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WHAT'S HAPPENING TO THE WORLD INCOME DISTRIBUTION?

THE ELEPHANT CHART REVISITED

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B | Global Economy and Development at BROOKINGS

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INTRODUCTION

In 2013, Christoph Lakner and Branko Milanovic published a graph—quickly dubbed the "elephant chart"—that depicts changes in income distribution across the world between 1988 and 2008. The chart has been used to support numerous reports of rising inequality fueled by increased globalization.[1] Every time a populist movement rises, every time the elite gather in Davos, every time Oxfam publishes a new report on inequality, the elephant chart resurfaces.

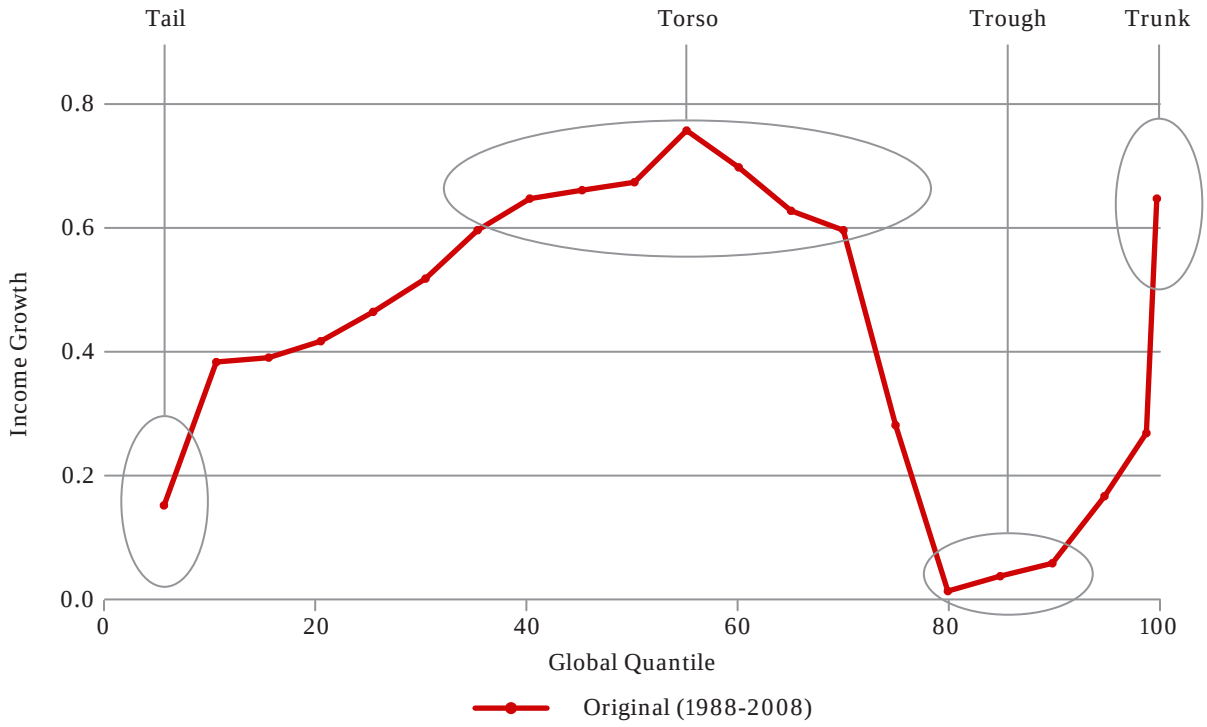
The original elephant chart, reproduced in Figure 1, records the income growth of each ventile of the global income distribution over the course of 20 years. It has been used as evidence to support four stylized facts about who has benefited from globalization:

- The global elite, in particular the top 1 percent, have enjoyed massive income growth over the past decades. Their high income growth, coupled with a high initial share of income, implies they continue to capture a large share of global income growth. This can be seen in the elephant's raised trunk.
- The global upper middle class has seen its income stagnate with zero growth over two decades for the 80th percentile. This appears to corroborate data showing stagnant real wage growth and other frustrations fueling populist politics in rich countries. This can be seen in the depth of the trough at the base of the elephant's trunk.
- The global middle class has risen rapidly as select developing countries have begun to converge toward rich countries. Countries like China have lifted large impoverished populations into the middle class. This can be seen in the graph's peak at the elephant's torso.
- The global extreme poor have largely been left behind, with several countries stuck in a cycle of poverty and violence. This can be seen in the elephant's slumped tail.

This paper examines how these four parts of the elephant chart—tail, torso, trough, and trunk—hold up to new data and new methods. We caution that while elements of the original story have certainly been confirmed by other data in other contexts, the elephant

[1] For example, O'Brien 2016, Kawa 2016, Thompson 2014, or Solman 2017.

Figure 1. Original Elephant Chart



shape itself may be an overburdened and inaccurate depiction of what is really going on in the world economy.

We return to the original chart and, step by step, make modest adjustments and updates to the data and methodology. We use the most recent update of global price comparisons (the 2011 purchasing power parity data, rather than the 2005 PPP series). We add surveys for countries that did not have data available when the original chart was published. We also extend the period to 2013, thereby including post-recession years. We further add data from countries with only a single household survey, making distributionally neutral assumptions about their growth incidence. This permits the broadest possible country coverage—our analysis is truly global in that it covers 97.5 percent of the world's population, compared to around 80 percent coverage in Lakner-Milanovic version.

Methodologically, we also compare the Lakner-Milanovic approach with an alternative method that better approximates the way the elephant chart has been (mistakenly) understood. This method, called a quasi-non-anonymous growth incidence curve, holds the country composition of each global decile constant across time and therefore shows the fate of specific economic classes in specific countries over time.

In doing so, we find that the primary narrative is one of convergence: Poorer countries, and the lower income groups within those countries, have grown most rapidly in the past 20 years. The data do not support the idea that the poorest people are being left behind, nor that the richest are taking all the income gains.

This is consistent with other findings. According to the World Bank, inequality between countries is fall-

ing, and inequality within countries is falling in many places as well.[2] The World Bank also finds that there is little difference in growth rates among the lowest 95 percent of the global population.[3]

One caveat: our analysis is based on household survey data only. Household surveys are notoriously weak in coverage of the top and bottom of the distribution and the representativeness of the sample gets worse at each tail. For this reason, we use grouped data that records the mean income of each decile or percentile of each country's distribution, and even for the world, we do not try to make finer distinctions beyond the top 1 percent—but recall that around 1990, 1 percent of the world is still over 50 million people. For many discussions, this is too crude a breakdown; for example, it does not distinguish between millionaires (about 16 million globally[4]) and the rest. To address this data shortfall, the World Inequality and Wealth Database (WID) spearheaded by Tony Atkinson, Thomas Piketty, Emmanuel Saez, and others has developed alternatives using tax administration data. These give a far different picture of what is happening at the very top, which we examine as well. While these efforts have brought a welcome empiricism to conversations about top incomes, the estimates remain controversial.[5]

As we unpack the elephant, it becomes clear that the distributional gains from the past 30 years of growth and globalization are far from settled fact.

[2] World Bank 2016.
[3] Lange et. al. 2018.
[4] Capgemini 2017.
[5] See for example Aiyar 2017 or Auten and Splinter 2018.

REVISITING THE ORIGINAL ELEPHANT CHART

Before modifying the elephant chart, it is worth summarizing in brief the original methodology.[6] The distributional data used in the original elephant chart comes from national household income and expenditure surveys. The surveys tell us the mean income/expenditure for households in each decile of each country's distribution. In an effort to maximize country coverage, the chart combines a range of surveys that are not directly comparable. Most importantly, consumption surveys are used when available but income surveys are used in much of Latin America, in developed economies, and elsewhere. Furthermore, while survey data may be the best tool for measuring the middle of the income distribution, especially in developing countries, the surveys often fail to capture the incomes of top earners or the consumption of self-produced goods at the bottom end of the scale.[7] (For a discussion of further issues with survey data, see Appendix B.)

Because not all countries conduct surveys in every year, the survey closest to the line-up year within a five-year period was selected. For example, surveys from the five-year period from 1986 to 1990 were considered for the 1988 period. Surveys were also selected so that all surveys for each country are of the same type (income or consumption).

Incomes or expenditures for each country were recorded in constant 2005 purchasing power parity (PPP) dollars, which corrects for price differences in different countries and inflation, thereby allowing a direct comparison across countries and over time.

Using this data, people across the world were ordered by their income levels, with each person taking on the average income of the decile in which they fell in their own country, and then placed into global ventiles (5 percent of the world's population). The weighted average income of each global ventile was then computed, first for 1988 and then for 2008. The growth of incomes for each ventile from 1988 to 2008 was then calculated.

Importantly, this methodology means that each ventile may be comprised of very different country deciles in the initial period and in the final period. For example, the poorest Chinese, Indians and other Asians made up much of the bottom ventile of the 1988 global distribution. But in the 2008 global distribution, the bottom ventile of the global distribution consists mostly of Indians, Nigerians and other Africans. This means that, when calculating the income growth of the bottom global ventile from 1988 to 2008, the elephant graph compares the income of Asians in 1988 to that of Africans in 2008.[8] For this reason, Lakner and Milanovic call the original elephant graph an *anonymous* growth incidence curve; it did not try to compute the income growth of actual people or groups of people.

That anonymity has proved important. Much of the debate around the elephant chart centers around the question of who is in which ventile of the global income distribution— despite the fact that Lakner and Milanovic helpfully made their data available online years ago. In Appendix A, we provide a summary of which country deciles fall in which global ventile for reference. It is apparent that the composition of ventiles changes markedly over time.

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[6] For a full description, see Lakner and Milanovic 2016.

[7] Korinek et. al. 2005, Szekely and Hilgert 2007, Sabelhaus et. al. 2012, Deaton 2005.

[8] This is somewhat simplified description; Table A1 in the appendix shows the full composition of the bottom ventile in 1988 and 2008 in the original elephant chart.

ADJUSTING THE ELEPHANT

With this in mind, we proceed to examine how changes in data and methodology impact the shape of the original graph.

Consistent Sample

We first modify the elephant chart by using a consistent sample of countries that have data in both 1988 and 2008. This modification, first suggested by Corlett (2016), raises both the tail and the trough of the original elephant. The original elephant curve includes data for 72 countries in 1988 and 118 countries in 2008. Of these, just 60 countries have data in both periods. An elephant chart for these countries, which capture 77 percent of the global population in 2008, is shown in Figure 2 below.

This shows that the droop of the elephant's tail is less extreme than in the original chart. As might be expected, more poor countries have data available in 2008, including very poor countries like the Democratic Republic of Congo, Kenya, Central African Republic, Madagascar, and Mozambique. These countries did not have data available in 1988.

