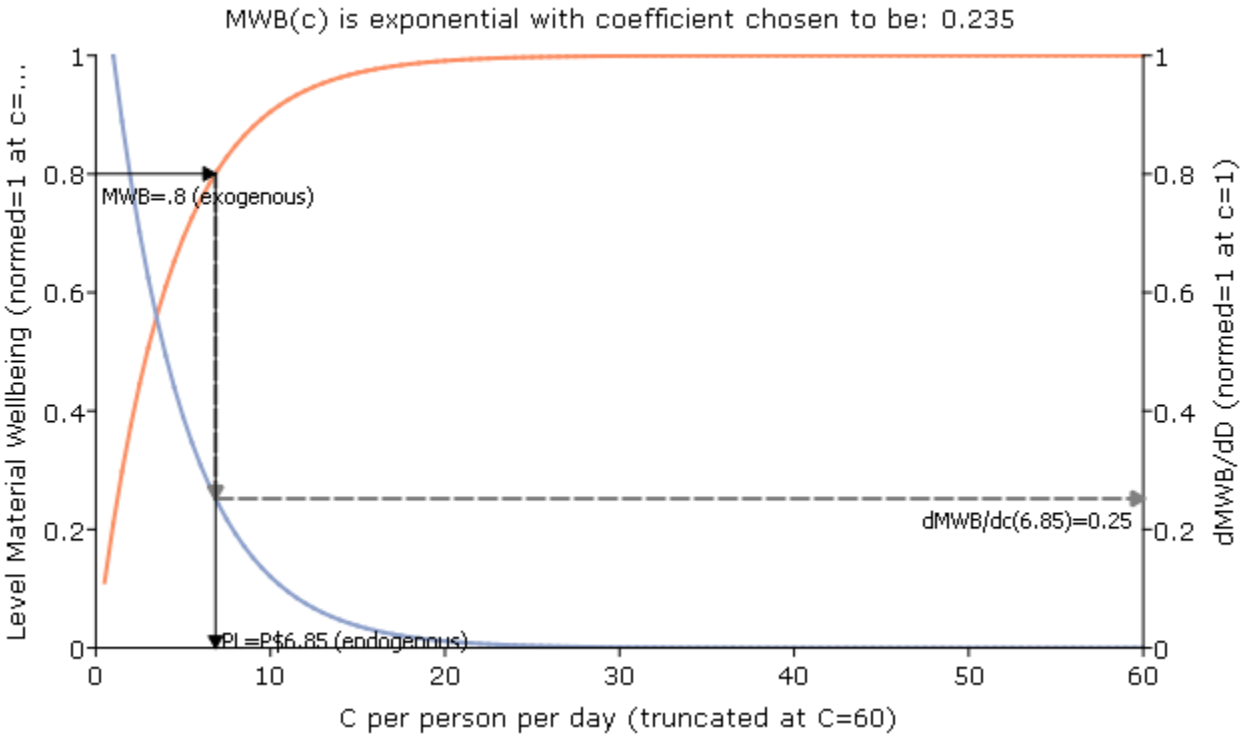


Figure 2b:…the level of the MWB poverty line depends on the empirical shape of the MWB(c) function



Source: Authors' calculations

II) Poverty lines using two different measures of wellbeing

In this section we use two different indicators of material wellbeing to estimate a GUBPL. First, we use a "multi-dimensional poverty index"-like approach with Demographic and Health Survey (DHS) data on six indicators of material wellbeing and an asset index. Second, we use the food share as an wellbeing indicator.

II.A) Household living conditions

We use the Demographic and Health Survey (DHS) data for five countries (Bangladesh, Ethiopia, Indonesia, Nigeria, Pakistan) from to construct a measure of whether a household meets six living conditions that we believe are minimal conditions of prosperity (MCP). We then estimate the relationship across households between achievement of these conditions and a cubic in the DHS wealth index, controlling for household size and rurality). We then use the coefficients from those regressions to estimate the wealth index at which a household reliably reaches these minimal conditions of prosperity, a predicted probability of .9. We then translate this wealth index threshold for MCP into a consumption poverty line by matching percentiles of the respective distributions.

Using the DHS data we compute a binary variable for each of six living conditions.

- *Electricity*: household has electricity,
- *Improved sanitation*: household has access to improved sanitation not shared with other households,
- *Safe water*: household has access to an improved source of drinking water,
- *Completed primary*: children in the household (i.e., son/daughter of household head) who are 12 years old or older have completed at least primary schooling,
- *Child survival:* No child born died under the age of 5,
- *Child malnutrition*: No child in the household less than 5 has weight for age less than -2 standard deviations of the reference group.

A question guiding out choice of the MCP is: would it make sense to say 'this household is prosperous at a global level but does not achieve X'? Claims of the type :This household is globally prosperous but has a malnourished child" or "This household is globally prosperous but doesn't have improved sanitation" do not seem defensible.

This approach builds on the multidimensional poverty index (MPI) pioneered by Sabina Alkire (Alkire and Foster 2011, Alkire, Kanagaratnam, and Suppa 2021) which, calculates household poverty status on direct measures of household living conditions and includes the asset index, as opposed to mapping them to a money metric indicator. The primary difference is that our method starts with an MPI-like measure of wellbeing, the MCP, and then estimates the association of achieving the MCP with the household asset index and establish the consumption level equivalent at which households are reliably not MCP poor as a GUBPL.

Three technical points about constructing the data. One, for those household living conditions that involve children of certain ages households without children in those age groups are counted as meeting the criteria, so, for example, a household with no children, or only children above 5, is counted as having no malnourished children. This clearly biases the MCP index upwards, but if we exclude all households without children under 5, for instance, we end up with small (and selective) sample. Two, certain of these criteria could be met, by random, sad, chance, even in a very wealthy household—like losing a child or having a child that is small (the criteria of 2 standard deviations from WHO reference weight for age norms implies (assuming a normal distribution) that 2.5% of children will be classified as "malnourished" even in a completely well-nourished population). For that reason, we prefer a threshold for the probability of achieving all six indicators that is not exactly 1. Three, the DHS data for Indonesia do not include child anthropometrics and hence do not have a measure of child malnutrition and hence all references to "all six" or "sum of the six" indicators are "all five" or "sum of five" for Indonesia.

Regressions of living conditions on wealth index. Our dependent variable is either: (i) a binary indicator that is 1 if the household meets all six MCP and zero otherwise or (ii) the sum of the six binary MCP indicators.

We regress these dependent variables on the DHS asset index, household size, and rural residence. The DHS household asset index is the first principal component of a set of asset ownership variables (e.g. does the household own a bicycle?) and housing conditions (e.g. does the house have a separate kitchen?) collected in the survey instrument. Filmer and Pritchett (2001) show this asset index is an excellent proxy for wealth and works at least as well as (usually better than) consumption per capita as an indicator of long-run household economic status. The asset index is for the household, not per capita, hence we include household size as a regressor. We also include a binary variable for rurality as some conditions may be harder to meet in a rural area. Since the DHS asset index is normed to have mean zero and standard deviation one, we shift the wealth index by a constant such that the minimum wealth index is zero (one cannot allow for (even) polynomial powers with positive and negative values).

The regression for both "all six" and "sum of six" are plain vanilla OLS even though the dependent variables are limited (to 0/1, or to integers 0 to 6). While limited dependent variable estimators might be more efficient, OLS estimates are consistent and we don't want to have the predicted values at the upper tail affected by the constraint that the probability cannot be greater than one, and our estimates are precisely estimated so estimator efficiency is not a key issue.

The regression results for the five countries are in *Results Appendix: MCP Regressions*.

Results of the MCP analysis. Figure 3 shows the results of this procedure for Bangladesh to explicate the procedure and its results, equivalent figures for the other countries are in the Results Appendix: MCP Regressions. The predicted value for "all six"--which is essentially the

fraction of households at each level of the wealth index that achieve all six indicators--is the orange line.

As discussed in Section I, the relationship between reaching all six MCP indicators and the wealth index can be used in two directions.

First, we can start from existing poverty lines and translate from a given poverty line in consumption to the headcount poverty rate, which is a percentile of the consumption distribution, then map to that same percentile in the wealth index distribution, then to a value of the wealth index, and then, via the regression coefficients to the predicted probability a household at that wealth index reaches all six living conditions.

$$Poverty\ Line \rightarrow Percent\ in\ poverty \rightarrow Wealth\ Index\ at\ that\ percentile \rightarrow Predicted\ Probability\ of\ All\ Six\ at\ that\ Wealth\ Index$$

For example, at the P$2.15 poverty line the share of poor in Bangladesh in our simulated log-normal consumption distribution is 14.62%. The value of the wealth index of the 14.62nd percentile of the DHS sample is .71 (in right shifted scale where the lowest wealth index is zero). The predicted value of "all six" at the wealth index of .71 is .08. This implies 92 percent of households at the dollar-a-day poverty line in Bangladesh are *not* achieving all of the six minimal conditions of prosperity.

Using the World Bank "high" poverty line, P$6.85, 86.9 percent of Bangladeshi households are considered poor. The wealth index at the 86.9th percentile is 2.98. At a wealth index of 2.98, 51 percent of households reach all six MCP. At the "high" poverty line nearly half of households to not meet the MCP.

To calculate out GUBPL we drive the calculation the other direction:

$$Predicted\ probability\ of\ all\ six\ MCP\ reaches\ high\ threshold \rightarrow Wealth\ Index \rightarrow Wealth\ Index\ percentile \rightarrow Consumption\ percentile \rightarrow "dollars\ a\ day"\ \ poverty\ line$$

