Economic growth *is* enough and *only* economic growth is enough

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Abstract. We show that *any* cross-national measure of human material wellbeing that is (i) based on *basics* (not luxuries), (ii) *general* (uses indicators from multiple domains), and (iii) *plausible* (uses any defensible choices for weights) will robustly have a statistical relationship with GDP per capita (GDPPC) with four features. One, the relationship will be *strong*, with *nearly all* cross-national variation in basics associated with variation in GDPPC. Second, the relationship will be *non-linear*. Third, GDPPC is empirically sufficient, achieving high levels of GDPPC will produce high levels of basics. Fourth, GDPPC is empirically necessary, only countries with high levels of GDPPC will achieve high levels of basics. These findings significantly extend the existing literature as (i) we show that not just specific money metric (e.g. poverty, Atkinson) or physical indicators of wellbeing (e.g. child mortality, access to sanitation) are associated with GDPPC but that *all* plausible, general, measures of the basics of human material wellbeing will have a strong, non-linear, empirically sufficient and empirically necessary relationship to GDPPC and (ii) give simple but strong economic reasoning for these results.

Introduction[1]

In 1988 Robert Lucas said "the consequences for human welfare" of differences in economic growth "are simply staggering," such that once one starts to think about them "it is hard to think about anything else." But something strange has happened. The importance of sustained economic growth for human wellbeing is now actively downplayed and development economics currently is taken up with thinking about "anything but" economic growth.

In a February 2021 op-ed and blog titled "Growth is Not Enough" the executive director and the communication director of a globally prominent development research institution, J-PAL (Abdul Lateef Jameel Poverty Action Lab) made the outlandish claim that: "…growth is not enough. Specific, targeted social programs based on rigorous empirical evidence are equally important to prevent people from being left behind." While acknowledging that technical progress and growth play a "vital role" the piece asserts: "The problem lies in assuming that these factors are sufficient"[2].

When Bill Gates argued in 2016 that anti-poverty programs providing chickens would be an important avenue for reducing poverty in Africa (blog), Chris Blattman responded that he thought: "the best investment we could make to fight world poverty" would be funding randomized studies comparing the efficacy of programs that transferred livestock assets like chickens versus those that distributed cash (Blattman and Niehaus 2014).

Rohini Pande, the director of the Economic Growth Center at Yale University in October 2021 published a blog at International Growth Centre at LSE titled: "Not by growth alone" arguing that growth "will not be sufficient to eradicate extreme poverty." Apparently even development organizations with *growth* actually in their name are unconvinced.

Economic growth is central to poverty reduction (Dollar and Kraay 2002, Sala i Martin 2006, Dollar, Kleineberg, and Kraay 2016, Roser 2021, Bergstrom 2022). Pritchett (2020) shows that median incomes across countries and over time explain essentially all of the variation in headcount measure of poverty. Pritchett (2024) shows that in countries that had large reductions in poverty, including cases where extreme poverty was eradicated, nearly all of that reduction was due to shifts in median income/consumption and the incremental contribution of improvements in the distribution (of the type that would be produced by targeted programs) was nowhere near "equal" to that of growth but ranged between zero to only a few percent of the total reduction in poverty.

A strong association with GDPPC extends beyond poverty to physical indicators of wellbeing. Filmer and Pritchett (1999) show that child mortality is highly correlated with GDPPC and just four factors, GDPPC, women's schooling, a measure of inequality (to account for non-linearity), and regional indicator variables account for nearly all cross-national variation. Pritchett and Viarengo (2010) show that the cross-national life-expectancy-GDPPC association is

[1] We thank Stephen Brien and Vicente Geloso for very helpful comments.

[2] And even when it was pointed out (blog) that an organization based on the premise that decisions should be based on rigorous evidence should either provide evidence that programs were in fact "equally" important or withdraw the assertion, the blog is live and unaltered in March 2026.

robust over measures extending over 100 years. Cross-national indicators of wellbeing built up exclusively from physical, non-economic, measures of wellbeing like the Social Progress Imperative's Social Progress Index are strongly associated with GDPPC (Pritchett 2022). The UNDP, building off Amartya Sen's (1985, 1999) arguments for a "capabilities" approach created an HDI (human development index) (UNDP, 1990) but the HDI eventually was modified because essentially all of the variation in the HDI was due to GDPPC (UNDP 2011).

We first show that relationship between a measure of the basics of human wellbeing and GDPPC has the following four features:

One, basics is *very* tightly correlated with GDPPC. The correlation between a very wide array of measures of basics and their "predicted" value based on GDPPC alone is typically around .9 (an R2 around .81). The p-levels for the hypothesis that all terms in GDPPC are zero are smaller than 10^{-37}. Even "data undermining"-- specification searches over the space of plausible measures of basics to *minimize* the correlation of basics with GDPPC—cannot produce weak correlations of basics and GDPPC.

Two, the relationship of basics and GDPPC is strongly non-linear, even more non-linear than logarithmic as the elasticity of basics and GDPPC is not constant but declines with GDPPC. The elasticity is between twice and eight times larger for countries in the second quintile of GDPPC than for countries in the fourth quintile,

Three, the statement "growth is not enough" or "not by growth alone" is demonstrably false for basics. GDPPC is *empirically sufficient*: while at any given level of GDPPC there are countries with higher or lower values, there are no countries with high GDPPC that have low achievement on basics.

Four, GDPPC is empirically necessary: there are no countries with low levels of GDPPC with a high levels of basics.

But showing that there exists a measure of basics that has a strong relationship with GDPPC is in some sense trivial as the existing evidence about poverty or specific non-money metric wellbeing indicators like under-5 mortality already shows very strong relationships. Our claim is much stronger. Our claim is that *any* and *every* measure of the basics of human material wellbeing[3] that is *general* (covers more than a few indicators) and *plausible* (constructs an aggregate indicator with defensible weights) has a relationship with GDPPC with these same four features. We demonstrate that there does *not* exist a general, plausible, measure of basics that does not show a strong, non-linear, empirically sufficient and necessary relationship with GDPPC.

[3] While subjective wellbeing (measured with survey questions that assess happiness or life satisfaction or affect) are important phenomena in their own right, we are limiting ourselves to objective measures of wellbeing.

Any national (or regional or sub-national or group) broad, general, measure of the basics of human material wellbeing must answer three questions: (i) which specific characteristics of wellbeing are to be included as 'basic'? (ii) what is the specific indicator and summary statistic reflecting that characteristic? (For instance, one could use an average across households or use a deprivation threshold, like stunting for child malnutrition.) (iii) in a general measure with a number of elements, how are the indicators normed and what are the weights for each indicator.

Equation 1 is the generic formula of a general basics measure for country k that is a linear weighted average of N indicators, each with weight α_n, where each indicator I^n is some mapping from the underlying distribution (*f(B)*)hunt[4] across households of the indicator B.

$$1)\ Basics^k = \sum_{n=1}^{N} \alpha_N * I^n(f_n^k(B^j))$$

Our claim is very strong: for *any* general, plausible, cross-national measure of the basics of human material wellbeing there is a strong, non-linear, empirically sufficient and empirically necessary relationship with GDPPC. We support this strong claim in three ways.

First, we use the Legatum Prosperity Index (LPI) data to construct "correlational" measures, using the correlation amongst various commonly normed indicators to select which are "basics" and then principal components to assign weights. We produce two correlational measures. One starts from the 22 'elements' of the four wellbeing pillars of Legatum Prosperity Index. The other starts from the 82 raw indicators from which the LPI elements are aggregates. We use these two basics measures to illustrate the four features of the relationship of basics and GDPPC.

Second, we compare the results of the correlational measures of basics with three other commonly used measures of basics: (i) the Social Progress Imperative's measure of Basic Human Needs, (ii) the Multi-dimensional Poverty Index (MPI) reported by Oxford Poverty Initiative, and (iii) the World Bank reported measures of headcount poverty at a moderate poverty line.

Third, we engage in three of "data undermining" exercises that purposively search over indicators and weights to find the weakest association possible. One, searches over the one free parameter of the correlational measures, the correlation threshold to find the weakest association possible. A second data undermining exercise creates "anchored" measures of basics by choosing one indicator as the "anchor" and adding N-1 other indicators chosen by their correlation with the anchor. A third data undermining exercise builds general measures of basics by randomly choosing one indicator from each of seven key domains of human wellbeing: health, education, nutrition, housing conditions, water and sanitation, poverty and natural environment. These seven indicators are then combined with randomly chosen weights. We repeat this procedure to create 100,000 measures of basics which span the space of measures than are general and plausible and report the results for the measure with the weakest correlation with GDPPC. Unlike data mining which is a purposive search over methods to produce the

[4] For instance, Foster, Greer, Thorbecke (1984) measures of poverty are partial integrals of the underlying distribution of income/consumption and hence are a non-linear mapping from a variable B to an indicator of well-being.

"best" results, we conduct a purposive search to find the weakest results and show even those produce the same four features of a strong, non-linear relationship with empirical necessity and sufficiency.

I) *Correlational Measures of Basics using the Legatum Prosperity Index*

We first create a general, plausible, cross-national measure of the basics based on an analytically grounded method for choosing which indicators of wellbeing are "basic" and then created a general measure as a linear weighted average of those indicators. We then show the relationship between that basics measure and GDPPC to establish a baseline set of results.

I.A) Constructing correlational measures of basics

The Legatum Prosperity Index (LPI) is a large and sophisticated exercise to measure a wide array of aspects of countries' development. The LPI has twelve pillars, with 66 elements, based on 294 distinct indicators. Four LPI pillars that are direct measures of individual/household material well-being: *living conditions, health, education,* and *natural environment*. Each of these four pillars has an aggregate measure built up from "elements" which are themselves aggregates of indicators (Table 1).

The specific indicators are of four types: (i) direct welfare relevant *outcomes*, (ii) *utilization* that (is thought to) improve wellbeing directly and indirectly, (iii) measures of *availability* and (iv) measures of household income or assets. Outcomes*,* like under-5 child mortality, or prevalence of stunting of children under 5 are directly measures of welfare relevant *outcomes.* The *utilization* indicators report whether a household has or uses specific goods or services like electricity, cellphone, immunization, schooling, attended births, contraception, etc. While these utilization indicators are often called "access", utilization is chosen by households given the various constraints they face, of which "access" as physical proximity is just one. The *availability* measures report not on utilization of households but the availability of local public goods like roads. The *living conditions* pillar includes headcount poverty rates as indicators and some direct asset ownership variable, like whether the household owns a refrigerator.

We make two modifications to the raw LPI data. One, we rescale all 22 elements and each of the 82 indicators to a common scale of 1 to 100, where 1 is the value for the worst country and 100 is the value for the best country. The transformation creates a cardinal (not ordinal) scale for each LPI element or indicator such that one-unit difference is $1/99^{th}$ of the gap between the worst and best country for that element or indicator. For instance, in 2018 for under 5 mortality the best outcome is Finland at 2 deaths per 1000 births and the worst outcome is for Somalia at 129.4 so a one unit change in the transformed indicator is $1/99^{th}$ of the gap between 129.4 and 2. This transformation is perfectly correlated with the untransformed element or indicator. While there is no perfect way to compare a wide variety of physical indicators this cardinal scale has a clear interpretation. As discussed below the choice of principal components to assign weights in creating a linear combination of indicators makes scaling less relevant. Two, we transform every measure so that "up is good" so that, for instance, for under-five mortality where in raw units "up is bad" we simply reverse the 1 to 100 scale, for the indicator "under-5 child mortality" therefore Somalia is 1 and Finland is 100.