Our use of a consistent sample shows that the salient characteristics of the elephant chart remain generally unaffected. We caution, however, that the sample of countries with data in both 1988 and 2008 is certainly not representative of the global distribution—countries

Figure 2. Growth Incidence Curve with Consistent Sample

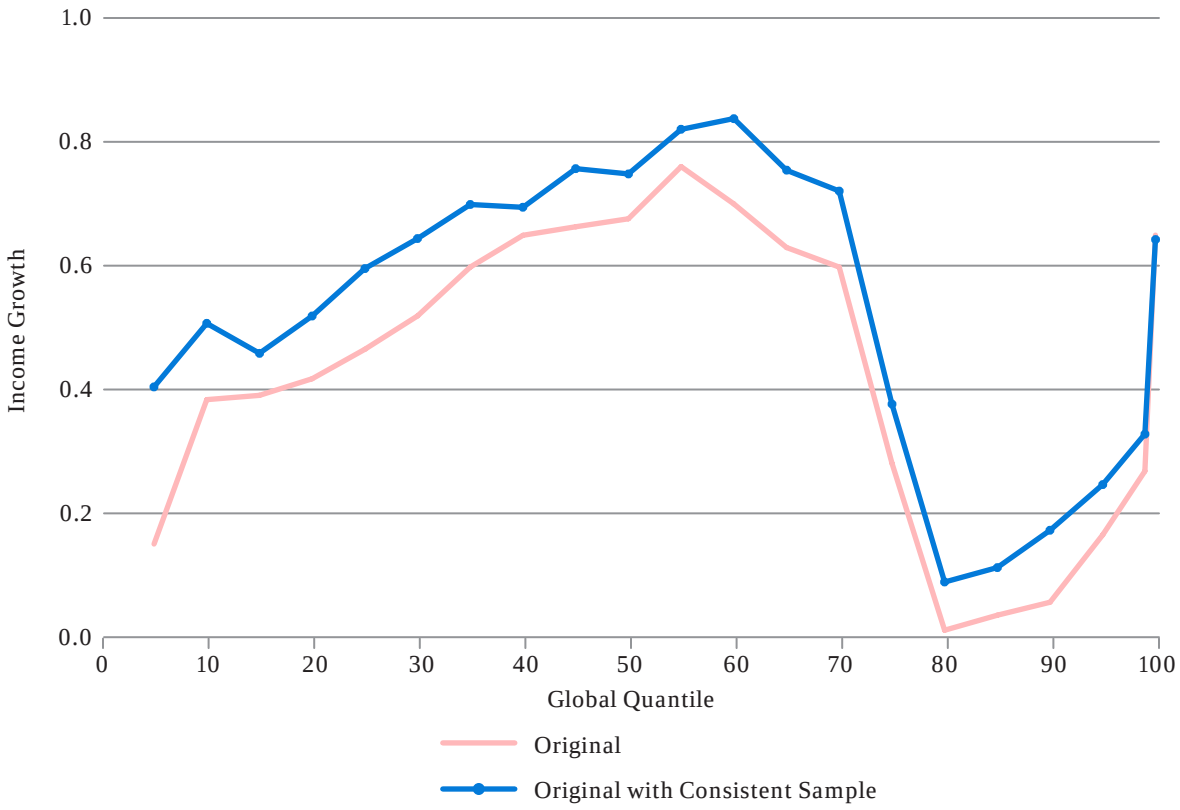
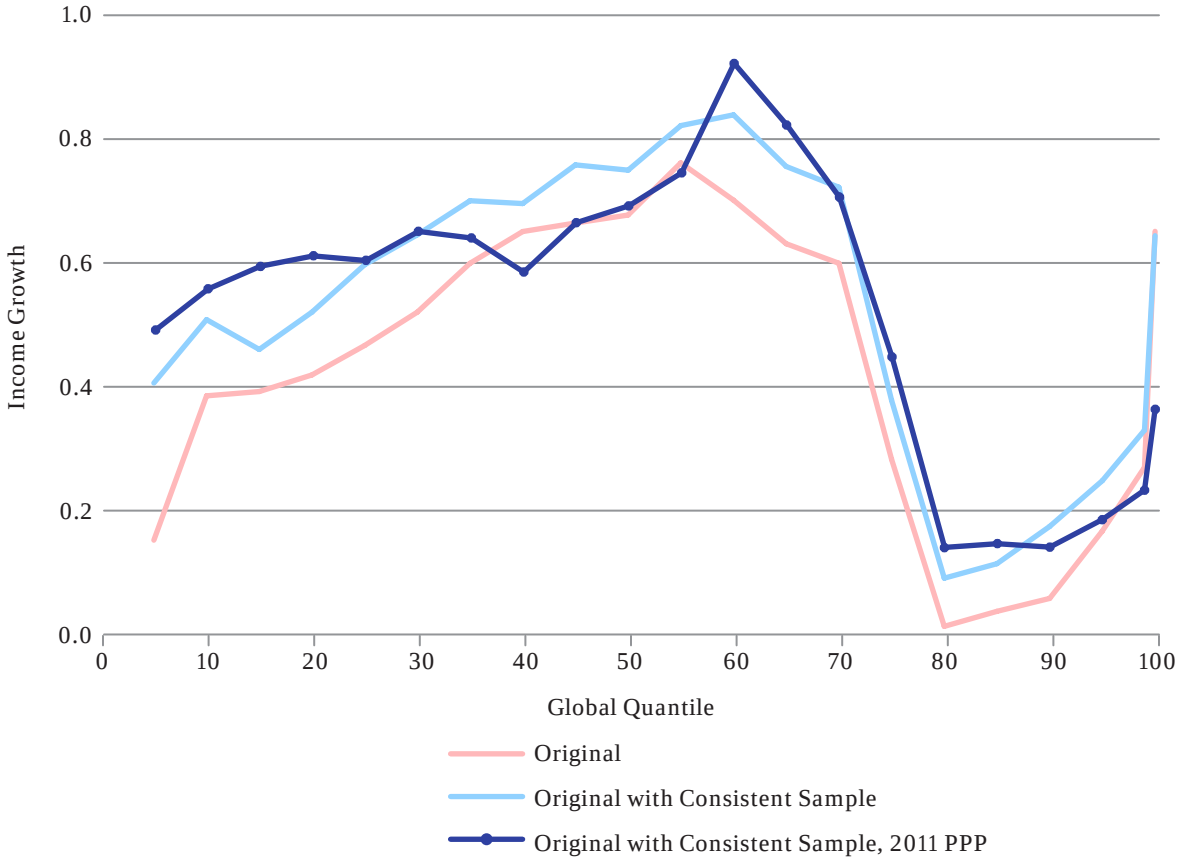


Figure 3. Growth Incidence Curve Using 2011 PPP



with data are both richer and regionally unbalanced. The move to a consistent sample suggests that the droop in the elephant's original tail shows not that the poor enjoyed little income growth between 1988 and 2008, but rather that many more poor people were surveyed in 2008 compared to 1988.

Updated Purchasing Power Parity (PPP) Data

We next adjust the elephant chart by replacing the original incomes in 2005 PPP with values in 2011 PPP.[9, 10] The updated PPP values enable us to better compare incomes across countries, and are widely considered to be more accurate than the previous values.[11] In brief, the 2011 PPP round found that incomes in African and Asian countries were under-reported by over 20 percent, changing the country composition of global ventiles and hence the computed growth rates.

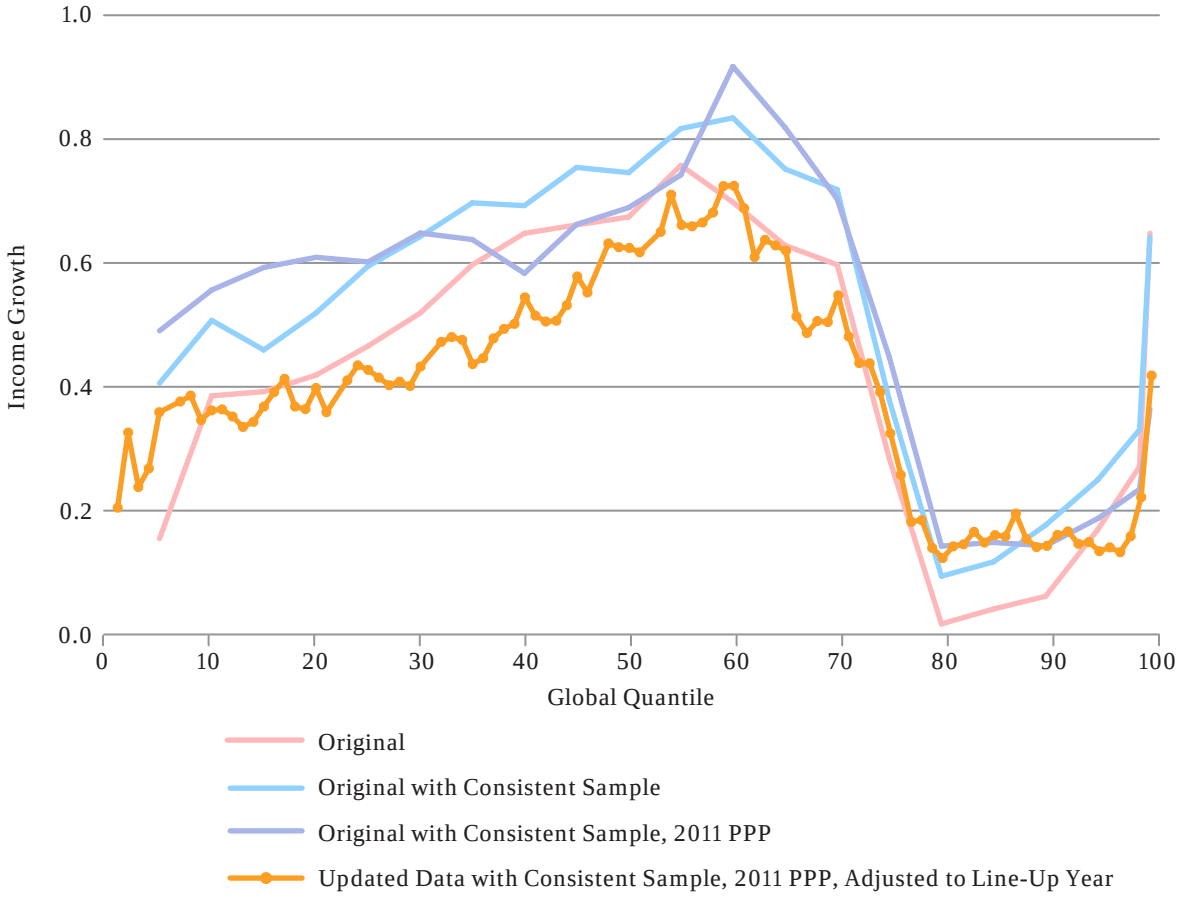
This change impacts three critical areas of the elephant, shown in Figure 3.First, the tail rises even higher, further challenging the notion that extreme poor are being left behind. Next, the entire trough rises well above

[9] A version of the elephant chart using 2011 PPPs with a changing sample is available in the appendix of Lakner and Milanovic 2016.