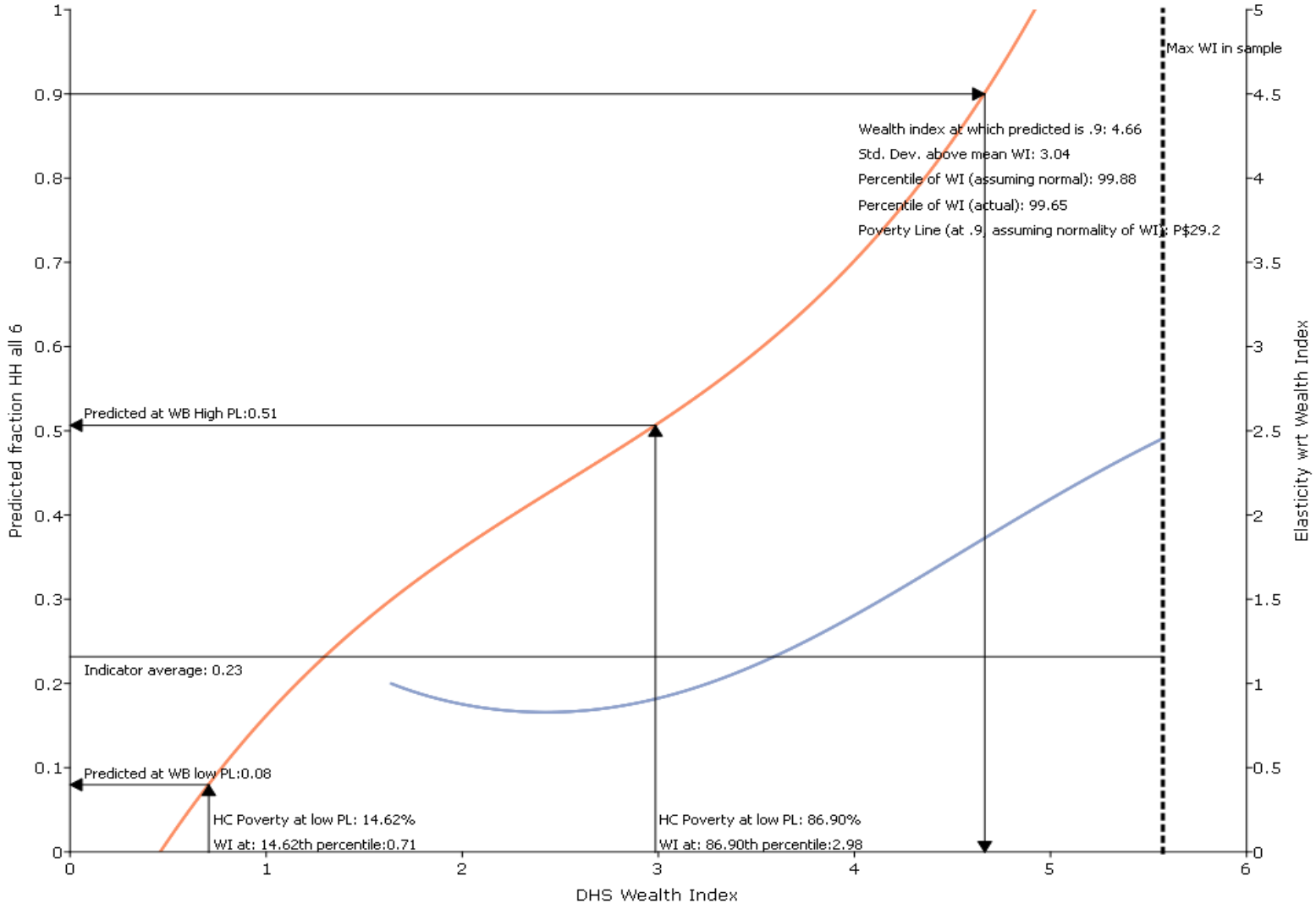
The results for Bangladesh are illustrated in Figure 3, which illustrates the method. The wealth index at which the predicted probability of reaching all six MCP is 90 percent is 4.66. This is 3.04 standard deviations above the average wealth index (the DHS wealth index normalized to a standard deviation of 1). We then use two calculations for the percentile of the wealth index. One is to assume the distribution of the wealth index is Gaussian Normal and calculate the percentile of the z-score of 3.04, which is the 99.88th percentile. Alternatively, we can calculate the percentile of a wealth index of 4.66 in the actual (right shifted) DHS sample and that gives the 99.65th percentile.

We then take the simulated values of log normal distribution of consumption using parameters that fit four summary statistics of Bangladesh's actual consumption distribution: the

mean, the Gini, the ratio of median to mean, and the average of the 10th deciles. We include fit to the 10th decile consumption in order to ensure better fit in the upper tail (see Simulations Appendix: Log-Normal Simulation).

The consumption level of the simulated distribution 99.88th percentile is P$29.2. So, equating percentiles of the wealth index and consumption our best estimate is that at consumption of P$29.2 pppd a household in Bangladesh has a 90 percent chance of reaching all six of the Minimum Conditions of Prosperity.

Figure 3: Calculating a GUBPL using six minimal conditions of prosperity (MCP), illustrated with Bangladesh



Source: Author's calculations with DHS regressions (Results Appendix: MCP Regressions) and World Bank PIP data, as described in text.

Table 1 summarizes the estimates of Material Conditions of Prosperity poverty lines across the five countries. Using the threshold that the "all six" indicator variable should reach a predicted a probability of .9 and assuming the Wealth Index has a normal distribution to calculate percentiles, the results in Column I are quite robust across four of the countries. The MCP poverty lines range from P$21.1 in Ethiopia to P$29.2 in Bangladesh, with a median of P$23.8. In Nigeria the maximum predicted value for "all six" did not reach .9. At the highest wealth index in the sample the predicted value was only .65, but since the estimated relationship was still strongly upward sloping at the maximum wealth index we predict out of sample to estimate the poverty line.

In Pakistan the estimated threshold reaches a peak and turns down (strangely, we admit, but we only have a fitted cubic so this is likely an artefact of the limited flexibility of the polynomial) and hence P$15.7 is the consumption equivalent level where the MCP prediction is the highest, at .74.

Columns II and III show the implied poverty lines for higher ($\hat{p}$=1) or lower (($\hat{p}$=.8) predicted value of achieving the MCP. Naturally the median poverty line is higher at P$33.5 when ($\hat{p}$=1. Column III shows the results for $\hat{p}$=.8 and, naturally, this median is lower, P$20.2. The value of P$21.5 (which we propose below as a focal point value) occurs at a predicted probability around .84 (between .8 and .9). As there is nothing sacrosanct about any specific value—or for that matter about these particular five countries and this same method could be replicated for many more countries—we make the modest claim that P$21.5 is consistent with a reasonable implementation of the MCP approach.

Column IV illustrates the technical problems of using the actual reported wealth index values. Since the wealth index is a principal-components-weighted average of binary indicators, it reaches a maximum value (censored above). This implies the DHS wealth index cannot estimate the upper tail of wealth. This can push the estimated wealth index for achieving the threshold above the maximum of the sample, which mapped to the maximum of the simulated log normal consumption data, produces a very high value, for instance, P$53.8 in Indonesia.

Column V reports the estimated poverty lines using the "sum of the six" dependent variable and calculating wealth index which predicts the value of six. In this case the median poverty line is P$24.8. That the poverty line results using "all six" and a threshold of .9 and the "sum of six" and a predicted value of 6 are so close is (mildly) reassuring that nothing vital hinges on econometric details of binary ("all six"=1) versus integer values ("sum of six").

Table 1: Estimates of a Global Upper Bar Poverty Line (Prosperity Line) using household data of achievement of six basic household living conditions					
Dependent variable:	All six indicators (binary)				Sum of the Six
Column	I	II	III	IV	V
Predicted threshold	0.9	1	.8	.9	6
Assumption about Wealth Index:	Wealth Index Assumed to have a Normal Distribution			Using actual DHS sample Wealth Index	Wealth Index Assumed Normal
Country:					
Bangladesh	29.2	34.6	23.9	23.2	25.8
Ethiopia	21.1	23.0	19.8	26.6	26.4
Nigeria	23.8 (.65)	26.60	20.2	48.1	NR
Pakistan	15.7 (.74)	15.7 (.74)	15.7 (.74)	NR	16.6
Indonesia	27.7	33.5	21.9	53.8	23.8
Median	**23.8**	**33.5**	**20.20**	**40.2**	**24.8**
Notes: NR: Not reached. The "all six" regressions for Pakistan never reach the predicted value of .9 (the maximum is .74) and then turns concave. So P$15.7 is where the predicted value reaches .74 and hence is the same for any probability above .74. In Nigeria the "all six" predicted value at the Wealth Index maximum is only .65 but the slope is positive so the predicted wealth index can be calculated.					

II.B) Engel's Law

Engel (1857) asserts: "*The poorer is a family, the greater is the proportion of the total outgo which must be used for food*." Engel's Law is one of the most widely replicated facts in economics (with, naturally, caveats and complications). Engel also claims: "The proportion of the outgo used for food, other things being equal, is the best measure of the material standard of living of a population."

A GUBPL can be set where: (i) the proportion of household income devoted to food is "low enough" and/or (b) the *marginal* propensity to spend on food is "low enough" that the FGT poverty implication that the gain to material wellbeing from additional consumption expenditures is zero can be taken as a "close enough" approximation (though not literally true). We can also calculate the predicted food share and marginal propensity to spend on food at the World Bank "high" poverty line to ask whether at P$6.85 it is plausible to claim gains in wellbeing are tolerably approximated by zero.

We use data on food shares across percentiles (declines, quintiles) or other consumption groups of households and across a large number of countries and years (see the Data Appendix: Food Shares). We use a dummy variable for each survey country/year so that the Engel curve estimates are identified only off within survey country/year differences in food share across consumption groups. This minimizes the noise from (i) different survey techniques (e.g. recall

periods, definitions of food share (e.g. whether the measure includes food away from home)) and (ii) adjustment for PPP to common units across time and space. As we want results that are robust to functional form we estimate a polynomial with powers from -2 to 4. Figure 4 also shows that using a completely non-parametric estimate, the rolling median of food share by total consumption ((the squiggly line in Figure 4) tracks the polynomial quite closely.

Our flexible polynomial estimates of the Engel relation demonstrate: (i) at any of the World Bank poverty lines both the average of food in consumption and the marginal propensity to spend on food are very high and (ii) if one sets a threshold of the marginal propensity to consume food (dF/dC) at which one is believes dMWB/dC is "close enough" to zero, the implied poverty line is between P$19.4 (as US poverty food shares) and P$40 (at actual shares of the poor in Europe).

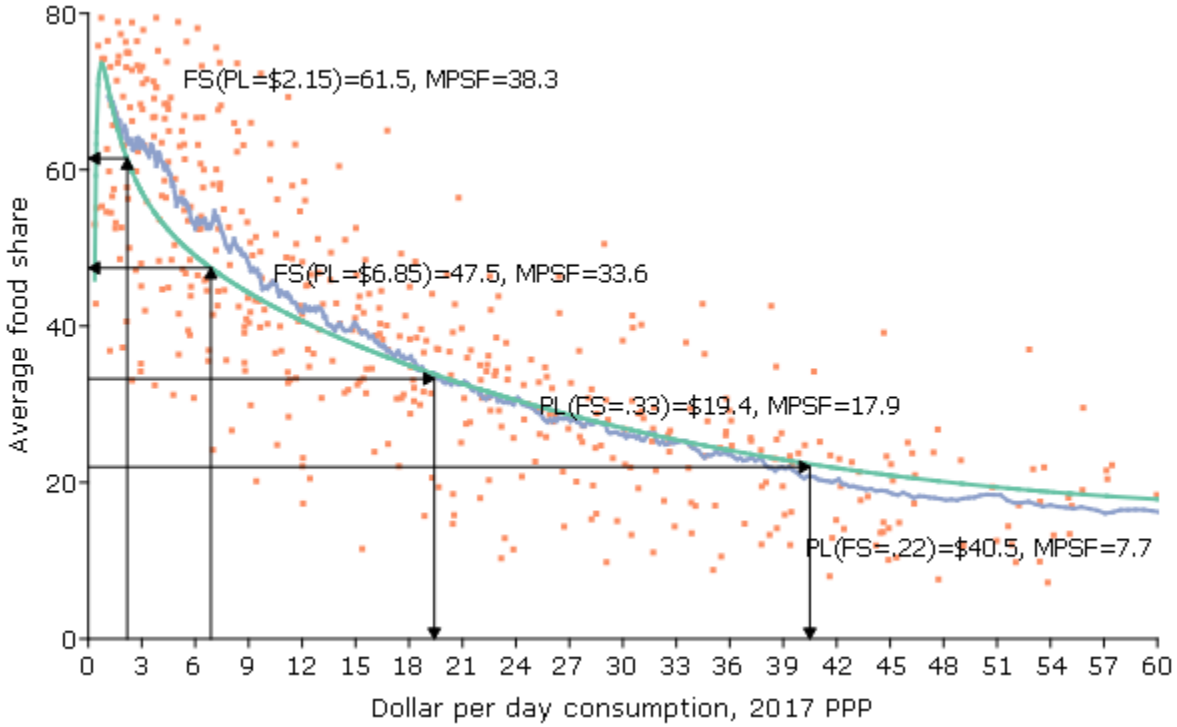
The key results are in Figure 4 and Table 2 (the estimates are in Results Appendix: Engel).