Table 1: Structure of four pillars, 22 elements and 82 indicators of living conditions from Legatum Prosperity Index		
Pillar	Elements (22)	Indicators (82)
Living Conditions (6 elements)	Material Resources (MRE):7	Poverty rate at national poverty lines, Poverty rate at $1.90 a day, Poverty rate at $3.20 a day, Poverty rate at $5.50 a day, Households with a refrigerator, Ability to source emergency funds, Ability to live on household income
	Nutrition (NUT): 4	Availability of adequate food, Prevalence of undernourishment, Prevalence of wasting in children under-5. Prevalence of stunting in children under-5
	Basic Services (BSC): 5	Access to electricity, Access to basic water services, Access to piped water, Access to basic sanitation services, Unsafe water, sanitation or hygiene
	Shelter (SHR): 4	Availability of adequate shelter, Housing deprivation, Access to clean fuels and technologies for cooking, Indoor air quality
	Connectedness (CTD): 6	Access to a bank account, Use of digital payments, Access to a cellphone, Rural access to roads, Satisfaction with public transportation, Satisfaction with roads and highways
	Protection from Harm (PHM): 4	Death and injury from road traffic accidents, Death and injury from forces of nature, Unintentional death and injury, Occupational mortality
Health (6 elements)	Behavioral Risk Factors (BRF): 3	Obesity, Smoking, Substance use disorders
	Preventive Interventions (HPI): 6	Diphtheria immunization, Measles immunization, Hepatitis immunization, Contraceptive prevalence, Antenatal care coverage, Existence of national screening programs
	Health Care Services (HCS): 7	Healthcare coverage, Health facilities, Health practitioners and staff, Births attended by skilled health staff, Tuberculosis treatment coverage, Antiretroviral HIV therapy, Satisfaction with healthcare
	Mental Health (MTH): 3	Emotional wellbeing, Depressive disorders, Suicide
	Physical Health (PHH): 5	Physical pain, Health problems, Communicable diseases, Non-communicable diseases, Raised blood pressure
	Life Expectancy (LEX): 5	Maternal mortality, Under 5 mortality, 5-14 mortality, 15-60 mortality Life expectancy at 60
Education (5 elements)	Pre-primary (PPE): 1 (1 Indicator)	Pre-primary enrolment (net)
	Primary (PRI): 3	Primary enrolment, Primary completion, Primary education quality
	Secondary (SEC): 4	Secondary school enrolment, Lower-secondary completion, Access to quality education, Secondary education quality
	Tertiary (TER): 5	Tertiary enrolment, Tertiary completion, Average quality of higher education institutions, Skillset of university graduates, Quality of vocational training
	Adult Skills (ASK): 5	Adult literacy, Education level of adult population, Women's average years in school Education inequality, Digital skills among population
Natural Environment (5 elements)	Emissions (EMS): 5	CO2 emissions, SO2 emissions, NOx emissions, Black carbon emissions, Methane emissions
	Exposure to Air Pollution (EAP): 3	Exposure to fine particulate matter, Health impact of air pollution, Satisfaction with air quality
	Forest, Land, Soil (FLS): 3	Forest area, Flood occurrence, Sustainable nitrogen management
	Freshwater (FWT): 4	Renewable water resources, Wastewater treatment, Freshwater withdrawal, Satisfaction with water quality
	Preservation Efforts (EPE): 6	Terrestrial protected areas, Marine protected areas, Long term management of forest areas, Protection for biodiverse areas, Pesticide regulation, Satisfaction with preservation efforts
Source: Legatum Prosperity Index.		

From the 22 elements or 82 indicators of the LPI which measure living standards, which are 'basic'? Analytically something to be said to be basic to human material wellbeing if: (i) the income expansion path is steep at low levels of income but flattens out as income increases and (ii) has low-price elasticities, especially at very low levels of consumption (and at moderate levels of aggregation: the price elasticity of "staples" (e.g. rice, wheat, etc.) is lower than that for any given staple). Perhaps the most well-established fact in economics is some variant of Engel's Law, that the food share in consumption expenditures declines as total consumption rises[5]. This marks food consumption as a 'basic' element of consumption.

Clearly it would be circular to define which elements/indicators are basics by their empirically estimated income expansion path (from household or aggregated data) and then "find" something about the relationship of the resulting basics measure and GDPPC. We build "correlational" indexes of basics that avoid circularity by using only the correlations *amongst* the elements/indicators (not with GDPPC) to define basics. Our working hypothesis is that, across a wide variety of causal models of basics (including, but not only, the "income expansion path" from standard microeconomics), we should expect that the cross-national correlation of individual indicators of basics high compared with correlations of basics with non-basics. If there are N distinct items, each of which is "basic" to material wellbeing then many causal models of the determinants of basics would predict a country which has more of the n^{th} basic (e.g. "utilization of sanitation") to have also have more of any other basic (e.g. "adequate nutrition").

To implement this approach we compute the bivariate correlation matrix among the 22 elements and calculate the median correlation of each of the 22 with the other 21 elements. The free parameter in this approach is a threshold of this median correlation. As our 'base case" (we examine robustness to this choice below) we choose .6, based on the large gap between the median correlation of the 14th element ranked by median correlation, Health, Preventive Interventions (HPI) at .647 and the 15th ranked, Freshwater (FWT) at .471 (Table 2).

An intuitive understanding of the mechanics of *how* the construction of this measure works and the how this then produces the results with GDPPC is important for understanding the results in the rest of the paper. In Table 2, column 3 we report the results of the median correlations for each of the 22 LPI elements and the table is sorted by that correlation.. For each of the 22 LPI elements we run a simple OLS regression on a quartic in GDPPC. Table 2 shows: (i) the regression predicted gain in moving from the 5th percentile of GDPPC to the 60th percentile, (ii) the same in moving from 60th to 95th percentile, (iii) the difference between those predicted gains, which is assesses the degree of concavity of the element's income expansion path, and (iv) the R2 of the quartic regression.

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[5] The enormous literature on Engel curves (the share of food in consumption wrt to total income/consumption) shows that over time and across countries (i) the budget share of food starts at a very high level and falls as income expands and (ii) Engel curves tend to be empirically strikingly similar across time and across countries (see, among the many, Pritchett and Spivack 2013 and references therein).

The 14 elements chosen as 'basics' by a .6 correlation threshold have very different relationship with GDPPC than the 8 elements which are deemed non-basics. The basics have (i) a very steep GDPPC expansion path at low levels of income: the median predicted gain in moving from the 5^{th} to 60^{th} percentile of GDPC for the basics is 32 (on a 1 to 100 cardinal scale), (ii) a highly non-linear GDPPC expansion path that flattens out: the gain from the 60^{th} percentile to 95^{th} percentile is only 8.7 and (iii) a high R2: the median is .729. In contrast, the median of the predicted gain for the non-basics is small: the median gain from the 5^{th} to 60^{th} percentile is only .7 and not particularly non-linear (falls to -2.5 for the 60^{th} to 95^{th} percentile of GDPPC, and the median R2 for the eight non-basics is only .153.

It is worth noting that none of the environmental measures are basics by this method and their relationship with GDPPC varies widely across the different indicators. Exposure to air pollution (EAP) has an environmental Kuznets curve (Grossman and Krueger 1995) getting worse with GDPPC at low levels, then improving. Preservation efforts (EPE) only get better at very high levels of GDPPC. Overall emissions (EMS), which includes climate change causing emissions of CO2 and methane, get consistently worse with respect to GDPC, deteriorating by roughly the same amount from 5^{th} to 60^{th} and 60^{th} to 95^{th}.

The LPI elements identified as basics by the correlational method are intuitive. Four of the six elements of health pillar are classed as basics: Life Expectancy (LEX), Physical Health (PHH), Health Care Services (HCS), and Preventive Interventions (HPI)). Mental Health (MTH) (e.g. depressive disorders, suicide) and Behavioral Risk Factors (BRF) (e.g. smoking, obesity) are not basics, which is not to say they are unimportant, just that they do not fit our criteria for basic. Four of the five elements of the education pillar, are basic (pre-primary (PPE), primary (PRI) and secondary (SEC) and adult skills (ASK)) whereas tertiary enrollment (TER) is non-basic. All of the living condition elements are chosen as basic: material resources (MRE), Nutrition (NUT), Basic Services (BSC), Shelter (SHR), Connectedness (CTD), and Protection from Harm (PHM) (which does not include crime). None of the natural environment measures are classed as basic by this method.

The important intuition from Table 2 is substantial number of variables reflecting living conditions that are (a) quite highly correlated amongst themselves and (b) quite strongly associated (non-linearly) with GDPPC. As we will see, these facts are going to imply that (roughly) if individual indicators chosen to be included in a general measure of basics are plausible as basics and (roughly) no matter how you choose weights for those indicators to produce a general measure of basics the resulting measure is going to have (roughly) the same relationship to GDPPC.

Table 2: A correlational threshold for choosing which of the 22 elements of wellbeing of the Legatum Prosperity Index are "basics"									
	Variable		Median Correlation with all other 21 elements (sorted)	GDPPC expansion path			R2 of quartic in GDPPC	Percent deviation of principal component weight from equality	
	Pillar	Element		Gain From 5th to 60th	Gain from 60th to 95th	Difference in predicted gain		With all variables	With just basics
Basics	**LC**	**Material Resource (MRE)**	**0.805**	**47.0**	**10.6**	**36.3**	**0.797**	**10.7%**	**-0.6%**
	ED	**Secondary (SEC)**	**0.802**	**36.3**	**9.6**	**26.7**	**0.777**	**-4.4%**	**-13.9%**
	LC	**Nutrition (NUT)**	**0.794**	**33.8**	**14.7**	**19.1**	**0.732**	**10.7%**	**-0.9%**
	ED	**Adult Skills (ASK)**	**0.781**	**41.7**	**8.2**	**33.5**	**0.726**	**8.6%**	**-2.7%**
	HL	**Life Expectancy (LEX)**	**0.778**	**32.1**	**3.9**	**28.1**	**0.654**	**20.2%**	**7.1%**
	ED	**Primary (PRI)**	**0.776**	**27.9**	**-0.6**	**28.5**	**0.555**	**25.2%**	**11.3%**
	LC	**Shelter (SHR)**	**0.774**	**56.4**	**9.1**	**47.3**	**0.838**	**19.2%**	**7.0%**
	HL	**Health Care Services (HCS)**	**0.767**	**28.8**	**15.7**	**13.1**	**0.774**	**-1.5%**	**-11.7%**
	LC	**Basic Services (BSC)**	**0.753**	**53.7**	**3.7**	**50.0**	**0.779**	**30.4%**	**16.6%**
	LC	**Connectedness (CTD)**	**0.726**	**20.9**	**19.3**	**1.6**	**0.752**	**2.1%**	**-9.0%**
	ED	**Pre-Primary (PPE)**	**0.718**	**32.0**	**5.5**	**26.4**	**0.581**	**-5.3%**	**-14.9%**
	HL	**Physical Health (PHH)**	**0.697**	**29.6**	**5.7**	**23.9**	**0.563**	**18.1%**	**4.8%**
	LC	**Protection from Harm (PHM)**	**0.648**	**15.5**	**14.7**	**0.8**	**0.504**	**6.8%**	**-5.5%**
	HL	**Health Preventive Interventions (HPI)**	**0.647**	**12.3**	**3.3**	**8.9**	**0.336**	**27.1%**	**12.4%**
Median of basics			**0.771**	**32.0**	**8.7**	**26.6**	**0.729**	**10.7%**	
Not basics	NE	Freshwater (FWT)	0.471	4.9	-4.3	9.2	0.284	-14.4%	
	NE	Preservation Efforts (EPE)	0.444	0.8	11.9	-11.1	0.311	-26.7%	
	HL	Mental Health (MTH)	0.271	13.3	-6.5	19.9	0.107	8.8%	
	NE	Forest, Land and Soil (FLS)	0.269	6.5	17.7	-11.2	0.200	-37.1%	
	NE	Exposure to Air Pollution (EAP)	0.149	-8.0	1.4	-9.5	0.089	11.4%	
	NE	Emissions (EMS)	-0.056	-13.5	-13.5	0.0	0.072	-1.2%	
	ED	Tertiary (TER)	-0.071	0.6	-0.6	1.1	0.009	-97.3%	
	HL	Behavioral Risk Factors (BRF)	-0.532	-34.8	-17.8	-17.1	0.457	-11.3%	
Median non-basics			0.209	0.7	-2.5	-4.7	0.153	-12.8%	

Source: Authors' calculations.
Note: a) Pillars: LC-living conditions, ED-Education, HL-Health, NE-Natural Environment.