[10] We remove four countries from the sample due to CPI issues (Belarus, Uzbekistan) or missing PPP conversion factors (Kosovo, Zimbabwe).

[11] Deaton and Aten 2015.

Figure 4. Growth Incidence Curve Adjusted to Line-Up Years



zero, indicating that that the global upper middle class was not entirely excluded from two decades of growth. Finally, the trunk of the elephant falls, showing less dramatic growth for the global one percent.

Additional Surveys, with Percentiles, Adjusted to Line-Up Years

Our next step is to update the data, leveraging the full amount of survey data available through the World Bank's PovcalNet database today. Several countries now have surveys available for the 2008 period that were not yet public when the elephant chart was first published, enlarging our consistent sample for 1988 to 2008 from 60 countries to 67 countries.

In addition, we now have average incomes for each percentile in many countries, instead of each decile. By definition, the use of percentile incomes where possible allows us to make a far more granular distribution of people into global quantiles.

To further improve accuracy, we also adjust survey means so as to approximate actual values for 1988 or 2008. In most countries, surveys are not taken every year, and in the original work, a survey "close" to 1988 or 2008 was used. But this meant comparing a country with data from, say, 1987 with another one with data from, say, 1990 in generating the base year observations. We adjust the survey values using the growth rate of household final consumption expenditure

(HFCE) per capita where available, and GDP per capita otherwise.[12] For example, if the survey closest to 1988 in a given country was actually conducted in 1987, we would apply the growth rate of HFCE per capita from 1987 to 1988 in that country to each income value.

Finally, we calculate the income growth for each global percentile instead of each global ventile.

Figure 4 on the previous page shows the elephant curve with fully updated data.

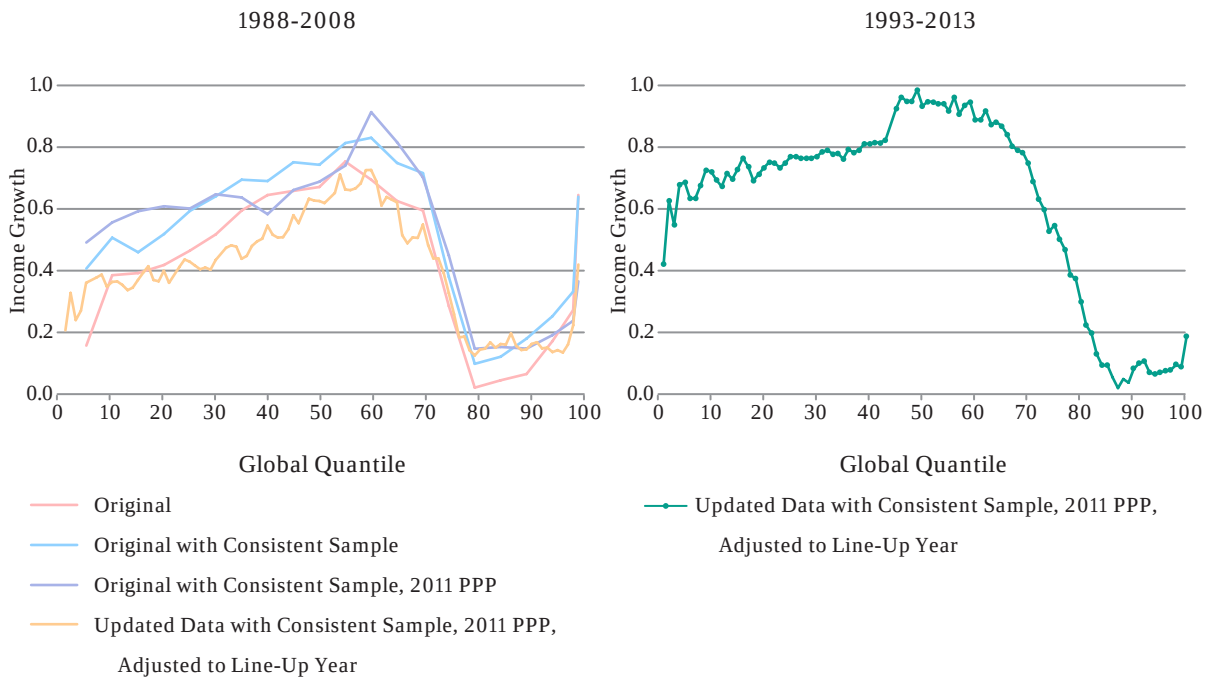
Notably, this elephant falls below our other versions for almost every quantile: The total global average income growth is lower using this data. This is largely because the Indian surveys used in the original version were from 1987 and 2009, not 1988 and 2008; adjusting mean expenditure to the line-up years lessens the total growth for India. In addition, middle-income countries with slower growth rates such as Iran, Morocco, Colombia, and Belarus have been added to the sample.

Updated Reference Period

Using the same methodology as above, we examine the elephant chart for the period 1993-2013 instead of 1988-2008. This chart is shown in Figure 5. In examining an altogether different period, we are able to include post-recession data and to expand the consistent sample to 77 countries.[13]

Two major changes stand out. First, total global growth is much higher in this period than it was in the previous period. This is partly the result of a larger sample, which now includes several additional rapidly grow-

Figure 5. Growth Incidence Curve for 1998-2008 versus 1993-2013



[12] There are 4 surveys in the 1988 round for which no national accounts data is available in WDI; for these cases, we do not make an adjustment.

[13] We include one 2009 survey for Japan taken from the UNU-WIDER World Income Inequality Database, though this falls outside the 2011-2015 window for surveys included in the 2013 benchmark year.

ing low-income countries. However, the higher global growth is also a result of the new period, indicating the sensitivity of the findings in the original elephant curve to cyclical factors at the start and end of the periods considered.

Second, the trunk of the elephant has disappeared almost entirely. The top 1 percent of the world in 1993 (about 38 million people in our sample) was comprised largely of the richest 10 percent of Americans, as well as Europeans and Japanese. Each of these groups had difficulties: The European inability to recover from the 2008 financial crisis, Japan's lost decade of economic stagnation, and the squeeze on Americans outside the top 1 percent.

Expanded Sample, Assuming Distributionally Neutral Growth

We next expand the sample of countries by drawing upon all available survey data from any year.[14] First, we create a continuous series of mean survey income or consumption for each country using growth rates from national accounts data in the World Development Indicators. We use the growth rate of household final consumption expenditure (HFCE) per capita if available, and GDP per capita otherwise.[15]

We then apply these survey means to the distribution from the closest survey, even if that survey is outside the five-year window used in other versions of the elephant chart. This allows us to include dozens of countries that did not happen to conduct a survey in the 1991-1995 or 2011-2015 periods.

There are two assumptions behind this methodology. First, we assume that expenditures recorded in household surveys grow at the same rate as household expenditures in the national accounts. Historically, national accounts income growth and survey income growth have diverged in many countries,[16] but national accounts growth rates remain our best clue about survey growth rates. The two rates seem to have been more closely correlated in recent years than they were in the past.[17]

A second assumption is that the distribution of growth over the period under consideration has been distributionally neutral. There is cross-country evidence that, on average, the growth rate of national accounts income matches the growth rate of income in the bottom two quintiles, suggesting some degree of distributional neutrality,[18] but of course this is only an average finding. For some countries, growth will surely not have been distributionally neutral. Nevertheless, we believe that the benefits of expanded coverage more than offset the simplifying assumptions we have to make; the expanded data set probably gives a better depiction of the world expenditure distribution.

Figure 6 therefore captures some changes in the within-country component of global inequality and all changes in the between-country component. It includes 159 countries that cover 97.5 percent of the global population

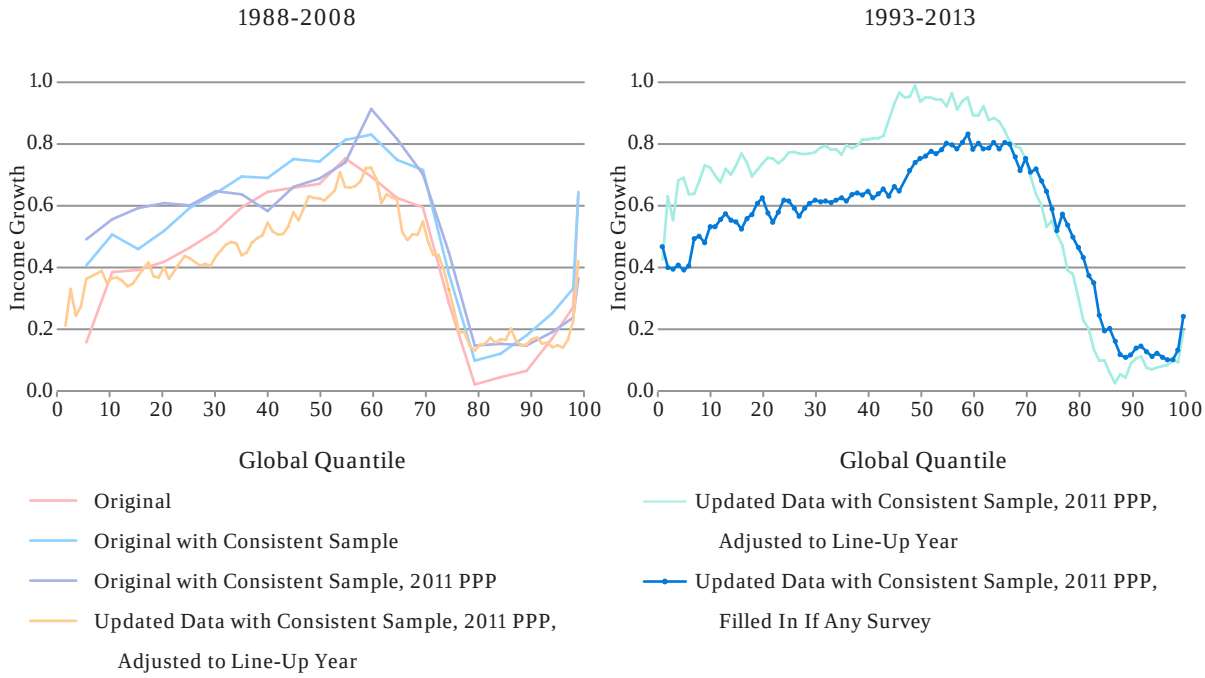
[14] We still compare only surveys of the same type—income or consumption—for any given country. [15] Before the first survey and after the last survey, we simply apply these growth rates to the first and last survey mean respectively. In between two surveys, we apply the growth rates to each survey mean separately and take the average of the two series weighted by how close the year of interest is to each survey year. This is based on a similar method used by the World Bank for extreme poverty measurement (Ferreira et. al. 2015).