At the dollar-a-day poverty line (P$2.15) the predicted food share is 61.5% and the marginal propensity to spend on food is .35. This illustrates that a lower-bound poverty line necessarily pushes the poverty line down to a point where standards of living very low as only 38.5 percent of expenditures are on anything but food. This illustrates the widely accepted point that dollar-a-day is impossible to defend as the *only* poverty line: a household with consumption of P$2.16 pppd might not be *extreme poor* but they are, judging by their food expenditures share, very poor.

The more interesting question is: "Is the highest of the WB low-bar poverty lines high enough?" As explicated with Figure 2 above this depends on the value of average food share and marginal propensity at which someone believes the gains from additional consumption (dMWB/dC) is "close enough" to zero. This in turn depends on the empirically estimated Engel relation is and how quickly these decline with consumption (the generalized analog of the concavity parameter in Figure 2).

Figure 4 and Table 2 show that at $P6.85 the food expenditures are still almost half of total consumption (47.5%) and the marginal propensity to spend on food is still 33.6 cents of every additional dollar. All considerations about a social construct like a poverty line have an element of subjectivity, but it seems hard to make the case that a person who is spending a third of an incremental dollar on food is nearly indifferent between having that extra dollar or not.

Figure 4: At the food share assumed in the US poverty line (1/3) the implied poverty line is P$19.5, at the actual food share of the European poor (.22) the implied poverty line is P$40.5



Source: Author's calculations with data described and estimation results presented in the Results Appendix: Engel.

Let's drive the calculation in the other direction, from food share thresholds of adequate material wellbeing to poverty lines.

The US poverty lines for non-farm households were first developed by Mollie Orshansky (1965) in an application of the Food-Energy Intake approach. The food expenditures needed to reach a nutritionally adequate diet based on the "economy" (cheapest) of the food plans developed by the US Department of Agriculture. This level of food expenditures was multiplied by three to estimate a poverty line, as the average share of food expenditures to after-tax money income of US households in the 1965 Department of Agriculture Household Food Consumption survey was one-third (Fisher 1992). This remains the basis of US poverty lines.

Using our Engel estimates a food share of 1/3 is predicted at consumption of P$19.4 pppd. The estimated marginal propensity to spend on food at P$19.4 is 17.9 cents for each dollar. One could make the case a food share of 1/3 is a proxy for a material wellbeing threshold for a GUBPL.

European poverty thresholds are, in general, relative. A commonly used measure is that a household is "at risk of poverty" if their post-tax and transfer income is less than 60% of

equivalized (for household size and composition) median income. Using those poverty lines about 17% of Europe's population as "at risk of poverty" in 2017. The food share of the bottom quintile of income of households in Europe is 22%. P$40.5 pppd is the level of consumption at which the predicted food share is 22%. At P$40.5 the marginal propensity to spend on food is only 7.7 cents on the dollar. If reaching the food share of the European poor as material wellbeing threshold (rather than 1/3) this would imply a much higher GUBPL of P$40.5.

Table 2: Engel curve, food share, marginal propensity to spend, and poverty lines

Direction of the calculation	Poverty Line	Average percent of expenditures on food	Marginal propensity to spend on food
World Bank poverty lines taken as fixed, average food shares and MPS on food estimated	P$2.15 (poverty line exogenous)	**61.5**	**38.3**
	P$6.85 (poverty line exogenous)	**46.6**	**31.8**
GUBPL poverty lines calculated with a fixed food share	**P$19.4 (endogenous)**	33.3 (Food share exogenous, based on US Poverty Line assumptions)	**17.9**
	P$40.5 (endogenous)	22.0 (Food share exogenous, Estimated food share of bottom quintile in Europe)	**7.7**

Source: Calculations based on the estimated Engel regressions using distributional data and country and year dummies (Column 2) in the Results Appendix: Engel.

II.C) How many people are "poor" at a GUBPL?

Table 3 shows a rough estimate of the headcount poverty rates for the World Bank's three poverty lines and a GUBPL of P$21.5 from the World Bank data. These are not based on our simulated distributions but on the interpolation using the World Bank estimates for P$20 and P$25, which were the values for which the World Bank website was able to produce estimates. Across the range from dollar-a-day (P$21.5) pppd to a GUBPL of P$21.5 either very few people in Pakistan are poor (as only 4.9% are below P$2.15) or almost everyone is poor (99.4% are in "global poverty" at P$21.5). Our argument is that *both* of these are important facts about global poverty represent facts about poverty.

While there are only 4.9% of Pakistan households in "extreme poverty" this estimate of the level of poverty is not robust even to small(ish) variations in the poverty line. Moving up to the "high" World Bank poverty line of P$6.85 implies 84.5% of the Pakistani population is poor.

Table 3: Estimates of headcount poverty rates at dollar-a-day (P$2.15), the World Bank "high" poverty line of P$6.85, and a GUBPL of P$21.5

Country (sorted by headcount poverty at P$2.15)	Years	Headcount poverty rate at P$2.15	Headcount poverty rate at P$6.85	**Headcount poverty rate at P$21.5**	% of population "poor" at GUBPL P$21.5 while not poor at P$6.85
Nigeria	2018	30.9	90.9	99.8	8.9
Ethiopia	2015	27.0	90.9	99.6	8.6
Bangladesh	2016	14.6	86.9	99.4	12.5
India	2019	10.0	83.8	98.4	14.6
Brazil	2021	5.8	28.4	75.2	46.9
Pakistan	2018	4.9	84.5	99.4	14.8
Indonesia	2022	2.5	60.4	95.9	35.5

Source: World Bank – Poverty and Inequality Platform - https://pip.worldbank.org/poverty-calculator. Estimates for P$21.5 are linear interpolations between P$20.0 and P$25.0.

A common reaction to a GUBPL that implies that essentially everyone in Pakistan and India and Nigeria and Ethiopia is "poor" by a reasonable upper-bound poverty line is "that just cannot be right." This is a not unreasonable reaction. The levels of headcount poverty implied by P$2.15 and a GUBPL of P$21.5 are completely different. But that there is a large range is precisely our point. The poverty "extreme poverty" is meant to be extreme, a penurious lower limit. By the same token a poverty line above which people are prosperous is intended to be an extreme upper limit of (development related) global poverty could mean. We are not saying these different poverty lines are different measures of the same phenomena, we are saying that "poverty" has common elements but also many aspects and so a wide range of poverty lines and corresponding words with modifiers are needed.

Moreover, this wide range of estimates does not just reflect on the proposed GUBPL, it also illustrates just how counter-intuitive and, well, extreme, the dollar-a-day line and "extreme poverty" really are (Pritchett 2024). The dollar-a-day standard has become the "norm" or the "default" definition of poverty only by repetition (and political power), not by actually having any firm analytic justification. Anyone who hasn't already been inured to the idea that dollar-a-day was *the* standard for poverty would find the claim that only 5% of Pakistan's population or only 10% of India's population was poor just ridiculous on the face of it. Somehow only 10 percent of Indian households are poor but the 2019-2021 NFHS (India's version of DHS) data report that very low living standards are still common: 32.1 percent of Indian children under 5

are malnourished by a weight-for-age, 29.8 percent of households don't use improved sanitation, 41.9 percent of households do not use a clean fuel for cooking, under five child mortality is 41.9 per thousand. This imply that the "non-poor" must have poor living conditions. Suppose that all of the poor do not use clean fuel, this implies that 31.9 percent of India's population is both "not poor" and do not use clean fuel. Believing in dollar-a-day poverty implies that in India something like one in five families are "not poor" but nevertheless have malnourished children.

Once one breaks the spell of dollar-a-day and acknowledges the need for multiple global poverty lines you quickly realize just how slippery and steep the slope is towards a high bar poverty line as the upper bound. The claim that "poverty" in Pakistan is 4.9% *and* the claim that "poverty" in Pakistan is 99.4% are *both* extreme claims, precisely as the lowest possible and a highest possible limit should be.

Our two alternative calculations of GUBPL based on either (i) reliable achievement of Minimum Conditions of Prosperity or (ii) reaching a target food share this gives a range of upper-bound poverty lines. This ranges includes P$21.5, which is a focal point as it is exactly ten times the lower-bound dollar-a-day poverty line in 2017 PPP of P$2.15.

A ratio of ten between the lower-bound and the upper-bound might seem "intuitively" too big[16], so it is worth clarifying what produces such a high ratio, referring back to Figure 2 and Figure 1.

One, a large gap between lower-bound and upper-bound global poverty lines is a result of an empirical relationship between the preferred measure of wellbeing and consumption that is not sharply concave. Our basic criteria is that upper-bound poverty lines should be at a level of consumption at which either: (i) households are reliably achieving an acceptable threshold and/or (ii) the incremental contribution to wellbeing from consumption gains is "close enough" to zero. These depend on the empirical shape of the budget expansion path of the measure of wellbeing.

Two, these calculations depend on the upper thresholds that define being "non-poor" in either levels or derivatives of the measure of wellbeing. As illustrated in Figure 2b, one could produce a GUBPL that is just a small integer multiple of the dollar-a-day (as P$6.85 is roughly a factor of three higher than P$2.15) choosing a wellbeing indicator that (i) was sharply concave in consumption and/or (ii) choosing a low threshold for defining poverty in the indicator.

Three, while the *ratio* of lower-bound to upper-bound is a factor of ten, the *absolute* gap is small relative to the spread of the world distribution of income. In the simulated log-normal distributions, parameterized to give fit to the actual summary statistics the gap between the average consumption/income in Denmark and Pakistan is P$61. The range between the dollar-a-day and our proposed GUBPL is only one third as large in absolute terms as this cross-national gap between Denmark and Pakistan. The fact is poor countries have a low average/median and inequality is quite similar across countries hence the gap between the top and bottom deciles is

[16] Although it is not clear on what basis anyone has an "intuition" about ranges of poverty. The ratio of largest breed of dog to smallest is over 25 (160 for an English Mastiff to 6 for a Chi

small in absolute terms. The gap in consumption pppd between the first decile and tenth decile in Pakistan is only P$10.6.

III) Comparison with approaches to a GUBPL

How does our proposed poverty line of P$21.5 compare to other proposed global upper-bound poverty, or alternatively, lines that define "prosperity"? We compare four alternative approaches: (i) rich country poverty lines, (ii) Rosling et al (2019) global levels of living, (iii) achievement of basics in cross-national data, (iv) the World Bank (2024) prosperity gap.

III.A) Rich country national and societal poverty lines

Max Roser (2021, 2025)[17], makes the case for calculating global poverty at rich country poverty lines. Our World in Data (of which Roser is co-founder) reports on poverty at rich country poverty lines in addition to extreme poverty, and other poverty lines.

There are three powerful arguments in favor of adopting rich country poverty lines as a GUBPL.

One, this embraces a universal standard in wellbeing to assessing whether a household is poor, rather than a poverty standard that depends on location.