Once it is decided which are indicators of a 'basic' an linear aggregate measure of basics needs weights. Equal weights are often used as a "focal point" default. This is not because equal weights actually has a good justification, but rather that since no particular set of weights, including equal weights, has a good justification, which leads to a default to an arbitrary "focal point" of equality. Our first preference is to use weights derived from the principal component of the set of indicators[6]. The final two columns of Table 2 show that if one chooses basics based on a correlational threshold the difference between principal component weights and equal weights is quite small (intuitively, as all the elements are highly correlated and normed to 1 to 100 so on the same scale). The correlation of basics with principal components weights and equal weights is over .99. If one uses all 22 elements, the principal components procedure produces quite different weights than equal weights, which illustrates the value of the correlational procedure for first choosing indicators and only then combining them with weights.

We implement the same procedure used for the 22 elements with the 82 LPI indicators using a median correlation threshold of .65 to distinguish between non-basic and basic indicators. This relatively high threshold produces 10 indicators of the 82 that are 'basic' with 6 of those 10 indicators from the education pillar. As with the elements, there are no natural environment indicators that pass the correlation threshold, as the highest median correlation of any natural environment indicator is "Long term management of forest areas" at only 0.445.

I.B) Relationship of correlational measures of basics with GDPPC

We estimate the association between the two correlational measures of basics and GDPPC. We use a standard source for cross-nationally comparable purchasing power adjusted estimates of GDP per capita, the Penn World Tables, version 10.0 (Feenstra, Inklaar and Timmer 2015). We use the expenditure based ('rgdpe') not output based ('rgdpo') based estimates. GDP for all countries is reported in PPP adjusted 2017 US$ (henceforth "P$"). We use a quartic in GDPPC to allow flexibility in the shape of the relationship as simpler functional forms impose very strong conditions.

Figure 1 illustrates the four distinct features of the relationship between GDPPC and the two correlational measures of basics (BCI-LE and BCI-LI). Figure 1 displays the scatterplot of basics and GDPPC with the standard three letter acronyms for each country. In addition, there are four lines in each graph.

One line is standard, the regression predicted value of basics of a quartic in GDPPC. This flexible functional form imposes some structure on the relationship against the modest analytical gain of traditional goodness of fit summary statistics, like R-Squared, and simple formulas for slope and elasticity (eqns 2 and 3).

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[6] The data reduction technique of principal components can be misleading if used mindlessly (Ravallion 2012, Mazziota and Pareto 2019) but this is a case where there is a coherent and widely accepted model that underpins the idea of a latent variable of 'basic' reflected in various indicators and in those cases using the first principle component to construct a linear index is justified (if not perhaps "ideal") (Filmer and Pritchett 2001).

A second line shows the 17-country rolling median of basics by GDPPC[7] which depicts the association robustly, in two senses: (i) it is non-parametric imposes no functional form and (ii) uses the median, which unlike the average, is robust to outlying observations.

The third and fourth lines are a data envelopment graphic device. The third, the upper bound of the envelope, shows the *best* basics outcome for a country with a given level of GDPPC or *lower*. This is, in a loose sense, the "possibility frontier" for basics outcomes for a given GDPPC and is analogous to a stochastic production possibility frontier (Aigner, Lovell, and Schmidt, 1977) or efficiency frontiers (Charnes, Cooper, and Rhodes, 1978).

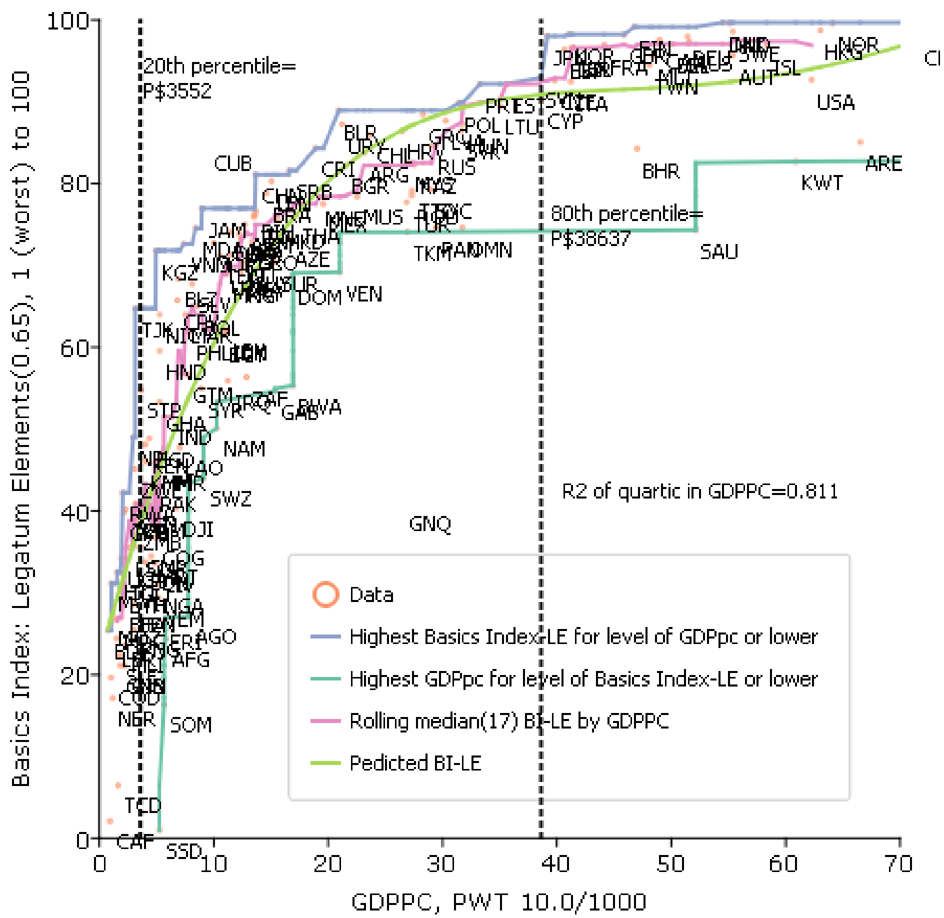
The fourth line is the lower bound of the envelope shows the *worst* outcome for basics for any country with a given level of GDPPC or *higher*.

We use this data envelopment technique for two reasons. One, while we could display standard error bounds to illustrate the tightness of the relationship what is displayed is not a statistical sample, it is the population as, data limitations aside, this is all the countries in the world so the usual approaches to statistical inference about the population from a sample are not really the issue. Two, this graphic device illustrates empirical necessity and empirical sufficiency. The white space in the upper left ("northeast") shows that no country has a achieved a high level of basics without reaching a certain threshold of GDPPC. Conversely, the blank space in the lower right ("southeast) illustrates empirical sufficiency in that no country with high GDPPC does not also achieve high levels of basics (and one exception to that rule, Equatorial Guinea (GNQ)).

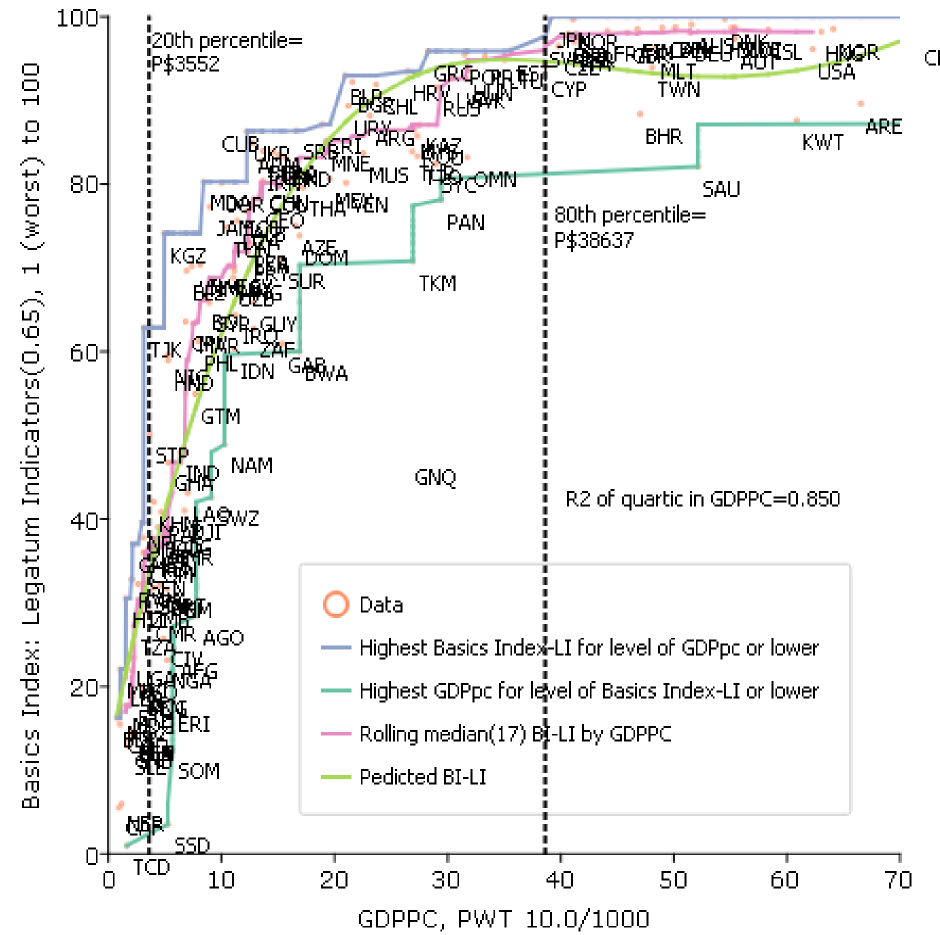
[7] This is a special case of a large variety of smoothed statistics, which pick a weighting function and a window, in this case we calculated the median using a rectangular window, with a window width of 17, roughly 10 percent of the sample.

Figure 1: Relationship between an index of Basics and GDPPC: strong, non-linear, sufficient, necessary

Panel A: Using 22 'elements' from Legatum Prosperity Index



Panel B: Using 82 'indicators' from Legatum Prosperity Index



Source: Authors' calculations.

Table 3 shows summary statistics from the regressions of basics on a quartic in GDPPC. (Table 3 also reports the exact same calculations for all other basics measures, which is a preview of coming attractions as the construction of the other basics measures have not yet been described). The regression coefficient estimates and other summary statistics are presented in Appendix Table A.R.1 (for BCI-LE, BCI-LI and three other measures).

The first column of Table 3 shows the regression R2, which is .811 for the BCI-LE(.6) and .850 for the BCI-LI(.65). With a bivariate linear regression the R2 is the square of the correlation coefficient, the correlation of predicted values from the quartic and GDPPC is .90 and .92[8]. In this era of "replication crisis" and "p-hacking" (Ioannidis 2005, Brodeur, et al., 2016, Brodeur, Cook, Heyes 2020) it is reassuring the p-levels of the test for inclusion of all terms in GDPPC for the two measures are 10^{-54} and 10^{-60} (Table A.R.1) which are astronomically low numbers[9].

The next four columns of Table 3 show the elasticity of the basics index wrt to GDPPC at the mean GDPPC in the first four quintiles of GDPPC: P$2,050, P$6,450, P$13,240 and P$27,010. With the quartic functional form in GDPPC the elasticity (eqn 2) varies across levels of GDPPC as the slope is a cubic in GDPPC (by simple differentiation, eqn 3). This allows the elasticity to vary flexibly across levels of GDPPC, unlike commonly imposed functional forms like linear, log-linear, or log-log which impose strong restrictions.

$$2)\ \epsilon_{BI,GDPPC} = \frac{dBI}{dGDPPC} * \frac{GDPPC}{BI}$$

$$3)\ \frac{dBI}{dGDPPC} = \beta_1 + 2 * \beta_2 * y + 3 * \beta_3 * y^2 + 4 * \beta_4 * y^3$$

The results show that the elasticity tends to start at a moderate level, then rise with GDPPC, reaching a peak in Quintile II, fall modestly but remains high in Quintile III, and then falls to a much lower level by the average GDPPC in Quintile IV, P$27,010. The mean income of quintile IV, P$27,010, is about the upper limit for "developing" countries. In 2018 Turkey was P$26,900, Malaysia P$27,100 and Greece P$28,300.