[16] Deaton 2005.

[17] The magnitude of the difference between survey means and national account means remains large, as illustrated in Appendix B.

[18] Dollar et. al. 2016

Figure 6. Growth Incidence Curve with Data Filled In If Any Survey



in 2013. For these reasons, the bold blue line in Figure 6 is our preferred version of the elephant chart.

Our imputation technique affects mostly the lower half of the distribution, which contains most countries with spotty survey data. The elephant's torso falls slightly, which largely reflects the fact that the average country with limited survey data grew slower than India and China. However, even after adding so many countries to the bottom of the income distribution, we see robust growth at the tail of the elephant.

We provide a summary of the country composition of each global ventile in this version of the chart in Table A2 of the Appendix.

Distributional National Accounts Data

From this point forward, we focus on comparing our preferred elephant chart for the 1993-2013 period with distributions derived from other methodologies and data. First, we examine a growth incidence curve made with distributional national accounts data from the World Wealth and Income Database (WID).[19] Sometimes referred to as the "Loch Ness monster" chart, this graph shows remarkable gains at the top of the income distribution that far outpace gains of the top in any other version of the chart.[20]

WID constructs distributional data by examining the income recorded in tax filings and scaling up this income to match each sector of the national accounts,

[19] World Inequality Lab 2018.
[20] Sandefur 2018.

using survey data and other supplementary sources as needed.[21] This ultimately provides a measure of income before taxes and transfers that is consistent with the national accounts.

Tax data indisputably captures the incomes of top earners better than survey data does. However, the tax data presents its own challenges. First, changes in tax law mean that different forms of income are reported in the tax returns at different times, and the incentives for tax evasion shift as well. Furthermore, the relationship between a tax unit and a household is not always clear, especially as demographics and social norms on marriage change. Large assumptions are also required to allocate income from self-employment that is recorded in the national accounts but not in the tax data.[22]

Furthermore, many citizens in developing countries do not pay taxes, which necessitates extensive use of survey data as well as further assumptions about the relationship between the population captured by the survey and the population captured by the tax data. Developing countries also often have large informal economies that are not captured by national accounts; estimates place the size of the informal economy at over 50 percent of formal sector economic activity in some sub-Saharan countries.[23]

A growth incidence curve using WID data for 1993 and 2013 is pictured alongside our preferred version of the elephant chart for the same period in Figure 7. The most obvious difference between the two curves is the massive growth of the top 1 percent recorded in the WID data. But perhaps the most surprising difference is the sharply lower level of growth imputed to the global middle class.[24]

Much of the difference is due to WID's remarkable work on measuring top incomes. However, several other key differences should be emphasized. First, WID is focused on capturing income before taxes and transfers, while the data used in the elephant chart records consumption whenever possible.[25] Income inequality is intrinsically higher than consumption inequality. Many people have zero or low income, especially when young and old, but smooth their consumption over their life cycle.[26] Likewise, top earners rarely consume all of their income, so the highest consumption values are well below the highest income values. While income distributions are useful for understanding the structure of the market economy, consumption is a much better measure of actual welfare around the world.

Second, WID examines only adults aged 20 and up in order to exclude large masses of zero-income children that would skew the distribution. However, this masks potentially important differences between countries at different stages of the demographic transition. For example, adult incomes go further in rich countries with fewer children per household. More generally, income distributions are more sensitive to changes in a population's age structure over time than are consumption distributions, as individuals tend to smooth consumption over their lifetimes.[27]

[21] See Alvaredo et. al. 2016 for further details on the construction of distributional national accounts data.

[22] A recent debate over the use of US tax data between Piketty, Saez & Zucman and Auten & Splinter illustrates that these assumptions are not uncontroversial.

[23] Medina et. al. 2017.

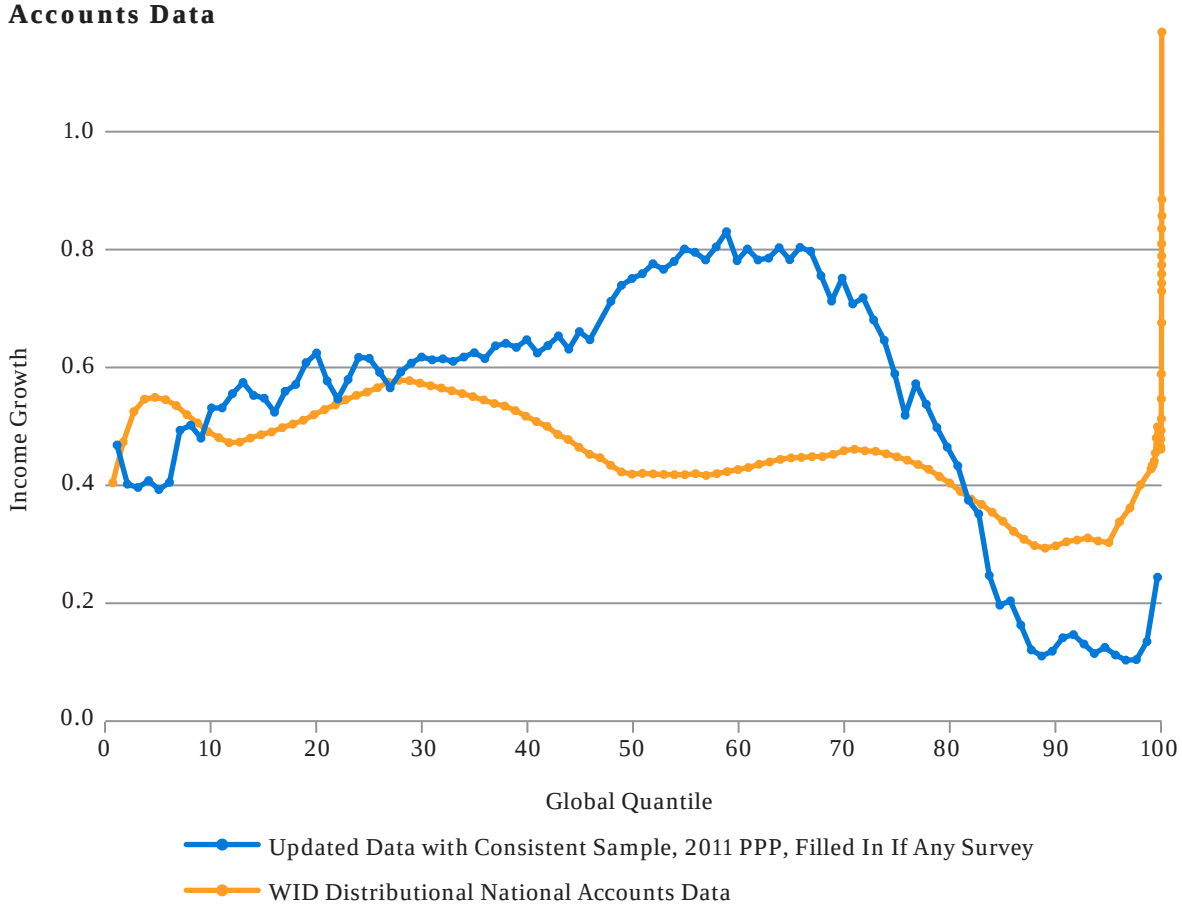
[24] Sandefur 2018.

[25] We use consumption surveys for 106 of the 159 countries included in our preferred version of the elephant chart (the blue line in Figure 7).

[26] Lee and Mason 2011.

[27] Lee and Mason 2011.

Figure 7. Growth Incidence Curve Using Survey Data versus Distributed National Accounts Data

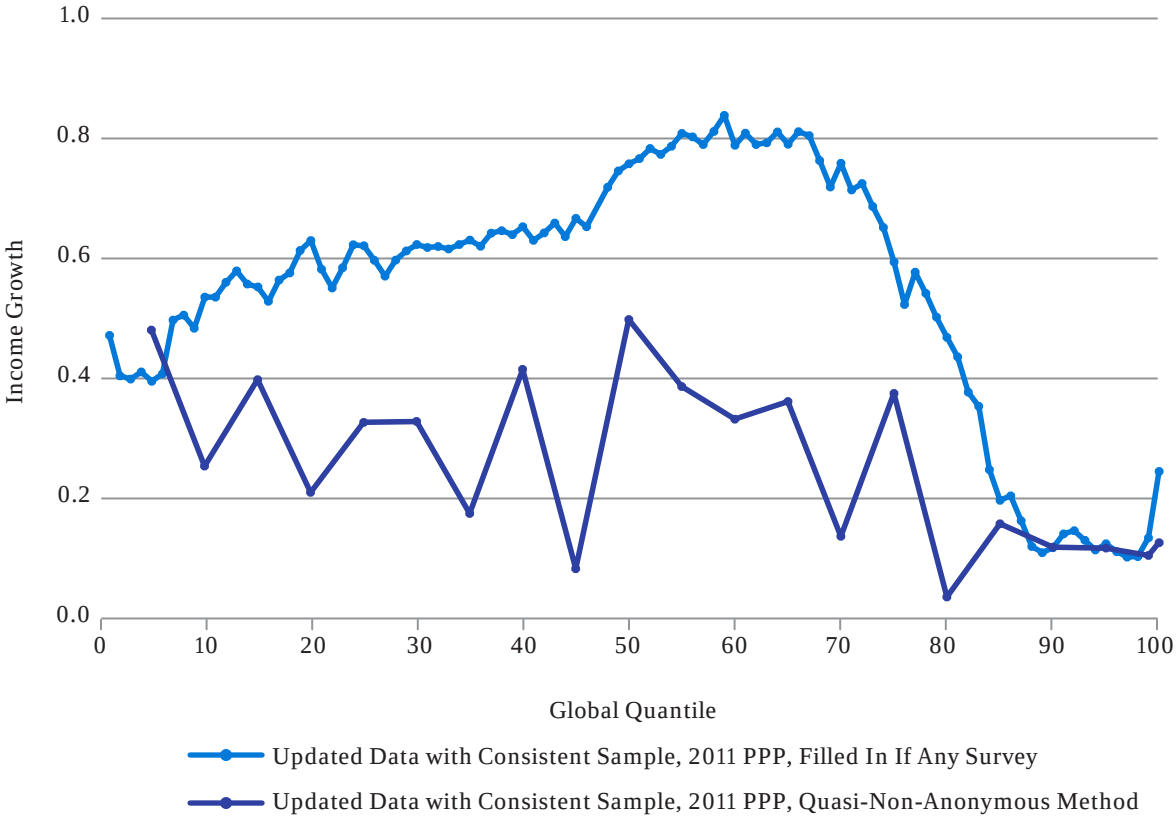


Third, the differences in the chart may reflect true differences in the underlying distributions of many countries. The WID growth incidence curve uses distributional national accounts data from a very limited number of countries as proxies for the shape of the distribution in all other countries.[28, 29] For example, the Chinese and Indian distributions are combined to make an "Asian" distribution, and the mean income per capita according to national accounts data from all other Asian countries (including Japan) is applied to

[28] For Eastern and Western Europe, a joint distribution for France, Germany, and the U.K. is used, with the bottom 90 percent of the distribution coming from France alone. For Asia, a joint distribution for China and India is used. For North America, the U.S. distribution is used. For Latin America, the Brazilian distribution is used. For the Middle East, the distribution comes from survey data in each country combined with top income data taken solely from Lebanon and applied to all other countries (Alvaredo et. al. 2017). And for Africa, the distribution comes from surveys for 25 of 48 countries combined with top income data taken solely from Cote d'Ivoire (Chancel and Czajka 2017). Full details are available in Chancel and Gethin 2017.