Two, the World Bank poverty lines implies there is very little poverty in rich countries (Table 4). The World Bank reported poverty rate for the USA at P$2.15 is .25%--that only one in 400 Americans are poor. Even at the P$6.85 line less than 1 in 100 of the population are poor across the five largest OECD countries (except for Japan at 1.45 percent). To deny that, even in rich countries, there are significant absolute deprivations of material wellbeing that can legitimately be counted as global poverty seems to us inadequate as a global approach.

Third, the argument for using rich country poverty lines is that this approach is symmetric to the method used for creating the dollar-a-day standard in 1990 (Ravallion, Datt, Van de Walle 1991): if the global lower-bound is the poverty line in the poorest countries. making the upper-bound poverty line that of the richest seems equally persuasive. Figure 5 shows that this symmetric calculation of the societal poverty line (see definition below) of the ten highest consumption countries produce a GUBPL of P$29.6

[17] Pritchett (2006) makes the case that since the World Bank has a governance structure in which countries vote their share of paid in capital, an upper bound definition poverty line could be the paid in capital share or voting power weighted average of poverty lines. That current calculation, using national poverty lines between 2013 and 2019 and current IBRD voting shares, gives a voting share weighted poverty line of P$19.8.

Table 4: Even the World Bank "high" bound poverty line implies there is essentially no poverty (one percent or less) in rich countries

Country	Year	Pop'l (mns)	Global poverty lines			**National measures**
			Lower-bound global lines		GUBPL	
			P$2.15	P$6.85	P$21.5	
Column	I	II	III	IV	V	VI
USA	2021	333.3	0.25%	1.00%	5.15%	11.60%
Japan	2013	124.9	0.73%	1.45%	10.93%	16.10%
Germany	2019	83.8	0.00%	0.25%	5.30%	10.90%
UK	2020	67.3	0.50%	0.74%	9.06%	11.20%
France	2020	67.9	0.11%	0.43%	7.33%	8.40%
Total poor in these five countries (mns)		677.3	2.15	6.14	46.4	81.2

Source: Columns I-V: World Bank – Poverty and Inequality Platform (https://pip.worldbank.org/poverty-calculator). Estimates for P$21.5 are linear interpolations between P$20.0 and P$25.0. Column V For national poverty rates: OECD data for Germany, UK, France at a poverty line of one half median of equivalized income. US Census for the USA.

Recently, in addition to absolute poverty lines the World Bank has been reporting "societal poverty lines" (Jolliffe and Prydz 2021, Tettah Bahh, et. al. 2024). These lines cope with the well-known fact (e.g. Ravallion (1998)) that subjectively reported poverty lines, such as answers to the question: "How much income does a household need to have a decent lifestyle?" tend to have an absolute and a relative component and the relative component of poverty lines grows as countries get richer. The societal poverty line is constructed for each country as the maximum of P$2.15 (so no countries line is lower than dollar-a-day) and P$1.15+.5*country median income/consumption.

In spite of our objections to calculations of global poverty based on societal poverty lines[18][19], we explore the implications of the cross-national range of societal poverty line in

[18] By adding up poverty across countries based on poverty lines for each person that is dependent on their residence seems to ignore that where a person lives is legally constrained by the immigration policies of rich countries. So, for instance, a person in Haiti may well be "not poor" because they live in Haiti with a low societal poverty line but if they legally could they would move to the USA even though their income in the USA at the USA poverty line they would be classified as poor. It seems hard to reconcile with basic ideas of the equality of all people to allow rich country coercively enforced restrictions on movement to imply that their aspirations for what being "not poor" means must only be relative to their current country of residence and not relative to where they would like to live. Gallup polls reveal that more than a billion people report that if they could they would move permanently to another country. An aggregate of poverty based on societal poverty lines would get the consequences of voluntary mobility of people on wellbeing exactly wrong (Clemens and Pritchett 2008).

[19] A different objection to relative poverty lines stems from a long-standing question in welfare measurement and "social welfare functions" of whether the consumption of others should be allowed as a direct argument in the "utility" function that is aggregated. That is, suppose a person in Dubuque Iowa has subjectively lower wellbeing if someone in Los Angeles views materials they regard as pornographic, even if we stipulate this has no effect on the person in any way. No question that envy of others is a

setting a GUBPL. We are focused on a poverty line to be used in framing *development* goals, such as the successors to the SDGs, and setting development goals and agendas for development assistance organizations like the World Bank and regional development banks. There can be poverty in countries that is not "development related" poverty, in two senses. Development goals need not be anchored in a threshold of prosperity determined by relative prosperity of people in the richest countries but compared to the poverty lines of "just developed" countries. Two, rich countries can have poverty that is not "development related" in the sense that even in the most developed countries, in the fourfold sense of national development (high productivity, state capability, responsive polity, and social cohesion) people will still will experience episodes of poverty. For instance, the P$21.5 line implies that poverty in the USA is roughly 5 percent or 1 in 20 are poor. Believing that a person in the 5th percentile of the US consumption distribution should be counted as globally poor, given the dire material conditions in some inner-city areas, some rural regions in long-term decline, the conditions where Native Americans live, etc., seems easily defensible.

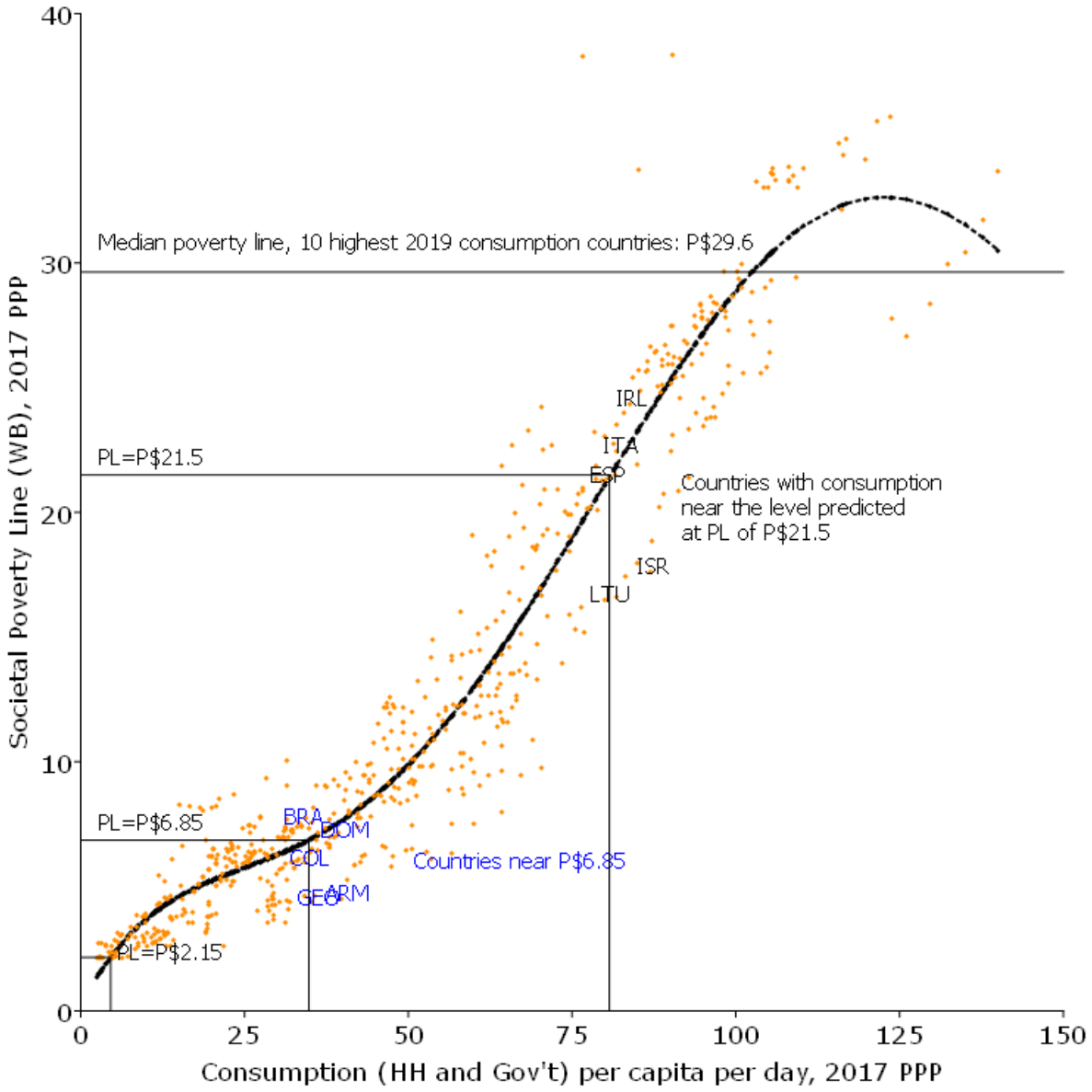
Figure 5 shows that the aggregate consumption level (household and government) per person per day at which the predicted societal poverty line is P$21.5 is P$80.7 (the societal poverty line is a formula based on median consumption from HH surveys, not the average of private and government consumption from national accounts so the fit is not perfect). The five countries nearest this consumption level are (alphabetically): Ireland, Israel, Italy, Lithuania, and Spain. A GUBPL of P$21.5 would be the typical poverty line of countries nearer lower-end of the traditionally defined "developed" countries, not the highest consumption countries. This fits with the notion of the threshold at which national poverty is no longer predominately "development related" poverty.

In contrast, the countries with national accounts consumption levels which are associated with a societal poverty line of P$6.85 are (alphabetically): Armenia (ARM), Brazil (BRA), Dominican Republic (DOM), Colombia (COL), Georgia (GEO), Ukraine (UKR) (not shown in Figure 5). While these are "upper middle income" countries by the World Bank classification, they are not widely regarded as "developed" countries nor touted as an aspirational upper-bound of development.

We are not suggesting that any country should lower its national poverty line to match the GUBPL or that a measure for a specific country of a societal poverty line above a GUBPL is completely uninteresting. But in setting development targets and goals it a range of poverty lines is needed: (i) a global lower-bound (which is dollar-a-day), (ii) a range of national or societal poverty lines of developing countries, and (iii) an absolute GUBPL for development-related poverty, acknowledging that many developed countries will choose even higher national poverty lines due to considerations of definitions of poverty that are dependent on national conditions.

common feature of human beings but is also regarded as a vice not a virtue to be covetous and constructing a social aggregate in which relative incomes play a role because that is subjectively how people feel about their wellbeing and wishing to avoid "paternalism" raises enormously difficult issues.

Figure 5: Societal Poverty Lines and Consumption per person across countries



Source: Author's calculations with World Bank PIP data and Penn World Tables 10.1

III.B) Global "levels of living"

In *Factfulness* (Rosling, Rosling, and Ronnlund, 2019) the world's population is grouped into four levels of income by purchasing power consumption per person per day: level 1, below P$2/day (close to the current dollar-a-day); level 2, above P$2/day but below P$8/day; level 3, above P$8/day but below P$32 per day; and level 4, above P$32/day.

They estimate that, as the time of their calculations, five of seven billion people live in level 2 and level 3, as only roughly a billion are in level 1 and roughly a billion in level 4. Their

description of the living conditions of a household in the middle of level 3 (p. 36), at P$16/day, is that they have an indoor cold-water tap, electricity, a cookstove, and children able to finish high school. These are similar to our proposed MCP. This analysis suggests a GUBPL somewhere between P$16/day and P$32/day (above which households are at level 4 and hence prosperous).