The population weighted average of GDPPC of those countries below the 80th percentile (roughly the "developing" countries) is P$10,044 (between the population giants of India at P$6366 and China at P$13,664). This implies the typical developing country person in 2018 lived in a country near the peak of the elasticity of basics wrt to GDPPC.

[8] The bivariate correlation which (incorrectly) imposes linearity in the relationship is only .73 and .71. There is no reason that the relationship should be linear and basic microeconomic theory suggests it should not. This point might seem too trivial to even mention but prominent authors often show scatterplots of measures of basics against GDPPC which are obviously non-linear but nevertheless report only a bivariate correlation or linear relationship (e.g. Figure 7 of Porter, Stern, and Artavia Loria 2013) and emphasize that this correlation is "low" which is just an artefact of misspecification.

[9] "Astronomical" because astronomy produces very large numbers: $3*10^{52}$ is the estimated mass of the universe in kg, 10^{24} a rough estimate of number of stars in the universe.

Table 3: Summary of the regression results of the relationship between GDPPC and the basics of material human wellbeing for the four different classes of basics indexes

Measure of country basics of material wellbeing	N	R-Squared of quartic	Non-linear: Elasticity of index wrt GDPPC at				Empirically necessary		Empirically sufficient	
			μ QI $2,030	μ QII $6,450	μ QIII $13,240	μ QIV $27,010	Pred at μ QI	Max at μ QI	Pred at μ QIV	Minimum at μ QIV
Basics defined by correlations, Legatum Elements (22) or Indicators (82)										
BCI-LE(.6) (Legatum Elements)	167	0.811	0.293	0.458	0.430	0.200	31.6	42.2	87.0	74.3
BCI-LI(.65) (Legatum Indicators)	167	0.850	0.497	0.613	0.503	0.162	24.5	32.8	93.0	78.2
Other proposed measures of basics										
Basic Human Needs (SPI)	153	0.833	0.290	0.424	0.342	0.051	37.9	40.6	90.2	79.1
Multidimensional poverty index (OPHI)	100	0.725	0.516	0.339	-0.02	NA	49.9	70.5	104.1	99.6
Poverty (P$5.50/day)	143	0.865	1.329	0.880	0.588	0.112	11.6	13.9	89.7	87.8
Anchored Basics Indexes (N=10, anchor plus 9 most highly correlated other indicators), PC weights, 15 different anchors										
Median of 15 Anchored Indices	167	0.821	0.468	0.579	0.452	0.090	30.2	33.2	100.1	85.9
Contraceptive Prevalence Rate (lowest R2 of the 15 anchors)	167	0.703	0.272	0.429	0.388	0.126	35.1	47.9	88.1	68.8
Seven Domain Basics Indexes, randomly chosen indicators and random weights, 100,000 iterations										
Lowest R2 over with randomly chosen indicators, equal weights:	167	0.625	0.165	0.290	0.262	0.019	50.5		91.3	
Lowest R2 with randomly chosen indicators and weights	167	0.327	0.071	0.146	0.155	0.048	45.7		62.9	

Source: Authors' calculations.

(a) Indicators: wasting, primary enrollment, maternal mortality, headcount poverty (extreme), indoor air quality, exposure to fine particulates

(b) Indicators (weights): wasting (.394), mortality rate age 15-60 (.009), education of adult population (.047), safe water (.185), extreme poverty (.012), housing deprivation (.001), exposure to fine particulates (.353)

The final four columns of Table 3 show the calculations of the predicted value of the measures of basics at the mean value of GDPPC of the first quintile (P$2,030) and at the average of the fourth quintile (P$27,010).

Also shown are the results of the "envelope" calculations showing the highest basics of any country at the mean of quintile I or below (which is an indicator of the "empirically necessary" aspect of GDPPC) and the lowest basics for any country at the mean of quintile IV or above (which is an indicator of the "empirically sufficient").

These results in Figure 1 and the first two rows of Table 3 are new results, but not the core results of the paper, they are just the starting point of this paper. These results are like an "existence" proof. The methods and results so far only show that there exists a plausible, analytically grounded, non-circular, procedure for defining a cross-national measure for basics of the type in equation 1 and that this measure has a relationship with GDPPC with four features: strong, non-linear, empirically sufficient, and empirically necessary. But, an existence result of this kind is relatively trivial as we already know this is true of many individual non-money metric measures of wellbeing (e.g. child mortality) or distributionally sensitive measures of money metric wellbeing (e.g. poverty) and or any of the elements of basics in Table 2 individually, hence one could have just chosen equation 1 to have one element, Life Expectancy, and produced roughly this same result.

The core argument of this paper is the much stronger claim that there *doesn't* exist a plausible, general, non-money metric measure of well being for which these core facts about the relationship *are not* true. The next section shows that the results from our new correlational measures are true of three other widely used indicators of basic. The third section then reports on three data undermining exercises.

II) *Other widely used indicators of basics*

The first step in demonstrating the robustness of findings about the relationship of basics and GDPPC is to compare the results of our correlational methods with three methods three widely used indicators: (i) Basic Human Needs from the Social Progress Initiative, (ii) the Multidimensional Poverty Index from the Oxford Poverty and Human Development Initiative, and (iii) income/consumption headcount poverty rates.

II.A) Basic Human Needs from Social Progress Initiative

As part of the general push back against economic growth there are a number of groups proposing alternative normative measures of progress. One such group is the Social Progress Imperative, whose mission statement is:

> *We dream of a world in which people come first. A world where families are safe, healthy and free. Economic development is important, but strong economies alone do not guarantee strong societies. If people lack the most basic human necessities, the building blocks to improve their quality of life, a healthy environment and the opportunity to reach their full potential, a society is failing no matter what the economic numbers say. The*

> *Social Progress Index is a new way to define the success of our societies. It is a comprehensive measure of real quality of life, independent of economic indicators.*

One of the three components of the Social Progress Index is named Basic Human Needs. Basic Human Needs is an equally weighted average of four sub-indices for Nutrition and Basic Medical Care, Water and Sanitation, Shelter, and Personal Safety and each of those is, in turn, based on indicators either in physical units (e.g. maternal mortality rate) or (rarely) subjective indicators like "perceived criminality" (Table 4). Hence the SPI Basic Human Needs measure is a weighted average of 16 indicators.

Table 4: The sub-components and indicators in the Social Progress Imperative's Basic Human Needs index

Sub-component of Basic Human Needs (number of indicators)	Indicators in sub-component
Nutrition and Basic Medical Care (5)	Undernourishment (% of pop.), Deaths from infectious diseases (deaths/100,000), Child stunting (% of children), Maternal mortality rate (deaths/100,000 live births), Child mortality rate (deaths/1,000 live births)
Water and Sanitation (4)	Unsafe water, sanitation and hygiene attributable deaths (per 100,000 pop'l), Populations using unsafe or unimproved water sources (%), Populations using unsafe or unimproved sanitation (%)
Shelter (3)	Usage of clean fuels and technology for cooking (% of pop.), Access to electricity (% of pop.), Household air pollution attributable deaths (deaths/100,000)
Personal Safety (4)	Traffic deaths (deaths/100,000), Political killings and torture (0=low freedom; 1=high freedom), Perceived criminality (1=low; 5=high), Homicide rate (deaths/100,000)
Source: Social Progress Imperative.	

The third row of Table 3 (and Figure GA.1) shows the results of regressing an index of Basic Human Needs constructed by an organization whose stated goal is to *de-emphasize* economic indicators. The relationship of SPI Basic Human Needs with GDPPC is strong, non-linear, necessary and sufficient. The R2 is .833 (with 153 countries) which is in between the R2 BCI-LE(.60) of .811 and that of BCI-LI(.65) of .850. The elasticities wrt GDPPC have the same non-linear pattern of increasing, reaching a peak at Quintile II at .424 then falling for a low elasticity of .051 by Quintile IV (and very similar magnitudes to the LPI elements measure of basics). The highest of any country at or below the mean of Quintile I (P$2,050) is 40.6 and the *lowest* of any country at or below the mean of Quintile IV is 79.1 so growth in GDPPC over the range of developing countries is empirically necessary and sufficient for SPI Basic Human Needs.

II.B) Multidimensional poverty index

The Multidimensional Poverty Index combines the features of a poverty measure (with deprivation thresholds) and non-money metric measures using physical outcome measures, like health, schooling, access to water and sanitation, housing condition. Perhaps the most widely used and cited multidimensional poverty measure is that developed, implemented, refined and maintained by Sabine Alkire (Alkire and Foster 2011, Alkire, Kanagaratnam, Suppa 2021) and the Oxford Poverty and Human Development Initiative. Table 5 (Alkire, Kanagaratnam and Suppa 2021) presents the indicators, thresholds for deprivation, and weights for the MPI. We rescale and invert the raw data so that it measures fraction of the population *not* in poverty, with 1 being the worst country and 100 the best.

The main drawback of this indicator is that it relies on collections of household survey data that are carried out only in developing countries, such as the Demographic and Health Survey (DHS), so the countries in the upper range of GDPPC is missing entirely. The highest GDPPC in the MPI sample is Trinidad and Tobago with GDPPC of P$35,800 (about the 80th percentile).

Table 5. MPI (Multi-dimensional Poverty Index): Dimensions, Indicators, Deprivation Cutoffs, and Weights

Domain	Indicator	**Deprived if...**	Weight
Health	Nutrition	Any person under 70 years of age for whom there is nutritional information is **undernourished**.	1/6
	Child mortality	A child **under 18** has **died** in the household in the five-year period preceding the survey.	1/6
Education	Years of schooling	**No** eligible household member has completed **six years** of **schooling**.	1/6
	School attendance	Any school-aged child is **not attending** school **up to** the age at which he/she would complete **class 8**.	1/6
Living Standards	Cooking fuel	A household cooks using **solid fuel**, such as dung, agricultural crop, shrubs, wood, charcoal, or coal.	1/18
	Sanitation	The household has **unimproved** or **no** sanitation **facility** or it is improved but **shared** with other households.	1/18
	Drinking water	The household's source of **drinking water** is **not safe** or safe drinking water is a **30-minute** or **longer walk** from home, roundtrip.	1/18
	Electricity	The household has **no electricity**.	1/18
	Housing	The household has **inadequate** housing materials in **any** of the three components: **floor**, **roof**, or **walls**.	1/18
	Assets	The household does **not own more than one** of these **assets**: radio, TV, telephone, computer, animal cart, bicycle, motorbike, or refrigerator, and does not own a car or truck.	1/18

Source: Table 1 of Alkire, S., Kanagaratnam, U. and Suppa, N. (2020). 'The Global Multidimensional Poverty Index (MPI) 2020', OPHI MPI Methodological Notes 49, Oxford Poverty and Human Development Initiative, University of Oxford.

The results in row 4 of Table 3 (and Figure GA.2) show the MPI has a strong, non-linear, necessary and sufficient relationship with GDPPC. The R2 is "only" .723, but that is to be expected from excluding the high-income countries and the p-level of the F-statistic for excluding GDPPC is on the order of 10^{-27}. As with income/consumption poverty, as a "deprivation" index the elasticity is higher at lower levels of income and falls faster—reaching essentially zero by Quintile III since by GDPPC of about P$20,000 the MPI has reached its maximum with (nearly) everyone of out multi-dimensional poverty. Growth is clearly sufficient. Again, given that the MPI has such a steep relationship wrt to GDPPC at low levels even at the mean of Quintile I the predicted score is 50--and the highest is 70.8--but nevertheless growth is still necessary to reach high levels of population out of MPI.

II.C) Income/consumption poverty and GDPPC

We use the data on headcount poverty ratios produced by the World Bank's PovCalNet[10] for the P$5.5/day poverty line, as a compromise between the advocates for "low bar" ("extreme") and "high bar" poverty lines (Pritchett 2006, Pritchett and Viarengo 2026), but the empirical results are robust to using any of the commonly used poverty lines.