[29] Even in countries with full distributional data, WID does not have data for every year and assumes distributionally neutral growth in years without data. For example, their earliest data for Brazil is from 2000. This is similar to our preferred methodology but departs from the methods used for the original elephant curve, accounting for some of the differences between those charts.

Figure 8. Anonymous Growth Incidence Curve versus Quasi-Non-Anonymous Growth Incidence Curve



this distribution. This method allows the authors to use a consistent definition of income across all countries, a benefit which should not be understated. However, the vast differences between the distributions in China and India alone illustrate the perils of assuming that regional patterns in income distributions exist. All told, the WID figure uses distributional data of any sort for just 53 countries covering 65 percent of the world's population.[30]

Quasi-Non-Anonymous Methodology

Finally, we present a methodology that aligns more closely with the way the elephant chart has often been interpreted. As described earlier, the original elephant chart is anonymous, meaning that the country decile composition of each global ventile changes from the initial period to the final period. However, interpreters often suggest that that the chart shows changes in the

[30] We arrive at this figure by counting all countries with full distributional national accounts data: U.S., France, China, India, Russia, Brazil, Germany, U.K., Cote d'Ivoire, and Poland. We then add countries from the Middle East and sub-Saharan Africa for which WID uses any distributional data (tax or survey). This includes all MENA countries save Saudi Arabia, and 22 additional African countries (Chancel and Czajka 2017, Alvaredo et. al. 2017).

incomes of the specific people—or at least, the specific country deciles—that were in each ventile of the global distribution in 1988.

We can create a rough approximation of such a chart for 1993-2013 by keeping the country-decile composition of each global ventile constant over time. For example, the 50th-54th percentiles (280 million people in 1993) were comprised of 150 million Chinese from the sixth deciles of urban China and the ninth and 10th deciles of rural China , plus 90 million Indians from the ninth decile of urban India and the ninth decile of rural India, plus people from other developing countries. We computed the weighted average growth of each of these groups and plotted this as the growth rate for the ventile at the 50th percentile. This chart is shown in Figure 8 below. It allows us to say what happened to the income growth of those people who were in each ventile of the global income distribution in 1993.[31]

The shape of this chart quite different. It suggests that people who were extremely poor in 1993 actually had, on average, reasonable income growth rates. This is unsurprising given that many rural Chinese and Indians are in this group.

More generally, the figure's downward-sloping trend shows that there has been considerable global convergence: People who were poorer at the start of the 1990s had more rapid income growth than those who were richer. At the upper end of the distribution, the stagnation in Japan and Europe has meant that the global rich have not been leaving everyone else behind. Of course, these are large aggregates based on survey data, and the global rich the ultra-rich may still have had handsome income growth. This demonstrates that income and consumption surveys are highly inadequate for the task of measuring top incomes.

[31] The existing data does not permit us to truly trace the fates of specific *people* over the course of several decades, only the fates of specific country-deciles. This is why charts such as Figure 8 are were termed *quasi*-non-anonymous by Lakner and Milanovic (2013).

RE-EVALUATING THE ELEPHANT

The Tail

The quasi-non-anonymous chart in Figure 8 shows us that the people in the poorest ventile of the global income distribution in 1993 actually experienced relatively rapid income growth. This is consistent with the general observation that extreme poverty has fallen fast over this period. Chinese and Indians, whose incomes grew rapidly, make up a fifth of this group in 1993. Mexicans, Nigerians, and those in other African countries like Ethiopia make up most of the rest. Rapid growth in these countries accounts for the high growth at the left of the quasi-anonymous chart.

Every version of the chart that we have produced shows higher growth for the poor than is recorded in the original elephant chart. These findings suggest that the slumped tail on the original elephant is an artefact of the shifting sample, not a reflection of individual people's experiences.

The Torso

The most robust part of the usual narrative is that the global middle, which mostly consists of Chinese and Indians, has enjoyed massive growth over the past few decades. Even in our version of the graph, which captures 97.5 percent of global population, China and India make up 55 percent of the population falling between the 40th and 70th decile of the global distribution in 1993. However, the remainder of the global middle is largely comprised of Brazilians, Mexicans, Russians, South Africans, and others living in countries caught in a middle-income trap. Their inclusion brings down the average growth rate of this group.

The Trough

The trough of the elephant is perhaps the most misunderstood part of the graph. Despite the excellent and widely-covered work by Adam Corlett, many still appear to believe that the proverbial poor populists from the rich world inhabit the trough. Even in the original elephant chart, just 36 percent of the population that falls in the very bottom of the trough 80th-84th ventile in 1988—which has been literally highlighted[32] as Trump's base—is from the U.S., Canada, or Western Europe.[33] In fact, none of that population is from the U.S.; the U.S. middle class is actually in the 90th through 99th percentile of the global distribution.[34] Our work corroborates the findings of others that this group gained relatively little over the past two decades.

Instead, the trough of the original chart contains large populations from Japan, Eastern Europe, and Latin America.[35] Japan's lost decade and the collapse of the Soviet Union are largely responsible for the slow growth of this cohort. It is possible that incomes in the latter are overestimated in the data (before the fall of the Berlin Wall), but it is an instructive reminder of the large income losses experienced by these countries in the initial phase of transition to market-oriented economies.

The Trunk

Finally, there is no trunk in the quasi-non-anonymous chart in Figure 8. Put simply, our data suggests that average incomes in the country deciles in question—

[32] O'Brien 2016.
[33] Table A1 shows the percent of each ventile in the trough from each of these regions.
[34] The U.S. middle class is defined here as the 3rd through 8th deciles of the U.S. distribution.
[35] Corlett 2016, Freund 2016.

namely, the top decile of earners in Austria, Canada, France, Hong Kong, Japan, Luxembourg, New Zealand, Singapore, Switzerland, and the U.S,—only increased by about 13 percent from 1993 to 2013. Even using the anonymous methodology, we find less growth in top incomes than recorded in the original elephant chart.

In part, this is because the top percentile of the global population covers large numbers of people. For example, over 10 percent of the top earners in the U.S. is in this segment of the global income distribution. So, even if the top 1 percent of the U.S. population had very large income gains, the average gain for the top 10 percent would be considerably smaller.

Nevertheless, we are cautious about our conclusions on the trunk because they are not consistent with others, notably, with the ongoing work of researchers affiliated with WID. However, all interpreters of WID data must keep in mind that the income distribution, pre-tax and—transfer, will necessarily overstate the difference between the rich and the poor's level of consumption.[36] Most governments have redistributive policies in place, and statistics about pre-tax and—transfer income do not capture the effects of these programs. Further efforts to improve survey coverage at the top would be helpful. But, more importantly, we need to pose questions carefully: Are we interested in how market forces distribute income, or with the bargaining power that seems to allow some groups to capture large amounts of pre-tax income, or about how welfare of different income groups across the world is changing?

[36] Piketty, Saez, and Zucman produced post-tax disposable income series for the U.S., which is conceptually closer to consumption. Efforts to produce such data for other countries are ongoing.

CONCLUSION: THE LIMITATIONS OF THE ELEPHANT

Calculating what is happening to the global income distribution requires a number of assumptions. In this paper, we have explored how changes in periods, country coverage, price comparisons, and methodologies can change the depiction and interpretation of what is going on. The reality is that simple narratives do not capture the wide variety of country experiences. Extreme caution is advised. The careful work done by the authors of the "elephant chart" has unwittingly been used as evidence to buttress claims that on closer examination turn out to be questionable.

One example is the frequent assertion that income or consumption distribution within countries is getting worse. This may be true, but of the 146 countries that report survey data in at least two years since 2000, only 50 show a deterioration in the Gini coefficient, while the remainder have an improvement. In 50 countries, the change in the Gini averaged less than 1 percentage point in a decade.[37]

The Gini is, of course, just one metric of income distribution. It has been widely used because in normal times, changes in the Gini correlate well with changes in other income distribution metrics. But these are not normal times. For example, the Gini may stay relatively unchanged if both top and bottom incomes rise, while the middle stagnates. This seems to be happening. In France, for example, minimum wage legislation seems to have protected low-income earners. In the U.K., the poorest 5 percent in 1993 have experienced reasonable growth in incomes. It could be that these gains at the low end of the distribution are offsetting gains at the top of the distribution. If the latter is what people care about, then modest changes in Gini ratios might hide large changes in the underlying structure of incomes.

Top income growth may be extremely concerning because when income is concentrated among a very few individuals, political power tends to be concentrated as well. This can be a toxic combination, resulting in greater unaddressed monopoly power and economic rents for a few individuals or companies. This further raises questions about fairness and about whether incomes are resulting from personal effort and contribution to the national economy or from political connections. It can result in reduced competition and less dynamism and opportunity in new ventures, something that is borne out by other data.

These are legitimate concerns. In this paper, however, we are simply asking whether megatrends such as globalization or technology have shaped changes in the global distribution of expenditure over time. We believe not. At each point in the global distribution, we find examples of people who have done well and those who have not. Rural Chinese, Indians, and Vietnamese were, until relatively recently, among the poorest people in the world. They have experienced rapid growth in consumption while the extreme poor in other places have not.

Some countries, especially in Asia, have had large rapidly growing middle classes in their urban areas. Other middle-income countries have become trapped and have stagnated. The poor in some rich countries have fallen behind, while in others they have kept pace. Major economic trends—the transition in Eastern European countries, Japan's lost decades, sluggish European recovery from the Great Recession, and wage

[37] Authors' calculations based on data from PovcalNet.

stagnation in America—have driven the changes we see. Overall, we conclude that country specific policies and experiences are far more important in determining people's prospects than their initial place in the global income distribution.