One fascinating contribution to the question of poverty is that the Gapminder.org website "Dollar Street" shows pictures of families and various characteristics of their material living conditions for households (houses, toilets, cooking utensils, etc.) and their estimated level of monthly consumption per adult equivalent in PPP around the world. If we roughly double the "per adult equivalent" amount they report, as the "per adult" gives much lower weight to children, to approximate a crude "per person" figure, the reader can actually see for themselves the homes and toilets of households around the P$6.85 per person per day (which is roughly what Gapminder reports as $330 to $492 per adult equivalent per month). It is worthwhile to peruse these images and ask "is this what we want mean by a household having reach an acceptable standard of living?" We think not.

A similar exercise is "100 Homes" in India. This endeavor used started from the results of a standard household survey that measured expenditures per person on the usual way and then chose one house at each percentile of that distribution of expenditures per person and, with permissions of course, took pictures of their household, including the interior, exterior, kitchen, toilet, and household possessions. As documented above (Table 3), moving the poverty line from P$6.85 to P$21.5 would shift measured headcount poverty in India from 83.8% to 98.4%, so the question is whether it is plausible and persuasive that households in the 84th percentile in India are *not* globally prosperous. Again, this is non-standard economic argumentation but we invite readers to look at the pictures of households 84 of 100 (here) and 85 of 100 (here) and ask themselves whether these household conditions can sincerely be called "prosperous." Whereas household 99 (here), conveniently for us measured at a consumption level of P$21.25, is plausibly in the category of "globally prosperous" (though hardly could be called "well off" or even "middle class" by any rich country standard).

III.C) Cross-national association of country levels achievement in "basics" and average consumption

A key argument of this paper is that if the upper-bound poverty line is to be drawn where (i) a "prosperity" level of material wellbeing is reliably achieved and/or (ii) the increment to material wellbeing of additional consumption is "close enough" to zero, then the empirical location and shape of the association between the preferred measure of material wellbeing and consumption expenditures/income is critical. Figure 6 shows the association between national levels of an index of "basics" (constructed with the preferred definition of 'basics' in Pritchett and Lewis (2023)[20]) and national accounts PPP consumption (household and government) per

[20] Pritchett and Lewis (2023) construct an index of 'basics' that does not simply assert *a priori* which indicators are 'basic' but allows an empirical process to identify basics. They start from a list of 22 indicators of wellbeing and, based on a simple theory of budget expansion paths, choose as 'basic' those indicators most highly correlated with other indicators. They then combine those indicators chosen as

capita from the Penn World Tables (Feenstra, Inklaar and Timmer, 2015). Since the index of basics is normed from 1 (worst) to 100 (best) country, we can have no *ex ante* beliefs about functional form and hence allow for a very flexible polynomial functional form for the association with PPP consumption per capita.

The key question is: "when the average consumption in a country is at P$21.5 has either (i) the country level of basics reached a 'prosperity' level or (ii) the elasticity (not the slope) of basics with respect to average consumption fallen to a low level?"

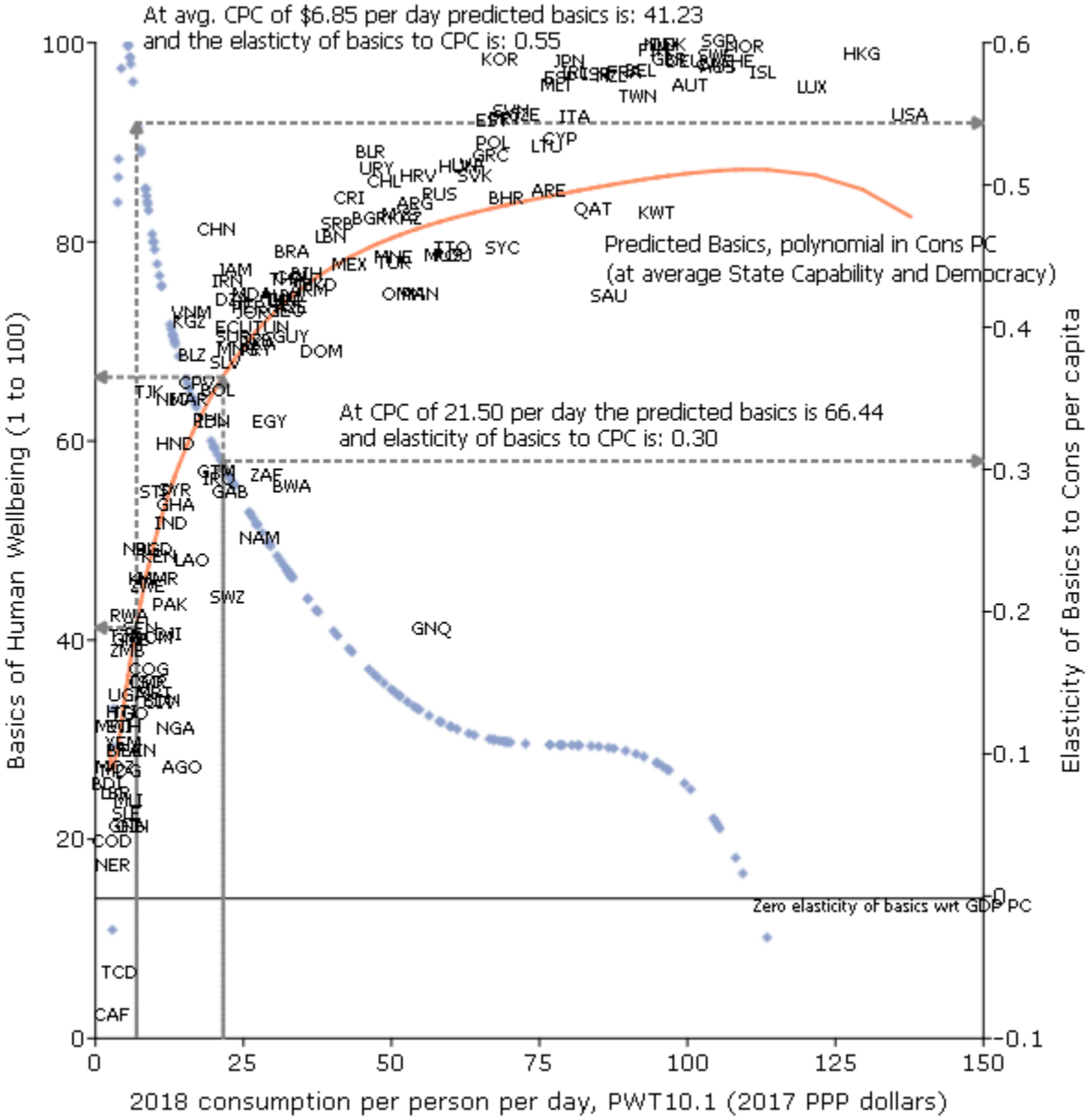
Figure 6 shows that when a country's average CPC per day is P$6.85 the level of basics is low (41.2 on a 1 to 100 scale) and the elasticity (estimated, not normalized) is also very high, .55. This makes P$6.85 a dubious candidate for an upper-bound as the typical person with this level of consumption has not achieved the basics of material well being and their gains to basics of from consumption are still very high.

Even at P$21.5 the level of the basics index is only 66.6 (on the 1 to 100 scale)—about the level of Bolivia—and the elasticity, which has fallen from its estimated peak of .6, is still relatively high.

The achievement of the basics of material wellbeing does not require "infinite" economic growth. At consumption of P$80 (as seen above, roughly the level of consumption for countries with an "expected" poverty line of P$21.5 pppd) the level of predicted basics a country with "average" governance is already quite high (above 80) and the elasticity has fallen to only about .10.

'basic' using principal components to set the weights. One important finding of the Pritchett and Lewis (2023) paper is that indicators of 'basics' tend to be quite robust and highly correlated with each other so the exact method does not matter much for the associations of basics with GDP per capita.

Figure 6: Association between "basics" and consumption per person, levels and elasticities



Source: Author's calculations drawing on data on 'basics' from Pritchett and Lewis (2023).

III.D) World Bank prosperity gap measure

Prior to October 2023 the World Bank, via their Poverty and Inequality Platform (or its predecessors) provided data at three poverty lines, the inflation adjusted dollar-a-day line, a middle line, and a high poverty line, P$6.85. This was consistent with the 2013 adoption of two goals of extreme poverty and shared prosperity, which was defined as progress for the bottom 40 percent in each country. The goal of "shared prosperity" acknowledged that poverty measures with low bar poverty lines were not adequate to describe global goals. It was also recognized that the "bottom 40 percent" measure of "shared prosperity" was inadequate as it implicitly treated progress in all World Bank borrowing countries the same even though the bottom 40

percent in Ethiopia and in Argentina, for example, were at very different absolute levels of consumption and wellbeing (World Bank 2025).

In October 2023 a new analytical measure, the "prosperity gap" was introduced into the standard reporting on poverty (World Bank 2023). This measure (Kraay, Lakner, Ozler, Decerf, Jolliffe, Sterck, and Yonzan 2023) is "the average factor by which individuals' incomes must be multiplied to attain a prosperity standard of $25 per day for all." This prosperity gap is different from our proposal of FGT poverty with a GUBPL, but similar to what we propose in two ways.

First, the "prosperity gap" threshold at P$25 per person per day is quite close to our proposed GUBPL of P$21.5. Like dollar-a-day or P$21.5, P$25 is chosen as a focal point and Kraay et al (2023) give two loose rationales. One, the "median poverty line about high-income countries" is P$24.4, which is consistent with what Figure above that the average national poverty line for the richest countries is P$29.6 and P$21.5 is the poverty line for the lower range of high income countries. Two, that this level is near the mean consumption in household surveys for countries at the World Bank threshold for high-income countries. As seen above some of our measures could support a P$25 GUBPL. Moreover, as seen in Figure 1 (visually) and Table 3 (numerically) since there are very few people above P$21.5 (the right tail is very thin) moving up to P$25 would make little difference to headcount poverty measures for most developing countries.

Second, the prosperity gap measure does away with a "line" altogether as the weights on the contribution of a household to the prosperity gap are continuous. As articulated in World Bank (2025) "a person with $30 contributes 0.83 (=25/30) to the Prosperity Gap, while a person with $20 contributes 1.25 (=25/20), or 1.5 times the contribution of the person with $30" hence, while the contribution of a person above the prosperity threshold is less than one but the contribution is continuous at the threshold. This implies "the selection of the $25 prosperity standard does not affect comparisons by the Prosperity Gap. That is, selecting any other threshold would yield exactly the same comparisons over time or across countries."

In practice, the difference between an FGT "poverty gap" measure with $\alpha=1$ and a poverty line of P$21.5 and a prosperity gap measure is likely small. We set a GUBPL at a level where the contribution to those above the line is "small enough." The contribution of the top 20 percent of the world's population above the prosperity threshold of P$25 contributes only 2 percent to the global prosperity gap (World Bank 2025), because the weight of their income in the calculation is so small compared to those of those below the prosperity threshold. A person at P$6.85 contributes $3.65 \approx 25/6.85$ to the prosperity gap measure versus exactly 1 at P$25.