Table 3, row 5 (and Figure GA.3) show the results. The R2 of poverty on a quartic in GDPPC is .863 which is higher than any of the other basics measures. The elasticity of poverty reduction wrt GDPPC is massively non-linear falling from 1.33 for Quintile I to .11 in Quintile IV[11]. The *best* poverty rate (on the inverted 1 to 100 'out of poverty' scale) is 13.9 at the median of Quintile I and the *worst* poverty rate is 87.8 at the mean of Quintile IV so higher GDPPC is an empirically necessary and sufficient condition for improvements in poverty. This section can be very brief as the empirically very tight connection between cross-national levels (or long-term changes) in poverty and economic growth, including GDP per capita is widely known and accepted (Dollar and Kraay 2002, Adams 2003, Dollar, Kleineberg, Kraay 2016, Pritchett 2020, McKenzie 2020) and well understood analytically (Bergstrom 2022).

III) *Data Undermining*

"Data mining" is a directed search over the many, many, degrees of freedom in any empirical research to find the strongest result for the point the authors are making. Data mining at worst, or just lack of robustness searches at best, is what puts the "con" into econometrics (Leamer 1978, 1983)[12]. Silberzahn et al. 2018 show that, even without any apparent intentional data mining, different groups of researchers presented with the same data and the same question come to substantively different conclusions based on analytic choices in data analysis. Huntington-Klein et al. (2021) show that "hidden researcher decisions" can make a large difference in empirical outcomes, such that the range of estimates from exactly the same data are

[10] PovcalNet: the on-line tool for poverty measurement developed by the Development Research Group of the World Bank.

[11] This empirical result for the pattern of elasticities is kind of baked into the definition of FGT poverty as, once the poverty line is below the mode of the distribution the slope with respect to a distribution neutral shift in f(y) necessarily falls.

[12] This paper has been heavily influenced by Leamer's classic "Taking the con out of econometrics" (Leamer 1983) and his more general work on specification searches (Leamer 1978) and how they invalidate the use of standard statistics.

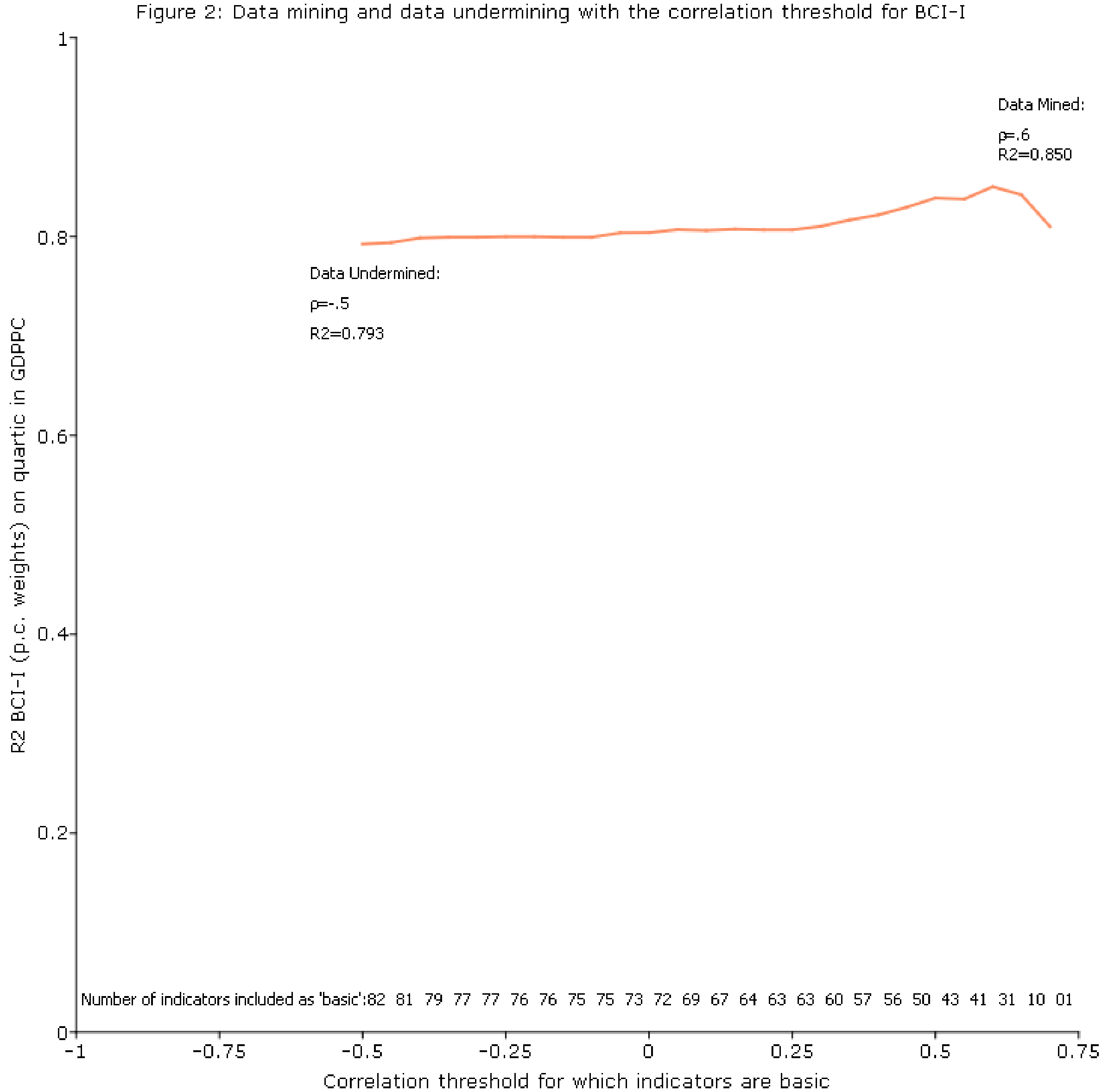
factor multiples (3 to 4 times) larger than reported standard errors for a given method. This is particularly concerning as Jelveh, Kogut, Naidu 2024 show an association between the political ideology of economists and their beliefs about estimated parameters.

The goal of this paper is to deploy data *undermining*--a purposive search across the various ways building a cross-national measure of basics to find a plausible procedure that *fails* to reproduce the same four results about the relationship with GDPPC. This notion of data undermining goes beyond "robustness" analysis which is typically just a check of a few alternatives.

III.A) The correlation threshold in correlational measures of basics

The results of our first simple data undermining exercise are shown in Figure 2. We iterate the construction of BCI-LI($\rho_{median}^{critical}$) over all possible choices of the median correlation threshold which is the only free parameter of the method. Even if one takes at the threshold the smallest possible correlation threshold (-.5) and hence includes all 82 indicators as 'basic' *and* uses equal weights for those indicators--the quartic R2 is still .79, not very much different from the highest possible quartic R2 of .85, when the correlation threshold is .6 and 31 indicators are included. This very smooth graph in Figure across the choice of median threshold illustrates what robustness of results to method choices looks like as the gap between the "data mined" result of the highest R2 and the data undermined result of .79 is small.

Figure 2: Data mining and data undermining with the correlation threshold for BCI-I



Source: Authors' calculations

III.B) Anchored measures of basics

A second data undermining exercise builds a number of "anchored" measures of basics and then reports the results of the worst results of any of the anchored measures.

Across the wide array of domains of human wellbeing--health, education, roads and transport, electricity, nutrition, reproductive health, early childhood development, drinking water, gender, sanitation, indoor air pollution, outdoor air pollution, gender, crime, etc. one cannot expect easy consensus about what is or is not a "basic." The "anchor" approach to a cross-national measure of basics is to start with a single indicator, preferably one that generates substantial consensus as a basic, use that indicator as an "anchor." An N-indicator anchored basics measure adds N-1 other indicators to the anchor by choosing the N-1 indicators most highly correlated with the anchor.

Hence:

(i) Choose any single indicator likely to generate significant agreement as a "basic" of human material wellbeing (e.g. under 5 mortality, access to safe drinking water, primary schooling completion, child malnutrition (stunting), indoor air pollution, headcount poverty rate).
(ii) Compute the correlation of that anchor indicator with all other indicators from a large set,
(iii) Choose the N-1 indicators with the highest correlation with the "anchor" indicator.
(iv) Use principal components to create the weights for an N-indicator anchored basics measure.

The two free choices in this method are the anchor and the total number of indicators. We start with N=10 indicators, which is similar to other existing indicators: the multidimensional poverty index (MPI) examined below has 10 elements, the Social Progress Initiative (SPI) Basic Human Needs index has 16 indicators, the BCI-LI(.65) has 10 indicators.

From the 82 Legatum indicators we build a 10 element basics measure using 15 different indicators as the anchor (Appendix Table R2): stunting, health care coverage, refrigerator ownership, rural roads, clean fuels for cooking, headcount poverty, women's years of schooling, access to piped water, access to electricity, access to sanitation, indoor air quality, attended births, under-5 mortality, primary school completion rate, contraceptive prevalence rate.

Table 3, row 6, shows the median of the regression results across all 15 anchors (Appendix Table R3 shows results for each of the 15 anchors). Not surprisingly the typical anchored measure results are close to the correlational results.

But our primary interest with anchor measures is data undermining. Table 3, row 7, shows the results for the anchor with the *weakest* R2 of any of the 15 anchors, which happens to be the contraceptive prevalence rate. This is not an implausible anchor as many consider the contraceptive prevalence rate to be a basic as it is key to reproductive health and also an important indicator of women's freedom to make important autonomous choices.

Even the *weakest* anchor measure produces all four facts. The quartic R2 was .703 so the association is strong. The elasticity falls from .43 at quintile II to .13 at quintile IV and so the relationship is strongly non-linear. On the 1 to 100 scale the highest at mean of Quintile I is 47.9 and the *lowest* at mean of quintile IV is 68.8 and so GDPPC is empirically necessary and (weakly) sufficient.

Variations over the number of included indicators in an anchored measure shows similar robustness. If the number of indicators is 6 (the anchor and five others) the *smallest* R2 of any of the 15 anchors falls from .703 to .676. Conversely, as the number of included indicators increases the R2 of the weakest anchor increases (and the variance across anchors decreases). This is intuitive as, in the limit, when all 82 indicators are included, the anchor is irrelevant.

III.C) Basics measures with randomly chosen indicators and weights

A third data undermining exercise is the most severe. We start from seven domains of human wellbeing listed in Table 6 that are nearly always included in a proposed of list basics: (i) health, (ii) education, (iii) nutrition, (iv) water and sanitation, (v) housing conditions, (vi) income/consumption headcount poverty and (vii) natural environment. In each of those seven domains we choose from the LPI indicators those that are plausibly "basic" (e.g. within "health" we do not include "obesity" and within "education" we do not include "average quality of higher education").

We create an instance of a "seven domain index of basics" by randomly choosing one indicator from each of the seven domains. For any set of indicators there are two choices for weights. One us just to use average weights. The other chooses the weight for each of the seven indicators as a draw from a random uniform distribution, but in order that the weights be "plausible" for a general measure of basics (and not degenerate to a single indicator) no single indicator can have a weight higher than 3/7 (.428) of the total.

Table 6: Seven domains of basics of human material wellbeing	
Domain (number of LPI indicators in domain)	Eligible indicators of basics from Legatum Prosperity Index
Health (7)	Healthcare coverage, Births attended by skilled health staff, Maternal mortality, Under 5 mortality, 5-14 mortality, 15-60 mortality, Life expectancy at 60
Education (10)	Pre-primary enrolment (net), Primary enrolment, Primary completion, Secondary school enrolment, Lower-secondary completion, Access to quality education, Adult literacy, Education level of adult population, Women's average years in school, Education inequality
Nutrition (4)	Availability of adequate food, Prevalence of undernourishment, Prevalence of wasting in children under-5. Prevalence of stunting in children under-5
Water and Sanitation (4)	Access to basic water services, Access to piped water, Access to basic sanitation services, Unsafe water, sanitation or hygiene
Housing (4)	Availability of adequate shelter, Housing deprivation, Access to clean fuels and technologies for cooking, Indoor air quality
Poverty (3)	Headcount poverty rate at extreme, low, and medium poverty lines (P$1.9/day, P$3.2/day, P$5.5/day).
Natural Environment (4)	Exposure to particulate matter, Health impact of air pollution, SO_2 emissions, NO_x emissions.