We conclude with three observations.

First, we remain optimistic that the world is a better place for more and more people, and that the real global story is now one of steady improvement in global income distribution; between-country and within-country convergence both appear to be widespread in the global economy. We find no evidence yet that major structural forces in the world economy, such as globalization or technology change, are driving income distribution outcomes in an unfair way in all countries. That said, we remain concerned about prospects for the very poor in fragile states, for those in middle-income countries that seem trapped and for those in countries where income distribution is shifting rapidly to the top.

Second, we would encourage the use of national data, not global data, when attempting to explain a country's social and political trends.[38] This is especially important because most individuals evaluate their socioeconomic status by comparing themselves to their neighbors and countrymen, not to the global population.[39] Arguing about whether the middle class in one country is being out-distanced by those in another country seems to be a distraction. The world is not yet so integrated that global trends render national policies irrelevant.

Third, we advise extreme caution in interpreting top incomes and in mixing data between surveys and tax administration sources. Both have limitations, and are of different quality and relevance in different parts of the world. They also address different questions. We are only starting to develop methods that can reliably give a sense of what is really happening.

The appendix to this paper identifies who is in which part of the global distribution in 1993 and 2013. Next time you read a story about what the elephant chart shows, ask if it really reflects the actual people that make up each section of the world income distribution.

[38] Much of this work is already being done. *The New York Times*, for example, published growth incidence curves for the United States and each state individually. The 2018 World Inequality Report includes growth incidence curves for most countries with distributional national accounts data, and the 2016 World Bank Poverty and Shared Prosperity report includes growth incidence curves based on survey data for select countries.

[39] Clark et. al. 2008, Luttmer 2005.

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APPENDIX A: WHO FALLS WHERE IN THE WORLD INCOME DISTRIBUTION

The tables in this appendix are intended to illustrate the country composition of each section of the global income distribution. To that end, we break down the population that falls in each global ventile, showing what percent is from each country or region of interest. Additionally, we separate the quantile from the 96th to 99th percentile from the top 1 percent. Each column sums to 100 percent of the population in that global ventile.

Because the elephant chart is an anonymous growth incidence curve, we show the country composition separately for the start year and the end year under consideration.

As a sample of how to interpret these tables, Table A1 shows that 64 percent of the population in the top 1 percent of the global income distribution in 1988 was American.

Table A1. Composition of Global Ventiles in Original Elephant Chart, 1988-2008 (Figure 1)

Country/Region	Global Ventile																				
	p5	p10	p15	p20	p25	p30	p35	p40	p45	p50	p55	p60	p65	p70	p75	p80	p85	p90	p95	p99	p100
1988																					
United States	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	12.2%	0.0%	11.8%	23.0%	24.3%	43.6%	64.0%
United Kingdom	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.8%	2.7%	8.2%	5.4%	5.7%	3.4%	0.0%
Japan	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.9%	17.3%	24.4%	14.6%	0.0%
China	37.4%	68.5%	36.2%	51.7%	0.0%	44.3%	51.9%	53.7%	39.7%	18.1%	14.5%	40.2%	41.6%	13.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
India	28.7%	8.8%	37.0%	29.5%	56.3%	33.7%	13.3%	30.6%	30.2%	53.7%	43.0%	9.9%	0.0%	39.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Russia	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indonesia	8.1%	7.4%	7.9%	8.3%	8.5%	7.2%	11.3%	0.0%	8.3%	8.1%	2.6%	6.0%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mexico	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.1%	0.0%	0.0%	0.0%	0.0%	0.0%	4.1%	0.0%	12.1%	19.5%	0.0%	0.0%	0.0%	0.0%	0.0%
Brazil	6.6%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.0%	0.0%	0.0%	7.4%	6.9%	7.3%	6.7%	7.2%	7.0%	7.0%	0.0%	7.2%	0.0%	0.0%
Nigeria	4.2%	3.9%	4.1%	0.0%	6.2%	3.7%	0.0%	0.0%	3.3%	5.9%	4.8%	4.4%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Egypt	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	0.0%	3.5%	2.8%	5.2%	5.5%	5.1%	0.0%	2.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Eastern Europe	0.9%	0.8%	1.7%	0.0%	1.3%	0.8%	1.2%	0.0%	0.7%	1.3%	0.0%	0.9%	0.0%	1.4%	3.6%	6.5%	3.6%	1.3%	0.1%	0.0%	0.0%
Other North America	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.3%	1.3%	2.5%	2.7%	4.8%	7.0%
Other Europe	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.7%	2.5%	3.4%	8.7%	25.7%	34.5%	46.3%	37.8%	29.5%	26.4%	23.8%
Other East Asia & Pacific	0.0%	0.0%	2.6%	0.2%	7.7%	0.0%	7.2%	0.0%	4.7%	3.8%	5.8%	8.9%	6.7%	6.9%	10.5%	10.4%	7.8%	5.8%	3.7%	3.9%	5.2%
Other South Asia	9.4%	8.6%	9.1%	9.6%	14.9%	8.3%	6.7%	5.7%	8.0%	0.0%	12.2%	1.6%	12.1%	0.0%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Sub-Saharan Africa	3.1%	1.4%	0.8%	0.7%	2.0%	0.6%	1.9%	0.1%	1.6%	1.9%	1.6%	2.6%	0.8%	2.0%	0.7%	0.6%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Middle East & North Africa	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.5%	0.0%	1.9%	1.5%	0.4%	5.3%	8.6%	5.5%	10.8%	3.4%	2.0%	3.0%	0.0%	0.3%	0.0%
Other Latin America & Caribbean	1.6%	0.7%	0.6%	0.0%	3.0%	0.5%	0.8%	0.3%	1.6%	2.1%	2.2%	5.7%	7.3%	7.2%	13.7%	11.4%	6.0%	3.9%	2.4%	3.2%	0.0%
2008																					
United States	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	9.8%	10.0%	10.1%	19.1%	50.1%	63.2%
United Kingdom	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0%	4.1%	5.8%	7.6%	12.8%
Japan	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	0.0%	4.2%	17.0%	12.1%	5.3%	0.0%
China	0.0%	26.4%	23.0%	0.0%	24.2%	24.3%	25.1%	35.8%	0.0%	44.0%	44.1%	43.6%	32.5%	19.8%	48.7%	18.3%	18.9%	0.0%	0.0%	0.0%	0.0%
India	34.5%	12.3%	51.1%	45.5%	38.2%	38.4%	39.7%	22.7%	48.0%	11.7%	11.7%	0.0%	23.9%	12.2%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Russia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.7%	4.0%	4.9%	5.2%	9.1%	9.4%	4.7%	4.5%	0.0%	0.0%
Indonesia	0.0%	8.2%	7.2%	4.4%	7.5%	7.6%	7.8%	6.3%	4.6%	4.0%	7.8%	4.0%	3.2%	0.0%	4.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Mexico	0.0%	0.0%	0.0%	4.2%	0.0%	0.0%	0.0%	0.0%	0.0%	3.7%	0.0%	3.6%	3.2%	7.7%	4.1%	3.5%	3.7%	0.0%	3.5%	0.0%	0.0%
Brazil	0.0%	6.7%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	7.7%	0.0%	6.4%	0.0%	5.5%	6.6%	7.0%	12.3%	6.3%	0.0%	6.0%	0.0%	0.0%
Nigeria	17.5%	10.6%	0.0%	5.8%	0.0%	4.9%	0.0%	4.1%	0.0%	0.0%	0.0%	0.0%	4.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Egypt	0.0%	0.0%	0.0%	0.0%	0.0%	2.5%	0.0%	2.1%	3.2%	5.2%	2.6%	5.2%	2.2%	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Eastern Europe	0.0%	0.2%	0.0%	0.6%	0.0%	0.3%	0.4%	0.4%	1.0%	1.0%	1.1%	3.6%	0.8%	4.7%	4.1%	5.8%	2.6%	1.8%	0.2%	0.0%	0.0%
Other North America	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.1%	0.0%	1.1%	3.1%	5.5%	6.9%
Other Europe	0.0%	0.0%	0.0%	0.0%	0.7%	0.0%	0.1%	2.1%	0.0%	1.1%	3.6%	2.7%	3.8%	12.6%	7.3%	15.7%	27.3%	41.7%	35.4%	23.6%	16.1%
Other East Asia & Pacific	0.2%	6.9%	0.6%	7.5%	5.9%	0.5%	6.6%	7.2%	5.5%	8.9%	8.2%	11.7%	5.5%	5.5%	7.2%	7.7%	5.2%	12.2%	5.7%	5.4%	1.0%
Other South Asia	4.2%	12.0%	5.3%	19.4%	11.0%	16.2%	7.2%	9.8%	13.8%	7.2%	1.7%	6.2%	0.0%	7.5%	0.0%	0.7%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Sub-Saharan Africa	40.6%	14.7%	11.0%	11.1%	9.1%	2.9%	10.9%	5.0%	8.1%	6.9%	5.6%	4.7%	2.4%	4.7%	3.2%	1.2%	1.6%	0.0%	1.5%	0.0%	0.0%
Other Middle East & North Africa	0.7%	0.8%	0.0%	0.9%	2.7%	0.7%	1.8%	2.3%	2.4%	2.2%	4.2%	3.6%	2.2%	2.6%	1.5%	1.6%	1.8%	0.6%	0.5%	0.3%	0.0%
Other Latin America & Caribbean	2.4%	1.2%	1.8%	0.6%	0.7%	1.7%	0.3%	2.4%	5.8%	3.9%	3.1%	6.5%	6.4%	11.2%	2.5%	10.6%	6.9%	6.6%	2.6%	2.3%	0.0%

Columns may not sum to 100% due to rounding.
Row titles list upper bounds; for example p5 includes country quantiles in the 1st through 5th global percentiles. The final column includes country quantiles in the top global percentile only.
Other Eastern Europe includes Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

Table A2. Composition of Global Ventiles in the Updated Elephant Chart, 1993-2013 (Figure 6)