The main difference between our proposal and the World Bank prosperity gap measure is therefore rhetorical. The prosperity gap measure has no particular word for people with incomes above the high World Bank threshold of P$6.85 and below the prosperity gap threshold of P$25. We agree with the prosperity gap implication that expanding incomes for people above P$6.85 is an important development goal. But we reason to not refer to people who are not "globally prosperous" as "globally poor." Rather than seeing "poverty reduction" and "prosperity increase" as two goals, measured quite differently, our proposal is to stick to the idea that the

over-arching goal of development is poverty reduction but shift the poverty line up to a globall decent level.

Conclusion

> *'When I use a word,' Humpty Dumpty said in rather a scornful tone, 'it means just what I choose it to mean — neither more nor less.*
>
> '*The question is,' said Alice, 'whether you can make words mean so many different things.'*
>
> *'The question is,' said Humpty Dumpty, 'which is to be master — that's all."*
>
> Lewis Carroll, Through the Looking Glass

This paper presents primarily technical analysis, yet we are happy to admit our goal is to be persuasive to practical people. Our aim is to convince the entire range of global development actors: from multi-lateral (e.g. UN, World Bank, Asian Development Bank) and bilateral development organizations (e.g. UK's FCDO) to non-governmental organizations, to development philanthropists (both organizations like the Gates foundation and individual givers), to development economists and scholars, and even the global media that discusses development, to *raise the bar* on global poverty, in three ways.

First, words matter. The development discourse needs to acknowledge and allow for a much wider array of meanings of poverty and stop the practice of conflating poverty with its most extreme definition. The weakness of FGT poverty using low-bar poverty lines as an exclusive, dominant, or overarching normative goal of development is widely recognized. The first of the 2015 UN Sustainable Development Goals is "End poverty in all its forms everywhere." The World Bank's standard measures of poverty have for a number of years included not just one, but an array of poverty lines, and in 2023 the World Bank's poverty data and reporting site was expanded to include a prosperity gap measure.

There must be an array of poverty lines because there is no line in human material wellbeing: there is just incrementally better or worse. Empirically neither subjective wellbeing nor indicators material wellbeing (sanitation, education, food adequacy and diet, etc.) show any sign of discontinuity or even kinks at any level. Acting as if "poverty" and "the poor" could be globally based on single poverty line (much less that this poverty line would be a line chosen as the lowest a poverty line could be) was an attempt to be "the master" of words and is the result of political power, not technical or economic analysis.

Second, as the need for an array of global and national poverty lines is already accepted, an obvious question is: "what is the upper-bound poverty line for development related poverty?" We are hoping to convince development actors that the GUBPL should (at least) $P21.5 (in 2017 PPP units), which is *ten times* as high as the widely used lower bound poverty line of P$2.15 and about three times the World Bank's "high" poverty line of P$6.85. We start from the premise that a poverty line should be set at a level of income/consumption where the normative gains to material wellbeing from additional income are "close enough" to zero. As FGT poverty

measures impose the implication that gains to income/consumption above the poverty line count for exactly zero in poverty reduction, using any of the current World Bank poverty lines is just grossly at odds with people's own assessment of their subjective wellbeing and with facts about material wellbeing.

Third, with the dramatic cuts in development assistance in 2025, not just the effective elimination of USAID but also significant cuts in the UK, the Netherlands, and other countries, this might seem an odd time to propose a new GUBPL that dramatically expands the number of people in the world counted as "global development" poor. But we believe that development assistance and development economics lost its way when they "defined development down" (Pritchett and Kenny 2013) by adopting as the supposed over-arching goals of development very low-bar goals like dollar-a-day poverty. These low-bar goals were an attempt by "North" based politics to limit the legitimate aspirations to prosperity of people in other countries. To be of any interest to the citizens and countries that include most of the world's population development assistance and development economics need to re-center around "high bar" aspirations for four-fold national development, including sustained, rapid, inclusive, increases in productivity, and thereby achieving the ambitious goals for social progress that have historically been central to the ideals of development.

We believe the frequent objection that a high upper-bound global poverty line results in the finding that nearly everyone in many developing countries is poor and hence cannot be used as a prioritization tool, is actually a strength of our proposed GUBPL. We believe that global measures of material wellbeing—which youth are getting a decent education, which people are living in acceptable housing, which standards of food consumption are adequate--all people should be treated equally, no matter their race, sex, or country of birth. If these calculations result in truths that are inconvenient, such that the obvious implication that these high levels of global poverty imply the current levels and approach of development assistance are radically unequal to the task to addressing global poverty, this is a *feature*, not a bug. Poverty should not be conveniently defined down to match the resources rich countries and hyper-rich donors wish to make available.

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Results Appendix: MCP Regressions

Table RA: MCP-Binary. OLS regression of binary indicator for "all six" living conditions						
Variable		Bangladesh	Ethiopia	Indonesia	Nigeria	Pakistan
Wealth Index	coeff	0.448***	0.263***	0.462***	-0.054	0.202**
	std err	0.037	0.056	0.050	0.043	0.066
Wealth Index^2	coeff	-0.121***	-0.154***	-0.093***	0.019	0.035
	std err	0.018	0.028	0.017	0.018	0.037
Wealth Index^3	coeff	0.016***	0.030***	0.009***	0.002	-0.010
	std err	0.003	0.004	0.002	0.002	0.006
Household Size	coeff	-0.021***	0.000	-0.015***	-0.002***	-0.023***
	std err	0.001	0.001	0.001	0.001	0.001
Rural	coeff	0.095***	-0.004	0.076***	0.004	-0.014
	std err	0.012	0.006	0.011	0.008	0.019
Constant	coeff	-0.182***	-0.139***	-0.380***	0.036	0.104***
	std err	0.023	0.033	0.044	0.032	0.026
R-Squared		0.172	0.332	0.100	0.150	0.212
N		19457	8663	47963	40427	14540
Notes: Indonesia lacks anthropometric data on malnutrition and so the dependent variable is "all five"						

Table RA: MCP-Sum. OLS regression of sum across binary indicator for each of six living conditions (values of integers 0 to 6).						
Variable		Bangladesh	Ethiopia	Indonesia	Nigeria	Pakistan
Wealth Index	coeff	2.756***	2.604***	1.893***	1.099***	2.834***
	std err	0.115	0.269	0.108	0.222	0.184
Wealth Index^2	coeff	-0.954***	-0.574***	-0.441***	0.032	-0.901***
	std err	0.055	0.110	0.034	0.077	0.087
Wealth Index^3	coeff	0.112***	0.054***	0.039***	-0.019*	0.101***
	std err	0.008	0.014	0.003	0.008	0.013
Household Size	coeff	-0.080***	-0.119***	-0.031***	-0.074***	-0.060***
	std err	0.003	0.005	0.002	0.003	0.004
Rural	coeff	0.155***	-0.127*	0.111***	-0.132***	-0.035
	std err	0.027	0.064	0.017	0.030	0.033
Constant	coeff	2.865***	1.009***	1.542***	1.587***	2.787***
	std err	0.070	0.200	0.107	0.202	0.159
R-Squared		0.321	0.601	0.212	0.465	0.400
N		19457	8663	47963	40427	14540
Notes: Indonesia lacks anthropometric data and so the regression is “all five”						

Results Appendix: Engel

Table RA-Engel: Regressions of food share on total consumption, estimates of Engel's Law						
	Data by income groups within countries				Cross national averages	
	Standard Engel Functional Form	Polynomial (powers -2 to 4)	Standard Engel Functional Form	Polynomial (-2 to 4)	Standard Engel Functional Form	Polynomial (-2 to 4)
Column	I	II	III	IV	V	VI
Constant	75.60	56.74	69.77	47.52	80.21	55.76
Ln(y)	-14.01		-11.91		-15.33	
y		-1.485		-1.156		-1.068
y^2		0.017		0.014		0.000
y^3		0.000		0.000		0.000
y^4		0.000		0.000		0.000
1/y		29.770		37.249		37.438
1/y^2		-11.675		-13.997		-34.959
Country/year dummies	No	No	Yes	Yes	No	No
R-Squared	0.736	0.760	0.932	0.943	0.795	0.823
N (country, year, income group)	593	593	593	593	191	191
N country/year observations	51	51	51	51	191	191
Notes: Standard errors are not reported but all terms in income/consumption have p-levels less than .000. For instance, the standard error on the estimate of ln(y) with dummy variables (column III) of -11.91 has a standard error of .331 and hence t-statistic of -35.96 and hence a p-level of essentially zero. The standard error of the prediction of the food share in the polynomial functional form is, in any case, a function of the covariance matrix and hence the individual standard errors on the polynomial terms are not of primary interest.						

Data Appendix: Food share data for Engel estimates

A) Distributional data (by percentiles)

The data come from four sources.

A.1) Japanese Historical Data

Data are taken from the tables for Annual Average of Monthly Receipts and Disbursements per Household that are available each year from 1951 to 2007. We use the ratio of Food Expenditure to Living Expenditure.
This is presented by quintile group for Workers Households ("workers" are non-agricultural, forestry or fishery) with households of two or more members.

Although the data are annual we only use one observation per decade, producing six observations from 1951-2001.

A.2) ILO Data

Downloaded from LABORSTA, the International Labour Organization (ILO) Labor Statistics Data Base, from the topic "Household Income and Expenditure Statistics" Table H2 "Distribution of Household Expenditure Groups" which is compiled from various sources and includes data on expenditure shares on "Food and non-alcoholic beverages" in total expenditure (consumption and non-consumption (e.g. taxes)). The expenditure groups for which food share and total expenditure was reported were deciles, quartiles, or survey specific ranges. The data was extracted in 2013 and includes data from 1998 to 2004 and data for 44 different countries.

A.3) FAO

From a publication of the FAO in 1981 we recover estimates of food expenditures and total expenditures and hence food shares from 26 countries, by various income groups (either percentiles or survey specific categories). The data are for the period between 1969 and early 1980s.

A.4) US Consumption expenditures

The data for the USA for 2017 are from the Consumer Expenditure Survey, Table 1110. Deciles of income before taxes: Annual expenditure means, shares, standard errors, and coefficients of variation.

B) Cross national data

The cross-national data is based on country averages. The data is from the FAO and ILO sources above, plus data from the LIS/Eurostat, a paper by Hoyos and Lessen (2008), data from the LSMS, and some we collected directly from national sources.

Simulations Appendix: Log Normal Simulations

The parameters for the log-normal simulations of consumption expenditures for each country are done with a simple grid search over the two parameters of the log-normal distribution to minimize the squared error of the simulated distribution in matching four reported statistics about the distribution from the World Bank PIP web site.

The statistics reported about the consumption distribution used are:

1) The mean (in dollars a day)
2) The Gini coefficient
3) The mean less the median, which is a summary statistic of the inequality in a log-normal distribution.
4) The mean consumption of the top decile. We include this as a key summary statistic for the log-normal simulation to replicate accurately as the estimated GUBPL are all in the top end of the distribution and hence we want the simulation to be accurate at the top end.