Our data undermining exercise asks first: “Across 100,000 iterations of choosing one indicator each from the seven domains and building an equal weights index of the basics, how bad could it be?”

Table 3, row 8 shows the answer is: “not so bad.” The R2 is .625. The elasticities in quintiles I, II and III are still substantial (.165, .290, .262) and non-linear (the elasticity falls to only .019 for Quintile IV), and the predicted value of basics rises from 50.1 to 91.3 between quintile I and quintile IV.

Our even more flexible data undermining exercise asks: “Across 100,000 iterations of both random indicators and also random weights for those indicators across, how bad can it be?”

Row 9 of Table 3 shows the worst case. The R2 to only .327. This still rejects zero association with GDPPC at astronomically small p-levels, on the order of 10^{-13}. The elasticities are still non-linear, but small (rising to .15, declining to .05) and countries are predicted to gain from 45.7 to 62.9.

This is a true “torture test” of robustness. In our view the weights that produce this measure of basics are wildly implausible. While the indicators included are plausible, the weights are not. Almost three quarters of the weight in the measure goes to “wasting” (.394) and “exposure to particulate emissions” (.353). But to adopt these weights one would have to believe that exposure to particulate matter was 40 times more important to an index of basics than overall adult mortality (.353/.009), 29 times more important than extreme poverty (.353/.012) and 7.5 times more important than adult education levels (.353/.047). We believe that nearly everyone would agree that putting over a third of the weight in a seven-domain measure of basics on just exposure to particulate matter is implausible (and no one in practice has ever proposed anything like this). But this is the point of the exercise is to show just how implausible one has to be—and that even putting nearly all the weight of a general basics measure on the two of the 36 possible indicators of basics that have a weak relationship with GDPPC still generates a quite strong relationship.

IV) Implications, clarifications and caveats

The economic intuition behind these results is simple but powerful as, to a very large extent, this is just the application in aggregate country data to the microeconomics of budget expansion paths, in two ways. One, that budget shares are non-linear has been demonstrated for "necessities" like food since the 19th century (Engel 1857) and, while there might be debate about the exact actual functional form, all empirically estimated consumer demand systems show shifting budget shares Deaton and Muellbauer 1980, Banks, Blundell, Lewbel 1997)[13]. So the strong non-linearity of our results is less of a new finding but rather just confirmation we have correctly measured basics.

Two, to imagine that there would not be a strong connection between basics and income one has to imagine that there are goods in the world that people value very highly and which are almost certainly price inelastic and yet we don't observe countries with higher levels of consumption (starting from very low levels especially) achieving higher levels of consumption of these goods. There are ways that could happen. One is if the good is a pure public good and private incomes cannot increase consumption *and* greater resources in the hands of the government from higher GDPPC and tax buoyancy don't lead to greater provision. There are indicators of wellbeing uncorrelated with GDPPC, like crime (e.g. Pritchett 2022), but not enough to construct a general measure of basics exclusively with indicators of that type.

The second way in which important goods could be uncorrelated with GDPPC is if the central tendency measures did not reflect the shift in the distribution of income. With non-linearity the distribution must matter. But the relative importance of growth versus distribution is an empirical question, not a logical or theoretical necessity, and our empirics just bracketed the question of distribution to examine in detail just growth. The country of Equatorial Guinea (GNQ) is a huge outlier in Figure 1 with high GDPPC and low levels of basics. This country illustrates that it is *possible* to have high GDPPC and low wellbeing, but really just makes the obvious point that if a country achieves high levels of GDPPC through producing oil with a kleptocratic government that hoards all the gains for a very narrow few then "growth alone" will not lead to high levels of basics.

Our demonstration that differences in GDPPC account for nearly all of the variation of basics reflects the empirical reality that differences in GDPPC across countries are just enormous relative to cross-national differences in within country distributions of income. It is an empirical fact that differences in growth rates across countries are large whereas measures of inequality tend to be quite stable across countries and hence even though differences in growth incidence,

[13] While economists may at times assume homotheticity for convenience, no one asserts it as an empirical fact.

the inclusiveness of growth can strongly affect outcomes, empirically they mostly do not. This is what Dollar and Kraay (2002, 2016) find for incomes of the poor, what Bergstrom (2022) finds for the evolution of poverty, this is what Dollar et al. (2015) find for distributionally sensitive measures of money metric wellbeing (e.g. Atkinson, Sen indices), and this is what we find for a wide variety of measures of non-money metric measures of the basics of wellbeing.

In fact, the strong non-linearity in the relationship in our estimates implies that growth incidence does affect the degree to which any given rate of growth of average income leads to improvements in basics. However, with non-linear relationships one has to do the arithmetic to see how much, and under what conditions, growth incidence matters.

Suppose we make the heroic assumption, not as an assertion, but merely to be illustrative, that the responsiveness of basics is the same within countries as across countries and hence the regressions in Table 3 provide a guide to the implications of within country growth incidence.

Figure 3 shows the calculated elasticities of basics wrt to GDPPC using the average of the coefficients across four measures of basics in Table 3 (the two Legatum correlational measures (rows 1 and 2), the SPI Basic Human Needs (row 3), and the median of the anchor measures (row 6)). Figure 3 also shows the average consumption (private plus government) in 2017 PPP$ from the PWT10.1 for the 10th and the 90th percentile for Ethiopia, Pakistan, Brazil, and Denmark, four countries chosen to represent an array of country conditions.

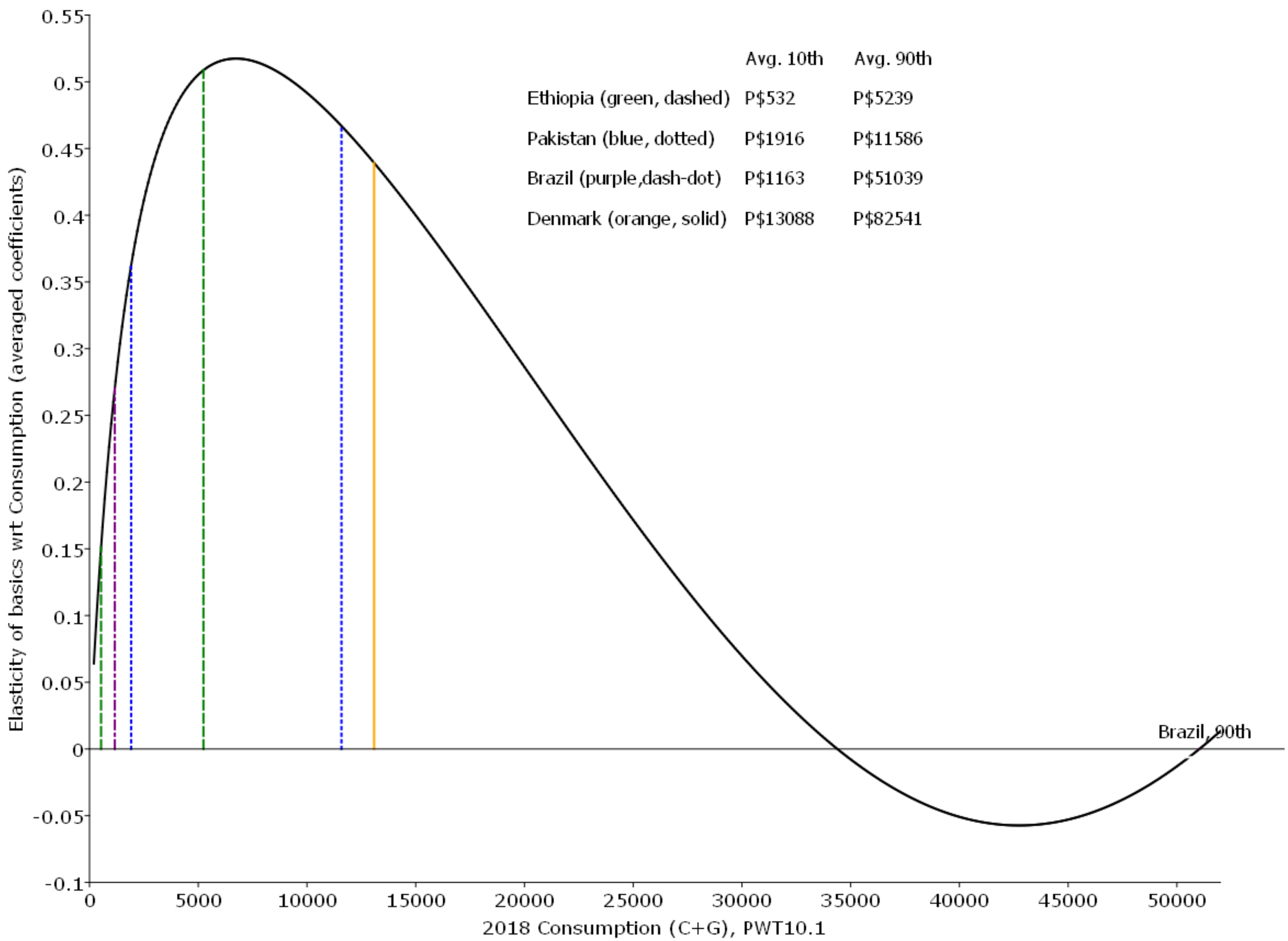
As the elasticity is different for each income decile in each country the pattern of growth determines the aggregate elasticity. We extend a standard approach to growth incidence curves to the case of basics (Ravallion and Chen 2003). With uniform growth the elasticity is just the elasticity at the mean. When growth is pro-poor this has two effects, the elasticity for the deciles is different but also in order to achieve 2 percent aggregate growth the rate of growth for the poorer deciles has to be higher as their share in aggregate growth is smaller, whereas for pro-rich growth the growth of the upper deciles does not need to be as high above 2 percent as they have a higher share of consumption and hence larger weight in the aggregate. For instance, in the pro-poor growth incidence scenario for Ethiopia the percent growth of the 10th decile is 6.4 percent whereas in the pro-rich growth incidence the growth of the 90th percentile is only 2.3 percent.

Table 7 shows the results of uniform, pro-poor or pro-rich growth on the elasticity of basics to growth. In Ethiopia is a very poor country and hence all deciles are in the range where the elasticity is rising so all of the patterns of growth produce almost exactly the same elasticity: .46 (uniform), .499 (pro-poor), .451 (pro-rich). Pakistan is a lower-middle income country with relatively equal distribution in the World Bank reported distributional data (the Gini is .29) and hence the 90th and 10th percentile of consumption are not absolutely far apart (P$1,916 to P$11,586). Again, the pro-poor growth elasticity is higher than pro-rich, but not by that much (.671 vs .544). Brazil is an upper-middle income country with very high inequality (Gini of .54, one of the highest in the world) such that the 10th decile in Brazil has consumption levels lower than those in Pakistan, P$1,163 whereas the 90th percentile has incomes higher than the 80th percentile in Denmark. This makes the elasticity of basics to pro-poor growth massively higher than uniform growth, .953 versus .351. Brazil, as a very high inequality countries, hence illustrates the conditions in which pro-poor growth will have much higher impact on measures of basics than uniform or pro-rich growth[14].

The most striking feature of Table 7 and Figure 3 is that the impact of growth on basics is much more a feature of where it happens than how pro-poor it is. The elasticity of basics to uniform growth in Denmark is only .10—because even the 30th percentile in Denmark is predicted to have very high levels of basics (90 of a maximum of 100). And pro-rich growth in Denmark has almost exactly zero impact on basics. But the same rate of growth in poorer countries, even if that growth is pro-rich, and even in an unequal, upper middle-income country, has three times the elasticity on basics as uniform growth in Denmark (all above .3 versus .10). So, yes, pro-poor growth would have more beneficial effects on basics of wellbeing than pro-rich growth. But it is odd that development economists would play down the essential role of rapid, sustained, economic growth for improving human wellbeing in favor of targeted programs and redistribution (more inclusive growth). Without high GDPPC redistribution can never be "empirically sufficient" for achieving basics. Even "the rich" (90th percentile) in Pakistan have lower predicted basics than "the poor" in Denmark and, even if "the poor" in Ethiopia got to the level of "the rich" in Ethiopia, their basics would still be half that of the middle class in Denmark.