Country/Region	Global Ventile																				
	p5	p10	p15	p20	p25	p30	p35	p40	p45	p50	p55	p60	p65	p70	p75	p80	p85	p90	p95	p99	p100
1993																					
United States	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.8%	0.0%	14.5%	13.9%	25.1%	35.7%	50.8%
United Kingdom	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	6.5%	6.2%	4.5%	2.6%	0.0%
Japan	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	13.3%	14.4%	17.1%	24.3%
China	12.6%	37.7%	23.5%	36.9%	31.8%	16.6%	31.9%	32.1%	30.9%	51.9%	30.4%	40.1%	15.7%	27.8%	0.0%	14.1%	0.0%	0.0%	0.0%	0.0%	0.0%
India	5.2%	16.0%	27.3%	24.1%	31.1%	33.7%	31.1%	31.4%	25.6%	16.2%	24.0%	19.6%	22.4%	16.0%	11.0%	6.0%	0.0%	2.4%	0.0%	0.0%	0.0%
Russia	0.0%	0.0%	0.0%	2.8%	0.0%	0.0%	0.0%	0.0%	3.1%	0.0%	0.0%	2.7%	3.4%	5.9%	8.7%	10.8%	10.7%	2.3%	2.4%	3.0%	0.0%
Indonesia	2.8%	5.1%	8.7%	5.9%	7.3%	7.4%	5.5%	6.0%	4.2%	3.0%	3.3%	3.0%	3.6%	1.9%	1.6%	0.9%	0.5%	0.0%	0.0%	0.0%	0.0%
Mexico	13.5%	6.6%	3.4%	0.0%	3.4%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.4%	0.0%	0.0%	0.0%	0.0%
Brazil	4.1%	1.1%	2.4%	1.2%	1.8%	2.4%	1.7%	2.4%	1.9%	2.2%	2.9%	2.7%	5.2%	4.7%	6.3%	5.8%	4.7%	2.3%	1.8%	0.7%	3.1%
Nigeria	9.6%	3.0%	3.5%	2.3%	2.3%	1.9%	1.9%	1.9%	1.9%	1.1%	1.9%	1.4%	2.1%	1.5%	1.1%	0.8%	0.0%	0.0%	0.0%	0.0%	0.0%
Egypt	0.0%	0.0%	0.0%	0.0%	0.0%	2.2%	0.0%	2.3%	2.2%	2.2%	2.2%	2.0%	2.4%	2.2%	2.2%	2.2%	0.0%	0.0%	0.0%	0.0%	0.0%
Other Eastern Europe	1.5%	0.8%	1.5%	0.8%	1.4%	1.9%	1.3%	1.5%	1.4%	2.1%	1.8%	2.8%	4.8%	4.9%	7.4%	6.8%	5.3%	1.7%	1.1%	0.1%	0.0%
Other North America	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	1.1%	2.6%	3.3%	3.3%	2.8%
Other Europe	0.2%	0.9%	0.4%	0.6%	0.2%	0.8%	0.9%	1.1%	2.1%	0.9%	2.3%	3.5%	4.9%	8.4%	11.5%	18.4%	27.9%	36.0%	32.7%	31.0%	14.5%
Other East Asia & Pacific	12.5%	5.0%	7.2%	4.0%	4.8%	8.2%	4.1%	4.7%	6.0%	2.2%	7.1%	5.0%	7.2%	6.1%	8.9%	8.5%	7.6%	10.6%	8.1%	4.7%	2.5%
Other South Asia	1.1%	9.2%	5.5%	9.4%	5.1%	9.6%	9.3%	5.3%	9.4%	5.0%	9.5%	4.8%	5.6%	0.8%	9.2%	0.3%	0.2%	0.1%	0.0%	0.0%	0.0%
Other Sub-Saharan Africa	32.8%	13.9%	14.7%	9.7%	9.2%	10.2%	7.8%	7.6%	6.6%	6.0%	5.9%	5.9%	9.0%	5.6%	5.1%	5.4%	2.9%	2.1%	0.7%	0.0%	0.2%
Other Middle East & North Africa	0.1%	0.3%	0.7%	0.8%	0.7%	3.5%	3.1%	1.5%	3.1%	1.4%	5.6%	2.7%	8.0%	6.7%	10.8%	8.8%	5.7%	1.2%	2.7%	0.2%	0.0%
Other Latin America & Caribbean	4.0%	0.5%	1.3%	1.6%	0.8%	1.6%	1.5%	2.4%	1.6%	2.3%	2.9%	3.7%	5.7%	7.6%	9.2%	10.6%	9.1%	5.2%	3.0%	1.7%	1.8%
2013																					
United States	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	4.5%	0.0%	0.0%	0.0%	0.0%	4.5%	9.1%	13.6%	22.4%	34.5%	46.2%
United Kingdom	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0%	0.0%	0.9%	2.8%	3.7%	5.5%	4.7%	4.4%
Japan	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	0.0%	0.0%	3.7%	3.6%	9.1%	10.8%	6.9%	9.3%
China	0.0%	0.0%	13.9%	12.4%	11.2%	21.4%	12.5%	30.3%	11.8%	31.8%	30.2%	40.0%	37.9%	36.2%	34.4%	24.7%	23.7%	7.7%	7.1%	0.0%	0.0%
India	4.9%	26.3%	30.7%	35.1%	35.0%	32.3%	36.6%	26.9%	32.7%	23.3%	22.0%	17.5%	13.6%	11.2%	6.2%	7.5%	2.8%	1.2%	2.1%	0.0%	0.0%
Russia	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.4%	0.8%	1.2%	2.1%	3.7%	5.4%	7.4%	7.0%	5.8%	3.7%	2.6%	4.2%
Indonesia	0.7%	3.2%	6.6%	6.9%	6.9%	5.9%	6.5%	5.3%	5.6%	5.0%	4.3%	3.6%	3.2%	2.8%	2.5%	1.4%	1.1%	0.3%	0.3%	0.0%	0.0%
Mexico	10.6%	10.5%	0.0%	3.5%	3.5%	0.0%	0.0%	0.0%	0.0%	3.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	3.6%	0.0%	0.0%	0.0%
Brazil	1.8%	0.6%	0.6%	1.2%	0.6%	1.1%	1.3%	1.6%	2.6%	1.8%	2.9%	3.5%	4.1%	5.3%	6.5%	7.6%	5.8%	4.1%	2.9%	3.0%	2.8%
Nigeria	15.4%	9.3%	5.5%	3.5%	3.5%	2.3%	2.2%	1.4%	1.6%	1.5%	1.0%	1.0%	0.5%	0.5%	0.0%	0.5%	0.0%	0.0%	0.0%	0.0%	0.0%
Egypt	0.0%	0.2%	0.8%	1.0%	1.5%	2.1%	3.1%	3.0%	3.6%	2.5%	2.5%	1.5%	1.3%	1.0%	0.5%	0.3%	0.3%	0.3%	0.0%	0.0%	0.0%
Other Eastern Europe	0.8%	1.3%	1.4%	1.7%	1.7%	1.4%	1.5%	1.3%	1.6%	1.4%	2.1%	2.3%	3.6%	4.4%	5.5%	4.5%	2.9%	1.4%	0.4%	0.1%	0.0%
Other North America	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.5%	0.0%	0.5%	0.5%	1.5%	3.0%	4.5%	2.6%
Other Europe	0.0%	0.8%	0.5%	0.7%	0.5%	0.6%	1.0%	1.6%	2.6%	1.7%	2.4%	3.2%	4.8%	6.6%	10.5%	13.6%	17.1%	27.5%	28.5%	30.5%	21.1%
Other East Asia & Pacific	17.5%	7.8%	6.9%	4.0%	4.3%	5.8%	4.9%	3.6%	6.0%	4.1%	4.7%	5.9%	4.4%	5.3%	9.1%	5.1%	8.0%	8.8%	7.8%	9.4%	5.0%
Other South Asia	0.5%	4.7%	8.9%	10.6%	11.6%	11.1%	12.6%	10.1%	11.3%	7.0%	6.5%	5.3%	3.9%	3.2%	2.0%	0.9%	0.7%	0.7%	0.0%	0.1%	0.0%
Other Sub-Saharan Africa	44.4%	32.8%	21.8%	17.1%	15.5%	13.0%	11.6%	9.4%	11.3%	7.6%	6.0%	5.4%	4.4%	4.0%	3.3%	1.9%	2.3%	1.1%	0.8%	0.6%	0.8%
Other Middle East & North Africa	0.3%	0.9%	1.0%	1.1%	2.6%	1.3%	3.5%	3.2%	5.3%	4.7%	5.7%	4.8%	8.6%	7.3%	6.4%	6.4%	5.4%	4.1%	1.4%	1.0%	0.6%
Other Latin America & Caribbean	3.1%	1.7%	1.4%	1.2%	1.7%	1.8%	2.3%	2.4%	3.5%	3.6%	4.3%	4.6%	6.0%	6.9%	7.8%	8.6%	7.0%	5.7%	3.2%	2.2%	3.0%

Columns may not sum to 100% due to rounding.
Row titles list upper bounds; for example p5 includes country quantiles in the 1st through 5th global percentiles. The final column includes country quantiles in the top global percentile only.
Other Eastern Europe includes Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Tajikistan, Turkmenistan, Ukraine, and Uzbekistan.

APPENDIX B: ONGOING ISSUES WITH SURVEY MEASUREMENT OF INCOME AND CONSUMPTION

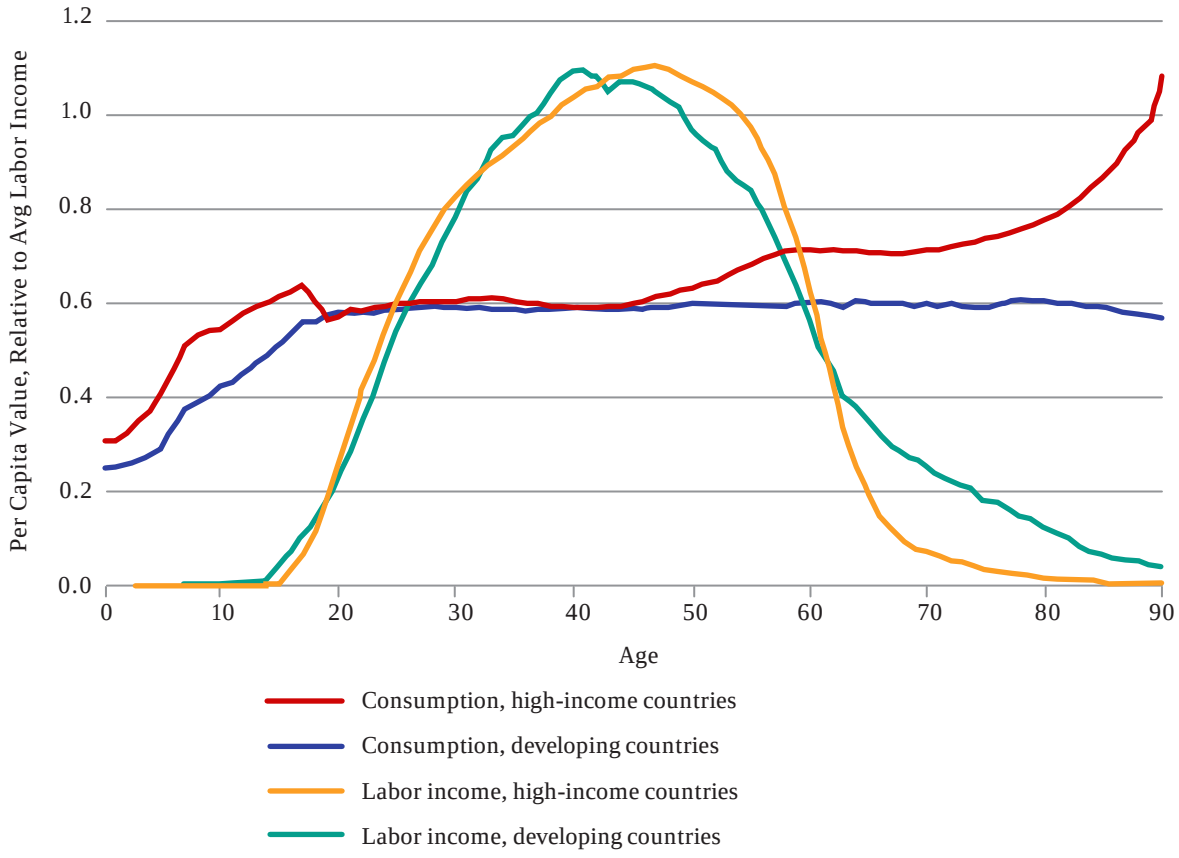
In this appendix, we note some ongoing issues with the survey data used for our preferred version of the elephant chart (in Figure 6). These issues should be kept in mind when interpreting any results from such sources.