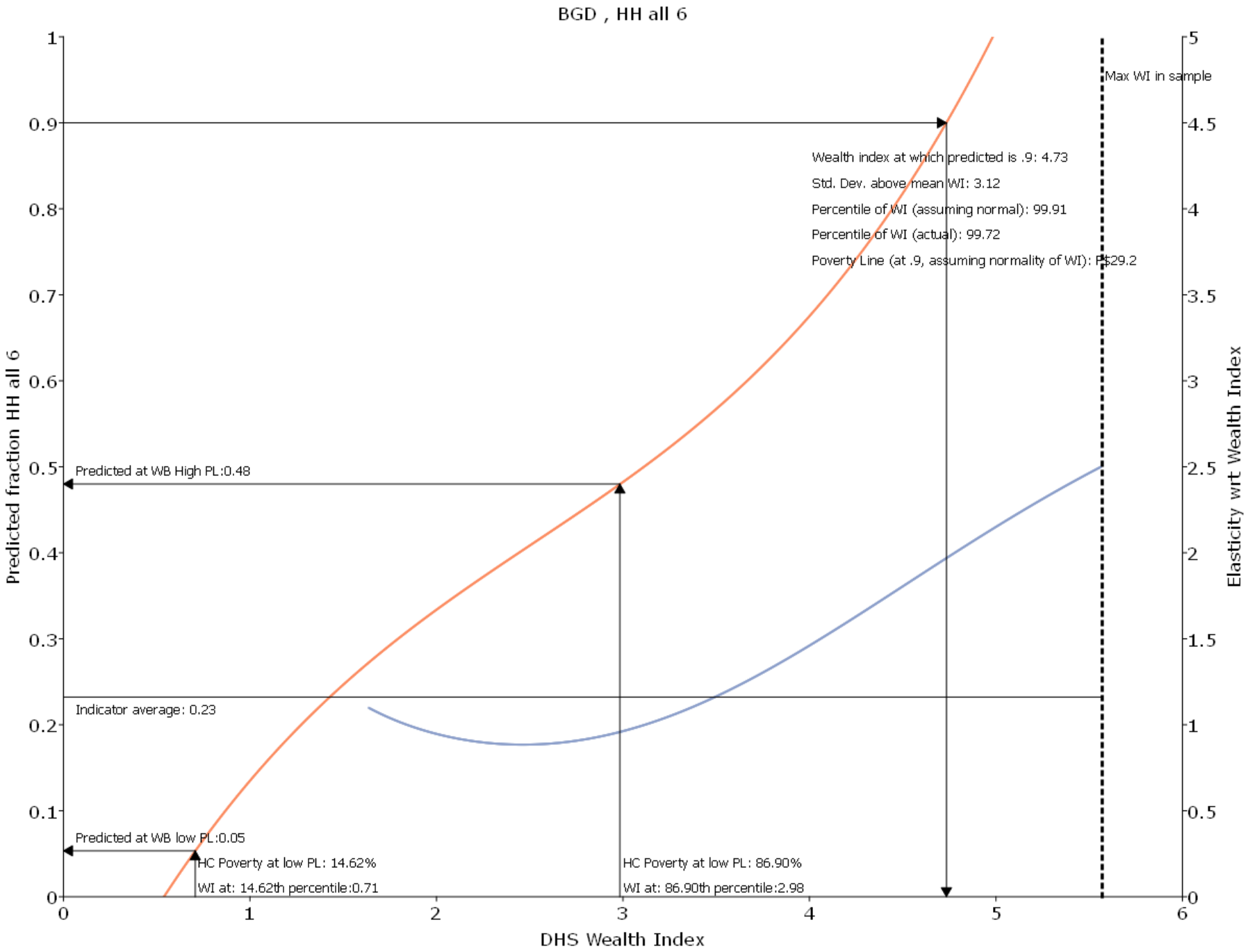
Using these four we seek to produce a log-normal that produces an accurate estimate of the central tendency (mean), inequality (Gini and mean less median), with special weight on the upper tail.

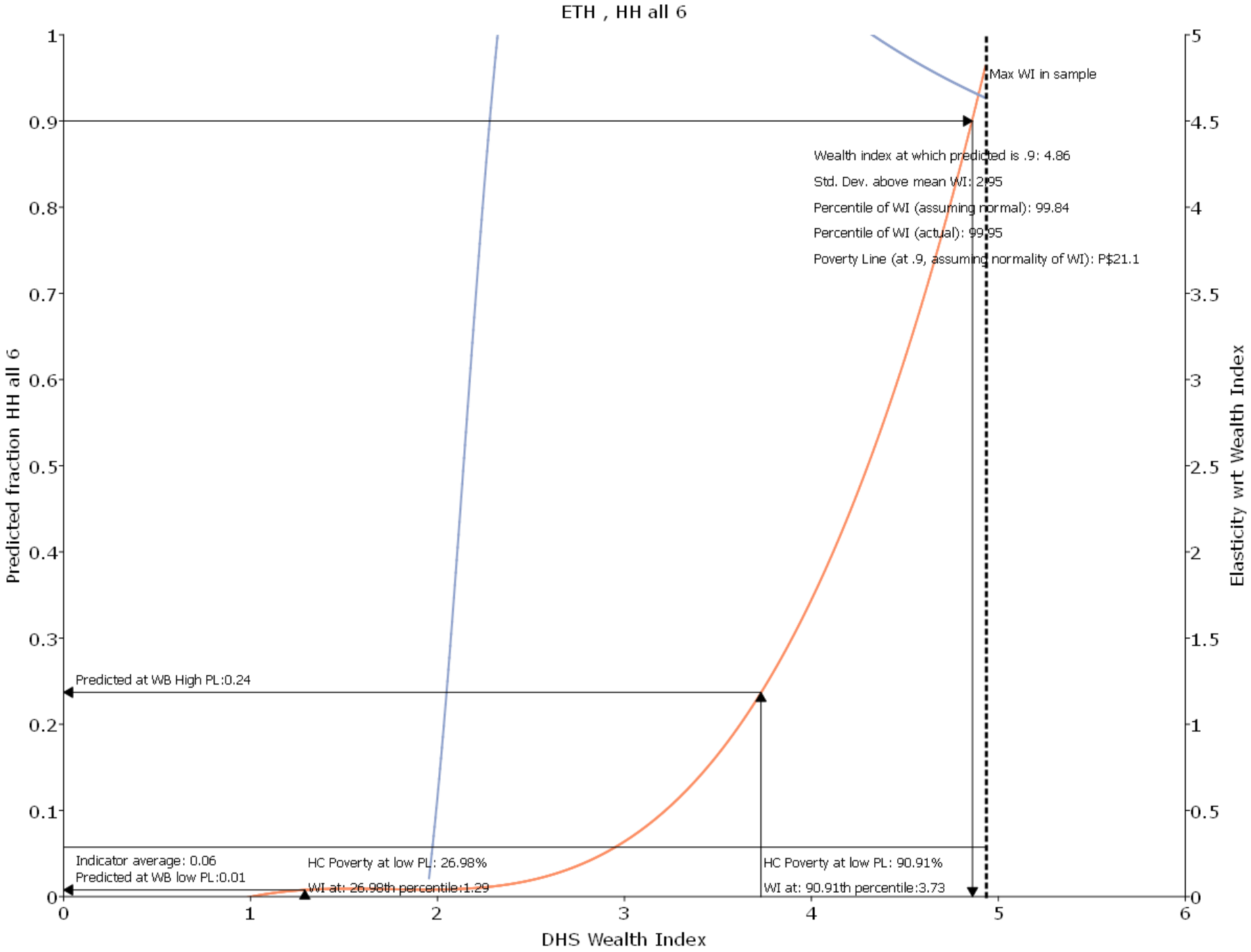
For each pair of parameters of the log-normal we simulate a log-normal distribution with 10,000 observations.

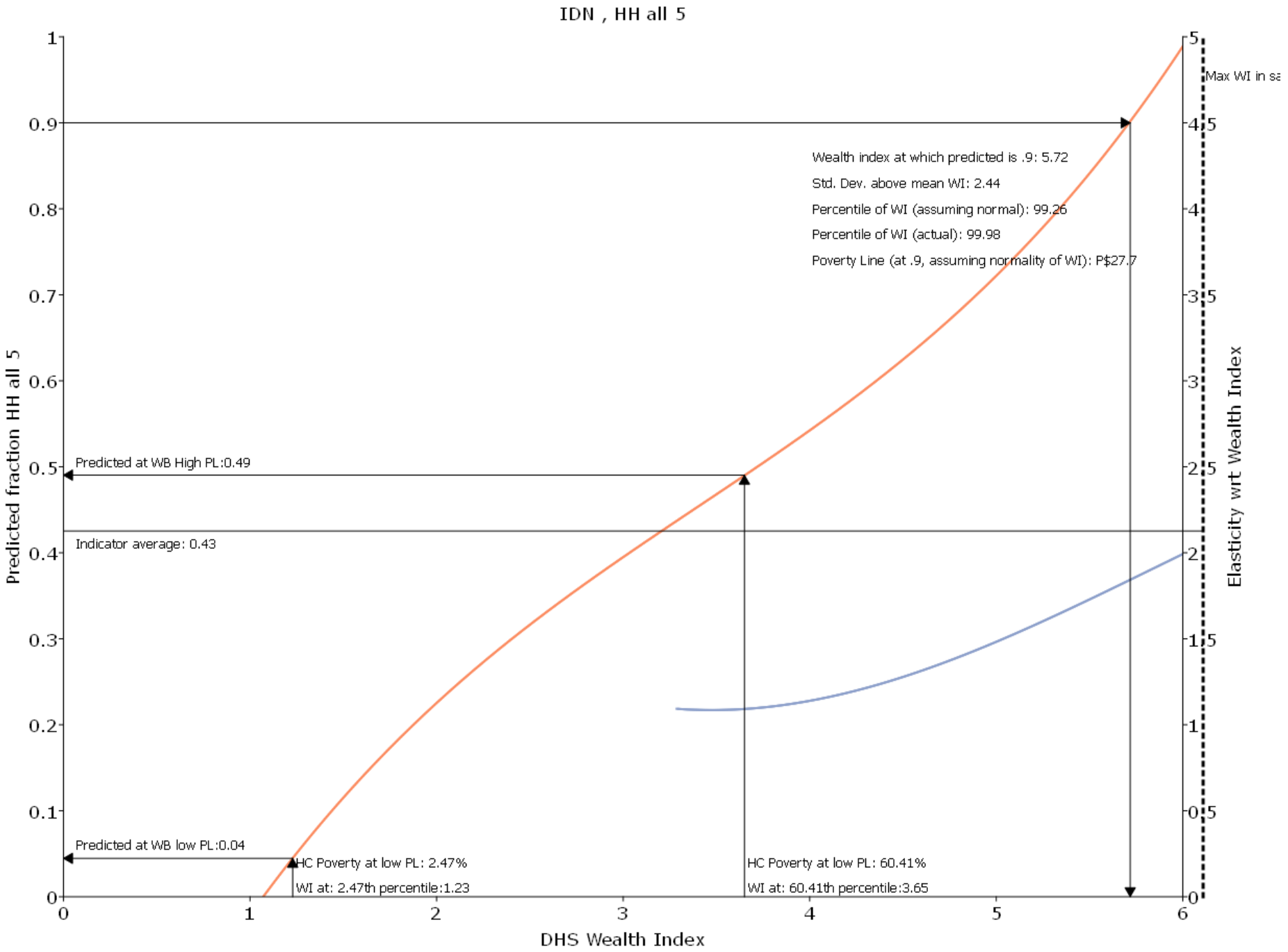
We then compute the weighted sum of the squared errors for each of the four statistics between the actual statistic and the computed value from the simulated distribution.