[14] The elasticity for pro-poor growth is so high because the growth in the lower deciles has to be very high as the high inequality implies these deciles get so little share in the weighted average the downward sloping growth incidence curve has to be shifted up substantially for aggregate growth to be 2 percent. The first decile pro-poor growth is 9.5 percent.

Figure 3: The elasticity of basics wrt to GDPPC first rises, then falls with GDPPC



Source: Authors' calculations with regression results in Table 3, average coefficients of the two correlational measures, SPI Basic Human Needs and the median of the 15 anchor measures.

Table 7: Simulating growth incidence (equal, pro-poor, pro-rich) illustrates that the impact of the responsiveness of basics to growth depends on the country's level of income and its inequality

Decile	Ethiopia			Pakistan			Brazil			Denmark		
	Consumption (private and government) per person	Predicted basics	Elasticity	Consumption (private and government) per person	Predicted basics	Elasticity	Consumption (private and government) per person	Predicted basics	Elasticity	Consumption (private and government) per person	Predicted basics	Elasticity
1	$532	22.0	0.151	$1,916	30.3	0.363	$1,163	25.9	0.270	$13,088	74.9	0.439
2	$820	23.8	0.212	$2,446	33.3	0.407	$2,588	34.1	0.417	$19,481	86.9	0.298
3	$1,026	25.0	0.248	$2,807	35.3	0.431	$3,735	40.1	0.474	$22,865	90.6	0.220
4	$1,200	26.1	0.276	$3,157	37.1	0.450	$4,987	46.3	0.505	$25,541	92.5	0.160
5	$1,404	27.3	0.304	$3,521	39.0	0.466	$6,376	52.5	0.517	$28,775	93.9	0.093
6	$1,604	28.5	0.329	$3,940	41.2	0.481	$8,067	59.2	0.512	$32,146	94.6	0.033
7	$1,801	29.6	0.351	$4,456	43.7	0.495	$10,082	66.3	0.491	$35,829	94.7	-0.018
8	$2,102	31.4	0.380	$5,167	47.1	0.508	$13,088	74.9	0.439	$41,259	94.1	-0.055
9	$2,677	34.6	0.423	$6,380	52.5	0.517	$19,045	86.3	0.309	$49,705	93.3	-0.016
10	$5,239	47.4	0.509	$11,586	70.8	0.467	$51,039	93.3	0.000	$82,541	102.2	0.000
Average	$1,840	29.6	0.318	$4,537	43.0	0.458	$12,017	57.9	0.393	$35,123	91.8	0.115
Simulated growth												
Uniform growth			0.460			0.572			0.425			0.123
Pro-poor growth			0.499			0.671			0.953			0.322
Pro-rich growth			0.451			0.544			0.351			0.039

Source: Authors' calculations.

Notes: Uniform growth (flat growth incidence) is 2 percent growth in each decile. Pro-poor growth incidence uses the formula that the raw growth in the i^{th} *decile is:* $rg^i=(.02+2*(5-i)*(.02)/10)$*, then adjusted so that the share weighted growth rate is equal to 2 percent so final growth rate for the ith decile is:* $fg^i=rg^i*(.02/\sum_{i=1}^{10} rg^i * s^i)$*. Pro-rich growth is the same formula, just with a minus sign in the formula for* rg^i*.*

Second, a clarification. We make no naïve generalizations about the "policy" implications of these results, in two important regards. One, we are not arguing against targeted programs or redistribution as being potentially beneficial. At any given level of GDPPC there may existing actions (projects, programs, policies) that pass a benefit cost threshold and improve wellbeing and finding, evaluating, and implementing those actions is an important endeavor. But, at the same time, one should not confuse "cost effective" with "effective and sufficient at achieving a goal." Programmatic actions alone in low- income settings can provide cost-effective mitigation of some of the worst consequences of a lack of a productive economy, and that is lovely, but they cannot be sufficient to reach universally decent standards of living as programs/projects are limited by resource and budget constraints, whereas sustained growth is sufficient. Two, just because GDPPC and basics have a strong empirical association does not mean that any action (policy, investment) that raises GDPPC is welfare beneficial, much less "optimal" (again, Equatorial Guinea as a case in point). But the results do suggest that the upside of economics devoted to finding and implementing actions that produce sustained economic growth in developing countries are very large.

Third, a technical caveat. The title of the paper is about "growth" whereas we have used only regressions of levels on levels. As a country's level of GDPPC is just their cumulative growth the only way to a higher level of GDPPC is growth this is partly just semantic. The technical question is whether the cross-national pattern represents a stable relationship best estimated with levels or whether one should estimate the relationship using changes over time. There are three advantages of using levels. One, a fundamental feature of OLS is that precision depends on variation. Most of the variation in GDPPC is across nations and, as growth rates have been roughly two percent on average with a standard deviation of roughly two percent, over any given period (five years, ten years, twenty years) growth only moves countries only modestly relative to the cross-national distribution. Therefore, any method that relies on just short to medium run growth will necessarily produce much less precise results[15]. Two, only with linearity (which could be linear in logs) do first differences represent the same relationship. As we are interested a relationship we believe ex ante to be non-linear on theoretical grounds and have no reason to impose a specific shape on that non-linearity using levels allows for greater flexibility. Three, using short-period changes on changes requires modeling explicitly the adjustment dynamics in order to recover the long-run associations. The coefficient on a five year or ten year changes on changes regression is, in of itself, irrelevant to the question of the long-run equilibrium relationship without having explicitly modeled the adjustment dynamics to recover long-run estimates. In work on child mortality (Pritchett and Viarengo 2010) we have found that very long-period differences (50 or 100 years), which allow for adjustment to equilibrium, reproduce the cross-national estimates nearly exactly[16].

[15] This can lead to confusion. One could estimate a relationship in levels on levels and then estimate the same relationship in ten-year log first differences. One could easily generate an absolutely larger coefficient but an also much (potentially much, much) larger standard error as the variance of the right hand side is so much smaller. This can generate lower t-statistics and lead one to conclude, completely mistakenly, that the evidence for the benefits of growth was "weaker" in time series than in levels. The correct conclusion would be that the evidence was of a larger magnitude but less precision, which was a consequence of discarding variation. Easterly (1999), for instance, in our view falls into this confusion.

[16] While our focus is mainly on recent data from developing countries, there are similar studies of historical data making the connection between multi-dimensional physical measures of living standards and economic growth (e.g. Gallardo-Albarran and de Jong 2020 on England 1750-1850 and Prados de la Escosura (2021) globally since 1870).

A final caveat is that we make no effort to address the question of causation empirically, with three justifications. One, we have a widely accepted theory of consumer demand that suggests causation runs from additional resources to consumption of goods and services that raise wellbeing. Two, while there might be feedback loops from some of the indicators, like education, to higher GDPPC, the question of the bias induced by such feedback loops is an empirical question and we need not deny any feedback loops to not find it persuasive these results are driven in any large part by these loops as many of the indicators are pure consumption items that are not growth determinants. Three, one of us has tried in the past to resolve the question of causality of one basic, child mortality, by using instruments for GDPPC (Pritchett and Summers 1996). While some found this empirical work persuasive, there are large sacrifices needed (e.g. moving to shorter periods with the consequent loss in precision) and many economists are just deeply convinced that resolving causation with instruments is impossible—and they might be right--and hence the game of attempting to address causality empirically is just not worth the candle.

Conclusion

Back to Robert Lucas. For poor countries he was exactly right. The welfare consequences of increased GDPPC on the basics of material wellbeing, assessed with either non-money metric measures or poverty measures, are indeed so large it makes it "hard to think about anything else." Ghana and South Korea had similar GDPPC in 1960. South Korea's rapid growth produced GDPPC of P$41,000 and Korea's basics are near the maximum possible (BCI-LI is 99.7). Ghana, while it does relatively well conditional on GDPPC of only P$5,300, has a basics index of 46--more than 50 points behind Korea.

This paper establishes an important fact. We establish not just the easy and obvious fact that "there exists" a measure of basics that is strongly correlated with GDPPC. Rather, we establish the much stronger claim that *all* general, plausible, measures of the basics of wellbeing based on linear combinations of individual indicators of wellbeing have a strong non-linear relationship with GDPPC. Moreover, the relationship is strong enough that economic growth is sufficient to achieve high levels of basics—all countries with high GDPPC achieve high levels of basics. And the relationship is empirically necessary and only high enough levels of GDPPC produce high levels of basics.

A main risk for a paper like this is that it will be dismissed as a "straw man" and that accounts for the polemic introduction that cites specific, prominent, development economists making claims that are demonstrably false. If it is a "straw man" to argue that development practice and development economics has wandered away from a focus on growth then we live in Oz as this straw man is singing and dancing.

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Appendix Table R1: Summary of regression results for Basics Correlational Indexes (Elements and Indicators), Social Progress Initiative Basic Human Needs, World Bank out of headcount poverty (P$5.5/day), Multidimensional Poverty Index (OPHI)

		Basics Correlation Index-Legatum Elements (.6)	Basics Index-Legatum Indicators (.65)	Basic Human Needs (SPI)	Out of income poverty, P$5.5	Multidimensional poverty index
Constant	Est.	21.79	11.57	26.08	4.4	18.7
	Std. err.	2.34	2.38	2.23	4.58	5.47
GDPPC	Est.	5.090	6.773	6.276	8.67	18.24
	Std. err.	0.430	0.438	0.474	0.704	2.573
GDPPC^2	Est.	-0.138	-0.195	-0.219	-0.281	-1.523
	Std. err.	0.020	0.020	0.027	0.040	0.330
GDPPC^3	Est.	0.00162	0.00231	0.00321	0.00379	0.05313
	Std. err.	0.00032	0.00033	0.00052	0.00079	0.01530
GDPPC^4	Est.	-6.65E-06	-9.44E-06	-1.62E-05	-1.80E-05	-6.45E-04
	Std. err.	1.60E-06	1.63E-06	3.16E-06	4.86E-06	2.27E-04
Number of countries		167	167	153	143	100
R-Squared		0.811	0.850	0.833	0.865	0.725
F-test of YPC and powers		173.9	229.6	184.1	206.0	62.7
p-level of F-test		2.95E-58	1.57E-66	3.37E-57	4.73E-58	2.70E-26

Appendix Table R2: Summary of results for all "anchored" basic indexes										
Measure of country basics of material wellbeing	N	R2 of quartic (sorted)	Non-linear: Elasticity of index wrt GDPPC at				Empirically necessary		Empirically sufficient	
			μ_{QI}	μ_{QII}	μ_{QIII}	μ_{QIV}	Pred at μ_{QI}	Max at μ_{QI}	Pred at μ_{QIV}	Minimum at μ_{QIV}
Anchored Basics Indexes (anchor plus 9 most highly correlated other indicators, PC weights)										
Nutrition, stunting (LCNUTPST)	167	0.862	0.827	0.768	0.574	0.158	17.1	27.8	94.8	81.0
Health care coverage (HLHCSHCV)	167	0.859	0.675	0.704	0.540	0.139	20.6	32.5	96.4	77.9
Own refrigerator (LCMRERFG)	167	0.851	0.624	0.675	0.516	0.107	23.1	28.5	99.4	86.1
Rural roads (LCCTDRAR)	167	0.849	0.473	0.597	0.492	0.149	25.7	33.3	93.5	79.6
Clear fuels for cooking (LCSHRCFC)	167	0.840	0.661	0.690	0.517	0.090	22.6	24.7	100.1	85.8
Headcount poverty, P$5.5/day (LCMREPRM)	167	0.838	0.689	0.707	0.534	0.120	20.8	30.7	97.1	80.3
Women's years of schooling (EDASKWYR)	167	0.831	0.549	0.641	0.511	0.141	23.4	31.0	94.0	79.0
Access to piped water (LCBSCABW)	167	0.821	0.424	0.550	0.437	0.056	32.2	36.1	101.6	87.6
Access to electricity (LCBSCELA)	167	0.815	0.468	0.579	0.452	0.054	30.2	33.2	101.5	86.7
Access to Sanitation (LCBSCABS)	167	0.815	0.468	0.579	0.452	0.054	30.2	33.2	101.5	86.7
Indoor Air Quality (LCSHRIAQ)	167	0.801	0.399	0.529	0.422	0.042	34.2	38.9	102.6	90.2
Births attended by Skilled health Staff (HLHCSBRA)	167	0.765	0.265	0.413	0.359	0.058	42.5	57.6	100.4	90.5
Under-5 mortality (HLLEXUFM)	167	0.758	0.280	0.425	0.357	0.030	42.6	53.4	101.8	89.4
Primary Completion Rate (EDPRIPRC)	167	0.756	0.295	0.440	0.367	0.033	40.5	49.6	100.1	85.9
Contraceptive Prevalence (HLHPICPV)	167	0.703	0.272	0.429	0.388	0.126	35.1	47.9	88.1	68.8
Median	167	0.821	0.468	0.579	0.452	0.090	30.2	33.2	100.1	85.9
Source: Authors' calculations.										