Combining Income and Consumption

Any attempt at global coverage using survey data necessitates the combined use of both income and expenditure surveys based on what is available in each country. In our preferred version of the elephant chart, we use consumption data for 106 countries and income data for 53 countries.

As detailed in the main text, income and consumption are very different concepts. Individuals smooth consumption over their lifetimes; the very old and the very young tend to have little to no income. For this reason, the income distribution is inherently less equal than the consumption distribution. Figure B2 below, reproduced from Lee and Mason (2011), illustrates the difference between income and consumption over the life cycle in high-income and developing countries.

Figure B1. Average Consumption and Labor Income for Six High-Income and Six Developing Countries



High income countries include Austria, Finland, Germany, Japan, Sweden, and the United States. Developing countries include China, India, Indonesia, Kenya, Nigeria, and the Philippines. Averages of NTA age profiles for indicated countries.

For select Eastern European countries that have conducted an income and an expenditure survey in the same year, it is possible to directly compare the income and consumption distributions. The Gini coefficient of income was more than ten points above the Gini coefficient of consumption in Armenia, Kyrgyzstan, Serbia, and Romania in 2013.[40]

Survey Methodology

Even in countries with consumption surveys, the final results can vary widely due to the specific questions included in the survey and the specific method used to construct a consumption aggregate. This makes it difficult to compare surveys conducted in different countries, or even surveys conducted in the same country in different years. Beegle et. al. (2012) conclude that just 27 of 48 countries in sub-Saharan Africa conducted two comparable surveys between 1990 and 2012, largely due to changes in survey methodology between survey rounds.

Key methodological decisions include the length of the recall period, the use of an interviewer versus a diary, the number of consumption items included in the questionnaire, the method (if any) used to calculate the rental value of owner-occupied homes, and the imputed value of asset depreciation.[41] While these questions arise for every consumption survey, we highlight below some major methodological choices in India, Nigeria, and China that have a large impact on our results.

In India, we use the National Sample Survey (NSS). Controversially, this survey uses a 30-day recall period for food rather than the more commonly used seven-day recall period. This imposes a downward bias on reported consumption, as respondents tend to forget food consumption quickly. By comparison, a separate Indian survey module that uses a mix of seven, 30, and 356-day recall periods estimates the 2011 poverty rate at 12.4 percent rather than 21.2 percent.[42] Furthermore, there is evidence that the NSS underestimates food consumption in India due to the omission of food consumed outside the home.[43] Finally, the rural portion of India's survey does not include an imputation for owner-occupied housing, which further reduces the reported consumption.

In Nigeria, our most recent data is the 2009/2010 Household National Living Standards Survey (HNLSS). We follow PovcalNet in our decision to use this survey, but there is reason believe that the HNLSS may have underestimated consumption, especially in urban areas.[44] The HNLSS reported markedly lower consumption than the 2010 General Household Survey-Panel (GHS), which used a recall method instead of a diary method as well as different procedures for field staff. The HNLSS reports a poverty rate of 46 percent and a Gini coefficient of 41, while the GHS reports a poverty rate of 35 percent and a Gini coefficient of 36.[45]

Finally, in China, we are cautious about comparing surveys over time due to a major methodological change in that occurred in 2013. The 2013 survey, unlike previous surveys, includes the imputed rental value of owner-occupied housing in the consumption aggregate. While the reported extreme poverty rate in China fell

[40] World Bank 2016.
[41] Deaton and Zaidi 2002, Beegle et. al. 2012.
[42] World Bank 2016.
[43] Smith 2013.
[44] World Bank 2013.
[45] World Bank 2013.

by 4 percentage points between 2012 and 2013, about half of that change (2 percentage points) is attributable to changes in the survey methodology.[46]

Spatial Price Variation

Purchasing power parity (PPP) conversion factors aim to capture price differences between different countries. However, they make no attempt to account for price differences between different areas of the same country. Prices in urban areas tend to be much higher than prices in urban areas.

There are three countries, however, where the World Bank uses separate PPP conversion factors for urban and rural areas: China, India, and Indonesia. In addition, separate urban and rural CPIs are used to capture price differences between the survey year and the PPP year in China and India. Table B1 below, reproduced in part from Ferreira et. al. 2015, shows the PPP conversion factors used in each country.

Table B1: National, Urban and Rural 2011 PPP Conversion Factors

Country	2011 PPP Conversion Factor		
	National	Urban	Rural
China	3.70	3.90	3.04
India	14.98	15.7	12.91
Indonesia	4091.9	4360.5	3666.16

This tells us that urban prices are 28 percent higher than rural prices in China, 22 percent higher in India, and 19 percent higher in Indonesia. The scale of within-country price variation in these three countries suggest that further efforts to measure spatial price variation, or at the very least to differentiate between urban and rural prices, would have a large impact on income and consumption estimates.

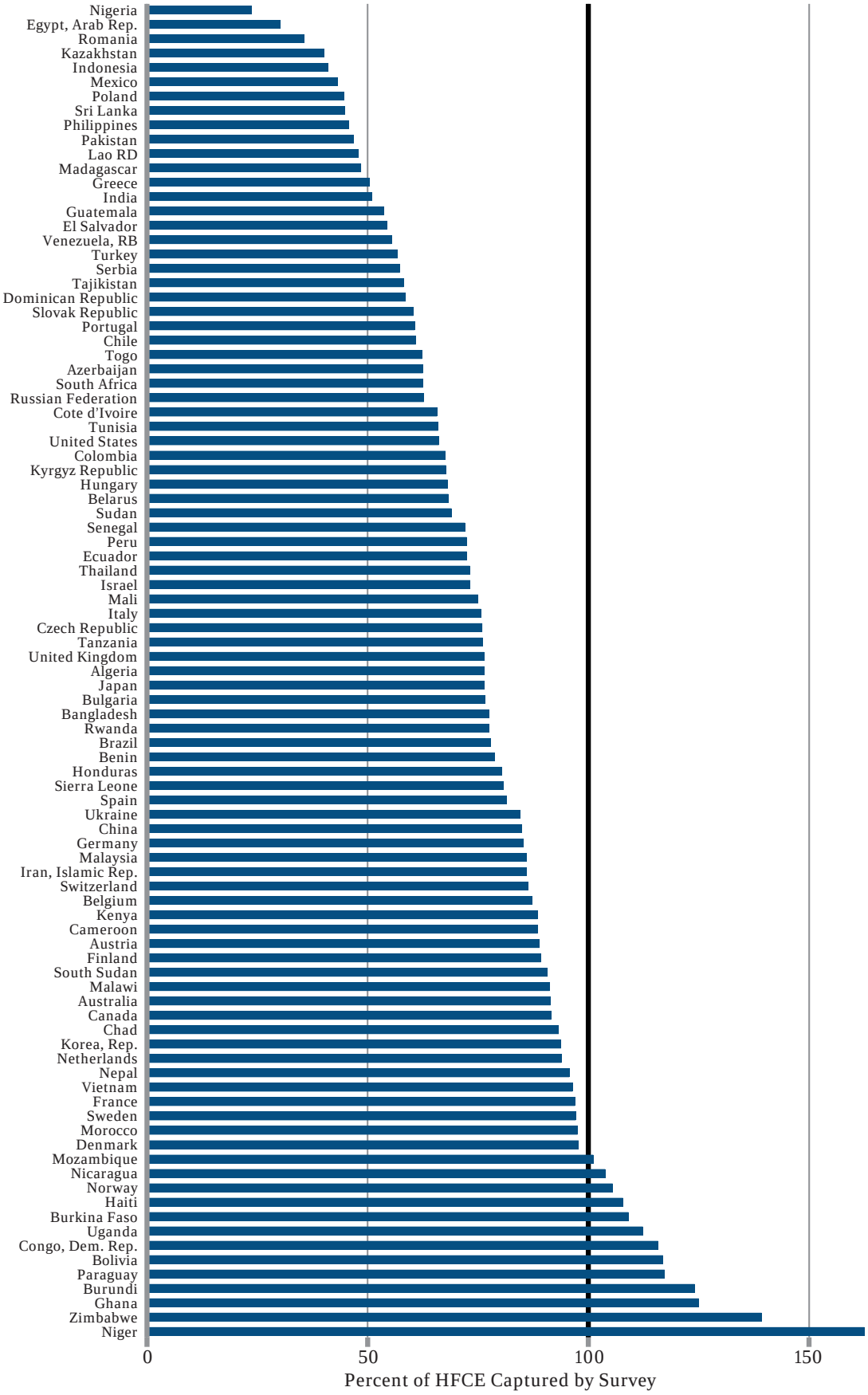
Gap Between Surveys and National Accounts

The total consumption captured by survey data often falls far below household final consumption expenditure, which is the private consumption component of national accounts data. There are several reasons for this, including the different price deflators used for surveys and national accounts, different definitions of income (most notably the exclusion of consumption by non-profit institutions serving households from survey data), and survey nonresponse at the top of the income distribution.[47]

HFCE exceeds survey consumption in 109 of 132 countries that conducted a survey between 2000 and 2016 and have HFCE data available.[48] In Figure B2, we show the percent of HFCE captured by the survey for each country.

[46] World Bank 2016.
[47] Deaton 2005, Nolan et. al. 2016.
[48] We use the most recent survey available for countries that conducted multiple surveys in this period.

Figure B2. Percent of HFCE Captured by Survey



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