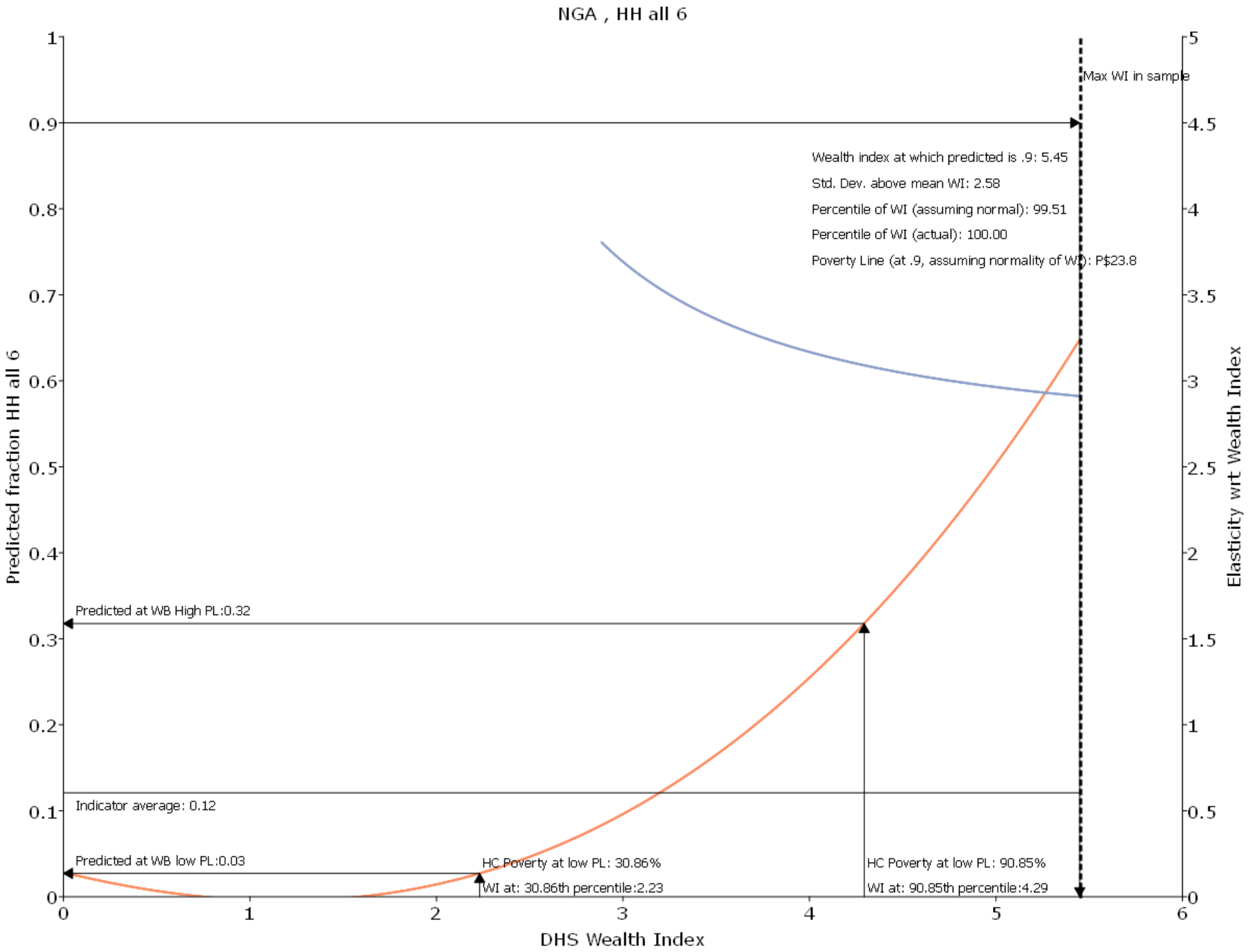
The grid search starts from parameters produced early just replicating the mean and Gini. From that starting point the grid is 15 steps in each direction, in units of 100ths for the parameters. We double check and in no case are the chosen parameters are at the edge of the search grid.

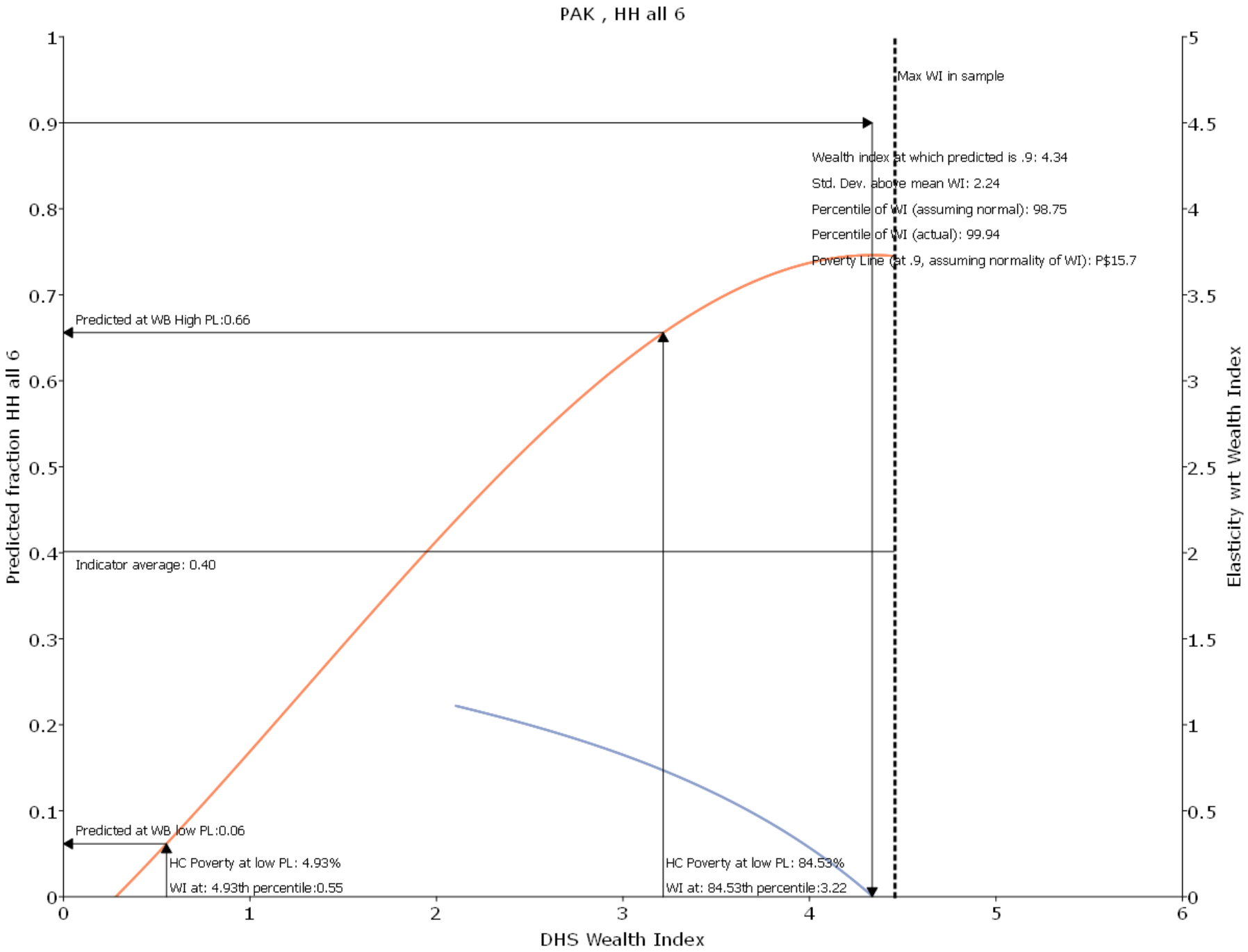
Our default to choose the parameters that produce the smaller sum of squares errors against each of the four reported distribution statistics equally. But we also iterate over giving the mean of the top decile more and more weight, adjusting the others, which gives roughly the same parameters.


BGD , HH all 6
Predicted fraction HH all 6
Elasticity wrt Wealth Index
DHS Wealth Index
Max WI in sample
Wealth index at which predicted is .9: 4.73
Std. Dev. above mean WI: 3.12
Percentile of WI (assuming normal): 99.91
Percentile of WI (actual): 99.72
Poverty Line (at .9, assuming normality of WI): PI$29.2
Predicted at WB High PL:0.48
Indicator average: 0.23
Predicted at WB low PL:0.05
HC Poverty at low PL: 14.62%
WI at: 14.62th percentile:0.71
HC Poverty at low PL: 86.90%
WI at: 86.90th percentile:2.98


ETH , HH all 6
Max WI in sample
Wealth index at which predicted is .9: 4.86
Std. Dev. above mean WI: 2.95
Percentile of WI (assuming normal): 99.84
Percentile of WI (actual): 99.95
Poverty Line (at .9, assuming normality of WI): P$21.1
Predicted at WB High PL:0.24
Indicator average: 0.06
Predicted at WB low PL:0.01
HC Poverty at low PL: 26.98%
WI at: 26.98th percentile:1.29
HC Poverty at low PL: 90.91%
WI at: 90.91th percentile:3.73
Predicted fraction HH all 6
Elasticity wrt Wealth Index
DHS Wealth Index
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
1
2
3
4
5
6


IDN , HH all 5
Predicted fraction HH all 5
DHS Wealth Index
Elasticity wrt Wealth Index
Max WI in sa
Wealth index at which predicted is .9: 5.72
Std. Dev. above mean WI: 2.44
Percentile of WI (assuming normal): 99.26
Percentile of WI (actual): 99.98
Poverty Line (at .9, assuming normality of WI): P$27.7
Predicted at WB High PL:0.49
Indicator average: 0.43
Predicted at WB low PL:0.04
HC Poverty at low PL: 2.47%
WI at: 2.47th percentile:1.23
HC Poverty at low PL: 60.41%
WI at: 60.41th percentile:3.65


NGA , HH all 6
Max WI in sample
Wealth index at which predicted is .9: 5.45
Std. Dev. above mean WI: 2.58
Percentile of WI (assuming normal): 99.51
Percentile of WI (actual): 100.00
Poverty Line (at .9, assuming normality of WI): P$23.8
Predicted at WB High PL:0.32
Indicator average: 0.12
Predicted at WB low PL:0.03
HC Poverty at low PL: 30.86%
WI at: 30.86th percentile:2.23
HC Poverty at low PL: 90.85%
WI at: 90.85th percentile:4.29
Predicted fraction HH all 6
Elasticity wrt Wealth Index
DHS Wealth Index
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
0
1
2
3
4
5
6


PAK , HH all 6
Max WI in sample
Wealth index at which predicted is .9: 4.34
Std. Dev. above mean WI: 2.24
Percentile of WI (assuming normal): 98.75
Percentile of WI (actual): 99.94
Poverty Line (at .9, assuming normality of WI): P$15.7
Predicted at WB High PL:0.66
Indicator average: 0.40
Predicted at WB low PL:0.06
HC Poverty at low PL: 4.93%
WI at: 4.93th percentile:0.55
HC Poverty at low PL: 84.53%
WI at: 84.53th percentile:3.22
Predicted fraction HH all 6
Elasticity wrt Wealth Index
DHS Wealth Index
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
0.5
1
1.5
2
2.5
3
3.5
4
4.5
5
1
2
3
4
5
6