Figure GA.1: Basic Human Needs (from Social Progress Imperative) and GDP per capita

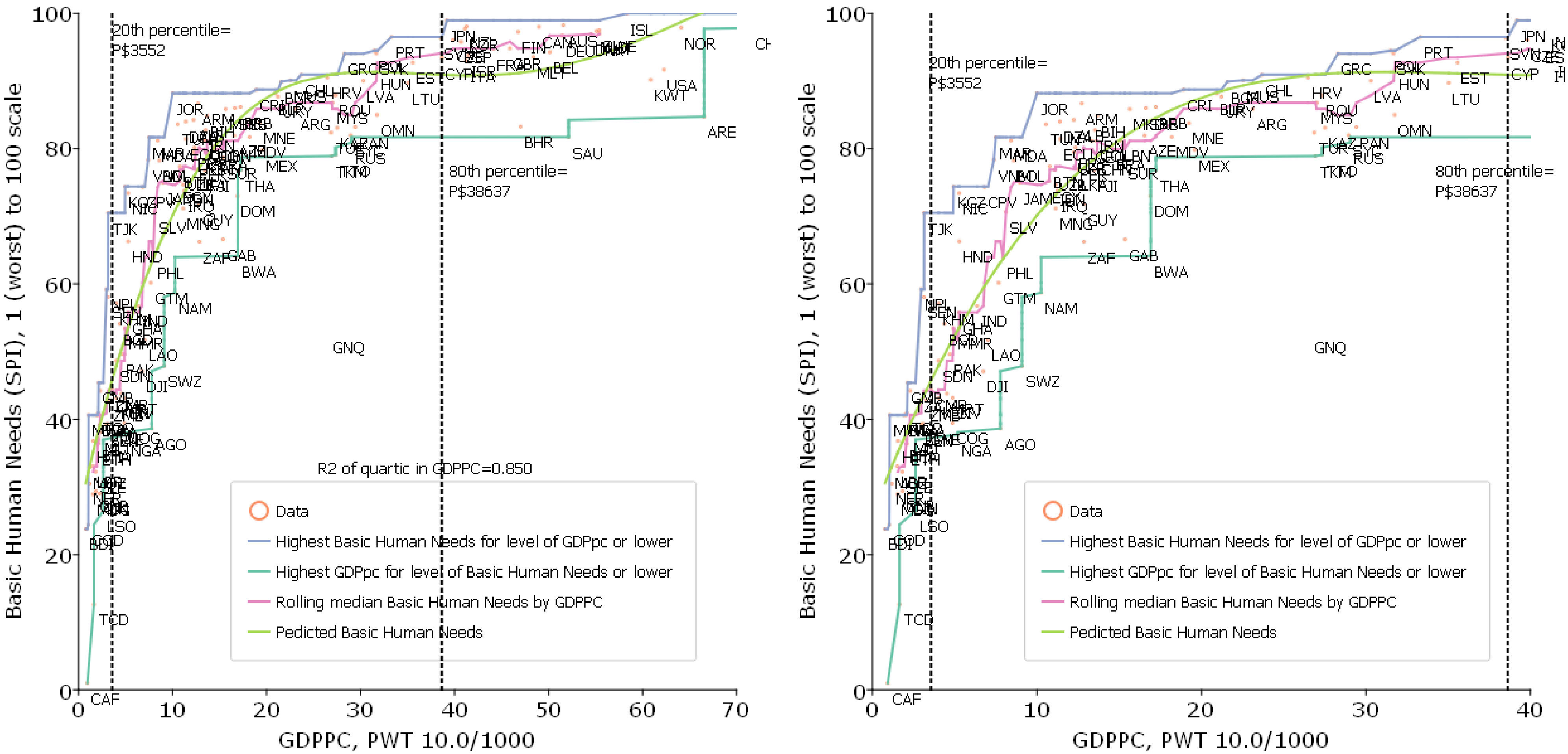


Figure GA.2: (Out of) Multidimensional Poverty Index (headcount and intensity), rescaled to 1 (worst) to 100 (best) scale and GDP per capita

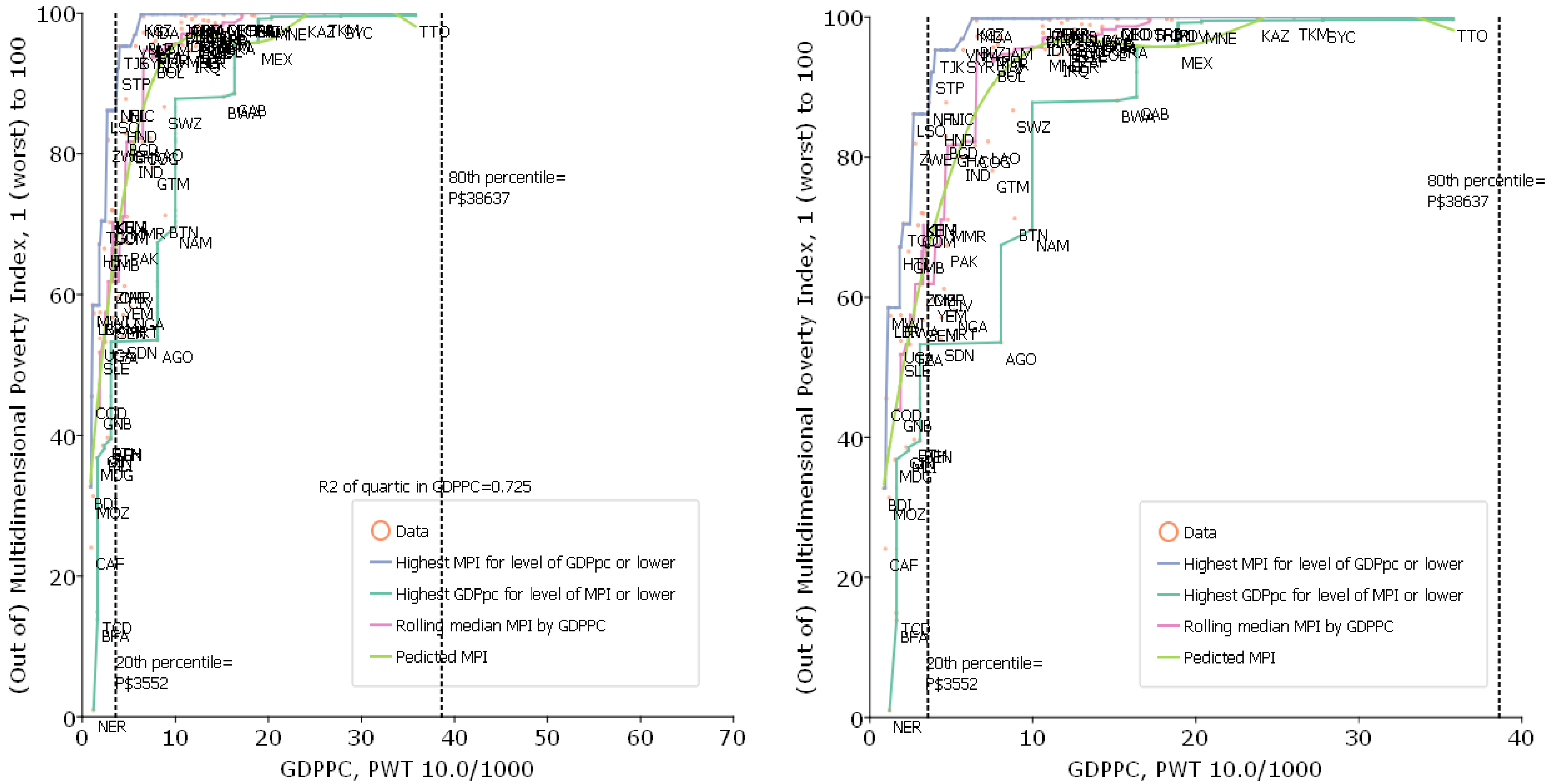
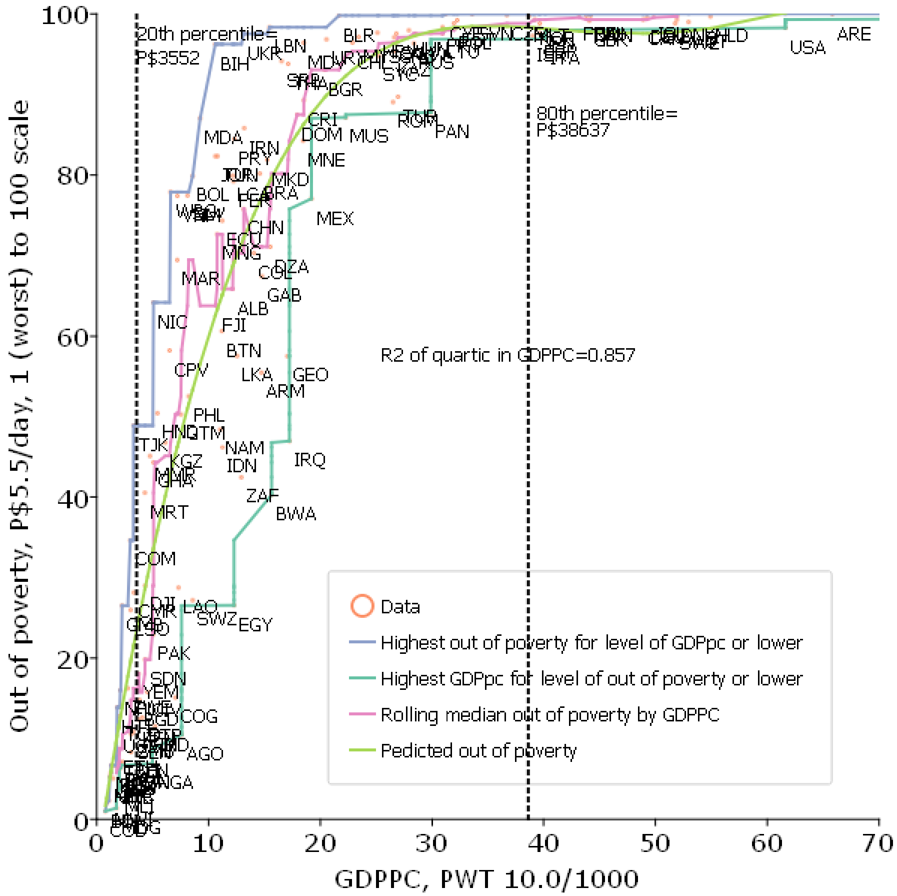


Figure GA.3: Population out of income/consumption poverty and GDP per capita

Panel A: All countries with GDPPC<P$70,000



Panel B: Countries with GDPPC<P$40,000